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Caregivers' malaria preventive practice for under-five children and its association in Ngapudaw high-risk Township, Ayeyarwady Region, Myanmar

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Abstract

Purpose - This study aimed to describe and find the associations of the characteristics and malaria preventive practices among caregivers of under-five children in Ngapudaw, high-risk Township, Ayeyarwady Region-Myanmar.

Design/methodology/approach - A community based cross-sectional study was conducted among 422 caregivers in April 2018. Data was collected using face-to-face interview with administered questionnaires. Chi-square and fisher exact's tests for bivariate analysis and multiple logistic regression for multivariate analysis were conducted for data analysis.

Findings - Majority of the respondents had good malaria preventive practices for personal protective measures (70.6%), and treatment seeking practice (80.5%); but they had poor malaria preventive practices for environmental control measures (57.4%). In bivariate analysis, statistically significant associations (p-value<0.05) were found among economic status, number of household members, knowledge, perceived susceptibility, severity, barriers and personal protective measures. There were statistically significant associations among economic status, perceived self-efficacy, benefits, severity and treatment seeking practice (p-value<0.05). Finally, there were statistically significant associations among perceived severity, barriers and environmental control practices (p-value<0.05). In multivariate models, statistically significant associations (p-value<0.05) were maintained among number of household members, perceived severity and personal protective measures; and among perceived severity, barriers, both environment control practices and treatment seeking practice.

Originality/value - Community based program for instance participatory rural appraisal (PRA) should be implemented in the area of poor environmental control practices in order to influence perceived severity on all malaria prevention practices.

Keywords Caregivers, Malaria preventive practices, Under-five children, Myanmar

Paper type Research paper

Introduction

Malaria is a life-threatening vector-borne disease which is caused by transmission of malaria parasites through the bite of infected female Anopheles mosquitoes. Children under 5, one of high-risk populations, have more chance to get illness and death due to severe malaria in high malaria transmission areas [1].

Although there has been a great reduction of malaria burden all over the world, within the past few years, malaria is still a priority public health problem and one of the leading cause of death among under-five children [2], especially in low and middle-income countries. Also, in Myanmar, it is still a major public health problem in malaria-endemic areas and the fourth leading cause of death among under 5 children.

According to World Health Organization(WHO), nearly half of world populations are living in malaria at-risk areas and globally estimated 216 million malaria cases in 2016 [3]. In South East Asia, 1.35 billion people are living in malaria-endemic areas and there were 1.3 million reported cases and estimated 14.6

billion cases by WHO in 2016 [3]. In Myanmar, among 52 million people, around 43% or 22.4 million were living in 291 malaria endemic townships out of total 330 townships in 2015. Out of 291, 171 townships had an Annual Parasite Incidence (API) > 1 per 1,000 populations at risk and there were total 182,616 malaria cases in 2015 [4].

Globally, 91% and 6% of 445 000 malaria deaths occurred within Africa and South East Asia in 2016 according to WHO World Malaria Report 2017 [3]. In 2015, 70% of total global malaria deaths, estimated 303,000 deaths, had occurred among under-five children [5]. The WHO and Maternal and Child Epidemiology Estimation Group (MCEE)'s estimated under-five children death rate as two deaths per 1000 live births in 2015 [6]. In Myanmar in 2015, WHO and MCEE estimated under-five death rate as one death per 1000 live births (equivalent to 527 under-five children deaths) but the Ministry of Health (MOH) reported 37 total malaria deaths only [4]. Furthermore, the disease causes huge economic loss especially in poor countries due to health-care costs and reduced productivity [7].

Due to the preventable and curable nature of malaria, practicing preventive measures and receiving early diagnosis and effective treatment are important in reducing malaria burden. In Myanmar, use of long lasting insecticide treated nets (LLINs) is a core malaria preventive measure [8]. From 2001 to date, LLINs distribution targeted and covered 1.8 people per net (WHO standard) [9] and was coupled with Behavior Change Communication (BCC) materials to ensure high and correct LLINs usage [4]. The other preventive measures are burning mosquito coils, wearing long clothing in the evenings and cleaning surrounding residential environment. However, using mosquito repellents is uncommon among community members while is, instead, frequently used among forest workers and migrants [10].

