

**MINISTRY OF HEALTH
DEPARTMENT OF MEDICAL RESEARCH
(LOWER MYANMAR)**



**DIMENSIONS OF MALARIA RESEARCH:
A COLLECTION OF ABSTRACTS (2001-2011)**



Golden Jubilee Publication

The Government of The Republic of The Union of Myanmar
Ministry of Health
Department of Medical Research (Lower Myanmar)

DIMENSIONS OF MALARIA RESEARCH: A
COLLECTION OF ABSTRACTS (2001-2011)

Edited by

Ye Htut, Pe Than Htun, Khin Thet Wai & Tin Oo

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ACRONYMS

DHP	Department of Health Planning
DMR (CM)	Department of Medical Research (Central Myanmar)
DMR (LM)	Department of Medical Research (Lower Myanmar)
DMR (UM)	Department of Medical Research (Upper Myanmar)
DOH	Department of Health
DSGH	Defence Services General Hospital
DSMA	Defence Services Medical Academy
DTM	Department of Traditional Medicine
IM (1)	Institute of Medicine (1)
IM (2)	Institute of Medicine (2)
MHRC	Myanmar Health Research Congress
MHSRJ	Myanmar Health Sciences Research Journal
MMC	Military Medical Conference
NMCP	National Malaria Control Programme
UM (1)	University of Medicine (1)
UM (2)	University of Medicine (2)
UOP	University of Pharmacy
VBDC	Vector Borne Diseases Control
WHO	World Health Organization

FOREWORD

Malaria is one of the major public health problems in Myanmar. Various kinds of basic, applied, and health systems research are conducted in support of National Malaria Control Program, either by internal or external collaboration with universities, research institutions, teaching hospitals, non-governmental organizations, and funding agencies. Due to its concerted efforts, Department of Medical Research (Lower Myanmar) has been recognized as WHO Collaborating Center for Research and Training in Malaria in Myanmar since September, 2003. The advancement in research techniques and further capacity strengthening efforts continue during the decade, looking forward to sustainability of the Center.

The structure of this collection highlights the different dimensions of malaria research in 5 sections: *Section 1-* Therapeutic efficacy, biochemical, immunological, and clinical studies; *Section 2-* Diagnostics: drug resistance and molecular studies; *Section 3-* Pharmacokinetics and traditional medicine; *Section 4-* Public health, health economics and social science; and *Section 5-* Malaria vector studies. This collection is aimed to attain the continuum of previous publication that has covered the period between 1990 and the year 2000. The core group of four members for this publication is led by Dr. Ye Htut, Deputy Director General (retd.), DMR (LM) cum Director, WHO Collaborating Center for Research and Training in Malaria in Myanmar as well as the member of the Technical Support Group (TSG) for malaria formed by WHO, Country Office, Myanmar. Following the preliminary meeting in August, 2012, the core group initiated for collection of *abstracts* by scanning through the internet, personal communications, and document reviews.

Currently, DMR (LM) participates in operational research component of Myanmar Artemisinin Resistance Containment (MARC) and an appropriate referencing has been done from the past research works. Both national and international publications arising out of the laboratory and field research are beneficial to the scientific community. Moreover, the information collated may be useful in planning and programming of resources allocation for malaria prevention and control. This collection is published as the commemoration of Golden Jubilee Event of DMR (LM). In addition, the value of this publication is embedded in way forward to narrow the gap between knowledge production and translation, thus enhancing utilization of research results.

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Special thanks go to all contributors and eminent scientists dedicated to malaria research especially from the National Malaria Control Programme, Department of Health, personnel from Departments of Medical Research (Upper and Central Myanmar), Universities of Medicine, University of Pharmacy, Department of Medical Science, Department of Traditional Medicine, Clinical Research Units affiliated to DMR (LM) and all staff from Central Biomedical Library of DMR (LM).

The editors would also like to extend their gratitude to all those who have shared their thoughts, opinions, and ideas for this special collection and due credit goes to Daw Moe Thida, Research Officer, Epidemiology Research Division, DMR (LM) and U Sein Thaung, Research Officer, Medical Entomology Research Division, DMR (LM) for their untiring efforts leading to successful development and production of this special commemorative publications focusing malaria.

INTRODUCTION

Between the period of 2001 and 2011, malaria research activities mainly focus on monitoring of therapeutic efficacy of malaria parasites (*P. falciparum* and *P. vivax*) to different combinations of antimalarials in high risk endemic regions, *in vivo* monitoring of drug resistant vivax malaria to chloroquine, molecular analysis of drug resistant malaria, determination of re-infection and recrudescence in falciparum malaria, screening of G6PD deficiency, effects of insecticide treated nets on disease burden of malaria in general and malaria in pregnancy, laboratory-based quality control testing of malaria rapid diagnostic tests, the application of Geographical Information System (GIS) for spatial distribution of malaria vectors and evaluation of insecticide susceptibility status, vector bionomics in malaria transmission, barriers to gene flow in a major malaria vector, the assessment of pharmacokinetics of artemisinin-based combinations (ACT), quality assurance of antimalarials used by public sectors, and networks of early diagnosis and prompt treatment (EDPT) in suspected malaria in the rural community.

Out of 236 abstracts in this collection, 91 abstracts represent therapeutic efficacy studies, biochemical, immunological and clinical studies, followed by 76 studies related to public health, health economics and social science, 40 studies related to diagnostics, drug resistance and molecular techniques, 19 studies in traditional medicine and pharmacokinetics and 10 malaria vector studies. Operational research studies dominated focusing prevention, especially the use of insecticide treated nets (ITN) and enhancement of control measures, especially EDPT beyond hospital/field based clinical studies. Studies using molecular techniques to confirm drug resistance were also included, coupled with benefits to the National Malaria Control Programme (NMCP). When categorized by *type of research*, there were 85 abstracts representing applied research followed by basic research (75) and 76 studies related to health systems research. In terms of *source*, 168 were extracted from conference proceedings, 6 abstracts from international publications and 22 abstracts from national publications and reports respectively. Abstracts extracted from doctoral dissertations and theses for Master Degree (both national and international) were 40 in number.

**SECTION-1 THERAPEUTIC EFFICACY, BIOCHEMICAL, IMMUNOLOGICAL
AND CLINICAL STUDIES**

2001

TITLE- 1

Comparing the efficacy and tolerability of coartem (fixed dose artemether-lumefantrine combination) with oral quinine in treatment of recrudescent uncomplicated falciparum malaria patients returning from endemic areas

AUTHOR (S) and AFFILIATION:

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¹DSMA, Ministry of Defense; ²Parasitology Research Division, DMR (LM)

SOURCE:

MHRC Programme and Abstract, 2001; pp. 2

ABSTRACT:

Coartem (benflumethol) a fixed combination of artemether 20mg and lumefantrine 120 mg has been reported to be highly effective and were tolerated in uncomplicated multidrug resistant falciparum malaria. Lumefantrine is a racemic fluorine derivative belonging to the aryl amino alcohol group like quinine, mefloquine and halofantrine. To compare the efficacy and tolerability of oral coartem (benflumethol) with oral quinine sulphate (MPF), sixty Myanmar male adults who contracted malaria from endemic areas and presenting with recrudescences and slide positive acute uncomplicated falciparum malaria were randomized to the two treatment regimens at the Clinical Research Unit (Defence Services General Hospital, Mingaladon) between April 2001 and October 2001. In this preliminary interim report, 14 patients received coartem and 31 patients received quinine sulphate tablet. Parasite clearance time was 71.9 ± 27.8 and 75.9 ± 27.8 hours; fever clearance time was 14.4 ± 18.5 and 18.4 ± 4.9 hours. Late treatment failure was 7.12% and 12.9%, and early treatment failure was 28.6% and 41.9% respectively in two groups. Reduction of parasite biomass was not different on day 1 (more than 50% parasitaemia persisted in 35.7% and 35.5% of patients in coartem and quinine sulphate groups). Difference, however, was marked after day 2. In coartem group, there was no patient with more than 50% parasitaemia on day 2, nor more than 25% on day 3. Residual parasitaemia was seen only in one patient on day 5 and all cleared on day 6. In the quinine group, 9% of patients had more than 50% parasite count on day 2 and 6% had more than 25% on day 3, the residual parasitaemia was 12.6% up to day 6, and cleared on day 7. There were no serious side effects or ECG changes noted in both groups. This preliminary analysis shows some usefulness of coartem in treating recrudesced uncomplicated falciparum malaria in adults.

TITLE- 2

The efficacy and compliance of artesunate and sulphadoxine-pyrimethamine combination in management of uncomplicated falciparum malaria

AUTHOR (S) and AFFILIATION:

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¹Parasitology Research Division, DMR(LM); ²Medicine Department, IM (2);

³Clinical Research Unit, North Okkalapa General Hospital; ⁴Bago District Heath Department; ⁵VBDC Team, Yangon Division

SOURCE:

MHRC Programme and Abstract, 2001; pp. 27

ABSTRACT:

The rapid reduction of the parasite biomass over the first few days by the artemisinin derivative followed by the residuum of parasites being exposed to maximum concentrations of the more slowly eliminated antimalarials trend has now been used to prevent development of drug resistant strain. Artemisinin and mefloquine combination is the ideal drug combination, but the high cost of these drugs make limitation from economic aspect to use widely. To solve this problem, artesunate and sulphadoxine-pyrimethamine combination trial has been evaluated at Indagaw Rural Health Centre, Bago Division and Clinical Research Unit, North Okkalapa General Hospital during 2000-2001 malaria season. Most of the patients attended at CRU were living in North Okkalapa Township, some from Shwe Paukkan, North Dagon and Mingaladon. They contracted malaria mainly from Bago Division, especially from Phaung Gyi area (54.3%) and 20% of patients contracted from Rakhine State, 17% from Kayin State and the rest from other States and Divisions. Artemisinin and mefloquine combination has been used as control group. Artesunate 200mg was given on day 1, followed by 100 mg daily on next 4 days in divided doses (12 hourly). Three tablets of sulphadoxine 500 mg-pyrimethamine 25mg were given on day 1 in test group and mefloquine 750 mg was also given on day 1 in control group. A total of 29 patients were finished to study in artesunate and sulphadoxine-pyrimethamine groups. Four patients recrudesced before day 28 in this group. In control group, 31 patients were completed to study. In which one patient developed late treatment failure on day 28. Patients' compliance was good and side effects were few and self limiting. Artemisinin and sulphadoxine-pyrimethamine combination is an effective alternative with low cost in treating uncomplicated falciparum malaria at rural health centre.

TITLE- 3

A double blind randomised controlled study on efficacy and tolerability of oral quinine sulphate (from Ministry of Industry-1) in uncomplicated falciparum malaria patients

AUTHOR (S) and AFFILIATION:

Marlar Than¹, Aung Zaw Oo¹, Kyan Aung², Thaw Zin³, Myat Phone Kyaw⁴,
Aye Yu Soe¹ and Kyi Kyi Tin¹

¹CRU, Malaria, DSGH; ²Pharmacology Department, DSMA;

³Pharmacology Research Division, ⁴Parasitology Research Division, DMR (LM)

SOURCE:

MHRC Programme and Abstract, 2001: pp. 47

ABSTRACT:

Currently used quinine sulphate tablets from Myanmar Pharmaceutical Factory (OS-MPF) have been prepared from imported cinchona powder from Indonesia. Now, quinine has been extracted from two varieties of locally grown cinchona plants obtained from Thandaungyi area and proven by standard purification tests to be of high quality. Ministry of Industry-1 (Myanmar Pharmaceutical Factory) has produced a new quinine sulphate tablet (QS-MOI-1/MPF) from this locally grown cinchona. *In vitro* efficacy tests and *in vivo* study on *Plasmodium berghei* infected rats have shown it to be effective. This local formulation of quinine sulphate (QS-MOI-1/MPF) is compared to the standard quinine sulphate from MPF (QS-MPF) in a hospital based, double-blind randomised controlled study and its efficacy, tolerability and adverse effects on *P. falciparum* infected malaria patients in the military population is studied at the Clinical Research Unit-Malaria (Defence Services General Hospital) from July to November 2001. Pharmacokinetic parameters are also carried out in parallel on the patients to determine whether any differences in outcome are related to differences in bioavailability. A total of 84 slide positive uncomplicated falciparum malaria patients are randomised by means of coded sealed envelopes to two regimens (42 patients in each group): 1) QS-MOI-1-MPF and 2) QS-MPF. Quinine sulphate (300 mg) 2 tablets, 3 times a day for three days in both groups. 56 patients have been included in the trial so far and 36 patients have completed the 28 days observation period, out of which, adequate clinical response (ARC = 13; 36.1%), late treatment failure (LTF) = 23 (63.8%) and early treatment failure = 1 (2.7%). No clinical, haematological, and biochemical adverse events or ECG changes were noted. The trial has not been decoded yet, but from the above data, it can be concluded that two forms of quinine sulphate do not have many early treatment failures and have no serious adverse effects when decoded at the time of presentation, correlation will be made between the responses and pharmacokinetic results on bioavailability.

TITLE- 4

A double blind comparative trial of two dosage regimens of artesunate suppository in combination with oral mefloquine in severe falciparum malaria

AUTHOR (S) and AFFILIATION:

Marlar Than¹, Zay Soe¹, Aung Zaw Oo¹, Aye Yu Soe¹, Kyi Kyi Tin¹, Khin Nyo and Myat Phone Kyaw²
¹CRU, Malaria, DSGH; ²DMR (LM)

SOURCE:

47th Myanmar Medical Conference, Programme and Abstract, 2001; pp. 71

ABSTRACT:

To confirm the usefulness of artesunate suppository (Plasmotrim rectocaps) in severe falciparum malaria including patients in unrousable coma, at the Clinical Research Unit (malaria) DSGH, in Mingaladon and at District No. 1 Military Hospital in Myitkyina, a Prospective double blind randomized controlled study was carried out between May 1998 and April 2000. A total of 100 patients with severe falciparum malaria (WHO definition) with positive asexual parasitaemia in the peripheral blood film, were assigned to two dosage regimens. In regime 1, 55 patients received 1200 mg of artesunate (6-rectocaps) over 3 days. In regime 2, 45 patients received 800 mg of artesunate (4-rectocaps) over 3 days. Oral mefloquine 1250 mg into divided doses was given on the fourth day in both regimes. *Pretreatment characteristics* in the two groups included cerebral malaria (32 and 25), anaemia (11 and 10), jaundice (6 and 4), hyper-pyrexia (3 and 2), hyperparasitaemia (1 and 2), in groups 1 and 2, respectively. The patients with single severe manifestations were 42 and 34, patients with 2 to 3 severe manifestations were 11 and 8, and those with more than 3 manifestations were 3 and 2 respectively. *Results:* In regimen 1 and 2 parasite clearance times were 59.32±27.5 and 50.4±28.2 hours. Fever clearance times were 34.6±46.0 and 33.83±39.44 hours. Mortality rates were 7.2% and 2.2%. Patients' compliance was satisfactory and there were no adverse effects. The 28 day cure rates were 100% and 91.1% respectively. *Conclusion:* Artesunate suppositories are well tolerated, rapidly clear patients in severe falciparum malaria and are effective even at a low dosage of 800 mg given over 3 days. The addition of mefloquine ensures a satisfactory cure rate over 28 days.

TITLE- 5

Biochemical profile of Myanmar patients with *Plasmodium falciparum* malaria infection

AUTHOR (S) and AFFILIATION:

Aung San, Hla Aung, Min Swe and Win Mar

SOURCE:

47th Myanmar Medical Conference, Programme and Abstract, 2001; pp. 85

ABSTRACT:

Introduction: Malaria is one of the most prevalent world-wide infections causing major health problem in almost every tropical country where the disease is endemic. Myanmar is no exception. Thus, some biochemical changes in *P. falciparum* malaria were done in this study. *Aim of this study:* To establish the changes in biochemical profile of Myanmar patients with *P. falciparum* malaria infection, without complications. *Objectives of this study:* To determine the level of serum total cholesterol, serum lactate dehydrogenase enzyme (serum LDH), serum alkaline amino transferase (ALT), previously glutamate pyruvate transaminase (GPT), and serum bicarbonate (HCO-3) in Myanmar patients with *P. falciparum* malaria infection, without complications; To compare the above data between apparently healthy normal Myanmar persons and Myanmar patients with *P. falciparum* malaria infection, without complications. *Materials and Methods-Materials:* Normal subjects- In this study, blood and urine samples were taken from 30 apparently healthy persons who donate blood to blood bank, Mandalay General Hospital. The age range of normal subject was 20-45 years, of both male and female. Subjects with *P. falciparum* malaria infection without complication were recruited. In the present study, 30 patients with malaria infection without complications were selected from the malaria campaign, Mandalay and from Mandalay General Hospital, *P. falciparum* malaria infection was confirmed by malaria parasite (MP) examination. Blood samples were taken from those patients during the attack of malaria. The age range of male and female patients with *P. falciparum* malaria was 20-45 years. *Methods:* Serum total cholesterol was measured by Lieberman Burchard reagent, described by Abelly and Levy (1958). *Determination of Serum Lactate Dehydrogenase enzyme by Ultra Violet method* which is an optimized standard method according to the recommendation of the Deutsche Gesellschaft fur Klimisch Chemie; *Determination of ALT (GPT) by colorimetric method* (Reitman and Frankel, 1957, Tietg, 1970, Bergmeyer and Brant, 1974; *Determination of serum bicarbonate* by Harleco's method (1972). *Results:* In normal subjects, mean serum total cholesterol was found to be 179.07 ± 22.07 (M \pm SD) mg/dl. In patients with *P. falciparum* malaria infection (uncomplicated cases), mean serum total cholesterol was found to be 113.50 ± 26.20 (M \pm SD) mg/dl. In normal subject, mean serum LDH concentration was found to be 258.62 ± 38.98 (M \pm SD) units/litre. In patients with *P. falciparum* malaria infection (uncomplicated cases), mean serum LDH was found to be 580.69 ± 106.28 (M \pm SD) units/litre. In normal subjects, mean serum ALT (SGPT) concentration was founded to be 11.97 ± 4.62 (M \pm SD) units/litre. In patients with *P. falciparum* malaria infection (uncomplicated cases), mean

serum ALT was 14.27 ± 5.16 (M \pm SD) units/litre. In normal subjects, mean serum bicarbonate was 26.00 ± 1.79 (M \pm SD) mmol/L. In patients with *P. falciparum* malaria infection (uncomplicated cases), mean serum bicarbonate was 26.37 ± 1.58 (M \pm SD) mmol/Litre. *Conclusion:* Decreased level of serum total cholesterol and increased level of serum LDH were found in *P. falciparum* malaria patients without complications. No significant changes of serum ALT and serum bicarbonate level were found in uncomplicated *P. falciparum* malaria patients.

TITLE- 6

A meta-analysis on efficacy of artemisinin derivatives in severe falciparum malaria

AUTHOR (S) and AFFILIATION:

Marlar Than¹, Aung Zaw Oo¹, Than Oo Lwin¹, Aye Yu Soe¹ and Myat Phone Kyaw²

¹Clinical Research Unit, DSGH, Mingaladon ²DMR (LM)

SOURCE:

10th Medical Specialties Conference, Programme and Abstract, 2001, pp. 35

ABSTRACT:

Aim: To provide evidence based information for Good Clinical Practice in the treatment of severe falciparum malaria. *Objectives:* To review all current available scientific evidences on the efficacy of artemisinin derivatives in severe falciparum malaria; To rank the level of evidences; To grade the recommendations based on the level of evidences. *Method:* All randomized or pseudo-randomised trials on different formulations of artemisinin derivatives in adults with severe falciparum malaria are searched through the Cochrane controlled trials register, Medline conference abstracts, citations in existing reviews and Myanmar researchers in the field. Identified trials were entered in a data base register. Analyses were made for prespecified outcomes. *Main Results:* Artemisinin derivatives clear parasites from the blood faster than quinine. Mortality in cerebral malaria is lower with artemisinin derivatives but not significantly better than quinine. Adverse effects though variable in trials are not serious, including neurological sequelae. Suppositories of artemisinin derivatives clear parasitaemia as efficiently as parenteral therapy. The best derivative, route of administration, dose and treatment has not been established in randomized controlled trials. *Conclusion:* Despite the large amount of studies identified, heterogeneity of patient population regimen comparisons and quality of studies gave difficulties in drawing conclusion. Informed decisions require all data to be accessible. There is a need for more coordinated and co-operative efforts between investigators for recommending better practice guidelines.

TITLE- 7

In vivo field drug sensitivity trial on antimalarial drugs in Kone-Nyaung cantonment area, northern Shan State (May 1999 to June 1999)

AUTHOR (S) and AFFILIATION:

Thein Htay Win, Thet Naing, Khin Maung Lwin, San Hla, Nwe Nwe Aye and Htay Myint Aung

SOURCE:

11th Myanmar MMC, Programme and Abstract, 2001; No. 1: pp. 1

ABSTRACT:

The seven day *in vivo* sensitivities of chloroquine, mefloquine and most 01 (Myanmar indigenous medicine plant) was done in highly endemic malaria area of Kone-Nyaung. This study aim to compare the sensitivity and resistance of (95) non-immune uncomplicated falciparum and mixed malaria infected subjects. The rate of resistance of chloroquine, mefloquine and most 01 (R2 and R3) observed in *P. falciparum* infected subjects were found to be 42.85%, 0.00% and 35.71% respectively. The efficacy of mefloquine in those subject infected with *P. falciparum* were still highly sensitive to standard regimen of mefloquine in the (750 mg) (100%) and moderately sensitive to standard regimen of chloroquine (600 x 600 x 300 mg) (57.14%). Most 01 has some antimalaria effects to cure falciparum malaria (64.28%) and mixed malaria (16.66%). The efficacy of traditional antimalaria (2 G 3 times a day for 6 days) was significantly lower than oral mefloquine but superior to oral chloroquine for falciparum malaria.

TITLE- 8

Both glycolipid and protein components are required for *P. falciparum* induced TNF- α and IL- β production in human monocytic cells

AUTHOR (S) and AFFILIATION:

Hla Myat Mon, Haruki Uemura, Shusuke Nakazawa and Hiroji Kanbara

SOURCE:

11th Myanmar MMC, Programme and Abstract, 2001; No. 30: pp. 15

ABSTRACT:

Tumor necrosis factor-(TNF) and interleukin-1 are the endogenous pyrogens which mediate fever in malaria. The excessive production of TNF is associated with pathology of human malaria. The nature and properties of malaria antigens, which stimulated monocyte to secrete these cytokines were studied *in vitro* using human monocytic cell line THP-1. The THP-1 cells produced the cytokines in response to *P. falciparum* malaria antigens similar to the response of peripheral blood monocytes. Malaria parasite components of infected erythrocytes and their culture supernatant were separately analyzed. Soluble and insoluble components of the infected erythrocytes and their culture supernatants stimulated cytokine production by THP-1 cells. Acid-base and pronase treatments stimulated supernatant greatly reduced the cytokine inducing activity, suggesting that both glycolipid and protein components are essential for cell stimulation. Considering the ultra filtration results together, we assume that a complex of glycolipid and protein stimulates host cells to induce cytokine secretion. Application of Triton X-

114 solubilization and phase separation procedures to the infected erythrocytes revealed that the membrane-free haemozoin pellet did not have any stimulation activity, whereas the hydrophobic components seemed to contribute to TNF- α and IL- β production.

TITLE- 9

Comparison of clinical efficacy between oral mefloquine (Mephaquine) 1250 mg and oral artesunate-doxycycline combination on uncomplicated *P. falciparum* malaria (April 1998-March 2000)

AUTHOR (S) and AFFILIATION:

Ye Thwe, Soe Tun, Nwe Nwe Win and Khin Hnaung Ei

SOURCE:

11th Myanmar MMC, Programme and Abstract, 2001; No. 37, pp. 19.

ABSTRACT:

Due to the decline in clinical efficacy of mefloquine and other antimalaria compounds and also the development of multidrug resistant *P. falciparum* strains in Myanmar, clinical studies on efficacy of higher doses of mefloquine as well as drug combination regimes are called for. This study was conducted on 157 patients with uncomplicated *P. falciparum* malaria who fulfilled the standard study criteria. Oral mefloquine was given at total dosage of 1250 mg in 2 split doses, 8 hours apart. Oral artesunate-doxycycline combination was given as 600 mg and 1400 mg in total doses during 7 days treatment. Patients were followed up for 28 days. Out of 80 patients treated with mefloquine, 75 (93.75%) were sensitive and 5 (5.8%) had R1 resistance. Out of 77 artesunate-doxycycline group, 73 (94.8%) were sensitive and 4 (5.2%) had R1 resistance. There were no major side effects observed.

TITLE- 10

Efficacy of oral mefloquine (Helm, Germany) in the treatment of uncomplicated falciparum malaria

AUTHOR (S) and AFFILIATION:

Marlar Than¹, Aye Yu Soe¹, Aung Zaw Oo¹, Kyi Kyi Tin¹, Khin Nyo¹ and Myat Phone Kyaw²

¹Clinical Research Unit, DSGH, Mingaladon; ²DMR (LM)

SOURCE:

11th Myanmar MMC, Programme and Abstract, 2001; No. 41, pp. 21

ABSTRACT:

Mefloquine has been used since 1985 in the military population in Myanmar and with good clinical results apart from reports of increasing development of resistance to the drug in some parts of Myanmar. There are now different brands of the drug in the market and there is likelihood of varying bioavailability and efficacy, with each formulation. To determine the efficacy, safety and tolerability of mefloquine hydrochloride (250mg) tablet (produced by HELM pharmaceuticals GMBH, Germany), a clinical trial was done on 37 uncomplicated falciparum malaria patients between March and November 2000 at the clinical research unit of DSGH. Results showed that 23/37 cases showed a 28 days cure rate (s) of 62.16%. (S/R1) 9/32=24.32%

and (R1) $5/32=13.5\%$. There were no R2 or R3 cases. No adverse effects were noted. Mefloquine (Helm-Germany) has a satisfactory early parasite clearance rate.

TITLE- 11

Assessment of therapeutic efficacy of anti-malarial drugs for uncomplicated falciparum malaria at No (1) Military Hospital (300 bedded), Myitkyina, Kachin State

AUTHOR (S) and AFFILIATION:

Myint Win, Khin Maung Aye, Zay Soe and Mi Mi Khin

SOURCE:

11th Myanmar MMC, Programme and Abstract, 2001; No. 42: pp. 21

ABSTRACT:

The resistance of *P. falciparum* to the range of drugs presently available has become the most important threat to the effective control of malaria. Therapeutic efficacy study of five anti-malarial drugs for the hospitalized patients was carried out to determine if the current policy is still valid and to guide the decision to change the recommended treatment of uncomplicated falciparum malaria in Kachin State. A hospital based prospective study was done among 292 adult patients. Chloroquine, sulphadoxine/pyrimethamine, artesunate, quinine and mefloquine tablets were used for five groups of patients with systematic sampling method selection (n= 57) after exclusion for each group. The inclusion and exclusion criteria were set for selection. The follow up duration was only 7 days after administration of standard regimen of drugs with parasitological blood examination on Day 0, 1, 3, and 7. Among the patients, the therapeutic efficacy of the drugs was classified as early treatment failure (ETF), late treatment failure (LTF) and adequate clinical response (ACR). Adequate Clinical Response was found that 74%, 61%, 78%, 79% and 86% in chloroquine, sulphadoxine/pyrimethamine, artesunate, quinine and mefloquine respectively. Artesunate had the least treatment failure than other drugs (X^2 10.89, P = 0.027). Among the drugs, artesunate was likely to be more effective than other drugs and sulphadoxine/pyrimethamine was least effective drug. Being the respondents were semi-immune persons and the study duration was only 7 days, further longer follow-up period for the study should be recommended.

TITLE-12

Serum cortisol response in falciparum malaria

AUTHOR (S) and AFFILIATION:

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¹DMR (LM), Yangon; ² IM (2), Yangon

SOURCE:

The MHSRJ 2001; 13(1-3): pp. 1-4

ABSTRACT:

Thirty patients with uncomplicated malaria, thirty with cerebral malaria and thirty controls were included in the study. The serum cortisol level of patients was determined at day 0, day 3 and day 7 by using radio-immunoassay method. The mean serum cortisol levels of patients with uncomplicated and cerebral malaria were 532.2 ± 120.9 nmol/L and 521.5 ± 800 nmol/L respectively. Among controls, the mean level was 398.8 ± 141 nmol/L. There was a significant rise of serum cortisol levels in patients with falciparum malaria when compared to controls at day 0 (day of admission). There was no significant difference between uncomplicated malaria and cerebral malaria. There was also no significant difference between different days of treatment. It was found that no cortisol insufficiency in falciparum malaria during acute and convalescent stages of illness. Relationship of serum cortisol level with parasite density and patient outcome was also studied and both of these variables showed no relationship with serum cortisol level.

TITLE - 13

A prospective study to look for neuro-psychiatric adverse effects related to mefloquine given as prophylaxis or as a therapeutic agent in un-complicated malaria

AUTHOR (S) and AFFILIATION:

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SOURCE:

The MHSRJ 2001; 13(1-3): pp. 10

ABSTRACT:

To confirm whether mefloquine (MEPHAQUIN- MEPHA) given either as a therapeutic agent in uncomplicated malaria, or as a prophylaxis is related with neuro-psychiatric adverse effects, a prospective study using the pre-tested carefully prepared neurological and psychiatric proforma was carried out in district Military Hospitals and Medical Battalions between May 1998 and April 2000. A total of 2,243 cases were studied (1081 uncomplicated malaria patients on mefloquine therapy 1000-1500 mg stat dose and 249 subjects on mefloquine 250 mg plus sulphadoxine-pyrimethamine prophylaxis 1 tablet weekly alone for at least 6 months). The trained researchers who filled the questionnaire form of proformas carefully interviewed subjects. A detailed check list of neuro-psychiatric and non-

neuro-psychiatric adverse effects was included. No severe neuro-psychiatric or non-neuro-psychiatric features were detected in both therapeutic as well as prophylactic groups and also in the control group. Mild transient symptoms included nausea, headache, dizziness and insomnia most of which subsided simultaneously within one week. Mefloquine (MEPHAQUINE-MEPHA) was not associated with any severe adverse neuro-psychiatric effects in patients treated with therapeutic dosage of 1000-1500 mg stat or prophylactic dosage of 250 mg weekly for 6 months.

TITLE- 14

In vitro susceptibility of *P. falciparum* isolates from Myanmar to antimalarial drugs

AUTHOR (S) and AFFILIATION:

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SOURCE:

Am. J. Trop. Med. Hyg. 2001; 65(5), pp. 450–455

ABSTRACT:

In vitro drug susceptibility profiles were assessed in 75 *P. falciparum* isolates from 4 sites in Myanmar. Except at Mawlamyine, the site closest to the Thai border, prevalence and degree of resistance to mefloquine were lower among the Myanmar isolates as compared with those from Thailand. Geometric mean concentration that inhibits 50% (IC 50) and 90% (IC 90) of Mawlamyine isolates were 51 nM (95% confidence interval [CI], 40–65) and 124 nM (95% CI, 104–149), respectively. At the nearest Thai site, Maesod, known for high level multidrug resistance, the corresponding values for mefloquine IC 50 and IC 90 were 92 nM (95% CI, 71–121) and 172 nM (95% CI, 140–211). Mefloquine susceptibility of *P.falciparum* in Myanmar, except for Mawlamyine, was consistent with clinical-parasitological efficacy in semi-immune people. High sensitivity to artemisinin compounds was observed in this geographical region. The data suggests that highly mefloquine-resistant *P. falciparum* is concentrated in a part of the Thai-Myanmar border region.

2002

TITLE- 15

Effect of maternal malaria on birth weight, placental weight and placental weight to birth weight ratio

AUTHOR (S) and AFFILIATION:

Mya Thida¹ and Than Than Tin²

¹Central Women's Hospital, Yangon; ²IM (I)

SOURCE:

MHRC Programme and Abstract, 2002; pp. 16-17

ABSTRACT:

Effect of maternal malaria on birth weight, placental weight and placental weight to birth weight ratio (PLW: BW) was studied. It is a prospective study. Ninety six pairs of mother and baby in exposed group (women with malaria infection in pregnancy) and 301 pairs of mother and baby in unexposed group (women with no malaria infection in pregnancy) were included in the study. The study was conducted in Thaton District Hospital from July 1998 to June 2000. Comparison of means of two groups was tested by Mann-Whitney U test and comparisons among different groups of clinical feature were tested by Kruskal-Wallis test. Although the placental weights of babies born by mothers without malaria were significantly larger than those born by mothers with malaria, there was no statistical difference in birth weights, PLW: BW between those with and without malaria. Mean difference of placental weight was 36.34 grams. The differences of group means of birth weight, placental weight and PLW: BW among four levels of clinical features of malaria was statistically significant ($P < 0.001$ for birth weight, $P = 0.005$ for placental weight groups and $P = 0.012$ for PLW: BW). On multiple pair-wise comparisons of different groups of clinical feature, the mean birth weight was significantly lighter in complicated malaria than no infection group and asymptomatic group. But there was no statistically significant difference between complicated malaria and uncomplicated malaria. Complicated malaria group has lighter placental weight and higher PLW: BW than no infection group ($P = 0.003$). Regarding PLW: BW, there was no statistically significant difference among other groups.

TITLE- 16

Clinical course of malaria in pregnancy in Thaton District Hospital, Mon State, Myanmar

AUTHOR (S) and AFFILIATION:

Mya Thida¹ and Than Than Tin²

¹Central Women's Hospital, Yangon; ²IM (I)

SOURCE:

MHRC Programme and Abstract, 2002; pp. 17

ABSTRACT:

To study the clinical course and outcome on pregnant women with malaria is the main aim of this study. It is a prospective study and 184 pregnant women with malaria admitted to Thaton District Hospital during the study period from July 1998 to June 2000 were included. Overall case fatality rate (CFR) was 8.13% and it was 13.83% in symptomatic group, the highest rate (36.4%) being in puerperium after home delivery. It was followed by first trimester malaria group (CFR=20%) and third trimester group (CFR=15.4%). Although 29.6% had parasitaemia at delivery and 15 (6.2%) had symptomatic malaria, there was no maternal death after hospital delivery. Overall fetal loss was found in 12.1% of women. Forty one patients (27.5%) did not come back for hospital delivery although fetus was viable at the time of discharge from hospital. Fetal wastage was 40% in first trimester malaria, 15% in second trimester malaria, 23% in third trimester malaria and 1.8% in puerperial malaria. There was neonatal parasitaemia rate of 3.13%, neonatal malaria rate of 1.04%, positive cord blood parasitaemia rate of 4.17% and positive placenta smear rate of 7.29% and low birth weight rate was 250/1000 total births.

TITLE- 17

Comparing peripheral blood film gametocytaemia in uncomplicated falciparum malaria patients on oral artesunate and oral quinine

AUTHOR (S) and AFFILIATION:

Marlar Than¹, Myat Phone Kyaw², Aye Yu Soe³, Kyi Kyi Tin³, Khin Nyo¹, Than Htut¹ and Ye Myint³

¹DSMA; ²DMR(LM); ³Clinical Research Unit, DSGH, Mingaladon

SOURCE:

MHRC Programme and Abstract, 2002; pp. 40

ABSTRACT:

To find out the gametocytocidal activity of oral artesunate a, randomized case control prospective study was done at DSGH between April and September 2002. The control group was treated with oral quinine 600 mg tds x 7 days and the rest group was treated with oral artesunate 200 mg bd x 3 days. The number of patients with gametocytes present in thick blood films within the 28 days *in vivo* study period and the duration of gametocyte positivity were noted. Gametocyte count and sex differentiation was also studied. The percentage of patients with gametocyte appearance was 37.2% in artesunate group and 38.7% in quinine group. The earliest appearance of gametocyte was noted 30 hours after 1st dose of artesunate and the latest was at 120 hours (day 5), with a mean value of 65.6 hours (2.7 days). The

duration of gametocyte positivity in blood film was short in artesunate group 168.4 ± 145.0 hours (7.0 ± 6.0 days) compared to 252.0 ± 204.5 hours (10.5 ± 8.5 days) in quinine group [$P < 0.1$]. The female gametocyte counts were higher than male on the first few days followed by equal or higher male counts on later days in the artesunate treated group, whereas in the quinine group, the findings were reversed with higher male than female gametocytes in the development period. Persistence of gametocytaemia for more than 200 hours in the peripheral blood was seen in 50% of patients in the quinine group compared to only 37.5% in the artesunate group. This study highlights some effects of artesunate on gametocytes of *P. falciparum* in adult patients with uncomplicated falciparum malaria. To confirm whether artesunate has gametocytocidal action for reduction of transmission of falciparum malaria, further studies including the exflagellation test and oocyst formation after membrane feeding for predicting infectiousness still need to be done.

TITLE- 18

Study of erythropoietic response to repeated attack of malaria in primary school children with anaemia

AUTHOR (S) AFFILIATION:

*San San Htwe, Myat Phone Kyaw, Zin Zin Thu, Kyin Hla Aye, Hnin Nu War, Soe Moe Shin, Tin Nwe Htwe and Ye Htut
Parasitology Research Division, DMR (LM)*

SOURCE:

MHRC Programme and Abstract 2002; pp. 41

ABSTRACT:

Children in malaria endemic areas have lower haemoglobin levels than children in areas without malaria transmission. This study was conducted to find the erythropoietic response to repeated attacks of malaria in children. A total of 97 primary school children aged 5-12 years with repeated attacks of malaria (fever with chills and rigor) and history of travel to forested areas were studied for haematological indices and bone-marrow responses in comparison with children with no history of malaria and travel to forested areas. The erythropoietic response of each patient with anaemia was categorized clinically, on the basis of absolute reticulocyte counts (ARC) and indirect bilirubin concentrations (IBC). The mean haemoglobin (Hb) level in study group was 9.91 ± 1.38 g/dl which was significantly lower than the value of 11.7 ± 7.3 g/l in other group ($P < 0.001$, adjusted for age and splenomegaly). The ARC and IBC in study group were significantly lower than control group which were consistent with hypoproliferative erythropoiesis (low to normal ARC and IBC; 35 patients). There were few cases with ineffective erythropoiesis (low to normal ARC but elevated IBC; 4 patients) or an appropriate response (elevated ARC and normal IBC; 1 patient). Therefore, hypoproliferative erythropoiesis appeared to be the most common mechanism of anaemia seen in the study cases. This finding suggested a partial interference with erythropoiesis leading to a homeostatic imbalance in which erythrocyte loss due to parasite replication is only partially compensated for by increased erythropoiesis.

TITLE- 19

Two years analytical study on severe and complicated malaria in Paediatric Unit, No. (1) M.H (500-Bedded) (1999-2000)

AUTHOR (S) and AFFILIATION:

Tin Tin Aye, Khin Maung Aye

SOURCE:

12th Myanmar MMC Programme and Abstract, 2002; No. 13: pp. 6

ABSTRACT:

Malaria was ranked one of infectious diseases in our unit: 11.5% (187/1623) and 14.17% (225/1587) respectively. Among those 5.88% (11/187) and 9.78% (22/225) were severe and complicated malaria respectively. Among those commonest presentation was severe anemia 45.45% (5/11) and other were cerebral 27.3% (3/11), hyperparasitaemia and sepsis 18.18% each (2/11) in 1999. In 2000, there were severe anaemia 54.55% (12/22), cerebral algid malaria and sepsis 13.64% each (3/22). There were no fatal cases in 1999. The case fatality rates (CFR) of year 2000 were 0.44% (1/22) and 4/55% (1/22) in term of total and severe and complicated malaria cases respectively.

TITLE- 20

Efficacy of artemether capsule (Myanmar Pharmaceutical Factory) in uncomplicated falciparum malaria-an open randomised clinical study

AUTHOR (S) and AFFILIATION:

Kyi Kyi Tin¹, Aung Zaw Oo¹, Aye Yu Soe¹, Myat Phone Kyaw², Than Oo Lwin¹, Khin Nyo¹, Marlar Than¹

¹DSGH, Mingaladon, ²DMR (LM)

SOURCE:

12th Myanmar MMC Programme and Abstract, 2002; No. 26: pp. 11

ABSTRACT:

To confirm efficacy of artemether (MPF) in uncomplicated falciparum malaria, an open randomised controlled study was carried out at the Clinical Research Unit (Defence Services General Hospital-Mingaladon). Sixty uncomplicated falciparum malaria patients with asexual parasitaemia positive in peripheral blood film were randomized to two treatment regimens. In regimen 1, 30 patients received oral artemether capsule (MPF), a total of 120 mg over 5 days. In regimen 2, 30 patients received oral quinine sulphate (MPF) 600 mg tds for 7 days. Assessments were made according to the WHO standard *in vivo* 28 day trial. Results will be presented and discussed.

TITLE- 21

Impact of iron status on parasitaemia and disease pattern in falciparum malaria patients

AUTHOR (S) and AFFILIATION:

Khin Thanda Aye

SOURCE:

8th Medical Specialties Conference, Programme and Abstract, 2002; pp. 3

ABSTRACT:

A total of eighty cases of malaria admitted to malaria unit and medical wards of Defence Services General Hospital were studied during a period of two years (February 2000-February 2002). Among them, thirty cases were SCM (severe and complicated malaria) and fifty patients were uncomplicated malaria. Various clinical manifestations were recorded and analysed according to proforma. After excluding other associated complication such as chronic liver and renal diseases, the parasite count, Hb level, serum iron level, TIBC (tissue iron binding capacity) and bone marrow (Perl's stain were performed). The impact of iron status on diseases pattern and parasitaemia in falciparum malaria patients were studied. There was significant parasitaemia in severe complicated malaria patients. Serum Hb level was also significantly lower in SCM cases and the reasons had already been discussed. Serum iron level, TIBC and percentage saturation iron binding capacity were not significant between SCM and uncomplicated malaria cases. But there were some cases with very high serum iron level and TIBC in SCM group. Therefore, iron status does not play a significant role in development of complication and parasitaemia in falciparum malaria patients even though, there is significantly low Hb level and high parasite count in SCM group. This is just a preliminary study of iron status in malaria patients and we have to go further for the prevalence of disease pattern, parasite growth (both *in vivo* and *vitro*) and iron status of malaria patients. Malaria is one of the top leading priority diseases in Myanmar (National Health Plan, 1996-2001). Malaria constitutes a major threat to almost half of the world's population and impedes economic betterment of the societies. Malaria is now seen as a developmental and poverty issue. This study might be helpful to a certain extent in National Malaria Control Programme in Myanmar.

2003

TITLE- 22

Efficacy of 'Dihydro-Dawna' (dihydro-artemisinin) in the treatment of uncomplicated falciparum malaria

AUTHOR (S) and AFFILIATION:

Marlar Than¹, Khin Phyu Pyar¹, Khin Nyo¹, Aung Zaw Oo², Moe Aung Kyaw Naing³, Than Oo Lwin⁴, Myat Phone Kyaw⁵, Than Htut¹ and Kyaw Oo Hla¹

¹DSGH, Mingaladon; ²No. (1) Military Hospital (300 Bedded), Myitkyina;

³Military Hospital (100 Bedded), Monywa; ⁴No. (1) BMH (700 Bedded),

Pyin Oo Lwin; ⁵Parasitology Research Division, DMR (LM)

SOURCE:

MHRC Programme and Abstract 2003; pp. 5

ABSTRACT:

Di-hydro-artemisinin is the active metabolite of artemisinin and is the most potent antimalarial among artemisinin and its derivatives. Di-hydro-artemisinin (COTECXIN®) a commercial product from Beijing Cotec New Technology Corp-Peoples' Republic of China has been studied in many countries including Myanmar and its efficacy proven in uncomplicated falciparum malaria patients. DIHYDRO-DAWNA (Di-hydro-artemisinin) 20 mg tablets have been prepared from the Ministry of Industry (I) Myanmar Pharmaceutical Factory, Yangon. Animal studies for acute toxicity and LD₅₀ tests have been performed and LD₅₀ dose calculated. Its full description has been reported from the quality control department. This study is a clinical trial on uncomplicated falciparum malaria patients. Ethical approval for the study was obtained from DMR (Lower Myanmar). To determine the efficacy and the optimal dose regimen for achieving satisfactory cure rate of DIHYDRO-DAWNA tablets in the treatment of uncomplicated falciparum malaria and also to study its tolerability and safety in the patients a multi centre hospital based randomized clinical study was done at 4 Military Hospitals in Mingaladon, Myitkyina, Pyin Oo Lwin, and Monywa on a total of 152 adult male, uncomplicated falciparum malaria patients between January to October 2003 after obtaining an informed consent. Patients were randomly allocated to two dosage regimens- Regimen 1: 6 tablets OD x 1 day, followed by 3 tablets OD x 4 days [Total = 360 mg] and Regimen 2: 6 tablets OD x 1 day, followed by 3 tablets OD x 6 days [Total = 480 mg] and 28 days clinical trial was done. The baseline parameters were comparable. Initial parasitaemia was mean (range) = 6351.8 (400-80,000) and 15595.8 (400-240,000) per microlitre. Parasite clearance time (PCT) was 45 ± 32 hours and 48 ± 32 hours. Fever clearance time was 19 ± 20 hours and 19 ± 26 hours, respectively in the two regimens. The 28 days cure rate was 87.7% and 89.3% respectively and not statistically different. There were no serious adverse effects. In conclusion, DIHYDRO-DAWNA in the total dose ranges of 360 mg over 5 days or 480 mg over 7 days is safe and efficacious for treatment of uncomplicated falciparum malaria in adults.

TITLE- 23

Assessment of therapeutic efficacy of antimalarial drugs for uncomplicated falciparum malaria through sentinel system in endemic areas of Myanmar

AUTHOR (S) and AFFILIATION:

Khin Lin¹, Thuzar Han², Aung Than³, Saw Lwin³, Soe Aung³ and Htay Aung¹
¹Parasitology Research Division, DMR (UM); ²Microbiology Department, IM (I); ³NMCP, DOH

SOURCE:

MHRC Programme and Abstract 2003; pp. 15

ABSTRACT:

Malaria is regarded as the top priority health problem in Myanmar and drug resistant falciparum malaria is one of the major constraints encountered by the control programme. Three sentinel sites, namely Myeik, Myitkyina and Kalay, situated near the border areas were chosen to assess the Therapeutic Efficacy of *P. falciparum* to standard antimalarials, chloroquine, sulphadoxine-pyrimethamine (S-P) and mefloquine. The study was conducted during March 2002 to January 2003 using WHO standard guidelines for assessment of therapeutic efficacy of antimalarials and the results were categorized as ACR (Adequate Clinical Response), ETF (Early Treatment Failure) and LTF (Late Treatment Failure). In Myeik sentinel site, the findings were ACR 45/72 (62.5%), ETF 9/72 (12.5%) and LTF 18/72 (25.0%) to chloroquine, ACR 49/70 (70.0%), ETF 15/70 (21.4%) and LTF 6/70 (8.6%) to sulphadoxine-primethamine and ACR 66/71 (94.2%), ETF 2/71 (2.9%) and LTF 2/7 (2.9%) to mefloquine. In Myitkyinar, the findings were ACR 53/70 (75.7%), ETF 6/70 (8.6%) and LTF 11/70 (15.7%) to chloroquine, ACR 48/71 (67.2%), ETF 12/71 g (16.7%) and LTF 11/71 (16.1%) to sulphadoxine-primethamine and ACR 56/70 (80.0%), ETF 4/70 (5.7%) and LTF 10/7(14.3%) to mefloquine. In Kalay, the findings were ACR 60/78 (77.0%), ETF 11/78 (14%) and LTF 7/78 (9%) to chloroquine, ACR 61/71 (85.9%), ETF 4/71 (5.6%) and LTF 6/71 (8.5%) to sulphadoxine-pyrimethamine and ACR 64/70 (91.4 %), ETF nil and LTF 6/70 (8.6%) to mefloquine. The study showed that chloroquine efficacy was least in Myeik and sulphadoxine-pyrimethamine was least in Myitkyina. Efficacy of mefloquine was highest in Myeik and lowest in Myitkyina.

TITLE- 24

The efficacy and compliance of artesunate + clindamycin versus artesunate + mefloquine in management of uncomplicated falciparum malaria

AUTHOR (S) and AFFILIATION:

*Myat Phone Kyaw¹, Khin Mae Ohn², Khin Maung Myint³, Aung Khin⁴,
Thaung Htay², Ni Ni¹ and Mya Thawdar Lwin²*
*¹Parasitology Research Division, DMR (LM); ²Clinical Research Unit,
North Okkalapa General Hospital; ³Institute of Pharmacy, Mandalay;
⁴DOH*

SOURCE:

MHRC Programme and Abstract 2003; pp. 16

ABSTRACT:

WHO has arranged a meeting on National Antimalarial Treatment programme in August 2002 and new National Antimalarial Treatment policy guideline was decided. According to this guideline, Artesunate+Clindamycin combination should be used in children under 8 years and pregnant mothers (2nd and 3rd trimesters) with uncomplicated falciparum malaria, but there was no study of this combination in Myanmar. The *in vivo* trial was started in October 2002 at the Clinical Research Unit (cerebral and complicated malaria, North Okkalapa General Hospital) and Indagaw field station in comparison with artesunate and mefloquine combination as an open randomized trial. The dosages were artesunate 600 mg (total dose) plus clindamycin 300 mg bd for 7 days and artesunate 600 mg plus mefloquine 750 mg (stat dose). Clinical and parasitological examinations were performed to assess efficacy. A total of 32 cases have been studied for each combination. In artesunate-clindamycin combination, 2 cases developed recurrence of parasitaemia on day 21. One case developed mild jaundice. In cases treated with artesunate-mefloquine combination, only one case has recurrence of parasitaemia on day 28. Compliances were good in all regimens. Cure rates found to be 93.75%, and 96.9% respectively. There were no early treatment failure cases in both groups. Therefore, these combinations can be used safely in uncomplicated falciparum malaria patients.

TITLE- 25

Level of 2, 3 Diphosphoglycerate (2, 3 DPG) and severity of malaria

AUTHOR (S) and AFFILIATION:

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and Myint Oo¹*
¹DMR (LM); ²Clinical Research Unit, DSGH, Mingaladon

SOURCE:

MHRC Programme and Abstract 2003; pp.17

ABSTRACT:

The aim of the study is to investigate the level of 2, 3 diphosphoglycerate (2, 3 DPG) in relation to severity of malaria. This study was conducted in patients who were attending the Clinical Research Unit (Malaria) of Defence Services General Hospital, Mingaladon. They were divided into three

groups, the first group was *Plasmodium vivax* infected patients (n = 31), the second group, *P. falciparum* infected uncomplicated malaria patients (n = 35) and the third group was cerebral malaria patients (n = 18). The level of 2, 3 DPG in whole blood was measured on day 0 and day 7 by 2, 3 Diphosphoglyceric acid Sigma diagnostic kit. Mean 2, 3 DPG levels of cerebral malaria patients were markedly lower than reference value (1.6 to 2.6 $\mu\text{mol/ml}$) on day 0 (0.88 ± 0.527) at the time of harbouring high parasitaemia and returned to normal on day 7 (1.6076 ± 0.058) when parasites disappeared. Mean 2, 3 DPG level of *Plasmodium vivax* infected patients on day 0 was (1.2339 ± 0.6663) and day 7 was (1.2273 ± 0.8526) and in *P. falciparum* infected uncomplicated malaria patients mean 2,3 DPG level on day 0 was (1.514 ± 0.9) and on day 7 was (1.566 ± 0.6387) respectively. The findings showed that 2, 3 DPG levels of uncomplicated falciparum malaria and vivax malaria were not much different between day 0 and day 7. Therefore low level of 2, 3 DPG during acute stage could be a bad prognostic indicator for severe falciparum malaria.

TITLE-26

In vitro micro test for the susceptibility of *Plasmodium vivax* to Chloroquine

AUTHOR (S) and AFFILIATION:

Ye Htut¹, Khin Aung Thu², Kyin Hla Aye¹, Khin San San², Zin Zin Thu¹, Soe Soe Han¹ and Nilar Shwe¹

¹DMR (LM); ²DSMA, Mingaladon

SOURCE:

MHRC Programme and Abstract 2003; pp. 43-44

ABSTRACT:

In recent years, several case reports have suggested the emergence of chloroquine resistant vivax malaria, which were mainly claimed basing on the clinical grounds. A confirmatory *in vitro* drug susceptibility test has been a necessity to prove the drug resistance status of *Plasmodium vivax* malaria. Many scientists had attempted to grow *Plasmodium vivax* in *in vitro* culture and to develop *in vitro* drug sensitivity test. But yet there is still a need of standard *in vitro* test which is reliable, accurate, feasible and applicable. The paper presented the step-wise development of *in vitro* micro-test system of *Plasmodium vivax* for antimalarials using chloroquine. After performing different experiments with varying cultural conditions on pre-test 70 isolates and 30 field isolates, it was observed that (1) use of Waymouth media as transport media and RPMI-Waymouth media-mix as incubating media (2) incubation of parasites at 37°C for 48 hrs (3) assessment made by differential counting of asexual stage parasites against 100 leucocytes for each testing well and (4) the chloroquine concentration of 8 pico-mol per well, used as cut off point level for distinguishing sensitive and resistant isolates appeared to produce the reliably good result. The detailed procedure, reliability, accuracy, feasibility and applicability of the test were discussed.

TITLE- 27

Comparative trial of coartem and mefloquine in treating uncomplicated falciparum malaria in Thaton

AUTHOR (S) and AFFILIATION:

Ye Htut¹, San Hla², Kay Thwe Han¹, Sint Sint Chaw², Ni Ni Win² and Kyin Hla Aye¹

¹DMR (LM); ²District Hospital, Thaton, Mon State

SOURCE:

MHRC Programme and Abstract 2003; pp. 44

ABSTRACT:

The randomized comparative trial was conducted on 62 uncomplicated falciparum malaria in-patients (age between 13 and 64 years) attending to medical ward of Thaton District Hospital, Mon State where drug resistant cases prevailed during 2002. Out of 62 subjects, 28 were treated with coartem (benflumethol) a fixed combination of artemether 20 mg and lumefantrine 120 mg, 6 dose regimen, consisting of 4 tablets administered at 0 hr, 8 hr, 24 hr, 36 hr, 48 hr and 60 hr. Thirty four were treated with single dose of mefloquine 25 mg/kg body weight. Cases were checked on days 3, 7, 14, 21 and 28 for fever and parasites. Nineteen cases of coartem treated group and 20 cases of mefloquine treated group, those completed the follow up to Day 28 were analyzed. Parasite clearance rates were evident as 78% for coartem and 75% for mefloquine on Day 3 and 100% for coartem and 90% for mefloquine on Day 7. Three cases (15%) of mefloquine treated group were found to have reappearance of parasites again, whereelse coartem group had none. Fever clearance rates were 68% for coartem and 70% for mefloquine on day 3 and 100% for coartem and 90% for mefloquine on day 7 respectively. The effect of antimalarials on gametocyte were assessed, and 20% of the mefloquine treated cases had gametocytes and only 5% of the coartem treated cases had these indicating the superior gametocyte suppression effect of coartem.

TITLE- 28

A study on association between pneumonia and malaria in children aged between two months- five years

AUTHOR (S) and AFFILIATION:

Khin Aye Nu

SOURCE:

Thesis M.Med.Sc (Paediatrics) IM (2) 2003

ABSTRACT:

A hospital based study on the clinical overlap between pneumonia and malaria in children aged between 2 months to 5 years was conducted in North Okkalapa General Hospital (MOGH) and Thingangyun Sanpya General Hospital (SPH). This study was a descriptive and, analytic study using observation method. The duration of study period was one year commencing from June 2002 to May 2003. This study included 150 children who fulfilled WHO criteria of diagnosis of pneumonia admitted to Paediatric Wards of NOGH and SPH. Severity of pneumonia was categorized by 3

groups. Chest X ray and blood films for malarial parasite were taken for all cases of pneumonia. Twenty subjects (13.33%) were pneumonia, 82 subjects (54.67%) were severe pneumonia and 48 subjects (32.00%) were very severe pneumonia. Radiographic evidence of pneumonia (including bronchopneumonia and lobar pneumonia) were found in approximately 47.33% (41.33% and 6%) respectively. After radiographic examinations and blood film tests, those results revealed 12 patients (8%) had malaria, 65 patients (43.33%) had pneumonia, 6 patients (4%) had both pneumonia and malaria and 67 patients (44.67%) had no pneumonia, no malaria. Fever, cough, fast breathing and chest wall indrawing were the common clinical manifestations of pneumonia in children. These symptoms were also the common clinical signs and symptoms of malaria in children. However, this study did not show statistically significant differences between clinical features of pneumonia and malaria. This study revealed that there is the clinical overlap between pneumonia and malaria. Therefore, in malaria endemic area, Basic Health Workers cannot differentiate between clinical presentations of pneumonia and malaria.

TITLE-29

A clinical study of acquired haemolytic anaemias other than due to malaria in Yangon General Hospital and New Yangon General Hospital

AUTHOR (S) and AFFILIATION:

Myint Myint Aye

SOURCE:

Thesis M.Med.Sc (Internal Medicine), IM (1), 2003

ABSTRACT:

Aetiologies, clinical presentations and haematological and biochemical characteristics of 33 patients with confirmed haemolytic anaemia of acquired causes admitted to Department of Clinical Haematology and four general medical wards of YGH and NYGH were studied during one year period between 2002 and 2003. The study excluded haemolysis caused by malarial infection by clinical history and appropriate investigations. Among 33 patients with acquired HA, 13 (39.4%) were diagnosed as AIHA and 20 (60.6%) were diagnosed as PNH. Commonest age group was 31-40 years and male were slightly more common than female. The commonest age group in male was 21-40 years and that of female was less than 20 years. Duration of diagnosis was longer in PNH than in AIHA. Symptoms of anaemia were present in all patients. Jaundice was present only in 81.8%. Hepatomegaly was present in 66.7% where as splenomegaly was detected in 75.8%. Blood group distribution of acquired Haemolytic Anaemia (HA) patients were found to be not different from general population. Haematological and biochemical parameters showed most of the patients had degree of anaemia and all patients had low red cell counts, low PCV, high serum LDH. Most of the patients showed increase RDW, high reticulocyte count and high serum bilirubin. Leucocytosis was observed in 18.2%. Leucopenia was observed in 24.2%. Thrombocytopenia was observed in 51.5%. Clinical presentations and haematological and biochemical characteristics of different aetiologies (AIHA and PNH) were studied and the characteristics of these two diseases

are compared. This study revealed that although acquired HA, it is not a rare disease and AIHA and PNH are the commonest HA found in this study. From this study certain benefits can be gained in term of diagnosis of HA. It is concluded that clinical history and examination remains valuable in diagnosis of HA which is strengthened by haematological and biochemical parameters. This study has many limitations such as small sample size, short study period and inadequacy of investigative facilities like immunological studies. The study had proved the value of complete blood picture by coulter counter. This is valuable in diagnosis of HA and can help to differentiate HA from other type of anaemias without performing invasive procedures facilitating effective clinical management. Larger population-based studies are necessary to elaborate more accurate information to detect different aetiologies, their clinical presentations and haematological and biochemical characteristics of acquired HA. To study the natural history of the disease and their prognostic factors, the longer study period is necessary.

