

**Compliance of Service Providers from Private and NGO Sectors in Prescribing Primaquine according to National Anti-malarial Treatment Guideline in Selected Townships in Myanmar**

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Primaquine (PQ) has been part of anti-malarial treatment (AMT) for both *Plasmodium falciparum* and *Plasmodium vivax* recommended by National Malaria Control Program. The study aimed to estimate the extent of compliance of service providers with national treatment guideline in prescribing PQ and to identify the factors associated with service provider compliance. Cross-sectional descriptive study was designed using a pretested structured questionnaire and observation of patient registers in past 3 months through face-to-face interview. All health care providers such as general practitioners, medical doctor, nurses, microscopists and trained volunteers from 7 INGOs working with support of the Global Fund, from randomly selected 111 villages and 21 wards across eight townships in six states and regions were interviewed. Total of 143 participants comprising 71% trained volunteers, 19% general practitioners and 10% other health staff participated in the study. Median service years of service providers was 4.2 and mean was 7.2±8.9. 3% out of 143 respondents prescribed incorrect dosage of PQ as part of *Plasmodium falciparum* treatment, 1% prescribed incorrect dosage of PQ as part of *Plasmodium vivax* treatment, 11% of them did not prescribe PQ as part of antimalarial treatment though they should do according to National Anti-Malaria Treatment Guideline (NAMTG). On the other hand, 87% of them found out to be complied with NAMTG in term of dosage, timing and considering contraindication. Service providers with high knowledge score were 2.9 (95% CI: 1.04-8.14) times more likely to comply with NAMTG than those with lower knowledge score (p=0.037). Similarly, majority of respondents 72% mentioned knowledge of the rationale of giving PQ as the promoting factor for them to prescribe it. This highlighted promoting service provider's knowledge level, particularly rationale of use of PQ as part of AMT is essential for their compliance with NAMTG.

*Key words:* Primaquine treatment, Compliance, Service provider, Malaria, National guideline, Myanmar

## INTRODUCTION

Malaria remains one of the leading causes of morbidity in Myanmar and about 70% of the population is susceptible to malaria. Moreover, due to the highly mobile nature of the population, even people in low or non-endemic areas can contract malaria infection from the migrant population. Migrants work in forestry, mining, road building, plantations, etc., and are most vulnerable to malaria infection and have

difficulty to access health services. Hence, malaria is still a priority public health disease in the country. The significant reduction of malaria morbidity (from 520,887 cases in 2007 to 182,452 in 2015) and mortality (from 1,701 in 2005 to 37 in 2015) achieved over the past decade is threatened by evolving complexity of the

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problem, especially multiple resistance of the parasites to antimalarial medications.<sup>1</sup>

In Myanmar, *Plasmodium falciparum* (*Pf*) species continues to be dominant (60%), *Plasmodium vivax* (*PV*) (36%) with negligible *malariae* and *ovale* malaria, as well as mixed species (4%) in 2015<sup>2</sup> while the proportion was 73%, 24% and 3%, respectively in 2013.<sup>3</sup>

Primaquine (PQ) has been part of anti-malarial treatment (AMT) for both *Plasmodium falciparum* and *Plasmodium vivax* recommended by National Malaria Control Program in 2011.<sup>4</sup> It was recommended to treatment *Pf* (+) cases with ACT plus primaquine 0.75 mg/kg stat dose as a gametocytocidal action (i.e. to prevent transmission), and with chloroquine and primaquine 0.25 mg/kg/day for 14 days for *Pv* (+) cases as radical treatment and for prevention of relapse. Dosage and timing of PQ treatment was slightly modified in 2012. Primaquine was to be given on Day 2 for *Pf* (+) cases, and primaquine 0.25 mg/kg/day for 14 days, starting from D2, was to be given by BHS (Health staff) and 0.75 mg/kg/week for 8 weeks was to be given by volunteer.<sup>5</sup>

This study aimed to estimate the proportion of service providers complying with current national antimalarial treatment guidelines (2011) in prescribing PQ and to identify the factors associated with service provider compliance.