After searching articles globally, we found thirteen-studies assessing knowledge and perception among caregivers of under-five children and knowledge, perception and malaria preventive practices among community. In Myanmar, there were only two studies assessing malaria preventive practice and treatment seeking practice, respectively, among caregivers of under-five children in Ingapu Township, Ayeyarwaddy Region and no study regarding malaria preventive practices among caregivers of under-five children in Ngapudaw Township though it is one of malaria-endemic areas in Myanmar. The literature search revealed the scarcity of malaria preventive practices studies among caregivers of under-five children. The one identified malaria preventive practice study in Myanmar included few quantitatively measured variables in relation to malaria preventive practices among caregivers and the some variables reported in qualitative findings in other studies such as condition of bed nets, ownership and availability of mosquito repellents, coils and long sleeves, presence of breeding sites, availability of health facility had not been quantitatively assessed. Therefore, our quantitative study was carried out to describe a larger number of variables and their associations with malaria preventive practices among caregivers for under-five children in Ngapudaw Township.

Methods

Study design and study area

This study was a community, household-based-cross-sectional descriptive and analytic study among primary caregivers of under-five children in malaria high risk areas (stratum3a according to 2016 Vector Borne Disease Control/VBDC data) in Ngapudaw townships of Ayeyarwady Region, Myanmar.