2004

TITLE- 30

Artemisinin-based combination therapies (ACTs) trials of artemether/lumefantrine combination and artesunate plus amodiaquine combination in Ayeyawady Division during 2004

AUTHOR (S) and AFFILIATION:

Myat Phone Kyaw¹, Ye Htut¹, Win Naing², Thaung Kyaing³, Aye Than¹, Tin Nwe Htwe¹, Soe Soe Han¹ and Baldip Khan⁴

¹DMR (LM); ²VBDC, DOH; ³Thidar Konpyin Rural Health Centre, DOH; ⁴Department of Nuclear Sciences and Applications, IAEA

SOURCE:

MHRC Programme and Abstract 2004; pp. 33

ABSTRACT:

Roll Back Malaria is committed to promote Fixed Drug Combination antimalarial products (FDC), particularly ACTs (Artemisinin-based Combination Therapies) in areas where resistance is a significant problem. The potential value of drug combinations, notably those containing an artemisinin derivatives, to improve efficacy, delays in development and selection of drug-resistance parasites and thus prolongs the therapeutic life of existing antimalarial drugs, is widely accepted. Combinations that do not contain artemisinin derivative could be a preferred option for reasons of cost in Myanmar. On the basis of the available safety and efficacy data, the WHO recommended 4 therapeutic options with potential for deployment (in prioritized order), if costs were not an issue: artemether/lumefantrine (coartem®); artesunate (3 days) plus amodiaquine as FDC; artesunate (3 days) plus sulphadoxine/pyrimethamine SP as FDC, in areas where SP efficacy is high; amodiaquine plus SP as FDC, in areas where efficacy of both drugs remains high. Among these, coartem and artesunate plus

amodiaquine had been selected to study *in vivo* 14 days trials in Ayeyawady Division during 2004. A total of 60 uncomplicated falciparum malaria patients were treated with coartem and 56 cases were treated with artesunate plus amodiaquine combination in a randomized controlled study. There was no early treatment failure cases in both trials, but 2 cases had recurrence on day 14 in patients treated with artesunate plus amodiaquine combination (3.6% LTF [Late Treatment Failure]). One hundred percent cure rate was noted in coartem group but the cost was high (15US\$ for one case). Therefore, artesunate plus amodiaquine which carries affordable price in Myanmar, has therapeutic value in management of uncomplicated falciparum malaria.

TITLE- 31

In vivo 14 days and 28 days trials of artesunate and amodiaquine combination in Ayeyawady Division during 2004

AUTHOR (S) and AFFILIATION:

Myat Phone Kyaw¹, Ye Htut¹, Win Naing², Kay Thwe Han¹, Thaung Kyaing³, Aye Than¹, Kyin Hla Aye¹, Tin Nwe Htwe¹ and Soe Soe Han¹
¹DMR (LM); ²VBDC, DOH; ³Thidar Konpyin Rural Health Centre, DOH

SOURCE:

MHRC Programme and Abstract 2004; pp. 34

ABSTRACT:

The length of time that is appropriate for assessment of treatment response *in vivo* has been a topic of debate in last decade. Studies with shorter follow-up (less than 14 days) can underestimate overall treatment failure rates, which is especially true of drug with longer elimination half-lives. The time to completely clear a drug from the body is six times the elimination half-life. Follow-up periods longer than 14 days are appropriate for amodiaquine, chloroquine and sulphadoxine/pyremethamine. Reinfection rather than recrudescence cannot be excluded in longer duration of post-treatment follow-up. More reinfections would be expected to occur between 14 and 28 days post-treatment in an area of intense transmission than in an area of very low transmission. It was difficult to follow the patients in the field up to 28 days. To solve these situations, artesunate plus amodiaquine had been selected to study *in vivo* 14 days and 28 days trials in Thidar Konpyin Rural Health Centre (low transmission area), Ayeyawady Division during 2004. A total of 122 uncomplicated falciparum malaria patients were randomly selected to study for 14 days period and 28 days period. Fifty six cases out of 61 cases selected could be followed up to 14 days (default rate 8.9%) and 38 cases out of 61 patients selected (default rate 60.5%), finished the study up to day 28 (P = 0.0002). There were no early treatment failure cases in both trials, but two cases had recurrence on day 14 in 14 days trial (3.6% LTF [Late Treatment Failure]). In 28 days trial, one case had recurrence on day 14, 3 cases have recurrence on day 21 and one on day 28; total late treatment failure rate was 13.1%. The recurrence rates between two trials were not statistically significant (P = 0.2174; Fisher Exact test). Therefore, 28 days follow-up was not successful in this study. The *in vivo* 14 days

therapeutic response of artesunate plus amodiaquine combination may represent the true recrudescence rate.

TITLE- 32

Clinical study of transfusion malaria in surgical patients of North Okkalapa General Hospital

AUTHOR (S) and AFFILIATION:

Hla Min Aung

SOURCE:

Thesis M.Med.Sc. (Surgery) IM (2), 2004

ABSTRACT:

The aim of this study is to know the incidence of transfusion malaria. It can vary center to center depending on many factors such as methods of detection and location of study where malaria may be endemic or not. For example, in the detection of malaria parasite positivity may be by direct microscopy or rapid paracheck test. The direct microscopy, itself, is dependent on the experienced technician's performance. Recently, introduction of rapid diagnostic test (RDTs) for malaria, that tests use immunochromatographic methods to detect plasmodium -specific antigens in a finger prick blood sample, is more important role in investigation of malaria patients. According to the literature, RDTs detect circulating antigens. They may detect *P. falciparum* infection even when the parasites are sequestered in the deep vascular compartment and thus undetectable by microscopic examination of a peripheral blood smear (New perspective on Malaria Diagnosis-WHO, 2000). It is said that RDTs has sensitivity close to 100% and specificity is at least 90% for all malaria species. It can reflect the persistence of antigenaemia despite parasite clearance following treatment. In our study, size of sample is small to describe the incidence of transfusion malaria. In detection of malaria parasite, direct microscopy is still useful in identification and counting of species. In this study, the results were confirmed by both techniques to detect the malaria parasite. Further study might be required for more accurate standard investigation in determination of malaria parasite. Any trauma can cause variable level of metabolic response and impair the body immune system of victims. It can predispose infection, even after discharging the hospital. In this study, post transfusion febrile patients during hospitalization were included. Followed up visit was unreliable in majority of patients. Fever after discharge of hospital cannot be counted. Although this study shows that no mortality and morbidity related with post transfusion malaria, these risks are still possible when the size of the study is larger. Even in low endemic areas, the possibility of transmission of malaria parasite after transfusion is still significant (6%). So, malaria infection could be considered as a cause of fever after operations which needed blood transfusion. Despite of difficulties in considering the accurate diagnosis of malaria, recent RDT test and routine direct microscopy are expected to prove the best confirmation in recent years. So, the result of this study may be a support to the further study of risk of blood transfusion and other related researches.

TITLE- 33

Optimising operational use of artesunate-mefloquine: a randomised comparison of four treatment regimens

AUTHOR (S) and AFFILIATION:

Frank Smithuis, Ingrid van der Brock, Nina Katterman, Moe Kyaw Kyaw, Alan Brockman, Saw Lwin and Nicholas J. White

SOURCE:

Transactions of the Royal Society of Tropical Medicine and Hygiene, March 2004; 98(3): pp. 182-192

ABSTRACT:

A randomised trial was conducted in adults and children (>1 year old) with acute falciparum malaria in Western Myanmar to compare the operational effectiveness of 4 different artesunate-mefloquine combinations. All regimens were well tolerated. During 42 days follow-up polymerase chain reaction genotyping-confirmed recrudescence occurred in 11 of 187 (5.9%) patients who received observed single low-dose mefloquine (15 mg/kg) and artesunate (4 mg/kg), 7 of 192 (3.6%) patients following observed single high-dose mefloquine (25 mg/kg) and artesunate (4 mg/kg), 7 of 180 (3.9%) patients following observed artesunate 4 mg/kg on day 0 plus self-administered mefloquine 15 mg/kg on day 1 and 10 mg/kg on day 2 with artesunate 4 mg/kg/day on day 1 and 2, and none of 177 patients who received this 3 d regimen under direct observation ($P=0.01$). Compared with 3 d treatment regimens, single dose treatments were followed by significantly more *P. vivax* infections during the 42 d follow-up ($P=0.009$). Post treatment anaemia (haemoglobin <10 g/dL) was reduced by the 3 d regimens. Gametocyte appearance was low with all 4 regimens. Single dose observed mefloquine-artesunate regimens were very effective, but the 3 d artesunate-mefloquine regimen is the best treatment for acute falciparum malaria in Western Myanmar. Active measures to ensure absorption and improve adherence will be necessary to realise this advantage operationally.

2005

TITLE- 34

Comparing the efficacy of initial single dose rectal artesunate versus single dose intravenous artesunate at 24 hours and after full consolidation treatment in both groups with intravenous artesunate in severe falciparum malaria in adults

AUTHOR (S) and AFFILIATION:

Win Win Myint¹, Khin Phyu Pyar¹, Myat Phone Kyaw², Than Htut¹, Khin Nyo¹ and Marlar Than³

¹DSGH; ²Experimental Medicine Research Division, DMR (LM); ³Clinical Research Unit (Malaria), DSGH

SOURCE:

MHRC Programme and Abstract 2005; pp. 16

ABSTRACT:

The mortality rate of severe *falciparum* malaria once vital organ dysfunction occurs is as high as 30%. In remote areas, transport problems lead to high morbidity and mortality. Rectal artesunate, single dose is recommended for initial management of severe *falciparum* malaria especially in remote areas, to be followed by consolidation treatment at the nearest health care facility. A randomized controlled trial of rectal artesunate and parenteral artesunate was studied on 60 severe *falciparum* malaria cases admitted to DSGH. Test drug was plasmotrim 50 mg, rectocap 200 mg stat dose. Control drug was injection artesunate 120 mg intravenous infusion, both arms followed at 24 hours by injection artesunate 60 mg intravenous infusion, repeated 12 hourly (total = 480 mg), plus tetracycline or clindamycin 250mg 6 hourly for 7 days. Parasite clearance time in rectal artesunate was 46.3 hours and IV artesunate group was 49.1 hours and the 24 hours parasite clearance rates were 81.7% and 76.3% respectively (P>0.5). There was no difference in the 48 hour parasite clearance rates which were 96.2% and 96.9% respectively. Fever clearance time (FCT) was 51.5 hours with rectal artesunate compared to 30.3 hours with IV artesunate (P>0.1). The clinical success rate for rectal artesunate was similar to that of parenteral artesunate at 24 hours in this study, highlighting that it can be used effectively prior to definitive treatment to reduce malaria morbidity and mortality.

TITLE- 35

A randomized controlled trial of intramuscular artesunate versus intramuscular artemether in combination with oral mefloquine in severe falciparum malaria

AUTHOR (S) and AFFILIATION:

Aye Yu Soe, Marlar Than, Than Oo Lwin, Myat Phone Kyaw, Aung Zaw Oo and Than Htut

SOURCE:

13th Myanmar MMC Programme and Abstract, 2005; No. 2: pp. 1

ABSTRACT:

To find a safe and effective practical drug regimen of parental artemisinin derivatives in the treatment of severe falciparum malaria patients, a randomized, case control prospective study was done at Defence Services General Hospital between May and December 2002. Group 1 was treated with deep intramuscular injection of artesunate 60 mg at 0 hrs, 4th, 24th, 48th, 72nd and 96th hours (Total 360 mg). Group 2 was treated with injection intramuscular artemether 160 mg at 0 hrs and 80 mg at 12th, 24th, 36th and 48th hr (Total 480 mg). Both groups received oral mefloquine 500 mg at 48th and 54th hrs. This study emphasized to compare the efficacy and clinical outcomes between the two regimens by measuring mortality, fever clearance time, parasite clearance time, time to regain consciousness, time to sit, time to walk and time to eat. It also highlighted the adverse effects of the two regimens within 28 days study period and nervous status at discharge. This study differentiates which type of artemisinin derivatives is a superior drug in the treatment of severe falciparum malaria patients in intramuscular form.

TITLE- 36

The efficacy and compliance of artesunate + clindamycin versus artesunate +mefloquine in management of uncomplicated falciparum malaria in children

AUTHOR (S) and AFFILIATION:

Myat Phone Kyaw, Khin Mae Ohn, Win Naing, Aung Khin, Thaung Kyaing, Thaung Htay Myint and Mya Thawdar Lwin

SOURCE:

13th Myanmar MMC Programme and Abstract 2005; No. 4: pp. 2

ABSTRACT:

WHO has arranged a meeting on National Antimalarial Treatment programme in August 2002 and new National antimalarial treatment policy guideline was decided. According to this guideline artesunate+clindamycine combination should be used in children under 8 years and pregnant mothers (2nd and 3rd trimesters) with uncomplicated falciparum malaria, but there was no study of this combination in children in Myanmar. The *in vivo* trial was started in October 2004 on children attended at Clinical Research Unit (Field stations) Thidar Konpyin Rural Health Centre and Indagaw field station in comparison with artesunate and mefloquine combination as an open randomized trial. The dosages were artesunate (4 mg/kg body weight) plus clindamycin (5 mg/kg twice a day) daily for 3 days and artesunate (4 mg/kg

body weight) plus mefloquine (4.6 mg base: 5 mg salt/kg of body weight) stat dose. Clinical and parasitological examinations were performed to assess efficacy. A total of 56 cases have been studied for each combination. There was no recurrence of parasitaemia in both regimens up to day 14. Compliances were good in all regimens and 100 percent cure rates were found in children with uncomplicated falciparum malaria.

TITLE- 37

A study on ECG changes in uncomplicated *P. falciparum* malaria patients treated with 1250 mg oral mefloquine

AUTHOR (S) and AFFILIATION:

Ye Thwe

SOURCE:

13th Myanmar MMC Programme and Abstract 2005, No. 5: pp. 3

ABSTRACT:

Safety of antimalarial compounds is very important in clinical practice. Electro-cardiographic (ECG) examination is traditionally conducted to detect the effect on the heart during treatment of malaria. ECG changes related to mefloquine 1000mg in total dosage was analysed and reported by Ye Thwe *et.al*, in 1993 and 1994. Because of decline in efficacy of mefloquine to *P. falciparum* in some parts of the country, the efficacy of mefloquine at a higher dosage of 1250 mg in total, given in 750 mg and 500mg 6 hours apart, was tested at the No. (2) Military Hospital (500 bedded). Since there was tendency to have more cardiac toxicity at a higher dosage, this study was conducted during September 1999 to June 2001. Patients who fulfilled the study criteria were selected for this study. ECG was taken before treatment (Day 0), at 24, 48, 72 hours post treatment and also on day 7. If there was abnormality, ECG was taken daily. 42 patients were included in this study. All were males and the mean age was 26.52 ± 12.73 years/sinus bradycardia was noted among 6 patients (14.29%). Prolonged PR interval was seen in 2 patients (4.76%) and 6 patients (14.29%) had prolonged QTc interval during day zero and five. However, the maximum QTc among these patients was 0.50 seconds. These changes later returned to normal. There were no significant changes in P, QRS, T waves, ST segments and mean PR, RP and QTc intervals. The results are as shown in the Table. No atrioventricular blocks, intraventricular blocks, dysrhythmias or other major ECG abnormalities were noted. Compare to ECG changes seen in patients treated with 1000 mg mefloquine, no significant difference was observed.

TITLE- 38

Malaria infection in pregnancy

AUTHOR (S) and AFFILIATION:

Moe Kyaw Tun, Thein Myint Thu and Zeyar Nyein

SOURCE:

13th Myanmar MMC Programme and Abstract, 2005; No. 32: pp. 15

ABSTRACT:

During one year study period (2002-2003) in the No. 2 Military Hospital (100 bedded) at Ann township, 131 pregnant women attended antenatal clinic. Among them, 46 pregnant mothers had clinical malaria, of which 30 patients were found to have malaria parasites in blood films, 12 patients had anaemia and there were 2 cerebral malaria cases. There was no maternal death. Four cases of clinical IUGR, 2 cases of IUFD and 2 neonatal deaths were observed. This study highlighted that malaria infection in pregnancy is the major cause of adverse pregnancy outcome and an important public health issue to be addressed.

TITLE: 39

Artesunate versus quinine for treatment of severe falciparum malaria: a randomised trial

AUTHOR(S) AND AFFILIATION:

South East Asian Quinine Artesunate Malaria Trial (SEAQUAMAT) group (including more than 10 Myanmar authors)

SOURCE:

Lancet 2005; 366: 717-725.

ABSTRACT:

Background: In the treatment of severe malaria, intravenous artesunate is more rapidly acting than intravenous quinine in terms of parasite clearance, is safer, and is simpler to administer, but whether it can reduce mortality is uncertain. *Methods:* We did an open-label randomised controlled trial in patients admitted to hospital with severe falciparum malaria in Bangladesh, India, Indonesia, and Myanmar. We assigned individuals intravenous artesunate 2.4 mg/kg bodyweight given as a bolus (n=730) at 0, 12, and 24 h, and then daily, or intravenous quinine (20 mg salt per kg loading dose infused over 4 h then 10 mg/kg infused over 2-8 h three times a day; n=731). Oral medication was substituted when possible to complete treatment. Our primary endpoint was death from severe malaria, and analysis was by intention to treat. *Findings:* We assessed all patients randomised for the primary endpoint. Mortality in artesunate recipients was 15% (107 of 730) compared with 22% (164 of 731) in quinine recipients; an absolute reduction of 34.7% (95% CI 18.5-47.6%; P=0.0002). Treatment with artesunate was well tolerated, whereas quinine was associated with hypoglycaemia (relative risk 3.2, 1.3-7.8; P=0.009). *Interpretation:* Artesunate should become the treatment of choice for severe falciparum malaria in adults.

TITLE- 40

A study on pathophysiological aspects of *P. falciparum* malaria

AUTHOR (S) and AFFILIATION:

Myat Phone Kyaw

SOURCE:

Thesis PhD Faculty of Medicine, University of Colombo, 2005

ABSTRACT:

Production of the inflammatory cytokine, Tumour Necrosis Factor (TNF) has a crucial role in the pathogenesis of severe *P. falciparum* malaria. However, there are no documented studies yet on the excessive production of TNF and its receptor in relation to the different clinical categories of falciparum malaria, and with the presence of Systemic Inflammatory Response Syndrome (SIRS) and organ dysfunctions in severe malaria. In order to explore this relationship, a descriptive case study on clinic-pathological changes in falciparum malaria, including biochemical and immunological changes at the molecular level was carried out in Sri Lanka (SL) (at the General Hospital of Anuradapura), and Myanmar (MM) (at the Defense Services General Hospital and North Okkalapa General Hospital), between 1997 to 1999. The purpose of the study was to investigate the pathogenesis of malaria and risk factors associated with severe and complicated disease, so as to aid in the clinical management of severe and complicated infections. Patients whose ages ranged from 1 to 82 years and clinically diagnosed as having malaria (both uncomplicated and severe malaria) were confirmed by means of microscopy and immunochromatographic test (ICT). Cases where microscopy or ICT result were for negative for malaria were also included as severe and complicated non malaria patients (SCNM) and their diagnoses were confirmed by means of other relevant investigation. In a total of 414 patients, 222 were from Sri Lanka and 192 from Myanmar. A total of 83; 158 severe and complicated malaria patients (SCM), 70; 26 uncomplicated malaria cases (UCM) and 69 and 8 (SCNM) were from Sri Lanka and Myanmar respectively. Clinical disease: a) Uncomplicated malaria: The severity intensity of the clinical disease was assessed by a clinical score which had been previously developed and validated. The total clinical score was significantly higher in Myanmar patients as was the prevalence of symptoms which was higher in Myanmar patients compared to that of Sri Lanka patients. The clinical score was significantly related to body temperature and parasitaemia. b) Severe and complicated malaria: Severe and complicated malaria was divided into three groups according to number of organ dysfunction as single organ dysfunction (SOD), multiple organ dysfunctions (MOD) and system failure. Hyperglycaemia, in relation with the various severe manifestations of falciparum malaria was noted in 43.7% of those with severe anaemia, 42.8% of those with acute respiratory distress (ARDS), and 40% of those with acute renal failure, 20% in hyperparasitaemia, 9.1% of those with impaired consciousness, 8% of cerebral malaria (CM), and 6.2% of hepatitis cases. It was found that (20.6-40.0)% of the patients who developed severe inflammatory response syndrome (SIRS) had hyperglycaemia, and so did 26.2% of patients with MOD. Mean lactate level of all the patients with

SIRS in SOD group and MOD group was significantly higher than those without SIRS in each group. MOD was noted in 61 (29.7%) patients, and 19 patients developed progressive organ failure and death. The overall mortality of these patients in the study was 14.1% and the mortality of MOD group was 31.1%. In SIRS patients, the patients who had hyperglycemia on admission had higher mortality than patients with normal glucose level on admission ($X^2=12.7668$; $P < 0.001$). The overall mortality between the two countries was not different ($X^2 = 0.0276$, $P > 0.5$), the ratio of MOD was higher in Sri Lanka (31/83 vs 30/158, $0.02 < P < 0.01$). The development of the hyperglycaemic state in CM with MOD was significantly higher than that in CM alone (52.4% vs 8%) ($P < 0.001$) and accounted for higher mortality in the former group. Therefore, the measurement of blood glucose level and the assessment of features of SIRS (temperature greater than 38 C or less than 36 C; heart rate greater than 90 beats per minute; tachypnea [>20 per minute or $PCO_2 < 32$ mm Hg.]; white blood cell count greater than $12.0 \times 10^9/L$ or less than $4.0 \times 10^9/L$ or more than 10% band forms), play an important role in diagnosing the hypermetabolic state, for predicting disease severity and indicating that oxygen transport need to be addressed early and treated aggressively in most critically ill patients.

TNF- α and its receptors: At the molecular level, TNF- α and its receptors sTNF-R1 levels and sTNF-R2 levels were significantly higher in SCM malaria than in UCM ($P < 0.001$). TNF- α levels were significantly raised in the MOD group with or without SIRS. A significantly high value of sTNF-R1 was noted in the system failure group. The highest value of TNF was noted in Acute Respiratory Distress syndrome-ARDS, followed by severe anaemia, MOD, hyperpyrexia and convulsions. The clinical score significantly correlated with TNF receptor R1 levels in UCM. Severe and complicated score for malaria (SCSM) previously developed and validated also had significant correlation with TNF α -R1 levels in SCM patients. Although mean TNF- α levels were high in hyperpyrexia cases, it was not related to oral temperature in UCM, whereas relationship between sTNF-R1 and oral temperature at the time of bleeding was noted in both countries ($r = 0.3381$; $n = 70$; $P < 0.001$ in Sri Lanka and $r = 0.6587$; $n = 13$; $0.02 < P < 0.001$ in Myanmar). TNF- α had no relationship with parasite count in either UCM of SCM. The TNF receptors TNF-R1 was related to the level of parasitaemia in both UCM and SCM cases. Evaluation of TNF- α levels in hypo, normo, and hyperglycaemic patients showed that when glucose levels were elevated without and signs of a hypermetabolic state or SIRS, TNF- α levels were normal in the normoglycaemic group. Serum creatinine and urea levels were significantly correlated with sTNF-R1 levels in all categories. A correlation between sTNF-R2 and urea was also noted. Both sTNF-R1 and R2 levels were significantly higher in MOD than in SOD, whereas sTNF-R1 alone was significantly higher in than organ failure group than in the system failure group. The sTNF-R1 was related to parasite count in UCM patients only, whereas sTNF-R2 positively correlated with the level of parasitaemia in both UCM and SCM cases. The TNF- α and sTNF-R2 levels were significantly higher in hyperparasitaemia cases. When TNF- α values of

sTNF-R2 level were significantly higher in hyperparasitaemia cases. When TNF- α values of hyperparasitaemia and hyperpyrexia cases who had no SIRS, were combined with TNF- α values of UCM cases, there was correlation between parasite count and TNF- α value ($r= 0.3239$, $n = 63$, $0.001 < P < 0.01$). Therefore this finding means that TNF- α is correlated with parasite count before SIRS has developed or before the body's homeostatic mechanism had progressed to the hyper-metabolic state. The level of TNF- α and its receptors were higher in the patients who died than in those who survived, and a marked significance was noted in sTNF-R1 levels ($P < 0.001$) and in sTNF-R2 levels ($0.02 < P < 0.05$), in which 68.4 % of death (26/38) were from MOD group. The significant finding was in MOD with CM group ($P < 0.02$). The TNF level in patients with CM who died were higher than in the survivor. Therefore the pathogenesis of CM is related to TNF- α production. The sTNF-R1 played a crucial role in patho-physiology of severe malaria. The points that supported this were (a) significantly higher level in SCM especially in MOD (b) significant correlation with the clinical scores in uncomplicated and severe and complicated malaria (c) the relationship with oral temperature (d) the relationship with parasite count in UCM but no relationship with hyperparasitaemia (e) rising trend in SIRS with SOF and system failure, indicating that it is involved early in the sequence of signaling pathway for TNF R1- mediated apoptosis. However, after multiorgan failure developed it seems to have action, which means that once it has started to be involved, the entire loop, as in *in vivo* and *in vitro* animal models will follow leading finally to cell death.

TITLE- 41

A study on pregnancy outcome of malaria in pregnancy in North Okkalapa General Hospital

AUTHOR (S) and AFFILIATION:

San San Yu

SOURCE:

Thesis M.Med.Sc. (Obstetrics and Gynaecology) IM (2), 2005

ABSTRACT:

A hospital-based descriptive study was done in North Okkalapa General Hospital, Myanmar during the year 2004 to assess the maternal and foetal outcome of pregnancy with malaria. The specific objectives were to assess the occurrence of malaria among pregnant patients, to describe the general and obstetric characteristics and to identify the presenting features of pregnant patients with malaria, to identify the presenting feature of pregnant patients with malaria, to identify the parasite species causing malaria in these women and congenital malaria in foetus if any, to study the maternal and foetal outcome of these cases. Twenty five cases of pregnant women with malaria parasite positive cases were studied. The overall prevalence of malaria during pregnancy was 4.3 per 1000 (0.43%), 60% of the cases occurred in the rainy season. Mean age of the cases was 29.12 ± 7.24 years and majority was in 20-24 years age group. Thirteen cases (13/53; 2%) were primigravidae and 12 cases (48%) were multigravidae. Fever, chills, rigor

and headache were the commonest symptoms. Eighty four percent of the cases were infected by *P. falciparum*. No congenital malaria infection was found. Mean haemoglobin level was 9.11gm%, 96% of the cases showed anaemia and severe anaemia was 12.5%. Out of 22 deliveries, 50% were delivered low birth weight babies and 41% were delivered preterm babies. Miscarriage cases were 12% in total 25 malaria infected cases. There were no significant associations between parasitaemia and socio-demographic characteristics, gravidity, anaemia and placental malaria changes. But statistically significant relationship was found in presence of placental malaria pigment (past infection) with outcome of low birth weight than that of no pigment group (80% to 11%) (P = 0.005).

TITLE- 42

Compliance and efficacy of three artesunate combination regimens in rural Myanmar

AUTHOR (S) and AFFILIATION:

Khin Maung Myint

SOURCE:

Thesis PhD Pharmacology, UM (1), 2005

ABSTRACT:

The objective of this study is to compare the efficacy, compliance and cost-effectiveness of three artesunate based combination therapy in uncomplicated malaria patients. The design of the study was a randomized comparative clinical trial. One hundred and thirty-five cases of uncomplicated malaria cases were assigned randomly to three group of artesunate base combination viz: artesunate plus mefloquine, artesunate plus tetracycline and artesunate plus doxycycline. Forty five patients were included in each group. Drug compliance was measured by tablet count, cross sectional interview and Dill and Glazko urine test. Clinical and parasitological outcome were measured by WHO 14 days method. Data was analysed by risk ratio. Cost-effective analyses were done by cost-effective ratio and impact ratio. Treatment failure rates were artesunate plus mefloquine 4.4%, artesunate plus tetracycline 26.6% artesunate plus doxycycline 13.3% respectively. Artesunate plus tetracycline was statistically significant (P<0.01). Although artesunate plus mefloquine regimen was three time more effective than artesunate plus doxycycline, but statistically not significant (P = 0.26). Artesunate plus doxycycline and artesunate plus tetracycline regimens were not statistically significant (P= 0.18) in effectiveness. In conclusion, artesunate plus mefloquine regimen was more cost-effective and better compliance then artesunate plus doxycycline. Artesunate plus doxycycline regimens also have good compliance and more cost-effective then artesunate plus tetracycline. Artesunate plus tetracycline regimen was least efficacious and less compliance than other regimens and therefore it should not be recommended for used in combination.

2006

TITLE- 43

Sensitivity of falciparum malaria parasites to different antimalarial drugs in Buthidaung and Kawthaung townships (2005)

AUTHOR (S) and AFFILIATION:

Ye Htut¹, Chan Thar², Ni Ni Aye³, Kyin Hla Aye⁴, Aung Than⁵, Ni Ni⁴, Tin Nwe Htwe⁴, Kay Thwe Han⁴ and Saw Lwin⁶

¹DMR (LM); ²VBDC Team, Sittwe, Rakhine State; ³VBDC Team, Dawei, Thanintharyi Division; ⁴Parasitology Research Division, DMR (LM); ⁵VBDC, Headquarters DOH; ⁶DOH

SOURCE:

MHRC Programme and Abstract 2006; pp. 3

ABSTRACT:

The current sensitivity status of falciparum malaria to different antimalarial drugs and their combinations was investigated in Kawthaung and Buthidaung Townships by conducting field-based randomized prospective trial during malaria transmission season in 2005. Therapeutic efficacy test was conducted on uncomplicated falciparum malaria subjects applying WHO 28 day test. Artesunate-mefloquine combination was found to be 100% (61/61) sensitive in Kawthaung but only 91.07% (51/56) ACPR (adequate clinical and parasite response) was evident with 8.9% (5/56) LTF (Late Treatment Failure) in Buthidaung. Artesunate-amodiaquine combination gave 96.61% (57/59) ACPR and 3.39% (2/59) LTF in Kawthaung and 92.98% (53/57) ACPR with 1.7% (1/57) ETF (Early Treatment Failure) and 5.2% (3/57) LTF in Buthidaung. Artemether-lumefantrine drug combination showed 98.33% (59/60) ACPR with 1.67% (1/60) LTF but in Buthidaung, only 96.29% (52/54) ACPR with 3.7% (2/54) LTF were found. The WHO standard *in vitro* drug sensitivity testing of *P. falciparum* parasites to antimalarials (chloroquine, amodiaquine, mefloquine, quinine and artesunate) were also carried out. More than 73% resistance to chloroquine and amodiaquine was observed in both areas which indicated that single use of these antimalarials must not be applied in treating falciparum malaria. Quinine resistance was found to be 24.48% in Kawthaung and 0% in Buthidaung. Therefore, plan to prevent and reduce the emergence of quinine resistance in Thai-Myanmar border should be considered. Mefloquine resistance was 14.28% in Kawthaung and 17.39% in Buthidaung. Although clinical studies have not revealed artesunate resistance yet, the *in vitro* results showed 4.08% resistance in Kawthaung and 6.5% in Buthidaung. The findings indicated that artemisinin-based combination (ACTs) should not be failed to use in the treatment of uncomplicated falciparum malaria especially in border areas.

TITLE- 44

The prevalence of hereditary ovalocytosis and its innate resistance to malaria infection

AUTHOR (S) and AFFILIATION:

Nwe Nwe Oo¹, Ye Htut², Myint Oo³, Kyin Hla Aye¹, Ni Ni¹ and Maung Maung Mya¹

¹Parasitology Research Division, DMR (LM); ²DMR (LM); ³Retired Director, DMR (LM)

SOURCE:

MHRC Programme and Abstract 2006; pp. 8

ABSTRACT:

Ovalocytosis is a hereditary condition in which majority of the circulating erythrocytes are oval in shape. In normal persons 0-10% of erythrocytes are ovalocytes. Hereditary ovalocytosis has an innate resistance to malaria infection due to the marked increased in membrane rigidity and resistance to invasion by the parasites. In our study, we compared the malaria parasite positive rate and *P. falciparum* antibody IgG level among the patients with normal erythrocyte group, 11-20% ovalocyte group and more than 20% ovalocyte groups. We recruited 355 malaria suspected cases in Thaton Township and 243 cases in Buthitaung Township. Examination of malaria parasite and ovalocytosis was done in Giemsa Stained thick and thin blood films. The anti-*P. falciparum* antibody IgG level was determined by ELISA method. In Thaton Township 93.5% (n = 332) of the patients had normal erythrocytes, 5.9% (n = 21) had 11-20% ovalocytes and 0.5% (n = 2) had more than 20% ovalocytes. In Buthitaung Township 93% (n = 226) had normal erythrocytes, 4.5% (n = 11) had 11-20% ovalocyte and 2.5% (n = 6) had more than 20% of ovalocytes. In both areas the malaria parasites were seen in normal and 11-20 % ovalocyte groups, whereas more than 20% of ovalocyte groups showed no malaria parasite in their blood films. *P. falciparum* antibody levels in these three groups were also compared. From the above findings there is an indication of preventing the parasite invasion into erythrocytes probably due to the innate resistance conferred by ovalocyte.

TITLE-45

Efficacy and safety of oral artemisinin-piperaquine (Artekin) compared to artesunate-mefloquine (Artequin) in uncomplicated falciparum malaria in adults

AUTHOR (S) and AFFILIATION:

Khin Phyu Pyar¹, Win Win Myint¹, Khin Nyo¹, Than Htut¹, Myat Phone Kyaw², Myo Nyunt¹ and Marlar Than³

¹Department of Medicine, DSGH; ²Experimental Medicine Division, DMR (LM); ³Advisor, DSGH, Mingaladon

SOURCE:

MHRC Programme and Abstract 2006; pp. 10-11

ABSTRACT:

Artekin compound [40 mg dihydroartemisinin and 320mg piperaquine phosphate] is a commercial product from Holleykin Pharmaceutical Co., Ltd Guangzhou, Peoples Republic of China, has been studied in many countries [Thailand, Vietnam, Cambodia, and China] and is found to be safe and effective in uncomplicated falciparum malaria. Dihydroartemisinin is the main metabolite of the artemisinin and has equivalent clinical efficacy to its parent compounds. Dihydroartemisinin-piperaquine (Artekin) is less expensive than artesunate-mefloquine (Artequin), available as a co-formulated tablet. A hospital based, randomized controlled study was done at DSGH 1000 bedded, Mingaladon on a total of 30 uncomplicated falciparum malaria patients, between January to September 2006, to determine the therapeutic efficacy, safety and tolerability of Artekin tablet in the treatment of uncomplicated falciparum malaria patients in adults. Artekin 2 tablets were given at 0, 6, 24 and 32 hours in one group and ArtequinTM (fixed dose combination pack of artesunate-mefloquine from Mepha-Switzerland) was given 2 tablets daily for 3 days in the control group. Initial parasitaemias were 13528.9 ± 1909.3 and 18144.0 ± 4049.7 , Fever clearance times (FCT) were 12.4 ± 13.1 and 12.9 ± 14.4 , and Parasite clearance times (PCT) were 46.8 ± 22.1 hours and 51.2 ± 19.9 respectively in Artekin and Artequin groups. Median parasite clearance was 42 hours and 56 hours. There was no early treatment failure (ETF) and adequate clinical and parasitological response (ACPR) was 100% in both groups. There were no serious side effects. Therefore Artekin is as safe and as effective as Artequin for treatment of uncomplicated falciparum malaria in adults.

TITLE- 46

Endotoxaemia in severe falciparum malaria infection

AUTHOR (S) and AFFILIATION:

Myat Htut Nyunt¹, Khin Wut Hmon², Hay Mar Hpoo³, Aye Thinzar Than Htay¹, Phyu Phyu Aye³, Khine Khin Maw¹ and Myat Phone Kyaw³
¹Clinical Research Unit, North Okkalapa General Hospital; ²Kyaing Ton General Hospital; ³DMR (LM)

SOURCE:

MHRC Programme and Abstract 2006; pp.13

ABSTRACT:

The effects of endotoxaemia resemble clinical, pathological, and pathophysiological, features of complicated falciparum malaria. Some physicians use antibiotics to treat the bacterial infections associated with malaria but many casually prescribed antibiotics, just to prevent infections. Hospital based descriptive study was carried out to detect gram-negative bacterial toxins in severe and complicated falciparum malaria cases admitted at North Okkalapa General Hospital, by using the most sensitive E-Toxate method. Endotoxaemia was recorded in 60.8% of the patients. Mortality of endotoxaemia patients and those of without endotoxaemia were not significantly different. Positive correlation existed between days of symptoms before admission and endotoxaemia. Significant difference was not found between the two groups: endotoxin positive group that was not taken antibiotics (80.7%) and endotoxin negative group treated with antibiotic (53.8%). The clinicians used antibiotics to treat the bacterial infections associated with malaria without measuring endotoxin has no significant effect. Endotoxaemia was present in severe falciparum malaria infection, but it is not a prognostic indicator.

TITLE- 47

Impairment of hepatic function in severe and complicated falciparum malaria patients admitted at North Okkalapa General Hospital in 2005

AUTHOR (S) and AFFILIATION:

Myat Phone Kyaw¹, Tin Tin Aung², Mar Mar Kyi², Ye Htut³, Khin Wut Hmon⁴, Myat Htut Nyunt⁵, Yin Thuzar Kyaw⁵ and Khine Khin Maw⁵
¹Experimental Medicine Research Division, DMR (LM); ²Department of Medicine, UM (2); ³DMR (LM); ⁴Kyaing Ton General Hospital; ⁵Clinical Research Unit, North Okkalapa General Hospital

SOURCE:

MHRC Programme and Abstract 2006; pp.13

ABSTRACT:

Impairment of hepatic function is common in severe malaria. It leads to improper handling of drugs and antimalarials. Alanine amino transferase (ALT) is the most sensitive marker for liver cell damage. To assess the impairment of liver function in severe and complicated falciparum malaria patients, descriptive case study was done on confirmed severe and complicated malaria (SCM) cases admitted at North Okkalapa General Hospital during June 2005 to November 2005. Total of 82 SCM cases were

finished to study and overall mortality was 11%. In which 13 patients have hepatitis (serum bilirubin >50µmol/l or 3g/dl). Two cases admitted with hepatitis alone have no mortality. Hepatitis with other complications has high mortality. Two cases admitted with hepatitis and severe anaemia, one with hypoglycaemia and 8 cases have multiorgan dysfunction. Raised ALT level was noted in 28% of these patients with 8.7% mortality. ALT is also raised in 15 patients with normal bilirubin level with 13.3% mortality. Therefore, ALT level needs to be checked in SCM patients. When ALT is excessively elevated, one should inspect other systemic dysfunction to prevent mortality.

TITLE- 48

Clinical significance of Antithrombin III in falciparum malaria

AUTHOR (S) and AFFILIATION:

Wai Wai Oo¹, Chit Soe², Ne Win³, San Hla⁴, Khin Thet Wai⁵ and Ohnmar⁵
¹Thingangyun Sanpya Hospital, Yangon; ²East Yangon General Hospital;
³National Health Laboratory, DOH; ⁴Mawlamyaing Civil Hospital, ⁵DMR
(LM)

SOURCE:

MHRC Programme and Abstract 2006; pp. 46

ABSTRACT:

Eighty eight falciparum malaria patients comprising 46 confirmed severe malaria (CSM) patients admitted to Thaton District Hospital and 42 patients with confirmed uncomplicated malaria (CUM) patients at outpatient department of Vector Borne Disease Control Centre (VBDC) Insein, Yangon were studied from 2003 to 2005 to determine the parasite count, antithrombin III (ATIII) levels and patients' outcome (full recovery, treatment failure and death). Patients were followed-up clinically for 7 days. Parasite count and ATIII levels were assessed on day 0, day 3, and day 7. The high parasite count (more than 10,000/cumm) was found 52% in CUM and 30% in CSM. In CUM, there was no statistical difference between ATIII-IgG and ATIII-IgM on all three assessments. In CSM, both ATIII-IgG and ATIII-IgM levels on day 0 were found low as expected and increased to near normal on day 3 and day 7 with standard antimalaria treatment. The ATIII levels were not significantly different between those with and without conditions like hyperpyrexia, cerebral malaria and circulatory collapse. ATIII-IgM levels on day 0 differ significantly between those with and without jaundice. The ATIII-IgG and ATIII-IgM levels were significantly lower in CSM than CUM. Treatment failure was noted higher in CUM (33.3%) than CSM (2.2%). Replacement therapy for ATIII can be considered more on arrival of patients with severe malaria particularly for those with jaundice. Further studies on high treatment failure rate for CUM are recommended.

TITLE- 49

In vivo sensitivities of chloroquine, quinine, mefloquine sulphadoxine-pyrimethamine and artemether capsule of malaria infected subjects from Ann regimental area, Rakhine State

AUTHOR (S) and AFFILIATION:

Thein Htay Win, Hein Hlwan Moe, Aung Aung, Wana Thaw and Win Tint

SOURCE:

14th Myanmar MMC Programme and Abstract, 2006, No. 16: pp. 9

ABSTRACT:

The seven day *in vivo* sensitivities of chloroquine, quinine, mefloquine, sulphadoxine-pyrimethamine and artemether capsule were studied on 311 *P. falciparum* infected subjects from Ann, Rakhine state. Decreased sensitivities were observed in *P. falciparum* infected subjects treated with chloroquine, quinine, mefloquine, sulphadoxine -pyrimethamine. The rates of resistant (R2 and R3) of chloroquine, sulphadoxine-pyrimethamine, and quinine were found to be 45.58%, 95.65%, and 32.97% respectively. It was surprising to observe the decreasing efficacy of artemether capsule in those subjects (R2=17.39%).

TITLE-50

Multi-centre randomized control trial of the efficacy of dawnasunate and mefloquine combination therapy compared to artesunate and mefloquine combination therapy among uncomplicated falciparum malaria cases in Military Hospitals

AUTHOR (S) and AFFILIATION:

Myat Khine, Kyaw Hlaing, Zaw Myo Han, Tin Maung Hlaing, Khin Maung Aye and Than Aung

SOURCE:

14th Myanmar MMC Programme and Abstract, 2006; No. 39: pp. 21

ABSTRACT:

Dawnasunate is produced by Myanmar Pharmaceutical Factory (MPF). It is an artemisinin compound extracted from Dawna Shwewa herbs, planted in Myanmar. Artesunate, a product of Yangon Pharmaceutical Factory (YPF), is currently used in combination with mefloquine as artemisinin based combination therapy (ACT) in Myanmar Army. This study was carried out to compare the efficacy of dawnasunate and mefloquine combination therapy to artesunate and mefloquine combination therapy among uncomplicated falciparum malaria cases to determine whether dawnasunate could be used in place of artesunate. Randomized control trial was conducted in 9 Military Hospitals from November, 2004 to August, 2005. Sample size was about 140 on each arm. Both study and control groups were comparable in the baseline data such as sample size, mean age, mean initial parasite count and so on. By outcome, Adequate Clinical and Parasitological Response (ACPR) was not significantly different between the study and control group, 100% and 99.3% respectively (P = 0.519). Mean Fever Clearance Time (Mean FCT) and Mean Parasite Clearance Time (Mean PCT) were also comparable. No significant side effects were also noted.

From this study, dawnsuntae could be used in combination with mefloquine as artemisinin based combination therapy (ACT) for the treatment of uncomplicated falciparum malaria in Myanmar.

TITLE- 51

Use of in-house test system for investigating prevalence of *P. falciparum* antiparasite antibodies in a malaria endemic area

AUTHOR (S) and AFFILIATION:

Muya Than¹, Aye Aye Myint², Aye Aye Maw¹, Sandar Aung¹, Myo Khin⁴, Ye Hut⁵, Khin May Oo², Aye Aye Yee¹ and Yi Yi Kyaw³

¹Nuclear Medicine Research Division; ²National Blood Research Center; ³Experimental Medicine Research Division, DMR (LM); ⁴DMR (CM); ⁵DMR (LM)

SOURCE:

MHRC Programme and Abstract 2006; pp.12

ABSTRACT:

Malaria ranks as first priority disease in Myanmar. For effective control of malaria, the situation of malaria transmission in the area must be known as much as possible. Of several indicators, antiparasite antibody is considered as a useful indicator for assessing the transmission and could be used in planning the progress of vector control programmes. We developed an in-house indirect Enzyme Immunosorbent Assay (EIA) system using synthetic peptide NANP3 as the solid phase and peroxidase labeled anti-human IgG (Rabbit) as the conjugate. Checkerboard titration was carried out and the dilutions determined. The antiparasite antibody levels of 384 subjects from Tarchileik (mean age 34.71 ± 19.2yrs) were determined. The mean antibody levels ranged from 0.08µg to 21.9µg. No significant difference in the anti-parasite antibody positive rate was found between males and females (29.2% vs 37.6%). A positive correlation (r = 0.32) with age (P<0.001) was found and highest antiparasite antibody positive rate was found in 20-40 years age group followed by 40-60 years age group. No association was found with history of malaria. The developed EIA could be used to assess the degree of malaria transmission in a locality.

TITLE: 52

Efficacy and effectiveness of dihydroartemisinin-piperaquine versus artesunate-mefloquine in falciparum malaria: an open-label randomised comparison

AUTHOR (S) AND AFFILIATION:

Frank Smithuis, Moe Kyaw Kyaw, Ohn Phe, Khin Zarli Aye, Lhin Htet, Marion Barends, Niklas Lindegardh, Thida Singtoroj, Elizabeth Ashley, Saw Lwin, Kasia Stepniewska, Nicholas J. White

SOURCE:

Lancet 2006; 367: 2075–85

ABSTRACT:

Background: Artemisinin-based combinations are judged the best treatments for multidrug-resistant *Plasmodium falciparum* malaria. Artesunate-mefloquine is widely recommended in Southeast Asia, but its high cost and tolerability profile remain obstacles to widespread deployment. To assess whether dihydroartemisinin-piperaquine is a suitable alternative to artesunate-mefloquine, we compared the safety, tolerability, efficacy, and effectiveness of the two regimens for the treatment of uncomplicated falciparum in western Myanmar (Burma). *Methods:* We did an open randomised comparison of 3-day regimens of artesunate-mefloquine (12/25 mg/kg) versus dihydroartemisinin-piperaquine (6.3/50 mg/kg) for the treatment of children aged 1 year or older and in adults with uncomplicated falciparum malaria in Rakhine State, western Myanmar. Within each group, patients were randomly assigned supervised or non-supervised treatment. The primary endpoint was the PCR-confirmed parasitological failure rate by day 42. Failure rates at day 42 were estimated by Kaplan-Meier survival analysis. This study is registered as an International Standard Randomised Controlled Trial, number ISRCTN27914471. *Findings:* Of 652 patients enrolled, 327 were assigned dihydroartemisinin-piperaquine (156 supervised and 171 not supervised), and 325 artesunate-mefloquine (162 and 163, respectively). 16 patients were lost to follow-up, and one patient died 22 days after receiving dihydroartemisinin-piperaquine. Recrudescence parasitaemias were confirmed in only two patients; the day 42 failure rate was 0.6% (95% CI 0.2–2.5) for dihydroartemisinin-piperaquine and 0 (0–1.2) for artesunate-mefloquine. Whole-blood piperaquine concentrations at day 7 were similar for patients with observed and non-observed dihydroartemisinin-piperaquine treatment. Gametocytaemia developed more frequently in patients who had received dihydroartemisinin-piperaquine than in those on artesunate-mefloquine: day 7, 18 (10%) of 188 versus five (2%) of 218; relative risk 4.2 (1.6–11.0) P=0.011. *Interpretation:* Dihydroartemisinin-piperaquine is a highly efficacious and inexpensive treatment of multidrug-resistant falciparum malaria and is well tolerated by all age groups. The effectiveness of the unsupervised treatment, as in the usual context of use, equalled its supervised efficacy, indicating good adherence without supervision. Dihydroartemisinin-piperaquine is a good alternative to artesunate-mefloquine.

TITLE-53

The role of endotoxins in complicated falciparum malaria

AUTHOR (S) and AFFILIATION:

Aye Thinzar Than Htay

SOURCE:

Thesis M.Res (Biotechnology), University of Yangon, 2006

ABSTRACT:

The role of endotoxins in complicated falciparum malaria especially in adult patients admitted to North Okkalapa General Hospital was examined with confirmed severe falciparum malaria during June 2005 to November 2005. Blood samples were collected from 51 cases to perform the tests. In this study, the highest mortality was detected in Multi organ dysfunction (MOD) group. Hyperglycaemia, which represents hypermetabolic state has been noted in MOD, acute respiratory distress syndrome (ARDS) and cerebral malaria (CM) with fits cases, in which 75% of the studied patients expired. All hypoglycaemia cases have organ involvement. Frequent measuring of glucose level is essential in management of severe falciparum malaria. Endotoxaemia was found in 60.8% of the patients. The mortality between patients with endotoxaemia and those without endotoxaemia were not significantly different which support the Tubbs hypothesis. Tested patients (80.7%) with endotoxaemia not treated with antibiotic, and 53.8% of endotoxin negative patients treated with antibiotics do not differ significantly. Positive relationship between days of symptoms before admission and endotoxaemia level was recorded. Cellular immunity could be suppressed, due to acute malarial infection or altered local flow in the gut allowed endotoxin produced by the gut flora to reach the blood stream during course of infection before treatment, judged from the recorded data. Suggestions for future work are outlined.

TITLE-54

Impairment of hepatic function and effect of hemolysis in severe and complicated malaria

AUTHOR (S) and AFFILIATION:

Yin Thuzar Kyaw

SOURCE:

Thesis M.Res (Biotechnology), University of Yangon, 2006

ABSTRACT:

Hospital based descriptive study has been carried out on 83 admitted cases with severe and complicated falciparum malaria at North Okkalapa General Hospital during June 2005, to know the exact liver damage and iron sequestration effect in severe falciparum malaria infection leading to oxidative stress on liver. Alanine amino transferase (ALT) enzyme level which represents liver damage and serum ferritin, iron storage protein levels were measured. Alanine aminotransferase level was raised in 27.7% of the patients with elevated bilirubin of 56.5%. Mortality was not observed in patients suffering only from hepatitis. However, high mortality rate was recorded in patients with high ALT and normal bilirubin level. Serum ALT

level is an essential tool to assess liver damage in severe falciparum patients. Serum ferritin levels between patients with high ALT level and normal level was not significantly different. No correlation exists between serum ferritin level and parasite count. Therefore, serum ferritin level need not to be assessed in severe falciparum malaria patients as routine measurement. Suggestions for future work are outlined.

TITLE- 55

Clinical significance of antithrombin III in severe malaria

AUTHOR (S) and AFFILIATION:

Wai Wai Oo

SOURCE:

Thesis Dr. Med.Sc. (General Medicine) IM (2), 2006

ABSTRACT:

A total of eighty eight patients comprising forty six of confirmed severe malaria patients admitted to Thaton District Hospital and forty two patients with confirmed uncomplicated malaria patients attending to out patient department of Vector Borne Disease Control (VBDC) Insein, Yangon were studied during a period of two years from June 2003 to June 2005. Patients with the associated medical illness such as malignant hypertension, and diabetes mellitus were excluded and the confirmation of malaria infection with the RDT ((Rapid Diagnostic Test) and microscopic examination was done. The pregnancy was excluded by urine for HCG. The parasite count, Hb level, random blood sugar, blood urea, platelet count and antithrombin III level measurements were done. Age group between CSM and CUM was compared and statistically significant. The older age distribution was found in CUM. Regarding the sex distribution, there was more male in CSM (M:F = 1.7:1) as well as in CUM (M:F = 5.4:1). The parasite count was studied in CUM and CSM patients. The high parasite count was found in CUM as the patients of CUM were residing in non-endemic areas such as Yangon who were non-immune patients. When the parasite count was explored in group, the high count > 10,000/cmm was found in 52% in CUM and 30% in CSM. The ATIII levels of both IgG and IgM in CUM and CSM was studied by days. In CUM the ATIII- IgG on D-0,-3 and D-7 was no statistically difference. The ATIII-IgM was also no significant difference in CUM. In CSM, there was low ATIII -IgG level on D-0 as expected. The ATIII -IgG level was came back to near normal value on D-3 and D-7 with standard anti malaria treatment. The ATIII - IgM was low on D-0 but gradual rise of IgM on D-3 and D-7 was seen and statistically significant. In CUM, although the comparatively lower level of ATIII was seen on D-0, there was no significant rise of ATIII on D-3 and D-7. In CSM, there was low ATIII level on D-0 and the level was back to near normal on D-3 and D-7 with standard anti-malaria treatment. The ATIII levels of CSM at D-0 were compared between CSM patients with and without particular presentations. Statistical significance was not found for some presentations (cerebral malaria, hyperpyrexia and circulatory collapse). Although there was no significant difference in ATIII -IgG at D-0 for patients with and without jaundice, the significant difference was noted for ATIII -IgM on D-0. The association of

ATIII and the severity of malaria was studied and found that there was significantly reduced ATIII-IgG and IgM level in severe type of malaria. The correlation of ATIII levels on day-0, 3 and 7 with the parasite count of day-0, 3 and 7 were studied in CUM and CSM. There was no correlation of ATIII both IgG and with the parasite count. The outcomes in CUM and CSM was reported as fully recovered, treatment failure and death. There were twenty-eight patients in CUM who were fully recovered. The remaining fourteen patients were treatment failure in spite of full dosage of anti malaria treatment because of non-immune status in CUM patients who were residing at non-endemic areas. No death was reported. In CSM there were forty –five patients who were fully recovered. The only one patient was reported as treatment failure. No death was reported. The association of ATIII –IgG and IgM and outcomes in CUM and CSM was studied. In CUM there was strong association of ATIII both IgG and IgM and the outcome. In CUM there was failure to rise ATIII –IgG and IgM level on D-3 and D-7 in treatment failure patients. In CSM patients there was low ATIII-IgG and IgM D-0 but gradual rise of ATIII level on D-3 and D-7 was seen in fully recovered patients. In treatment failure patients, low ATIII-IgG was seen in D-0 with gradual rise of IgG on D-3 and D-7 was seen. The ATIII-IgM was not low on D- 0 and no rise on D- 7. The above findings in this study were limited due to small sample size. The high parasite count in CUM was probably due to non-immune status. The increase formation of ATIII-IgG was attenuated by duration of infection in this study because nearly all patients had repeated attacks of malaria.

TITLE- 56

Cytokines, inflammation and brain injury: role of tumour necrosis factor in severe and complicated falciparum malaria

AUTHOR (S) and AFFILIATION:

Lily Myint

SOURCE:

Thesis Ph.D (Zoology), University of Yangon, 2006

ABSTRACT:

No documented study has yet been conducted on the relationship between the Tumour Necrosis factor (TNF), with the concept of Systemic Inflammatory Response Syndrome (SIRS) and Multiple Organ Dysfunction (MOD) in falciparum malaria in this country. A detailed clinical picture, including biochemical and immunological changes associated with falciparum malaria were studied on 93 admitted patients within the age ranging from 1 to 82 years at the North Okkalapa General Hospital, Myanmar within the study period from May 2003 to May 2005 as a hospital based descriptive case study. The TNF- α level was recorded to be significantly higher in severe and complicated falciparum malaria (SCM) when compared to the levels in uncomplicated malaria (UCM) ($P < 0.001$). The patients when categorized according to WHO classification, TNF levels were recorded to be higher in Adult Respiratory Distress syndrome except in two patients with macrohaemoglobinuria, followed by severe anemia, MOD, hyperpyrexia, hepatitis, convulsion and cerebral malaria. Although mean

TNF and levels were high in hyperpyrexia cases, it did not correlate with the temperature values in uncomplicated malaria (UCM) cases of this study. There was no relationship between TNF- α and parasite count in this study in UCM ($r = 0.1510$; $n = 91$; $P > 0.5$) and SCM patients ($r = 0.0479$; $n = 204$). Hyperglycaemia, which represents hypermetabolic state, was noted in 43.7% of the severe anaemia patients, 42.8% of ARDS, 40% of acute renal failure, 26.2% of MOD, 20% in hyperparasitaemia, 9.1% of impaired consciousness, 8% of cerebral malaria, and 6.2% of patients with hepatitis cases. The most salient finding of the development of hyperglycaemia state in cerebral malaria (as a single organ dysfunction) was significantly lower than in cerebral malaria with MOD (8% vs 52.4%; $P < 0.001$) and it was highest when compared to different subgroups.

2007

TITLE- 57

Efficacy of oral single-dose therapy using artemisinin-naphthoquine phosphate in treatment of uncomplicated falciparum malaria

AUTHOR (S) and AFFILIATION:

Thein Tun¹, Hla Soe Tint¹, Khin Lin¹, Saw Lwin², Than Win², Thar Htun Kyaw², Moe Kyaw Myint² Win Khaing³ and Thida¹

¹DMR (UM); ²DOH; ³University of Medicine, Mandalay

SOURCE:

MHRC Programme and Abstract 2007; pp.3

ABSTRACT:

Different forms of artemisinin based combination therapy (ACT) combinations have been used in many countries since 2001. In Myanmar, the new National Antimalarial Treatment Policy was introduced in September 2002. ACT was recommended for treatment of uncomplicated falciparum malaria. The new generation ACT containing artemisinin plus naphthoquine is a single-dose antimalarial drug. A total of 55 uncomplicated falciparum malaria cases were studied during June to September 2007. A single dose of eight tablets (containing Artemisinin 125 mg plus Naphthoquine 50 mg in each tablet) was given orally. Average body temperature at the time of drug administration was 38.8 ± 0.7 degree Celsius. Average duration of illness was 3.2 ± 1.0 days. Geometric mean of plasmodium parasite count at day0 was 12286 ± 14979 per μl . Out of total 55 cases, 2 cases were excluded from study because of appearance of *P.vivax* on day 28. Fifty two out of 53 cases achieved Adequate Clinical and Parasitological Response (ACPR). ACPR rate was 98.1%. In one case falciparum parasite reappeared on day14. Late Parasitological Failure (LPF) rate was 1.9% ($n = 1/53$). Mean fever clearance time and parasite clearance time were 18.21 ± 6.15 and 34.6 ± 14.25 hours respectively. Apart from slight dizziness complained by two female patients and relieved by oral glucose ad lib, drug was well tolerated and no correlative adverse reactions found in remaining patients. The liver function tests including GOT, GPT, total bilirubin, and alkaline phosphatase showed no significant changes

during trial (between day 0 and day 14). New generation ACT containing artemisinin plus naphthoquine is found to be a single dose ACT with reliable efficacy, high cure rate, and good tolerance.

TITLE- 58

Assessment of therapeutic efficacy of chloroquine for treatment of vivax malaria in sentinel sites of Upper Myanmar

AUTHOR (S) and AFFILIATION:

Khin Lin¹, Win Pa Pa Win¹, Phyu Phyu Win¹, Than Win², Thar Htun Kyaw² and Thein Tun¹

¹DMR (UM); ²Department of Health

SOURCE:

MHRC Programme and Abstract 2007; pp.10

ABSTRACT:

Malaria is one of the top priority health problems in Myanmar and *Plasmodium vivax* accounts for 20-25% of total malaria patients. Although chloroquine is recommended as the drug of choice for treatment of vivax malaria, it still needs to assess its therapeutic efficacy. A study was done in villages of Northern Shan State (Lashio and Naung Cho townships) and Mandalay Division (Thabeikkyin and Patheingyi Townships) during 2006 June to 2007 July to assess therapeutic efficacy of chloroquine according to the standard guidelines of WHO for monitoring of drug resistant malaria (28 days test). Blood was taken from finger tips of clinically suspected malaria patients and malaria microscopy was done for species identification and parasite count determination. *P.vivax* positive patients were given chloroquine 10 mg, 10 mg and 5 mg per Kg body weight on days 0, 1 and 2 respectively. Follow up of patients was done on days 2, 3, 7, 14, 21 and 28 days. In Northern Shan State, out of 1058 patients examined, 72 patients were *P.vivax* positive and 63 patients completed the study. In Mandalay Division, out of 640 patients examined, 63 patients were *P. vivax* positive and 61 completed the study. Adequate Clinical and Parasitological Response (ACPR) was 95.2% (60/63) and 96.7% (59/61) in Northern Shan State and Mandalay Division respectively. No significant difference was found between the two areas. (P = 0.12). The study showed that chloroquine is really effective and should be recommended for treatment of vivax malaria in Myanmar.

