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

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Shwe Zar and Myothagyi villages of Maungdaw Township, Rakhine State are in the border area of Myanmar and Bangladesh. These villages are in the coastal area of the 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 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* 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 mixed (*P.f+P.v*) infection was found in Myothagyi village. Further detailed study of parasitological, entomological, immunological and sociological studies need to be conducted for epidemiological perspective.

INTRODUCTION

Malaria is one of the most widespread diseases and is a major public health problem of tropical and subtropical countries. In Myanmar, malaria has been identified as one of the most important public health problems in every national health plan since 1978. It is still the main public health problem in Myanmar. It has been accorded first priority disease in third People's Health Program (PHP) (1986-1990). Malaria is caused by a protozoan parasite of the genus *Plasmodium*. *Plasmodium falciparum*, *Plasmodium vivax*, and *Plasmodium malariae* are commonly known to infect people living in Myanmar. Although *P. vivax* and *P. malariae* infections are not generally life threatening, sometimes they can cause severe acute illness. *Plasmodium falciparum* is one of the most dangerous species compared to others; it causes complications, such as cerebral malaria and sometimes death. *Plasmodium falciparum* is the dominant malaria parasite species in Myanmar, causing 85% of the infected cases [1, 2, 3, 4] but incidence of *P. vivax* is gradually rising in some parts of the country [5]. However, reliable determination of the site of transmission is problematic for Myanmar. Anti-malaria programmes are being implemented in many areas of the country where villages are located close to the suitable habitats for vectors, such as forests, forested foothills, rubber plantations and rice fields etc. Myanmar is one of the malaria endemic areas in Southeast Asia region because of its climate and geographic situation, which provide favorable ground for breeding of

mosquitoes. The most troublesome areas in the country are located mainly in the borders with forested mountain regions where mosquitoes can breed well. Border areas in Myanmar are mostly forest-fringe foothills and swamp areas where temperature and rainfall would most likely allow the Anopheline mosquitoes to survive and multiply. *An. dirus* and *An. minimus* are primary vectors in Myanmar and they are widely distributed in forests, forested foothills, rubber plantations and rice fields [6, 7]. Tun Lin *et al.,* [3] had already reported on *An. dirus* occurrence in water wells within a coastal village where all shade comes from occasional fruit trees. Incidence of malaria is also high in cold-dry season in coastal areas [8, 9, 4]. *An. dirus* is widely distributed in Bangladesh and Thailand [10, 11, 12, 13, 14]. The present study was planned to investigate the prevalence of parasite, risk area and malaria infection in human population from the border area of Maungdaw Township, Rakhine State.

MATERIALS AND METHODS

Study area and population

The study was conducted in Shwe Zar and Myothagyi villages of Maungdaw Township, Rakhine State which are border areas of Myanmar and Bangladesh. The area is situated in the North-west part of the Rakhine State; Shwe Zar is four miles away from Myothagyi and near a rocky hill area. Paddy fields, creeks, water pools, streams, wells and ponds are also present in these areas. The total population of Shwe Zar and Myothagyi are about 5000 and 6000 respectively. Ninety percent of the population are farmers. The climate of these areas comprises of heavy rainfall and heavy wind in the rainy season. Some local people fish in streams, coastal area, sea and deep sea water and some are doing prawn culture.

Most of the villagers go into the hilly area to cut bamboo and wood for general use. The houses are made of wood and bamboo and some houses are constructed of brick. About 90% of the villagers are Muslims. Maungdaw area is a border area of Myanmar and Bangladesh.

Blood collection

For prevalence of malaria in the village population, 251 villagers from Shwe Zar and 400 villagers from Myothagyi villages were recruited for the malaria study. Finger-tip blood specimens were collected on grease- free clean glass slides. Thick and thin blood films were made on the glass slides. Thick film was used for the detection of malaria parasite and thin blood film was used for species identification.

Staining and examination of malaria parasite

Thin blood films were fixed with 100% alcohol then dried in room temperature, after that thick and thin blood slides were stained with 10% Giemsa's stain for 10 minutes. After staining, slides were washed with buffer water and dried in room temperature. Thick and thin films were examined under high power oil immersion lens (x 100), Olympus. Malaria parasites were counted against 300WBC according to WHO method.

