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Epidemiological Situation of Malaria in Rakhine State, Myanmar during 2000-2014

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Abstract

Rakhine State is the state with highest number of malaria cases in Myanmar. The objective of the study was to investigate the malaria situation in Rakhine State during 2000-2014. Data on malaria monthly reports from all townships during 2000-2014 were reviewed and analyzed. The malaria morbidity rate in Rakhine State was observed to decrease from 40.0 per 1,000 population in 2000 to 13.5 per 1,000 in 2014. Marked reduction in mortality and case-fatality rates were also observed. Although the morbidity and mortality rates were reduced in all townships, some townships had maintained high malaria positivity rate and low annual blood examination rate. Ten percent of cases in under 5-year children indicated the endemicity and local transmission of malaria. Malaria cases treated by community volunteers were increased from 1.7% in 2011 to 27.9% in 2014. The majority of malaria cases were caused by *Plasmodium falciparum*. Reduction in malaria morbidity and mortality might be due to early detection and treatment of cases. Efforts to detect and treat cases earlier should be a high priority in townships with high malaria positive rate and low annual blood examination rate in order to reduce the burden of malaria infection in Myanmar.

Keywords: malaria, morbidity, mortality, case-fatality, Rakhine State, Myanmar

Introduction

Malaria is one of the priority diseases in Myanmar and has been endemic in 284 out of 330 townships. The objective of the National Malaria Control Programme was to reduce malaria morbidity and mortality by 60% in 2016, compared to the baseline in 2007. The prevention and control activities were based on eight strategies, including early diagnosis and appropriate treatment. Community-based malaria control, case detection using the rapid diagnostic testing (RDT) and treatment by volunteers had been started since 2006.[1] Malaria cases were diagnosed clinically or microscopically and treated before the use of RDT. All examined and treated cases from health facilities and volunteers were recorded in registration, compiled and reported monthly.[2]

Long-term trend showed decreasing malaria morbidity and mortality in Myanmar. Morbidity rate per 1,000 population and mortality rate per 100,000 population were 24.4 and 12.6 in 1990, and 6.4 and 0.5 in 2013. Four malaria parasite species are detected in Myanmar. In 2013, the proportion of *Plasmodium falciparum* was 73% and *Plasmodium vivax* was 24%. The proportion of mixed infection was low (3%). *Plasmodium malariae* and *Plasmodium ovale* accounted for very low as 0.001%.[3]

Rakhine State is one of the malaria highest-risk areas in Myanmar. Each year, Rakhine State contributes about 20-25% of total malaria cases in Myanmar.[4] However, not all townships in Rakhine State reveal equal risk for malaria. The objective of the study was to investigate the malaria situation in Rakhine State during 2000-2014.

Methods

Rakhine State is situated between Rakhine Mountain Range and the Bay of Bengal in western part of Myanmar. In 2014, the state consisted of 17 townships, 3 sub-townships, 123 wards, 1,044 village tracts and 3,805 villages. The total population in 2014 was about three million, with 83% lived in rural areas.[5]

A descriptive cross-sectional study was carried out. Data on malaria monthly reports from all 17 townships and the state during 2000-2014 were reviewed and analyzed. Data were analyzed using morbidity and mortality rates by year and township during 2000-2014. Monthly cases for seasonal pattern, proportion of cases by gender, age group and malaria species from 2011-2014 were analyzed. Annual blood examination rate (ABER), including both active and passive cases identified by all service providers, and malaria positive rate (MPR) by townships in 2014 were also investigated.

Malaria slide microscopy had been used for malaria diagnosis in centers where microscopes were available and the RDT was used in all centers. Malaria case definition differed from year to year. Before the introduction of RDT, the reported malaria cases included those confirmed with slide-positive examination by microscope and clinically suspected ones based on only patient's clinical symptoms and those receiving treatment. The RDT was introduced in 2008, detecting only *P. falciparum*. However, it was not enough for all centers. In 2010, the RDT was distributed to all health centers, and malaria was diagnosed as confirmed cases by microscopy or RDT. For those clinically suspected cases with negative RDT were diagnosed as probable malaria. Both confirmed and probable malaria cases were reported. From 2011 onwards, the RDT that could diagnose both *P. falciparum* and *P. vivax* was distributed, and all reported malaria cases were confirmed ones.[2]

Descriptive statistics included frequency, rate and proportion. Malaria morbidity rate was calculated based on the number of malaria cases per 1,000 population and mortality rate was calculated based on number of malaria death per 100,000 population. ABER was calculated by percentage of the examined cases in the population and MPR was calculated by number of positive cases per examined cases.