TITLE- 59

Efficacy and safety of artesunate-amodiaquine (Larimal) compared to dihydroartemisinin-piperaquine (Artekin) in uncomplicated falciparum malaria in adults

AUTHOR (S) and AFFILIATION:

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SOURCE:

53rd Myanmar Medical Conference, Programme and Abstract, 2007, pp. 57

ABSTRACT:

According to the current National policy and guidelines for treatment of malaria in Myanmar, artemisinin derivatives are not recommended, to be used as single agents. Artemisinin combination therapy (ACT) regimens currently available are artesunate-mefloquine and artemether-lumefantrine (Coartem) combinations, which are however, rather costly for the consumer. The other combinations with cheaper price are artesunate-amodiaquine (Larimal) and dihydroartemisinin-piperaquine (Artekin) combinations. Dihydroartemisinin is the main metabolite of artemisinin and has equivalent clinical efficacy to its parent compounds. Hence these two combinations have been tried. A hospital based, randomized controlled study was done at DSGH 1000 bedded, Mingaladon on a total of 52 uncomplicated falciparum malaria patients between January to September 2006, to determine the therapeutic efficacy, safety and tolerability of Larimal and Artekin in the treatment of uncomplicated falciparum malaria patients in adults. Larimal (artesunate 200 mg + amodiaquine 600 mg) was given for 3 days in one group and Artekin 2 tablet (Artekin compound) (Dihydroartemisinin 40 mg + Piperaquine phosphate 320 mg) was given at 0, 6, 24 and 32 hours in other group, initial parasitaemia were 9319.072 ± 17296.5 and 19982.2 ± 47225.5 , fever clearance times (FCT) were 11.8 ± 16.6 and 15.1 ± 15.7 , and parasite clearance time (PCT) were 47.1 ± 11.6 hours and 43.8 ± 19.0 respectively in Larimal and Artekin groups. There was no early treatment failure (ETF) and adequate clinical and parasitological response (ACPR) was 100% in both groups. There were no serious side effects. Therefore, these two combinations are safe and effective for treatment of confirmed uncomplicated falciparum malaria in adults.

TITLE-60

Study of rheological parameters in healthy adults, confirmed uncomplicated and severe falciparum malaria patients

AUTHOR (S) and AFFILIATION:

Aye Aye Myint

SOURCE:

Thesis Ph.D (Physiology) UM (1), 2007

ABSTRACT:

The aim of the present study was to study the rheological parameters of healthy adults, confirmed uncomplicated and severe falciparum malaria patients. Rheological parameters such as relative blood viscosity (RBV), relative plasma viscosity (RPV), packed cell volume (PCV), and red cell aggregations like erythrocyte sedimentation rate (ESR) and rosette formation, and *in vitro* blood flow were determined in healthy adults, uncomplicated and moderately severe falciparum malaria patients and the values were compared between the normal healthy adults and malaria patients. Plasma proteins, red cell count (RCC), mean cell volume (MCV), and red cell distribution width (RDW) were also determined as they are determinants of relative blood viscosity. To determine the physico-chemical change of red cells, rolling of the blood cells was also investigated. Erythrocyte sedimentation rate, fibrinogen concentration and red cell distribution width were found to be significantly greater, and albumin significantly lesser in the malaria patients than in the healthy adults. Erythrocyte sedimentation rate was found to be significantly and inversely correlated with albumin concentration and red cell count in normal subjects. In malaria patients, ESR was significantly correlated with mean cell volume whereas blood flow was significantly and inversely correlated with blood viscosity and packed cell volume as in the normal healthy subjects. Rosette formation was not correlated with both the red cell and plasma factors investigated. Correlations between packed cell volume and blood flow, between mean cell volume and ESR, were stronger in the malaria patients than in the normal healthy subjects. On investigating the factors influencing red cell aggregation, RPV, RBV, albumin, globulin, red cell count, RDW, PCV, and fibrinogen were found to be important determinants in normal healthy adults, and RPV, RCC, MCV and fibrinogen in malaria patients. Out of many factors, RBV, RPV, albumin, RCC, and PCV were found to be important blood flow determinants in the normal healthy adults, whereas RBV, RCC, and RDW were more important in the malaria patients. In multivariate analysis, RPV and RBV were more important than others in determining red cell aggregations and blood flow in normal healthy adults. However, RPV and RCC were more important than others in red cell aggregation, and RBV and RCC more important than others in blood flow determination in malaria patients. Thus, red cell aggregations seem to depend mainly on plasma portion and blood flow mainly depends on red cell portion of the whole blood in vertical vessels. Changes in rheological parameters that contribute to abnormal red cell aggregations and blood flow reduction in malaria patients might be indicative of their pathophysiological importance in clinical manifestation of malaria. It seems that the changes in

red cells and plasma parameters were beginning to occur, even from the early stage of malaria, and this aberration seems to increase with the disease severity and becomes overt once the malaria develops into the complicated and fatal stage.

TITLE- 61

Relationship between malaria infection and thalassaemias and HbE disorders

AUTHOR (S) and AFFILIATION:

Htay Htay Tin

SOURCE:

Thesis Ph.D. (Pathology) UM (2), 2007

ABSTRACT:

Since about last 50 years ago, Haldane's attractive hypothesis that the high gene frequencies for thalassaemia in the Mediterranean population may have resulted from heterozygote advantage in regions where *P. falciparum* malaria was common in the past. Haldane proposed malaria hypothesis there was possible relationship about between malaria infection and inherited haemoglobin disorders from the role of natural protection against malaria infection. To study the relation between malaria infection, thalassaemia and HbE disorders, a total of 632 patients infected with *Plasmodium falciparum* were studied. The diagnosis of malaria was clinically confirmed by microscopic examination of the thick and thin blood film. Parasite density was also calculated according to WHO guidelines. The patients include 413 cases attending to Yangon VBDC, 44 patients admitted in Yangon General Hospital, North Okkalapa General Hospital, Insein General Hospital, Hlegu, Hmawbi and Taikkyi Township Hospital, Patheingyi General Hospital and 175 patients admitted in DSGH. Patient's data were collected by proforma and clinical examination as well as necessary biochemical tests were done when required. Complete blood counting (CBC) using Beckman Coulter Counter and blood film reporting was done as a first step for screening of thalassaemia. Then reticulocyte count calculation, H inclusion bodies, osmotic fragility test and serum ferritin estimation were done as screening methods of thalassaemia. Types of Hb were analysed by Hb electrophoresis at pH 8.6, Isoelectric focusing (IEF) and High Performance Liquid Chromatography (HPLC) by HPLC-G, to detect quantitative Hb concentration: HbA, HbA₂, HbF and any other Hb variants. Among 632 patients, 51.9% (328/632) were normal Hb phenotype 19.0% (120/632) were alpha thalassaemia 6.8% (43/632) were beta thalassaemia, 20.6% (130/632) were HbAE (HbE heterozygous), 1.1% (7/632) were HbEE (HbE disease) and 0.6% (4/632) were HbEF (E-beta thalassaemia). Incidences of common red cell genetic disorders in present study were comparable with previous studies which revealed 10-25% were alpha thalassaemia and 2-28% were HbE heterozygous apart from beta thalassaemia which was higher to 6.8% in this study although 0.4-2.3% only in Myanmar by previous reports. Out of 632 patients, 33 cases were found to be complicated malaria according to definition of severe malaria by working group of WHO. Twenty four cases were found in normal Hb phenotype, 2 patients were in alpha thalassaemia, 2 patients were in beta thalassaemia, 4 patients were in HbAE and 1 patient

was in HbEE phenotype. Out of 33 complicated cases, 2 cases were cerebral malaria, 13 cases were severe anaemia, 4 cases were hypoglycemia, 1 case was acute renal failure, 1 case was respiratory distress, 3 cases were hypoglycemia and 9 cases were having other manifestations of severe malaria like impaired consciousness, prostration, hyperparasitemia and jaundice. Protective effect of different Hb phenotypes on malaria infection was assessed based on clinical severity, presence or absence of complication and parasite density. Statistically significant protective effect was noted in alpha thalassaemia patients ($P < 0.05$) (severity percentage of 6.8% in alpha thalassaemia vs 72.2% in normal Hb phenotype). Lower numbers of complicated cases were markedly seen in beta thalassaemia, HbE heterozygous and HbE disease with 6.1%, 12.0%, 3.1% respectively although not statistically significant to prove the protective role of these abnormal haemoglobin against malaria. Regarding the haematological parameters, RBC indices namely mean Hb%, mean MCV, mean MCH and mean Hct value as well as absolute WBC and platelet counts were reduced in the majority of malaria cases compared to normal reference ranges. Serum ferritin and parasite density have no influential role in malaria severity but positive relationship between serum ferritin and parasite density was existed in HbE trait. Malaria parasite density encountered in normal Hb phenotype was significantly higher than those of alpha thalassaemia, beta thalassaemia and HbAE phenotype indicated that thalassaemia and HbE disorders suffered less parasitaemia than normal haemoglobin phenotype and supported the concept of natural selection in red cell genetic disorders.

TITLE- 62

Efficacy and safety of dihydrodawn-mefloquine compared to dihydroartemisinin-piperaquine (Artekin) in uncomplicated falciparum malaria in adults

AUTHOR (S) and AFFILIATION:

Win Win Myint, Khin Phyu Pyar, Khin Nyo, Than Htut, Myat Phone Kyaw, Myo Nyunt and Marlar Than

SOURCE:

15th Myanmar MMC Programme and Abstract, 2007; No. 1: pp. 1

ABSTRACT:

Dihydrodawn [Dihydro-artemisinin] prepared from MPF in treatment of uncomplicated falciparum malaria has been confirmed from our previous studies. It is found to be safe and effective. Dihydroartemisinin is the main metabolite of the artemisinins and has equivalent clinical efficacy to its parent compounds. According to the current National policy and guidelines for treatment of malaria in Myanmar, Artemisinin derivatives are not recommended to be used as single agents. Artemisinin based combination therapy (ACT) regimens currently available are artesunate-mefloquine and artemether-lumefantrine combinations, which are however, rather costly for the consumer as they are imported drugs. Hence the combination of dihydrodawn plus mefloquine has been tried. A hospital based, randomized controlled study was done at No (1) DSGH (1000 bedded), Mingaladon on a total of 44 uncomplicated falciparum malaria patients, between January to

September 2006 to determine the therapeutic efficacy, safety and tolerability of dihydro-dawna plus mefloquine in the treatment of uncomplicated falciparum malaria patients in adults. Dihydrodawna [20mg]-6 tablets together with mefloquine [250 mg] 2 tabs was given daily for 3 days in one group and artekin 2 tablets (artekin-compound) [40mg dihydroartemisinin and 320 mg piperazine phosphate] from Holleykin Pharmaceutical Co., Peoples' Republic of China was given at 0, 6, 24 and 32 hours in the control group. Initial parasitaemia rates were 17752.72 ± 36339.49 and 16551.11 ± 16906.66 . Fever clearance times (FCT) were 12.95 ± 19.92 respectively in Dihydrodawna and Artekin groups. There was no early treatment failure (ETF) and adequate clinical and parasitological response (ACPR) was 100% in both groups. There were no serious side effects. Therefore, dihydro-dawna plus mefloquine is as safe and as effective as artekin for treatment of uncomplicated falciparum malaria in adults

TITLE-63

Comparison of efficacy and safety of different brands of oral artesunate plus mefloquine in uncomplicated falciparum malaria in adults

AUTHOR (S) and AFFILIATION:

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¹Defence Services General Hospital; ²DMR (LM); ³Clinical Research Unit (Malaria) DSGH, Mingaladon

SOURCE:

The MHSRJ 2007; 19(2): pp. 63-68

ABSTRACT:

The efficacy of artemisinin derivatives in treatment of falciparum malaria is well established and a variety of different brands are now available, assumingly to be identical in composition and efficacy. A hospital-based, double blind randomized, controlled study to find out the efficacy and pharmacokinetics of different brands of artesunate when combined with mefloquine in Myanmar population was carried out in CRU (Malaria) DSGH, to establish the relative merits of the different brands, provide data for consumer choice and for better future utilization of these combinations in the chemotherapy of malaria. A total of 120 adult uncomplicated falciparum malaria patients were randomized, to receive 4 different brands of artesunate 200 mg OD for 3 days. A single brand of mefloquine (Helm-Germany) 500 mg OD for 3 days was used as the combination drug in all four regimens. Artequin TM600/1500 combi-pack (Mepha-Switzerland) was used as the control drug. The mean values of Fever Clearance Time (FCT) were 11.15 hrs, 13.69 hrs, 11.8 hrs, 11.68 hrs and 12.88 hrs. The Mean Parasite Clearance Times (PCT) were 46.12 hrs, 50.51 hrs, 46.88 hrs, 42.45 hrs and 51.22 hrs in the Plasmotrim Lactab TM 200 mg (Mepha-Switzerland), Falcinate Tab 50 mg (Aurocham-India), Dawnasunate Tab 50 mg (MPF, Myanmar), Artenmed Tab 50 mg (Vietnam) and control drug Artequin TM600/1500 combi-pack (Mepha-Switzerland) respectively. The 14 days Adequate Clinical and Parasitological Response (ACPR) was 100 % in all the five groups. There were no adverse, clinical, hematological, biochemical

and ECG changes in all the groups. The different brands of artesunate available are comparable in efficacy for the treatment of uncomplicated falciparum malaria in adults.

TITLE- 64

Detection of Glucose-6-Phosphate Dehydrogenase G6PD enzyme deficiency in the field for treatment of malaria

AUTHOR (S) and AFFILIATION:

¹*Khin Lin*, ²*Aung Than*, ¹*Mya Moe*, ²*Saw Lwin* and ¹*Thein Tun*
¹*DMR (UM)*; ²*DOH*

SOURCE:

The MHSRJ 2007; 19(2): pp. 103-105

ABSTRACT:

Malaria is the first priority health problem in Myanmar and early diagnosis with prompt and effective treatment is essential for reduction of morbidity and mortality due to the disease. Primaquine is the only effective drug to prevent relapses of liver form of *Plasmodium vivax* and *Plasmodium ovale* and can also be used to kill gametocyte form of *P. falciparum* and *Plasmodium malariae*. Primaquine can cause haemolysis in glucose-6-phosphate dehydrogenase (G6PD) deficient individual and prevalence of G6PD deficiency varies among different ethnic races. Malaria survey was done during 2001-2003 in Mon and Shan States and prevalence of G6PD deficiency was investigated by rapid screening method of Hirono using DEAE (Di-Ethyl Amine-Ethylene) and sephadex mixture. In normal person, the test shows orange ring due to the presence of G6PD enzyme which is absent in G6PD deficient person. Among 1079 samples tested, 47 (4.5%) was found to have severe type of G6PD deficiency by the test. In relation to the ethnic region, G6PD deficiency rate was 5.5% (29/338) among Bamar, 3.2% (6/191) among Chinese, 3.4% (5/146) among Indians, 3.3% (3/92) among Mon, 5.1% (3/59) among Shan and 6.7% (1/15) among Kayin races. This rapid test can detect severe G6PD deficiency in the field, thus primaquine can be prescribed safely to malaria patients.

2008

TITLE- 65

A randomized trial on artemether-lumefantrine *versus* dihydroartemisinin-piperaquine phosphate for treatment of uncomplicated falciparum malaria

AUTHOR (S) and AFFILIATION:

Khin Lin¹, Win Pa Pa Win¹, Phyu Phyu Win¹, Mya Moe¹, Than Win², Thar Htun Kyaw² and Thein Tun¹

¹DMR (UM); ²Department of Health

SOURCE:

MHRC Programme and Abstract 2008; pp. 9

ABSTRACT:

Malaria is one of the main health problems in Myanmar and prompt, effective treatment is crucial for reducing malaria morbidity and mortality. Among various Artemisinin Base Combination Therapy (ACT) regimes, Artemether-Lumefantrine (coartem) is the standard treatment regime in Myanmar and Dihydroartemisinin and piperaquine phosphate combination (duocotecxin) has been recommended as a new ACT by the Technical Advisory Group (TAG) since February 2008. A randomized trial on Artemether-Lumefantrine (Coartem) versus dihydroartemisinin and piperaquine phosphate combination (Duocotecxin) was done in rural areas of Kalay and Mu-se Township to assess efficacy and safety of these two regimes for treatment of uncomplicated falciparum malaria during June to September 2008. Microscopic examination of Giemsa stained thick blood smears was done to identify malaria parasites from clinically suspected malaria patients. Out of 1777 examined in both sites, *P. falciparum* was positive in 338 patients, thus 136 patients were treated with each of the above two regimes as the standard treatment guidelines and follow up was done according to the WHO guidelines for monitoring of drug resistant malaria. Adequate Clinical and Parasitological Response (ACPR) was found in 94.1% of coartem group and 95.0% of duocotecxin group, respectively while no serious adverse effects were observed in both groups. The study shows that dihydroartemisinin and piperaquine phosphate combination (duocotecxin) is effective as well as safe for treatment of uncomplicated falciparum malaria in Myanmar.

TITLE- 66

Efficacy and safety of Artesunate-Amodiaquine *versus* Artemether-Lumefantrine for the treatment of uncomplicated *P. falciparum* malaria in 4 sentinel sites (Rakhine, Kayin, Mon, and Kachin States) in Myanmar

AUTHOR (S) and AFFILIATION:

Myat Phone Kyaw¹, Ye Htut¹, Than Win², Nwe Nwe Oo¹, Kyin Hla Aye¹,
Myat Htut Nyunt¹, Win Htut Lin¹ and Khine Nyein Chan¹
¹DMR (LM); ²DOH

SOURCE:

MHRC Programme and Abstract 2008; pp.10-11

ABSTRACT:

The therapeutic efficacy and safety of Artesunate-amodiaquine and Artemether-lumefantrine combinations were conducted as randomized control trial in 4 sentinel sites (Rakhine, Kayin, Mon and Kachin States) in Myanmar, between July and November 2007. Study subjects are febrile individuals, age between 6 to 59 years with confirmed uncomplicated *P. falciparum* infections by microscopy. Artesunate 200 mg plus amodiaquine 600 mg combination blister tablets was administered by 6mg/kg/day for artesunate and 48mg/kg/day for amodiaquine in two divided dose daily for 3 days and artemether 2mg/kg plus lumefantrine 12mg/kg two times a day for three days was given in other group. Clinical and parasitological parameters were monitored over a 28-day follow-up period. Late treatment failure cases after 14 days period were differentiated from reinfection with PCR technique. A total of 70 subjects completed the study with artesunate-amodiaquine combination at Rakhine State, 32 at Kayin State, 45 at Mon State and 68 at Kachin State. In which 3 late treatment failure cases (one each from Kayin, Mon and Kachin) were detected. After molecular analysis of MSP1 gene, MSP2 gene and GLURP gene, one patient from Kachin was re-infected case and the other two (Kayin and Mon) were true recrudescence. In artemether-lumefantrine group, 83 patients at Rakhine State, 39 at Kayin State, 38 at Mon State and 75 at Kachin were completed, in which 2 patients from Rakhine, 1 from Kayin and 2 from Mon State were found to be recurrent clinically and microscopically. After PCR analysis, those from Rakhine and Kayin are re-infected cases and 2 from Mon State were true recrudescence. Therefore, molecular diagnosis is the final statement in therapeutic efficacy trials.

TITLE- 67

Red cell deformability and nitric oxide concentration in confirmed uncomplicated falciparum malaria patients

AUTHOR (S) and AFFILIATION:

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¹University of Medicine (1), Yangon; ²DMR (LM)

SOURCE:

MHRC Programme and Abstract 2008; pp.11-12

ABSTRACT:

The aim of the present study was to study the red cell deformability and serum nitric oxide level in confirmed uncomplicated falciparum malaria patients. Thirty confirmed uncomplicated falciparum malaria patients, aged between 20 and 40 participated in this study. Red cell deformability (RCD), red cell count (RCC), mean cell volume (MCV), red cell distribution width (RDW), mean corpuscular haemoglobin concentration (MCHC) and plasmaproteins such as fibrinogen and albumin concentration and level of nitric oxide (NO) were determined. Deformability of red blood cells of malaria patients was determined by *in vitro* filtration model, fibrinogen concentration by precipitation method and albumin concentration by dye-binding method and nitric oxide level by Greiss reagent and haematological parameters by Coulter counter. The mean RCD of the patients was 32.9 ± 6.83 . There was a negative correlation between RCD and RDW ($r=0.618$). The NO level was positively correlated with RCD ($r=0.436$). There was also a positive correlation between NO and haemoglobin concentration ($r=0.656$). No significant correlation was found between RCD and fibrinogen and albumin concentration. This research finding could contribute to the evidence of reduced red blood cell deformability in falciparum malaria which in turn is dependent on the level of nitric oxide.

TITLE- 68

Efficacy and safety of artesunate-amodiaquine different brands in uncomplicated falciparum malaria in adults

AUTHOR(S) and AFFILIATION:

Khin Phyu Pyar, Win Win Myint, Myat Phone Kyaw, Chan Thar, Nyan Hein Latt and Marlar Than

SOURCE:

16th Myanmar MMC, Programme and Abstract 2008, No. 1: pp. 1

ABSTRACT:

Artesunate-amodiaquine combined blister packets from different companies have been studied at sinthay rural health subcentre, Ponnagyun Township, Rakhine State during October and November 2007. Arsuamoon, a product of Guilin Pharmaceutical Co. Ltd. (50 mg artesunate, 150 mg amodiaquine hydrochloride base); Artemodi, a product of Beijing Holley-Cotec Pharmaceuticals Co. Ltd (100 mg artesunate, 200mg amodiaquine hydrochloride base) and Larimal, a product of Cipla Co. Ltd. (100 mg artesunate, 200 mg amodiaquine hydrochloride 150 mg base) were selected

to study. A total of 16 cases were treated with Arsuamoon, 21 cases with Artemodi and 31 cases with Larimal were finished to follow up to day 28 after random selection. There were no treatment failure cases and nausea and giddiness were the complaints given by Artemodi group. Therefore, the commercially available artesunate-amodiaquine combinations are safe to use in treatment of uncomplicated falciparum malaria in adults.

TITLE- 69

Efficacy and safety of artesunate-amodiaquine vs artemether-lumefantrine for the treatment of uncomplicated falciparum malaria at Sinthay Rural Health Sub-Centre, Ponnagyun Township, Rakhine State from July, 2007 to October, 2007

AUTHOR (S) and AFFILIATION:

Myat Phone Kyaw, Ye Htut, Than Win, Chan Thar, Nyan Hein Latt, Leonard Ortega, Aung Than and Thein Nyunt

SOURCE:

16th Myanmar MMC Programme and Abstract 2008, No.1: pp. 1

ABSTRACT:

Randomised controlled trial of artesunate-amodiaquine versus artemether-lumefantrine (coartem) for the treatment of uncomplicated falciparum malaria was done at Sinthay rural health sub-centre, Ponnargyun Township, Yakhine State from July, 2007 to October, 2007. A total of 171 subjects (144 male and 57 female) were enrolled for with therapeutic efficacy study. Ninety five subjects were treated with coartem and 76 subjects with artesunate-amodiaquine after random selection. Nine cases failed to come on day 7 onwards and 3 cases failed on day 28 at coartem group. Two cases failed to come on day 7 onwards and 4 cases on day 28 at artesunate-amodiaquine group. Therefore, 83 cases were completed for study in coartem group and 70 in artesunate-amodiaquine group. In coartem group, 2 cases had recurrence of symptoms and parasitaemia in day 21 and day 27, i.e. 97.6 percent sensitivity but there were no treatment failures with artesunate-amodiaquine. There were no side effects in coartem group but 2 cases complained of dizziness after completion of artesunate-amodiaquine treatment. The recurrence of 2 cases in coartem group needed to differentiate from reinfection by PCR method. Otherwise, newly implemented ACT (artesunate combination therapy) at public sector should be monitored yearly in this area for maintenance of new drug policy.

TITLE- 70

A study on the clinical patterns and changes in blood glucose levels in adult severe falciparum malaria patients

AUTHOR (S) and AFFILIATION:

Kyaw Zay Zar, Win Win Myint, Khin Phyu Pyar, Ko Ko Aung and Marlar Than

SOURCE:

16th Myanmar MMC, Programme and Abstract 2008, No. 3: pp. 1

ABSTRACT:

To study the clinical patterns and changes in blood sugar levels in relation to the mortality in severe falciparum malaria, a hospital based descriptive study was done on 226 adult severe falciparum malaria patients, age 15-65 years. The presentations were: anaemia (48.7%), jaundice (47.8%), cerebral malaria- unrousable coma (35.8%), hyperpyrexia (31.8%), severe prostration (27.9%), acute renal failure (18.1%), circulatory collapse (16.8%), hypoglycaemia (15.0%), haemoglobinuria (3.5%), acidosis (9.7%), impaired consciousness (8.4%), pulmonary oedema (0.9%) and convulsions (0.9%). Single organ dysfunction was the commonest pattern in 121 patients (53.5%). Seventy-five (33.2%) had no organ dysfunction while 28 (12.38%) developed multi-organ dysfunction. Eight patients developed Severe Inflammatory Response Syndrome. Twelve patients died. Mortality was 0.83% and 39.26% in single-organ and multi-organ dysfunctions. None of the patients without organ dysfunction died. Hyperglycaemia at time of admission (≥ 120.0 mmol/L) was observed in ten patients and was associated with 60% and 30% single-organ and multi-organ dysfunctions respectively and had a mortality of 30%. Hypoglycaemia (≤ 2.2 mmol/L or symptomatic with ≤ 4.0 mmol/L) was seen in 24 patients on admission, eight had no organ dysfunction but 11 had single organ dysfunction and 5 developed multi-organ dysfunction and two died. Anaemia, jaundice and cerebral malaria were the commonest presenting features but were not associated with high mortality. Severe prostration, anemia, cerebral dysfunction or renal dysfunction as single manifestations when treated promptly had low mortality. Hyperglycaemia as well as hypoglycaemia are important indicators of severity in malaria. Late arrival and severe inflammatory response syndrome contributed to multi-organ dysfunction and mortality.

TITLE- 71

A study on impact of some hepatic co-infections and co-morbidities on severity and outcome of malaria hepatitis

AUTHOR (S) and AFFILIATION:

Ye Phy Aung and Win Win Myint

SOURCE:

16th Myanmar MMC Programme and Abstract 2008, No. 4: pp. 2

ABSTRACT:

The clinical presentation of acute malaria hepatitis is similar to that of other acute hepatitis and often creates diagnostic and treatment problems. This is a cross-sectional descriptive study to find out the frequency of some co-infections (leptospirosis, HBsAg positivity, cholangiohepatitis) and co-morbidities (alcoholism, chronic liver diseases) in malaria patients with jaundice and the impact of these factors on the severity and mortality. Fifty four malaria patients with jaundice were studied, including 42 *P. falciparum* (6 uncomplicated, 36 severe malaria), 5 *P. vivax* and 7 mixed malaria cases. All six uncomplicated *falciparum* patients had a co-infection or co-morbidity. Two were HBsAg positive, two had stigmata of chronic liver disease, and two were chronic alcoholics with stigmata of chronic fever disease. Among 36 severe *falciparum* malaria cases, 9 were associated with co-infection or co-morbidity (5 with leptospirosis, 1 with HBsAg positive, 1 with cholangiohepatitis and 2 were chronic alcoholics). Of 5 *vivax* malaria patients only 2 were associated with HBsAg. Among 7 mixed malaria patients, 1 was associated with alcoholism, 1 with cholangiohepatitis, 3 with stigmata of chronic liver disease and 1 with leptospirosis. Uncomplicated and severe *falciparum* malaria patients with co-infections and/or co-morbidities had significantly higher serum bilirubin and liver enzymes. Dual infection had significantly higher morbidity and mortality and patients having co-morbidity had higher mortality ($P < 0.04$).

TITLE- 72

A study on clinical profile of falciparum malaria in children admitted to paediatric ward of No (1) Defense Services Obstetrics, Gynaecology and Children Hospital (300-bedded) and No (2) Military Hospital (500 bedded)

AUTHOR (S) and AFFILIATION

Aung Khant, Sandar Myint and Kay Thi Htun

SOURCE:

16th Myanmar MMC Programme and Abstract, 2008; No. 24: pp. 12

ABSTRACT:

This study was carried out to find out the incidence and clinical profile of falciparum malaria in children admitted to No (1) DSOGCH and No (2) MH (500 bedded) and also to find out the association between late hospitalization and severity of the disease and the response of uncomplicated falciparum malaria to antimalarial drugs commonly used in military hospitals. It was conducted from May, 2006 to April, 2007 and it was cross sectional descriptive study. There were total 3,309 cases admitted to these hospitals during the one year study period and 72 falciparum malaria cases were included in this study. *P. falciparum* was the dominating species of malaria parasites. Majority of falciparum malaria cases came from Yangon Division, mainly from Taikkyi, Hlegu and Hmawbi Townships. There was seasonal variation in incidence of falciparum malaria, highest in rainy season with the peak incidence in June. The commonest age group affected was less than 4 years age group and it was also prone to complications as well as fatal outcome. Fever was the commonest presenting feature found in 96% of cases, followed by hepatomegaly in 62.5%, splenomegaly in 55.6%, anaemia in 47.2% abdominal pain in 25% and vomiting in 23.6% respectively. Among 19 complicated cases (26.4% of all cases), cerebral malaria was the commonest complication which accounted for 31.6%, followed by severe anaemia for 26.3%, hypoglycaemia for 21%, jaundice for 21.1%, hyperpyrexia for 15.7%, hemoglobinuria for 10.5% and hyperparasitemia for 5.3% respectively. Malnourished patients with falciparum malaria presented with severe manifestations and were also prone to fatal outcome. The response rates of uncomplicated falciparum malaria were 78.3%, 81.3% and 75% for quinine, mefloquine and artemisinin respectively. Most of the resistant cases came from Taikkyi and Hlegu Townships. The mortality rate of all falciparum malaria cases was 4.2% and that of complicated cases was 15.7%. There was a significant association between late hospitalization and complications of falciparum malaria. However, late hospitalization did not predict the fatal outcome. All fatal cases were due to complicated malaria and most were due to cerebral malaria.

TITLE- 73

The relationship between age and the manifestations of and mortality associated with severe malaria

AUTHOR (S) and AFFILIATION:

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SOURCE:

Clinical Infectious Diseases 2008; 47:151–7

ABSTRACT:

Background: The reported case-fatality rate associated with severe malaria varies widely. Whether age is an independent risk factor is uncertain. *Methods:* In a large, multicenter treatment trial conducted in Asia, the presenting manifestations and outcome of severe malaria were analyzed in relation to age. *Results:* Among 1050 patients with severe malaria, the mortality increased stepwise, from 6.1% in children (age 10 years) to 36.5% in patients aged 11–50 years. Compared with adults aged 21–50 years, the decreased risk of death among children (adjusted odds ratio= 0.06; 95% confidence interval, 0.01–0.23; P = 0.001) and the increased risk of death among patients age >50 years (adjusted odds ratio, 1.88; 95% confidence interval, 1.01–3.52) was independent of the variation in presenting manifestations. The incidence of anemia and convulsions decreased with age, whereas the incidence of hyperparasitemia, jaundice, and renal insufficiency increased with age. Coma and metabolic acidosis did not vary with age and were the strongest predictors of a fatal outcome. The number of severity signs at hospital admission also had a strong prognostic value. *Conclusion:* Presenting syndromes in severe malaria depend on age, although the incidence and the strong prognostic significance of coma and acidosis are similar at all ages. Age is an independent risk factor for a fatal outcome of the disease.

2009

TITLE- 74

Efficacy and safety of artemether-lumefantrine *versus* dihydroartemisinin-piperaquine for the treatment of uncomplicated *P. falciparum* malaria in 2 sentinel sites (Bago and Tanintharyi Divisions) in Myanmar

AUTHOR (S) and AFFILIATION:

Myat Phone Kyaw¹, Ye Htut¹, Than Win², Nwe Nwe Oo¹, Kyin Hla Aye¹,
Myat Thu Soe¹, Moe Moe Aye¹ and Ni Ni Aye²
¹DMR (LM); ²DOH

SOURCE:

MHRC Programme and Abstract 2009; pp. 10

ABSTRACT:

The therapeutic efficacy and safety of artemether-lumefantrine and dihydroartemisinin-piperaquine combinations was determined as a one-arm, prospective evaluation of the clinical and parasitological response to directly observed treatment for uncomplicated malaria in 2 sentinel sites in Myanmar, between June and September 2009. Study subjects were febrile individuals aged 6 years and above with uncomplicated *P. falciparum* infections confirmed by microscopy. Artemether 2mg/kg body weight plus lumefantrine 12mg/kg body weight two times a day for three days was given to one group and dihydroartemisinin 6.4 mg/kg and piperaquine 51.2 mg/kg was given in three equally divided daily doses to the other group. Clinical and parasitological parameters were monitored over a 28-day follow-up period. A total of 85 subjects completed the study with artemether-lumefantrine combination at Shwekyin Township, Bago Division and 80 at Kawthaung Township, Tanintharyi Division. One early treatment failure case and seven late treatment failure (LTF) cases (6 LTF from Kawthaung, one from Shwekyin) were detected. In dihydroartemisinin-piperaquine group, 72 patients at Shwekyin and 80 at Kawthaung completed, of which four LTF patients were found to be recurrent clinically and microscopically at Kawthaung. A salient finding was day 3 persistent parasitaemia, during this study period, 9.6% and 10% of patients treated with artemether-lumefantrine still have parasitaemia on day 3 at Shwekyin and Kawthaung respectively and also 4.2% and 29.6% in dihydroartemisinin-piperaquine group. The resistance monitoring showed the proportion of patients who were parasitaemic on day 3 was the best indicator of slow parasite clearance from available clinical trial data and should be used as an early warning system for monitoring artemisinin resistance.

TITLE- 75

The efficacy of artemisinin-naphthoquine (ARCO) in adult uncomplicated falciparum malaria

AUTHOR (S) and AFFILIATION:

Khin Phyu Pyar¹, Win Win Myint¹, Myat Phone Kyaw², Thaw Zin², Than Oo Lwin³, Sai Aik Hla⁴ and Marlar Than¹

¹No. (1) DSGH, Mingaladon; ²DMR (LM); ³No. (1) BMH, Pyin Oo Lwin;

⁴No. (9) Military Hospital, Lashio

SOURCE:

MHRC Programme and Abstract 2009; pp. 13

ABSTRACT:

ARCO compound [125mg artemisinin and 50 mg naphthoquine phosphate], a commercial product from Kunming Pharmaceutical Co., Ltd. Qigongli, West Suburb, Kunming, Peoples Republic of China had been studied in many countries [Thailand, Vietnam, Cambodia and China] including Myanmar and is found to be safe and effective in uncomplicated falciparum malaria. It is a schizonticide to erythrocytic plasmodium parasite. It has a combined quick action of artemisinin and a prolong effect of naphthoquine phosphate, delaying drug resistance. It is available as a co-formulated tablet and needs to take only a single oral administration (8 tablets once-1000 mg artemisinin and 400 mg naphthoquine phosphate). To find out the effectiveness of Arco single dose, an open labeled hospital-based clinical study using 28-day WHO standard therapeutic efficacy test was carried out on 25 acute uncomplicated falciparum malaria adult male patients from January to October 2009 at CRU (Malaria) DSGH Mingaladon. The patients were monitored clinically, parasitologically, haematologically and biochemically including ECG for side effects. Results showed an age range of 19-52 years (mean = 27.8), initial parasitaemia 3341.67 ± 7238.72 , fever clearance time (FCT) 24.5 ± 14.03 , and parasite clearance time (PCT) 41.75 ± 33.03 hours. There was no early treatment failure or late clinical failure. Only one late parasitological failure was seen. Adequate clinical and parasitological response (ACPR) was 96%. There were no serious clinical or laboratory side effects. Arco single dose is safe and effective for the treatment of uncomplicated falciparum malaria in adults.

TITLE- 76

The association between 'ABO' blood group distribution and HIV seropositivity among falciparum malaria patients in NOGH (2007-2008)

AUTHOR (S) and AFFILIATION:

Mar Mar Kyi, Chit Soe, Myo Lwin Nyein, Than Than Aye, Aye Tun, Mg Mg Thant, Pyei Phyo, Min Min Myo Lwin, Naw Ae Bwe, Tin Myo Thet, Khin Thandar Kyaw and Moe Moe Thandar

SOURCE:

55th Myanmar Medical Conference Programme and Abstract 2009, pp. 56

ABSTRACT:

P. falciparum malaria remains a common cause of morbidity and mortality throughout the world with an estimated one million deaths a year. HIV infection among adult malaria patients caused increased risk of malaria mortality. An exploratory study of association between ABO blood group and HIV seropositivity among malaria patients was carried out starting from December 1st 2007 to November 30th 2008 in NOGH. *Objective:* This study aimed to determine the incidence of falciparum malaria patients in NOGH, case fatality rate among falciparum malaria patients with HIV co-infection, association between HIV seropositivity and distribution of ABO blood grouping among falciparum malaria patients. *Findings:* Only two patients had confirmed HIV positive by ELISA (n = 106). Severe falciparum malaria contributed to 72.8% and uncomplicated was 27.2% (n = 114). Forty three percent of severe falciparum malaria had single complication mostly cerebral malaria. More than 27% of severe patients have double complication like cerebral malaria, acute renal failure, anaemia, bleeding, shock, metabolic acidosis (n = 83). Case fatality rate of falciparum malaria was 7.02% (n = 114). There is no effect on mortality of falciparum malaria with HIV co-infection (n = 2). There is no significant association between HIV seropositivity and ABO blood grouping among falciparum malaria patients. In contrast to severe versus uncomplicated malaria with blood groups, blood group O showed 31.15% and 52%, blood group A showed 23% and 12%, blood group AB showed 8.2% and 4% and blood group B showed 37% and 32% respectively. *Conclusion:* Case-control study emphasizing on ABO grouping and severity of malaria should be performed.

TITLE- 77

A study on ocular manifestations of falciparum malaria

AUTHOR (S) and AFFILIATION:

Kaung Myat Khaing

SOURCE:

17th Myanmar MMC Programme and Abstract 2009; No. 3: pp. 2

ABSTRACT:

The objective was to study the ocular manifestations of falciparum malaria. It is a hospital based descriptive study. 160 patients of falciparum malaria including severe complicated falciparum malaria, cerebral malaria and uncomplicated falciparum malaria admitted to the medical wards and ICU of No 1/1000 DSGH were included in this study. Ocular manifestations were found in 48 patients (28%) in which 20 patients, (12%) with cerebral malaria, 11 patients (7%) with severe falciparum malaria, 14 patients (9%) with uncomplicated falciparum malaria. The common frequent manifestation were various types of retinal haemorrhages (20%) and others were retinal pacification (9.38%), retinal vessels changes (4.37%), sub-conjuntival haemorrhages (3.75%), yellow coloration of conjunctiva and sclera (5%), disc oedema (3.13%) and optic atrophy (0.62%). It was concluded that the various types or retinal haemorrhages were the common frequent ocular manifestations of falciparum malaria.

TITLE- 78

Efficacy and safety of artemisinin-piperaquine (Artequick) compared to dihydroartemisinin-piperaquine (Artekin) in uncomplicated falciparum malaria in adults

AUTHOR (S) and AFFILIATION:

¹Khin Phyu Pyar, ¹Win Win Myint, ²Myat Phone Kyaw, ²Thaw Zin and ¹Marlar Than

¹Clinical Research Unit (Malaria), DSGH, Mingaladon; ²DMR (LM)

SOURCE:

The MHSRJ 2009; 21(2): pp. 78

ABSTRACT:

A hospital-based, randomized controlled study was done at No. 1 Military Hospital (MH) (1000 Bedded), Mingaladon, No. 1 MH (700 Bedded), Pyin Oo Lwin and No. 9 MH (100 Bedded), Lashio, on a total of 64 uncomplicated falciparum malaria patients from January to September 2007, to determine the therapeutic efficacy, safety and tolerability of artemisinin-piperaquine (Artequick) tablet in comparison with dihydroartemisinin-piperaquine (Artekin) for the treatment of 30 uncomplicated falciparum malaria patients in adults. Artequick 2 tabs was given at 0 and 24 hours in one group and Artekin 2 tabs was given at 0, 6, 24 and 32 hours in the control group. Initial rates of parasitaemia/ μ l were 16471.88 ± 38755.1 and 13528.9 ± 1909.3 . Fever clearance times (FCT) were 43.23 ± 17.35 and 12.4 ± 13.1 hours, and parasite clearance times (PCT) were 57.6 ± 21.88 and 46.8 ± 22.1 hours, respectively, in Artequick and Artekin groups. In Artequick group, there were four late treatment failures (LTF) that adequate clinical

and parasitological response (ACPR) was 94% compared to 100% ACPR in Artekin group. There were no serious side effects. Artequick is as safe as Artekin but with lower ACPR in this study. Further dose finding studies will be needed to establish its efficacy in the treatment of uncomplicated falciparum malaria in adults.

2010

TITLE- 79

Evaluation of efficacy and safety of artemether-lumefantrine for the treatment of uncomplicated *P. falciparum* malaria and chloroquine for the treatment of *Plasmodium vivax* in a sentinel site (Tanintharyi Division) in Myanmar

AUTHOR (S) and AFFILIATION:

Myat Phone Kyaw¹, Ye Htut¹, Khin Mon Mon², Tin Tun Oo², Soe Aung Myint³, Myat Thu Soe¹, Soe Soe Han¹ and Cho Cho¹
¹DMR (LM); ²DOH; ³Yuzana Palm Oil Project

SOURCE:

MHRC Programme and Abstract 2010; pp. 11

ABSTRACT:

Kawthaung area has been selected as a sentinel site for the therapeutic efficacy and safety of Artesiminin combinations therapies (ACTs) at meeting of Informal Consultation on Monitoring *P. falciparum* and *P. vivax* Resistance to Anti-malarial Drugs in Mekong Region, Phuket, Thailand, 2007. The persistence of parasitaemia up to 3 days was noted in 18.7% of the patients treated with dihydroartemisinin-piperaquine combination in 2009. Therefore, one-arm, prospective evaluation of the clinical and parasitological response to directly observed treatment with artemether-lumefantrine for uncomplicated *P. falciparum* malaria, and chloroquine for *P. vivax* was conducted to verify the declining efficacy of ACTs in this border area between August and October 2010. Clinical and parasitological parameters were monitored over a 28-days follow-up period. A total of 84 subjects were completed to study with artemether-lumefantrine combination. Day 3 persistent parasitaemia, was noticed in 3.5% of patient and five late treatment failure (LTF) cases were detected. In 66 *P. vivax* infected cases, treated with chloroquine, late treatment failure (LTF) was detected in eight cases (12.1%) with no persistent of parasitaemia on day 3. Whereas a similar finding with this ACT and chloroquine was noted in 2009 study thus monotherapy of artesunate with pharmacokinetic measurement should be started to confirm spread of artesunate resistant and also for chloroquine in this area.

TITLE- 80

Glucose-6-Phosphate Dehydrogenase enzyme deficiency in Kayah and Rakhine States

AUTHOR (S) and AFFILIATION:

Nwe Nwe Oo, Myat Phone Kyaw, Ye Htut, Ni Ni Zaw and Phyo Zaw Aung DMR (LM)

SOURCE:

MHRC Programme and Abstract 2010; pp. 36

ABSTRACT:

The aim of the study was to detect Glucose-6-Phosphate Dehydrogenase (G6PD) enzyme deficiency in healthy male and female subjects in Kayah and Rakhine State. In male subjects G6PD enzyme deficiency was detected by a qualitative test, Methaemoglobin reduction test (Brewer's test) and followed by, a semi quantitative test agarose gel electrophoresis. For detection of enzyme deficiency in female subjects the cytochemical staining method of Cornelis, Van-Nooder and Vogels (1985) was used. It is a method for staining G6PD activity in individual erythrocyte. The study was done in subjects who lived in Demowsoe of Kayah state and Sittwe of Rakhine State during the period of April and May 2010. In Kayah State out of 152 male subjects 1.3% (n=2) was mild deficient and no severely deficient persons was detected. In 252 female subjects 0.44% (n=1) was mild deficient and 1.98% (n= 5) was severely deficient. In Rakhine State 151 male subjects were recruited and out of these patients 3.97% (n=6) were mild deficient and in 250 female subjects 0.8% (n=2) were mild deficient. The subject with severely enzyme deficiency was not found. In treatment of malaria infection the antimalaria drug, primaquine can cause haemolysis in G6PD enzyme deficient patients. The finding of this study may be useful in primaquine treatment of hypnozoite stage in *Plasmodium vivax* and gametocyte stage in *P. falciparum* infection.

TITLE- 81

Clinical study on efficacy and safety of piperamisinin (dihydroartemisinin-piperaquine) in uncomplicated falciparum malaria in adults

AUTHOR (S) and AFFILIATION:

Khin Phyu Pyar¹, Myat Phone Kyaw², Moe Zaw Myint³, Kyaw Zin Oo⁴, Sai Aik Hla¹, Tin Maung Hlaing⁶ and Marlar Than⁵

¹No. (1) DSGH (1000 Bedded), Mingaladon; ²DMR (LM); ³No. (9) MH (100 Bedded), Lashio; ⁴No. (1) MH (300 Bedded), Myitkyinar; ⁵Clinical Research Unit (Malaria) No. 1 DSGH (1000 Bedded) Mingaladon; ⁶Ministry of Defence

SOURCE:

MHRC Programme and Abstract 2010; pp. 43

ABSTRACT:

Dihydroartemisinin and piperaquine phosphate coformulated tablets produced from China namely Artekin [40 mg dihydroartemisinin and 320 mg piperaquine phosphate] and Artepip (Dihydroartemisinin 40 mg - Piperaquine 320 mg) had been studied in Clinical Research Unit (Malaria) No. 1 DSGH (1000 Bedded) Mingaladon in 2006-2008 for the treatment of

uncomplicated falciparum malaria and was found to be safe and effective. Piperamisinin combined tablet, containing 50 mg dihydroartemisinin and 350 mg piperazine phosphate, is produced from Ministry of Industry (1), Myanmar Pharmaceutical Factory, Yangon in 2009. An open labeled hospital based clinical study using 28 days WHO standard therapeutic efficacy test was done at No. (1) DSGH (1000-Bedded) Mingaladon, No. (1) BMH (300-Bedded) Myitkyina and No. (9) MH (100-Bedded) Lashio on a total of 23 acute uncomplicated falciparum malaria adult patients between March to October 2010 to study the effectiveness, tolerability and safety of piperamisinin. The patients were given piperamisinin combined tablets with the dosage of 3 tablets at 0 hour, 24 hour and 48 hour. The patients were monitored clinically, parasitologically, haematologically and biochemically (blood sugar, urea and serum creatinine) including ECG for side effects for 28 days. Results showed, age range 14-57 years (mean = 28.43), initial parasitaemias 2233 ± 2582 per μL , initial temperature $37.8 \pm 0.88^\circ\text{C}$, fever clearance time (FCT) 16.74 ± 13.26 hours and parasite clearance time (PCT) 31.7 ± 11.73 hours. There was no early treatment failure or late treatment failure. Adequate clinical and parasitological response (ACPR) was 100%. There were no serious clinical or laboratory side effects. Piperamisinin combined tablet is safe and effective for the treatment of uncomplicated falciparum malaria in adults.

TITLE- 82

Hypothetical approach of natural protective role of haemoglobinopathies in Myanmar malaria patients

AUTHOR (S) and AFFILIATION:

Htay Htay Tin¹, Ne Win² and Aye Aye Myint³

¹Yangon Children Hospital, ²National Health Laboratory, ³DSMA

SOURCE:

56th Myanmar Medical Conference, Programme and Abstract, 2010; No. 17: pp. 62

ABSTRACT:

Background: Proven but still controversial Haldane's hypothesis of epidemiological relationship between malaria infection and prevalence of hereditary haemolytic diseases is existed for several years. *Objectives:* To find out the epidemiology of inherited common haemoglobin disorders among *P. falciparum* malaria patients; to discover the natural protective role of malaria infection against homozygous heterozygous alpha thalassaemia, beta thalassaemia and haemoglobin E disorders. *Methods:* Basic thalassaemia screening tests including complete blood count with blood film reporting, reticulocyte count including body detection were investigated to a total of *P. falciparum* infested 632 patients whom were collected from hospitals and Central Vector Borne Disease Control Clinics. Osmotic fragility tests, serum ferritin level determination, cellulose acetate electrophoresis at pH 8.6 were also preceded and finally Hb types were differentiated by isoelectric focusing (LEF) and High performance Liquid Chromatography (HPLC) (HPLC 723 G7) for identification of HbA, HbA2 and HbF from November 2005 to March 2007; *Results:* Normal HbAA was

noted in 51.9%, 19.0%, 6.8%, 20.6%, 1.1% and 0.6% of malaria patients were found to be coexisted with alpha thalassaemia, beta thalassaemia, HbAE, HbEE and HbEF respectively. Only 5.2% of all malaria patients suffered severe complications. Statistically significant protective effect of alpha thalassaemia against malaria severity was found. Decreased malaria severity in beta thalassaemia, HbE heterozygous and HbE homozygous were explored compared to those in normal HbAA although statistically not significant. Mean parasite density in normal HbAA was significantly higher than those of haemoglobinopathies. *Conclusion:* Phenotypically, natural protective role of alpha thalassaemia against malaria infection is significantly proved but need to be extended by genotyping. The basic haemoglobinopathies screening project in malaria endemic regions should be initiated to discover the epidemiological relationship between these 2 prevalent diseases in Myanmar.

TITLE- 83

Glucose-6-Phosphate Dehydrogenase (G6PD) enzyme deficiency in Chin State

AUTHOR (S) and AFFILIATION:

Nwe Nwe Oo¹, Myat Phone Kyaw², Ye Htut³, Ni Ni Zaw² and Maung Maung Mya²

¹Biochemistry Research Division; ²Parasitology Research Division; ³DMR (LM)

SOURCE:

The MHSRJ 2010; 22(3): pp. 159-163

ABSTRACT:

The oxidant drug primaquine is used to get complete cure from *Plasmodium vivax* infection. Primaquine can cause haemolysis in severely deficient G6PD enzyme activity. The laboratory facility to detect the G6PD enzyme activity is limited. The aim of this research was to find out the prevalence of G6PD enzyme deficiency in Chin race. A total of 408 healthy adults (147 male subjects and 261 female subjects) from Hakha Township, Chin State were recruited in June 2009. These subjects were not related to each other. Blood samples of the male subjects were tested by methaemoglobin reduction test (Brewer's test) followed by agarose gel electrophoresis. G6PD enzyme deficiency is the X-linked recessive gene disorder, which is hidden in female heterozygous carrier. The cytochemical staining method can detect the female heterozygous carrier. In male subjects, 4.76% (n = 7) had enzyme deficiency and among them, 0.68% (n = 1) had severe deficiency. In female subjects, 2.68% (n = 7) had enzyme deficiency and among them, 0.38% (n = 1) had severe enzyme deficiency.

TITLE- 84

A simple score to predict the outcome of severe malaria in adults

AUTHOR (S) and AFFILIATION:

Josh Hanson^{1,3}, Sue J. Lee^{1,3}, Sanjib Mohanty⁴, M. A. Faiz⁵, Nicholas M. Anstey⁸, Prakaykaew Charunwatthana¹, Emran Bin Yunus⁷, Saroj K. Mishra⁴, Emiliana Tjitra⁹, Ric N. Price^{3,8}, Ridwanur Rahman⁶, Francois Nosten^{1,2,3}, Ye Htut¹⁰, Gofranul Hoque⁷, Tran Thi Hong Chau¹¹, Nguyen Hoan Phu¹¹, Tran Tinh Hien¹¹, Nicholas J. White^{1,3}, Nicholas P. J. Day^{1,3} and Arjen M. Dondorp^{1,3}

¹Faculty of Tropical Medicine, Mahidol University, Bangkok; ²Shoklo Malaria Research Unit, Mae Sot, Thailand; ³Centre for Tropical Medicine, Nuffield Department of Clinical Medicine, Churchill Hospital, Oxford, United Kingdom; ⁴Department of Medicine, Ispat Hospital, Rourkela (Orissa), India; ⁵Sir Salimullah Medical College and ⁶Shaheed Sharwardhy Medical College, Dhaka; ⁷Chittagong Medical College, Chittagong, Bangladesh; ⁸International Health Division, Menzies School of Health Research and Charles Darwin University, Darwin, Northern Territory, Australia; ⁹National Institute of Health Research and Development, Ministry of Health, Jakarta, Indonesia; ¹⁰DMR (LM), MOH, Yangon, Myanmar; and ¹¹Oxford University Clinical Research Unit, Hospital for Tropical Diseases, Ho Chi Minh City, Vietnam

SOURCE:

Clinical Infectious Diseases 2010; 50:679–685

ABSTRACT:

Background: World Health Organization treatment guidelines recommend that adults with severe malaria be admitted to an intensive care unit (ICU). However, ICU facilities are limited in the resource-poor settings where most malaria occurs. Identification of patients at greater risk of complications may facilitate their triage and resource allocation. **Methods:** With use of data from a trial conducted in Southeast Asia, a logistic regression model was built to identify independent predictors of mortality among adults with severe malaria. A scoring system based on this model was tested in the original data set and then validated in 2 series from Bangladesh and Vietnam. **Results:** Acidosis (base deficit) and cerebral malaria (measured as Glasgow Coma Score) were the main independent predictors of outcome. The 5-point Coma Acidosis Malaria (CAM) score was simply derived from these 2 variables. Mortality increased steadily with increasing score. A CAM score 2 predicted survival with a positive predictive value (PPV) of 95.8% (95% confidence interval [CI], 93% – 97.7%). Of the 14 of 331 patients who died with a CAM score 2, 11 (79%) had renal failure and death occurred late after hospital admission (median, 108 h; range, 40–360 h). Substitution of plasma bicarbonate as the measure of acidosis only slightly reduced the prognostic value of the model. Use of respiratory rate was inferior, but a score 2 still predicted survival with a PPV of 92.2% (95% CI, 89.1% – 94.7%). **Conclusions:** Patients with a CAM score 2 at hospital admission may be safely treated in a general ward, provided that renal function can be monitored.

TITLE- 85

Study of red cell deformability, nitric oxide and haematological parameters in confirmed uncomplicated falciparum malaria patients

AUTHOR (S) and AFFILIATION:

Ohnmar Myint Thein

SOURCE:

Thesis Ph.D. (Physiology), UM (1), 2010

ABSTRACT:

Malaria is today a disease of poverty and underdeveloped countries. The aim of the present study was to study the red cell deformability (RCD), plasma nitric oxide level (NO) and hematological parameters in confirmed uncomplicated falciparum malaria (CUM) patients. In addition, the factors affecting red cell deformability, and the effect of *in vitro* changes in pH, osmolality and glucose concentration on red cell deformability of CUM patients and normal controls were also investigated. Thirty confirmed uncomplicated falciparum malaria patients, age between 20 and 40 years, and age matched 12 normal healthy controls had participated in this study. Plasma nitric oxide level and hematological parameters such as RCD, red cell count, mean cell volume (MCV), red cell distribution width (RDW), mean corpuscular hematological concentration (MCHC) and plasma proteins such as fibrinogen and albumin concentration well determined. Deformability of red blood cells was determined using in-vitro filtration model, fibrinogen concentration using precipitation method; albumin concentration using dye-binding method; nitric oxide (NO) level using Greiss method and hematological parameters using automatic haematology analyser. The effect of pH, osmolality and fibrinogen on red cell deformability was studied by incubating the washed red blood cells of both patients and healthy subjects *in vitro* with phosphate buffered saline of different concentrations of pH, osmolality and fibrinogen concentration. The RCD, red blood cell count, haemoglobin concentration, haematocrit, white blood cell count and platelet count were found to be significantly lower in the CUM patients than in the healthy adults. On the other hand, the NO level, red cell distribution width, mean platelet volume and albumin concentration were significantly higher in the CUM patients than in the healthy adults. It was found that RCD was significantly correlated with red blood cell count, haemoglobin concentration, haematocrit, and fibrinogen concentration in normal subjects. In CUM patients, the RCD was found to be significantly correlated with NO, red blood cell count and haemoglobin concentration, haematocrit and significantly but inversely correlated with RDW. The NO level was positively correlated with red blood cell count and haemoglobin concentration in CUM patients. It was also found that red blood cell deformability is influenced by pH and osmolality, and the deformability is best at optimal pH and osmolality. It was observed that RCD was decreased with increasing concentration of fibrinogen *in vitro*. These findings indicated that red blood cell deformability is reduced in falciparum malaria and is influenced by plasma nitric oxide level. Changes in plasma factors that occur concomitantly with reduction in red cell deformability in malaria patients might be indicative of their pathophysiological importance in clinical

manifestation of malaria. Alteration in RCD, NO and hematological parameters seems to occur even from the outset of malaria, and changes in plasma factors rather than properties of red cells contribute more to reduction of RCD in CUM patients.

2011

TITLE- 86

Clinical study on efficacy and safety of Duocotexin (dihydroartemisinin-piperaquine) in uncomplicated falciparum malaria in adults

AUTHOR (S) and AFFILIATION:

Khin Phyu Pyar¹, Sai Aik Hla¹, Zarni Htet Aung², Tin Maung Hlaing³, Thein Zaw² and Marlar Than¹

¹No. (1), DSGH, Mingaladon; ²No. (3), Military Hospital (300 Bedded), Kyaing Tone; ³Ministry of Defence

SOURCE:

MHRC Programme and Abstract 2011; pp. 36

ABSTRACT:

Different brands of dihydroartemisinin and piperaquine phosphate co-formulated tablets from Peoples' Republic of China namely Artekin and Artepip and from Myanmar namely Piperamisinin had been studied in Clinical Research Unit (Malaria) No. (1) DSGH (1000 Bedded) Mingaladon in 2006-2010 for the treatment of uncomplicated falciparum malaria and was found to be safe and effective. Among dihydroartemisinin and piperaquine phosphate co-formulated tablets (40/320mg), duocotexin, produced from Holleypharm, China is the only drug registered in WHO. A hospital based clinical study using 28 days WHO standard therapeutic efficacy test was done at No. (1) DSGH (1000 Bedded) Mingaladon, No. (3) MH (300 Bedded) Kyaing Tone on a total of 51 acute uncomplicated falciparum malaria adult patients between August 2010 to October 2011, to study the effectiveness, tolerability and safety of duocotexin. The patients were administered 2-2.4/16-19.2 mg/kg once a day for 3 days. The patients were monitored clinically, parasitologically and haematologically for 28 days. Mean age was 29 ± 10.77 years. Mean height and weight were 163 ± 7.6 cm and 52.33 ± 5.9 kg respectively. Initial parasitaemia was 16773.31 ± 11209.88 per μL . Initial temperature was $38.49 \pm 0.99^\circ\text{C}$. Fever clearance time was 24.0 ± 10.72 hours and parasite clearance time was 48 ± 1.44 hours respectively. There was no early or late treatment failure. Adequate clinical and parasitological response was 100%. There were no serious clinical or haematological side effects. Duocotexin is safe and effective for the treatment of uncomplicated falciparum malaria in adults.