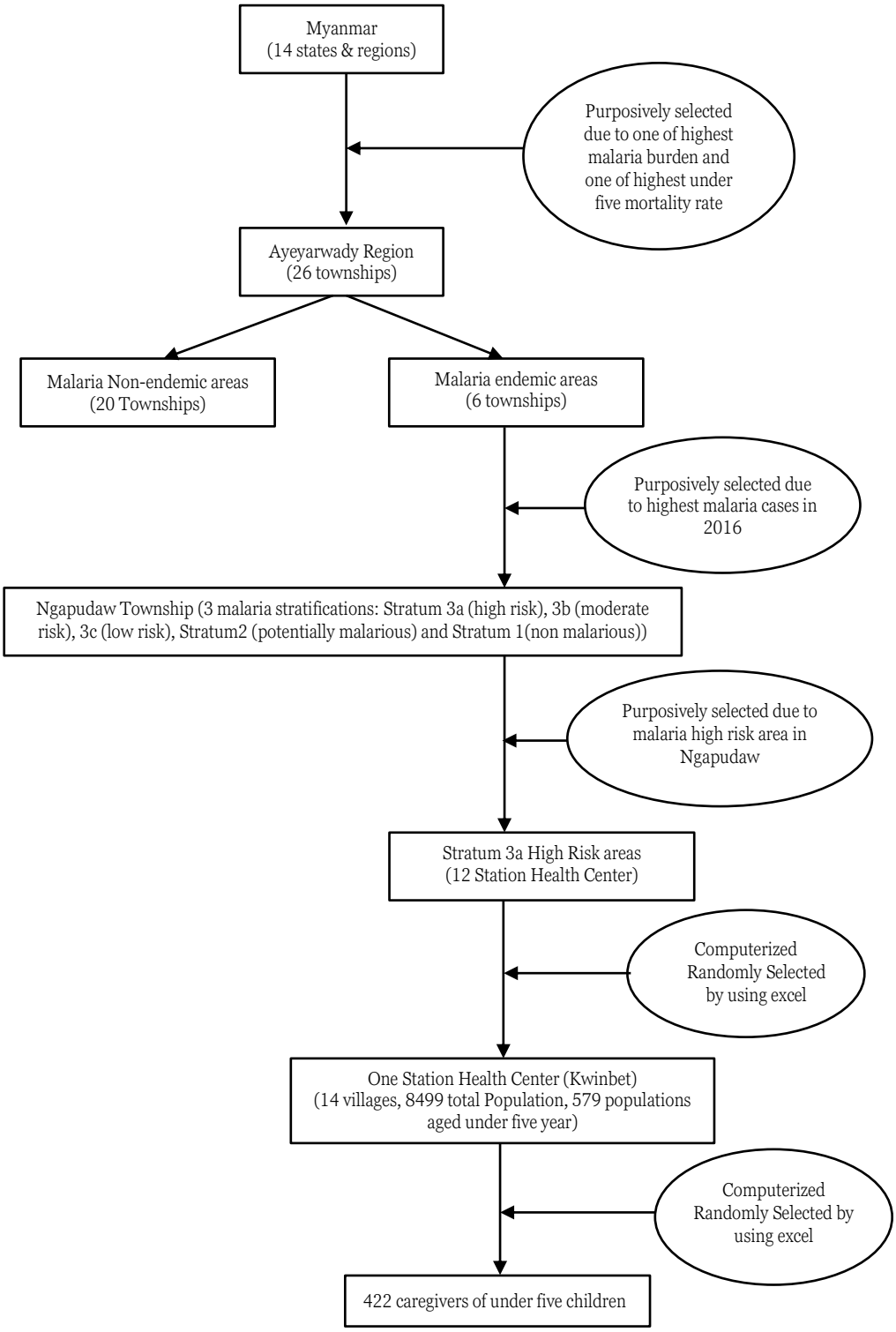

Figure 1. Sampling Flow Chart

Sample size and sampling procedure

The required minimum sample size, was calculated by Cochran's formula in 1977 [11] with the following assumptions 95% confidence interval, 5% marginal error, an estimated proportion assuming 50% of caregivers' having good malaria preventive practices for under-five children to get maximum sample size due to non-

existing reliable data of preventive practice proportions. After adding 10% for refusals and withdrawals, the sample size was 422 caregivers.

Multistage sampling technique was used as shown in Figure 1. Inclusion criteria were both male and female caregivers of under-five children in the household who were willing to participate and give oral and written consent. Exclusion criteria were caregivers aged less than 18(illegal age to give consent in Myanmar) or had mental problems or serious illness or could not talk at the time of interview.

Variables

The Independent variables included modifying factors [12-24]; socio-demographic characteristics namely age, sex, marital status, education level, occupation and economic status, wealth index, household characteristics namely, relationship of respondents to under-five children, number of household members, number of under-five children, age of under 5 children and level of knowledge, perceptions towards malaria [24]; perceived susceptibility, perceived severity ,perceived benefit, perceived barrier and perceived self-efficacy and cues to malaria preventive practices [25, 26]. The operational definition for cues to malaria preventive practices refers to cues or readiness to initiate such practices i.e. ownership and availability at local shops of LLINs, mosquito repellents and coils, coverage of 2 people per LLIN, ownership of bed nets and long sleeves, condition of bed nets and LLINs, presence of bushes and stagnant water around the house, availability of health facilities or volunteer to seek treatment for under-five children and source of information about malaria prevention, death of family members and children under-five year due to malaria.

Dependent variables [27] included three malaria preventive practices: practicing personal protective measures (sleeping under bed nets/LLINs, let children sleep under bed nets/LLINs, checking tears/holes in bed nets/LLINs, wearing children long sleeves and pants at night time, using mosquito repellents, using mosquito coils), practicing environmental control measures (cleaning bushes around the house and cleaning stagnant water around the house) and treatment seeking practice (receiving health care from health center (station health center, sub center)/health volunteer if their children get fever). The operational definition of malaria preventive practices refers to routine activities or actions of respondents to prevent his/her children getting malaria infection and that of caregivers refers to primary caregivers who take care of youngest under-five child in the household for most of the time and were the child's father, mother, grandparents, or others.

Instrument & data collection

The data was collected using interviewer-administered structured questionnaire. Construct and Content Validity were established by adapting the health belief model theory, literature reviewing and involving three malaria experts using item-objective congruence (IOC). As IOC for each item was more than 0.75, the questionnaire was not modified. Face validity of questionnaire and internal consistency reliability tests were evaluated during pilot testing on 38 under-five caregivers with similar characteristics to the study participants. Internal consistency reliability used Cronbach's Alpha for perceptions and Kuder-Richardson formula 20 for knowledge with acceptable items having a cutoff point of 0.7 and above [28, 29].