Data analysis

Microsoft excel was used for malariometric calculations.

RESULTS

Microscopic examination of malaria parasite

The result of malaria prevalence study in Shwe Zar and Myothagyi villages of Maungdaw Township, Rakhine State is shown in Table 1 & Fig. 1. Of the recruited population from Shwe Zar, 12.75% were found to have malaria, out of which 81.25% of the population were infected by *P. falciparum* and the rest 18.75% were *P. vivax* positive. In Myothagyi village, 8.5% of the population were malaria positive. Among these cases, 79.41% were due to *P. falciparum* and 17.65% were

caused by *P. vivax* and 2.94% were mixed infection in Myothagyi village.

Table 1. Parasite positive rate by microscopic examination in villages of Maungdaw Township, Rakhine State

Study location	Total examined	Total positive	Malaria parasite species			Gametocyte positive	Parasite density index (PDI)
			P.f	*P.v*	mixed		
Shwe-Zar village	251	32 12.8 %	26 81.3 %	6 18.8 %	-	1 (0.39) %	1.9
Myothagyi village	400	34 8.5 %	27 79.4 %	6 17.7 %	1 2.9 %	1 (0.25) %	1.79
Total population	651	66 10.4 %	53 80.3 %	12 18.2 %	1 1.5 %	2 (0.31) %	1.81

P. f = P.falciparum *P. v= P. vivax*
mixed=P.falcip+vivax

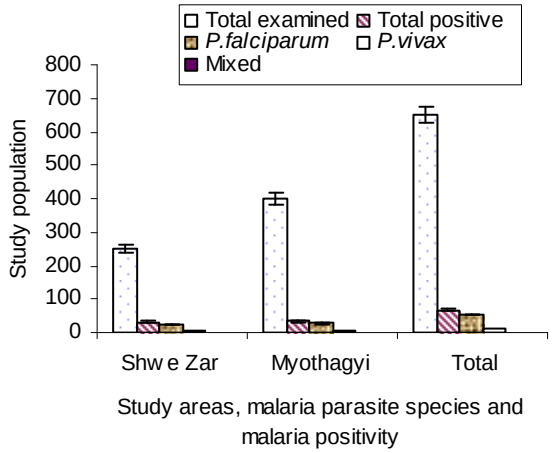

Fig. 1. Prevalence of malaria in Shwe Zar and Myothagyi villages of Maungdaw Township

Gametocyte rate

Gametocyte positivity rate of Shwe Zar and Myothagyi villages were 0.39% and 0.25% respectively (Table 1, Fig. 2).

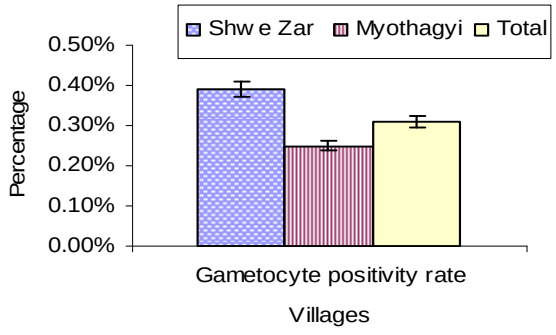

Fig. 2. *P. Falciparum* gametocyte positive rate of Shwe Zar and Myothagyi villages

Parasite Density Index (PDI)

Parasite Density Index of Shwe Zar and Myothagyi villages were 1.9 and 1.79 respectively (Table 1, Fig. 3).