TITLE- 87

Evaluation of efficacy and safety of dihydroartemisinin-piperaquine 42 days trial for the treatment of uncomplicated *P. falciparum* malaria in Kawthaung, Tanintharyi Region, Myanmar

AUTHOR (S) and AFFILIATION:

Myat Phone Kyaw¹, Ye Htut¹, Tin Tun Oo², Myat Htut Nyunt¹, Ni Ni Zaw¹, Cho Cho¹, Phyo Zaw Aung¹ and Aung Kyaw Kyaw¹
¹DMR (LM); ²DOH

SOURCE:

MHRC Programme and Abstract 2011; pp. 36-37

ABSTRACT:

Kawthaung area has been selected as a sentinel site for the evaluation of therapeutic efficacy and safety of Artesiminin combinations therapies (ACTs) since 2009. The follow up period for efficacy trial was 28 days in previous study. The half life of partner drug for artemisinin compound is an important issue that 42 days trial has been recommended for long half life partner drugs like mefloquine and piperaquine by WHO. The persistence of parasitaemia up to 3 days was noted in 18.7% of the patients treated with dihydroartemisinin-piperaquine combination, 28 days trial in 2009 and one late clinical failure and one late parasitological failure has been noted on day 21 and 28. Therefore, one-arm, prospective evaluation of the clinical and parasitological response to directly observed treatment with dihydroartemisinin-piperaquine for uncomplicated *P. falciparum* malaria, 42 days trial was conducted in this border area between March and May 2011. A total of 67 subjects were completed to study. Day 3 persistent parasitaemia was noticed in 7 (10.4%) of patients and two (2.7%) late treatment failure (LTF) cases were detected, one on day 35 and one on day 42. Therefore, 42 days trial should be needed to follow in future study with dihydroartemisinin-piperaquine combination.

TITLE- 88

Piperaquine concentrations in red blood cells and plasma of Myanmar healthy volunteers and uncomplicated falciparum malaria patients

AUTHOR (S) and AFFILIATION:

Khine Kyi Han¹, Marlar Myint¹, Thaw Zin² and Yee Yee Tin¹
¹University of Pharmacy, Yangon; ²DMR (LM)

SOURCE:

MHRC Programme and Abstract 2011; pp. 40

ABSTRACT:

The study was done to develop and validate a sensitive and specific HPLC-UV method suitable for quantification of piperaquine (PPQ) in human RBCs and to compare RBC to plasma partition ratio of PPQ between healthy volunteers and uncomplicated falciparum malaria patients. A single dose (three tablets) of piperamisinin (350 mg of PPQ and 50 mg of dihydroartemisinin [DHA]) was given orally to 18 healthy volunteers. Three tablets of piperamisinin were given once a day for 3 days to 18 acute, uncomplicated falciparum malarial patients. Blood samples were collected from each subject at specified times. PPQ concentrations in plasma and

RBCs were assayed by HPLC-UV method. PPQ concentrations in RBCs significantly exceeded those in plasma of both healthy volunteers ($P = 0.008$) and malaria patients ($P = 0.033$) according to independent-samples 't' test. There was no significant difference of mean RBC to plasma partition ratio of PPQ between healthy volunteers and malarial patients ($P = 0.618$). Mean PPQ concentrations in both plasma and RBCs of malarial patients at Day 28 were within the range of *in vivo* minimal inhibitory concentrations. The findings revealed that PPQ was more concentrated in RBCs as other antimalarial drugs (e.g. chloroquine). The study also showed that RBC to plasma partition ratio of PPQ was not appreciably altered in parasitized RBCs. Moreover, it was found that PPQ in the dosage regimen of Piperamisinin may produce post-treatment prophylactic effect up to 28 days. Thus, it can be concluded that PPQ is a suitable partner drug for artemisinin derivatives.

TITLE- 89

Malaria antibody: Is it an alternative tool for estimation of local malaria transmission in malaria micro-stratified areas?

AUTHOR (S) and AFFILIATION:

Khin Myo Aye¹, Myat Phone Kyaw¹, Thaung Hlaing¹, Khin Thet Wai¹, Myat Htut Nyunt¹, Myo Min², Soe Soe Han¹ and Phyzo Zaw Aung¹
¹DMR (LM); ²Myanmar Medical Association

SOURCE:

MHRC Programme and Abstract 2011; pp. 40-41

ABSTRACT:

Malaria antibodies have been suggested as a useful tool for measures of malaria transmission intensity because it reflects cumulative exposure and is less affected by seasonality due to the longer duration of specific antibody responses. Therefore, a cross-sectional field-based study was conducted to assess the usefulness of the malaria antibody to estimate the local transmission at micro-stratified areas in Longlone and Yebyu Townships of Tanintharyi Region in October, 2011. A total of 1,455 residents over two years of age were recruited to detect the malaria parasite by blood film examination and malaria antigen RDTs, and the presence of malaria merozoite antibodies by using Immunochromatographic assay. Malaria antibody was detected in 121 (27.07%), 32 (5.77%) and 23 (5.08%) for *P. falciparum* and in 62 (13.87%), 20 (3.60%) and 21 (4.63%) for *P. vivax* malaria in high (Ia), moderate (Ib) and low transmission (Ic) microstratified areas respectively. Malaria antigen for *P. falciparum* was detected in 39 (11.47%), 4 (0.72%) and 1 (0.23%) and for *P. vivax* 11 (3.24%), 1 (0.18%) and 4 (0.93%) in Ia, Ib and Ic respectively. Malaria antibody positivity for both *P. falciparum* and *P. vivax* was not associated with sex but strongly associated with transmission intensity ($P = 0.00001$) for both *P. falciparum* and *P. vivax*. It can be concluded that malaria antibody is a useful tool for rapid assessment of recent trends in malaria transmission intensity and will be invaluable for monitoring and evaluation of malaria control programs.

TITLE- 90

Association between the use of Insecticide-Treated Nets (ITNs) and parasitaemia and presence of malaria antibody in Thanbyuzayat Township, Mon State

AUTHOR (S) and AFFILIATION:

Khin Myo Aye¹, Ye Htut¹, Myat Phone Kyaw¹, Khin Thet Wai¹, Myat Htut Nyunt¹, Thura², Soe Soe Han¹, Ni Ni Zaw¹ and Moe Thida¹
¹DMR (LM); ²Thanbyuzayat Hospital, Mon State

SOURCE:

The MHSRJ 2011; 23(1): pp. 44-50

ABSTRACT:

A cross-sectional community based study was conducted in six villages of Thanbyuzayat Township, Mon State in July 2010 to detect the association between the insecticide-treated nets (ITNs) usage, parasitaemia and merozoite antibody. Fifty-two percent of 183 adult population used ITN regularly and most of them were aware of ITNs through health personnel. They used ITN to prevent mosquito bite and malaria, but only 29% could buy ITN. The unpleasant smell of ITNs was complained in 14.8%. About 22.1% of ITN users washed their nets every 4-6 months and only 7% had retreated their nets after washing. Fever suspected as malaria during last year and two days before study were present in 25.3% of ITN users, 69.6% in net users and 63.2% in non-users, respectively. Malaria parasite was not detected in ITN group, but 18.3% was detected in non ITN group (nets and non-users). The presence of antibody detected by rapid diagnostic test (RDT) were 45.5% among ITN usage of up to 6 months and 54.5% among more than 6 months users (P = 0.03). It was also cross-checked by ELISA and the results were found to be similar. In non-ITN group, 52.2% was positive by RDT and 46% by ELISA, respectively. There was no association between parasitaemia and antibody. However, kappa agreement between RDT and ELISA was 0.66 (P = 0.0005). It indicated that the use of ITN has no effect on the development of acquired immunity to malaria and also confirmed the protective effect of ITN.

TITLE- 91

Study of plasma malondialdehyde and ascorbic acid levels in *Plasmodium vivax* and *P. falciparum* malaria patients

AUTHOR (S) and AFFILIATION:

Khaing Moe

SOURCE:

Thesis M.Med.Sc. (Physiology), DSMA, 2011

ABSTRACT:

The role of oxidative stress in malaria pathogenesis has been widely studied for many years. This study was carried out with the aim of measuring plasma malondialdehyde concentration as the marker of oxidant, and plasma ascorbic acid concentration as antioxidant defense, in *P. vivax* and *P. falciparum* malaria patients in Myanmar. Thirty *P. vivax* malaria patients and thirty *P. falciparum* malaria patients were involved in this study. Normal healthy adult males were collected as control. Mean plasma malondialdehyde levels of *P. vivax* and *P. falciparum* patients were $0.576 \pm 0.156 \mu\text{mol/L}$ and $0.592 \pm 0.109 \mu\text{mol/L}$ respectively. Mean plasma malondialdehyde level of control subjects was $0.534 \pm 0.116 \mu\text{mol/L}$. Although plasma malondialdehyde level of malaria patients were higher than that of control subjects, it was not statistically significant. Mean plasma ascorbic acid levels of *P. vivax* and *P. falciparum* were $1.236 \pm 0.282 \text{ mg/dl}$ and $1.189 \pm 0.237 \text{ mg/dl}$ respectively. Mean plasma ascorbic acid level of control subjects was $0.846 \pm 0.237 \text{ mg /dl}$. Plasma ascorbic acid levels of malaria patients were significantly higher than that of control subjects ($P < 0.05$). There was no significant correlation between plasma malondialdehyde and plasma ascorbic acid in all groups ($r = - 0.346$ in control subjects, $r = - 0.061$ in *P. vivax* patients, $r = 0.018$ in *P. falciparum* patients). In conclusion, increased oxidative stress appears to be well balanced by elevated plasma ascorbic acid concentration in acute state of malaria infection.

SECTION-2 DIAGNOSTICS: DRUG RESISTANCE AND MOLECULAR STUDIES

2001

TITLE- 92

The human materno-foetal relationship in malaria: histological and immunohistochemical studies of the placenta

AUTHOR (S) and AFFILIATION:

Nyan Htein Lin¹, Khin Saw Aye², Soe Soe² and Than Than Tin³

¹CRU (Malaria) DSGH, Mingaladon, ²DMR (LM), ³Central Women's Hospital

SOURCE:

11th Myanmar MMC Programme and Abstract 2001; No. 29: pp. 14

ABSTRACT:

Histological and immunohistological studies of ten placentae heavily infected with *P. falciparum* revealed large intervillous accumulation of erythrocytes containing parasites together with monocytes which had ingested pigment. In six other placentae which contained scanty amounts of pigment but no parasites, representing past or inactive infection, no large collection of monocytes. Immunohistochemical method revealed no significant differences between placentae positive for parasites and those containing pigment only. These findings establish that *P. falciparum* infection in the placenta may result in substantial damage although lesions within the villous are rare. Furthermore, previous infection may leave a heritage of pigment deposition and immunopathological lesions. These results may thus account for both the high frequency of intra-uterine growth retardation and rarity of congenital malaria in the presence of *P. falciparum* malaria.

TITLE- 93

Diagnosis of multiple plasmodium infection by thin film microscopy

AUTHOR (S) and AFFILIATION:

Khin Lin¹, Aung Than¹, Saw Lwin¹ and Soe Aung²

¹VBDC, DOH, ²Public Health and Disease Control, DOH

SOURCE:

MHRC Programme and Abstract 2001: pp. 43

ABSTRACT:

Among various diagnostic methods of malaria, Giemsa stained blood film microscopy is the most well known method and commonly used in many countries. It has a considerable degree of validity with ease in field operation and relatively low cost. Thick blood film examination was done routinely, which takes 20 minutes for staining and 10 minutes for examination parasites. However, morphology of malaria parasites is distorted during staining and usually plasmodium species are under diagnosed or misdiagnosed in thick film examination. Therefore, an attempt is being made

to compare findings of thick film examination with those of thin film in diagnosis of multiple infections. Clinically suspected malaria patients attending Central VBDC clinic, Mandalay and Sagaing VBDC clinic were taken both thick and thin films, and microscopic examination for plasmodium species was done by the same technician. Among a total of 999 patients examined, plasmodium parasites were detected in 327 patients (32.7%) by both thick and thin films. Out of 327 patients, thick film examination detected double plasmodium species in only one patient and remaining were single infection. By thin film examination multiple plasmodium species infection was found in 64 patients with 40 double infection, 18 triple infection and 6 quadruple infection. In 10 patients of single infection detected by thick film examination also, it was found to be other species infection by thin film examination. The study revealed that thin film examination can detect multiple plasmodium species with better identification ability than thick film examination.

TITLE- 94

A study on distribution of human malaria species in Myanmar

AUTHOR (S) and AFFILIATION

Khin Lin, Aung Than, Saw Lwin and Soe Aung
VBDC, DOH

SOURCE:

11th Myanmar MMC, Programme and Abstract 2001; No. 3: pp. 2

ABSTRACT:

Among human malaria parasite prevalence in Myanmar, *Plasmodium falciparum* and *Plasmodium vivax* are detected in many parts of the country. With the objective of having detailed and complete information on human malaria species distribution, identification of malaria parasites and species differentiation was done by using Acridine-Orange stained thin blood film microscopy and Polymerase Chain Reaction (PCR) technique. The study was done in Dawei, Kawthaung, Myitkyina, Lashio, Kalaw, Tarchileik, and Mandalay, Pyin Oo Lwin, Thaton, Mawlamyaing, Mrauk Oo and Than Twe during from October 1996 to November 2000. Among 4474 clinically suspected malaria patients examined, malaria parasites were found in 1163 patients (26%), as *Plasmodium falciparum* 869 (74.7%) patients, *Plasmodium vivax* 145 patients (12.5%), *Plasmodium malariae* 90 patients (7.7%), *Plasmodium ovale* 10 patients (0.9) and remaining 49 (4.2%) as mixed infections. *P. falciparum* and *P. vivax* were found more or less in all areas, *P. malariae* was common in Rakhine and Shan States, with *P. ovale* in Dawei, Thaton and Kawthaung. Genetic sequencing of the malaria isolates confirmed that all known four human malaria species and variants are prevalent in Myanmar with varying percentage of species composition.

TITLE- 95

Role of Optimal Immunochromatographic Test Kit for the rapid diagnosis of *P. falciparum* and *P. vivax* in Rural Health Centre (Preliminary survey)

AUTHOR (S) and AFFILIATION:

Myat Phone Kyaw¹, Thar Htun Kyaw², Ye Htut¹, Aung Khin³, Myint Kyi⁴,
Thaung Htay⁵ and Mya Thawdar Lwin⁶

¹DMR (LM); ²Bago District Health Department, DOH; ³Bago Township Health Department, DOH; ⁴Zeetaw Rural Health Centre, DOH; ⁵VBDC, Yangon Division, DOH; ⁶Clinical Research Unit, NOGH

SOURCE:

MHRC Programme and Abstract 2001: pp. 50

ABSTRACT:

Since malaria is one of the foremost health problems in Myanmar, it accounts for 35 percent of all outpatient cases. The National Malaria Control Program (NMCP) emphasizes prompt clinical recognition and treatment of febrile illness using chloroquine or sulphadoxine-pyremethamine either at Rural Health centre (RHC) or at home. The potential applicability of a sensitive, specific, simple and inexpensive diagnostic test for malaria needs to be tested. A negative result of rapid diagnostic test could help the health staff to avoid unnecessary malaria therapy. However, if the feasibility of a rapid malaria diagnostic test is not investigated early, it can lead to misuse of limited resources and management of the cases. It usually takes some time to get acceptance of the newly introduced products and services. Zeetaw RHC in Zaung Tu area, close to Bago Yoma, deep-forested area was selected to explore the actual situation of a health assistant who is working in an endemic area with transportation difficulty especially in rainy season. In the first month of study, slides were taken from all clinically treated malaria cases. From second to fourth month, optimal immunochromatographic test strips were employed to all clinically suspected malaria cases together with routine blood smears. Slide positive rate on first month was 28.6 percent. On second month, hesitation to use test strip had been encountered after having negative results of clinically suspected malaria by test strips. Confidence on the use of test strip became reduced. After counseling and encouragement, parasite positivity rates were 33.3% in the third month and 57.1% in the fourth. Sensitivity of test strip measured on third month onwards was also increased from 33.3% to 75% for *P. falciparum* and from 50% to 80% for *P. vivax* respectively. This study indicated that users considered four main factors in adopting new products or service, which were 1) safety 2) effectiveness 3) cost and 4) reliability. The training is essential to be able to use it. Therefore, this preliminary survey showed significant reduction in antimalarial drug consumption, especially in areas with high malaria prevalence where all fever cases are presumptively treated as malaria. High parasite positive rate after introducing test strips reflected the improvement in ability to diagnose clinically.

2002

TITLE- 96

Hemoglobin E prevalence among different malaria population: Myanmar

AUTHOR (S) and AFFILIATION:

Ne Win¹, Saw Lwin², Khin Lin², Myat Su Cho¹, Khin Saw Aye¹ and Aung Htay³

¹DMR (LM); ²VBDC Unit, DOH; ³Kanbauk Station, Dawei Township, Total Myanmar Exploration Project

SOURCE:

MHRC Programme and Abstract 2002; pp. 39

ABSTRACT:

Both malaria and hemoglobin E (HbE) are prevalent throughout Myanmar with a geographical variation. Although type of malaria endemicity in different regions of Myanmar has been widely reported, there is only a few small-scaled reports on the prevalence of HbE in relation to ethnicity, malaria endemicity and to clinical severity. Cellulose acetate paper hemoglobin electrophoresis was done for the detection of HbE carrier states either heterozygote (HbEA) or homozygote (HbEE) in 456 villagers living in five different malaria endemic villages (Gant-gaw-taung, Mee-gyaung-laung, Thae-chaung, and Ein-da-yar-zar, in Da-Wae Township and Oo-do in Hlegu Township) and 151 patients attending to Outpatient Department (OPD), Central Vector Borne Disease Control Unit Insein, Yangon. HbE prevalence was 21.5% in Gant-gaw-taung, 6% in Mee-gyaung-laung 5.4% in Thae-chaung, 2% in Ein-da-yar-zar, 13.1% in Oo-do, and 24.4% in OPD attendants. Village population revealed HbE significantly prevails more in Bamar than in Kayin population. OPD attendants showed that: (i) both *P. falciparum* infection and *P. vivax* infection was observed in patients with HbEA; (ii) HbE content was inversely proportional to parasite count; (iii) although highest parasite density was not observed in cases with HbEA, there is no significant difference of parasite density in the HbE carriers and non-carriers; and (iv) HbEE cases were infected with *P. falciparum* only. The finding from this study will be of great help in malaria control program in Myanmar. Hence, HbE (a) has protective effects, (b) potentiates the antimalarial effect of artemisinin derivatives, (c) ameliorates the course of acute falciparum malaria, and (d) has influence on fertility.

TITLE- 97

Feasibility and limitations of acridine orange fluorescence technique using a malaria diagnosis microscope in Myanmar

AUTHOR (S) and AFFILIATION:

Ye Htut¹, Kyin Hla Aye¹, Kay Thwe Han¹, Myat Phone Kyaw¹, Kunio Shimono² and Shigeru Okada³

¹DMR (LM); ²Shimono Hospital; ³Okayama University

SOURCE:

Acta Medica Okayama 2002; 56 (5): pp. 219-222

ABSTRACT:

We studied parasite detectability in thick films by an acridine orange fluorescence technique (AO) to test its applicability and the use of a Malaria Diagnosis Microscope (MDM)-ESL in the detection of parasites, compared to the conventional Giemsa staining method. This study was conducted on 1,390 clinically suspected malaria cases of Thaton Township, Myanmar. We found sensitivities of 82.8% for *Plasmodium falciparum* (*P. falciparum*) and 100% for *Plasmodium vivax* (*P. vivax*) and specificities of 97.1% for *P. falciparum* and 98.6% for *P. vivax*. AO had a higher sensitivity than Giemsa-stained films at low levels of parasitemia (< 1,000/micro l). AO showed lower sensitivity and higher specificity than the Giemsa method at parasite levels of more than 1,000/micro l. The results of using the AO method, achieved by both novice and experienced observers, showed no significant difference and required less practice to perform the test as well as to identify the parasite. The acridine orange fluorescence technique using a malaria diagnosis microscope MDM-ESL series is simple, rapid and cost effective. The microscope is conveniently operable using standard AC power or a 12-V DC car battery, and it is easily convertible to a conventional biological microscope. With the exception of species differentiation, which is not possible with this method, this method would be appropriate for both clinical and epidemiological studies.

TITLE- 98

Sensitivity and specificity of isolated antigen from *Plasmodium falciparum* culture supernatant

AUTHOR (S) and AFFILIATION:

Maung Maung Mya, R.K. Saxena and A. Roy

SOURCE:

Indian Journal of Clinical Biochemistry, January 2002; (17-1): pp. 75-82

ABSTRACT

Immunological sensitivity and specificity properties of isolated *Plasmodium falciparum* (GPL) antigen from culture supernatant have been measured and compared with malarial antigens and non malarial filtered paper blood sera for potency and efficacy. Latex bead coded GPL, Pf and RESA antigens immunoreaction properties of human filter paper blood samples (FPB) were studied by laser light scattering immunoassay (LIA) and Enzyme linked immunoabsorbent assay (ELISA) techniques. Results of GPL antigen sensitivity study by LIA method showed a very high malaria antibody

binding response (MABR) i.e. 6% compared with 78% with RESA and 88% Pf antigens. Malaria detection by ELISA method also found similar results. Specificity study of GPL antigen for different non malarial filter paper blood sera (NMFS) showed no immunoreaction however Pf and RESA antigen showed few positive immunological responses. These results suggest that sensitivity and specificity properties of isolated GPL antigen is better than other antigens.

TITLE- 99

Isolation, part characterization, immunogenicity, and specificity study of *Plasmodium falciparum* culture supernatant

AUTHOR (S) and AFFILIATION:

Maung Maung Mya, A. Roy¹, R.K. Saxena² and Kunal B. Roy³
Centre for Biomedical Engineering, Indian Institute of Technology, Hauz Khas, New Delhi

¹Malaria Research Centre, 22 Shamnath Marg, Delhi; ²Corresponding author: Tel: +91-68-64851, E-mail: rks@cbme.iitd.ernet.in and ³Centre for Biotechnology, Jawaharlal Nehru University, New Delhi, India

SOURCE:

Jpn. J. Infect. Dis., 2002; 55: pp. 150-156

ABSTRACT:

A *Plasmodium falciparum* malaria blood stage antigen was isolated from *in vitro* parasite culture supernatant. The chemical composition of the antigen was studied by high-performance thin-layer chromatography, thin-layer chromatography, gas-liquid chromatography, and other chemical methods. Such analysis indicated it to be a glycopospholipid (GPL) and to be composed of xylose, mannose, galactose, and glucose linked to a phospholipid, but no inositol. The extracted and purified antigen's sensitivity and specificity properties were assessed by laser immuno assay and enzyme-linked immunosorbent assay. The results of the sensitivity study showed a very high malaria antibody-binding response compared to other known antigens. The specificity study of GPL antigen with different nonmalarial samples showed no positive response within the limit of significance. This isolated GPL antigen appears to be better than other antigens.

TITLE- 100

Study of malaria in a village of Lower Myanmar

AUTHOR (S) and AFFILIATION:

Maung Maung Mya, R.K. Saxena, and Paing Soe

SOURCE:

Indian J Malariol, 2002; 39(3-4):pp. 96-102, PMID 14686117

ABSTRACT:

Malaria endemicity in Lower Myanmar has been studied to identify the causes for the prevalence of malaria in Yeasitkan village of Lower Myanmar. Vector mosquitoes were collected by mosquito net in cattle sheds and in human dwellings (indoor and outdoor) by biting and catching procedure for the identification of species, insecticide susceptibility test and

sporozoites detection. Larvae of mosquitoes were also collected in and around the village for vector identification and for breeding sources. Malaria infection in humans was examined by blood examination and blood antibody detection by ELISA method. Results showed that malaria infection was 43.2% in children under 10 years of age and *An. dirus* and *An. minimus* were found as main vectors. Total parasite positive rate was found to be 41.28% and in this 78.87% were *P. falciparum* infections and remaining 18.31% were of *P. vivax*. Spleen positive rate has been found very high in children between 2 and 9 years (52.94%). Study indicates that villages near to dam areas are more prone to malaria infection.

2004

TITLE- 101

Rapid Diagnostic Test (RDT) for malaria: study on sensitivity and specificity of Paracheck test stored in two different climates; very wet intermediate zone and humid hot tropical zone

AUTHOR (S) and AFFILIATION:

Myat Phone Kyaw¹, Win Naing², Chan Thar³, Thein Nyunt³, Thauung Kyaing⁵, Khin Aung³, Tin Nwe Htwe¹, Soe Soe Han¹ and Myint Myint Than³
¹DMR (LM); ²VBDC, DOH; ³Rakhine State Vector Borne Diseases Control, DOH; ⁴Thidarkonpyin Rural Health Centre, Ye Kyi Township, DOH

SOURCE:

MHRC Programme and Abstract 2004; pp. 9-10

ABSTRACT:

Quality assurance and quality control system of Rapid Diagnostic Test for malaria needs to be developed in Myanmar. According to temperature and humidity, 21 climatic zones can be differentiated: among which, two malaria endemic areas with population of 1,200,000 to 1,400,000 and malaria incidence rate between 11 to 50 per 1,000 population were selected to study: i.e., Sittwe and Ye Kyi Townships (Thidarkonpyin Rural Health Centre). The distribution of Paracheck test to these areas was under control of Zone malariologist and expiry date of the distributed RDT were the same and transporting period from head quarter to these areas was the same (within 48 hours), but route was different by plane and bus. All the RDTs were stored in shaded area with good ventilation. Active case detection of malaria was done simultaneously with two teams (VBDC and DMR) during pre-monsoon (first peak of malaria in both areas). All the patients with fever were checked with RDT and microscopy by two technicians without knowing the results of each other. Seventy two patients from Sittwe and 82 patients from Thidar Konpyin RHC completed the study. The sensitivity of Paracheck test in Sittwe (very wet and intermediate zone) was 84.2% and 98.2% in Thidarkonpyin (humid and hot tropical zone) ($P = 0.0013$). The specificity of the test were 82.4% and 84% respectively. Therefore, humidity and temperature were the probable factors causing statistically different sensitivity of RDT. Regular check up of temperature and humidity of the storage area is recommended by this study.

TITLE- 102

Evaluation of different methods for diagnosis of vivax malaria

AUTHOR (S) and AFFILIATION:

Khin Lin¹, Aung Than², Myint Shwe³, Win Naing², Saw Lwin² and Thein Tun¹

¹DMR (UM); ²VBDC (Head Quarter), DOH; ³VBDC Team, Mandalay

SOURCE:

MHRC, Programme and Abstract, 2004; pp. 16

ABSTRACT:

In Myanmar, vivax malaria accounts for 20% of total malaria patients and laboratory diagnosis of *P. vivax* is usually missed due to lack of skills and experience of technicians. To evaluate the validity of different laboratory methods for diagnosis of *P. vivax*, we examined 234 clinically suspected malaria patients in Yangon and Mandalay Division. A total of 100 patients were diagnosed as malaria positive by Giemsa stained thick smear microscopy and same samples were examined by thin smear microscopy and Polymerase Chain Reaction (PCR). Polymerase Chain Reaction test and Circum Sporozoite Protein (CSP) analysis were done in National Institute of Health of Republic of Korea. Thick smear microscopy showed 14 *P. falciparum* positives, 73 *P. vivax* positives and 13 mixed infections. Thin film results were 8 *P. falciparum* positives, 69 *P. vivax* positives, 16 mixed infections and 7 negative samples. Polymerase Chain Reaction test showed 52 *P. vivax* positives, 43 mixed infections and 5 negative samples. Genotyping of vivax strains on CSP gene showed 76 VK 210 strains, 23 VK 210 and 247 strains and one VK 247 strain. The findings reveal that thick smear microscopy could miss (70%) of mixed infections and 5% are false positives. Thin smear microscopy also missed 62% of mixed infections as compared to the Gold Standard PCR test with better results for true negative infections. It highlights that there are about 43% of mixed malaria infections in Myanmar, diagnosed by PCR test.

TITLE- 103

Determination of immunoreactivity of *Plasmodium falciparum* antigens, serum dilutions and biomaterials

AUTHOR (S) and AFFILIATION:

Maung Maung Mya, R.K. Saxena, A. Roy¹ and D.N. Rao²
Centre for Biomedical Engineering, Indian Institute of Technology, New Delhi
¹Malada Research Centre, and ²Department of Biochemistry, All India Institute of Medical Sciences, New Delhi

SOURCE:

Indian Journal of Clinical Biochemistry, 2004; 19 (1): pp. 88-92

ABSTRACT:

Immunoreactivity properties of serum dilutions and *Plasmodium falciparum* malaria antigens were measured and compared by ELISA technique using different ELISA plates to evaluate the role of antigens and serum dilutions for optimum binding. Also effort has been made to see the effect of reaction surface and material i.e. ELISA plates for binding capacity. Serological properties were estimated by ELISA methods for detection of malaria and determination of immunological characteristics. Three *Pf* antigens (*PfAg*) i.e. dng infected erythrocyte surface antigen: AR-1 (RESA), histidine-rich protein 2 antigen (HRP-2) and glycopospholipid antigen (grown and developed *Pf* antigen from PSJ-M strain): GPL1 have been used for serological testing of human blood samples by Enzyme Link Immunosorbant Assay (ELISA). 1:100, 1:1000 and 1:10000 dilutions of *Pf* positive and negative serum (50 samples in each group) and 1:1000 dilution of *Pf* antigens were used to measure immunoreactive properties by ELISA method. Result of *PfAg*-serum immunoreactivity study showed that GPL1 has the highest degree of immuno binding reactivity compared to other *Pf* antigens. HRP-2 and RESA antigens showed no significant difference to each other. Study also found that Costar and Fastec ELISA plates have a better Ag-Ab binding capability compared to Immulon and Falcon plates at all dilutions of serum. Serum dilution of 1:100 showed best binding and reactivity with *Pf* antigens followed by 1:1000 and 1:10000 showed lowest reactivity.

TITLE- 104

A study on prevalence of HIV infection, syphilis and malaria in blood donors of Yangon Children Hospital and West Yangon General Hospital

AUTHOR (S) and AFFILIATION:

Myat Myat Thin

SOURCE:

Thesis M.Med.Sc. (Microbiology), IM (1), 2004

ABSTRACT:

This study was done to determine the prevalence of HIV infection, syphilis and malaria in blood donors from Yangon Children Hospital (YCH) and West Yangon General Hospital (WYGH). It was a laboratory based, cross-sectional prospective study. In this study, a total of 500 blood donor, who

came to YCH and WYGH were randomly selected. Blood samples were obtained for the screening of HIV infection and syphilis, and in addition thick and thin blood film preparation was done from each blood sample bottle for the detection of malaria parasite. All blood samples were tested for syphilis with VDRL test and confirmed by specific TBHA test. Every serum sample was also tested for HIV antibody with an indirect ELISA test and positive results were confirmed by another HIV antibody detection test using a different immunological principle, that is HIV TRI-DOT. Among the 500 blood donors 6 were found to be HIV antibody positive by both ELISA (Microlisa HIV) and HIV TRI-DOT, giving overall HIV prevalence rate of 1.2% and all infection were caused by HIV 1. Of 500 blood samples tested 34 were found to be positive to VDRL testing and among them, only 20 were positive by confirmatory TBHA test. The false positive rate of VDRL test was 2.9% and using the TBHA test as a reference, the sensitivity and specificity of the VDRL was 65% and 9% respectively. Of the 500 blood samples tested, 31 were positive for syphilis antibodies by TBHA test, giving an overall syphilis prevalence rate of 6.2% among blood donor. Out of 31 blood samples positive to TBHA test, 20 sera were also positive to VHRL test and 11 samples were false negative to VDRL test. Of the 500 samples of blood, none had detectable malaria parasite by staining and microscopy of blood films.

2005

TITLE-105

The study of the prevalence of malaria in blood donors of National Blood Centre, Yangon

AUTHOR (S) and AFFILIATION:

Swe Setk

SOURCE:

Thesis M Med Sc (Pathology), UM (1), 2005

ABSTRACT:

The study was done to determine the prevalence of malaria in blood donors at National Blood Centre, Yangon. It was a laboratory based, cross-sectional study. In this study, a total number of 500 blood donors, who come to National Blood Centre were randomly selected. Blood samples obtained were tested for malaria parasites using thin and tick blood film stained with Acridine Orange and Giemsa stain. Out of 500 samples of blood, none had detectable malaria parasites. So, in non-endemic area, screening of malaria by using donor questionnaire can be considered effective.

TITLE- 106

Preliminary report on prevalence of chloroquine resistance transporter gene (*Pfcr*) haplotype IET and *Pfmdr* 1 N86Y mutation in *P. falciparum*

AUTHOR (S) and AFFILIATION:

*Ye Htut*¹, *Kay Thwe Han*¹, *Myat Phone Kyaw*², *Kyin Hla Aye*¹ and *Aye Than*¹
¹*Parasitology Research Division,* ²*Experimental Medicine Research Division, DMR (LM)*

SOURCE:

MHRC Programme and Abstract 2005; pp. 17

ABSTRACT:

Molecular surveillance tools using genetic markers are of value nowadays in monitoring the drug resistant falciparum malaria. Mutation in *Pfcr* gene at the codon 76 (Tyr -76) is being applied as a genetic marker to predict the chloroquine (CQ) resistance. Among different haplotypes corresponding to amino acid residues at codon 74-76, *Pfcr* IET is reported as predominant CQ resistance haplotype in South East Asia. *PfMDR* 1 N86Y mutation has also a modulating effect on CQ resistance. *Pfcr* IET haplotype and *PfMDR* 1 N86Y were investigated among the samples collected from Tarchileik and Pa-an districts and the results were presented.

TITLE-107

The 14 day *in vivo* drug sensitivity patterns of Chloroquine, Sulphadoxine-Pyrimethamine, Quinine and Mefloquine (1992-2002)

AUTHOR (S) and AFFILIATION:

Aung Myo, Than Htut, Khin Nyo, Kyi Kyi Tin, Aye Yu Soe and Marlar Than
CRU (Malaria), DSGH, Mingaladon

SOURCE:

13th Myanmar MMC Programme and Abstract 2005; No. 3: pp. 2

ABSTRACT:

Since the establishment of the Clinical Research Unit (Malaria) at DSGH Mingaladon in March 1990, antimalarial drug trial have been carried out on various forms of malaria including uncomplicated and severe complicated falciparum malaria using new drugs as single agents and in various combinations. Quinine or Mefloquine (single or combinations) is usually used as the standard drug to compare with the new drugs. The data are recorded in prepared proformas and systematically kept in their respective files. In CRU (Malaria)-DSGH, patients who already received antimalarials like (chloroquine, sulphadoxine-pyrimethamine, quinine single or in combination with tetracycline) from various referral sites before coming to find out the annual *in vivo* drug sensitivity patterns. This study is a review of the 10 years information collected. The total number of patients who received these old standard drugs was 8391. The response rates of the individual drugs and the newer drugs, over the 10 year period will be presented and discussed.

TITLE- 108

Diagnosis of *P. falciparum* infection from two different endemic areas by two immunological methods using Glycophospholipid antigen

AUTHOR (S) and AFFILIATION:

Maung Maung Mya¹, R.K. Saxena³, A. Roy⁴, K. B. Roy⁵, W. Tun Lin¹, Sein Min¹, Sein Thaung¹, Sein Maung Than¹ and Kyaw Zaw²
¹DMR (LM); ²VBDC; ³Centre for Biomedical engineering IIT New Delhi, India; ⁴Malaria Research Centre, New Dehli, India; ⁵Centre for Biotechnology, Jawaharlal Nehru University, New Delhi 110067, India

SOURCE:

The MHSRJ, 2005; 17(2): pp. 55

ABSTRACT:

Previously described isolated Glycophospholipid (GPL) antigen's diagnostic sensitivity and specificity properties were tested on malarial and non malarial blood samples from two different malaria endemic areas in Myanmar and India. The control area is a non-endemic area, Delhi, India. Standard Enzyme-Link Immunosorbent Assay (ELISA) and modified Laser Immunoassay (LIA) methods were used. The crude parasite rates were found to be 28.75% in Assam, India and 32.5% in Taikkyi, Myanmar respectively. *P. falciparum* was predominantly high in both forested-hilly areas. Immunoreactivity and specificity of GPL antigen were compared with those of another previously reported RESA derived synthetic peptide antigen (R1). The diagnostic sensitivity properties of GPL antigen were found cent percent sensitive for *P. falciparum* cases in both areas by LIA method but ELISA with R1 antigen showed a slightly lower level of sensitivity than GPL antigen. The specificity studies of GPL and R1 antigens tested on malarial and non malarial diseases sera were found to be very specific for *P. falciparum* as they did not react with other non malarial diseases sera. LIA method with the application of GPL coated latex beads can be an excellent diagnostic tool for *P. falciparum* infection.

2006

TITLE- 109

Prevalence of malaria in Shwe Zar and Myothagyi villages of Maungdaw Township, Rakhine State, Myanmar

AUTHOR (S) and AFFILIATION:

Maung Maung Mya¹, Khin Saw Aye², Khin Myat Tun³, Pe Than Htun⁴, Han Win⁵, Sein Min⁴ and Yan Naung Maung Maung⁴

¹Parasitology Research Division, DMR (LM); ²Immunology Research Division, DMR (LM); ³DMR (LM); ⁴Medical Entomology Research Division, DMR (LM); ⁵Clinical Research Division, DMR (LM)

SOURCE:

MHRC Programme and Abstract 2006; pp. 8

ABSTRACT:

Shwe Zar and Myothagyi villages of Maungdaw Township, Rakhine State are in border area of Myanmar and Bangladesh. These villages are the coastal area of Bay of Bengal. In May 2004, we studied the prevalence of malaria in these villages. Two hundred and fifty one villagers were recruited from Shwe Zar village and 400 villagers were recruited from Myothagyi village. Diagnosis of malaria was done by examination of stained thick and thin blood films with direct microscopy. The prevalence of malaria in Shwe Zar and Myothagyi villages were found to be 12.75% and 8.5% respectively. In Shwe Zar and Myothagyi villages, *P. falciparum* parasite positivity rates in total malaria positive patients were 81.25% and 79.41%. *P. vivax* parasite positivity rates were 18.75% and 17.65%, gametocyte positive rates were 0.39% and 0.25% and Parasite Density Index (PDI) were 1.9 and 1.79 respectively. Only one mix (*Pf* + *Pv*) infection was found in Myothagyi village. Further detailed study of parasitological, entomological, immunological, and sociological studies should be conducted to know the epidemiological picture of this endemic area.

TITLE-110

P. falciparum sporozoite antibody levels in subjects with malaria from Buthidaung (Myanmar-Bangladesh Border)

AUTHOR (S) and AFFILIATION:

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¹DMR (LM); ²Nuclear Medicine Research Division, DMR (LM); ³National Blood Centre, DMR (LM); ⁴DMR (CM); ⁵VBDC, Sittwe, Rakhine State; ⁶Parasitology Research Division, DMR (LM)

SOURCE:

MHRC Programme and Abstract Poster 2006; pp. 59

ABSTRACT:

Of six priority diseases in Myanmar, malaria tops the ranks. Investigation of malaria problem in border areas is essential for cross-border malaria control activities. We determined the sporozoite antibody levels of 74 subjects (1 to 75 years of age; mean age (SD) 27.77 (15.3) yrs) presenting at a malaria clinic in Buthidaung Township by Enzyme Linked Immunosorbent Assay

(ELISA). Blood film examinations for malaria parasites were also carried out. The mean (SD) antibody levels ranged from 0.24 μ l to 14.4 μ l. No significant difference in sporozoite antibody levels was found between males and females (5.03 μ l vs 4.15 μ l). There were no significant differences in sporozoite antibody positive rates among male and female (38.2% vs 42.1%), and among children and adults (54.5% vs 61.9%). No correlation between sporozoite antibody levels and age was also found. However, a significantly higher sporozoite antibody levels were observed in those with positive malaria blood film as compared to those without (6.4 μ l vs 4.1 μ l; $p < 0.05$, Student's "t" test). A significant difference in the sporozoite antibody positive rate was also found between those with active malaria infection and those without (72% vs 56%; $P = 0.015$, Z-test for proportions). Among those with positive blood film, higher sporozoite antibody positive rate was observed in adults (84.6%) as compared to children (55.6%). The sporozoite antibody positivity and levels could be of some use in assessing the malaria situation in an area.

TITLE- 111

Efficacy and effectiveness of dihydroartemisinin-piperaquine versus artesunate-mefloquine in falciparum malaria: an open-label randomised comparison

AUTHOR (S) and AFFILIATION:

Frank Smithuis, Moe Kyaw Kyaw, Ohn Phe, Khin Zarli Aye, Lhin Htet, Marion Barends, Niklas Lindegardh, Thida Singtoroj, Elizabeth Ashley, Saw Lwin, Kasia Stepniewska, Nicholas J. White

SOURCE:

Lancet 2006; 367: 2075–85

ABSTRACT:

Background: Artemisinin-based combinations are judged the best treatments for multidrug-resistant *Plasmodium falciparum* malaria. Artesunate-mefloquine is widely recommended in Southeast Asia, but its high cost and tolerability profile remain obstacles to widespread deployment. To assess whether dihydroartemisinin-piperaquine is a suitable alternative to artesunate-mefloquine, we compared the safety, tolerability, efficacy, and effectiveness of the two regimens for the treatment of uncomplicated falciparum in western Myanmar (Burma). *Methods:* We did an open randomised comparison of 3-day regimens of artesunate-mefloquine (12/25 mg/kg) versus dihydroartemisinin-piperaquine (6.3/50 mg/kg) for the treatment of children aged 1 year or older and in adults with uncomplicated falciparum malaria in Rakhine State, western Myanmar. Within each group, patients were randomly assigned supervised or non-supervised treatment. The primary endpoint was the PCR-confirmed parasitological failure rate by day 42. Failure rates at day 42 were estimated by Kaplan-Meier survival analysis. This study is registered as an International Standard Randomised Controlled Trial, number ISRCTN27914471. *Findings:* Of 652 patients enrolled, 327 were assigned dihydroartemisinin-piperaquine (156 supervised and 171 not supervised), and 325 artesunate-mefloquine (162 and 163, respectively). 16 patients were lost to follow-up, and one patient died 22

days after receiving dihydroartemisinin-piperaquine. Recrudescence parasitaemias were confirmed in only two patients; the day 42 failure rate was 0.6% (95% CI 0.2–2.5) for dihydroartemisinin-piperaquine and 0 (0–1.2) for artesunate-mefloquine. Whole-blood piperaquine concentrations at day 7 were similar for patients with observed and non-observed dihydroartemisinin-piperaquine treatment. Gametocytaemia developed more frequently in patients who had received dihydroartemisinin-piperaquine than in those on artesunate-mefloquine: day 7, 18 (10%) of 188 versus five (2%) of 218; relative risk 4.2 (1.6–11.0) $p=0.011$. *Interpretation:* Dihydroartemisinin-piperaquine is a highly efficacious and inexpensive treatment of multidrug-resistant falciparum malaria and is well tolerated by all age groups. The effectiveness of the unsupervised treatment, as in the usual context of use, equalled its supervised efficacy, indicating good adherence without supervision. Dihydroartemisinin-piperaquine is a good alternative to artesunate-mefloquine.

2007

TITLE- 112

Parasitological and serological diagnosis of malaria infection in two endemic areas of Kachin State

AUTHOR (S) and AFFILIATION:

Khin Nang Myint

SOURCE:

Thesis Ph.D (Zoology), YU, 2007

ABSTRACT:

The parasitological and serological indices of malaria were determined from the blood films and filter papers taken from the clinically suspected malaria patients of the out-patients departments in Bahmaw and Mansi townships, Kachin State during the study period from December 2003 to October 2006. Three kinds of plasmodium (*P. falciparum*, *P. vivax* and mixed *P. falciparum* and *P. vivax*) were recorded from Bamaw Township and six kinds (*P. falciparum*, *P. vivax*, *P. malariae*, mixed *P. falciparum* and *P. vivax*, mixed *P. falciparum* and *P. malariae* and mixed *P. vivax* and *P. malariae*) were from Mansi Township. The parasite positivity rates, parasite density and gametocyte rates were found to be higher in Mansi than in Bahmaw. However, the ratio of *P. falciparum* and *P. vivax* was recorded to be 6:1 in Bahmaw and 1:1 in Mansi. This indicated that malaria campaign in Mansi, the endemic area has reduced rate of infestation of *P. falciparum*. The high rates of seropositivity level were respectively recorded in 13-45 years age group and 2-12 years age group in both study areas. Regarding sexes, seropositivity rate in female was recorded to be low in both survey townships. The analyzed data were presented with tables and graphs. Suggestions for future work were outlined.

2008

TITLE- 113

Parasitological indices of malaria infection in some villages of Thaton Township, Mon State

AUTHOR (S) and AFFILIATION:

Yee Htwe

SOURCE:

Thesis Ph.D (Chemistry), University of Yangon, 2008

ABSTRACT:

A cross sectional study was carried out to determine the prevalence of malaria in seven villages, namely, Shwechaung, Kyarban, Gaw, Zayitthaung, Alantanya, Aungsaing, and Thayettaw of Thaton Township, Mon State from September 2005 to September 2007. A total of 385 blood samples were collected from subjects and examined for malaria parasite by Giemsa stained and Acridine Orange (AO) stained microscopy and malaria antibody detection by enzyme-linked immunosorbent assay (ELISA) method. Local antigen was prepared from *P. falciparum* *in vitro* culture. Out of 385 subjects 63 (16.4%) were found as malaria positive by Giemsa stained microscopy 76 (19.7%) by AO stained microscopy, and 102 (26.0%) were detected as malaria antibody positive by ELISA method. The predominant species in all the study villages was found to be *P. falciparum* except in Shwechaung. Species of *P. malariae* and *P. ovale* were not detected. The parasite positivity rates were presented in village-wise, species-wise and age-wise. The advantages and disadvantages of each method were also discussed. There was no association between the serum antibody level and parasiteaemia. The highest parasite positivity rates (revealed by Giemsa and AO) and the highest sero-positivity rates (by ELISA) were found in Alantaya village. These indices suggested priority in malaria control should be given to the Alantaya village. The combined interpretation of the parasite positivity rate and sero-positivity rate filled the lacking gaps and reflect more informative picture of the malaria situation in the study area, contributing valuable information to the health administrators and decision makers.

TITLE- 114

Sensitivity and specificity of Parasite Lactate Dehydrogenase (pLDH)-Based Rapid Diagnostic Test (SD Bioline Malaria Antigen Test) in comparison with parasite density

AUTHOR (S) and AFFILIATION:

Khin Myo Aye

SOURCE:

Thesis M.Med.Sc. (Microbiology), UM (1), 2008

ABSTRACT:

A cross-sectional hospital-based study on 103 clinically suspected malaria patients attending the outpatient clinics of Thanbyuzayat Township Hospital, Mon State who were tested with malaria microscopy and parasite lactate dehydrogenase (pLDH) based rapid diagnostic test strips (RDTs) (SD Bioline Malaria Antigen test) during 2008. The results were blinded to each procedure. The blood film results, as the gold standard, indicated that 84 (81.55%) patients were malaria parasite positive and 19 (18.45%) were malaria negative. When compared with RDT result, 42 cases diagnosed as *P. falciparum* were diagnosed by microscopy as 35 cases of *P. falciparum*, 2 cases of *P. malariae*, one case of *P. falciparum* and *P. malariae* 4 cases of *P. falciparum* and *P. vivax*. The 41 patients diagnosed as non *P. falciparum* (*Plasmodium* species other than *P. falciparum*) by RDT were diagnosed by microscopy as 39 cases of *P. vivax* and 2 cases of *P. falciparum* and 2 cases of *P. vivax*. The 20 cases diagnosed as negative by RDT comprised of 19 negative and 1 as *P. vivax* by microscopy. One patient that was diagnosed as *P. vivax* by microscopy was not detected by pLDH based RDT. The sensitivity was 100% and 97%, specificity was 90% and 96%, positive predictive value was 83% and 95% and negative predictive value was 100% and 98% for *P. falciparum* and non *P. falciparum* respectively. The lowest parasitaemia detected by SD Bioline Malaria Antigen test was 109.5 parasites/ μ l for *P. falciparum* and 160 parasites/ μ l for *P. vivax*. The dipstick was unable to distinguish *P. vivax* or *P. malariae* in the presence of *P. falciparum* because of cross-reactivity in the pan specific band. So, accurate species identification in mixed infections remains a problem in malaria diagnosis. The minimum and maximum parasite densities in score 1, 2 and 3 were 160 parasites/ μ l and 7685.8 parasites/ μ l, 2601.1 parasites/ μ l and 13182.2 parasites / μ l and 6031.1 parasites / μ l and 49304.1 parasites/ μ l respectively. The differences in mean parasitemia between faint score 1 and intermediate score 2, intermediate score 2 and strong score 3 were significant for *P. falciparum* ($P = 0.0005$ and $P = 0.0005$ respectively) and band intensity and parasite density of *P. falciparum* was ($R = 0.66$, $P = 0.01$) and non *P. falciparum* was ($R = 0.61$, $P = 0.01$). In this study, band intensity was significantly related to parasite density and the differences between mean parasite count was significant between faint and intermediate, intermediate and strong, it can generally estimate the parasite count especially for determinate of hyperparasitemia in *P. falciparum* malaria infection and it can be used in the field for screening of malaria parasite for preparation of quality control sample.

TITLE- 115

Pfprt T76 and *Pfmdr1* Y86 mutations and their relation to *in vitro* sensitivity Of Mefloquine

AUTHOR (S) and AFFILIATION:

Ye Htut, Kay Thwe Han, Kyin Hla Aye, Myat Phone Kyaw, Ni Ni and Nay Chi Aung San
DMR (LM)

SOURCE:

MHRC Programme and Abstract 2008; pp. 4

ABSTRACT:

Artemisinin-based Combination Therapy (ACT) has been employed in Myanmar since 2002. Artesunate-mefloquine combination is the first line treatment for falciparum malaria. It is not possible to evaluate the therapeutic efficacy of mefloquine alone because of the masking effect of highly efficacious partner drug, artemisinin derivative, upon mefloquine so that the applicability of molecular markers are being investigated. Fifty one *P. falciparum* isolates from Kawthaung, Butheedaung, and Tarchileik were tested by molecular assays and *in-vitro* drug sensitivity test. Mean EC₅₀ of mefloquine was 600.31nmol/lit (95% CI471.99-763.52). Prevalence rates of *pfprt* T76 mutation and *pfmdr1* Y86 mutation were 78.43% (40/51) and 9.8% (5/51) respectively. Eighty percent of isolates harboring *pfmdr1* Y86 mutation were found mefloquine sensitive and 41% of isolates harboring wild type *pfmdr 1* N86 were found resistant. Among *pfprt* mutant isolates, 32.5% was observed as mefloquine resistant. There was negative correlation between *pfmdr1* alleles and minimum inhibitory concentration (MIC) of mefloquine (Spearman's rho = -0.173, *P* = 0.022). A weak correlation was noted between *pfprt* 76 alleles and MIC of mefloquine (Spearman's rho = 0.06, *P* = 0.675). The findings indicated that *pfmdr1* Y 86 mutation was linked with increased mefloquine sensitivity and it could be used as a molecular marker for monitoring mefloquine sensitivity in the country where ACT is practiced.

TITLE- 116

A study on usefulness of Rapid Diagnostic Test (Paracheck *Pf*) for malaria diagnosis in children

AUTHOR (S) and AFFILIATION:

Win Thandar Shwe, UM (2)

SOURCE:

MHRC Programme and Abstract 2008; pp. 8

ABSTRACT:

A hospital based cross-sectional descriptive study was conducted at North Okkalapa General Hospital, Thingangyun Sanpya General Hospital, and Hmawbi Township Hospital. To find out the positive test results of rapid diagnostic test among children with clinically suspected malaria (CSM), to assess the validity of rapid diagnostic test, and to determine the predictive value of rapid diagnostic test. A total of 155 children aged 12 years and below admitted to the above hospitals with clinically suspected malaria were

included. It was observed that 34.2% of clinically suspected malaria cases were Paracheck *Pf* positive and 38.7% of CSM cases were blood for MP positive. By using microscopy as gold standard, sensitivity of Paracheck *Pf* test was 92.45% and specificity was 95.79%. The positive predictive value of the test was 92.45% and negative predictive value was 95.79%. Because of high sensitivity and specificity of the test, it was concluded that Paracheck *Pf* was useful for diagnosis of falciparum malaria in children in whom clinical features of acute attack of malaria are rare and symptoms overlap with other illness.

TITLE- 117

Sensitivity and specificity of Parasite Lactate Dehydrogenase (pLDH) - Based Rapid Diagnostic Test

AUTHOR (S) and AFFILIATION:

Khin Myo Aye¹, Myat Phone Kyaw¹, Thuzar Han², Tin Oo³, Tin Oo¹, Kyin Hla Aye¹, Cho Cho Win³ and Cho Cho¹

¹DMR (LM); ²UM (1), ³Thanbyuzayat Hospital, DOH

SOURCE:

MHRC Programme and Abstract 2008; pp. 11

ABSTRACT:

Rampant drug resistance places an increasing importance on the accuracy of malaria diagnosis. Giemsa microscopy (gold standard) and rapid diagnostic tests (RDTs) have the largest impact on malaria control today. One hundred and three clinically suspected malaria patients attending the outpatient clinics of Thanbyuzayat Township Hospital, Mon State were tested (during 2008 January to February) (cross-sectional hospital-based study). The blood film results indicated that 84 (81.55%) patients were infected with malaria and 19 (18.45%) were malaria negative. All slides were examined independently (researcher and experienced microscopist) and were blinded to the RDT results and mixed infections were excluded from this study. Among them, 35 cases were infected with *P. falciparum*, 40 cases with *P. vivax*, 2 cases with *P. malariae* and 7 cases with mixed infections. The sensitivity was 100% and 97%, specificity was 90% and 96%, positive predictive value was 83% and 95% and negative predictive value was 100% and 98% (Kappa = 0.86 and 0.94, 95% CI = 75 to 96 and 87 to 100) for *P. falciparum* and non *P. falciparum* respectively. The two slides that showed *P. malariae* were detected by RDT as *P. falciparum* positive. The dipstick was unable to detect *P. vivax* or *P. malariae* in the presence of *P. falciparum* because of cross-reactivity in the pan-specific band. The pLDH based RDTs can be used for diagnosis of *P. falciparum* malaria and non *P. falciparum* malaria but accurate species identification in mixed infections remains a problem in malaria diagnosis.

TITLE-118

Molecular assay and *in vitro* susceptibility test for monitoring chloroquine resistant falciparum malaria in the era of artemisinin-based combination therapy

AUTHOR (S) and AFFILIATION:

Kay Thwe Han¹, Ye Htut¹, Wah Win Htike² and Kyin Hla Aye¹
¹DMR (LM); ²UM (I)

SOURCE:

MHRC Programme and Abstract, 2008; pp. 12

ABSTRACT:

Drug resistance is the major obstacle for successful control of malaria. New drug policy switching from monodrug therapy to ACT (artemisinin-based combination therapy) for management of malaria has been adopted since 2002. Monitoring of individual antimalarial drug sensitivity is a challenge in the era of ACT. This study was aimed to explore the applicability of molecular markers for detection of chloroquine resistant falciparum malaria. A total of 48 *P. falciparum* isolates collected from Vector Borne Diseases Control Unit, Yangon, during 2007-8 were included in the study. *In-vitro* drug susceptibility to CQ was assessed according to WHO method (1995). PCR followed by restriction fragment length polymorphism was applied to detect *pfmdr1* Y86 and *pfcr1* T76 mutations. Eight-three percent of isolates were found CQ resistant. Prevalence rate of *pfmdr1* Y86 mutation and *pfcr1* T76 mutation were 6.2% and 72.9% respectively. It was found that *pfcr1* 76 polymorphism was significantly associated with CQ sensitivity status ($P = 0.045$) and positively correlated with MIC (minimum inhibitory concentration) of CQ (Spearman's $\rho = 0.318$, $P = 0.028$). Lack of association between *pfmdr1* Y86 mutation and *in-vitro* sensitivity status was noted. Risk estimation revealed that isolates harboring *pfcr1* T76 mutation were 10 times more risky to be CQ resistant (Odds ratio = 10.33, $P = 0.005$). The study could provide the evidence on the applicability of *pfcr1* T76 in monitoring of CQ resistant falciparum malaria as a molecular marker.

2009

TITLE- 119

Pfmdr1 N86 alleles and *in-vitro* dihydroartemisinin sensitivity status of *P. falciparum* in Kawthaung and Butheedaung

AUTHOR (S) and AFFILIATION:

Kay Thwe Han, Ye Htut and Kyin Hla Aye
DMR (LM)

SOURCE:

MHRC Programme and Abstract 2009; pp. 11

ABSTRACT:

Contributory role of *pfmdr1* gene on sensitivity status of some antimalarials has been widely studied. To find out the relationship between *pfmdr1* 86 polymorphism and dihydroartemisinin sensitivity *in vitro*, 20 *P. falciparum* isolates from Kawthaung and 25 isolates from Butheedaung were investigated. *In vitro* drug susceptibility tests were conducted according to WHO (2000). Geometric mean EC90s (effective concentration 90%) of dihydroartemisinin were found to be 255.56 nM in Kawthaung and 131.08nM in Butheedaung. Resistant rate of dihydroartemisinin was found to be 15% (3/20 isolates) in Kawthaung and 12% (3/25 isolates) in Butheedaung respectively. PCR/RFLP revealed that prevalence of *pfmdr1* Y86 (mutant type) were 10% and 24% in Kawthaung and Butheedaung respectively. Among isolates harboring *pfmdr1* Y86 (mutant) allele, 85.7% were dihydroartemisinin sensitive. Geometric mean EC90 of dihydroartemisinin was found to be lower in isolates carrying mutant *pfmdr1* Y86 than wild type isolates. The findings of this study highlighted the enhancing role of *pfmdr1* Y86 mutation in increasing dihydroartemisinin sensitivity *in vitro*.

TITLE- 120

Glucose-6-Phosphate Dehydrogenase enzyme deficiency in Kayah and Rakhine States

AUTHOR (S) and AFFILIATION

*Nwe Nwe Oo, Myat Phone Kyaw, Ye Htut, Ni Ni Zaw and Phyto Zaw Aung
DMR (LM)*

SOURCE:

MHRC Programme and Abstract 2010; pp. 36

ABSTRACT:

The aim of the study was to detect Glucose-6-Phosphate Dehydrogenase (G6PD) enzyme deficiency in healthy male and female subjects in Kayah and Rakhine States. In male subjects, G6PD enzyme deficiency was detected by a qualitative test, Methaemoglobin reduction test (Brewer's test) and followed by, a semi quantitative test agarose gel electrophoresis. For detection of enzyme deficiency in female subjects, the cytochemical staining method of Cornelis, Van-Nooder and Vogels (1985) was used. It is a method for staining G6PD activity in individual erythrocyte. The study was done in subjects who lived in Demowsoe of Kayah state and Sittwe of Rakhine State during the period of April and May 2010. In Kayah State out of 152 male subjects 1.3% (n = 2) was mild deficient and no severely deficient persons was detected. In 252 female subjects 0.44% (n = 1) was mild deficient and 1.98% (n = 5) was severely deficient. In Rakhine State 151 male subjects were recruited and out of these patients 3.97% (n = 6) were mild deficient and in 250 female subjects 0.8% (n = 2) were mild deficient. The subject with severe enzyme deficiency was not found. In treatment of malaria infection the antimalaria drug, primaquine can cause haemolysis in G6PD enzyme deficient patients. The finding of this study may be useful in primaquine treatment of hypnozoite stage in *Plasmodium vivax* and gametocyte stage in *P. falciparum* infection.