Results

The malaria morbidity rate in Rakhine State reduced from 40.0 per 1,000 population in 2000 to 13.5 per 1,000 in 2014 (Figure 1). The mortality rate also reduced from nine per 100,000 population in 2000 to 0.3 per 100,000 in 2014. The highest morbidity rate was observed in 2003 and the highest mortality rate occurred in 2001.

The malaria case fatality rate reduced from 0.23% in 2000 to 0.02% in 2014 (Figure 2). The highest case fatality rate was found in 1-4 year age group during 2011 to 2014.

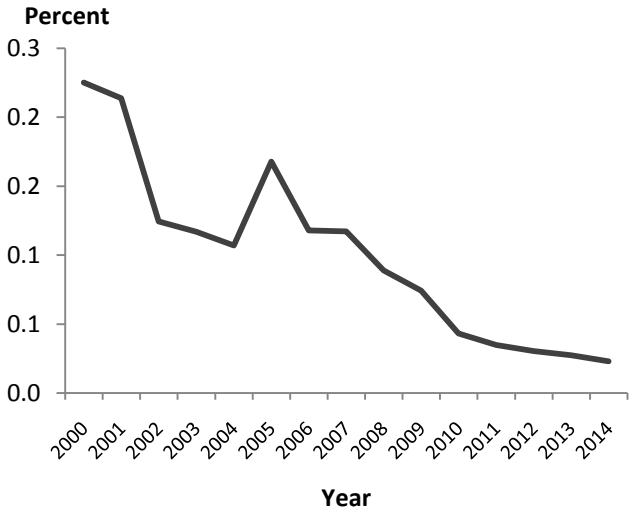

Figure 2. Case fatality rates of malaria by years in Rakhine State, Myanmar, 2000-2014

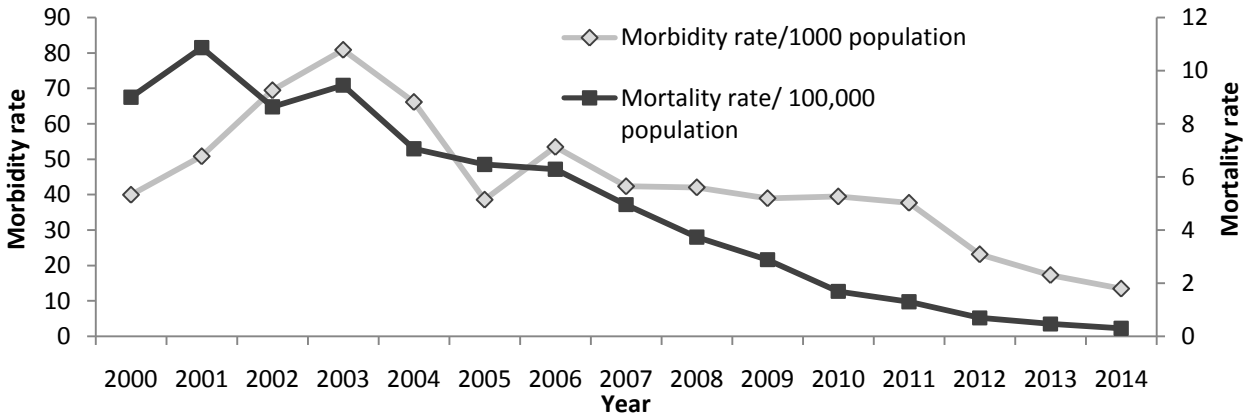

Figure 1. Malaria morbidity and mortality rates by years in Rakhine State, Myanmar, 2000-2014

In Rakhine State, malaria cases were high throughout the year, except in March and April, early summer months (Figure 3).

Malaria endemicity differed from township to township. However, all townships showed a decreasing trend. The township with the highest mortality rate (18.0/100,000 population) in 2000 had no malaria death for two consecutive years (2013-2014) (Figures 4 and 5).