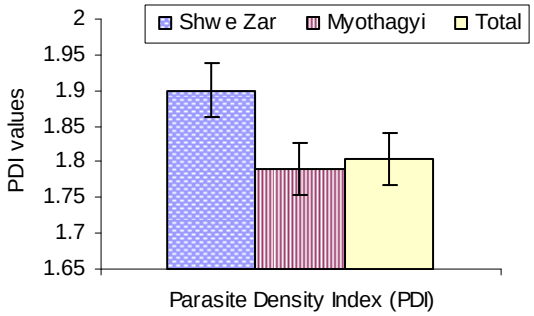

Fig.3. Malaria Parasite Density Index (PDI) of Shwe Zar and Myothagyi villages

DISCUSSION

Malaria is considered the first national priority disease in Myanmar [15] since it also affects the socioeconomic condition of the country. Anti-malaria programme has successfully decreased the incidence in many areas of the country where villages are located close to the suitable habitats for vectors. However malaria is gradually rising in some parts of country, such as forests, forested foothills, rubber plantations and rice fields. Previous studies [3,6] from Thabye-wa village, Oktwin Township, Bago Division and a coastal area of Yepyu Township, Thanintharyi Division [4] found that, the parasite positivity rates were 46.8%, 30.1% and 54% respectively. Those are higher than our findings (12.75% in Shwe Zar and 8.5% in Myothagyi). A study at Ann Township of Rakhine State [17] revealed that the parasite positive rate was 29.64%. It is higher when compared with our present study. Malaria parasite positive rate detected by microscopy in Tachileik Township was 10.76% [18] and it is similar to our present study. Another study in the same place showed 14.77% in pregnant women, 17.33% in delivery cases, 22.66% in placenta and 2.66% in neonatal blood respectively [19]. Several researchers reported that *P. falciparum* is the dominant

species (>80% in different parts of Myanmar [16, 20] and the present study also showed 81.25% and 79.41% *P. falciparum* prevalence in villagers from Shwe Zar and Myothagyi. The present study was conducted in April and May and the parasite positive rate was found to be lower, but it may be higher in transmission season. Gametocyte positive rates were 0.39% and 0.25% in Shwe Zar and Myothagyi villages. Parasite Density Index (PDI) of Shwe Zar and Myothagyi villages were 1.9 and 1.79 respectively. The PDI was lower than that of Tha-bye-wa village i.e. 3.23 in the study of Tun Lin *et al*., (1995). *An. dirus* and *An. minimus* are primary malaria vectors of Myanmar. *An. dirus* is widely distributed in forested and forest foothill areas [20, 21, 16,3] and also distributed in domestic wells at Mon State and Tanintharyi Division [8,4]. Khin Maung Kyi *et al.,* [6] epidemiologically studied that area and assumed that *An. annularis* could be a vector in Sittway. During the cyclone disaster in Rakhine State in August-September 1968, a severe malaria epidemic occurred and during that time *An. annularis* was found to breed in profusion around villages and also found resting in human habitations. Another study found that *An. barbiostrias, An. hyrecanus, An. vagus, An. maculatus*and *An. culicifacies* were the most dominant mosquito species in Ann area of Rakhine State whereas *An. annularis* is the primary vector [17]. Based on the topography of the areas, possible vectors may be *An. minimus* and *An. annularis*. Both species were collected near the study areas during the survey conducted by MERD, DMR (LM) in 2006 (unpublished record). The changes in ecology influence the mosquito population, vector prevalence and human behavior. During the study period of April and early May 2004, parasitological studies indicated that gametocyte carriers are present in the villages and >10% were positive for malaria parasite. It is assumed that, seasonal changes in post monsoon situation may aggravate the malaria prevalence in these areas and therefore, proper surveillance is required. Seasonal parasitological, entomological, immunological and social studies are required to have a complete epidemiological picture of these border areas.