The questionnaire was translated into Myanmar language and back translated into English language by two malaria experts with English skills. Data collection was done in April 2018 by the principal investigator and three research assistants, trained one day prior to the survey.

Statistical analyses

Manual double entry of data was adopted for transferring data from paper to electronic format using excel. Data analysis was processed using Excel and SPSS software version 22 (licensed from Chulalongkorn University). Wealth index scoring, was categorized into five quintiles by principle component analysis in Myanmar Equity Tool /Myanmar Census [18]. Level of knowledge was categorized into three groups using Bloom's Criteria (<60%, poor 60-80% moderate and >80% high) [30, 31], and then we combined poor and moderate level for analysis. Each component of perceptions towards malaria was categorized into low, moderate and high by mean scores and standard deviations for descriptive statistics and categorized into low and high (below or above the mean scores respectively) for inferential statistics [12]. Similarly cue to malaria preventive practices was divided into low and high by mean scores [12]. Each dependent variable was dichotomized into poor and good using mean score. Descriptive statistics were performed using mean, number and percentage. Bivariate analysis was done by chi-square test or the Fisher's exact test. Multivariate analysis was done with multiple logistic regression, entering into the model all variables with p-value <0.025 in bivariate analysis and the following theoretically important variables drawn from the literature: for personal protective measures and environmental control measures , sex, economic status, education and age of children under-five year [16], marital status [14], occupation [16, 21], level of perceived susceptibility [32] and for treatment seeking, age of caregivers, level of perceived susceptibility, level of perceived barriers [12], education [33] and level of knowledge [12, 15].

Ethical approval from the Ethical Review Committee of Chulalongkorn University (COA No. 080/2018, 28.3.2018) and permissions from respective village leaders and general administrative office of Nga Yoke Kaung Sub-township of Ngapudaw Township were got to conduct research.

Results

Table 1, among 422 respondents, the mean age of the respondents was 34 and ranged from 18 to 83 years. Over half (59.5%) of respondents were above 30. Most respondents were female (95.3%), married (91.9%), housewives (72.3%), mothers (79.9%). The highest number of respondents had secondary school level education (38.2%) and were in the second quintile (poor level) of the wealth index (30.8%). Most respondents (53.1%) had more than four household members and the average number of household members was 5 (min - 2, max - 11). Over half of the respondents (50.7%) had good knowledge, and moderate levels of perceived susceptibility (55.5%), perceived severity (51.9%), perceived benefits (64.2%), perceived barriers (67.1%) and perceived self-efficacy (69.2%) and high levels of cues to malaria preventive practices (58.5%).

Table 2 shows that 70.6% among 422 respondents had good malaria preventive practice for overall personal protective measures. Among 176 respondents exposed to environmental risks (bushes and stagnant water) around their households, 57.4% had poor environmental control practice for malaria prevention. Among 410 respondents who had health center or health volunteer close to the households, 80.5% always received health care when their children got fever.

In bivariate analysis, personal protective measures showed no statistically significant association with age, sex, marital status, education, occupation, relationship of respondents to under-five children, and number and age of under-five children under among socio-demographic and household characteristics, perceived barriers and perceived self-efficacy among perceptions towards malaria and cues to malaria preventive practices. Also, environmental control practices

Table 1. Descriptive findings of characteristics of caregivers of under-five children