TITLE- 121

Early screening of G6PD deficiency among the healthy children living in malaria area at Bogalay Township, Ayeyawady Division

AUTHOR (S) and AFFILIATION:

*Moh Moh Htun, Kyaw Soe, Min Min Myint Thu, Myat Mon Oo, Hein Sithu Aung, Hnin Nu Htwe, Mya Thandar Win, Kay Thwe Win and Ohnmar
DMR (LM)*

SOURCE:

MHRC Programme and Abstract 2009; pp. 71

ABSTRACT:

Glucose-6-phosphate dehydrogenase (G6PD) deficiency is the commonest enzyme-deficiency disease in the world. Approximately 200 million people are affected worldwide. The X linked inherited disorder is caused by mutations in the terminal region of long arm of the X chromosome (Xq 28) and commonly affects the people of Africa, Asia, and the Mediterranean. G6PD is an enzyme in the pentose phosphate pathway (metabolic pathway) that reduces energy to cells (erythrocytes) by maintaining the level of co-enzyme nicotinamide adenine dinucleotide phosphate (NADPH). The aim of

this study was to find out the G6PD deficiency and malaria infection in one hundred healthy children (53 male and 47 female) within the age of 5-12 years who were living in a post-Nargis cyclone area at Bogalay Township, Ayeyawady Division. Positive test for G6PD deficiency was detected in 9 subjects (9%) of 100 children (8 male and one female) by Cogent test kit (Span Diagnostics Ltd). *P. falciparum* parasite (MP) was detected in 13 children (13%) including 9 male and 4 female by thick and thin blood film examination. The mean hemoglobin (Hb) of G6PD negative children was 10.94 g/dl and G6PD positive children had 11.17 g/dl in this study. The mean Hb value of MP positive subjects had 10.89g/dl and MP negative subjects had 10.97 g/dl. The overall mean Hb was 11.01 g/dl in males and 11.09 g/dl in females. Prevalence of G6PD deficiency in healthy children living in malaria area was 9% in this study. In the present study, G6PD deficient children had a higher value of mean haemoglobin concentration (11.17 g/dl) than those of the negative children (10.94 g/dl) and overall healthy children (11.01 g/dl). These children had absence of haemolytic anaemia picture in blood film examination. MP was found to be negative in G6PD deficient children who were living in malaria areas for a long time. Plasmodium parasite did not survive well in G6PD- deficient red cells in a previous research study. G6PD deficiency can cause haemolytic anaemia usually after exposure to certain drugs, fava beans and infections.

TITLE- 122

High frequency of genetic diversity of *Plasmodium vivax* field isolates in Myanmar

AUTHOR (S) and AFFILIATION:

Sung Ung Moon¹, Lee HW¹, Jung Yeon Kim¹, Byoung Kuk Na¹, Shin Hyeong Cho¹, Khin Lin², Woon Mok Sohn¹, Tong Soo Kim¹

¹Division of Malaria and Parasitic Diseases, National Institute of Health, Korea Centers for Disease Control and Prevention, Seoul 122-701, Republic of Korea. ²Vector Borne Diseases Control Project, Department of Health, Myanmar

SOURCE:

Acta Trop. 2009 Jan; 109(1):30-6. doi: 10.1016/j.actatropica.2008.09.006.

ABSTRACT:

Malaria is one of the most serious problems threatening human health in Myanmar. Although the morbidity and mortality rates due to malaria have been gradually declining, Myanmar still contributes to a large proportion of malarial death in the South-East Asia region. However, little is known about the nature and extent of genetic diversity of the malarial parasites circulating in Myanmar. In this study, we investigated the overall infection status of Plasmodium and the population diversity of *Plasmodium vivax* by analyzing three genetic markers, circumsporozoite protein (CSP), merozoite surface protein-1 (MSP-1), and merozoite surface protein-3 (MSP-3alpha), of *P. vivax* field isolates collected from infected individuals. In 349 blood samples collected from the individuals who exhibited clinical symptoms associated with malaria, 63.0% showed a positive result for malaria (220/349). *P. vivax* was detected in 58.2% (128/220) and *Plasmodium falciparum* was detected

in 29.1% (64/220). Mixed infections with both parasites were detected in 12.7% (28/220). The 116 blood samples in which single infection of *P. vivax* was confirmed were selected and subjected to further genetic analysis. Genotyping of the CSP gene of *P. vivax* showed that VK210 type (98.3%, 114/116) is predominant in Myanmar, but a significant level of mixed infections of VK210 and VK247 types (24.1%, 28/116) was also identified. Sequence analyses of MSP-1 and MSP-3alpha genes revealed a large number of distinguishable alleles: 12 for MSP-1 and 25 for MSP-3alpha. These results collectively suggest that the *P. vivax* population in Myanmar is highly diverse and multiple clonal infections are prevalent in the country.

2010

TITLE- 123

Association of *Pvmdr1* Y976f mutation and *in vitro* chloroquine sensitivity of *Plasmodium vivax* in Kawthaung

AUTHOR (S) and AFFILIATION:

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SOURCE:

The MHSRJ 2010; 22(3), pp. 131-136

ABSTRACT:

Plasmodium vivax is prevalent throughout tropics accounting for 25-40% of global malaria burden. Chloroquine (CQ) is the first-line treatment though chloroquine-resistant *Plasmodium vivax* had been reported since 1989. Vivax malaria has long been considered as benign but some recent reports on complicated and fatal forms of vivax malaria draw a great attention to monitor emergence of drug resistance in *Plasmodium vivax*. To find out *in vitro* CQ status and its association with polymorphism of *Pvmdr1* gene of *P. vivax*, a total of 26 *P. vivax* isolates from Kawthaung District were investigated during transmission season of 2009. Polymerase chain reaction could detect *Pvmdr1* Y976F mutation in 30.8% of isolates. Mean effective concentrations 90 (EC90) of CQ was noted as 307.18 nM (95% CI, 162.46-580.84). Mean EC90 of CQ among isolates carrying *Pvmdr1* Y976F was higher than that of wild types (444.14 nM vs. 281.87 nM). Minimum inhibitory concentration (MIC) of CQ and number of isolates harboring *Pvmdr1* Y976F mutation were found to be directly associated (R² = 0.457). The findings of the study could report applicability of molecular tool in relation to *in vitro* test for monitoring of CQ-resistant vivax malaria.

TITLE: 124

Mutations in the antifolate-resistance-associated genes dihydrofolate reductase and dihydropteroate synthase in *plasmodium vivax* isolates from malaria-endemic countries

AUTHORS AND AFFILIATION:

Feng Lu¹, Chae Seung Lim², Deok Hwa Nam³, Kwonkee Kim⁴, Khin Lin⁵, Tong Soo Kim⁶, Hyeong Woo Lee⁷, Jun Hu Chen⁸, Yue Wang⁸, Jetsumon Sattabongkot⁹ and Eun Taek Han⁹

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SOURCE:

Am. J. Trop. Med. Hyg., 83(3), 2010, pp. 474–479
doi:10.4269/ajtmh.2010.10-0004

ABSTRACT:

Parasite dihydrofolate reductase (DHFR) and dihydropteroate synthase (DHPS) are known target enzymes of antifolate drugs used for the treatment and prophylaxis of persons with malaria. We sequenced the *Plasmodium vivax* dihydrofolate reductase (*pvdhfr*) and dihydropteroate synthase (*pvdhps*) genes to examine the prevalence and extent of point mutations in isolates from malaria-endemic countries. Double mutations (S58R and S117N) or quadruple mutations (F57L/I, S58R, T61M, and S117T) in the *pvdhfr* gene were found in isolates from Thailand (96.4%) and Myanmar (71.4%), but in only one isolate (1.0%) from Korea, where sulfadoxine-pyrimethamine has never been used. The *pvdhfr* point mutations correlated strongly with the *pvdhps* point mutations and ranged from single to triple mutations (S382A, A383G, and A553G), among isolates from Thailand, Myanmar, and Korea. These findings suggest that the prevalence of mutations in *pvdhfr* and *pvdhps* in *P. vivax* isolates from different malaria-endemic countries is associated with selection pressure imposed by sulfadoxine-pyrimethamine.

TITLE: 125

Genetic polymorphism and effect of natural selection at domain I of apical membrane antigen-1 (AMA-1) in *Plasmodium vivax* isolates from Myanmar

AUTHOR (S) AND AFFILIATION:

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SOURCE:

Acta Trop 2010, 114:71-75. doi: 10.1016/j.actatropica.2010.01.006

ABSTRACT:

Malaria is endemic or hypoendemic in Myanmar and the country still contributes to the high level of malaria deaths in South-east Asia. Although information on the nature and extent of population diversity within malaria parasites in the country is essential not only for understanding the epidemic situation but also to establish a proper control strategy, very little data is currently available on the extent of genetic polymorphisms of the malaria parasites in Myanmar. In this study, we analyzed the genetic polymorphism and natural selection at domain I of the apical membrane antigen-1 (AMA-1) among *Plasmodium vivax* Myanmar isolates. A total of 34 distinguishable haplotypes were identified among the 76 isolates sequenced. Comparison with the previously available PvAMA-1 sequences in the Gen Bank database revealed that 21 of them were new haplotypes that have never been reported till date. The difference between the rate of nonsynonymous (dN) and synonymous (dS) mutations was positive (dN-dS, 0.013+/-0.005), suggesting the domain I is under positive natural selection. The Tajima's D statistics was found to be -0.74652, suggesting that the gene has evolved under population size expansion and/or positive selection. The minimum recombination events were also high, indicating that recombination may occur within the domain I resulting in allelic diversity of PvAMA-1. Our results collectively suggest that PvAMA-1 displays high genetic polymorphism among Myanmar *P. vivax* isolates with highly diversifying selection at domain I. These results have significant implications in understanding the nature of *P. vivax* population circulating in Myanmar as well as providing useful information for malaria vaccine development based on this antigen.

TITLE: 126

Genetic polymorphism of merozoite surface protein-1 and merozoite surface protein-2 in *Plasmodium falciparum* field isolates from Myanmar

AUTHOR(S) AND AFFILIATION:

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SOURCE:

Malaria Journal 2010, 9:131

<http://www.malariajournal.com/content/9/1/131>

ABSTRACT:

Background: Merozoite surface protein-1 (MSP-1) and MSP-2 of *Plasmodium falciparum* are potential vaccine candidate antigens for malaria vaccine development. However, extensive genetic polymorphism of the antigens in field isolates of *P. falciparum* represents a major obstacle for the development of an effective vaccine. In this study, genetic polymorphism of MSP-1 and MSP-2 among *P. falciparum* field isolates from Myanmar was analyzed. *Methods:* A total of 63 *P. falciparum* infected blood samples, which were collected from patients attending a regional hospital in Mandalay Division, Myanmar, were used in this study. The regions flanking the highly polymorphic characters, block 2 for MSP-1 and block 3 for MSP-2, were genotyped by allele-specific nested-PCR to analyze the population diversity of the parasite. Sequence analysis of the polymorphic regions of MSP-1 and MSP-2 was also conducted to identify allelic diversity in the parasite population. *Results:* Diverse allelic polymorphism of MSP-1 and MSP-2 was identified in *P. falciparum* isolates from Myanmar and most of the infections were determined to be mixed infections. Sequence analysis of MSP-1 block 2 revealed that 14 different alleles for MSP-1 (5 for K1 type and 9 for MAD20 type) were identified. For MSP-2 block 3, a total of 22 alleles (7 for FC27 type and 15 for 3D7 type) were identified. *Conclusion:* Extensive genetic polymorphism with diverse allele types was identified in MSP-1 and MSP-2 in *P. falciparum* field isolates from Myanmar. A high level of mixed infections was also observed, as was a high degree of multiplicity of infection.

TITLE: 127

Prevalence of *Plasmodium vivax* VK210 and VK247 subtype in Myanmar

AUTHOR (S) AND AFFILIATION:

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¹Division of Malaria and Parasitic diseases, Korea Centers for Disease Control and Prevention, Seoul 122-701, Republic of Korea, ²Vector Borne Diseases Control Project, Department of Health

SOURCE:

Malar J. 2010 Jul 9; 9: 195. doi: 10.1186/1475-2875-9-195.

ABSTRACT:

Background: *Plasmodium vivax* is divided into two subtypes, a dominant form, VK210 and a variant form, VK247. This division is dependent on the amino acid composition of the circumsporozoite (CS) protein. In this study, the prevalence of the VK247 variant form of *P. vivax* was investigated in Myanmar. *Methods:* The existence of malaria parasites in blood samples was determined by microscopic examination, polymerase chain reaction (PCR) and DNA hybridization assays. To test for antibodies against *P. vivax* and *Plasmodium falciparum* in blood samples, an indirect immunofluorescence antibody test (IFAT) was performed using asexual blood antigens. An enzyme-linked immunosorbent assay with synthetic VK210 and VK247 antigens was carried out to discriminate between the *P. vivax* subtypes. *Results:* By thick smear examination, 73 (n=100) patients were single infected with *P. vivax*, one with *P. falciparum* and 13 with both species. By thin smear, 53 patients were single infected with *P. vivax*, eight with only *P. falciparum* and 16 with both. Most of the collected blood samples were shown to be *P. vivax* positive (n=95) by PCR. All cases that were positive for *P. falciparum* by PCR (n=43) were also positive for *P. vivax*. However, 52 cases were single infected with *P. vivax*. IFAT showed antibody titres from 1:32 to 1:4,096. Additionally, using specific antibodies for VK210 and VK247, ELISA showed that 12 patients had antibodies for only the VK210 subtype, 4 patients had only VK247 subtype antibodies and 21 patients had antibodies for both subtypes. Using a DNA hybridization test, 47 patients were infected with the VK210 type, one patient was infected with VK247 and 23 patients were infected with both subtypes. *Conclusions:* The proportion of the VK247 subtype in Myanmar was 43.1% (n=25) among 58 positive cases by serodiagnosis and 25.6% (n=24) among 94 positive cases by genetic diagnosis. In both diagnostic methods, the infection status of malaria patients is highly diverse with respect to malaria species, and multiple clonal infections are prevalent in Myanmar. Therefore, the complexity of the infection should be considered carefully when diagnosing malaria in Myanmar.

TITLE- 128

Role of HRP2 and Pan pLDH Based Immunochromatographic Assay in therapeutic monitoring of uncomplicated falciparum malaria in Myanmar

AUTHOR (S) and AFFILIATION:

Myat Htut Nyunt

SOURCE:

Thesis M.Med.Sc (Microbiology), UM 1, 2010

ABSTRACT:

A prospective longitudinal evaluation of Histidine rich protein 2 (HRP2) and pan parasite lactate dehydrogenase enzyme (pan pLDH) based immunochromatographic assay (SD[®] Bioline, 05FK60) was done in uncomplicated falciparum malaria cases in Myawaddy, Myanmar-Thai border area in Myanmar in 2010. It was accompanied with the study on efficacy and safety of artemether-lumefantrine combination for the treatment of uncomplicated *P. falciparum* malaria in Myanmar. A total of 844 patients were screened by microscopy and malaria parasites were detected in 346 slides (40.9%). The 63.2% (219 cases) of the microscopy positive cases were *Plasmodium vivax*, 29.4% (102 cases) were *P. falciparum* and 7.2% (25 cases) were mixed infection. The *P. falciparum* mono infection cases that met the selection criteria were recruited to the study and direct observed treatment with artemether-lumefantrine combination. The participants were monitored for a period of 28 days according to the scheduled visits. The HRP2 and pLDH based assay was tested for the accuracy, persistence of the two antigens, the duration required to become negative result after treatment, false positive, usefulness of the test to monitor the treatment response and ability to detect the treatment failure of the combined HRP2 and pan pLDH based assay, on day 0 and subsequent scheduled follow up visits i.e. day 3, day 7, day 14, day 21, day 28 and day of failure. The HRP2 was observed high sensitivity (100%) in initial as well as all of the follow up days although its specificity was low. The pan pLDH based assay was more specific than HRP2 but not much sensitive as HRP2. The sensitivity of the pan pLDH was significantly increased if gametocyte was considered positive for malaria parasite in adequate clinical and parasitological response cases (ACPR) (P<0.0001). Among the 63 ACPR cases, 60.32% were still positive for HRP2 based test while no continuous false positive case of pan pLDH based test was detected. On day 3 onwards, no cases of pan pLDH false positive was observed in non gametocyte carrying cases.

There were 12 late parasitological failure cases in which one was detected as falciparum mono-infection, 3 cases of mixed infection and 8 cases of vivax infection. All of the treatment failure cases were detected by the pan pLDH based assay test except in one case of low level parasitaemia of *P. vivax* on day 28. Moreover, the pan pLDH assay could not differentiate the mixed infection from *P. falciparum* mono-infection. The HRP2 based assay also detected the reappearance of *P. falciparum* parasite but it could not differentiate between the persistence antigens of resolving infection from new antigen of the re-emerged parasite. Moreover, HRP2 could not detect the appearance of *P. vivax* on follow up period. However, continuous

decreasing of the band intensity of the HRP2 indicated the resolving infection although being equal band intensity could not exclude the ACPR. The mean duration required to become negative result of HRP2 in uncomplicated falciparum malaria patient was 20 days and that of pan pLDH was 6 days with or without gametocyte and 3.7 days without gametocyte. Therefore, reassessment for treatment response can be tested by pan pLDH based assay after day 3 if the gametocidal drug had been administered and after day 7 if the presence of gametocyte was not excluded. If the band intensity was recorded, decreasing the band intensity of pan pLDH on and after day 3 indicated the resolving infection.

Long term persistence of the HRP2 and pan pLDH was correlated with the initial parasite count in ACPR cases. Initial parasite count was also correlated with the persistence of higher band intensity of HRP2 but not in pan pLDH. The persistence of the HRP2 caused high false positive after successful treatment. More than half of the cases showed false positive on day 28. The result of pan pLDH caused low false positive and was comparable with the microscopy. Both assays rarely caused false negative in this study. However, more than 30% of cases resulted in HRP2 positive although there was no sexual or asexual parasite on microscopy. The gametocyte carrying cases showed the positive result of pan pLDH on follow up visits. The pan pLDH based assay was a suitable test to monitor the treatment response of uncomplicated falciparum malaria patient.

2011

TITLE- 129

Field evaluation of HRP2 and Pan pLDH based Immunochromatographic Assay in therapeutic monitoring of uncomplicated falciparum malaria

AUTHOR (S) and AFFILIATION:

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¹DMR (LM); ²UM (1); ³Myawaddy District Health Department, DOH

SOURCE:

M HRC, Programme and Abstract, 2011; pp. 39

ABSTRACT:

A longitudinal field evaluation of Histidine rich protein 2 (HRP2) and pan parasite lactate dehydrogenase (pan pLDH) based immuno-chromatographic rapid test was done in 77 uncomplicated *P. falciparum* cases in Myawaddy, Myanmar-Thai border area in 2010. The patients received direct observed treatment with artemether-lumefantrine. The HRP2 and pLDH based assay and blood film examination were done on day 0 and subsequent scheduled follow up i.e. day 3, 7, 14, 21, 28 and day of failure for the accuracy, persistence of the antigens and, usefulness of the test for treatment response and detection of treatment failure. The HRP2 was observed higher sensitivity while the pan pLDH was more specific. Among the 63 adequate clinical and parasitological response cases, 60.3% were still positive for

HRP2 up to day 28. Eleven out of 12 parasite reappearing cases (91.6%) were detected by the pan pLDH. The mean duration required to become negative result of HRP2 was 20 days and that of pan pLDH was six days with or without gametocyte and 3.7 days without gametocyte. Therefore, reassessment for treatment response can be tested by pan pLDH based assay after day 3 if the gametocidal drug had been administered and after day 7 if the presence of gametocyte was not excluded. If the band intensity was recorded, decreasing the band intensity of the pan pLDH on and after day 3 indicated the resolving infection. Therefore, the pan pLDH based assay was a suitable test to monitor the treatment response of uncomplicated falciparum malaria patient.

TITLE- 130

Study on malaria antibody prevalence to *P. falciparum* and *Plasmodium vivax* infections in endemic areas of Mandalay Region

AUTHOR (S) and AFFILIATION

Khin Lin, Moe Kyaw Myint and Kyaw Zin Thant
DMR (UM)

SOURCE:

MHRC Programme and Abstract 2011; pp. 3-4

ABSTRACT:

Malaria is regarded as the top ranking health problem in Myanmar and nearly 60% of the population resides in malaria risk areas. A study was done in rural malaria endemic areas of Mandalay Region (Pyin Oo Lwin, Pa Thein Gyi and Madaya Townships) in February 2007 to assess the level and extent of malaria antibody to *P. falciparum* and *P. vivax* infections using Giemsa stained thick and thin film microscopic examination as well as IFAT (Immuno-Fluorescence Antibody Test) using asexual stage malaria antigens. The objective of the study was to assess parasite positive rate as well as antibody prevalence using different methods. Among 112 clinically suspected malaria patients examined in the study, 40 were positive by thick film microscopy (falciparum 26, vivax 14), while 47 were positive by thin film microscopy (falciparum 19, vivax 23 and both species in 5 patients). Testing with IFAT revealed that IgG antibody for falciparum was detected in 84(75%) patients and IgG antibody for vivax in 53(47.3%) patients. Thus, the study showed that microscopic examination is useful for diagnosis of recent malaria infections, while IFAT is more sensitive to assess malaria antibody prevalence in determining malaria transmission in endemic areas of Myanmar.

TITLE- 131

In vitro susceptibility status of *P. falciparum* to antimalarial drugs and prevalence of its *Pfmdr1* 86 polymorphism in Kawthaung

AUTHOR (S) and AFFILIATION:

Kay Thwe Han, Kyin Hla Aye, Myat Phone Kyaw and Ye Htut
DMR (LM)

SOURCE:

MHRC Programme and Abstract 2011; pp. 42-43

ABSTRACT:

Emergence of drug resistance in *P. falciparum* is a serious public health problem. To monitor the antimalarial sensitivity status and prevalence of *pfmdr1* 86 polymorphism of *P. falciparum* in Kawthaung, venous blood samples were of 25 uncomplicated falciparum malaria patients were collected during malaria transmission of 2011. *In vitro* drug susceptibility tests were conducted according to WHO guide lines (2000) and *pfmdr1* 86 polymorphism was detected by PCR/RFLP (polymerase chain reaction followed by restriction fragment length polymorphism) method. Geometric mean of effective concentration (EC50) was 13.41 nmol/l in artesunate (AS), 42.86 nmol/l in amodiaquine (AMQ) and 2193.7 nmol/l in chloroquine (CQ). Resistance rate was 40% in AS and cent per cent in both CQ and AMQ. Prevalence rate of wild type *pfmdr1* 86Asn was 64% (n=16) and multiclonal infection (carrying both wild and mutant types) was detected in 36% (n = 9). Among AS resistant isolates, 60% carried *pfmdr1* 86 Asn (wild type). *In vitro* resistance rate of AS and prevalence of *pfmdr1* 86NY multiclonal infection were found increased in compare to the findings of 2005-2006.

SECTION-3 PHARMACOKINETICS AND TRADITIONAL MEDICINE

2001

TITLE- 132

Antimalarial activity of selected Myanmar medicinal plants: A profile of *Aristolochia tagala* (Nga-Phone-Say) as a natural drug resource

AUTHOR (S) and AFFILIATION:

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³Research and Development, DTM; ⁴Chemistry Department, YU

SOURCE:

MHRC Programme and Abstract 2001: p 28

ABSTRACT:

Eleven plant specimens which are traditionally reputed to cure malaria were investigated for their antimalarial activity by standard *in vitro* and *in vivo* techniques to reveal the true efficacy of these plants chemical characterization of the most promising plant extract, resulted from the screening, was to be carried out to explore the useful basic information on the antimalarial chemical skeleton. A total of 44 extracts obtained by extracting 11 plant specimens with various solvents of different polarities were subjected to *in vitro* and *in vivo* experiments. Of the 44 extracts of 11 plant specimens, petroleum ether and alcohol extracts of *Artemisia annua* (Qinghao), chloroform extract of *Coptis teeta* (Khan-tauk), alcohol extract of *Brucea javanica* (Yar-dan-seet), aqueous extract of *Sweetia angustifolia* (Shan-say-khar-gyi) and petroleum ether extract of *Aristolochia tagala* (Nga-phone-say) showed antimalarial activity in *in vitro* and/or *in vivo* experiments. Petroleum ether extract of *Aristolochia tagala* (Nga-phone-say) was selected as a promising plant extract in view of the availability, cost and safety aspect to study the chemical constituents present there in. Thin layer chromatographic screening of active extract of *Aristolochia tagala* revealed 8 spots when the chromatogram was detected in day light, under ultraviolet light (short and long wave lengths) and by treating with spraying reagent. Out of 8, 5 constituents could be isolated by column and preparative thin layer chromatographic techniques. Of these 5 constituents isolated, denoted as A, B, C, D and E, 4 were found to be steroids and one, a non-steroid compound. Ultraviolet (UV) and Infrared (IR) spectra of all 5 constituents were obtained. Nuclear Magnetic Resonance (NMR) and mass spectra were also obtained for compound A, and thus its structure could be deduced. The chemical structure of steroid A thus deduced is assumed to be a new chemical structure, which has never been reported from any plant source before.

TITLE- 133

Pharmacokinetics of mefloquine enantiomers in healthy volunteers and in patients with malaria

AUTHOR (S) and AFFILIATION:

Thaw Zin

SOURCE:

Thesis Ph.D. (Pharmacology), University of New South Wales, Australia, 2002

ABSTRACT:

Mefloquine is a very useful antimalarial drug having efficacy against multi-drug resistant malaria. The enantiomers were compared with regards to the differences in the pharmacokinetic parameters, the likely reasons underlying the differences, and their relation to the outcome of therapy. Studies included the influence of demographic characteristics, gender and ethnic group, drug formulation and malaria infection on various aspects of the pharmacokinetics. In all groups studied, the pharmacokinetic differences between the two enantiomers were consistent even though marked inter-individual variation was seen. The apparent clearance (CL/F) and the apparent volume of distribution ($V\beta/F$) for RS-mefloquine was always significantly higher than the corresponding parameters for SR-mefloquine while the terminal elimination half life ($t_{1/2\beta}$) for SR-mefloquine was significantly longer than RS-mefloquine. Healthy Australian subjects had approximately 30% lower values of $V\beta/F$ and CL/F of SR-mefloquine and correspondingly higher maximal plasma concentration than healthy Myanmar subjects. Relative to body weight, the Australian subjects had 50% lower values of $V\beta/F$ and CL/F. No difference in pharmacokinetics was seen between males and females although females had a higher incidence of side effects than males. There were trends towards faster and greater total absorption of both enantiomers of mefloquine from Lariam tablets (Roche) than from Mephaquin tablets (Mepha). No overall difference in pharmacokinetics was seen between either the healthy subjects and malaria patients. However, the patients who were resistant to mefloquine had lower CL/F values of SR – mefloquine than the cured patients. This indicates that drug resistance is due to reduced parasite sensitivity rather than lower plasma concentration in these patients. RS- mefloquine had a significantly higher unbound fraction than SR- mefloquine which correlates with the higher CL/F and $V\beta/F$, and also a shorter $t_{1/2\beta}$ of RS-mefloquine. The renal clearance of RS-mefloquine was also higher than that of the SR enantiomer. The shorter half-life of RS- mefloquine may make it less likely to develop resistant strains but a more extensive pharmacokinetic study is needed to demonstrate its true advantage over the SR enantiomer or the race mate.

TITLE- 134

Controlled clinical trial of Myanmar indigenous antimalarial drug (Nga-Ta-Ya) on uncomplicated *Plasmodium falciparum* malaria

AUTHOR (S) and AFFILIATION:

Hla Aung¹, Khin Phyu Phyu¹ and Swe Swe¹
¹DMR (UM)

SOURCE:

MHRC Programme and Abstract 2002; pp. 7

ABSTRACT:

The study was conducted to scrutinize the therapeutic efficacy and to determine the toxicity of indigenous antimalarial drugs. The test antimalarial drug Nga-Ta-Ya consisted of *Piper nigrum*, *Azadirachta indica* and *Ferula asafoetida*. Individual plants of Nga-Ta-Ya had been used by Myanmar Ssaysayas (traditional practitioners) as an antimalarial drug and was claimed to have antimalarial action. It was tested in 126 acute uncomplicated falciparum malaria patients (aged 16-55 years) in an endemic area at Madaya township hospital, and at the rural area of Sedawgyi and Salay village groups. In this trial, quinine sulphate (300 mg sugar coated tablet, MPF) was used as control. Three groups of malarial patients were randomly chosen and each group was given different doses of test drug, group (a) 2000mg 8 hourly for 3 days, group (b) 2000 mg 5 hourly for 3 days and group (c) quinine 10mg /Kg 8 hourly for 7 days. The mean initial parasite count of test and control groups were 9349 parasites/L (n=75) and 12150 parasites/μL (n=51) respectively. The mean fever and parasite clearance times of test drug in group (a) were 47.97 ± 14.55 and 72.45 ± 1.92 hours respectively. In group (b) the mean fever and parasite clearance times were 40.67 ± 22.36 and 55.33 ± 5.00 hours respectively. In group (c) controlled group, the mean fever and parasite clearance times were 48.00 ± 6.00 and 78.85 ± 4.14 hours respectively. In this study, the results indicated that Nga-Ta-Ya had a therapeutic efficacy and it could be useful in the treatment of uncomplicated falciparum malaria. Moreover, no major side effects were observed in the malaria patients receiving Nga-Ta-Ya 40mg/Kg 8 hourly for 3 days during clinical trial.

2003

TITLE- 135

Antimalarial activity of Traditional Medicine Formulation-AAC on rodent malaria

AUTHOR (S) and AFFILIATION:

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¹DMR (LM), ²YU

SOURCE:

MHRC Programme and Abstract 2003; pp. 26

ABSTRACT:

The study aimed to assess the combined antimalarial activity of Traditional Medicine formulation-AAC (a mixture of *Artemesia annual* Linn leaf, *Aristolochia tagala* root and *Curcuma comosa* root in the ratio of 10: 5: 3) was prepared into 6 different extracts, namely ethanol extract, petroleum ether extract, methanol extract, ethyl acetate extract, water partition and water fraction. Four different concentrations of each TMF-ACC preparation were tested for the antimalarial activity on DDY experimental mice by infecting them with rodent malaria parasite *Plasmodium berghei*. Those preparations showed parasite suppression in Suppressive test and further tested for therapeutic effect. It was observed that ethanol extract of TMF-AAC induced parasite suppressions both in Suppressive and Therapeutic test. In Suppressive test, 250 mg/ kg/ day for 4 day course induced 41.22% parasite suppression in terms of control, 500 mg/ kg/ day for 4 day course gave 71.8% and 1000 mg/ kg/ day for 4 day course induced 91.22% suppression respectively. 500 mg/ kg/ day for 4 day course of petroleum ether extract of TMF-AAC also induced 46.26% suppression, 1000 mg/ kg/ day for 4 day course had 58.48% suppression and 2000 mg/ kg/ day for 4 day course gave 74.84% suppression respectively. When subjected to Therapeutic test, 1000 mg/ kg/ day for 4 day course of ethanol extract induced only 41% parasite suppression and 2000 mg/ kg/ day for 4 day course of petroleum ether extract also gave 42% suppression. The results appeared encouraging for pursuing the study of TMF-ACC.

TITLE- 136

Stereoselective bioequivalence study of two different brands of mefloquine

AUTHOR (S) and AFFILIATION:

Thaw Zin¹, G.G. Graham², S.E. Tett³, Aung Zaw Oo⁴, Aye Yu Soe⁴, Kyi Kyi Myint¹ and Marlar Than⁴

¹DMR (LM); ²University of New South Wales, Sydney, Australia; ³University of Queensland, Brisbane, Australia; ⁴Clinical Research Unit (Malaria), DSGH

SOURCE:

MHRC Programme and Abstract 2004; pp. 37-38

ABSTRACT:

Two different brands of mefloquine (Lariam and Mephaquin) are available in Myanmar. Both brands are used extensively with the assumption that they are equivalent, both in efficacy as well as in bioavailability. Later studies, both locally and internationally, however, have shown that they are not bioequivalent, and that Lariam tend to have a greater bioavailability than Mephaquin. Since mefloquine, like many other antimalarial drugs, are chiral drugs and possess stereoselective pharmacokinetics, conventional methods used for racemic drugs may not be applicable to chiral compounds like mefloquine. In addition, mefloquine has an extremely long half-life and the AUC under the terminal elimination phase caused by enterohepatic circulation may become a confounding variable when considering absorption. In order to overcome the above limitations, a stereoselective bioavailability study using partial area methods was studied on 10 healthy volunteers and 34 malaria patients admitted to the Clinical Research Unit (Malaria), DSGH. The results indicated that the Lariam had a significantly shorter absorption half-life and a higher bioavailability than Mephaquin in the SR, but not with its optical antipode RS, when the area under the concentration-time curve (AUC) was calculated up to 504 hours. In healthy subjects, the truncated AUC values of SR-mefloquine were consistently higher after Lariam ($91 \pm 14\text{mg/Lh}$) than after Mephaquin ($85 \pm 14\text{mg/Lh}$), although the differences were small. Such difference in bioavailability was less apparent in malaria patients. Similarly, both brands are found to possess similar therapeutic efficacy as assumed by clinicians in clinical trials which have proven each to be equally effective in the treatment of malaria although the incidence of side effects seem more common in the Lariam group. The study highlights the importance of stereo-selective bioavailability studies in drugs like mefloquine, where the pharmacokinetics of the racemate may give little information on the enantiomer of interest, especially when the difference may have relation to toxicity and development of resistance even if the efficacy is likely to be similar.

2005

TITLE- 137

Renal clearance of mefloquine enantiomers: correlations with pharmacokinetic and protein binding data

AUTHOR (S) and AFFILIATION

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SOURCE:

MHRC Programme and Abstract 2005; pp. 15

ABSTRACT:

Increasing resistance of malarial parasites to antimalarial agents necessitates urgency of understanding the cause of resistance and the need for devising the strategies to limit its spread. Mefloquine is a chiral antimalarial drug, possessing stereoselective pharmacokinetics. Thus, conventional methods used for studying racemates may not be applicable to mefloquine. In order to understand the effect of stereoselectivity on clearance, and its relation to pharmacokinetics and plasma protein binding properties, the present study was conducted on 10 malaria patients, admitted to the Clinical Research Unit (Malaria), DSGH, having symptomatic malaria and detection of *P. falciparum* (>1000/μL blood) in their peripheral blood film. Subjects were administered mefloquine (Mephaquin: Mepha Pharmaceuticals), 25mg/kg body weight, and timed blood samples collected for the pharmacokinetic study. Timed urine samples were collected at each time the patient had an urge to void on the first day, and on subsequent days, a 24-hour collection was done. Binding of mefloquine to plasma proteins was determined by ultrafiltration technique, using Amicon Ultrafiltration Set with PM 30 filter membrane. Mefloquine enantiomers in plasma, ultrafiltrate and urine were measured by HPLC pre-column derivitization technique. The pharmacokinetic and protein binding profile, total apparent clearance and urinary clearance were calculated accordingly using a population pharmacokinetic software (KINETICA 4.1). Results showed that mefloquine possess stereoselective renal clearance with the RS-mefloquine significantly greater than that of SR-mefloquine (P<0.002). Renal clearance of both enantiomers was low and accounted for only 1.5% (1-2%) for the RS, and 4% (2-7%) for the SR mefloquine, of the total body clearance of mefloquine. No significant correlation was seen between renal clearance and the apparent total clearance, which was in contrast to a good, but negative correlation seen between bound form and renal clearance of both the enantiomers. It was anticipated that low renal clearance was due to weak basic properties of mefloquine which would involve a high renal tubular re-absorption and varying with the urinary pH. Negative correlation seen between protein binding data and renal clearance may indicate that stereoselectivity in renal

clearance may be secondary to the stereoselective plasma protein of mefloquine enantiomers.

2006

TITLE-138

Use of locally available traditional medicine for malaria in Bago Division, Myanmar

AUTHOR (S) and AFFILIATION:

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¹DMR (LM) ²VBDC, Bago Division, DOH

SOURCE:

MHRC Programme and Abstract Poster, 2006; pp.55

ABSTRACT:

Locally available traditional medicine packets were collected to identify their contents from 21 villages of 5 townships, Bago Division during the household survey. Five hundred and seven respondents with history of malaria fever during the last 3 months were face to face interviewed. Qualitative information was collected through informal conversation with shop owners, interviews with traditional healers, persons with history of malaria fever and focus group discussions with community members. Traditional medicine used for malaria fever was 222 (43.8%) and 182 (82%) of them used it as the first line self-treatment. None of the children under 5 used traditional medicine only for malaria. Traditional drugs use included packets with antipyretics (59%), packets with traditional medicine (22.5%), packets with other contents (8.5%), ဆေးခါးကြီး (*Andrographis paniculata*) (5%) and other traditional herbs (21.6%). The cost of each packet ranges from 10 to 100 kyats. Relatively costly (1200 kyats) traditional medicine like Plasmogyn was not available in these villages. ဆေးခါးကြီး is used by a few respondents only for unavailability, difficult preparation and unpleasant taste. Licensed traditional healers usually refer malaria patients to the health staff. Health education should include emphasis on avoidance of such medicine packets which are not approved by the Traditional Medicine Department. A scrutiny on marketing of ineffective medicine packets is recommended.

TITLE- 139

Authenticity of commercially available artemisinin compounds in Myanmar: application of simple, cost-effective methods

AUTHOR (S) and AFFILIATION

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SOURCE:

MHRC Programme and Abstract Poster 2006; pp. 56

ABSTRACT:

Recently, the WHO has reported the appearance of counterfeit and substandard antimalarial drugs in the Southeast Asia and Asia Pacific Region, including Myanmar and Vietnam. This has prompted a search for simple field assay methods to differentiate these from genuine drugs especially in the border areas where malaria is highly prevalent and the drug legislation laws are weak. Artesunate and dihydroartemisinin are the main group of antimalarials, used in these areas as artemisinin-based combinations, because of their effectiveness against multi-drug resistance malaria. The main objective of the study is to find out the likelihood of counterfeit or substandard artemisinin derivative drugs being imported into the Myanmar market. Artesunate and dihydroartemisinin containing brands of antimalarials commercially available in Myanmar were collected and screened qualitatively and quantitatively by standard methods described in the International Pharmacopoeia, 2002. This was again rechecked by using the WHO standard method. Analytical parameters include uniformity of weight, pH and disintegration rate of tablets. Analysis consists of identification of active substance and/or inert ingredients by Thin Layer Chromatography, FT-IR and UV spectrophotometric methods and further quantification of the content of the active substance by the WHO standard methods. The findings indicated the variability in weight to be <5%, disintegration to be <30 minutes and pH ranging from 6.5 to 7.2. Qualitative analysis confirmed the presence of either artesunate or dihydroartemisinin in the tablets tested, without significant detection of impurities. Quantitative analysis indicated the content of artesunate and dihydroartemisinin to range from 98% to 115% of the specified content in these tablets. The results proved the authenticity of the commercially available artemisinin-based antimalarials available in Myanmar.

TITLE- 140

Mefloquine pharmacokinetics in mefloquine resistant *P. falciparum* malaria patients

AUTHOR (S) and AFFILIATION:

Thaw Zin¹, Marlar Than², Aung Zaw Oo², Aye Yu Soe² and Kyi Kyi Myint¹
¹DMR (LM); ²Clinical Research Unit (Malaria), DSGH, Mingaladon

SOURCE:

14th Myanmar MMC, Programme and Abstract, 2006; No. 31: pp. 16

ABSTRACT:

Difference in response due to the effect of disease states on the pharmacokinetics of drugs necessitates the importance of testing drugs in patients rather than relying solely on extrapolated pharmacokinetic data from limited studies on health volunteers. With malaria, the rapidity with which parasitaemia are achieved in non-immune individuals and the remarkable variability of the clinical course with regards to parasite sensitivity as well as age and immune status of the patients, indicated the importance of studying the difference in the pharmacokinetics of mefloquine in malaria patients showing different response to mefloquine therapy. Blood samples were collected from 34 patients with *P. falciparum* malaria admitted to the Clinical Research Unit (Malaria) No (1) DSGH, treated with mefloquine 25mg/Kg body weight and the mefloquine levels determined by stereo-selective HPLC method using pre-column derivitization. The patients were stratified into different groups depending on their sensitive or resistance response to mefloquine and their pharmacokinetics compared. The findings showed a significantly higher AUC and a corresponding lower clearance in patients showing resistance to mefloquine, indicating that resistance was unrelated to reduced bioavailability of mefloquine. The mean apparent volume of distribution was also 25% higher in sensitive patients when compared showing resistance and MDR-resistant patterns. However if the mefloquine isomers were analysed separately, only the SR-mefloquine showed increased an AUC, where an opposite was seen with its optical antipode RS- mefloquine although in both instances the difference was not statistically significant. Since the RS- mefloquine has been reported to be twice as potent as the SR- mefloquine which had an extremely long half-life (twice of the RS-mefloquine), it was concluded that stereo selectivity in pharmacokinetics may play a role in the development of resistance of *P. falciparum* to mefloquine.

TITLE- 141

Antimalarial activities and related chemical constituents of *Swertia* Species which are grown in Kayah State

AUTHOR (S) and AFFILIATION:

Khin Phyu Phyu

SOURCE:

Thesis Ph.D (Chemistry), University of Mandalay, 2006

ABSTRACT:

Pan Kha, an important Myanmar medical plant naturally grown in Kayah State was investigated for its chemical constituents and antimalarial activity. It has been utilized by local people as a good remedy to treat malaria. Three species of Pan Kha, namely *Swertia affinis*, *Swertia angustifolia* and *Swertia purpurascens* available in Kayah State were identified botanically. The highest activity was found in ethanol extracts of *Swertia purpurascens* (whole plant) at the dosage of 2.8 g/kg/day both in suppressive and therapeutic test when various extracts of these three plant specimens were preliminarily screened for antimalarial activity, using *in vivo* model. The active ethanol extract was observed to have significant antimalarial activity both *in vivo* model and *in vitro* system. Its antimalarial activity was found starting from the dose of 1000 µg/ml. Chemical separation of the active extract was serially carried out by means of solvent – solvent partition, column chromatographic and thin layer chromatographic techniques. Out of seven fractions yielded, only one fraction showed to have suppressive activity against malarial parasite in both experimental models with the dosage of 20 mg/kg/ day and 1320 µg/ml (ED₉₀). The active compound from fraction three was identified as a 1,5,8- trihydroxy -3-methoxy xanthone molecule by means of UV, FT IR, ¹HNMR (600 MHz), ¹³C NMR, DEPT, DQF- COSY, EL-mass, HSQC, HMBC and NOE spectroscopic technique. *Swertia chirata* and xanthone molecules have been known as antimalarial agents in recent years. For the first time this research work indicated that *Swertia purpurascens* possesses antimalarial activity.

2007

TITLE- 142

Antimalarial activity and related chemical constituents of *Swertia* species from Kayah State

AUTHOR (S) and AFFILIATION:

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¹DMR (UM), ²DTM, ³DMR (LM), ⁴University of Mandalay

SOURCE:

The MHSRJ 2007; 19(3): pp. 131-135

ABSTRACT:

The most promising activity was found in ethanol extracts of *Swertia purpurescens* (whole plant) at the dosage of 2.8 g/kg/day both in suppressive and therapeutic tests when various extracts of these three plant specimens were preliminary screened for antimalarial activity, using in *in vivo* model. The active ethanol extract observed to have significant antimalarial activity in *in vivo* model was subjected to *in vitro* *P. falciparum* system. It's antimalarial activity was found starting from the dosage of 1000 µg/ml. Chemical separation of the active extracts was serially carried out by means of solvent-solvent partition, column chromatographic and thin layer chromatographic techniques. Out of seven components yielded, only one showed to have suppressive activity against malaria parasite in both experimental models. The active compound was identified as a xanthone molecule by means of UV, FTIR, HNMR (600MHz), DQF-COSY, HSQC, HMBC and NOE spectroscopic techniques. *Swertia chirata* and xanthone molecules have known to be antimalarial agents in recent years. Therefore, this study could structurally elucidate an active compound Bellidifolin from *S. purpurescens* and for the first time, the possessing of antimalarial activity in *S. purpurescens* could be reported.

TITLE- 143

Pharmacokinetics of Dihydroartemisinin in healthy volunteers and uncomplicated falciparum malaria patients

AUTHOR (S) and AFFILIATION:

Khin Thane Oo

SOURCE:

Thesis Ph.D (Pharmacology), UM (I), 2007

ABSTRACT:

This research is concerned with the study of the pharmacokinetics of dihydroartemisinin (DHA) in healthy volunteers and in patients with uncomplicated falciparum malaria since it is as effective as other artemisinin derivatives and cheaper than those in treatment of falciparum malaria. The type of study was prospective study on two groups of subjects. The pharmacokinetics of oral dihydroartemisinin (DHA) following 4 mg/kg dose was investigated in twenty healthy volunteers and twenty patients with uncomplicated falciparum malaria. On the day of experiment each healthy

subject received DHA in a single dose of 4 mg/kg day body weight in the form of 20 mg tablets; and patient received DHA in a 4 mg/kg dose for 3 days together with mefloquine 750 mg 8 hour after the first dose of DHA and 500 mg for the next day. Blood samples were taken at 0, ½, 1, ½, 2, 4 and 6 hours after DHA in both groups. All blood samples were centrifuged and plasma samples were stored at -70°C until analysis. From each sample, concentration of DHA was measured by HPLC - UV method. Blood films for parasitic density were examined at the same time as samples collection (0, ½, 1, ½, 2, 4 and 6 hour from peripheral blood), 6 hourly on day one and once daily up to 3 consecutive days. The pharmacokinetics of DHA was studied by measuring concentration in plasma and estimating its elimination half life, elimination rate constant, volume of distribution and clearance in both group and comparing these parameters between two groups. At the same time, the study was done to observe any relationship between plasma DHA concentration achieved and parasite clearance time, fever clearance time and untoward effects. The present study also determined the pharmacokinetic difference between male and female in both healthy volunteers and falciparum malaria patients. The mean C_{max} of DHA were 458.57 ± 107.49 mg/ml and 1869.74 ± 908.09 ng/ml, in healthy volunteers and in patients, respectively ($P < 0.00001$). The mean $AUC_{(0-\infty)}$ in healthy volunteers and patients were 1301.86 ± 174.00 ng.h/ml and 4904.94 ± 642.29 ng.h/ml respectively ($P < 0.0001$). It was found that the mean C_{max} and $AUC_{(0-\infty)}$ in patients were markedly higher than that of the healthy volunteers. The mean absorption half- life and absorption rate constant in healthy volunteers and patients were 0.67 ± 0.19 versus 0.65 ± 0.20 hour and 1.14 ± 0.35 versus 1.15 ± 0.07 hour⁻¹, respectively. The mean elimination half-life and elimination rate constant in healthy volunteers and patients were 1.58 ± 0.25 hour versus 1.55 ± 0.23 hour and 0.45 ± 0.8 versus 0.46 ± 0.07 hour, respectively. The differences were statistically not significant ($P = 0.72$) for elimination half-life and ($P = 0.83$) for elimination rate constant. The clearance of DHA was 3.13 ± 0.47 L/h/kg and 1.72 ± 0.40 L/h/kg, in healthy volunteers and in patients, respectively and the clearance was significantly reduced in malaria patients ($P < 0.0001$). The volume of distribution in healthy volunteers and patients were 7.19 ± 1.88 L/h/kg and 3.92 ± 1.29 L/kg (Mean \pm SD) respectively in the present study. The V_d of DHA was significantly reduced in patients compared to that of volunteers ($P < 0.0001$). There was no significant difference in pharmacokinetics of DHA between sexes. The parasites had been cleared within 12 to 24 hour after oral DHA. Mean parasite clearance time was 19.8 ± 3.43 hour. There was positive correlation between plasma DHA concentration achieved and parasite time and AUC and parasite clearance time in first 2 hours after DHA. Parasite counts were decreased as the plasma drug concentrations were increased in first 2 hours. There was also no difference in parasite clearance time between both sexes. The fever clearance times in all patients were within 12 to 24 hour after drug administration. Mean fever clearance time was 18.6 ± 2.68 hour. Oral DHA was generally well tolerated and were no significant untoward effects. It was found that plasma samples should be stored at -70°C in order to keep DHA to be stable. This finding can be

applied in further study concerning DHA assay. The above findings showed that for the treatment of uncomplicated falciparum malaria, DHA could be an effective agent as artesunate and artemether which are being used now. Moreover, optimization of artemisinin therapy can be based on pharmacokinetics of DHA since it is active metabolites of artesunate and artemether.

TITLE- 144

In vitro parasite clearance of herbal antimalarial traditional medicine compound for uncomplicated falciparum malaria

AUTHOR (S) and AFFILIATION:

Tin Tin Htay

SOURCE:

Thesis M.Med.Sc. (Microbiology), UM (1), 2007

ABSTRACT:

The emergence and spread of multi-drug resistant *P. falciparum* worsen the global malaria situation. Artemisinin-based combination therapy is recommended to treat malaria. One of the herbal antimalarial traditional medicine compound which contains the extracts of *Dichroa febrifuga* (ယင်းပြား), *Coptis teeta* (ခန်းတောက်မြစ်) and Qinghao leaf extract (ကျင်ဟောင်ရွက်). These three plants are cheaply available in Myanmar. Three hundred and fifty three clinically suspected malaria patients attending the outpatient clinics of Vector Borne Disease Control Centre, Gyogone, Insein were tested during the study period of one year. Among those patients, 31 isolates met the selection criteria for *in vitro* drug sensitivity testing. Out of 31 isolates tested, 20 isolates were successfully grown in *in vitro* test culture for the traditional medicine compound and 22 isolates were successfully grown for those of chloroquine and-mefloquine. The mean initial parasitaemia level was 33829 parasites/cu.mm for the traditional medicine compound and 33333.8 parasites/cu.mm for chloroquine and mefloquine. The traditional medicine compound showed 89.59% schizont inhibition at a concentration of 1000 nmol/l on *P. falciparum in vitro*. EC₅₀, EC₉₀, EC₉₅ and EC₉₉ values of the traditional medicine compound were found to be 169 nmol/l, 1404 nmol/l, 2558 nmol/l and 7886 nmol/l respectively with mean MIC value of 1550 nmol/l. These parasite inhibition data indicated that the traditional medicine compound has definite *in vitro* antimalarial activity against *P. falciparum*. Its potency was found to be less than chloroquine and mefloquine. But the efficacy of traditional medicine compound may be as good as or even better than the two other drugs tested in parallel because of its nature of three herbal drugs combination.

2008

TITLE- 145

Preparation and standardization of an antimalarial phytopharmaceutical product from *Swertia Purpurescens* (Pan Kha)

AUTHOR (S) and AFFILIATION:

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¹DMR (UM), ²DTM, ³DMR (LM), ⁴Myanmar Pharmaceutical Factory

SOURCE:

The MHSRJ 2008; 20(1): pp. 46-50

ABSTRACT:

A standardized phytomedicine is locally produced from Pan Kha, *Swertia purpurescens*. Its antimalarial activity and the active principle were approved in 2004. The plant material was extracted with three different concentrations of ethanol: 50%, 70% and 96%. The 96% ethanol extract showed the presence of large amount of flavonoid (xanthone). This herbal drug was physicochemically and phytochemically standardized by using chromatographic and phytochemical methods for its herbal pharmacopoeial quality criteria. This phytomedicine was found to contain 7.82 mg % active principle, bellidifolin by HPLC analysis. The median lethal dose (LD50) was determined as 37 (27.40- 49.95) g/kg. Sub-acute toxicity test showed that there was no decrease in body weight of albino rats. No significant changes in weight of the internal organs, the biochemical and haematological profiles of the test groups were observed when compared with the control group. These findings call for a clinical trial of this medicine to be tested on human being.

2010

TITLE- 146

Pharmacokinetics of piperazine and clinical outcome of acute, uncomplicated falciparum malaria patients after administration of Piperamisinin, a locally manufactured ACT in Myanmar

AUTHOR (S) and AFFILIATION:

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¹UOP, Yangon; ²DMR (LM); ³Loikaw General Hospital, Kayah State

SOURCE:

MHRC Programme and Abstract 2010; pp. 53

ABSTRACT:

Uncomplicated *P. falciparum* malaria is mainly treated with artemisinin-based combination therapy (ACT) and Piperamisinin, a locally manufactured Dihydroartemisinin-piperazine (DHA-PPQ) co-formulation. Eighteen acute, uncomplicated falciparum malaria patients admitted to Loikaw General Hospital were recruited in the study. They were given 3 tablets of Piperamisinin once a day for 3 consecutive days. Temperature, parasite count and plasma PPQ concentrations were investigated. Plasma PPQ concentration were analyzed at 0h, 0.5h, 1h, 2h, 3h, 4h, 6h, 8h, 24h, 48h, 168h, 336h, 504h and 672h by HPLC-UV method. Pharmacokinetic parameters of PPQ were concentration at time 0 (C_0) $1029.20 \pm 1250.25 \mu\text{g/L}$, maximum concentration (C_{max}) $356.03 \pm 176.83 \mu\text{g/L}$, time to reach maximum concentration (t_{max}) $4.56 \pm 1.9\text{h}$, absorption rate constant (k_{ab}) $0.62 \pm 0.40\text{h}^{-1}$, absorption half life ($t_{1/2\text{ab}}$) $1.61 \pm 0.99\text{h}$, elimination rate constant (k_{el}) $0.002 \pm 0.0008\text{h}^{-1}$, elimination half life ($t_{1/2\text{el}}$) $446.90 \pm 244.85\text{h}$ ($18.62 \pm 10.20\text{ days}$), area under the concentration-time curve (AUC) $620290 \pm 1062390 \mu\text{g/L/h}$, volume of distribution (V_d) $40.26 \pm 26.92\text{ L/kg}$ and clearance (CL) $0.0643 \pm 0.0341\text{L/h/kg}$. Wide inter-individual variations of pharmacokinetic parameters of PPQ were found among the patients. Mean Fever Clearance Time (FCT) and Mean Parasite Clearance Time (PCT) were $22.67 \pm 17.04\text{ h}$ and $6.78 \pm 3.0\text{ h}$ respectively. Adequate Clinical and Parasitological Response (ACPR) was 100%. All patients were well tolerated with very few minor side effects. No significant cardiovascular, haematological and biochemical abnormalities were detected. Piperamisinin is an efficacious, tolerable and less expensive ACT with wide margin of safety and is also responsible for prevention of transmission and recrudescence.

TITLE- 147

Determination of piperazine concentration in red blood cells and plasma of Myanmar healthy volunteers and uncomplicated falciparum malaria patients

AUTHOR (S) and AFFILIATION:

Khine Kyi Han

SOURCE:

Thesis Master of Pharmacy, UOP, 2010

ABSTRACT:

Piperazine is a bisquinoline antimalarial drug and a structural analog of chloroquine. It is highly effective against *P. falciparum* and *Plasmodium vivax* malaria. It has recently received the renewed interest as a suitable partner drug in artemisinin-based combination therapies (ACTs). It is now available as a fixed-dose combination with dihydroartemisinin or artemisinin. The present study compared piperazine concentrations in plasma and red cells between healthy subjects and malarial patients. The study was carried out on eighteen healthy subjects and eighteen patients with acute *P. falciparum* malaria, who had mean initial parasitaemia of 3500 ± 2699 per μL (range: 960-10560) and mean auxiliary temperature of 39.08 ± 0.75 °C (range: 37.6-40.6). Healthy volunteers were given a single oral dose (three tablets) of DHA-PPQ fixed dose combination tablets (each containing 350 mg of PPQ phosphate and 50 mg of DHA) and malaria patients were given multiple doses (three tablets per dose at 0, 24 and 48 hr) of DHA-PPQ fixed dose combination tablets and monitored for 28 days following treatment. Venous blood samples were collected prior to dosing and at 0.5, 1, 2, 3, 4, 6, 8 hours after drug administration. Subsequent blood samples were collected at Day 1, 2, 7, 14, 21 and 28 after dosing. Mean plasma maximum concentrations (C_{max}) of piperazine were 839.9 ± 513.5 $\mu\text{g/L}$ (95% confidence interval [CI]: 584.6-1095.3) in healthy subjects and 356.0 ± 176.8 $\mu\text{g/L}$ (95%CI: 261.8-444.0) in malaria patients. Time to reach maximum concentration (T_{max}) were 2.67 ± 0.84 hours (95% CI: 2.25-3.08) in healthy subjects and 4.56 ± 1.85 hours (95% CI: 3.63-5.48) in malaria patients. Both C_{max} and T_{max} were significantly different ($P = 0.001$ and 0.0005 respectively) between healthy subjects and malarial patients. There were no significant differences of mean plasma piperazine concentrations between male and female healthy subjects ($P = 0.970$) and male and female malaria patients ($P = 0.322$). C_{max} RBCs were $16166. \pm 1041.9$ $\mu\text{g/L}$ (95% CI: 1098.5-2134.7) in healthy subjects and 525.6 ± 270.8 $\mu\text{g/L}$ (95% CI: 390.9-660.2) in malarial patients. T_{max} in RBCs were 3.67 ± 1.33 hours (95% CI: 3.01-4.33) in healthy subjects and 4.39 ± 2.25 hours (95% CI: 3.27-5.51) in malarial patients. C_{max} in red blood cells was significantly different ($P = 0.0005$) between healthy subjects and malarial patients but T_{max} was not significantly different ($P = 0.249$). There were no significant differences of piperazine concentrations in red blood cells between male and female healthy subjects ($P = 0.657$) and male and female malaria patients ($P = 0.567$). C_{max} in red blood cells was significantly higher than those in plasma of both healthy volunteers ($P = 0.008$) and malaria patients ($P = 0.033$). T_{max} in red blood cells was significantly different ($P = 0.011$) from those in plasma of healthy subjects but in malarial patients, T_{max} in plasma and red

blood cells were not significantly different ($P = 0.810$). Piperazine was detectable in all plasma and red blood cell samples up to 28 days. Mean plasma PPQ concentration at the end of the sampling period (Day-28) were $63.1 \pm 14.4 \mu\text{g} / \text{L}$ (95% CI: 56.0-70.3) in healthy subjects and $65.5 \pm 37.7 \mu\text{g}/\text{L}$ (95% CI: 44.6-86.4) in malaria patients. Mean PPQ concentrations in red blood cells at Day-28 were $119.7 \pm 60.1 \mu\text{g}/\text{L}$ (95% CI: 89.8-149.6) in healthy subjects and $122.7 \pm 76.3 \mu\text{g}/\text{L}$ (95% CI: 80.4-164.9) in malaria patients. According to *in vitro* investigation, the mean RBC to plasma partition ratio of piperazine was 1.36 ± 0.31 over the concentration range of 100-6000 $\mu\text{g} / \text{L}$. The mean RBC to plasma partition ratio of piperazine were 2.54 ± 1.35 (95% CI: 2.37-2.72) in healthy subjects and 2.73 ± 2.28 (95% CI: 89.8-149.6) in healthy subjects and $122.7 \pm 76.3 \mu\text{g}/\text{L}$ (95% CI: 2.43-3.03) in malaria patients. There was no significant difference of mean RBC to plasma partition ratio of piperazine between healthy subjects and malaria patients ($P = 0.618$). No apparent change in RBC to plasma partition ratio of piperazine was seen with decline in parasitaemia that occurred after antimalarial treatment. Up to Day-7, the positive correlation of the RBC to plasma partition ratio of piperazine with time was seen in both healthy subjects ($r = 0.233$; $P = 0.002$) and malaria patients ($r = 0.555$; $P = 0.0005$). Parasite clearance was obtained in all patients within 4 to 12 hours after drug administration. In conclusion, acute *P. falciparum* malaria did not appreciably alter the RBC to plasma partition ratio of piperazine. Mean piperazine concentrations in both plasma and RBCs of malarial patients at Day-28 exceeded the lower limit for the *in vivo* minimal inhibitory concentration (MIC). This suggests a mean post-treatment prophylactic effect of approximately 28 days with the current dosage. Thus, piperazine is a good partner drug for the artemisinin derivatives.