In Rathedaung Township, though the highest MPR resulted as 42.6% in 2014 (Figure 6), the ABER was only 1.7%. The lowest positivity rate was found in Manauang Township (1.3%). Ann Township revealed the highest ABER of 40.6% and the MPR as only 15.6%.

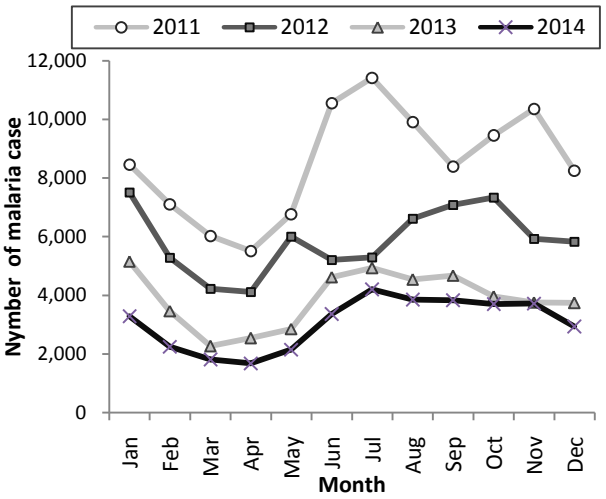

Figure 3. Malaria cases by months in Rakhine State, Myanmar, 2011-2014

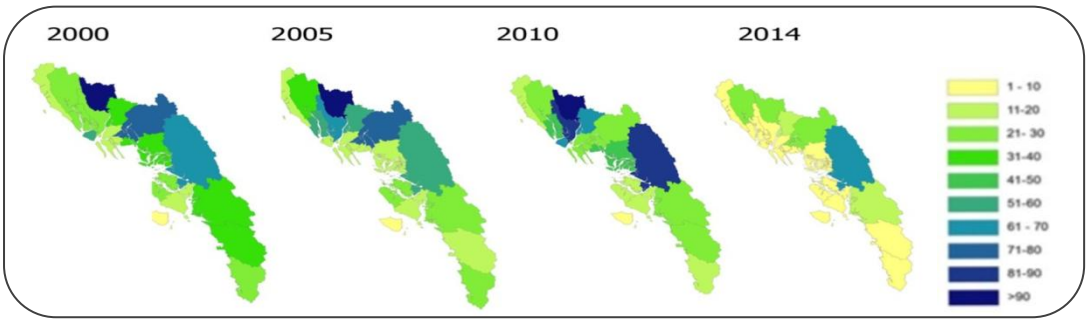

Figure 4. Malaria morbidity rates per 1,000 population by townships in Rakhine State, Myanmar, 2000-2014

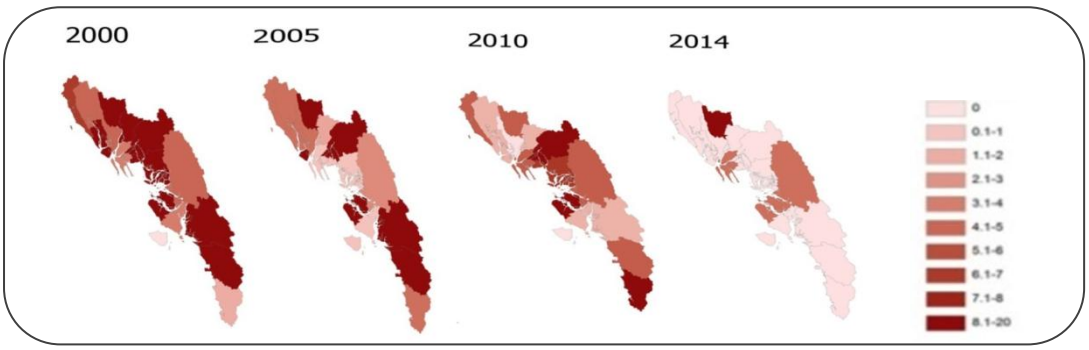

Figure 5. Malaria mortality rates per 100,000 population by townships in Rakhine State, Myanmar, 2000-2014