## MATERIALS AND METHODS

Cross-sectional descriptive study design applying quantitative methods was carried out from November 2015 to February 2016. Seven INGOs sub recipients (SRs) working with support of the Global Fund participated in the study. Project townships were clustered by each INGO and at least one township was selected from each cluster based on malaria case load of those INGOs in recent years (i.e. 2013 and 2014). Eight townships namely Madaya, Ye, Waingmaw,

Maungdaw, Monywa, Myitkyina, Homalin and Myeik were selected. Across those townships, 111 villages and 21 wards were randomly selected and all health care providers such as general practitioners, medical doctors, nurses, microscopists and volunteers, supported and trained by INGO SRs, from those selected villages/sites were interviewed. Total of 143 participants has been recruited in the study. Case management register of service providers were observed to estimate service provider compliance, and face-to-face interview with pre-tested structured questionnaire were conducted to find out associated factors of their compliance with NAMTG.

SPSS 21 (IBM) was used for all descriptive statistics and bivariate/multivariate logistic regression analysis between service provider compliance and independent variables which were socio-demographic factors of service providers, training, availability of supply, and knowledge level. Chi-square tests were used to determine the association between categorical variables and odds ratios and 95% confident intervals were used for quantification. P value <0.05 was considered to be statistically significant.

### *Ethical consideration*

The study was reviewed and approved by the Ethics Review Committee of Department of Medical Research, Ministry of Health and Sports.

## RESULTS

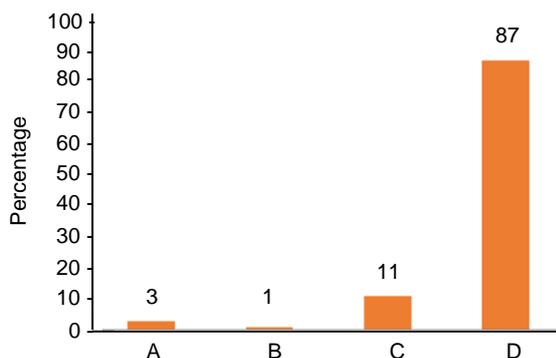
### *Background characteristics of participants*

Total of 143 participants comprising 71% trained volunteers, 19% general practitioners and 10% other health staff participated in the study. The study comprised of 54% males and 46% females. Bamar (34%), Shan (22%), and Kachin (20%) ethnic groups were the majority. About 83% had education at least completed middle school and beyond. Median years of service of service providers was 4.2 and mean was 7.2±8.9. Fifty-five percent of total

respondents had suspected malaria cases  $\geq 15$  in last quarter. INGOs involved in the study were cooperazione e sviluppo (CESVI), Health Poverty Action (HPA), International Organization for Migration (IOM), Malteser, Population Services International (PSI), Save the Children International (SCI) and World Vision International (WVI) and 82% of respondents were from Malteser, PSI and SCI.

### Compliance outcome

Based on observation of patient register books of service providers, 3% out of 143 respondents prescribed incorrect dosage of primaquine as part of *Pf* treatment, 1% prescribed incorrect dosage of primaquine as part of *Pv* treatment, 11% of them did not prescribe PQ as part of antimalarial treatment as per the National guideline (Fig. 1). These incidents were considered as non-compliance. On the other hand, 87% of them prescribed primaquine in line with NAMTG as part of the antimalarial treatment.



- A= Who prescribed incorrect dosage of PQ as part of *P. falciparum* treatment
- B= Who prescribed incorrect dosage of PQ as part of *P. vivax* treatment
- C= Who didn't prescribe PQ as part of malaria treatment though they should do
- D= Who prescribed PQ as part of the malaria treatment while considering contraindication according to national antimalarial treatment guideline

(Note: As there were some overlapping of individual among non-compliance categories, total percentage is not equal to 100%)

Fig. 1. Proportion of service providers complied with NAMTG

In term of compliance, about 93% of general practitioners participants, 86% of other health staff, 84% of community health workers and 87% of malaria volunteers complied with NAMTG including contraindicated cases (Table 1).

Table 1. Proportion of compliance among service providers with NAMTG by type of service provider

Compliance/ non-compliance	Types of service providers				Total
	GP	Other HS	Community health worker	Malaria volunteer	
Prescribed in- correct dosage of PQ as part of <i>Pf</i> treatment			7%(4)**	2%(1)*	5
Prescribed in- correct dosage of PQ as part of <i>Pv</i> treatment				4%(2)*	2
Failed to pre- scribe PQ as part of malaria treatment as per GDMM	7% (2)	14% (2)	14%(8)**	9%(4)	16
Prescribed PQ as per GDMM, including con- traindicated cases	93% (25)	86% (12)	84%(47)	87%(40)	124
Total number of service providers	27	14	56	46	

\*One person overlapped in 2 non-compliance categories, hence total percentage is not equal to 100%.