TITLE- 148

Pharmacokinetics of piperazine in Myanmar healthy volunteers and acute, uncomplicated falciparum malaria patients after oral administration of dihydroartemisinin-piperazine co-formulation

AUTHOR (S) and AFFILIATION

Marlar Myint

SOURCE:

Thesis Ph.D (Pharmacology), UM (2), 2010

ABSTRACT:

Malaria burden is a global problem. Since 2001, WHO has recommended the use of artemisinin-based combination therapies (ACTs) for *P. falciparum* malaria which is usually resistant to conventional antimalarial agents. In order to implement ACT effectively, National Anti-malarial Treatment Policy in Myanmar was developed and adopted in September and was updated in February 2008. Piperaquine (which contains 50mg of dihydroartemisinin and 350 mg of piperazine in each tablet) is the first locally manufactured ACT in Myanmar. As pharmacokinetic analysis of dihydroartemisinin has already been done, pharmacokinetic analysis of piperazine, assessment of efficacy, tolerability and safety of Piperaquine on malaria patients is required for safe and effective use of the drug. The

study on pharmacokinetic of piperazine in Myanmar health volunteers and in patients with acute uncomplicated falciparum malaria after oral administration of dihydroartemisinin-piperazine co-formulation was done on 18 healthy volunteers (9 male and 9 female, aged 24-48 years) and 18 patients with acute uncomplicated falciparum malaria (12 male and 6 female, aged 18-50 years) who has been admitted to Loikaw General Hospital, Kayah State. The demographic data and baseline clinical, cardiovascular (heart rate, sitting blood pressure and ECG), haematological (blood for complete picture) and biochemical (random blood sugar level, plasma bilirubin, liver enzymes such as alkaline phosphatase, alanine aminotransferase, aspartate aminotransferase, plasma urea and creatinine) parameters of both groups were assessed. Each healthy volunteer was given a single dose of three tablets of piperazine after an overnight fasting for single dose pharmacokinetic study. In malaria patients, diagnosis was confirmed by direct microscopy of Giemsa stained thick blood films. They were given 3 tablets of Piperazine once a day for 3 consecutive days for multiple dose pharmacokinetics analysis. Axillary temperature was recorded 6 hourly during stay in hospital for 7 days. Parasite count was recorded 2 hourly until 2 consecutive slides were negative and on 24h, 48h and on the days of follow up once a week, until day 28. Clinical, cardiovascular, haematological and biochemical data of the malaria patients were also recorded during stay in hospital and on the days of follow up once a week, until 28 days. In both group of subjects, plasma piperazine concentration of 0, 0.5, 1, 2, 3, 4, 6, 8, 24, 48, 168, 336, 504, and 672 hours were analyzed by minor modification of the HPLC-UV method of Hung *et al.* (2003). Pharmacokinetic analysis of piperazine was done using Prism 1.0 (Graph Pad, USA) population kinetics software. The plasma concentration-time profile of piperazine could be best described by a one-compartment model with first-order absorption kinetics. There was no significant difference between the demographic characteristics of the healthy volunteers and the malaria patients, but the patients had lower hemoglobin concentrations, albumin levels, A:G ratio, higher plasma bilirubin and urea levels. Significantly higher plasma piperazine concentrations of the healthy volunteers at 2 to 24 hours and higher plasma drug concentration at time zero (C_0), maximum plasma drug concentration (C_{max}), absorption rate constant (k_{ab}), indicated that there was a faster rate and a greater extent of absorption of the drug in the healthy volunteers who were given the drug on empty stomach than that of the malaria patients who were given the same dose of the drug irrespective of meals on day 0. It could be assumed that the presence of food (probably soft bland diet usually taken by the patients during acute stage of illness) may interfere absorption of piperazine. Elimination half life ($t_{1/2el}$) of piperazine in the healthy volunteers and the malarial patients were 257.28 ± 129.11 hours (10.72 ± 5.38 days) and 446.90 ± 244.85 hours (18.62 ± 10.20 days) respectively. There was no statistically significant difference in pharmacokinetic parameters of piperazine between the male and female healthy volunteers, as well as between the male and female malaria patients. However, there was a wide inter-individual variation in pharmacokinetic parameters of piperazine among the subjects

of both groups. In spite of these variations, piperamisinin 3 tablets once a day for 3 consecutive days produce a satisfactory clinical response with rapid mean Parasite Clearance Time (PCT) 6.78 ± 3.00 hours, mean Fever Clearance Time (FCT) 22.67 ± 17.04 hours and 100% Adequate Clinical and Parasitological Response (ACPR) up to 28 days. Piperamisinin was quite tolerable by the patients with no significant clinical, cardiovascular (including ECG), haematological and biochemical adverse effects. The pharmacokinetic and pharmacodynamic profile of piperamisinin showed that the drug is quite safe with good efficacy. Piperamisinin could be recommended as a promising partner drug for artemisinin derivatives in ACTs as it has a longer half-life, more than 4 days (for at least two parasite life-cycles). Due to a longer half-life, piperamisinin may be effective to prevent transmission and recrudescence. Piperamisinin 3 tablets once a day for 3 consecutive days could be considered as a less expensive, optimal dosage regimen for safe and effective use in the treatment of uncomplicated falciparum malaria with satisfactory patient compliance.

TITLE- 149

Antimalarial activities and chemical investigation of *Nyctanthes Arborescens* Linn.(Seikphaleu) leaves and *Garcinia Pedunculata* Roxb (Metlinchin) Bark

AUTHOR (S) and AFFILIATION:

Thet Thet Mar

SOURCE:

Thesis PhD (Chemistry), YU, 2010

ABSTRACT:

To find a new antimalarial medicine derived from natural resource, two plant malerials, namely of *Garcinia pedunculata* Roxb, (Metlinchin) and leaves of *Nyctanthes arborescens* Linn. (Seikphaleu) were evaluated for their chemical constituents and antimalarial activities. Chromatographic separation of ethyl acetate extract of *G. pedunculata* provided oleanolic acid acetate (1) (0.020% yield, m.p. 230°C) β -sitosterol (2) (0.009% yield, m.p. 135°C), rubraxanthone (3) (0.082% yield, m.p. 190°C), gracinsoned (4) (0.005% yield, m.p. 210°C), 2,3,6,8-tetrahydroxy xanthone (5) (0.005% yield, m.p. 205°C) and 1, 5, 6,- trihydroxy-4H-xanthene-3, 9-dione (6) (0.01% yield, m.p. 204°C). β -sitosterol (2) (0.05% yield, m.p. 138°C), was isolated from ethanolic extract of *N. arborescens*. Identification of isolated compounds were done by melting point determination, Co-TLC with authentic sample, spectroscopic measurements such as UV-Vis, FT-IR, ^1H -, ^{13}C -NMR, DEPT and HSQC, and mass spectrometry. *In vitro* antimalarial activity was measured via schizontocidal activity using 96 well micro titer plates with fresh isolates of *P. falciparum* stains. Among the tested plant extracts, ethanolic extract of *N. arborescens* leaves found to possess the highest schizontocidal activity ($\text{IC}_{50} = 73 \mu\text{g/mL}$) which was followed by ethyl acetate extract of *G. pedunculata* bark ($\text{IC}_{50} = 226 \mu\text{g/mL}$) and petroleum ether extract of *N. arborescens* leaves ($\text{IC}_{50} = 272 \mu\text{g/mL}$). The (IC_{50} of isolated compounds were: 3, $18 \mu\text{g/mL}$; 4, $2.22 \mu\text{g/mL}$; 6, $28 \mu\text{g/mL}$; 5, $62 \mu\text{g/mL}$; 2, $126 \mu\text{g/mL}$; and 1, $176 \mu\text{g/mL}$). Compound 3, 4 and 6 showed

moderate activity ($10 < IC_{50} < 73 \mu\text{g/mL}$). The *in vivo* antimalarial activity of plant extracts were carried out in mice infected with *Plasmodium yoelii*, using Peter's 4-day suppressive test and Rane's therapeutic test. The dose used for testing antimalarial activity of the individual extracts was 500, 250 and 125 mg/kg body weight once a day for four consecutive days. Ethanolic extract of *N. arbortristis* leaves at 500mg/kg x 4 dose provided 41.6% inhibition in suppressive test and 34.59 % inhibition in therapeutic test. This extract was safe and nontoxic up to 4.0g/kg. This study demonstrated that ethanol extract of *N. arbortristis* has promising antimalarial activity. Although ethyl acetate extract of *G. pedunculata* did not provide satisfactory schizontocidal activity, isolated compound from this provided moderate activity.

TITLE- 150

Anti-malarial activity and identification of active principle of *Dichroa febrifuga* growth in Pyin Oo Lwin area

AUTHOR (S) and AFFILIATION:

Khin Ohnmar Kyaing

SOURCE:

Thesis PhD (Pharmacology), IM (1) 2010

ABSTRACT:

Myanmar medical plant, Yin Pyar, grown in Pyin Oo Lwin area was botanically identified by this study as *Dichroa febrifuga* of hydrangeaceae family. The anti-malarial properties of dry root of Yin Pyar plant were evaluated against rodent malaria, *Plasmodium berghei*, in mouse model by *in vivo* suppressive test and therapeutic test. In the suppressive test treatment started at 3 hour after inoculation of parasite when parasitemia was minimal. In the therapeutic test treatment started on the fourth day after inoculation of parasite, parasitemia in mice reached 2.97-3.67%. Effect on human malaria, *P. falciparum*, was also evaluated by performing *in vitro* continuous cultivation and drug sensitivity assay. In addition active principle was isolated from the most active crude extract by bioassay guidance separation and fractionation using column and thin layer chromatographic methods. The power root of Yin Pyar was percolated in four different solvents namely methanol, 70% ethanol, chloroform extracts and aqua. Out of four extracts methanol, ethanol, and chloroform extracts had promising anti-malarial activity. The highest activity was found with 400 mg/kg dose of same dose of methanol extract which inhibited 61.35% of parasite growth in suppressive test and 59.8% of those in therapeutic test. The parasite inhibitions of same dose of 70% ethanol extract were 60.63% in suppressive test and 58.8% in therapeutic test. Chloroform extract were inhibited 48.08% and 38.88% of parasite growth respectively. Insignificant inhibits was seen with aqueous extract in those tests. In the same experiment, 10 mg/kg of chloroquine, control drug inhibited 94.12% of parasite growth in superessive test and 89.53% in therapeutic test. Methanol extract inhibited growth of *P. falciparum in vitro* with 50% parasite inhibition (EC_{50}) of 196.25 $\mu\text{g/ml}$. Those of 70% ethanol and chloroform

extracts were 205.22 $\mu\text{g/ml}$ and 263.07 $\mu\text{g/ml}$ respectively. Acute toxicity study was carried out to find out the median lethal doses (LD_{50}), 1100mg/kg for methanol extract, 1200 mg/kg for 70 % methanol extract, 1400 mg/kg for chloroform extracts and 2000 mg/kg for aqueous extract. The does at which a specified toxic effect is not seen was found to be 400 mg/kg and was selected as the maximum dose for *in vivo* experiments. From the most active methanol extract, ethyl acetate soluble and insoluble fractions were separated and *in vivo* and *in vitro* experiments were carried out for their anti-malarial activity. Biologically active ethyl acetate soluble fraction was subjected to further fractionation which resulted three non alkaloid fractions and two alkaloid fractions. Out of five fractions yielded, one fractions (F_5) was found out to be the most active one. The ED_{50} values of F_5 were 10 mg/kg in *in vivo*, with EC_{50} of 7.51 $\mu\text{g/ml}$, After purification into one compound form the most active fraction (F_5), was then characterized by physicochemical tests and spectroscopic studies. Finally the active anti-malarial principal isolated from root extract of Yin Pyar (*Dichroa febrifuga*) could be identified as an alkaloid compound, Febrifugine. The isolated active principle is a known compound, but the scientific evaluation of anti-malarial activity and identification of active principle from the root of Yin Pyar plants grown in Pyin Oo Lwin area is being reported for the first time and it is an essential basic work in exploring valuable natural source from Myanmar herbal plants for development of new anti-malarial drug.

SECTION-4 PUBLIC HEALTH, HEALTH ECONOMICS AND SOCIAL SCIENCE

2001

TITLE- 151

Study on factors influencing the susceptibility to malaria among pregnant women in Thaton District Hospital

AUTHOR (S) and AFFILIATION:

Mya Thida and Than Than Tin
Obstetrics and Gynaecology Department, Central Women's Hospital, Yangon

SOURCE:

MHRC Programme and Abstract 2001: pp. 15

ABSTRACT:

To study the factors influencing the susceptibility to malaria among pregnant women is the main aim of this study. It was a nested case control study undertaken as a part of a hospital-based cohort study of maternal and fetal outcome of malaria in pregnancy among 1081 pregnant women admitted to Thaton District Hospital during the period of July 1998 to December 1999. Altogether 184 cases and 381 controls were included. Variables recorded were analyzed using SPSS version 10.0 for Window. Seven variables that had significant association with malaria on univariate analysis were tested by Logistic Regression Analysis (forward stepwise likelihood ratio) method. The following variables were statistically significantly associated with malaria in pregnancy: migrant (OR = 4.01, 95% CI = 1.53-10.52); multiparous women (parity 1 to 4) (OR = 1.59, 95% CI = 1.003-2.525), those who had history of malaria (OR = 5.89, 95% CI = 3.39-10.25), those who had no antenatal care (OR = 2.54, 95% CI = 1.32-4.89), or antenatal care without malaria screening (OR = 2.00, 95% CI = 1.204-3.326), those with anaemia (OR = 2.03, 95% CI = 1.288-3.192), and women who delivered in winter season (OR = 5.53, 95% CI = 2.96-10.57). After controlling the effect of possible confounders, all variables apart from parity remained as significant factors influencing the susceptibility of women to malaria during pregnancy at slightly reduced odds ratio. The model can correctly predict in 80.4% of cases and can explain about 28% of the variation in the outcome variables. The model appears to fit the data reasonably well. The findings of this study uncover the factors influencing the susceptibility of women to malaria during pregnancy. It may be of help in health planning for implementation of the intervention and in focusing target population for malaria chemoprophylaxis to be given cost effectively so as to maintain pregnancy safer in malaria endemic areas.

TITLE- 152

Malaria situation analysis of Kawthaung Township

AUTHOR (S) and AFFILIATION:

Saw Lwin, Aye Min, Khin Maung Wynn and Khin Mon Mon

SOURCE:

11th Myanmar MMC Programme and Abstract, 2001; No. 5: pp. 3

ABSTRACT:

The purpose of the study is to elaborate the situation of health system and treatment seeking pattern of local population residing at border areas to have a base line data for Roll Back Malaria Initiative. Semi-structured interview questionnaires are used as tools for investigation. Malaria is the most prevalent disease in that area among all age group. Self-treatment is the main treatment seeking pattern followed by local traditional healers and drug sellers also superimposed the condition. Decision maker for seeking treatment in the family is the "Mother". According to the findings, targets of IEC programmer should be "Women". Strengthening of health facilities and capacity building of BHS are also essential and organization of traditional healers and drug sellers will also be worthy for prevention and reduction of malaria mortality.

TITLE- 153

Experiences and knowledge of malaria among military personnel

AUTHOR (S) and AFFILIATION:

Cho Cho Oo, Aung San and Marlar Than

SOURCE:

11th Myanmar MMC Programme and Abstract, 2001; No. 6: pp. 3

ABSTRACT:

The objectives of the study are to assess the malaria knowledge in military personnel, to explore the malaria experience in curative and preventive measure, to identify the health seeking behaviours and to determine the experiences and knowledge of malaria among military personnel. Characteristically, service men in the military have to travel often and stay in the malaria areas for reasonably long time. Therefore, military personnel are highly exposed to malaria infections. As chances of contracting malaria by military personnel are very high, positive measures should be effectively taken to prevent the servicemen from being stricken by the disease. The target population was 300 hospitalized medical and surgical patients from Defence Services General Hospital (DSGH). Quantitative methodology, a cross sectional descriptive approach was employed to study a selected group of male hospitalized patients from DSGH. A standardized questionnaire was administered. The respondents were all male with majority between 18 and 50 years of age and educational levels of 34.3% with high school level and above, 65.7% with below high school. It was found that misconception on causes of malaria include eating banana and fruits (39.71%), drinking swampy stream water (60.3%), tiredness (29.7%), sleeplessness (34.3%), changing weather (32.3%) and getting caught in the rain (34.3%). As for malaria preventive measures, the study found that 34% of respondents do not want to use mosquito net due to warm weather, 32.3% do not want to use

mosquito net due to lose breath feeling inside the net and 68% of them do not want to use mosquito net due to their habitual nature. The study suggested that they practice differently in health seeking behaviours. Some 49.3% of the respondents believe in indigenous medicine for cure of malaria and 58.9% believe in using both western and indigenous medicine. Therefore, measures should be taken to further improve the level of knowledge and conception for the military personnel in malaria. New strategy in health education is necessary to achieve behavioural change in military personnel.

TITLE- 154

Effectiveness of insecticide impregnated bed-nets in malaria infection among the migrant workers in Pidaung village, Kachin State, Myanmar

AUTHOR (S) and AFFILIATION:

Myint Win

SOURCE:

11th Myanmar MMC Programme and Abstract, 2001; No. 36: pp. 18

ABSTRACT:

In Myanmar, malaria is highest priority, in part because of its negative impact on productivity. We conducted this study to locally assess the effectiveness of insecticide-impregnated bed nets (IBN) on the risk malaria infection among agricultural migrant workers. We invited migrant workers to sleep either under IBN (n = 120), ordinary bed-nets (OBN) (n = 125) for 16 weeks in Pidaung, Kachin State, a malaria hyperendemic village. We treated bed nets of the intervention group with permethrin, killing *anopheles* throughout the trial. Measurements of body weight and haemoglobin were conducted at the beginning as baseline and at the end of the 16 weeks. Case ascertainment was done through biweekly intervals and of malaria infection as dependent variable. Among workers sleeping under OBN, 58 became infected while only 26 workers sleeping under IBN did (Incidence rates of 4.8 and 1.8 per 100 person-weeks respectively [Incidence ratio (IR) = 2.7, (95% CI = 1.7, 4.2; P<0.0001]. Previous results did not change in multivariate analysis accounting for baseline differences [IR=2.9, (1.8, 4.7)]. Other risk factors were permanent residence in low endemic malaria areas, and higher education. Mean haemoglobin decreased (-0.1g/dl) in the OBN group while increased (+0.4g/dl) in the IBN group (P<0.05). Use of permethrin treated bed nets reduced malaria parasite infection by 53% among agricultural migrant workers. Migrants recruited from low endemic malaria areas are at higher risk. Use of insecticide-impregnated bed nets should be encouraged in these setting in Myanmar.

TITLE- 155

Gender, mosquitos and malaria: implications for community development programs in Laputta, Myanmar

AUTHOR (S) and AFFILIATION:

Tin Oo¹, Pe Thet Htoon², Khin Thet Wai³, Will Parks¹ and JH Bryan¹
¹*Tropical Health Program, Australian Center for International and Tropical Health and Nutrition, University of Queensland, Brisbane, Australia;*
²*International Health Division, Ministry of Health, Myanmar;* ³*DMR (LM)*

SOURCE:

Southeast Asian J Trop Med Public Health 2001; 32(3): pp. 588-594

ABSTRACT:

This paper examines the gender roles linked to division of labor and potential exposure to mosquitoes and malaria prevention activities. A “Human Development Initiative” (HDI) Project has been launched in Laputta, a mangrove delta region of Myanmar assisted by United Nations Development Program since 1994. The project aims to improve rural community access to primary health care and provide micro-credit programs, income generation schemes, and educational opportunities as a basis for community empowerment. Women and children of low income households are the target beneficiaries. Prior to self-care training program and distribution of self-care manuals, altogether 20 focus group discussions (separately assigned to men and women) were conducted in eight study villages between January to February 2000. The primary vector for malaria in study area is *Anopheles sundaicus*. Rural women were prone to malaria due to exposure to mosquitoes within the peak biting period at night because of their gender assigned roles. Both men and women perceived that mosquitoes commonly bite before midnight, more at dusk. Lack of awareness of correlation between mosquitoes and malaria together with lack of affordability enhance either non-use or shared use of bed-nets at home. Rural women did not consider destruction of breeding places of mosquitoes as their major concern. Thus, it is essential for program planners to motivate local women for more active participation in vector control measures within and beyond their households in the context of community development programs.

TITLE- 156

The study of malaria drug policy development in Myawaddy Township

AUTHOR (S) and AFFILIATION:

Ngwe San

SOURCE:

Thesis M.Med.Sc. (Public Health), IM (2), 2001

ABSTRACT:

The objective of the study is to develop drug policy for uncomplicated falciparum malaria cases in Myawaddy Township. Myawaddy is the one of the malaria high risk areas where main efficient vectors are prevalent and transmission is present throughout the year. Among seven townships in Kayin State, the highest malaria morbidity and mortality were seen in

Myawaddy Township. Unusual occurrence of malaria was reported in 1993 and the causes of epidemic were most probably due to population migration, new settlement and unusual climate condition. It is also neighbouring with Tak Province of Thailand, epicenter of multi drug resistance for *P. falciparum* malaria. A total of 1186 patients were given full clinical examination and checked for fever and parasitaemia at ten study sites in Myawaddy Township. Altogether 82 patients were selected for the study and only 63 patients completed the 14 days follow up period. Among 24 patients tested with chloroquine, 8 patients (33.3%) exhibited treatment failure. For mefloquine, 27 patients were tested and treatment failure was found in 12 patients (44.4%). All 12 patients tested with sulphadoxine- pyrimethamine showed treatment failure response. Although patient with falciparum malaria did not respond satisfactorily to chloroquine and mefloquine, these two drugs can be used in adult patient with certain parasite density. Chloroquine 25 mg/kg body weight stat dose can be used as a first line drug for uncomplicated falciparum malaria patients with parasite density between 10,000 to 30,000 parasites/cu mm. In children less than 15 years of age, chloroquine and mefloquine should not be used as antimalarial drugs. Sulphadoxine-Pyrimethamine should not be used as an antimalarial drug in Myawaddy Township. Nineteen health care providers and 11 drug sellers were also interviewed for availability, acceptability and rational prescribing of antimalarial drugs. It was found that patients generally went to drug sellers and private practitioners. Many inappropriate drugs were being sold over the counter for treatment of malaria.

2002

TITLE- 157

Factors associated with the fetal loss in pregnancy with malaria

AUTHOR (S) and AFFILIATION:

Mya Thida¹ and Than Than Tin²

¹Central Women's Hospital, Yangon; ²IM (1)

SOURCE:

MHRC Programme and Abstract 2002; pp. 18

ABSTRACT:

To study factors associated with the fetal loss in pregnancy with malaria is the main aim of the study. It is nested case control and 18 women with malaria in pregnancy associated with fetal loss were included as cases and 131 pregnant women without fetal loss were included as control. The study was conducted in Thaton District Hospital from July 1998 to June 2000. The following variables: age, migratory status, residence, parity, history of malaria, antenatal care, season at the time of admission, season at the time of delivery and clinical severity on admission, presence of splenomegaly, haemoglobin level at the time of admission, stage of pregnancy at which malaria infection occurred, species of plasmodium parasite, parasite density (count/pl) and fetal loss were tested. After bivariate and multivariate analysis, clinical severity groups, and anaemia groups remained significant.

Complicated malaria had about nearly 36 times higher risk than asymptomatic malaria ($P < 0.01$). Women with uncomplicated malaria had about nearly 7 times increased risk than women with asymptomatic malaria ($P < 0.05$). Women with severe anaemia ($Hb \leq 7Gm\%$) were 10 times increased risk to have fetal loss than those without severe anaemia ($Hb > 7Gm\%$) ($P = 0.045$). The clinical severity at the time of admission was the most important factor associated with fetal loss in pregnancy with malaria.

TITLE- 158

Preliminary study on antimalarial drug utilization pattern in a malaria endemic area

AUTHOR (S) and AFFILIATION:

Ye Htut¹, Maung Maung Toe², Kay Thwe Han¹ and Kyin Hla Aye¹

¹Parasitology Research Division; ²Epidemiology Research Division, DMR (LM)

SOURCE:

MHRC Programme and Abstract 2002; pp. 40

ABSTRACT:

The success of malaria control and management greatly depends on the drug utilization pattern of the area concerned. The project aimed to explore the antimalarial prescribing pattern of health care providers and utilization pattern of community in a malaria endemic area, Thaton, Mon Sate, Myanmar. The study was conducted in 3 malaria endemic villages of Thaton Township during August and September 2002. Face-to-face interviews using open-ended questionnaire among 93 respondents who suffered from clinically suspected malaria within last 3 months and key-informant interviews on 9 health care providers were carried out. The shopkeepers of 5 private medicinal stores of Thaton Township were also enquired about the availability and popularity of antimalarials. It was found that 53.76% (50/93) of the respondents had heard about at least one antimalarial. Among them, quinine appeared to be the most well known drug (53.8%), which was followed by artesunate (24.7%) and sulfadoxine-pyrimethamine (SP) (15.80%). Only 8% of the respondents had heard about chloroquine (CQ). For therapeutic purpose, artesunate was found to be the most frequently prescribed antimalarial (44.44%), mefloquine was 22.22%. Other antimalarials, namely, quinine, SP and CQ were equally prescribed (11.11%) by health care providers comprising of General practitioners (GPs), Township Medical Officer (TMO), Health Assistants (HAs) and Midwives (MWs). The determinants of prescribing patterns of antimalarials were also enquired from the health care providers. The findings are being discussed with reference to availability and popularity of antimalarials, treatment seeking pattern and drug utilization pattern among community. The possible contributing role of drug utilization pattern towards the development of the drug resistance was also discussed.

TITLE- 159

Strengthening the services of rural health workers with respect to malaria control in Myanmar

AUTHOR (S) and AFFILIATION:

Myint Lwin, Htein Lin, Alan Pearson and Kyaut Kyaut Swe

SOURCE:

12th Myanmar MMC Programme and Abstract 2002; No. 27: pp. 11

ABSTRACT:

The purpose of this study was to explore the performance of rural health workers and facilitate change to strengthen their services in order to improve the health services in rural areas with respect to malaria control in Myanmar. The study aimed to discover whether change in rural health workers occurred particularly in their technical knowledge, attitudes, perceptions and practices concerning malaria control, whether these changes were advantageous to rural health workers and community, and to explore the change process in the study health centres themselves. An action research methodology was used and integrated quantitative and qualitative methodologies were applied in this study. Moreover, a triangulation of methods arose and data was collected through participant observation, focus group discussions among health staff and among community members, staff surveys and surveys of community members. Data were obtained before, during and after changes in knowledge, attitudes and practice were introduced at study health centres. The study was undertaken at 2 rural health centres and their sub centres. The study sample was small and some of the methods employed were highly subjective thus definitive conclusions cannot be formulated. However, the multi-method approach identified trends, which supported some propositions about new concepts of service deliveries related to malaria control for rural health workers and their applicability in practice. The change process pursued seemed to be beneficial to staff and community. The knowledge, attitudes and practice of the community concerning malaria and its control improved as a result of the change effort. Proposals are made for practice change and the improvement of service of rural health workers for malaria control and recommendations are provided for the direction of future research.

TITLE- 160

Situation of malaria infections between 1994 to 2000 and antimalarial sensitivities in Inntakaw Area, Bago Division, Myanmar

AUTHOR (S) and AFFILIATION:

Aung Khin, Myint Swe, Kyin Htwe, Tin Shwe and Myat Phone Kyaw

SOURCE:

12th Myanmar MMC Programme and Abstract, 2002; No. 28: pp. 12

ABSTRACT:

Inntakaw area, 36 miles north to Yangon has been developed by rubber plantation since 1994. A total of 30,503 people that is around 10% of the total population of Bago Township are living in this area. Round about 11% of them are attending to RHC every year. Retrospective descriptive analysis

of record was done. Clinical malaria cases attending to RHC were high in later months of hot-dry season (April, May) to pre-monsoon season (June) and minimal rises again in cold-dry season (December). Consistently and repeatedly, the higher prevalence rates of *P. falciparum* were observed in mobile, adults male population groups, but *P. vivax* infection were dominant in majority of female adults and children (stable population). This situation had changed with increasing trend during 1994 to 1996 period, because of population movement to work at rubber plantation sites. Therefore, in Inntakaw RHC has been selected as a field station of Clinical Research Unit (Cerebral and Complicated Malaria) since 1995 and slide checking system has been developed and WHO standard *in vivo* monitoring system has also been established at RHC. Blood slides were collected during clinic hours and sent to Bago VBDC and the results were given back by phone. Mean slide positivity rate in 1994 is 39.6 ± 20.8 and 49.2 ± 25.2 in 1995, 79.5 ± 8.7 in 1996 and after that it was ranged between 50% and 65%. Artesunate (AS) and mefloquine (MQ) combination study was started in 1995 and cure rate was 99.03. Artesunate alone had 86.1% sensitivity. Therefore, AS and MQ combination was used as a control arm in later studies. Artesunate and chloroquine trial was followed in 1999 and sensitivity of 62.5% with early treatment failure 2.5% and late treatment failure 12.5% and the AS and MQ combination trial was done in 2000 with sensitivity of 86.2% with late treatment failure 13.8% and the control arm AS and MQ combination trial had 96.8% sensitivity. Slide positive *P. falciparum* and *P. vivax* infection were changed after WHO granted project of AS and MQ trial during 1995 and 1996. The ratio was nearly 1:1 in 1997. This condition regained in 2001 after artesunate with chloroquine in 1999 and with SP in 2001 trials. It may be due to gametocidal effects of artesunate and no hypnosoidal effects of artesunate. In conclusion, this study highlighted that it is a time to use artesunate derivatives in combination with other antimalarials at peripheral level.

TITLE- 161

A malaria control trial using insecticide treated bed net and targeted chemoprophylaxis in Man-Kat Training, Northern Shan State

AUTHOR (S) and AFFILIATION:

Thein Htay Win, Win Myint, Aye Ko, Kyaw Min and Myint Oo

SOURCE:

12th Myanmar MMC Programme and Abstract 2002; No. 43: pp. 20

ABSTRACT:

The effect of insecticide treated bed net and targeted chemoprophylaxis on mortality and morbidity from malaria during July 2000-September 2000, among a group of trainees (n = 200) of age between 20 to 25 years. It was randomized control single blind trial. First group consisted of 100 subjects and took (pyrixine, pyrimethamine 25 mg + sulphadoxine 500 mg) one tablet weekly. Second group consisted of 100 subjects and they used insecticide (permethrin-target dose 0.5 G/m², dose achieved 0.2 G/m²) impregnated bed nets and were urged to follow malaria discipline. After three months study period, it was noted that chemoprophylaxis reduced the

incidence of malaria parasitaemia by 15% to 6% respectively and insecticide impregnated bed nets provided significant protection in trainees showing reduction in malaria parasite rate by 7% to 3%. Other results on morbidity and mortality will be presented and discussed.

TITLE- 162

Experiences and knowledge of malaria among hospitalized patients of Myanmar

AUTHOR (S) and AFFILIATION

Cho Cho Oo¹, Htein Lin¹ and Alan Pearson²

¹Military Institute of Nursing and Paramedical Science ²La Trobe University, Bundoora, Australia

SOURCE:

The MHSRJ 2002; 14(1-3): pp. 22

ABSTRACT:

A study was conducted among hospitalized patients from General Hospital of Mingaladon. The aim of the study was to identify the malaria related perceptions, beliefs and health seeking behaviors among hospitalized patients so that necessary health education may be given effectively. A standardized questionnaire was administered to 300 hospitalized medical and surgical patients from the hospital. The respondents were all males with majority between 18 and 55 years of age. It was found that misconception on causes of malaria included: eating banana (39.71%); drinking swampy stream water (60.3%); tiredness (29.7%); sleeplessness (34.3%); changing weather (32.3%); and getting caught in the rain (34.3%). As for malaria preventive measures, the study found that 68% of them do not want to use mosquito net owing to their habitual nature. In combating malaria, prevention is the most efficient method to be employed. Once it is contracted, effective cure of the disease can only be realized by employing correct use of the anti-malarial drugs with full confidence and reliance. The study explored and determined the experience of malaria in hospitalized patients and their beliefs and practices in combating the disease. The results of the study can be used to identify appropriate approaches and methods to give the patients the broader knowledge in malaria and to educate them in the self-care health practices to prevent and combat malaria effectively. The findings suggest that the strong measures should be taken to further improve the level of knowledge and conception of the patients in malaria.

TITLE- 163

Treatment seeking behavior for malaria in an endemic area Taikkyi Township

AUTHOR (S) and AFFILIATION:

Aung Kyaw Htwe

SOURCE:

Thesis M.Med.Sc (Public Health), IM (1), 2002

ABSTRACT:

Treatment seeking behavior for malaria in an endemic area (Taikkyi) was studied. There were 476 samples that were interviewed by using a pretested questionnaire. Collected data were analyzed in the computer using Epi info version 6.04. Chi square test was performed to investigate the correlation of some variables with treatment seeking outside the government health service. The result of study included two types of treatment seeking behavior, that is, formal (government health service) and informal (outside government health service including self medication). A large proportion of population (63%) sought treatment from quacks, drug sellers or self treatment. Self medication habit was found in 52% of population. Reasons for not going to government health sector were mainly due to beliefs that signs and symptoms were not serious enough (54.4%) or difficult access to health post (19.9%). Seventy six percent of the population knew the correct method of malaria prevention, and 68% knew the mode of transmission. As regards to delay in treatment, 324 (69%) sought treatment within 4 days of fever and the rest (31%) after 4 days of fever. The study also explored the determinants that influenced the treatment seeking behavior. Three variables namely, net use, economic status and staying near the health post were significantly associated with the treatment seeking behavior.

TITLE- 164

Factors influencing fetal and maternal outcome in pregnancy with malaria in Thaton Township, Mon State, Myanmar

AUTHOR (S) and AFFILIATION:

Mya Thida

SOURCE:

Thesis Dr. Med Sc. OBGYN, IM 1, 2002

ABSTRACT:

To study the clinical and epidemiological features and to determine the factors influencing fetal and maternal outcome of pregnant women with malaria are the main aims of this study. It was conducted during the period of July 1998 to June 2000 at the Maternal and Child Health Center (MCH) and in Thaton District Hospital. Parasite prevalence rate was 12.3% among a total of 958 antenatal patients out of which *P. falciparum* was found in 62.71%, *P. vivax* in 33.9 % and mixed infection comprised 3.39%. The highest prevalence rate was found in the 25-29 year age group (14.2%), in parity-3 group (18.3%), in first trimester (26%) and in group with severe anaemia (83.3%) and in group with previous history (21.9%), migration (OR = 4.01, 95% CI = 1.53-10.52), history of malaria (OR = 5.89, 95% CI =

3.39-10.25), no antenatal care (OR = 2.54, 95% CI = 1.32-4.89), no malaria screening at ANC (OR = 2.00, 95% CI = 1.204-3.326), anaemia (OR = 2.03, 95% CI = 1.288-3.192), and delivery in winter season (OR = 5.53, 95% CI = 2.96-10.57) were significant factors influencing the susceptibility of women to malaria during pregnancy. Overall case fatality rate was 8.13%. Fetal loss rate was 12.1%. There were neonatal parasitaemia rate of 3.13%, neonatal rate of 1.04%, and cord blood parasitaemia rate of 3.17%, and positive placenta smear rate of 7.29%. Low birth weight rate was 250/1000 births. Relative risk of low birth weight was 2.89% in mothers with malaria. Age, parity, season of delivery, anaemia and presence of antenatal care modified the effect of malaria on LBW although they had no confounding effect. The placental weights of significant difference were found in birth weight and placenta weight to birth weight ratio. There was a significant difference of birth weight, placenta weight and placenta weight to birth weight ratio among the four different groups of clinical features. The severity of malaria and anaemia were most important influencing factors on maternal and fetal outcome in pregnancy with malaria.

2003

TITLE- 165

Chloroquine and malaria self-care: revisiting unmet requirements

AUTHOR (S) and AFFILIATION:

Tin Oo¹, Ye Htut¹, Pe Thet Htoon², Khin Thet Wai³, Aye Aye Sein⁴ and Saw Lwin⁵

¹Parasitology Research Division, DMR (LM); ²International Health Division, MOH; ³Epidemiology Research Division, DMR (LM); ⁴DHP; ⁵VBDC, DOH

SOURCE:

MHRC Programme and Abstract 2003; pp. 42

ABSTRACT:

Chloroquine remains as first line and self-medicated antimalarial in moderate and low risk areas of Myanmar. A case study design was used to acquire the source of information, knowledge, perceptions, decisions and practices related to chloroquine in treating simple malaria. Altogether 28 focus group discussions, 24 in-depth interviews, 17 case histories and structured interviews of 193 sick adults, 89 sick children and 405 married couples were carried out in randomly selected eight villages in moderate risk malarious area in Laputta, Ayeyarwaddy Division in the year 2000. Self-care training for women was conducted between March-April 2000 and self-care manuals were distributed. Over 40% of 405 randomly selected households did not have self-care manual. Besides, low attendance rate in self-care training (184/405, 45%), low literacy rates and misperceptions hindered local people to improve their malaria-related knowledge and practices. Poor knowledge of drug sellers at first contact worsened the situation. Decisions for administering chloroquine were made by men more frequently than

women (82/193, 42.5%) in adults and jointly with their wives in children (58/89, 65.2%). Matched pair analyses revealed poor agreement between husband and wife in knowledge and use of chloroquine, indicating the need of training for men to reach consensus. Enabling factors in correct use of chloroquine were analysed by stepwise logistic regression and implications discussed. Self-care intervention alone cannot improve the role of men and women in malaria treatment with chloroquine. Unmet requirements should be focused by the National Malaria Control Programme (NMCP) to strengthen correct practices thereby delaying drug resistance.

TITLE-166

Self-care training and self-care manual: channeling malaria information in Laputta

AUTHOR (S) and AFFILIATION:

Tin Oo¹, Pe Thet Htoon², Khin Thet Wai³, Aye Aye Sein⁴, Aung Kyaw Kyaw⁴, Ye Htut¹ and Saw Lwin⁵

¹Parasitology Research Division, DMR (LM); ²International Health Division, MOH; ³Epidemiology Research Division, DMR (LM); ⁴DHP; ⁵VBDC, DOH

SOURCE:

MHRC Programme and Abstract 2003; pp. 43

ABSTRACT:

Self-care intervention in Laputta has been launched under the aegis of "Human Development Initiative (HDI)" by the United Nations Development Programme. The availability of malaria information requires a critical review. The case study design used analyses how messages are conveyed and communicated highlighting barriers and locally appropriate solutions. 8 focus group discussions, 24 in-depth interviews and structured interviews of 405 married couples were carried out in eight randomly selected villages during the year 2000. Just over half of the representatives from study households attended the training course regularly. Though women believed training was confined to them only, 96% of men thought they should attend the training. Although the manual was perceived as useful by 96% of men and 78% of women, it was practically used only by 24% of men and 47% of women. The gap between use and perceived usefulness indicates difficulty in reading, lack of free time to read or preferring other forms of media rather than the manual. Information on malaria stated in the manual was accurate but many people found it difficult to understand selected parts indicating the need for improvement. Gender specific predictors of non-use of self-care manual and preferences of media channels were analyzed by multinomial logistic regression and implications discussed. The National Malaria Control Programme (NMCP) needs to look at ways to enhance the channels of dissemination of information to improve community awareness in line with new treatment policy.

TITLE- 167

Usefulness of rapid diagnostic test (Paracheck *Pf*) for malaria diagnosis in rural areas of Hlegu Township

AUTHOR (S) and AFFILIATION:

Win Naing

SOURCE:

Thesis M.Med.Sc. (Public Health), IM (1), 2003

ABSTRACT:

In the absence of microscopy, malaria diagnosis was done by clinical criteria alone. But, clinical criteria alone were high sensitive and very low specific that caused un-necessary treatment and inappropriate treatment. However, recently several non-microscopy rapid diagnostic tests have been developed for situations where reliable microscopy is not available. Now, Vector Borne Disease Control Program (VBDC) distributed Paracheck *Pf* test that detects *P. falciparum* histidine- rich protein 2 antigen (*Pf* HRP-2) for *P. falciparum* diagnosis to some selected remote areas. A field based cross- sectional analytic study was conducted at rural areas in Hlegu Township, a malaria meso endemic area in Yangon Division. Four hundred and ninety seven fever cases were screened and out of which four hundred and twenty four cases (85.31%) were diagnosed as clinically suspected malaria (CSM) and seventy three cases (14.69%) were diagnosed as other fever cases by BHS. Blinded microscopy with Giemsa stain was used as the gold standard to compare the usefulness of Paracheck *Pf* test and clinical diagnosis. Paracheck *Pf* test can detect one hundred and sixty eight (33.8%) and microscopy result got one hundred and seventy (34.2%) in four hundred and ninety seven patients. When compare with Paracheck *Pf* test and microscopy result among four hundred and ninety seven patients, sensitivity and specificity of clinical diagnosis made by all categories of health personnel with Para check *Pf* test were 98.8% and 21.6 % respectively. Sensitivity and specificity of clinical diagnosis with blood for MP for all species of plasmodium were 97.1% and 20.8% respectively. Paracheck *Pf* test was useful for malaria diagnosis in remote areas where microscopy was not available with recent history of anti- malaria drug. Para check *Pf* test was more useful than microscopy. Among 101 cases with history of recent history of anti-malaria drug test positive rate 64.36% was greater than slide positive rate 23.76%.When compare with major clinical criteria from record of all health personnel, sensitivity, specificity, positive predictive value and negative predictive value of Paracheck *Pf* test were higher than major clinical criteria. With gold standard microscopy, fever alone criteria was 20.6% sensitive and 78.0% specific. Fever and chills/rigor was 50.4% sensitive and 47.8% specific, fever, chills/rigor and sweating and 29.1 % sensitive and 74.2% specific. Para check *Pf* test had 57.4% sensitive and 89.2 % specific in all species of Plasmodium. With multiple logistic regression, Paracheck *Pf* test was statically significant (P=0.000). Clinical accuracy of categories of BHS with Paracheck *Pf* test, Doctor group had 100% sensitivity and 28.4% specificity. HA group had 95.7% sensitivity and 27.6% specificity. LHV had 100% sensitivity and 31.0% specificity. MW group had 100% sensitivity and 17.5% specificity. PHA II group had 94.7%

sensitivity and 14.35% specificity. Doctor group and LHV were more specific than other BHS. Diagnosis made by BHS was highly sensitive to malaria. When compare with gold standard microscopy, clinical accuracy of categories of BHS were slightly change due to detection of falciparum and non-falciparum. Doctor group had 97.7% sensitivity and 28.1% specificity. HA group had 93.8% sensitivity and 30.6% specificity. LHV had 100% sensitivity and 42.9% specificity. MW group had 97.3% sensitivity and 20.5% specificity. PHS II had 95.7% sensitivity and 15.8% specificity. Clinical accuracy between Doctor and other BHS with gold standard microscopy, sensitivity 97.7% of Doctor was slightly higher than sensitivity 96.1% of other BHS. Specificity 28.1% of Doctor was higher than specificity 24.7% of other BHS. Stratified analysis OR (MH) 9.63 means that prediction of Doctor, group was higher than prediction of other BHS. In this study, diagnostic accuracy was not dependent on duration of service in each category of BHS. The Para check *Pf* test showed sensitivity (83.1%) and specificity (89.1%) for the diagnosis of *P. falciparum* malaria with a positive predictive value (PPV) (67.0%) and a negative predictive value (NVP) (95.2%) respectively.

TITLE- 168

Effectiveness of utilization of insecticide treated nets (ITN) for malaria in Zayat Hla Station Hospital Area, Padaung Towhship

AUTHOR (S) and AFFILIATION:

Yan Naung Maung Maung

SOURCE:

Thesis M.Med.Sc. (Public Health), IMI, 2003

ABSTRACT:

A community-based post intervention comparative study of two villages was carried out to assess the utilization and effectiveness of LLITN in Zayat Hla area, Padaung Township. Thabyegone village was randomly selected as test village and Kyeepin village was selected as control village. Thirty percent of households were interviewed with questionnaires. Blood slides for malaria parasite were taken from the whole population of the two villages. All two to nine years old children were examined for spleen enlargement. It was found that the two villages have similar socio- behavioural characteristics. Bed net coverage was found more than 80 percent in both villages. Utilization pattern of bed nets was also similar in the two villages. Ninety four percent of families in the test village used LLITN throughout the year and the remaining six percent lused only in the rainy season. Malaria cases were significantly decreased in the test village after intervention (64% reduction, $P < 0.05$). There was 68 percent reduction in parasite positive rate among children younger than 10 years old ($P = 0.0051$). Overall reduction in parasite positive rate was 57 percent after intervention ($P = 0.0004$). Spleen positive rate decreased from 34.5 percent to 10.25 percent in the test village. It was concluded that ITN could effectively reduce malaria transmission in the study area.

TITLE- 169

Gender dimensions of malaria self care in rural Myanmar

AUTHOR (S) and AFFILIATION:

Tin Oo

SOURCE:

Thesis PhD (Tropical Health) School of Population Health, University of Queensland, Australia, 2003

ABSTRACT:

The central argument of the thesis is that self-care intervention alone cannot improve the role of men and women in malaria treatment and prevention. Social, economic, cultural, administrative and health infrastructure have to be considered also. Analysing gender dimensions in malaria is essential to strengthen home management. Multiple methods were used in eight villages of Laputta of moderate malaria endemicity, where the United Nations Development Programme assisted self-care intervention under the 'Human Development Initiative' was launched, to understand villager's knowledge and behaviour associated with malaria. The research started with 11 in-depth interviews of personnel familiar with policy issues, integrated with the perspectives of 24 villagers (religious leaders, elders, teachers, health workers, drug sellers), 28 focus group discussions and field observations. The conceptualised gender framework for decision-making roles was investigated for 193 adults and 89 children who had experienced malaria, supplemented by 17 case histories. The associations between behaviour, knowledge and use of the manual and barriers to appropriate behaviour of 405 currently married couples with at least one child under ten years were ascertained by bivariate, stratified and multivariate analyses. Important findings include: Approximately 70% of men and women knew that fever with chills and rigor could be due to malaria but very few were aware of diagnostic services. Self-medication, particularly with chloroquine, was widespread but under-dosing was common. Poor knowledge related to malaria transmission (42% of men, 36% of women) and high cost prevented purchasing of bed-nets. Despite the self-care training, poor knowledge scores for 33 questions (18 for men, 17 for women) ($P = 0.001$) favored incorrect use of chloroquine, not using chloroquine to prevent and treat malaria in pregnant women, irregular use of bed-nets, not using personal protective measures against the vector and not giving priority to source reduction. Men often made decisions for the first action at home (52%) and administering chloroquine (43%) for simple malaria in adults, while joint decisions were common for the first action at home (69%) and to administer chloroquine (65%) to children, indicating an unmet requirement for training of men. Despite the self-care intervention, the majority perceived that their competencies in caring for a malaria patient did not improve (91% of men, 82% of women) ($P < 0.0005$) as over half of the respondents (76% of men, 53% of women) ($P < 0.0005$) did not use the manual or had difficulty in understanding it. An important barrier to correct treatment with chloroquine was the difficulty in understanding the tabular format for its doses given in the manual, worsened by poor knowledge of drug sellers. Matched pair analyses revealed poor agreement to seek help from the formal sector by

only 38% of couples. Though women believed training was confined to them, 96% of men thought that they should also attend. Low attendance rates of women at the training (45%) and distribution of manuals to households with low literacy rates did not allow villagers to improve their knowledge. Although the manual was perceived as useful by 96% of men and 78% of women ($P < 0.0005$), it was used by only 24% of men and 47% of women ($P < 0.0005$). Non-use of the manual was higher for men in fishing non-remote villages and for women who worked all year round. Households with literate males and previous experience of malaria had lower chances of men using the manual, while the presence of representatives at the self-care training, higher levels of schooling and good literacy skills favored women's use of the manual. Residing in fishing villages (remote and non-remote) and working all seasons significantly contributed to women's preference for face to face discussion and health talks and journal/posters/pamphlets over the self-care manual. Tackling gender issues alone cannot solve the problem of poor knowledge and practices. Targeting men for training and health education, sustaining functional literacy, creating opportunities for household income generation, improving access to sources other than the self-care manual, modifying the manual into a more readable format, training drug sellers, strengthening collaboration between authorities, health workers, education sector and local Maternal and Child Welfare Associations could improve self-care and accessibility to diagnostic and curative services.

2004

TITLE- 170

Malaria morbidity during pregnancy in Tarchileik

AUTHOR (S) and AFFILIATION:

Kay Thwe Han¹, Myat Kyaw², Ye Htut¹, Thein Thein Htay³, Tin Nwe Htwe¹ and Soe Soe Han¹

¹DMR (LM); ²VBDC Team, Tarchileik, DOH; ³MCH, DOH

SOURCE:

MHRC Programme and Abstract 2004; pp.17

ABSTRACT:

Malaria infection during pregnancy is an important factor among the indirect causes of maternal death in malaria endemic countries. In order to have a good estimation of the disease burden, the study was conducted in Tarchileik Township during malaria transmission season of 2004. One hundred and two pregnant women and seventy five delivery cases were included in the study. Malaria parasite positive rates detected by microscopy were 14.77% (15/102) in pregnant women, 17.33% (13/75) in delivery cases, 22.66% (17/75) in placenta and 2.66% (2/75) in neonatal blood respectively. Mean haemoglobin level of pregnant women in this study was 10.06 gm% (SD \pm 1.63). Regarding the antenatal care, 56.86% of enrolled pregnant women gave the history of taking regular antenatal care. Most of the pregnant women (98%) were found to use mosquito nets at home. The study

documented the magnitude of malaria burden among the pregnant women at Tarchileik Township in transmission season of the year 2004.

TITLE- 171

Evaluation on the results of long-lasting-insecticide-treated bed nets on malaria morbidity in a malaria endemic area of Myanmar

AUTHOR (S) and AFFILIATION

W. Tun Lin¹, Saw Lwin², Sein Min³, Yan Naung Maung Maung³, Sein Thaug³, Thaug Hlaing³, Than Tun Sein¹ and Pe Than Htun³

¹DMR (LM); ²VBDC, DOH; ³Medical Entomology Division, DMR (LM)

SOURCE:

MHRC Programme and Abstract 2004; pp. 32

ABSTRACT:

This study is a 2-year randomised community intervention trial with the community (village level) as an intervention unit. A total of 8 village clusters (4 pairs) comprising 17 malaria endemic villages in Padaung Township, Bago Division were selected, out of which 4 clusters were randomly given long-lasting-insecticidal-nets (LLIN) (PermaNet) and the remaining act as controls. The total households were 2,045 having a total population of 7,744 persons. Baseline data were collected in the first half of 2002 and intervention (distribution of LLIN) was carried out in June/July 2002. Epidemiological, parasitological, entomological, socio-economic and meteorological data were collected before and after the intervention. It was found that PermaNet nets are effective against the anophelines vectors only for less than 6 months after distribution. This is supported by bioassay results carried out on anophelines and on deltamethrin residue analysis. Bioassay results indicated high knock-down rates at 60 minutes, but the mosquito mortality after 24 hours was rather low (mean: 56% at 6 months). One year after the intervention, mass blood survey was undertaken in June 2003 to determine the impact of LLIN on malaria morbidity. Even these bed nets with low insecticide persistence have a protective action and % slide positivity rate reduction was 28.9% (relative risk = 0.71; P < 0.0001). However, it is suggested that a new PermaNet version should be developed by the manufacturers. For partial sustainability of LLIN, a Bed net Trust Fund was introduced for the welfare of poor malaria patients who were discharged from the station and township hospitals.

TITLE- 172

Knowledge, attitude and practice on insecticide treated net

AUTHOR (S) and AFFILIATION:

Chit Soe, Khin Saw Nu, Myo Lwin Nyein, Tint Tint Kyi, Nay Aung and Nay Yee Yee Lin
Sanpya Hospital, Yangon, IOCH, Magwe, Minbu General Hospital, Pathein General Hospital

SOURCE:

50th Myanmar Medical Conference, Programme and Abstract, 2004; (2): pp. 30

ABSTRACT:

Objectives: To know the KAP at baseline regarding bed nets; To support the logistical issues around delivery and financing of the nets; *Introduction:* There is a systematic review which identified 18 RCTs in malaria endemic settings which found that nets sprayed or impregnated with permethrin reduced the number of mild episodes of malaria and child mortality. Insecticide treated nets constitute one of the cheapest, simplest, and most effective methods of preventing morbidity and mortality from malaria in Africa and Asia. The greatest challenges over the next 10 years will be to expand coverage of affordable nets through public and private sectors to all who need them. Special approaches are being developed to reach disadvantaged and poor people, whom often need the nets the most. Each cultural and economic setting needs a different approach, and combined entomological and socioeconomic research is needed in each setting. *Design:* A cross sectional descriptive study using questionnaires was developed to collect data from random sample of people living in 3 townships, Pathein (46), Magwe (100), and Minbu (90). A total of 256 participants were assessed their KAP on insecticide treated nets by 18 item structured questionnaires. *Findings:* Among participants, 53.9% were from urban and 46.5% from rural. For knowledge, only 22.4% heard about insecticide treated net. Only 24.2% replied it seems to have insecticide smell. Besides, 9.8% thought that it could be yellowish in colour. Most (67.5%) replied that it may span for 6 months after treating once. Most (93.6%) believed that it can prevent malaria. Regarding attitude and practice, among the community, 94.1% of households have bed nets and only 1.5% had the insecticide treated net. Each family had an average of 3.6 net and average daily net usage per household is 2.7. The average usage of insecticide net for under 5 years old children is 8.13% and under 12 years old children is 2.6 among each children group at that 1 moment. Most (61.7%) of the people have habit to start sleeping time from 8-10 PM. For children under 5, most (51.6%) start to sleep between 6-8 pm. Between 6 and 8 pm, other family members usually watched television (1.3%) and take other activities (22.5%). Most of the adults (61.66%) started to sleep between 8 pm and 10 pm. They suggested that the cost of a single bed net should be average 2175 kyats and for double, 3147 kyats. Most (79.9%) of participants accept the programme of the distribution of net from government. Besides, 88.37% agree to take self-treatment for net. Among participants, 61.9% usually carry the net while they travel around the

countryside. There is a weak correlation between total family number and having bed nets in each family [$r = 0.23$ (CI = 0.07 to 0.18)]. There is also positive correlation between total income and having total bed net in each family [$r=0.4$ (95% CI = 0.03 to 0.29)]. They suggested that the average cost of net should be 2050 kyats. Among their family members, the attack rate of malaria was on average of 0.394 per 3 months.

TITLE- 173

A study of severe falciparum malaria and hospital deaths in Toungoo General Hospital (2003)

AUTHOR (S) and AFFILIATION:

*Thar Htun Kyaw¹, Mar Mar Kyi² and Thida Yee²
VBDC (Central), Toungoo General Hospital*

SOURCE:

50th MMC Programme and Abstract 2004; pp. 50

ABSTRACT:

Aims and objectives of the study: To study the malaria inpatients of Toungoo General Hospital in 2003; To review the Hospital deaths of severe falciparum malaria at Toungoo General Hospital in 2003. *Introduction:* Malaria remains a threat to almost 50% Malaria of the world population, with 200 million estimated new cases and 1-2 million deaths per year, the disease remains a major cause of mortality and morbidity. Malaria contributes 10% of the total outpatients attendance at health institutions and 7% of the total inpatients admitted in hospitals. The mortality rate per 100,000 populations has increased from 10.06 in 1997 to 11.62 in 1999. In Toungoo General Hospital, total of 1986 patients were admitted to medical ward in 2001. Among them, 425 patients (21.38%) were malaria patients. Complicated malaria shared 66.78% (319) and 106 patients (33.22%) were uncomplicated malaria. Total 50 expired. Case fatality rate was 11.76%. In 2002, total 475 malaria patients were admitted to T.G.H (SFM-400, uncomplicated malaria 75). Total 41 patients expired. (CFR 8.63%). *Patients and Method:* It is the hospital-based, analytical study. A total of 280 malaria patients were recorded and uncomplicated malaria cases were analyzed and recorded. Severe falciparum malaria patients were separately recorded and studied. Expired patients were reviewed including date and time of admission, pre-hospital treatments, expired date and time, hospital stay, blood for malaria parasite result and other basic laboratory investigations (blood sugar, urea, urine RE and haemoglobin). The case fatality rate of 2002 and 2003 were statistically analyzed by chi-square test. *Results:* Total of 280 patients with malaria were included in this study (M-200, F-80). 241 patients were presenting with SFM features (M-175, F-66) and 39 patients were uncomplicated malaria (M-62, F-11) (30.29% of SFM) [44.75% of SFM in 2002]. Twenty two patients died because of SFM, [Cerebral malaria (21), ARF (1)] and case fatality rate was 7.86% [hospital death in 2002 was 26, cerebral malaria (25), ARF (1) CFR (10.05%)]. The chi-square result of case fatality rate between 2002 and 2003 was > 0.05 . (No significant difference between 2002 and 2003). Twelve patients died within 24 hours, 6

patients expired between (24-72 hours) and remaining 4 patients expired after 72 hours. The longest hospital stay was 13 days. *Conclusion:* Data showed that cerebral malaria was the commonest cause of hospital deaths due to malaria in T.G.H. Malaria case fatality rate was high in T.G.H as compared to Myanmar figure (10.05% in 2002, 7.86% in 2003). Nearly half of the malaria deaths were assumed to be due to late referral and another 50% were related to hospital management. So we need to review and promote hospital referral procedure and by doing this we can reduce the hospital deaths due to malaria by half.

TITLE- 174

A study on effect of utilization of insecticide treated mosquito net on malaria in Kayah State, Myanmar

AUTHOR (S) and AFFILIATION:

Thar Htun Kyaw

SOURCE:

Thesis M.Med.Sc (Public Health), IM (2), 2004

ABSTRACT:

A cross-sectional descriptive community based analytical study was carried out on October (2003), to assess the effectiveness of insecticide treated mosquito nets and its utilization in rural area, Lawdalay Rural Health Centre area, Loikaw township, Kayah State. The study was conducted by the reviewing the documents and records in Kayah State VBDC office. Malariometric survey community survey utilization practices of bed nets and focus group discussion were conducted. Four hundred people were selected to conduct the household malariometric survey and four hundred households were selected to conduct the community survey on utilization practices of bed nets. Insecticide treated mosquito net was effective in prevention of malaria in general population ($P < 0.005$, $OR = 2.9$) was compared to be non-user. Insecticide treated mosquito net was more effective in prevention of malaria in the female population ($P < 0.005$, $OR = 4.7$) than in the male population ($P > 0.05$, $OR = 1.8$). Insecticide treated mosquito net was more effective in prevention of malaria in under five year old children ($P = 0.0294$, $OR = 5.9$), in five to nine years age-group children ($P < 0.005$, $OR = 5.6$) and ten to fourteen years age-group children ($P < 0.025$, $OR = 1.79$). Insecticide treated mosquito net was less effective in prevention of malaria in fifteen years and above adults ($P > 0.1$, $OR = 2.17$) and male population ($P > 0.05$, $OR = 1.8$). Bed net ownership in study area and control area was 2.79 bed nets per household and 0.12 bed nets per household respectively. Only 24% of respondents carried their bed nets to the forest and agricultural farms while the whole family was moved to the farms for occupation reasons. These findings pointed out the necessity of health education programme for the community with emphasis on carrying bed nets while they are going to the forest or farms.