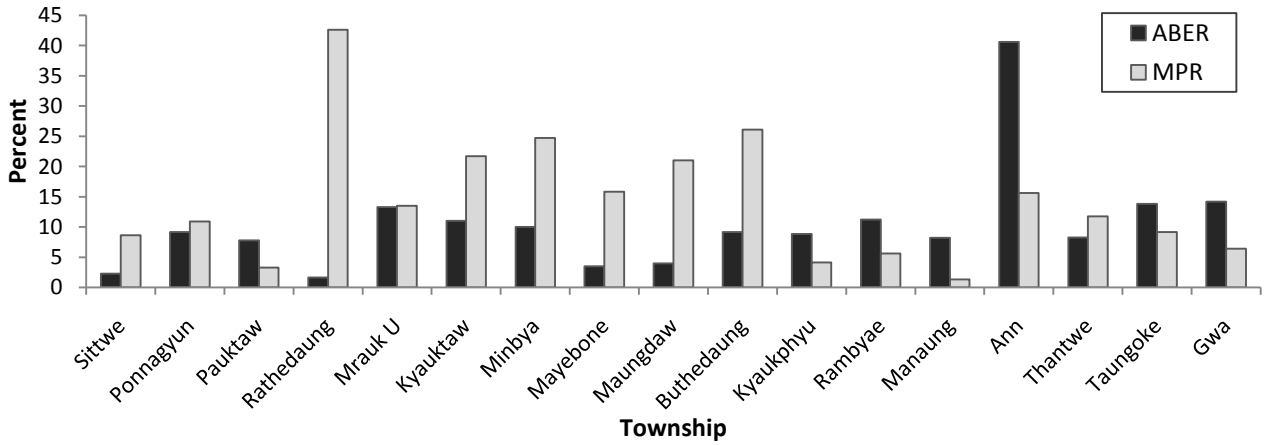

Figure 6. Malaria positivity rate (MPR) and annual blood examination rate (ABER) by townships in Rakhine State, Myanmar, 2014

During 2011-2014, the proportion of malaria cases in males was much higher than that in females. In 2014, the proportions of malaria in males and females were 70% and 30% respectively. The proportions of confirmed malaria cases in under 1-year and 1-4-year old groups in Rakhine State were 8.7% of the total cases. The proportion of malaria in under one year old group was 1.9% in 2011 and 0.7% in 2014. Among 1-4 years old children, it was 11.6% in 2011 and 8.0% in 2014. Of the 5-9 year old group, it was 13.7% in 2011 and 10.2% in 2014 (Figure 7).

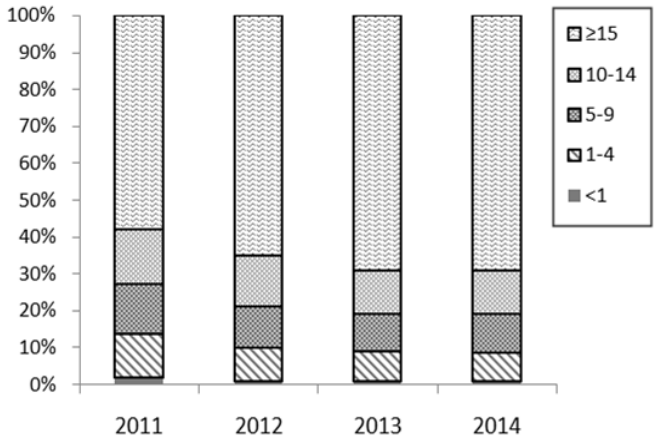

Figure 7. Yearly proportion of malaria cases by age groups in Rakhine State, Myanmar, 2011-2014

There was no malaria death in less than 1-year age group. The highest case-fatality rate was in the 1-4 age group. In 2014, CFR of 1-4 year old group was 0.1%. Malaria case management was performed not only in health facilities but also in the community level by volunteers trained by the National Malaria Control Programme. International NGOs and local NGOs also conducted case management through mobile and fixed clinics. In 2011, 19,488 cases (15.7%) were treated by NGOs and only 1.7% were treated by volunteers. The proportion of cases treated by volunteers increased year by year. In 2014, 56.2% of cases were treated at health facilities, 27.9% were treated by volunteers and 15.9% were treated by NGOs (Figure 8).