\*\*Three persons overlapped in 2 non-compliance categories, hence total percentage is not equal to 100%.

### Training received

The mean number of trainings about malaria prevention, diagnosis and treatment received among service providers was  $3.7 \pm 2.6$ . Sixty percent of total respondents received less than four trainings of malaria prevention, diagnosis and treatment. The majority (76%) received refresher training every year and 54% had already received refresher training in the current year.

### Availability of supply

Out of 143 respondents, 20% had ever experienced shortage of antimalarial drugs, with 10% having occurred in current year. Coartem (5% of respondents) was most common one and followed by chloroquine and primaquine. Similarly, 18% of providers had ever experienced of shortage of diagnostic

equipment with 9% having occurred in current year. Rapid malaria diagnostic test (RDT) was most common shortage in 8% of respondents.

Table 2. Knowledge score among service providers by organization

Organization	Mean	Median	Range (Min-Max)	95% CI for mean	P
A	7.92	9.0	1-11	6.33-9.51	0.887
B	7.27	7.5	2-10	6.18-8.37	0.092
C	8.44	9.0	5-11	7.00-9.89	0.543
D	8.69	9.0	6-10	8.12-9.26	0.244
E	8.44	9.0	1-11	7.68-9.20	0.125
F	7.58	8.0	3-10	6.90-8.26	0.166
G	8.40	8.0	8-9	7.72-9.08	0.688
Total	8.01	9.0	1-11	7.64-8.37	

### Knowledge of service providers about NAMTG

Knowledge scores among service providers ranged from 1 point to 11 points as the

maximum, median was 9 and mean was  $8 \pm 2.2$ . Mean across organizations ranges from 7.27 to 8.69, and variation of mean across organizations was found out to be minimal (Table 2).

### Bivariate analysis between independent variables and compliance of service providers

Table 3 showed the association between respondent's socio-demographic characteristics, training received, availability of supply, knowledge level of national treatment guideline, and compliance of service providers on national treatment guideline. Service providers with high knowledge score were 2.9 (95% CI: 1.04-8.14) times more likely to comply with national treatment guideline than those with lower knowledge score ( $p=0.037$ ).

Table 3. Bivariate analysis of respondent's socio-demographic characteristics, training received, availability of supply, knowledge level and compliance of service providers with NAMTG in Myanmar

Variables	Adherence (%)	OR	CI (95%)	P	
Association between socio-demographic factors of patient and compliance of service providers with NAMTG					
Yes	124(87)				
No	19(13)				
<i>Age (years)</i>					
≤39	7(36.8)	74(59.7)	2.54	0.93-6.89	0.061
>39	12(63.2)	50(40.3)			
<i>Gender</i>					
Male	12(63.2)	65(52.4)	1.56	0.57-4.22	0.382
Female	7(36.8)	59(47.6)			
<i>Service</i>					
<5	10(52.6)	74(59.7)	1.33	0.51-3.51	0.561
≥5	9(47.4)	50(40.3)			
<i>Education level</i>					
≤High school	14(73.7)	78(62.9)	1.65	0.56-4.88	0.361
At least high school level passed	5(26.3)	46(37.1)			
<i>Ethnic</i>					
Bamar	2(10.5)	46(37.1)	3.71		0.131
Shan	9(47.4)	22(17.7)	0.39		0.136
Kachin	3(15.8)	25(20.2)	1.34		0.704
Others	5(26.3)	31(25)	0		0.035
<i>Type of service provider</i>					
Health staff	4(21.1)	37(29.8)	1.59	0.5-5.13	0.430
Volunteer	15(78.9)	87(70.2)			
Association between training received, availability of supply, knowledge level and compliance of service providers with NAMTG					
<i>Training</i>					
≤3	14(73.7)	72(58.1)			
>3	4(21.1)	50(40.3)	2.43	0.74-7.82	0.127
Received training this year	12(63.2)	65(52.4)	1.56	0.57-4.22	0.382
Experienced shortage of anti-malaria medicine in the past	4(21.1)	24(19.4)	1.11	0.34-3.65	0.862
Experienced shortage of diagnostic materials in the past	5(26.3)	20(16.1)	1.86	0.60-5.74	0.276
Shortage of anti-malaria medicine this year	2(10.5)	12(9.7)	1.1	0.23-5.34	0.908
Shortage of diagnostic materials this year	3(15.8)	10(8.1)	2.14	0.53-8.60	0.275
<i>Knowledge level</i>					
<9	13(68.4)	53(42.7)			
≥9	6(31.6)	71(57.3)	2.9	1.04-8.14	0.037