TITLE- 175

Treatment seeking behavior of malaria patients in Hmawbi Township, Yangon Division

AUTHOR (S) and AFFILIATION:

Myat Ohnmar Winn

SOURCE:

Thesis M.Med.Sc. (Public Health), IM (2), 2004

ABSTRACT:

A descriptive and analytic study was conducted in Hmawbi Township, Yangon Division, Myanmar, to investigate the health seeking behavior of malaria treatment among the 389 respondents in that township who had ever had malaria or malaria patients during the last year. The study tried to find out factors related to treatment seeking behavior. The results of the study revealed that most of the respondents had negative health seeking behavior. Nearly 45% of them visited to health personnel for their first treatment choice. Self treatment was about 44% and 11.5% of respondents took their treatment from quacks, drug shops and traditional practitioners. Nearly 60% of patients had good knowledge of malaria. One third of these respondents sought the malaria treatment from health personnel within 24 hour while 37.4% treated within two to three days. Regarding the underlying factors of health seeking pattern, socio-demographic characteristics of respondents such as education, occupation, income, socio-economic status, knowledge level, episode of fever, and decision makers were significantly associated with health seeking behavior. The results of this study suggest that proactive efforts should be made to identify these people with negative health seeking behavior and target them for malaria health education.

2005

TITLE- 176

Malaria decision-making in rural area of Laputta

AUTHOR (S) and AFFILIATION:

Tin Oo¹, Ye Htut¹, Pe Thet Htoon², Khin Thet Wat³, Aye Aye Sein⁴, Kyin Hla Aye¹ and Saw Lwin⁵

¹Parasitology Research Division, DMR (LM); ²International Health Division, MOH; ³Epidemiology Research Division, DMR (LM); ⁴DHP; ⁵NMCP, DOH

SOURCE:

MHRC Programme and Abstract 2005; pp. 3

ABSTRACT:

In Myanmar, there are limited existing evidences of process of malaria illness starting from acquisition of infection to getting accurate diagnosis and the mechanism of making family decision which affects on it. Hence, the study explored the context of family decision-making in response to malaria. A case study of sequential qualitative and quantitative design was used. Altogether 193 adults and 89 children reported suspected malaria within the past three months in 66% (267/405) of households surveyed in

eight villages of Laputta in the year 2000. For the first action at home, husbands were more likely to decide to give medicine to 89% (113/127) of sick male than for sick females. For sick children, 69% (61/89) of women alone or jointly with their husbands, decided self-medication. Further details in decision-making were sought through case history interviews of 20 microscopically confirmed cases. Of these, three were hospitalized cases of severe and complicated malaria. Family decisions were made taking into account severity, nature of illness, expected quality of care, financial status and advice by parents, experienced persons and elders. Results indicated husbands' influence over wives in making decisions for seeking health care for malaria and also inappropriate patterns of self-medication linking to local misconceptions and lack of awareness. In conclusion, case history interviews from bio-social aspect were proved to be useful to gain insight on the process of illness decision-making. More rational basis for family decisions in choosing available treatment options should be further encouraged to slow down the spread of drug resistance from programmatic view-point.

TITLE- 177

Study of knowledge, attitude and practices for malaria transmission and prevention among residence of Pyinmana Township

AUTHOR (S) and AFFILIATION:

Aye Min¹, Htun Naing Oo², Ye Hla² Yee Yee Myint³, Soe Oo², Zeyar Lin², Than Naing² and Moe Aung²

¹Epidemiology Research Division, DMR (CM), ²DMR (CM); ³Pathology Research Division, DMR (CM)

SOURCE:

MHRC Programme and Abstract 2005; pp. 17-18

ABSTRACT:

KAP survey and bed net utilization survey among sample 742 respondents from 742 families of 30 clusters of Pyinmana Township were done at June-August 2004. In study families, 49.23% (1925) were male population and 50.77% (1985) were female population. Among 3910 householders, 2817 (72.05%) were ever bed net users. History of malaria is low in higher education level and high in illiterate group of family members. History of malaria attack was associated with age group of family members. Malaria attack rate was low in ever bed net users of householders. 48.4% of respondents knew the correct mode of malaria transmission. Correct knowledge for mode of malaria transmission was high in at least middle school exam passed respondent group, male group, 30-39 year age group, and teacher's occupation group. Knowledge for mode of transmission was high in persons with history of malaria attacks. Among 742 respondents, 401 (54.04%) knew the correct method for prevention of malaria (avoid mosquito bite). At least middle school exam passed respondents, respondents of more than 400,001kyats family income group and teacher's group had correct knowledge than others. Sex, educational level and type of occupation of respondents were associated with correct practice for malaria prevention. 55.48% of respondents knew that responsible person of malaria prevention is

everybody. Among 179 suspected malaria prevention cases of respondents, 36.31% took treatment from private clinics and 25.0% took self treatment. Some 73.18% of cases decided themselves, the health care provider from whom they want to take treatment.

TITLE- 178

Using Jame Spradley: “An Ethnographic Approach” to malaria in Myanmar

AUTHOR (S) and AFFILIATION:

Cho Cho Oo, Htein Lin and Alan Pearson

SOURCE:

13th Myanmar MMC Programme and Abstract 2005; No. 32: pp. 19

ABSTRACT:

The study is focused on perception, beliefs and practices related to malaria in the Shan ethnic group (Pa-Os) of Myanmar. The research aims to find out significant underlying principles of the problem within the Shan ethnic group in terms of perceptions, beliefs and practices towards malaria. The purpose of presentation is an ethnographic approach application description on malaria; knowledge sharing to get exchange health research methodology. The Myae Ni Kyin village of Kyone village tract in Pindaya Township, the Shan Thurae (Pa-O) people’s cultural health practices in malaria was learned by applying ethnography. The Developmental Research Sequence of Spradley was clearly used and the processes were described by focused field data. There are twelve stages in Spradley’s Developmental Research Sequence (DRS) but some of the stages are difficult to interpret because each DRS’s domain has many included terms. In conclusion, the methodology is useful tool for cultural learning about malaria from participants’ experiences. All of the findings are valuable to promote the identification of malaria control by using ethnography. There are primitive ideas and concepts on malaria, traditional ways in curative measures taking, use in indigenous and western style of health seeking behaviours. All of the findings can be applied in malaria control strategies effectively.

TITLE- 179

Promoting active community participation in relation to malaria prevention and control in Mudon Township, Mon State: Participatory Action Research

AUTHOR (S) and AFFILIATION:

Yin Yin and Myint Lwin

SOURCE:

13th Myanmar MMC Programme and Abstract 2005; No. 32: pp. 20

ABSTRACT:

This participatory action research was conducted in four villages of the Mudon Township in Mon State to explore the cost effective, local need based and comprehensive malaria control actions. In Phase 1, the situation was analyzed using conducting of FGDs among villages and rural health workers; In-depth interviews among authorities, village leaders and key persons; participant observation and documentary reviews in order to reveal the true scenario of malaria in each village. In Phase 2, these findings were

presented to village leaders, rural health workers and key villagers including representatives of NGOs at a special meeting. Then, an action committee was formed and future control plans were developed in each village. In Phase 3, health promotion activities such as releasing larvivorous fish into selected domestic wells; provision of health information to school children; door-to-door health teaching programs using audio- visual aids conducted by selected NGO member; erection of bill-boards regarding malaria; delivery of a one day workshop to Auxiliary Midwives on malaria; and dissemination of information on anti-malaria drugs to local medical vendors. Reanalysis of malaria situation was under taken in Phase 4 to identify differences between the two phases. In this short project the participants became actively involved in decision-planning, implementation and mobilization of available local resources as well as evaluation of malaria control activities. Women were more active than men were. The factors which inhibited active community participant's long cultural heritage of being in the passive role; the many competing demands of rural life; power differences between villagers and health personnel or between men and women; and general lack of resources. The findings suggest the need for a combination of the target oriented medical model and the empowerment model rather than a single approach.

TITLE- 180

The knowledge, attitude, and behaviour of military personnel regarding HIV/AIDS prevention and control in 18 Military Units from 9 Townships, 2004

AUTHOR (S) and AFFILIATION:

Nay Soe Maung, Tin Myo Han, Nay Tun Lin, Yan Naung, Win Naing, Kyaw Min Htike, Moe Myint Aung and Final Part (I) M.B., B.S. Students D.S.M.A

SOURCE:

13th Myanmar MMC Programme and Abstract 2005; No. 32: pp. 28

ABSTRACT:

A cross sectional descriptive study on knowledge, attitude and behavior of military personnel, regarding HIV/AIDS prevention and control was done in September, 2004. This study was conducted by staff from Preventive and Social Medicine Department, Defence Services Medical Academy and their Final Part I M.B.B.S medical students during residential field training. The study area included Yangon, Mandalay, Pathein, Inndine, Magwe, Taunggyi, Pyin Oo Lwin and Lashio. The sample size was 1549 military personnel from 18 military units. The results, findings and discussion will be presented.

TITLE- 181

Factors influencing the outcome of severe and complicated malaria in selected areas of Myanmar

AUTHOR (S) and AFFILIATION:

Zaw Lin

SOURCE:

Thesis M.Med.Sc (Public Health), UM (2), 2005

ABSTRACT:

A hospital-based, cross-sectional descriptive and analytical study was conducted in 17 study areas/hospitals with high endemicity and mortality throughout the country to investigate the factors influencing on the outcome of severe and complicated malaria among 272 total study cases attending to the study hospital with the diagnosis of severe and complicated malaria during study period i.e. August and September, 2005. The study tried to find out factors related to the outcome of severe and complicated malaria. The results of the study revealed that referral personnel, distance in mile to the hospital admitted, level of parasitaemia, presenting symptoms on admission and associated conditions have shown statistically significant association with the outcome of severe and complicated malaria whereas other factors such as age, sex, education level, occupation status, traveling history, bed-net and insecticide-treated mosquito net utilization, duration of fever before admission and transportation time in hour to the hospital admitted were found to be not associated with the outcome of severe and complicated malaria. The result of this study suggest that proactive efforts should be made for raising awareness, promoting knowledge through effective means of IEC, improving personal protective measure and practice as well as creating favorable conditions for early diagnosis and prompt and effective treatment, upgrading the facility and quality of health infrastructure and man-power, and coordinating the necessary measure in order to get achievement of aims and objectives.

TITLE- 182

Utilisation and cost of malaria treatment in Shan State, Myanmar, 2000

AUTHOR(S) and AFFILIATION:

Aung Kyaw Zaw

SOURCE:

Doctoral Thesis, PhD Tropical Health, School of Population Health, The University of Queensland, Brisbane, Australia, 2005

ABSTRACT:

The objective of the study is to analyse the economic costs incurred by malaria patients and households in seeking treatment, and patterns of, and factors influencing, treatment-seeking behaviour in response to a malaria episode by using quantitative and qualitative methods in Shan State, in Myanmar. Two surveys were conducted in Pindaya Township, (one of the 52 townships in Shan State) in Myanmar by collecting data from 648 malaria patients from 390 households in July and September 2000. Quantitative data were analysed by descriptive statistics followed by

analytical statistics with non-parametric statistics, logistic and multiple regression. Important findings are: most malaria patients sought treatment from the formal sector health services that accounted for about 80% of treatment seeking by malaria patients with 30.3% using public sources and 49.1% using private providers. Relatively few (20%) of patients self-treated, very few people (0.5%) reported using traditional medicines. Malaria patients with higher incomes were more likely to use public health facilities for the treatment of malaria compared to lower income group [OR = 1.02, 95% CI: (1.01-1.04)]. Among four different cost items for malaria treatment, drug cost was the highest (48%) and income loss and food costs were second (23%) and third (22%) in rank respectively. The overall average cost of seeking malaria treatment was very high, the average cost of treatment for an episode of malaria was equivalent to the amount earned by a wage earner working for 18 days a higher figure than in other countries studied. The average cost of seeking malaria treatment was highest for the hospital (US\$74.10 per an episode of malaria), community health workers (CHW) were the second most expensive source of treatment (US\$16.80) and private clinic the third (US\$16.40). Self-treatment was the cheapest option. The average number of days lost due to a malaria episode was 8.8 days. Delay in seeking treatment for malaria was associated with higher treatment costs. Many variables were found to have significant positive relationships with costs of malaria treatment but two variables, age of patient and experience of a malaria death in the household, did not have positive linear relationships. Among the factors influencing utilization of sources of treatment were per capita income of malaria patients, the means of travel to the health service and the income loss while seeking malaria treatment. Malaria patients with a high per capita income were more likely to use a public health provider than patients with low per capita income [OR = 1.02, 95% CI: (1.01-1.04)]. In seeking a public health provider, patients using a bullock cart or tractor/trailer were less likely to use a public health provider compared to those who walked [OR = 0.28, (0.13-0.61)] for bullock cart and [OR = 0.32, (0.12-0.86)] for tractor/trailer. Malaria patients with high income losses were more likely to use public health providers [OR = 1.07, (1.02-1.12)]. Malaria patients using bullock cart or tractor/trailer were more likely to use private health providers than those who walked [OR = 2.36, (1.20-4.65)] and [OR = 4.82, (1.77-13.11)]. Patients with moderately severe malaria were less likely to use private health providers compared to those with mild symptoms [OR = 0.37, (0.19-0.75)]. Those using additional services were more likely to self-treat malaria [OR = 35.76, (8.16-156.77)]. Child patients (<12 years of age) were less likely to use self-treatment compared to adult patients [OR = 0.45, (0.28- 0.71)], suggesting that parents tended to use health providers for treatment when their children suffered from malaria. Policy implications are:

- (1) To implement strategies to reduce economic burden of malaria to the community.
- (2) To encourage and evaluate the distribution of blister packaged antimalarials.
- (3) To implement ongoing training for the basic health staff, especially community health workers (CHWs).

- (4) To seriously consider a policy for a combination of private and public health services for the management of malaria cases while improving the quality of services and to ensure prompt and correct treatment of malaria to reduce morbidity and mortality of malaria in Myanmar.
- (5) To introduce training of shopkeepers in the correct dosages of commonly used antimalarials to improve malaria treatment of those who treat themselves.

2006

TITLE- 183

The effect of gender on knowledge of malaria in rural area of Laputta

AUTHOR (S) and AFFILIATION:

Tin Oo¹, JH Bryan², G. Williams², Ye Htut³, Pe Thet Htoon⁴, Khin Thet Wat⁵, Aye Aye Sein⁶ and Saw Lwin⁷

¹Parasitology Research Division, DMR (LM); ²School of Population Health, The University of Queensland (UQ), Australia; ³DMR (LM); ⁴International Health Division, MOH; ⁵Epidemiology Research Division, DMR (LM); ⁶DHP; ⁷DOH

SOURCE:

MHRC Programme and Abstract 2006; pp. 7-8

ABSTRACT:

To accelerate the downward trend of malaria prevalence in Myanmar, existing knowledge level should be monitored. Since, there is no study on links between gender and malaria knowledge, this study examined the knowledge on malaria and influencing factors on gender specific knowledge scores in eight villages, Laputta, in the year 2000. A case study design of sequential approach and integrated qualitative and quantitative methods was used. Structured interviews of 405 married couples on 33 knowledge items revealed: high responses for risk groups (72.3% of males vs 57.3% of females), major symptoms (over 80% of both sexes), early treatment of suspected malaria (over 95% of both sexes), complications in pregnancy (82% of male vs 79% of female), mosquitoes as malaria vectors (80.7% of male vs 73% of female), and 4 items on prevention (ranging from 66% to 99%). However, low responses were obtained for: recognition (53.6% of male vs 51.4% of female) and major complications of severe malaria (46.7% of male vs 40.5% of female), prevention in pregnancy 144 (51.6% of male vs 37.3% of female), and 3 items on mosquito vectors (ranging from 31% to 48%). The mean score for female was significantly lower than male (17.1±4.5 vs 17.9±3.7) (P = 0.001). Determinants of gender specific knowledge scores were identified by General Linear Model. The adjusted mean scores varied significantly by years of education and literacy skills among men whereas in women, the scores varied by education, seasonal employment and use of self-care manual. Thus, sub-groups should be identified and targeted for interventions to improve knowledge.

TITLE- 184

Cost effectiveness of insecticide treated net (ITN) as a strategy for control of malaria in Pyinmana Township

AUTHOR (S) and AFFILIATION:

Aye Min¹, Ye Hla², Yee Yee Myint², Pyone Lwin³, Maung Maung³ and Nwe Nwe Aye⁴

¹Epidemiology Research Division, DMR (CM); ²DMR (CM); ³Central VBDC; ⁴Mandalay Divisional VBDC Team

SOURCE:

MHRC Programme and Abstract 2006; pp.10

ABSTRACT:

Malaria ranks as the first priority disease in Myanmar. The present study was carried out to determine the costs of case management and implementation of ITN in control of malaria in order to improve the efficient use of resources for malaria control in Myanmar. Patient cost survey was carried out on 50 in-patients of Pyinmana Civil Hospital, 100 malaria suspected patients attending private clinics, 50 patients from station hospitals and rural health centres and 100 patients with self-treatment during 2004 June to December. Data collection for government cost analysis was done at Central, Divisional and Township levels. Two villages (Sal Kan and Kan Oo), five miles apart, were selected in a meso-endemic area at Pyinmana Township. Four hundred ITN (Delta-methrin 25%, 1.6mg) were distributed to villagers from Sal Kan village. At Sal Kan, a significant reduction in confirmed malaria cases was seen. The biting behavior of *An. minimus* also changed from indoor to outdoor and the peak biting time was changed from night time to late evening with preferences converted to animals. The average patient cost per suspected malaria case was calculated to be 23605.7 Kyats and the government costs for malaria management per patient was 180.82 Kyats at Pyinmana Township. These values are far more expensive as compared to use of ITN where a single ITN (including re-treating) was only 2344 Kyats. During the study period, a reduction in 62 confirmed malaria cases was documented in Sal Kan village contributing to a community saving of 1,463,553 Kyats. The present study highlights the cost effectiveness of ITN in malaria meso-endemic area of Myanmar.

TITLE- 185

Use of modern drugs and traditional medicine for malaria in Bago Division, Myanmar

AUTHOR (S) and AFFILIATION

Ohnmar¹, May Aye Than², Wai Wai Myint¹, Tun Min³, Thae Maung Maung¹ and San Shwe¹

¹Epidemiology Research Division, DMR (LM); ²Pharmacology Research Division, DMR (LM); ³VBDC Team, Bago Division, DOH

SOURCE:

MHRC Programme and Abstract 2006; pp. 15

ABSTRACT:

A cross-sectional study was undertaken in 21 villages of 5 townships, Bago Division in 2006 to determine the use of modern drugs and traditional medicine for malaria. Overall, 411 households with reported malaria fever within the last 3 months were selected. Qualitative information was obtained through informal conversation and focus group discussions. Locally available traditional medicine packets were collected. Modes of transmission of malaria by key household respondents included infected mosquito bite (79%), use of stream water (75%) and eating banana (47.7%). Only 9.2% could answer it correctly. Among 2096 household members, 507 (24.2%) reported history of malaria. Modern drug use (93.3%) was higher than traditional medicine (43.8%) and 78.4% of modern drug use was prescribed by health staff. None of the children under 5 used traditional medicine only. Modern drug use included artesunate/ artemether (64.2%), mefloquine (21.9%), quinine (5.8%), chloroquine (3.3%), sulfadoxine-pyrimethamine (3.3%) and antipyretics only (19.3%). One-fifth of artesunate use was self-treatment. Incorrect use of artesunate was 52%. The use of prepackaged modern drugs from local shops was 12.4% and some contained antimalarials. Some traditional medicine packets contained antipyretics like aspirin. Commonest reasons for traditional medicine use were usual practice (60.6%), perceived curability (57.1%) and unavailability of modern medicine (46.5%). Efforts should be made to improve availability and correct use of antimalarials through health staff and drug sellers. Avoidance of use of locally available ineffective packets should be highlighted.

TITLE- 186

Development of diagnostic criteria for *P. falciparum* malaria at primary health care level and field trial using artesunate-mefloquine combination therapy

AUTHOR (S) and AFFILIATION:

Zaw Myo Han

SOURCE:

Thesis Ph.D (Public Health) IM (1), 2006

ABSTRACT:

In malaria endemic areas where laboratory facilities are limited or absent, early diagnosis and prompt treatment depends on clinical diagnosis. A simple and reliable diagnosis clinical criterion is necessary to have early case detection and treatment to reduce malaria mortality. A field based case control study was conducted in Taikkyi Township, Yangon Division to determine the diagnosis criteria for *P. falciparum* malaria in the areas. Three age groups were divided (6 years and less age group, 7-12 year age group and 13 years and above age group) and clinical and parasitological findings are recorded using data collection format. Age group specific pyrogenic threshold parasite densities were calculated. Logistic regression was further applied to determine diagnosis criteria for respective age group using age group specific pyrogenic threshold parasite densities as malaria episode. For 6 years and less age group, pyrogenic threshold parasite density was calculated as >1600/ microlitre of blood. Using this threshold density as malaria episode, logistic regression was applied to clinical features that were indicative of malaria. It was found that fever- together with chills and rigor and anaemia were indicative clinical features and in the presence of these three features with parasite density corresponding to the threshold density, the probability of having malaria was calculated as 0.8. For 7 to 12 years age group, pyrogenic threshold parasite density was calculated as > 1400/microlitre of blood. Using this threshold density as malaria episode, logistic regression was applied to clinical features that were indicative of malaria. It was found that fever, together with chills and rigor, sweating and anaemia were indicative clinical features and in the presence of these four features with parasite density corresponding to the threshold density of this age group, the probability of having malaria was calculated as 0.88. For 13 years and above age group, pyrogenic threshold parasite density was calculated as > 1100/microlitre of blood. Using this threshold density as malaria episode, logistic regression was applied to clinical features that were indicative of malaria. It was found that fever, together with chills and rigor and palpable spleen were indicative clinical features and in the presence of these three features with parasite density corresponding to the threshold density, the probability of having malaria was calculated as 0.86. Artemisinin based combination therapy is widely used as effective first line treatment for uncomplicated falciparum malaria. In Myanmar, artesunate-mefloquine combination therapy has been chose as first line treatment for confirmed falciparum malaria but it has never been tested in a field trial. Therefore, a field trial using artesunate-mefloquine combination therapy was conducted in the same area applying the World Health Organization's

guideline for assessment and monitoring of antimalaria drug efficacy for the treatment of uncomplicated falciparum malaria (2003). Artesunate 4 mg/kg (single dose) for 3 days in combination with mefloquine 15 mg/kg on the first day and 10 mg/kg on the second day were given to 70 cases who met the criteria to be included in the trial. It was found that only 5 out of 70 cases had parasitaemia on day 2 but parasite densities were well below the respective initial parasite densities of day 0. No fever or parasitaemia was noted on day 3 in all cases indicating the absence of Early Treatment Failure (ETF). Throughout day 4 to day 28, neither fever nor parasitaemia was noted in all cases indicating the absence of Late Clinical and Parasitological Failures (LCF and LPF). Therefore, all included cases in the trial were found to have 100% Adequate Clinical and Parasitological Response (ACPR).

TITLE- 187

Parasitological and entomological indices of malaria in Ann Area, Rhakine State

AUTHOR (S) and AFFILIATION:

Thein Htay Win, Hein Hlwan Moe, Win Tint and Khin Maung Aye

SOURCE:

14th Myanmar MMC Programme and Abstract, 2006; No. 37: pp. 20

ABSTRACT:

Parasitological and entomological surveys were conducted in Ann area, Rakhine State during August, 2005 to September, 2005. Total sample of 921 subjects (both adults and children) from nine regimental units until were screened for the presence of malaria parasites. The prevalence rates of *P. falciparum* were 29.64%, *P. vivax* and mixed infection 0.5% and 2.97% respectively. *P. falciparum* infection was dominantly observed in both military personnel and families including children. *P. falciparum* gametocyte positive rate was the highest in regimental units of Sutsi and Ywathaya areas. Entomological surveys were conducted in nine regimental units and 15 *Anopheles* species were caught by cattle bait. *Anopheles barbiostris*, *An. phillipinensis*, *An. hyrcanus*, *An. vagus*, *An. maculatatus* and *An. culcifacies* were the most dominant mosquito species in those areas where as *An. annularis* the primary vector was caught only at two regimental units of Ingone area.

TITLE-188

Control of malaria using indoor residual spraying and insecticide treated bed-nets in No. 11 Defense Industry, 2005

AUTHOR (S) and AFFILIATION:

Htin Zaw Soe, Khin Oo Kyi and Khin Maung Aye

SOURCE:

14th Myanmar MMC Programme and Abstract, 2006; No. 38: pp. 21

ABSTRACT:

A field-based longitudinal study (post test only design) was conducted to evaluate the effectiveness of two control measures-indoor residual spraying (IRS) and insecticide treated bed-nets (ITNs) in control of malaria in No.11 Defence Industry from May to October, 2005. The study area was a malaria endemic forested hilly area as well as a highly restricted area situated in Taikkyi Township, Yangon Division, with an annual malaria incidence of 290 per 1,000 populations in last five years on average. A research team launched malaria control activities comprising IRS (DDT 75% WP and lambda-cyhalothrin 10% WP) and ITN (Deltamethrin 2.5% SC) at WHOPEs- recommended dosage, the first and foremost control of its kind ever in an isolated and restricted area of Myanmar military community in mid-May with subsequent monthly monitoring on entomological and epidemiological parameters. Simultaneously, local vector species identification and bi-monthly assessment of vector susceptibility against the insecticides were also under taken. At the end of the study period, there were a significant reduction of indoor man-biting rate (56% reduction) and malaria incidence on seasonal basis (81% case reduction) ($p < 0.005$). Most dominant anopheles vectors were identified as secondary ones- *An. hyrcanus* (51%) and *An. Barbirostris* (14%) out of eleven species and residual efficacy of IRS lasted about five months (percent mortality of *Anopheles* 67- 100%) and that of ITN six months (percent mortality 90%). This study had highlighted that combined use of IRS and ITNs in addition to currently used and poorly complied chemoprophylaxis (*Pyrixine* one tablet per week) in highly malarious and highly restricted military area could effectively protect the military personnel, their family members against malaria achieving the main goal of high defence productivity.

2007

TITLE- 189

Situation of strengthening malaria prevention and control among national races, Eastern Shan State, Myanmar, Greater Mekong Sub-Region

AUTHOR (S) and AFFILIATION:

Tin Oo¹, Myat Kyaw², Khin Thet Wai¹, Kyin Hla Aye¹, Ye Htut¹ and Than Tun Sein¹

¹DMR (LM); ²DOH

SOURCE:

MHRC Programme and Abstract 2007; pp. 4

ABSTRACT:

An operations research explored dimensions of strengthening malaria prevention, early diagnosis and prompt treatment (EDPT) in seven villages of Shan, Lahu and Akhar in Tarchileik, Mong Hsat and Mong Tone Townships in September, 2007. Five qualitative methods covered 150 discussants/interviewees revealing perspectives of both community and basic health staff (BHS). In Shan villages, majority listened to head men and elders while in Lahu and Akhar villages, preachers were the social leaders. Participatory discussions improved sense of ownership and taking responsibility for their own health. Knowledge of malaria was high but awareness of drug resistance was poor or none. Though villagers did not pay attention to malaria unlike in the past, they felt that the illness could drain away their energy. Major barriers in strengthening prevention and control measures included climate, altitude and distance, language difficulty, existing culture, traditions and habits. The BHS realized constraints for EDPT within 24 hours among those staying out in the farms and by some mobile populations and to ask each and every household to buy sufficient number of bed-nets. Bridges for implementation were adaptation and acceptance towards impregnation of bed nets and easy communication of community owned resource persons (CORP) to their local people. In conclusion, capacity building was satisfactory and effective in motivating community members to rely on rapid diagnostic technique (RDT). But still there were gaps in following treatment guidelines in RDT negative cases and to provide sufficient numbers of insecticide treated nets (ITN). Further implications were discussed on improved RDT results, use of ITN, intensifying local partners and project expansion.

TITLE- 190

Situation of malaria in Sinthay Rural Health Sub-Centre, Ponnagyun Township, Rakhine State from July, 2007 to October, 2007

AUTHOR (S) and AFFILIATION:

Nyan Hein Latt¹, Van Nay Lwe², Myat Phone Kyaw¹, Ye Htut¹, Than Win², Chan Thar², Leonard Ortega³ and Aung Than²

¹DMR (LM); ²DOH; ³WHO Country Office for Myanmar

SOURCE:

MHRC Programme and Abstract 2007; pp. 9

ABSTRACT:

Sinthay rural health sub-centre has coverage of 4 village tracts with 19 villages. A total population of 4872 were living in this area, in which 2 village tracts (Sinthay and Thet-kyine-taung) with population of 3455 lived in 9 villages were selected to study. Cross-sectional analytical study was applied to find out the prevalence of malaria. Research team consisted of one medical officer, one technician grade I and one PHS-2 who were assigned at the sub-centre from July, 2007 to October, 2007. All fever cases from these 9 villages were arranged to attend at clinic during this period. A total of 2004 cases (58% of total population) had been screened, in which 180 subjects (8.9%) were *P. falciparum* positive, 23 subjects (1.1%) were *P. vivax* positive, one case came with mixed infection (*P. falciparum* and *P. vivax*), one case with *P. vivax* and *P. ovale* and 8 cases with *P. malariae*. A total of 213 cases (10.6%) were malaria parasite positive. Out of 2004 cases, 212 subjects were under 5 children. In that group, *P. falciparum* positive rate was 5.6 %, *P. vivax* was 6.0%, *P. malariae* was 1.4%. Total positive rate was 13.2%. These children had no history of going outside the village, which indicated presence of local transmission in this area. The villagers had awareness of malaria but they took incomplete course of artesunate. The minority of the population were using bed nets. One of the preventive measures of these people was pipe-smoking, including young female who were accepting this habit. Most of the people were farmers and few were wood and bamboo cutters. They went to their farms closed to the mountains where they contracted malaria repeatedly as second attack of malaria was noted after 35 days of initial treatment. Most of the people were in video theatres during the peak biting hours (evening hours). Therefore, it is difficult to implement the vector control measures in that area and early diagnosis with prompt and effective treatment will be the better way to decrease the morbidity and mortality.

TITLE- 191

Participation of private general practitioners in disease management of malaria

AUTHOR (S) and AFFILIATION:

Thein Tun¹, Hla Soe Tint¹, Khin Lin¹, Saw Lwin², Than Win², Thar Htun Kyaw², Moe Kyaw Myint², Hein Myo Hter² and Thida¹
¹DMR (UM); ² NMCP, DOH

SOURCE:

MHRC Programme and Abstract 2007; pp. 12

ABSTRACT:

New antimalarial drug policy has been practiced in Myanmar with artemisinin based combination therapy (ACT) to be given to all falciparum malaria positives. Both public and private sectors were giving treatment to malaria patients. Objective of the study was to explore the participation of private General Practitioners (GPs) in disease management through educational intervention. 32 GPs in Singu, Madayar and Kyaukse Townships were given one day training covering relevant subjects. Monthly data collection was done by research team and focus group discussion (FGD) and in-depth interview (IDI) were carried out to collect additional information from GPs during June 2006 to March 2007. Simultaneously, Population Service International (PSI) introduced its franchising scheme at the GP clinics by providing ACT and Rapid Diagnostic Test (RDT) at a highly subsidized rate. Microscopic facilities were made available for GPs. Knowledge on disease management was significantly improved immediately after training and salient knowledge was retained up to the end of study period. Majority was making only clinical diagnosis before this study. GPs used RDT in 92.42%, microscopy in 3.07% and clinical diagnosis in 4.51% of 4458 patients. 47.73% (2082/4362) were falciparum positives, diagnosed mostly by RDT. 94.52% of them (1968/2082) were treated with artesunate and mefloquine combination. 60.08% (1249/2079) of falciparum negatives were treated as vivax malaria. Treatment completion rate among patients treated with ACT was 98.25% (1793/1825). Incomplete treatment rate among patients treated with 14 day-primaquine course was 15.93% (212/1331) and 56.25% (18/32) of GPs participated in this study. Number of malaria patients who took treatment at private GPs (i.e. 4463) was 2.2 times higher than those of public sector (i.e. 2039). This study revealed that by making availability of ACT and RDT at a reasonable price and giving an education intervention, GPs can actively participate in malaria disease management.

TITLE- 192

Compliance of Basic Health Staff (BHS) on National anti-malarial treatment guideline in selected townships of Upper Myanmar

AUTHOR (S) and AFFILIATION:

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SOURCE:

MHRC Programme and Abstract 2007; pp. 18

ABSTRACT:

In Myanmar, the new National Antimalarial Treatment Guidelines (NAMTG) was introduced in September 2002. The BHS are frontline workers to carry out early diagnosis as well as prompt and adequate treatment of malaria at the community level. This study assessed the level of compliance of BHS on NAMTG. Study areas were Singu, Thabeikkyin, Patheingyi, and Moegoke Townships. It was conducted from June 2006 to September 2007. It was a cross-sectional descriptive study. A total of 144 BHS were studied and 103 BHS (71.53%) had good knowledge and 41 BHS (28.47%) had poor knowledge on NAMTG. 113 out of 144 BHS (78.5%) well complied and only 31 BHS (21.5%) poorly complied. Male BHS (Crude OR = 4.78), attending university or graduates (Crude OR = 1.67), working at Township Health Department or RHCs (Crude OR = 4.27), and BHS who thoroughly understood the essence of NAMTG (Crude OR = 6.06) were more likely to comply on NAMTG. The RDT allotment for each BHS was 14.2 ± 7.9 per month. 99 out of 144 BHS were receiving an adequate amount of RDT. Average ACT allotment for BHS was 2.6 ± 3.0 per month. If BHS were supplied an adequate amount of RDT and ACT, they were 15.17 times more likely to be efficient health care providers at the community level. According to multivariate analysis results if BHS with good knowledge on NAMTG (Adjusted OR = 12.24) were supplied with adequate RDT and ACT (Adjusted OR = 14.51) while other variables were kept remained constant ($R^2 = 0.35$, $P < 0.001$), they were very likely to be effective healthcare providers in disease management of malaria according to NAMTG. Upgrading knowledge level of BHS accompanied by adequate and uninterrupted supply of RDT and ACT were paramount importance to comply on NAMTG at the community level.

TITLE- 193

Role of drug shops in malaria control

AUTHOR (S) and AFFILIATION:

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SOURCE:

MHRC Programme and Abstract, 2007; pp. 28

ABSTRACT:

Antimalarial drug selling pattern should be improved to achieve prompt and effective treatment at the community level. The study was aimed to assess the effectiveness of educational intervention activities among the drug sellers in study townships compared to those in control townships. Intervention was introduced by conducting one-day workshop on latest antimalarial treatment guidelines in Kyaukse, Madayar and Singu Townships while Thabeikkyin, Pyin Oo Lwin, and Myitthar Townships were regarded as controls. Drug sellers were continuously encouraged to sell antimalarial drugs according to guidelines and the constraints were identified and solved during monthly visits of research team. This study was conducted from May, 2006 to April, 2007. Local drug sellers were made understand that selling antimalarials according to the guidelines would cure the disease, and prevent the emergence of drug-resistance malaria. Forty six drug shops in intervention townships and 65 drug shops in control townships were included in the study. It was found that number of full-course drug selling episodes in intervention townships exceeded than that of control townships (14,692 vs 10,819). 5,493 consumers who initially intended to buy a partial-course were successfully advised to take a complete-course in intervention townships with only 1,760 in control townships ($P < 0.001$). 836 versus 93 episodes of selling ACT (self-combined, full-course) took place in intervention and control townships respectively ($P < 0.0005$). The reasons for selling partial-courses included high price (44.2%), customers' habit (10.9%), and customers' belief on antimalarials as dangerous drugs (17.7%). The majority (over 70%) of the partial courses was sold for self-medication. It was found that the local drug sellers can contribute to some extent in malaria management as a health educator in the community.

TITLE- 194

Risk factors influencing malaria mortality in Pyin Oo Lwin district

AUTHOR (S) and AFFILIATION:

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¹DMR (UM); ²DOH

SOURCE:

MHRC Programme and Abstract 2007; pp. 33

ABSTRACT:

Malaria control program in Myanmar set the objective of reducing malaria morbidity and mortality 50% by 2010 taking the year 2000 as baseline. In planning and implementing the disease management components, understanding the risk factors of severe and complicated malaria cases is paramount importance. Identifying risk factors at their earliest stage of manifestation can prevent further deteriorations and mortality. A hospital based prospective study was conducted. All admitted malaria cases (n = 822) in Pyin Oo Lwin District were studied during 1st September, 2005 to 31st August, 2006. Among them, 47.4% (n = 390/822) were severe and complicated malaria cases. 56 patients expired. Univariate analysis results revealed: Adults (>14years) (Crude OR = 1.97), history of travel to malaria endemic areas (Crude OR = 1.8), no past history of malaria (Crude OR = 3.84) presentation with fits (Crude OR = 2.18), treatment seeking with untrained healthcare providers (Crude OR = 4.6), duration of illness more than 3 days (Crude OR = 5.55), without clinical spleen enlargement (Crude OR = 3.01), with deep jaundice (Crude OR = 1.76), oliguria (Crude OR = 4.33), heavy parasite density (Crude OR = 8.15), those needed complicated ancillary treatments (Crude OR = 2.08) were more likely to die of malaria. Multivariate analysis results revealed: no past history of malaria (Adjusted OR = 7.5), treatment seeking with untrained healthcare providers (Adjusted OR = 4.4), duration of illness more than 3 days (Adjusted OR = 8.2) and heavy parasite density (Adjusted OR = 4.7) were more likely to die of malaria.

TITLE- 195

Opinions towards options for social movements concerning with early diagnosis and prompt treatment in response to new antimalarial policy guidelines in Myanmar

AUTHOR (S) and AFFILIATION:

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SOURCE:

Report 2007. Funded by Alliance for HPSR, WHO (Project ID 1.307)

ABSTRACT:

Problem: Seeking for diagnostic facilities and appropriate treatment in endemic areas following introduction of new antimalarial treatment policy in Myanmar in 2003 is questionable. Strong and dynamic partnership among key stakeholders and mechanisms for inter-sectoral co-ordination for social

movements need to be assessed. Thus, this research encompasses efforts and constraints encountered by stakeholders and factors influencing community acceptance of various options in social movements focusing early diagnosis and prompt treatment (EDPT). *Methods:* A case study design was used conducting 33 in-depth interviews and 600 structured interviews during household opinion survey between 2005 and 2006 covering six villages in three malaria endemic areas of the country, document reviews and non participant observations. *Findings:* Options identified were creating partnerships between stake holder groups, continuing advocacy, contribution of village fund and awareness raising activities. Deep knowledge in EDPT and trust towards the BHS could attract the interest of village authorities in consensus building. Rural health sub centres (40%; 241/600) and general practitioners' clinics (58%; 343/600) were mostly known by respondents as specific places to acquire EDPT. Nearly 53% (316/600) were fully aware of diagnostic microscopy but not of 'Rapid diagnostic test' (3%; 20/600). Some 86% (518/600) provided their opinions that there should be strong links among health staff, volunteers and NGOs in the village to enhance the acceptance of EDPT services. Over 90% thought that people will accept EDPT services more if they get full information, if only diagnostic facilities were available at their village, the acceptance of EDPT services might be improved and if only antimalarials were available at a reasonable price, people will try appropriate treatment for suspected malaria. Household literacy, formal schooling, previous use of EDPT services, and gender had significant positive correlations with opinion scores. *Conclusion:* Whether the area was high, moderate or low endemicity for malaria, enabling factors for community acceptance in strategies related to social movements in EDPT did not differ. Appropriate partner organizations were essential for effective planning and implementation of social movements. Moreover, ways to collaborate and negotiate among each other was to be strengthened for an integrated works in social movements for EDPT. With limited available resources in the NMCP, there was a demand for new mechanisms in rural areas to prevent weak or lack of co-ordination in social movements.

2008

TITLE- 196

Knowledge, attitude and practice study on malaria in 4 different malaria endemic areas in Myanmar

AUTHOR (S) and AFFILIATION:

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SOURCE:

MHRC Programme and Abstract 2008; pp. 10

ABSTRACT:

Studies pertaining to knowledge, attitude and practices (KAP) showed that direct interaction with community plays an important role in circumventing malaria problem. So, to assess the KAP status on malaria in 4 different malaria endemic areas, a cross sectional study was carried out using a pre-coded questionnaire and face to face interview method. A total of 611 residence from Kachin, Kayin, Mon and Rakhine States were studied from June 2007 to November 2007. 60% of them were male and 40% were female. Most of them (53%) were Basic Education High School (BEHS) level. Over half of them (64.3%) had 4-6 family members. The nets were washed frequently (over 10 times per year). Just only 2.62% of respondents said that they had no nets but 28.8% of them used it only in rainy season. Some still did not have clear cut knowledge on transmission of Malaria and said that drinking or bathing of stream water, taking banana and some fruit can be a route of transmission. Most of them got the knowledge on malaria from friends and relatives leading misunderstanding and false beliefs. Regarding the practices, 7% have even done the needle prick (မက်ကလောင်ဖောက်ခြင်း) and 6.7% have tried self treatment. No correlation was found between sex and KAP status (p values: 0.81, 0.72 and 0.82 respectively). But there was a correlation between education level and knowledge status (P = 0.004). It is necessary to increase the KAP status on malaria and remove the false beliefs by proper health promotion and education especially in endemic remote areas.

TITLE- 197

Assessment of counselling services of general practitioners from 21 selected townships of Myanmar for 3 Diseases: Malaria, Tuberculosis, and HIV/AIDS in 2008

AUTHOR (S) and AFFILIATION:

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¹SCME Project, MMA; ²GP Society and Coordinator of PPM-DOTS Project, MMA; ³HIV/AIDS, MMA; ⁴Malaria and TB Project, MMA

SOURCE:

MHRC Programme and Abstract 2008; pp. 21

ABSTRACT:

A cross-sectional descriptive and analytical study was conducted to assess counselling services of general practitioners (GPs) and their constraints using pre-tested self administered questionnaires for 3 Diseases (malaria, TB, and HIV) during June to October 2008. 125 GPs from 21 townships participated in the study. 77 out of 125 GPs (62%) received counseling training from Myanmar Medical Association, International Non Governmental Organizations, disease control teams and colleagues. Some 24.8% of GPs have separated rooms for counselling. There were significant difference between district townships and townships of Yangon Division regarding the existence of counselling rooms ($\chi^2=7.72$, $P = 0.02$) but not different in training ($\chi^2=1.87$, $P = 0.59$). The GPs practiced counseling services in clinical practice (78%), separately (2.4%) and in both situations (16%) and keeping counselling records (13%). The GPs counselled about prevention and treatment of malaria (54%), about tuberculosis emphasized on Direct Observed Treatment Short Course (73%) and about prevention and treatment of HIV /AIDS (69%). Constraints for counselling were time limitation and need for separate room (77%), patients' factors (5%), insufficient support and advanced intervention after counselling (2%). Suggestions to conduct effective counselling are to provide more training (67%), to give technical and material supports (26%). About 62% of GPs accepted that counselling is essential to establish doctor patient relationship. In conclusion, advanced counselling training for malaria, TB and HIV should be provided for GPs. Technical and logistic support for both counsellors and clients may be also pivotal. Follow up constructive supervision by technical experts should be planned to evaluate effectiveness of counselling.

TITLE- 198

Long lasting insecticidal nets (LLINs): a simple effective personal protective measure for malaria prevention

AUTHOR (S) and AFFILIATION:

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¹DMR (LM); ²DOH

SOURCE:

MHRC Programme and Abstract 2008; pp. 58

ABSTRACT:

A community based intervention study was carried out in two villages of Zayat Hla Station Hospital area in Padaung Township, Bago Division from June 2002 to June 2003 to assess the utilization and effectiveness of long lasting insecticidal nets (LLINs). Tha Bye Gone Village was selected as test village and Kyee Pin Village was selected as control. The main vectors of the area are *Anopheles dirus* and *Anopheles minimus*. Blood slides for malaria parasite were taken from the whole population of the two villages. All 2-9 years old children were examined for spleen enlargement. Thirty percent of households were interviewed with structured questionnaire. Ninety four percent of families in the test village used LLINs throughout the year. Malaria cases were significantly decreased in the test village after intervention (P<0.05). There was 69 percent reduction in parasite positive rate among children younger than 10 years old (P<0.01). Overall reduction in parasite positive rate was 61% after intervention (P<0.001). Spleen positive rate decreased from 34.5% to 10.25% in the test village after intervention. It was found that LLINs could effectively reduce malaria transmission in the study area.

TITLE- 199

Study of utilization of rapid diagnostic tests by community health workers and acceptance of the served community of the diagnostic tests in remote malaria endemic areas

AUTHOR (S) and AFFILIATION:

Htin Zaw Soe¹, Aye Min², Ye Hla¹ and Aye Ko Ko²
¹DMR (CM), ²Township Health Department, Pyinmana Township

SOURCE:

The MHSRJ 2008; 20(2): pp. 75

ABSTRACT:

A descriptive study using quantitative and qualitative methods was conducted in seven remote malaria-endemic villages of Pyinmana Township, Central Myanmar from September 2006 through May 2007 with the main objective of studying the utilization of rapid diagnostic test (RDT) for malaria in remote endemic areas by community health workers (CHWs) and the community. The study revealed that RDT, 'HEXAGON MALARIA COMBI' has a good efficacy (sensitivity 88.64%, specificity 88.89% and accuracy 88.68%) emerged under an enthusiastic endeavour by seven CHWs among fifty-three study subjects of clinically suspected malaria. It was also noted that RDT was well-utilized by CHWs and well-accepted by

the served community. It is concluded that RDT should be equipped to CHWs together with appropriate anti-malarials under the supervision of one of the basic health staff to ensure early diagnosis and effective treatment for the cases suffering from deadly malaria in remote endemic areas.

2009

TITLE- 200

Socio-behavioral study on malaria prevention and control among forest related workers in hard to reach areas

AUTHOR (S) and AFFILIATION:

*Moe Kyaw Myint, Khin Lin, Hla Soe Tint, Myitzu Tin Oung, Thi Thi Khaing, Khin Htet Zin, Aye Hnin Thwe and Marlar Aung
DMR (UM)*

SOURCE:

MHRC Programme and Abstract 2009; pp. 16

ABSTRACT:

This study was done to identify socio-behavioral risk factors of malaria among the forest related workers in hard to reach areas of Pyin Oo Lwin Township. Community based cross-sectional survey was carried out by collecting data on socio-demographic characteristics, knowledge, attitude and practice of forest related workers and their behavior using both quantitative and qualitative approaches. Study population consisted of forest related workers in hard to reach areas of the township. Face-to-face interviews with forest workers were conducted using pre-tested, closed-ended questionnaires. Focus group discussion with forest workers was also conducted using thematic guidelines concerning malaria. A total of 204 forest related workers were studied. Among them, 149 (73%) had history of malaria and only 55(27%) were free from malaria in the last two years. A total of 141 (69%) workers did not use bed nets. Old aged persons who were frequently living in the forest without using bed net had greater risks for getting malaria infection than the bed net users ($P = 0.001$). Their reasons for not using bed nets were being not affordable and not convenient for location of bed nets in the forest. According to the recommendations, the forest related workers should be supplied with specific kind of bed nets which are convenient for use in the forested sites.

TITLE-201

Prevalence and knowledge, attitude and practice (KAP) of malaria and insecticide treated bednet (ITN) in Mingone Village, Yangon Division

AUTHOR (S) and AFFILIATION:

Chit Soe, Myo Lwin Nyein, Mar Mar Kyi, Aye Tun, Mg Mg Thant, Sithu Kyaw and Yeminthu
Technical Working Group, MMA, Malaria Project

SOURCE:

55th Myanmar Medical Conference, Programme and Abstract, 200; pp. 70

ABSTRACT:

This study was done in Mingone Village, Yangon Division which located within 10 miles of Bago Yoma, one of the malaria endemic areas. On 10th Feb 2008, out of the 927 houses from 4 quarters of the village, we randomly choose 100 houses on the map of village council office. Three to four members of the house were randomly choose on arrival to that house by asking them to pick the coloured pencil with code. After getting informed consent, blood for MP by paracheck was done to every participant (total 343) and KAP questions were filled via one by interview. *Results:* Out of 4,830 populations, 343 villagers were RDT tested and, 8 found to be falciparum positive indicating point prevalence of 23.3/1000. Regarding the knowledge, 99.1% of people know the name of malaria, while 88.7% know that is fatal. As for the cause of malaria, 0.3% thought that malaria can get from eating banana, 1.8% from food, 3.1% from going to forest, and 8% by drinking spring water. Only 51.2% of respondents knew that malaria is transmitted by biting mosquitoes. Some 23.6% of people give combined answer i.e. malaria can be caused by drinking, eating and biting by mosquitoes. For the prevention knowledge of malaria, 10% of people assumed that using coils and repellents can prevent malaria, 66.6% of people by using mosquito net to prevent malaria, 2% thought by doing environmental sanitation while only 1% knew by using ITN, the last (20%) confessed being not known about prevention of malaria. About 60% of people had known the name ITN, among them only 4% use it. Among 343 villagers 65.8% of people have bed net for each one. There is no significant association between KAP and age group, and also on the sexes. Lower KAP score was not found to be associated with education level. *Conclusion:* KAP score about malaria for a villager living in an endemic area is relatively low. Bed net occupancy of 2.5 nets per household is similar to the national figure, but even then, only 65% of them had bed nets for each one.

TITLE- 202

Qualitative research of knowledge and practice of malaria and insecticide treated net (ITN) in Mingone Village, Yangon Division

AUTHOR (S) and AFFILIATION:

*Chit Soe, Sabai Phyu, Mar Mar Kyi and Aye Htun
Technical Working Group, MMA, Malaria Project*

SOURCE:

55th Myanmar Medical Conference, Programme and Abstract, 2009, pp. 71

ABSTRACT:

This study was done in Mingone village, Yangon Division which located within 10 miles of Bago Yoma, one of the malaria endemic areas. Two focus group discussions (FGD) of nine villagers in each group followed by in-depth interview of five key villagers on 10th Feb 2008 at Mingone Village Maternal and Child Health (MCH) center. Objectives are to explore the knowledge and practice of malaria disease and that of ITN and to probe their opinion regarding usage of bed net and obtaining ITN. The FGD participants knew malaria can be chronic and locally called old fever (Phya-O). They pointed out malaria as endemic and can happen in those who stay in village although more common in those who work in forest. They also have noticed malaria severity is related to immunity by saying that if a villager caught malaria, he will usually recover, but if it caught migrant workers, they tended to become unconscious and die. Knowledge of ITN found to be low and practice is very sparse. Although most of them use bed net at home, they do not want to carry nets while going to forest because of difficulty in finding a suitable place to place the net and because of lack of knowledge of association between mosquito bite at night and malaria. 38 years old graduate housewife mentioned, "I have heard about ITN but I have not seen one" and it was found that Super Tab (chemical used for ITN) was not practically available in Mingone village even in drug vendor. We need to scale up health education and material support to reach pocket places in Yangon Division where malaria is still endemic.

TITLE-203

Utilization of basic health staff by rural community in disease management of malaria

AUTHOR (S) and AFFILIATION:

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¹DMR (UM), ²DOH*

SOURCE:

The MHSRJ 2009; 21(2): pp. 88-92

ABSTRACT:

This study aimed to assess the utilization of basic health staff (BHS) by rural community in disease management of malaria. A community-based cross-sectional analytic study was conducted from September 2007 to September 2008 at selected malaria endemic areas of five townships in Mandalay Division. A total of randomly selected 1500 heads of household or family members aged over eighteen years and 153 BHS were included in this study.

Among 153 malaria cases, 33.3% of patients utilized BHS. Only 18.3% knew the availability of proper anti-malarial treatment with BHS. In multivariate analysis, locally contracted malaria, affordable traveling cost, reasonable treatment cost, domiciliary treatment service, shorter duration of treatment and knowledge on availability of anti-malaria treatment at BHS are significantly associated with utilization ($P < 0.05$). Parallel to maintenance and strengthening BHS services including domiciliary care, information on availability of anti-malaria treatment with BHS should be given to community.

TITLE: 204

The effect of insecticide-treated bed-nets on the incidence and prevalence of malaria in an area of unstable transmission in western Myanmar

AUTHOR (S) AND AFFILIATION:

Frank Smithuis¹, Moe Kyaw Kyaw¹, Ingrid van der Brock¹, Nina Katterman¹, Ohn Phe¹, Colin Rogers¹, Patrick Almeida¹, Piet Kager², Julie A Simpson^{3,4}, Nicholas J. White^{3,5}

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SOURCE:

Treating and preventing malaria in Myanmar, Medicine sans Frontieres-Holland 2009; pp. 73

ABSTRACT:

Background: Insecticide-treated bed-nets (ITNs) reduce malaria morbidity and mortality consistently in Africa, but their benefits have been less consistent in Asia. *Methods:* A cluster-randomized trial was conducted in Rakhine state (western Myanmar) to assess the efficacy of ITNs in preventing malaria and anaemia. The data were aggregated for each village to obtain cluster-level infection rates in total 8175 children under 10 years of age were followed up for 10 months, which included the main malaria transmission period. The incidence and prevalence of *P. falciparum* and *P. vivax* infections, and the biting behavior of Anopheles mosquitoes in the area were studied concurrently. *Results:* Malaria infections, spleen rates, haemoglobin concentrations, and weight for height, did not differ significantly during the study period between villages with and without bed-nets. The limited efficacy of ITN may be explained by the biting behaviour (peak biting time between 6 and 7 pm, mainly outdoors) of the most common Anopheles mosquito vectors in this area. *Conclusion:* Given the lack of significant efficacy and relatively high material costs of ITN, early diagnosis and effective antimalarial treatment is more cost effective than deployment of ITN in western Myanmar.

TITLE: 205

The development and results of a large-scale malaria project in Rakhine State, Myanmar

AUTHOR (S) AND AFFILIATION:

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SOURCE:

Treating and preventing malaria in Myanmar, Medicine sans Frontieres-Holland 2009; pp.107

ABSTRACT:

Artsen zonder Grenzen (AZG) has carried out a large malaria project in Rakhine State (and to a lesser extent in Kachin and Shan State), in Myanmar since 1993. Activities focused on early microscopic diagnosis and effective treatment of malaria in clinics of the Department of Health and through mobile malaria clinics by boat in remote areas, where the accessibility to health facilities is limited. Thorough monitoring was put in place to make sure that the services reached the population and misuse of donor money was limited" Research was performed to identify effective treatment regimen and to assess the effect of insecticide treated bednets. This project has provided a diagnostic test for malaria to more than two million people and a very effective artemisinin combination treatment to more than one million patients with confirmed malaria (850,000 in Rakhine, 200,000 in Kachin and Shan). The research performed has assured that highly effective treatment regimens were used in this project and lead to important changes in the national malaria treatment policy.

TITLE- 206

An epidemiological study of malaria in military community of Thebeik Kyin Township in 2009

AUTHOR (S) and AFFILIATION:

Aung Bann

SOURCE:

Thesis M.Med.Sc. (Public Health), DSMA, 2009

ABSTRACT:

A community based cross-sectional study on epidemiological survey of malaria was carried out in Thabeikkyin cantonment area, Thabeikkyin Township from July to October 2009. Malariometric survey for determination of endemicity was done on 2 to 9 years aged group of preprimary and primary school children of Aung Chan Thar village tract. A total of 225 participants were examined for spleen rate and their blood films were checked for parasite rate. The epidemiological study malaria was done on CSM cases from all four Units of Thabeikkyin cantonment. The sample size was 225. Their blood films were thoroughly checked and slide positivity and types of parasite species were recorded. Entomological survey was also done in the cantonment area during the studied period. Thabeikkyin cantonment area was situated in malaria endemic area with monsoon forest favourable for mosquitoes breeding and endemic malaria. The spleen rate in

2 to 9 years old primary school children was 29.33%. Average enlarge spleen was 1.6. Out of 225 subjects 66 spleens were palpated. Among the palpable spleen, about 66.67% were class 1 spleen and 21.21% were class 2 spleen and each class 3 and class 4 were only 7.58%. Spleen rate in different sex groups was 34.29% in male and 25.0% in female. According to spleen rate Thabeikkyin was situated in malaria mesoendemic area. Therefore Thabeikkyin cantonment area was also situated in malaria mesoendemic area. Slide positivity rate in military community was 16.44%. There were two main types of parasites species in this area. These were *P. falciparum* and *P. vivax*. There were no evidences of *P. ovale* and *P. malariae*. Distribution of malaria infection among different units showed that the unit A which was situated in Kyaukkyi reserved forest got 18.67% slide positivity and 12% Sfr; the unit B near Aung Chan Thar village got 9.33% slide positivity and 6.67% Sfr; the unit C which was situated in Shwe Oo Daung reserved forest got 20.37% slide positivity and 11.11% Sfr and the unit D which is situated in Kyaukkyi reserved forest got 23.81% slide positivity and 19.05% Sfr. This showed malaria infection rates were increased in the units which were situated in forest area. In vector species, 9 kinds of anopheles vector species were found. These are *An. minimus*, *An. annularis*, *An. culicifacies*, *An. aconitus*, *An. maculatus*, *An. philippinensis*, *An. babirostris*, *An. theobaldis* and *An. hyrcanus*.

2010

TITLE- 207

Effects of insecticide-treated nets (ITN) on malaria in pregnancy in Thaton District

AUTHOR (S) and AFFILIATION:

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¹DMR (LM); ²NMCP, DOH

SOURCE:

MHRC Programme and Abstract 2010; pp. 3

ABSTRACT:

Malaria in pregnancy is a major contributor of maternal morbidity and mortality though it is preventable. In order to study the effects of ITN, malaria related parameters were collected by applying Rapid Assessment Tools (WHO 2004) in two Rural Health Centers (RHC) of ITN project implemented areas (study area) and another two RHCs with no ITN project (control), of Thaton District, during 2008-2009. A total of 101 delivery cases (50 from Control, 51 from study area) and 113 antenatal care (AN) cases (61 from Control, 52 from study area) were recruited. Malaria prevalence rates of AN cases and delivery cases were higher in control area than study area (11.5% vs 7.7%, and 12% vs 7.8%). Reported ownership and use of ITN was significantly higher in the study area than control. It was true in both malaria positive (P = 0.0005) and negative group (P = 0.03). Placental malaria rate

was higher in control than study area (14% vs 11.8%). Use of ITN was more reported among placental malaria negative group ($P = 0.0005$). Proportion of pregnant women with low birth weight babies (LBW) was double in control area than study area (8.0% vs 3.9%). All women with LBW babies, and all placental malaria positive women were ITN non-users. In comparison with base line data collected (2004-2005) before ITN project, proportion of LBW babies and anemia prevalence were significantly reduced ($P = 0.017$, and $P = 0.0005$) although placenta malaria was slightly reduced (11.8% vs 15%). The findings of this study highlighted some beneficial effects of ITN on malaria in pregnancy.