Number of malaria cases diagnosed by microscope and RDT were nearly the same in 2011. However, number of cases examined by microscope reduced year by year and only 14,015 (7.0%) of cases were examined by microscopy in 2014. Proportion of *P. falciparum* malaria parasite was higher than *P. vivax* diagnosed by both microscopy and RDT. In 2014, 72.4% of malaria cases identified by microscopy and 82.4% of those tested by RDT were *P. falciparum* (Figure 9 and table 1).

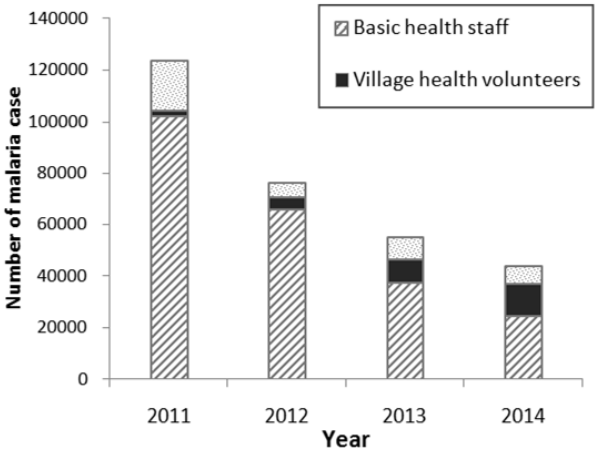

Figure 8. Malaria cases treated by different services in Rakhine State, Myanmar, 2011-2014

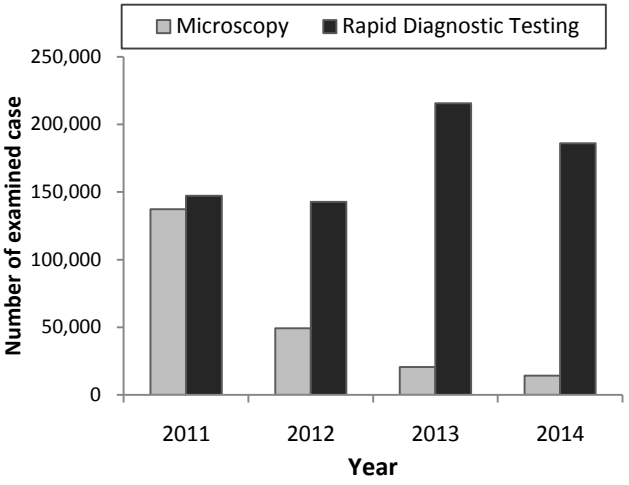

Figure 9. Number of examined cases by type of diagnosis in Rakhine State, Myanmar, 2011-2014

Table 1. Diagnostic method and malaria species distribution in Rakhine State, Myanmar, 2014

Year	Diagnostic method	Total number examined (%)	Number of positive case (%)			
			Plasmodium falciparum	*Plasmodium vivax*	Mixed	*Plasmodium malariae/ Plasmodium ovale*
2011	Microscopy	137,320 (48.3)	19,799 (56.0)	14,386 (40.7)	1,037 (2.9)	137 (0.4)
	Rapid test	147,203 (51.7)	49,053 (73.3)	14,034(21.0)	3,789 (5.7)	
2012	Microscopy	49,163 (25.6)	7,953 (63.9)	4,237 (34.1)	195 (1.6)	52 (0.4)
	Rapid test	142,797 (74.4)	45,146 (78.2)	9,446 (16.4)	3,176 (5.5)	
2013	Microscopy	20,533 (8.7)	2,685 (71.0)	948 (25.1)	130 (3.4)	21 (0.5)
	Rapid test	215,668 (91.3)	34,539 (81.8)	6,650 (15.6)	1,553 (3.6)	
2014	Microscopy	14,105 (7.0)	985 (72.4)	301 (22.1)	75 (5.5)	0 (0.0)
	Rapid test	186,076 (93.0)	29,240 (82.4)	4,932 (13.9)	1,293 (3.6)	

Discussion

The malaria morbidity and mortality rates in Rakhine State reduced during 2000-2014. After the introduction of RDT (*P. falciparum* only), more cases could be examined at peripheral levels and probable cases were included as malaria cases. Therefore, the morbidity did not significantly reduce between 2008 and 2011. After that the RDT which could examine both *P. falciparum* and *P. vivax* was used. All malaria cases were then confirmed cases and no more probable and suspected cases, giving the markedly reduction of morbidity.