Table 4. Promoting factors for service providers to prescribe PQ

Factor	Frequency	%
To prevent Malaria recurrence/ To kill malaria parasite	81	56.6
Due to training and guideline	17	11.9
To kill gametocytes in liver	15	10.5
To control malaria transmission	6	4.2
No answer	14	9.8
Others	10	7
Total	143	100

*Promoting factors for service providers to prescribe primaquine as part of antimalarial treatment*

As in Table 4, majority of respondents (57%) mentioned knowledge of the rationale of giving primaquine in *Pv* cases while another 15% mentioned knowledge of the rationale of giving primaquine in *Pf* cases as the promoting factors for them to prescribe it. Some proportion (12%) identified receiving training/guideline as the promoting factors. Another 10% did not respond any, and the other responses were categorized as others.

Table 5. Barriers for service providers to prescribe PQ

Factor	Frequency*	%
Side effect of PQ	10	10
Unknown G6PD deficiency status	11	11
Contraindications	34	35
According to Guideline or training	18	19
Others	22	23
No answer/don't know	7	7
Total	96	100

\*More than one response per participant

*Barrier for service providers to prescribe primaquine as part of antimalarial treatment*

As shown in Table 5, among the participants who responded they do not prescribe primaquine to every confirmed case, 35% was due to awareness of contraindications, 19% was according to treatment guideline or training, 10% showed concern of other side effects of PQ and another 11% showed concerns of unknown G6PD deficiency status as the barrier. Another 23% responded

different reasons including misconception, over concerns of other side effects of PQ and patient refusal. The rest did not respond any or gave “do not know” response.

## DISCUSSION

The study revealed that 87% of participated service providers fully complied with national anti-malarial treatment guideline by prescribing correct dosage and schedule as well as by considering contraindicated cases for prescribing PQ. In term of non-compliance, 3% prescribed incorrect dosage of PQ as part of *Pf* treatment, 1% prescribed incorrect dosage of PQ as part of *Pv* treatment, and 11% of them did not prescribe PQ as part of antimalarial treatment as per national guideline.

A study conducted in four townships Mandalay region showed that awareness of patients about medicines they had been prescribed influenced their adherence to treatment and then treatment outcome.<sup>6</sup> The patients would certainly not have correct information of prescribed medicine unless service providers know exactly the rationale of medicine that they prescribe. Another study conducted in selected townships of upper Myanmar highlighted that basic health staff with good knowledge on national treatment guideline and adequate supply of RDT and ACT, they will be effective health care providers.<sup>7</sup> In this study, only knowledge score was significantly associated with compliance outcome (OR: 2.9, 95% CI: 1.04-8.14,  $p=0.037$ ). Knowledge scores among service providers range from 1 point to 11 points as the maximum, median was 9 and mean was  $8\pm 2.2$ .

Majority of respondents, 72% highlighted knowing the rationale of prescribing PQ as part of antimalarial treatment promoted them to prescribe PQ. Another 12% identified training of guideline as the promoter. There was high awareness among service providers on contraindications for PQ prescription mentioned in national

treatment guideline. Provider concerns regarding unknown G6PD deficiency status and other side effects of PQ also prevented prescription. Interestingly, there was no correlation between training (quantify or time elapsed since) and knowledge score. This raises questions regarding the quality and effectiveness of the training, and how the role of supportive supervision affects knowledge of malaria health care providers.

Based on the findings, it is concluded that strengthening knowledge level of service providers for malaria diagnosis and treatment, particularly rationale of use of PQ as part of antimalarial treatment is essential for their compliance with NAMTG, and supervision and mentoring could be important approaches given that training was not found effective in the study.

#### *Competing interests*

The authors declare that they have no competing of interests.

### **ACKNOWLEDGEMENT**

We would like to express gratitude to Director of Disease Control, National Malaria Control Program and Malaria Technical Strategy Group for their kind permission to conduct this study. Special thank goes to our colleagues from implementation partners - CESVI, Health Poverty Action, International Organization for Migration, Malteser International, Population Services International, Save the Children International and World Vision International, in both Yangon coordination

level and field level for their kind collaboration, assistance, technical and operational advices throughout the study. Without their support this study would never be existed. We thank the Global Fund to Fight AIDS, Tuberculosis and Malaria for funding support to conduct this study.

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