TITLE- 208

Validation of malaria diagnosis and treatment made by basic health staff in sub-centres

AUTHOR (S) and AFFILIATION:

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Maung Maung Naing² and Kyaw Zin Thant¹*
¹DMR (UM); ²VBDC, DOH

SOURCE:

MHRC Programme and Abstract 2010; pp. 9-10

ABSTRACT:

Malaria is regarded as the top ranking health problem in Myanmar, while prompt diagnosis with effective treatment is vital for control of malaria. Rapid Diagnostic Test RDT (Paracheck test) detecting *P. falciparum* antigen has been widely used in public health centres since early 2002. The study was done in sub-centres of Pyin Oo Lwin Township and Myit Kyi Nar Township to assess the validation of malaria diagnosis and treatment rendered by basic health staff. Microscopic examination of Giemsa stained thick film slides was done to all RDT tested patients seeking treatment in the sub-centres. The findings showed that among 259 patients tested, diagnosis for *P. falciparum* had sensitivity 52/65 (80%), specificity 177/187 (94.7%) while for *P. vivax* had sensitivity 30/35 (85.8%) and specificity 90.8 %. Overall sensitivity for all species of malaria had 82/100 (82%) and specificity 122/152 (80.2%). One impending severe falciparum malaria case was missed by basic health staff and patient was not referred in time. Thus, the study showed that although using RDT could detect malaria with overall sensitivity 82% and specificity 80.2% in the health centres, refresher training of basic health staff should be continued to follow the instructions of national treatment guidelines properly.

TITLE- 209

Malaria in Myeik District: Feasibility of health and health related community networks in mobilizing early diagnosis and prompt treatment

AUTHOR (S) and AFFILIATION:

Tin Oo¹, Myat Phone Kyaw¹, Khin Thet Wai¹, Ni Ni Aye², Kyin Hla Aye¹, Moe Thida¹ and Tin Tin Wai¹

¹DMR (LM); ²DOH

SOURCE:

MHRC Programme and Abstract 2010; pp. 60

ABSTRACT:

The case study design of sequential approach was conducted from October to November, 2009 in Myeik district, Tanintharyi Region to analyze the feasibility of health and health related community networks in mobilizing early diagnosis and prompt treatment (EDPT) of malaria. Initially, the multidisciplinary research team transferred knowledge on malaria transmission and drug resistant malaria to facilitate participatory discussions. 61 representatives from five stake-holder groups joined discussions using Social Analysis System methods. Responses to questionnaire provided before and after discussions showed 21-28% increased knowledge for antimalarials ($P < 0.0001$); 18% increase for rapid diagnostic test (RDT) ($P = 0.0007$); > 30% increase for malaria parasites ($P = 0.0005$); 20% increase for drug resistance ($P = 0.002$) and improved intended practices ($P < 0.05$). Subsequently, 400 respondents from 4 villages of 2 village tracts were interviewed. Multi-stakeholder discussions revealed traditional beliefs, inadequate knowledge, rooted habits of self-medication, poverty, mobility, transport difficulty and weak co-ordination between them as underlying causes. Feasible options identified were channeling information for good knowledge through trained volunteers, and arrangements for easy availability of RDT and potent antimalarials. Likewise, nearly 65% of villagers during structured interviews realized that partnership with stakeholder groups was essential for EDPT. Villagers also had high opinion score towards social mobilization by strong co-ordination with stakeholder groups for EDPT (8.3 ± 2.2). In conclusion, knowledge transfer to multi-stakeholders was effective. And EDPT for malaria in remote villages could be sustained by intensifying partnership driven intervention delivery mechanisms through well coordinated, influential multi-stakeholder groups in the locality equipped with comprehensive information.

TITLE- 210

Treatment seeking behaviour of malaria patients admitted to Loikaw State Hospital

AUTHOR (S) and AFFILIATION:

Tin Tin Yee, Cho Mar Lwin and Chit Soe

SOURCE:

56th Myanmar Medical Conference, Programme and Abstract 2010; pp. 49

ABSTRACT:

Aim: To determine treatment seeking behavior of malaria patients admitted to Loikaw State Hospital; *Study:* A cross sectional descriptive study of consecutive patients admitted to Loikaw State Hospital during October 2009 to December 2009 *Result:* During the study of 68 malaria patients, 27 patients (40.3%) were female and 40 patients (59.7%) were male. Among them, Kayar race is the most with 37 patients (55.2%), followed by Bamar with 10 patients (14.9%) and Shan with 7 patients (10.4%). The rest, Pa-O, Ka Yin, Gaw Ra Khar, Inn Thar and Pa-Daung are total of 19.4%. According to survey by type of malaria, 27 patients (40.3%) are confirmed uncomplicated malaria, 23 patients (34.3%) are probable severe malaria and 17 patients (25.4%) are confirmed sever malaria. On studying initial treatment seeking of malaria, self treatment is 4/68 (6%), quack treatment is 5/68 (7.5%), treatment by community health workers is 23/68 (33.8%) and treatment in GP is 6/68 (8.8%). Treatment taken by more than one step before hospitalization was 14/68 (20.6%). One patient has crossed 4 steps before reaching hospital. Recognition of severe malaria condition and referral indicated that 15/68 patients (33.3%) recognized their diseases at Loikaw State Hospital and 9/68 patients (20%) recognized by community health workers. Some recognized by themselves and some by station/township hospital with 17.8% each case. Pre-hospital fever day differs according to patients address, means of transportation to hospital and affective transportation time. Only 9 (13%) of patients reached hospital within 24 hour and 36/68 patients (53%) suffered prolong pre-hospital fever day for more than 3 days. Only 22-24% of patients lived at Loikaw downtown and within 5 miles areas. The patients 37/68 (54%) who lived at beyond 5 miles from Loikaw can have more prolong pre-hospital fever day. Some 40.3% patients came to hospital by car, 25.4% by trawlergyi and 16.4% use motorcycle. Prolonged transportation time usually takes 4 hours by 11/68 patients (16.4%), 3 hours by 3/68 patients (4.5%). 40/68 patients (60%) have a knowledge that malaria is caused by mosquito bite. Only 22% of patients aware that malaria is better be treated by ACT. 45% of patients use ITN at home and have knowledge that malaria should be prevented by ITN where 55% do not use ITN at home. In practice, 36% of patients wear long sleeved clothes and 64% are not. *Conclusion:* First contact is mainly by community health worker followed by GP. Late referral after 3 days occurred in more than 50% indicating needs for community health education and CME to health staff.

TITLE- 211

Social burden of malaria on family in Hlegu Township, malaria endemic area

AUTHOR (S) and AFFILIATION:

Le Le Win¹, San Shwe¹, Than Win², Thandar Min¹ and San San Aye¹
¹DMR (LM), ²NMCP, DOH

SOURCE:

The MHSRJ 2010; 22(1): pp. 58-61

ABSTRACT:

To explore social burden of malaria on family in a malaria endemic area, a cross-sectional study was conducted in Hlegu Township during March 2009. After getting consent, 56 family members who had suffered from malaria involved in eight sessions of focus group discussions and pile sorting, four each for males and females. About half had suffered from malaria at least once in their life. While most males were working in the forest, most females were either working odd jobs or dependants. Social burden was explored in sequence, like health, financial issue, family, social, children and personal factors. They all agreed that the poorer the people, the more they were affected badly from the malaria, particularly those who worked in the forest. The family suffered many hardships when major earner and the housewife got the disease. Of them, the housewife was the key person who had to handle all of the household matters- finding household expenses, treating the patient, for children's schooling, paying back the loan, and trying to get more loans. The findings revealed that human misbehaviour, malaria-related environment and poor knowledge about the disease largely influenced for having these burdens.

TITLE- 212

Sociocultural and behavioural determinants of malaria and its appropriate control measures in forested areas of Central Myanmar

AUTHOR (S) and AFFILIATION:

Htin Zaw Soe¹, Aye Min¹, Haukying¹, Kyaw Shwe², Nyein Chan³, Ohnmar Nyo¹, Win Htay Hlaing¹, Khin Mar Win¹ and Htun Naing Oo¹
¹DMR (CM), ² District Health Department, Nay Pyi Taw, ³ Taungnyo Station Hospital, Nay Pyi Taw

SOURCE:

The MHSRJ 2010; 22(2): pp. 83-88

ABSTRACT:

A case-control study was conducted using pretested interview questionnaire in Gwegyo and Lewun villages of Pyinmana District, Nay Pyi Taw from January to October, 2009, with the main objective of determining the socio-cultural and behavioral factors of malaria among local residents in forested areas of Central Myanmar and assess the feasibility of its control. The study was preceded by epidemiological and entomological surveys and followed by in-depth interviews among local key informants. The study depicted that study areas were found to be malaria meso-endemic with abundance of vectors including the main vector, *An. dirus*, in their vicinity. The

determinants of malaria were male gender (OR=2.6, P = 0.004), water fetching habit in the evening (P<0.001), traveling habit (OR=2.6, P = 0.006), traveling without bed net (OR=9.6, P<0.001), habit of going out at dawn (OR=2.3, P = 0.01) and low level of correct practice on malaria prevention (P = 0.007). Most (80.52%) of the participants normally used bed nets but only 50% brought bed nets when traveling and all used blankets. Some 81.17% said that they would accept if their bed nets were treated with insecticide. In-depth interviews expressed some local cultural misbeliefs. In conclusion, the study highlighted the necessity to launch an effective health education programme to remove some risk factors among the victims and it would be appropriate to provide insecticide-treated bed nets, blankets and/or mufflers to reduce the incidence of deadly disease of malaria in the forested areas.

TITLE- 213

Patients' perspectives on choosing either public or private sector for malaria treatment in Upper Myanmar

AUTHOR (S) and AFFILIATION:

Hla Soe Tint¹, Thein Tun¹, Thar Htun Kyaw², Kyaw Ko Ko Htet¹, Kyaw Thu Soe¹, Myitzu Tin Oung¹ and Phyu Phyu Thin Zaw¹
¹DMR (UM), ²DOH

SOURCE:

The MHSRJ 2010; 22(2): pp. 123-128

ABSTRACT:

In spite of vigorous activities of Vector Borne Disease Control Program making available rapid diagnostic tests and anti-malarial drugs down to community level free-of-charge, a considerable number of patients are purchasing anti-malarial treatments at private sector. Thus, this study identified the determinants of choosing either public or private sector for malaria treatment from the consumer side. A community-based cross-sectional, analytical study was conducted at Moegoke, Kyaukse and Myitthar townships of Mandalay Division. A total of 200 uncomplicated malaria patients, 100 each from public and private sector, were interviewed within one-year study period from September 2008 to September 2009. In the final multivariate model, significant factors influencing the choice of public sector included: poor socio-economic status [adjusted odds ratio (AOR) = 5.0], residing close to health center (AOR = 14.0), treatment cost ≤1000 kyats (AOR = 24.5), sympathy and humanity of provider (AOR = 6.2 and 3.9), acceptable waiting time (AOR = 3.0), domiciliary treatment service (AOR = 20.4) and knowledge on availability of free-of-charge treatment at public sector (AOR = 4.1).

TITLE- 214

Cost analysis of severe and complicated malaria cases admitted to Medical Intensive Care Unit, No.1 Defence Services General Hospital (1000 Bedded)

AUTHOR (S) and AFFILIATION:

Khin Chaw Chaw Kyi¹, Nyo Nyo Wint¹ and Le Le Win²

¹Military Institute of Nursing and Paramedical Sciences, ²DMR (LM)

SOURCE:

The MHSRJ 2010; 22(2): pp. 95-100

ABSTRACT:

Malaria is a major global health problem and burden of malaria is multi-determined, including economic, educational and environmental factors. To assess costs of treating severe and complicated malaria, hospital-based cross-sectional descriptive study was carried out at Medical Intensive Care Unit among 20 respondents with face-to-face interview using semi-structured proforma and 6 participants for in-depth interview about illness-related burden in 2008. The mean age of respondents was 27.5 years and 16 were army soldiers with mean salary of 32,975 kyats. The currency exchange rate approved by Directorate of Military Medical Services, the reference price of National Health Laboratory and the Nutrition Department of No.1 DSGH were used in calculation of costs. The total provider cost was 1,271,930 kyats in which the total drugs cost was the highest and the total material and instrument cost was the lowest with the good quality treatment regimes were utilized. The total patient cost was 415,263 kyats in which the food cost was the highest and the cost of purchasing drugs and taking blood investigations was the lowest because of receiving free-of-charge treatment as reported by the in-depth interviews. The unit cost of treating severe and complicated malaria was 84,360 kyats for one episode of illness in which the unit cost of provider was three times higher than that of the patients. The results of the study can be used to further improve the existing malaria control measures in military health care setting.

TITLE- 215

Knowledge, attitude and practice on malaria and insecticide treated bed nets (ITN) in Salin Township

AUTHOR (S) and AFFILIATION:

Tun Myint

SOURCE:

56th Myanmar Medical Conference, 20-26 January, 2010; No. 5: pp. 50

ABSTRACT:

Malaria is one of the major and re-emerging public health problems in Myanmar. A cross-sectional descriptive study using both quantitative and qualitative methods was done in 16 villages of Salin Township, Magway Division by Master of Public Health students in August, 2009. The study aims to assess knowledge, attitude and practice of community on malaria and insecticide-treated bed-nets (ITNs). For quantitative study, face to face interviews were conducted on 256 adult household members by using pre-tested structured questionnaire. For qualitative assessment, four focus group

discussions and one key informant interview were carried out. The findings showed that nearly half (48.0%) of the study population had low knowledge on malaria and ITN use, and some misconceptions regarding the modes of transmission of malaria. Regarding attitude on malaria prevention, 29% of the respondents perceived that malaria could not be prevented if people live in endemic areas and nearly same percentage of respondents believed that sleeping inside mosquito nets at night did not prevent malaria. About half (45.3%) of respondents had low attitude score on malaria prevention and ITN usage. Although 97.7% of households owned bed-nets, only 16.0% had ITN. There was a significant association between knowledge and attitude level of respondents and their educational status. The qualitative assessment showed that there were some confusion of prevention methods between malaria and dengue, and low knowledge about ITN use. This study showed that there is a need for increasing availability of information on ITN and ITN tablets to prevent malaria transmission in the study township.

TITLE- 216

Risk factors of malaria among the migrant populations

AUTHOR (S) and AFFILIATION:

Khaing Nwe Tin

SOURCE:

10th Medical Specialities Conference, Programme and Abstract, 2010; pp. 35

ABSTRACT:

To determine risk factors of malaria among the migrant populations, a case-control study was conducted among migrant workers in KawThaung, 15-65 years aged and at least two weeks and not more than 30 months of migration to the study area. Out of 750 eligible migrant workers tested by RDT (Combo), total 105 were positive and the positivity of RDT results was 14% and major problem was *P. vivax*. For case-control study, 103 cases and 206 controls were interviewed by pretested questionnaire. The statistical analysis was carried out by the chi-square test and multivariable logistic regression. The socio-demographic characteristics, occupational related exposures of malaria, knowledge and attitude of malaria were not significant risk factors for malaria in this study. In logistic regression, after controlling for possible confounding factors, irregular and never use of the personal protection from mosquito- bite in the plantation had increased risk of malaria (OR = 2.45, 95% CI: 1.09- 5.46, P = 0.028) and (OR = 2.73, 95% CI: 1.29- 5.72 and P = 0.009) respectively. There were increased risk of malaria among those who irregular slept under mosquito net (OR = 2.93, 95% CI: 1.34 – 6.39, P = 0.007) and those who had history of malaria attack within last six months (OR = 11.36, 95%CI: 4.17-30.99, P = 0.0005). In this study, treatment seeking behavior and accessibility of health care facilities were not found to be significant risk factors of malaria infection.

TITLE- 217

Malaria related risk behaviors among rubber plantation workers near Pann-Ta-Pwint hill, Hmawbi Township in 2008

AUTHOR (S) and AFFILIATION:

Aung Khant and Tin Oo

SOURCE:

18th Myanmar MMC Programme and Abstract, 2010; No. 18: pp. 16

ABSTRACT:

A community based cross sectional descriptive study conducted to demonstrate risk behaviors related to malaria illness among rubber plantation workers near Pann-Ta-Pwint hill, Hmawbi Township, Yangon Division, from July to September, 2008 among respondents and they answered structured interview questionnaires. General objective of this study was to study risk behaviors related to malaria and malaria illness among rubber plantation workers near Pann-Ta-Pwint hill, Hmawbi Township, Yangon Division. Specific objectives of this study were to identify malaria related risk behaviors (knowledge and attitude, use of preventive measure) among rubber plantation workers near Pann-Ta-Pwint hill area, to determine the malaria prevalence in rubber plantation workers near Pann-Ta-Pwint hill area and to find out the association between malaria related risk behaviors and prevalence of malaria among rubber plantation workers. In this study, final results of rubber plantation workers who suffered malaria infections were 17/225 (7.56%). Rubber plantation workers with low knowledge score among malaria parasite positive cases were 64.7% (11/17). Moreover, low knowledge scores and misconceptions enhanced less use of personal protective measures at risk hours in transmissions seasons. Reported malaria illnesses within past one year among young people under 30 years of age were significantly related to slide positive for malaria parasite (13/16, 81.2% vs. 3/16, 18.8%; $P = 0.001$). Both men and women who had suffered from malaria in the past were significantly more likely to have current malaria illness confirmed by conventional microscopy than those without (7/9, 77.8%, vs. 57/146, 39%, $P = 0.022$ vs. 7/8, 87.5%, 26/62, 41.9%, $P = 0.002$) respectively. Rubber plantation workers worked in risk hours during transmission season and were found to have low usage of repellants. Concomitantly man-vector contact increased and transmission occurred among vulnerable rubber plantation workers diagnosed as malaria. In conclusion this study pointed out that promoting health knowledge about malaria and their working conditions prone to malaria risk are to be emphasized during their visits to the private clinic close to management office of rubber plantations and required promotion to use repellants rather than using mosquito coils during working hours and to sleep under bed nets, if possible insecticide treated nets during non-working hours.

2011

TITLE- 218

How community health workers participated in malaria control and prevention at Madaya Township

AUTHOR (S) and AFFILIATION:

Kyaw Kyaw, Myitzu Tin Oung, Thi Thi Khaing, Aye Hnin Thwe, Khin Htet Zin and Marlar Aung
DMR (UM)

SOURCE:

MHRC Programme and Abstract 2011; pp. 37

ABSTRACT:

This cross-sectional study aimed to find out prevention and control practice among community health workers (CHW). Altogether 38 CHWs participated in focus group discussions followed by structured questionnaire. Thirty (78.9%) were male and, eight (21.9%) were female. Their mean age was 35.23 ± 12.38 years. Three were daily wagers and 35 were farmers. Seventeen knew malaria from television, ten knew it from newspaper and magazine, ten heard from friends and one from other. All CHWs replied that biting of mosquito was main cause of malaria. Thirty seven CHWs reported that malaria was preventable if people avoided the biting of mosquito. Thirty two (84.2%) CHWs reported utilization of insecticide treated net. Twenty seven (71%) CHWs revealed using mosquito coil and spraying method. Twenty nine (76.3%) CHWs took part in environmental sanitation. Twenty three (60.52%) respondents were involved in spraying. Nineteen CHWs (50%) enjoyed taking part in mosquito controlling activities. Thirteen CHWs (34.2%) reported spraying for malaria prevention. Qualitative data analysis revealed that CHWs advised to provide health education, to sleep under insecticide treated bed nets, to control mosquito proliferation. They gave opinions to provide sufficient supply of insecticide treated bed nets, insecticides for impregnation, and anti malarial drugs.

TITLE- 219

Cluster randomized trial on the use of community volunteers to improve early diagnosis and treatment of malaria in Bago Region, Myanmar

AUTHOR (S) and AFFILIATION:

Ohnmar¹, Tun Min², San Shwe¹, Than Win³, Poe Poe Aung¹, Wai Wai Myint¹, Aung Soe Min¹, Aye Win Khine¹ and Khin Maung Zaw¹
¹DMR (LM); ²VBDC Team, Bago Division, DOH; ³NMCP, DOH

SOURCE:

MHRC Programme and Abstract 2011; pp. 38-39

ABSTRACT:

This study assessed the effect of a six-month intervention (trained village volunteers for malaria diagnosis with Paracheck-Pf[®] rapid diagnostic test and artemisinin-based combination therapy) on coverage, timeliness and reduction of malaria mortality through a cluster randomized trial conducted in 38 villages lacking health staff in Bago Division in 2009-2010. Additionally, review of patients' logbooks and verbal autopsy were performed. In the end-line survey, three groups [intervention group, comparison group and additionally, villages with midwives (MW)] were compared. Intention-to-treat analysis was used. Characteristics were comparable between intervention and comparison groups in the baseline survey. Blood test service by volunteers per month declined overtime from 279 to 41 while the decline in MW group was from 326 to 180. In the endline survey, the coverage of RDT was low in all groups (14.9%, SE 2.4% in intervention; 5.7%, SE 1.7% in comparison; 21.4%, SE 2.6% in MW). The intervention (OR 3.2, 95% CI 1.5 - 6.7) and MW (OR 5.4, 95% CI 2.6-11.0) groups were more likely to receive a blood test. Mean (SE) of blood tests after onset of fever in days was untimely in all groups [Intervention 3.6 (0.3); Comparison 4.8 (1.3); MW 3.2 (0.4)]. Malaria mortality rates per 100,000 populations in a year were not significantly different (Intervention 130 SE 37; Comparison 119 SE 34; MW 50 SE 18). None of the dead cases had consulted volunteers. It may be beneficial to expand the volunteer programme but the timeliness of treatment and sustainability of their service must be improved.

TITLE- 220

Scaling up mechanisms for early diagnosis and prompt treatment of malaria in rural areas prior to Myanmar Artemisinin Resistance Containment

AUTHOR (S) and AFFILIATION:

Tin Oo, Myat Phone Kyaw, Khin Thet Wai, Kyin Hla Aye, Moe Thida and Tin Tin Wai
DMR (LM)

SOURCE:

MHRC Programme and Abstract 2011; pp. 42

ABSTRACT:

Artemisinin resistance is emerging in Greater Mekong Region including Myanmar. Before introducing Myanmar Artemisinin Resistance Containment (MARC) measures, cross sectional household surveys were conducted in Myeik from Tanintharyi Region and Thanbyuzayat from Mon State between 2009 and 2010 to identify the malaria-related knowledge, practices and preferences. The surveys covered 400 rural households in each site. In both sites, around 30% and 22% of households reported 1-5 cases of suspected malaria in adults and children respectively within 6 months. Nearly 40% sought help from health facilities. Fever as a malaria symptom was well known (over 60%). But their experience of antimalarials especially artesunate was not high in both sites (20%). Most of the time, they used analgesics. Over 90% were fully aware of places to seek help for suspected malaria. But less than 50% knew the requirement to confirm malaria before using antimalarials. Around 45% received information from anyone of their family members regarding the sources of EDPT. Less than 30% recognized migrant workers as vulnerable groups for malaria. Around 34.3% from Myeik and 21.8% from Thanbyuzayat had ever heard of resistance to antimalarials in their localities. Respondents from both sites preferred partnership of local stakeholder groups in mobilizing the villagers for EDPT (529/799, 66.2%) followed by other strategies such as training volunteers (510/799, 63.8%) and information dissemination (400/799, 50.1%). The rankings for 6 strategies were analyzed by spider diagram. Thus, scaling-up EDPT through effective mechanisms for social mobilization is crucial in risk areas moving from malaria control to containment.

TITLE- 221

Epidemiological significance of malaria in Mon State, Myanmar

AUTHOR (S) and AFFILIATION:

Nyan Sint¹, Su Latt Tun Myint², Khin Thet Wai², Tin Oo², Pe Thet Zaw², Zaw Win¹, Sithu Ye' Naung¹ and Ye Htut²
¹VBDC, Mon State, DOH; ²DMR (LM)

SOURCE:

MHRC Programme and Abstract, Poster, 2011; pp. 57

ABSTRACT:

Strengthening epidemiological surveillance activities is required to control potential outbreaks triangulating the existing secondary data from multiple sources could highlight the impact of malaria control. This study outlined the magnitude, trends and epidemiological significance of malaria in ten

townships of Mon State (2001-2010) and underlying factors. A retrospective desk-based research design was used. Secondary data analysis revealed 49.5% of total populations being resided in high and moderate risk areas in 2010. Morbidity rate per 1,000 populations of malaria combined outpatients, inpatients and severe malaria showed decreasing trend. Malaria mortality rate per 100,000 populations decreased from 10 in 2001 to 1.7 in 2010. These changes were more distinct after the modification of anti-malarial treatment policy in 2008. In addition, strengthened facilities of microscopy and rapid diagnostic techniques (RDT) led to improved case detection and appropriate treatment especially in Ye and Kyaikhto Townships. However, cases and deaths were highest in Ye followed by Kyaikhto and Mawlamyaing in 2010. This might be due to untimely referral because of heavy rain fall and transportation difficulties intertwined with weak health infrastructure. Delivery of impregnated bed nets initiated in 2002 covered 4,583 households in 15 villages of Thaton and Thanbyuzayat townships which increased to over 60,000 households in five townships from 2009 to 2010. Mobile populations over 10,000 were found in Ye, Thanbyuzayat, and Paung Townships that required attention for detailed mapping in time and space and surveillance of malaria. These findings contributed towards public health decisions for resource allocation and planning for improved control measures.

TITLE- 222

The effect of innovative personal protection on malaria among temporary migrant workers in rubber plantation, Mon State, Myanmar

AUTHOR (S) and AFFILIATION:

Maung Maung Mya¹, Myat Phone Kyaw¹, Tin Oo¹, Phyo Zaw Aung¹, Aung Kyaw Kyaw¹, Thu Ya² and Thaung Hlaing¹
¹DMR (LM); ²Township Health Department, Thanbyuzayat Township, Mon State

SOURCE:

MHRC Programme and Abstract 2011; pp. 67

ABSTRACT:

Malaria transmission is provoked by man-vector contact and vector density. Generally, rubber plantation workers work from dusk to dawn coinciding with peak biting time of *Anopheles* vectors and protect from wind and cold by wearing of hats, shirts, longyi, jackets, jeans and sweaters etc. There is a need to introduce locally available, convenient and innovative measure for those temporary migrant workers. Three rubber plantation villages, Thatkot and Weayet villages as intervention and Kyaungkan village as control areas of Thanbyuzayat, were selected to undertake a quasi-experimental study from November 2010 to June 2011. Fifty each of migrant rubber plantation night time workers with no history of malaria previously were recruited from the above areas. Appropriate clothes of 100 workers from Thatkot and Weayet villages were impregnated with deltamethrin (50 mg/meter) bi monthly. Blood films were taken monthly for six months. The results showed that only one malaria positive case was found in Thatkot village (intervention area) while there were 4-6% of monthly malaria positive cases

found in Kyaungkan village (non-intervention area) ($P < 0.05$). Spleen positivity was found 24%, 22% and 26% of 2-9 years old school children in Thatkot, Waeyat and Kyaungkan villages respectively. Infant parasite rate was none in all areas. More than 90% of the workers wore deltamethrin impregnated clothes regularly. Nearly all workers (98%) had willingness to impregnate their cloths regularly. The study revealed that deltamethrin impregnated clothes are very effective (98-100% protection) to prevent mosquitoes bite and malaria transmission to rubber plantation workers in Mon State.

TITLE- 223

Access to a blood test and antimalarials after introducing rapid diagnostic tests in rural Myanmar: Initial experience in a malaria endemic area

AUTHOR (S) and AFFILIATION

Ohnmar, Tun Min, May Aye Than, San Shwe, Wai Wai Myint and V. Chongsuvivatwong

SOURCE:

J. Int Health 2010, 10.1016/j.inhe.2010.09.008

ABSTRACT:

This study describes the use of a blood test, antimalarials and their determinants among 446 subjects with febrile illness in remote villages of Bago Division, Myanmar in 2006 after five months initialization of a rapid diagnostic test (RDT) and artemisinin-based combination therapy (ACT) programme. A structured questionnaire was used in a cross-sectional survey. Knowledge on malaria was asked of 357 key household respondents. The proportions of use of traditional medicine, modern medicine and both among febrile subjects were 31 (7.0%), 247 (55.4%) and 168 (37.7%), respectively. A blood test was taken by 41.0% of respondents and, of these, 81.4% were reported positive. Among 166 artesunate users, 45.8% reported positive test results and 18.1% were self-medicated. Only 37 (10.4%) key household respondents did not have misconceptions on malaria transmission. Predictors for having a blood test were being male (odds ratio [OR] = 1.96; 95% CI 1.20–3.22), having a higher knowledge on malaria (OR = 1.77; 95% CI 1.03–3.06) and aged 50 years or above (OR = 0.32; 95% CI 0.13–0.78). Predictors for having both a blood test and using artesunate were being male (OR = 2.71; 95% CI 1.31–5.59) and having a higher knowledge on malaria (OR = 2.49; 95% CI 1.27–4.92). The low coverage of proper clinical services and high prevalence of ineffective drug use confirmed the need for further strengthening of the programme.

TITLE- 224

Community acceptance on insecticide treated bed nets in selected rural communities

AUTHOR (S) and AFFILIATION:

Hla Soe Tint¹, Kyaw Ko Ko Htet¹, Myitzu Tin Oung¹, Kay Thwe Thwe Maung¹, Yadanar Aung¹, Kyaw Thu Soe¹, Kyaw Tint² and Zar Chi Win¹
¹DMR (UM), ²DOH

SOURCE:

The MHSRJ 2011; 23(2): pp. 116-122

ABSTRACT:

Malaria control program in collaboration with non-governmental organizations has been launched Insecticide Treated Bed-net (ITN) projects in selected malaria endemic areas since 2002. This study investigated the community perception, acceptance and utilization of ITN in the selected rural communities in Pyin Oo Lwin Township. Four focus group discussions were carried out in March, 2010. These discussions explored community perceptions, acceptability, preference on types of bed-net and the barriers to use ITN. Free availability, mosquito nuisance, and popularity were the main determinants of ITN use. Forest related works and evening social activities had negative impact on compliance with ITN usage. Majority of participants in Twin-nge village (received free ITN for every household) reported using ITN regardless of any unfavorable characteristics. Most of the participants in Sikar Village (received limited ITN distribution) described unfavorable characteristics of ITN as reasons for their intermittent use or non compliance. The main reason for ITN acceptability was effectiveness in killing mosquitoes and other insects. Discussions highlighted considerable confusion around ITN care and washing. Not only adequate and free distribution based on sex and age composition of household members, but also provision of information about ITNs will be important for improving compliance.

TITLE- 225

Positivity of plasmodium species and risk factors for contracting malaria among military personnel of No (11) Light Infantry Division

AUTHOR (S) and AFFILIATION

Khin Mar Yee

SOURCE:

Thesis M.Med.Sc (Disease Prevention and Control), DSMA, 2011

ABSTRACT:

This study was conducted to determine the prevalence of plasmodial infection and risk factors for contracting malaria among military personnel of No (11) Light Infantry Division. Data collection was carried out on mid June, 2011. A total of 224 respondents were tested by RDT (SD- Standard Diagnostic Test Kit) and interviewed with pre- tested structured questionnaire. Among respondents, 119 (53.1 percent) were from No (214) L.I.R and 105 (46.9 percent) were from No (218) L.I.R. All came back from the front line (Mon and Kayin State) within two weeks. Most of the study

population (218/224; 97.3 percent) stayed at the front line for more than four months. Out of 224 respondents tested by RDT (SD) that can detect both *P. falciparum* and *P. vivax*, total 25 (11.2 percent) were positive. Among them, 15 (6.7 percent) were showed *P. falciparum* positive, 8 (3.6 percent) had *P. vivax* positive and the remaining 2 (0.9 percent) were found to have mixed infection. Each half of the respondents lies within low and high knowledge level. Regarding preventive measures, almost all respondents (220/224; 98.2 percent) took chemoprophylaxis in the front line. Only half of the study population (106/ 224; 47.3 percent) ever slept under mosquito net and only 38.8 percent (87/224) had ever treated their nets with insecticide. Repellents and mosquito coils were not widely used among them (29 percent and 11.6 percent respectively). Out of them, more than half of the study population (140/224; 62.5 percent) had suffered from fever in the front line. Moreover, 65.2 percent (146/ 224) carried anti-malaria drugs, mostly artesunate tablets along with them. Regarding treatment seeking behavior, most respondents (128/ 140; 91.4 percent) consulted with health personnel when they suffered from fever in the front line. The statistical analysis was carried out by the chi - square test and Odds ratios (OR) adjusted using the Mantel Haenszel procedure to find out association between potential risk factors and RDT positivity. There was no significant association between level of knowledge and RDT positivity. A significant association was found out between past history of fever in the front line and RDT positivity. The respondents who had ever suffered from fever in front line had increased risk for RDT positivity. There were no significant associations between risk behaviors and RDT positivity.

TITLE- 226

Knowledge, perception and utilization of insecticide treated nets (ITNs) for malaria prevention and control in Indaw Township

AUTHOR (S) and AFFILIATION:

Myo Min

SOURCE:

Thesis M.Med.Sc. (Disease Prevention and Control), DSMA, 2011

ABSTRACT:

A cross-sectional descriptive study was carried out in order to study the knowledge, perception and utilization of insecticide treated nets (ITNs) in Indaw Township, starting from May to September, 2011. Villages were randomly selected and then proportionate 392 samples from 14 villages were face-to-face interviewed with pretested structured questionnaire. Data were analyzed with SPSS version 16.0 and Microsoft Office Excel 2007 software. Nearly (55%) of the respondents had primary school level and (2.6%) was illiterate. More than (93%) was peasants. Seventy six per cent of the respondents got family income less than 50,000 kyat per month. The maximum family size was one member only. Not less than (16%) of households was 6 family members. Findings on knowledge level were low (21.43%), moderate (55.87%) and high (22.7%); in perception level, it was (15.8%) low, (73.5%) moderate and (10.7%) high. Concerning with the ITN

utilization, 9.7% never used, 29.6% used often and 61.2% used always. Reasons for not using ITNs consistently were due to having ordinary bet nets and due to no more need (mosquitoes do not bite now). The reason why current mosquito nets were not re-impregnated was due to no insecticide (88.66%). Knowledge on that mosquito bite causes malaria was not significantly associated with the utilization ($P = 0.380$) but the knowledge on that ITNs could prevent malaria transmission was significantly associated with the utilization of ITNs ($P = 0.019$). ITNs were used very often but were not being used consistently. Misunderstanding and misperceptions on causes of malaria prevention methods were found. They were influencing on ITNs utilization. The proper, strong and specific health education programs, not to rectify the misconceptions and misunderstandings, but to promote utilization of ITNs should be given. Moreover, easy access to insecticides to impregnate the ordinary bets and to re- impregnate current ITNs should be encouraged by selling insecticides (e.g. K-O Tab) properly at grocery shops, garment shops and local pharmacies.

SECTION-5 MALARIA VECTOR STUDIES

2001

TITLE- 227

A recent entomological survey on malaria control in Mingaladon Township Area, Yangon Division

AUTHOR (S) and AFFILIATION:

Myint Ohn, Myint Thida, Pyone Lwin, Ngwe Ngwe Aye and Soe Minn

SOURCE:

11th Myanmar MMC, Programme and Abstract 2001; No. 2: pp. 1

ABSTRACT:

Mingaladon Township is the heart of military medical care services. It includes DSGH, DSOH, DSRH, DSOGCH, DSIM, DSIN, and MCC. Close relation of malaria patients to other non-immune resident or close relation of malaria reservoirs to susceptible persons needs only anthropophilic *Anopheles* species of mosquito vector to provoke an epidemic. On the other hand, neighbourhood Townships of Mingaladon are Hmawbi, Hlegu and Taikkyi which possess malaria carrying, athrophilic *Anopheles* species. Repeated outbreaks of malaria epidemics in those areas are on the score of close situation near mountainous areas, i.e. Bago yoma. Surveillance on mobility or migration of these anthropophilic *Anopheles* species into Mingaladon Township is on the scent of preventing malaria epidemic. A survey on spread of anthropophilic *Anopheles* species can save the epidemic situation. Results of survey are: resident in Mingaladon Township is out of reach of dangerous anthropophilic *Anopheles* species from Hmawbi, Hlegu and Taikkyi Townships. It is to assume that malaria carrying anthropophilic *Anopheles* species do not come into existence in Mingaladon Township. The study did not find out anthropophilic *Anopheles* species that mainly carry malaria parasites. Only zoophilic cattle biting *Anopheles vagus* is the main species found out by this survey. Mosquito density starts to increase from June and declines again in October and later on.

2002

TITLE: 228

Studies on identification, rearing, colonization and larvivorous potential of *mesocyclops* for prevention and control of dengue haemorrhagic fever and malaria in Myanmar

AUTHOR (S) AND AFFILIATION:

Pe Than Htun, W. Tun Lin, Than Than Swe, Than Myat Htay, Sein Thaug, Sein Min, Thaug Hlaing and Yan Naung Maung Maung
Medical Entomology Research Division, DMR (LM)

SOURCE:

MHRC Programme and Abstract 2002; pp. 38

ABSTRACT:

Establishment of a method for colonization of *Mesocyclops* (copepoda) was first carried out in the laboratory of Medical Entomology Research Division, Department of Medical Research (Lower Myanmar). Identification, rearing, colonization and larvivorous potential of indigenous inland *Mesocyclops* from natural habitats of Dagon Township (Yangon Division) and Mudon Township (Mon state) were studied under laboratory conditions for the first time. Two species of *Mesocyclops*, namely *Mesocyclops thermocyclopoides* and *Mesocyclops pehpeiensrs* were identified, successfully reared and colonized in the laboratory. *Me. thermocyclopoides* were collected from ponds and wells and *Me. pehpelensis* were collected from concrete tanks. Ciliated protozoan *paramecium* were cultured and used as food medium for *Mesocyclops*. Both species were adaptable and multiplied at room temperature and can be maintained in the laboratory for extended periods. Methods of identification, rearing and colonization are described and the possibility of large scale rearing and colonization is discussed. Regarding the examination of larvivorous potential, a series of comparative experiments were undertaken in the laboratory. Both species were found to be effective against 1st and 2nd stages *Ae. aegypti* larvae with mean predatory rate of 28 larvae/mesocyclops/24hr (n=570) for *Me. pehpeiensls* and 25 larvae/mesocyclops/24hr (n=509) for *Me. Thermocyclopoides* respectively. The number of *Ae. aegypti* larvae were significantly reduced ($p < 0.001$) in treated containers with *Mesocyclops* as compared to that of control groups without *Mesocyclops*. It is envisaged that *Mesocyclops* can also be used against *Anopheles* larvae that breed in confined places such as wells and rock pools. The prospect of the use of *Mesocyclops* as an additional bio-control measure is discussed in the context of integrated vector management activities for future Dengue Haemorrhagic Fever and malaria control programs.

2005

TITLE- 229

The efficacy of *Artemisia annua* crude extracts on *Anopheles dirus* in the laboratory and whole plants on other mosquitoes in the field

AUTHOR (S) and AFFILIATION:

Sein Min¹, Than Myat Htay¹, Than Than Swe¹, W. Tun Lin¹, Sein Thaing¹,
Pe Than Htun¹, Win Win Maw² and Sein Hla Bo³

¹Medical Entomology Research Division, ²Pharmacology Research
Division, DMR (LM); ³Myanmar Agricultural Service, Horticultural Crops,
Ministry of Agriculture and Irrigation

SOURCE:

The MHSRJ 2005; 17(1): pp. 15-21

ABSTRACT:

Evaluation of the efficacy of an aromatic plant *Artemisia annua* against *Anopheles dirus* mosquito (a major vector of forest malaria in Myanmar) was conducted in the laboratory and in the field situation. Repellent effect on adult mosquito was observed at the concentration as low as 0.5% *Artemisia* extract solution. At the concentration of 6.0 %, the repellency was markedly increased and the protection provided was found to be 94.74 % during an exposure period of six hours ($r = 0.95$, $df = 6$, $P = 0.001$). The larvicidal effect on 3rd and 4th instar larvae of *An. dirus* showed that the LC50 and LC90 were 0.04 % and 0.14 % respectively based on the dose-effect probit analysis ($\chi^2 = 3.05$, $df = 3$, $P < 0.05$). The residual effect persisted for at least 6 days at 0.25% and 0.50% concentrations. Regarding the ovicidal effect, a series of concentrations starting from 0.025% were tested and at 0.40% concentration, the relative reduction in egg hatching rate was 93.85% compared to that of control ($r = 0.92$, $df = 4$, $P = 0.026$). However, protection from mosquito bites was not observed when *Artemisia annua* plants were placed around baits under field situation ($\chi^2 = 1.69$, $df = 1$, $P > 0.05$). The prospects for the use of indigenous plants and its extracts for personal protective measures in prevention and control of vector borne diseases are also discussed.

2006

TITLE- 230

Use of larvivorous fish control of malaria in Kyauktaw Township, Rakhine State, Myanmar

AUTHOR (S) and AFFILIATION:

Pyone Lwin, Aye Aye Myint and Than Win

SOURCE:

14th Myanmar MMC Programme and Abstract, 2006; No. 41: pp. 22

ABSTRACT:

Malaria incidence in Rakhine State has increased year after year due to lack of transmission risk reduction actions. *Anopheles annularis* is the main and primary vector in the area, it is exophilic, exophagic and highly resistant to DDT. The breeding places are confirmed to the big ponds. In order to overcome the situation it is to urgently launch a feasibility cum trial on the bioenvironmental control of malaria vector. The effective use of larvivorous fish necessitates even more detailed knowledge of the ecology and biology of the vector than that required for the application of chemical pesticides, since larvivorous fish are living organisms that interact with the vector and its environment. In many situations, a balance between the vector, host and fish show no effective control. It is therefore necessary to acquire knowledge of the factors that affect the relationship between the control agent and the vector in those particular environments. Furthermore, it is essential to study the factors concerned not only for different geographical regions, but also for different types of habitat. It is therefore, vectors and fishes information relating to one type cannot often be applied to another. Two months after the releasing of *Poecilia reticulates*, slide positive rate (2-9 years of age) in control and intervention difference was 11.53% while intervention is 53.64%. The percent difference between control and intervention shown highest in cold season (71.62%) than dry season (42.58%) and wet season (1.209/dip) for the whole year percent different was 41.31%. Larval density are assessed with three seasons (dry, rain and cool). In dry season, in the control area, number of *An. annularis* per dip is 0.557, rainy 0.41 and cool 1.40. In intervention area, numbers per dip include 0.471 in dry season, 0.41 in rainy season and 0.832 in cool season. In dry season, the reduction rate is 15.44%, rainy 0% and cool season 72.07%. Total percent reduction in three seasons is 46.64%.

2007

TITLE: 231

Laboratory repellency effect of the indigenous plant *Cybopogon winterianus* Jowitt. (Zabalin–Hmwé) crude extracts on three important mosquito vectors

AUTHOR (S) AND AFFILIATION:

Sein Min¹, Pe Than Htun¹, Ei Ei Soe², Yan Naung Maung Maung¹, Sein Thaug¹,
Khin Myo Aye¹ and Yee Yee Myint¹
¹DMR (LM), ²University of Yangon

SOURCE:

MHRC Programme and Abstract 2007; pp. 56

ABSTRACT:

Laboratory studies were carried out to determine the relative efficacy of repellent action of citronella oil (*Cybopogon winterianus* Jowitt) for protection of mosquito bite. Citronella oil extracted from *Cybopogon winterianus* Jowitt was tested for repellent activity against *An.dirus*, *Ae.aegypti* and *Cx.quinquefasciatus*, vectors of malaria, dengue and filariasis respectively. Human volunteers were used by exposing bare arm in cage studies and commercially available repellent namely 12% deet (N,N-Diethyl-Benzamide) was used as positive control. Results revealed that topical application of 2ml of 50% (w/v) citronella oil provided at least 1¹/₂ hours of complete protection and reduced the biting rate by 88.15% after 6 hours exposure time for *Ae.aegypti* mosquito. Complete protection for 6 hours from the bites of the *Cx.quinquefasciatus* and *An.dirus* mosquitoes were observed by 50% (w/v) and 10% (w/v) preparations. Topical application of citronella oil produced varying degree of protection against various mosquito vector species and the repellent effect was more pronounced in *An.dirus* mosquitoes than *Ae.aegypti* and *Cx.quinquefastiatus*. Citronella oil can be used as a repellent for the protection of malaria vector mosquito bites and subsequently it will be an alternative personal protection tool for prevention and control of malaria. Therefore, the indigenous plant of *cymbopogon winterianus* Jowitt based product may be a promising repellent against mosquitoes. However, mixing the citronella oil with appropriate lotion or cream is required to obtain a suitable formulation to be used as a commercial product in the field.

2009

TITLE- 232

Seasonal prevalence and biting patterns of malaria vectors in a hard to reach area

AUTHOR (S) and AFFILIATION:

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¹DMR (UM); ²VBDC Team, Mandalay Division, DOH

SOURCE:

MHRC Programme and Abstract 2009; pp. 12

ABSTRACT:

In Myanmar, malaria is still recognized as one of the public health problems and usually malaria endemic areas are located in forested, rural, hilly or mountainous and hard to reach. This study aimed to determine the seasonal prevalence of malaria vectors and their biting patterns. Mosquitoes were collected on human baits (indoors and outdoors) and animal baits by trap net from October 2008 to July 2009 in Thayet Pin Inn Village, Pyin Oo Lwin Township, Mandalay Division. A total of 1814 *Anopheles* mosquitoes with 15 *Anopheles* species were collected. Primary vector, *Anopheles minimus* was the predominant vector in premonsoon season (May). Most abundantly collected secondary vectors were *Anopheles maculatus* in premonsoon (May), and both *Anopheles annularis* and *Anopheles philippinensis* in postmonsoon (October). The results of the biting patterns on human baits showed that *An. minimus* was an early night biter especially in the first quarter (6:00 pm-9:00 pm) and second quarter (9:00 pm-12:00 midnight) of night. The biting patterns of *An. maculatus*, *An. annularis* and *An. philippinensis* on human baits also showed that they were early night biters especially in the first and second quarters of night. *An. minimus*, *An. maculatus*, *An. annularis* and *An. philippinensis* preferred to feed on human bait outdoors than indoors. The results from this study are expected to be useful in personal protection in this area.

TITLE- 233

Development of Cytogenetic method for identification of *Anopheles culicifacies* species complex and its applications at malaria endemic areas of Myanmar

AUTHOR (S) and AFFILIATION:

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¹Parasitology Research Division; ²Medical Entomology Research Division, DMR (LM)

SOURCE:

MHSRJ, 2009; 21(3): pp. 157

ABSTRACT:

Cytogenetic method for detailed identification of *An. culicifacies* was developed and tested in the field and laboratory. The objective of the study was to develop polytene chromosome cytogenetic method for *An. culicifacies* and to identify its sibling species complex by ovarian nurse cell polytene chromosome technique in malaria endemic areas of Myanmar. The study was conducted in two endemic areas, Paukkaung Township, Bago Division and Madaya Township, Mandalay Division. Adult mosquitoes were collected by animal baited big net trap and WHO recommended sucking tube in the field. Blood fed *An. culicifacies* were kept for 12 hours, 24 hours and 36 hours and ovaries were dissected and fixed in 10% methyl alcohol and ethyl alcohol fixatives in the field. In main laboratory, they were kept at 4°C in refrigerator. Ovarian nurse cell chromosome bands were examined by compound microscope under 400 x magnifications. Blood fed *An. culicifacies* accounting 613 specimens from Bago Division and 35 specimens from Mandalay Division were examined and the result revealed that both methyl alcohol and ethyl alcohol were found to be suitable fixatives and preservatives for prolong period. Up to 70% to 80% of clear and accurate polytene chromosome bands were detected from the 36 hours aged ovary group. Furthermore, sibling species of *An. culicifacies* were studied in detail by using this cytogenetic method and found to be type "B" of *An. culicifacies* complex. It is assumed that in Myanmar type B species are abundant in Bago and Mandalay Divisions. However, further study is needed to find out the presence of other type of species complexes in endemic areas. Although *An. culicifacies* is not a primary vector in Myanmar, it has been abundantly present in association with primary vectors such as *An. dirus* and *An. minimus* in endemic areas. Better understanding of species complex distribution and the role in malaria transmission will be beneficial in prevention and control of malaria.

TITLE: 234

Relationship of anopheline vector abundance and behaviour to the efficacy of insecticide treated bed nets in preventing malaria in western Myanmar

AUTHOR (S) AND AFFILIATION:

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SOURCE:

Treating and preventing malaria in Myanmar, Medicine sans Frontieres-Holland 2009; pp. 91

ABSTRACT:

In Rakhine state, western Myanmar, in two coastal regions, characterised as moderate- and high- malaria transmission areas, entomological surveys were conducted between 1995-2000 in association with a large-scale cluster randomised trial of impregnated bed nets (ITN) Mosquitoes were collected by four different catching methods; human biting catches, knockdown spray-catches, exit traps and animal biting catches. The most prevalent Anopheles species biting humans were Anopheles sudaicus (1469). An. Subpictus (626), An. Annularis (349), An. Aconitus (192), An. maculatus(147) and An. Vagus (132). Of 4883 dissected female anopheles mosquitoes, only one An. annularis was inferted with malaria parasites. The density of Anophelines was considerably higher in the post-monsoon period in December/January, the main period of malaria transmission, and was generally proportional to malaria prevalence. Biting was mainly outdoors (77%). The peak biting time was in the early evening between 6pm and 7pm and early biting was particularly prominent during the main malaria transmission season. Vector behavior probably explains the disappointing effectiveness of ITN in this region.

2010

TITLE- 235

Detection of insecticide resistance in anopheline mosquitoes in selected areas of Selangor, Malaysia

AUTHOR (S) and AFFILIATION:

Yi Yi Mya¹, Aziz Ibrahim² and Sadiyah Ibrahim²

¹DMR (UM); ²Unit of Medical Entomology, Institute for Medical Research (Malaysia)

SOURCE:

MHRC Programme and Abstract 2010; pp. 12

ABSTRACT:

Vector control activities are important tools to control malaria in Malaysia. At present, chemical control using pyrethroid is a major method for malaria control. However, extensive use of insecticides for malaria control has selected *Anopheles* mosquito resistance to insecticides. It was experimental laboratory based study using controlled and studied mosquitoes to assess insecticides resistance. Expression of elevated oxidases and esterases were measured by micro-enzyme assay. Results indicated that the mean optical density value of oxidase activity was consistently elevated in *Anopheles hyrcanus* (Sungai Besi Camp) was 0.78 ± 0.26 in compared to *An. hyrcanus* (Puchong) was 0.52 ± 0.24 . The mean optical density of oxidases indicated statistically significant different between *An. hyrcanus* (Sungai Besi) and *An. hyrcanus* (Puchong) ($P < 0.05$). The mean optical density value of oxidases in *An. maculatus* (laboratory strain) was 0.48 ± 0.21 and that in *An. maculatus* (Jeram Kedah) was 0.53 ± 0.19 . The intensity of oxidases was statistically different in enzymes expression between *An. maculatus* (laboratory stain) and *An. maculatus* (Jeram Kedah) ($P < 0.05$). The mean optical density value of esterases in *An. maculatus* (laboratory strain) was 0.13 ± 0.02 and that in *An. maculatus* (Jeram Kedah) was 0.31 ± 0.12 . The mean optical density of esterases indicated statistically significant different between *An. maculatus* (laboratory strain) and *An. maculatus* (Jeram Kedah) ($P < 0.05$). Based on resistance enzyme activities, Malaysian *An. maculatus* and *An. hyrcanus* exhibit resistance against chemical insecticides.

2010

TITLE- 236

Understanding malaria transmission and vector bionomics at a forest fringe hilly rural area incorporating Geographical Information System (GIS) application

AUTHOR (S) and AFFILIATION:

Pe Than Htun¹, Myat Phone Kyaw¹, Sein Thaung¹, Sein Min¹, Sai Zaw Min Oo¹, Htun Min², Yan Naung Maung Maung¹ and Thaung Hlaing¹
¹DMR (LM); ²VBDC Team, Bago Region, DOH

SOURCE:

MHRC Programme and Abstract 2011; pp. 41

ABSTRACT:

Entomological, parasitological, and household surveys were conducted at a forest fringe hilly village in Bago Region for better understanding of local malaria transmission and vector bionomics during malaria season. GIS application was incorporated for accurate mapping and better linkage with related parameters. A total of 236 persons residing in 66 households at the village were examined and seven were found to be malaria positive. Out of 390 *Anopheles* adult mosquitoes collected in the village, 11 *Anopheles* species were identified comprising important mosquitoes such as *An. minimus*, *An. aconitus*, *An. annularis* and *An. maculatus*. The major vector of the area was regarded as *An. minimus* and breeding habitats were found to be surrounding rice fields of the village. Flight range was estimated as 120 m from breeding sites and *An. minimus* was active only after 9 pm and clearly demonstrated as a night-time biter. From human dwelling collection, 67% of *An. minimus* were caught from indoor and 33% were caught from outdoor. It was also found that *An. minimus* equally fed on both humans and cattle. Household survey indicated that all 66 houses have one insecticide treated bed net (ITN) each and a total of 111 ordinary bed nets were recorded with the rate of 1.7 net per household. The mosquito characteristics like indoor biting and active late in the night are favorable for effective vector control using ITN and leading to low level transmission in this area. More ITN coverage and zooprophylaxis are desirable for further reduction of malaria cases.

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**Malaria Research Papers and Posters awarded in Myanmar Health
Research Congresses**

2001

Best Poster

A double-blind randomized controlled study on efficacy and tolerability of oral quinine sulphate (from Ministry of Industry-1) in uncomplicated falciparum malaria patients (p. 7)

Marlar Than, Aung Zaw Oo, Kyan Aung, Thaw Zin, Myat Phone Kyaw, Aye Yu Soe and Kyi Kyi Tin

2002

Best Paper for Basic Research

Studies on identification, rearing, colonization and larvivorous potential of mesocyclops for prevention and control of DHF and malaria in Myanmar (p.196)

Pe Than Tun, W. Tun Lin, Than Than Swe, Than Myat Htay, Sein Thaug, Sein Min, Thaug Hlaing and Yan Naung Maung Maung

2004

Best Paper for Basic Research

Antimalaria activity and related chemical constituents of *Swertia* species which are grown in Kayah State (p. 119)

Khin Phyu Phyu, Mya Aye, Win Myint, Ye Htut, Kyin Hla Aye and Ni Ni

2007

Best Paper for Basic Research (Second Prize)

Preparation and standardization of an antimalarial phytopharmaceutical product from *Swertia Purpurescens* (Pan Kha) (p.123)

Khin Phyu Phyu, Win Myint, Aye Than, Thein Tun, Ye Htut, Myint Sein, Tin Tin Thein, Le Le Win and Saw Ohnmar Khin

Best Paper for Health Systems Research (Second Prize)

Study of utilization of rapid diagnostic tests by community health workers and acceptance of the served community of the diagnostic tests in remote malaria-endemic areas (p. 172)

Htin Zaw Soe, Aye Min, Ye Hla and Aye Ko Ko

Best Paper for Health Systems Research (Third Prize)

Situation of strengthening malaria prevention and control among national races, Eastern Shan State, Myanmar, Greater Mekong sub-region (p. 163)

Tin Oo, Myat Kyaw, Khin Thet Wai, Kyin Hla Aye, Ye Htut and Than Tun Sein

Best Poster

Laboratory repellency effect of the indigenous plant *Cybogen winterianus* Jowitt. (Zabalin Hmwe) crude extracts on three important mosquito vectors (p.199)

Sein Min, Pe Than Htun, Ei Ei Soe, Yan Naung Maung Maung, Sein Thaug, Khin Myo Aye and Yee Yee Myint

2008

Best Paper for Applied Research

Efficacy and safety of artesunate-amodiaquine versus artemether-lumefantrine for the treatment of uncomplicated plasmodium falciparum malaria in 4 sentinel sites (Rakhine, Kayin, Mon and Kachin States) in Myanmar (p.56)

Myat Phone Kyaw, Ye Htut, Than Win, Nwe Nwe Oo, Kyin Hla Aye, Myat Htut Nyunt, Win Htut Linn and Khin Nyein Chan

Best Poster (Third Prize)

Long lasting insecticidal nets (LLINs): A simple effective personal protective measure for malaria prevention (p. 172)

Yan Naung Maung Maung, Pe Than Htun, Sein Min, Sein Thaug, Saw Lwin and W. Tun Lin

2009

Best Paper for Basic Research

Pfmdr1 N86 alleles and *in-vitro* dihydroartemisinin sensitivity status of plasmodium falciparum in Kawthaung and Butheedaung (p.98)

Kay Thwe Han, Ye Htut and Kyin Hla Aye

2010

Best Paper for Basic Research

Pharmacokinetics of piperazine and clinical outcome of acute, uncomplicated falciparum malaria patients after administration of Piperamisinin, a locally manufactured ACT in Myanmar (p.124)

Marlar Myint, Thaw Zin, Marlar Than, Yamin Ko Ko, Khine Kyi Han, Tin Tin Yee, Thin Sandi Htun, Yee Yee Tin and Than Than Nu

Best Paper for Health Systems Research (Second Prize)

Malaria in Myeik District: feasibility of health related community networks in mobilizing early diagnosis and prompt treatment (p.180)

Tin Oo, Myat Phone Kyaw, Khin Thet Wai, Ni Ni Aye, Kyin Hla Aye, Moe Thida and Tin Tin Wai

Best Paper for Health Systems Research (Third Prize)

Sociocultural and behavioural determinants of malaria and its appropriate control measures in forested areas of Central Myanmar (p.182)

Htin Zaw Soe, Aye Min, Haukying, Kyaw Shwe, Nyein Chan, Ohnmar Nyo, Win Htay Hlaing, Khin Mar Win and Htun Naing Oo

2011

Best Paper for Applied Research

Understanding malaria transmission and vector bionomics at a forest fringe hilly rural area incorporating Geographical Information System (GIS) application (p. 204)

Pe Than Htun, Myat Phone Kyaw, Sein Thaung, Sein Min, Sai Zaw Min Oo, Htun Min, Yan Naung Maung Maung and Thaung Hlaing

Best Paper for Health Systems Research (Second Prize)

Cluster randomized trial on the use of community volunteers to improve early diagnosis and treatment of malaria in Bago Region, Myanmar (p.188)

Ohnmar, Tun Min, San Shwe, Than Win, Poe Poe Aung, Wai Wai Myint, Aung Soe Min, Aye Win Khine and Khin Maung Zaw

Best Paper for Health Systems Research (Third Prize)

Scaling up mechanisms for early diagnosis and prompt treatment of malaria in rural areas prior to Myanmar Artemisinin resistance containment (p.189)

Tin Oo, Myat Phone Kyaw, Khin Thet Wai, Kyin Hla Aye, Moe Thida and Tin Tin Wai

Best Poster (Second Prize)

The effect of innovative personal protection on malaria among temporary migrant workers in rubber plantation, Mon State, Myanmar (p.190)

Maung Maung Mya, Myat Phone Kyaw, Tin Oo, Phyto Zaw Aung, Aung Kyaw Kyaw, Thu Ya and Thaung Hlaing

Young Researcher Award (Basic Research)

Malaria antibody: is it an alternative tool for estimation of local malaria transmission in malaria micro-stratified areas? (p.75)

Khin Myo Aye, Myat Phone Kyaw, Thaung Hlaing, Khin Thet Wai, Myat Htut Nyunt, Myo Min, Soe Soe Han and Phyto Zaw Aung

Young Researcher Award (Applied Research)

Field evaluation of HRP2 and pan pLDH based immunochromatographic assay in therapeutic monitoring of uncomplicated falciparum malaria (p.107)

Myat Htut Nyunt, Myat Phone Kyaw, Kyu Kyu Win, Khin Maung Myint and Aung Kyaw Kyaw