Community case management activities by volunteer in Rakhine State started in 2009.[5] Therefore, early diagnosis and treatment could be done not only in health facilities, but also in the village level by volunteers, which significantly contributed to the reduction in the morbidity and mortality after 2011. Reduction in case fatality rate of malaria was likely a result of early diagnosis and treatment.[4] The seasonal pattern of transmission was not observed with the reduction of malaria transmission. Instead, a more constant level of perennial transmission was observed.

Malaria morbidity and mortality differed from township to township and might be due to different ecological conditions of the townships.[4] Even though the morbidity and mortality reduced by year, some townships still had high morbidity. Malaria mortality rate was high in many townships in 2000. However, in 2014, only a few townships had malaria death cases. Malaria positivity rate is one of the indicators in malaria control.[6]

In Rathedaung Township, the positivity rate was high even though the morbidity rate was not high in 2014. It might be due to the blood examination performed only in the suspected cases. When the disease burden becomes low, all cases should be find out to remove the residual parasite for transmission interruption.[6] In Ann Township, annual blood examination rate was high and the positivity rate was also high, indicating the high burden of malaria in the township.

The main economy of the state is forest-related works.[4] It was found that predominance of males among malaria cases might be due to their occupational exposure. Studies in Vietnam also showed that regular forest activities was the main factor for malaria infection.[7,8] The information on case's occupation could not be found from monthly report and it was a limitation of this study. In Myanmar, malaria cases occurred mainly in the age group of 15 years and above, and only about 4% were in age under-5-year old group.[9] In Rakhine State, about 10% of total cases occurred in children under five years old, which was a high burden of disease in the state. The proportion of malaria cases among under five children indicates the local transmission since children usually stay home.

Contribution of case detection by volunteers increased by year and might be due to the fact that malaria cases were more detected in hard-to-reach areas where health services were not available. From 2011 onwards, the RDT which could detect both *P. falciparum* and *P. vivax* were distributed. Health staff might prefer to use RDT, which increased the number of examined cases by RDT and decreased cases examined by microscopy in recent year.

Although the number of cases reduced in both *P. falciparum* and *P. vivax* cases, proportion of *P. falciparum* malaria was high in both microscopy and RDT. It might be due to higher incidence of *P. falciparum* compared to *P. vivax* in Rakhine.[2]

The highest malaria burden is found in Rakhine State compared with other states and regions[3]. Malaria morbidity and mortality rates reduced markedly and need to be sustained.

Public Health Recommendations

Since early case finding and treatment are major contributed factors[10], this program should be strengthened such as increased active case finding or training of more volunteers in rural remote areas. Community case management activity through volunteers should also be expanded and covered in high risk areas[11].

As the townships of Ann, Kyauktaw, Mrauk U, Minbya and Butheaung remained high malaria burden, control activities should be prioritized in these area. More prevention and control measures and locally appropriate vector control measures should also be considered in these townships. For malaria elimination, MPR is needed to achieve less than 5% in order to shift from the control to the pre-elimination phase,[9] for which, the ABER should also be considered. The township with very low ABER and high MPR should examine more patients, especially those with fever to get actual malaria positive rate. To increase ABER, malaria diagnosis should be scaled up and all fever cases should be screened in all health facilities.

Factors related to male predominance in malaria should be investigated. If it was due to occupational exposure, specific measures to prevent the exposure should also be considered. To reduce the case fatality

rate in children, rectal artesunate could be provided for pre-referral treatment.

Conclusions

Reductions in malaria morbidity and mortality were strongly related to early detection and treatment of cases. Therefore, efforts to detect and treat cases early should be a high priority in townships with high MPR and low ABER. The efforts would reduce the burden of malaria illness in Myanmar.

Suggested Citation

Khine SK, Swaddiwudhipong W, Lwin NN, Timasarn K, Hlaing T. Epidemiological situation of malaria in Rakhine State, Myanmar during 2000-2014. OSIR. 2017 Sep;10(3):16-21.

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