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REFERENCES

1. Vector Borne Disease Control. National Health Plan (1993) Department of Health.
2. Myint Lwin, Maung Maung Mya, Win Myint & Kyaw Win. The effect of chloroquine chemoprophylaxis on workers in Kazunma area. *Myanmar Health Sciences Research Journal* 1992; 4(3): 123-127.
3. Tun Lin W, Myat Myat Thu, Sein Maung Than & Maung Maung Mya. Hyperendemic malaria in a forested, hilly Myanmar village. *Journal of American Mosquitoes Control Association* 1995; 11(4): 401-407.
4. Htay Aung, S. Minn, S. Thaung, M.M. Mya, S.M. Than, T. Hlaing, Soe Soe, Druilhe P & Queuche F. Well-breeding *Anopheles dirus* and their role in Malaria transmission in Myanmar. *South-East Asian Journal of Tropical Medicine and Public Health* 1999; 30: 447-453.
5. Myint Oo, Than Swe, Ye Htut, Tin Shwe, Nyunt Win, Aung Khin, Khin Hla Aye & Thi Thi Aye. The changing incidence of *Plasmodium vivax* infection in subjects with malaria. *Myanmar Health Sciences Research Journal* 1999; 1: 61-63.
6. Khin Maung Kyi. Malaria vectors in Burma 3. *Anopheles annularis*. *Union of Burma Journal of Life Science* 1972; 5: 81-98.
7. Myo Paing, Thi Thi Naing, Sein Min and Zaw Myint. Anopheline mosquitoes of Myanmar III *Anopheles* (Cellia). *Myanmar Health Sciences Research Journal* 1990; 2: 37-38.

8. Tun Lin W, Moe Moe, Htay Aung & Myo Paing. Larval density estimation of well-breeding anophelines by mark-release-recaptures technique in Burma. *Mosquitoes Borne Diseases Bulletin* 1986; 3: 1-4.
9. Tun Lin W, Myo Paing & Zaw Myint. A modification of the WHO dipping procedure for well-breeding anophelines in Burma. *Tropical Biomedicine* 1988; 5: 51-55.
10. Rosenberg R & Maheswary NP. Forest malaria in Bangladesh, II. Transmission by *Anopheles dirus*. *American Journal of Tropical Medicine and Hygiene* 1982; 31: 183-191.
11. Ismail IA, Notonanda V & Schepens J. Studies on malaria and responses of *Anopheles balabacensis balabacensis* and *Anopheles minimus* to DDT residual spraying in Thailand Part I. Pre-spraying observations. *Acta Tropica* 1974; 31: 130-164.
12. Ismail IA, Notonanda V & Schepens J. Studies on malaria and responses of *Anopheles balabacensis balabacensis* and *Anopheles minimus* to DDT residual spraying in Thailand Part II. Post-spraying observations. *Acta Tropica* 1975; 32: 206-229.
13. Rosenberg R, Andre RG & Ketrangsee S. Seasonal fluctuation of *P. falciparum* gameto-cytaemia. *Transactional Royal Societies of Tropical Medicine and Hygiene* 1990; 84: 29-33.
14. Rosenberg R, Andre RG & Somchit L. Highly efficient dry season transmission of malaria in Thailand. *Transactional Royal Societies of Tropical Medicine and Hygiene* 1990b; 84: 22-28.
15. Department of Health. VBDC annual report, Yangon, Myanmar, 1993.
16. Myo Paing, Sein Min, Zaw Myint & Thi Thi Naing. Comparison of malaria situation in a forested foot hill area of Bago Division between monsoon and cool-dry season. *Myanmar Health Sciences Research Journal* 1990a; 2: 88-90.
17. Thein Htay Win, Hein Hlwan Moe, Win Tint & Khin Maung Aye. Parasitological and Entomological indices of malaria in Ann area, Rakhine State. *Military Health Research Congress 2006*. 2006; P-25.
18. Ye Htut, Myat Kyaw, Kyin Hla Aye, Kay Thwe Han, Ni Ni, Myat Phone Kyaw & Saw Lwin. Malaria Situation in Tachileit (Thai-Myanmar Border) 2004. *Proceedings of Myanmar Health Research Congress 2004.* 2004; P-15.
19. Kay Thwe Han, Myat Kyaw, Ye Htut, Thein Thein Htay, Tin Nwe Htwe & Soe Soe Han. Malaria morbidity during Pregnancy in Tachileit. *Proceedings of Myanmar Health Research Congress 2004.* 2004; P-17.
20. Myo Paing, Tun Lin W, Sein Min & Zaw Myint. Malaria situation in a forested foot-hill area of Pegu. *Myanmar Health Sciences Research Journal* 1989; 1: 52-54.
21. Scanlon JE & Sandhin W. The distribution and biology of *Anopheles balabacensis* in Thailand. *Journal of Medical Entomology* 1965; 2: 61-69.