Characteristics	n = 422	%	Characteristics	n = 422	%
Modifying factors			**Household characteristics**		
Socio-demographic characteristics			**Number of household members**		
Age (years)			≤4	198	46.9
<30	171	40.5	>4	224	53.1
≥30	251	59.5	**Number of under-five children**		
Sex			1	382	90.5
Male	20	4.7	2	37	8.8
Female	402	95.3	>2	3	0.7
Marital status			**Age of under-five children (months)**		
single	10	2.4	<12	77	18.2
married	388	91.9	12-23	64	15.2
divorce/separated	5	1.2	24—35	108	25.6
widow/widower	19	4.5	36-47	84	19.9
Education			48-59	89	21.1
Illiterate	25	5.9	**Level of knowledge**		
Primary school	112	26.5	Poor (<17scores)	8	1.9
Secondary school	161	38.2	Moderate(17-23scores)	200	47.4
High school	97	23.0	Good (>23 scores)	214	50.7
Higher education level	27	6.4	**Perceptions towards Malaria**		
Occupation			**Perceived susceptibility**		
Employee (Government)	11	2.6	Low	79	18.7
Employee (Private)	3	0.7	Moderate(13-15scores)	234	55.5
Self-employee	64	15.2	High (≥16 scores)	109	25.8
Employer	28	6.6	**Perceived severity**		
Housewife	305	72.3	Low (≤11scores)	97	23
Unemployed	3	0.7	Moderate(12-14scores)	219	51.9
Student	3	0.7	High (≥15 scores)	106	25.1
Others (monks or religious leaders or elderly people)	5	1.2	**Perceived benefits**		
			Low(≤18scores)	68	16.1
Economic status			Moderate(19-23scores)	271	64.2
Poorest	81	19.2	High (≥24scores)	83	19.7
Second	130	30.8	**Perceived barriers**		
Middle	106	25.1	Low (≤17scores)	76	18
Fourth	45	10.7	Moderate(18-22scores)	283	67.1
Richest	60	14.2	High(≥23scores)	63	14.9
Household characteristics			**Perceived self-efficacy**		
Relationship of respondents			Low (≤20scores)	42	10.0
Mother	337	79.9	Moderate (21-27scores)	292	69.2
Father	10	2.4	High (≥28scores)	88	20.8
Grandparents	54	12.8	**Cues to malaria preventive practices**		
Others(sibling, aunt or uncle)	21	4.9	Low (<15scores)	175	41.5
			High (≥15 scores)	247	58.5

Table 2. Descriptive findings of malaria preventive practices among caregivers of under-five children

Level of malaria preventive practices	n	%
Personal protective measures (n=422)		
poor(<7 scores)	124	29.4
good(≥7 scores)	298	70.6
Environmental control measures (n=176)		
Poor(<3scores)	101	57.4
Good(≥3scores)	75	42.6
Treatment seeking practice (n=410)		
Poor(<2scores)	80	19.5
Good(≥2scores)	330	80.5

Table 3. Bivariate analysis between characteristics and malaria preventive practices among caregivers of under-five children

Characteristics	Personal protective measures (n=422)					Environment control measures (n=176)					Treatment seeking practice (n=410)				
	Poor		Good		*p*-value	Poor		Good		*p*-value	Poor		Good		*p*-value
	n	%	n	%	(X^2)	n	%	n	%	(X^2)	n	%	n	%	(X^2)
Economic status					0.033*					0.441					0.032*
Poorest/Second poor	72	34.1	139	65.9		49	60.5	32	39.5		48	23.8	154	76.2	
Middle/fourth/Richest	52	24.6	159	75.4		52	54.7	43	45.3		32	15.4	176	84.6	
Relationships of respondents to U5 children					0.995					0.577					0.496
mother	99	29.4	238	70.6		83	56.5	64	43.5		66	20.2	261	79.8	
other	25	29.4	60	70.6		18	62.1	11	37.9		14	16.9	69	83.1	
Number of household members					0.005*					0.553					0.908
≤4	45	22.7	153	77.3		49	59.8	33	40.2		37	19.3	155	80.7	
>4	79	35.3	145	64.7		52	55.3	42	44.7		43	19.7	175	80.3	
Level of knowledge					0.011*					0.097					0.584
Poor level	73	35.1	135	64.9		49	64.5	27	35.5		38	18.4	168	81.6	
Good level	51	23.8	163	76.2		52	52	48	48		42	20.6	162	79.4	
Perceived susceptibility					0.002*					0.467					0.418
Low level	58	38.7	92	61.3		35	53.8	30	46.2		32	21.6	116	78.4	
High level	66	24.3	206	75.7		66	59.5	45	40.5		48	18.3	214	81.7	
Perceived severity					0.000**					0.039*					0.000**
Low level	80	45.5	96	54.5		28	46.7	32	53.3		60	34.5	114	65.5	
High level	44	17.9	202	82.1		73	62.9	43	37.1		20	8.5	216	91.5	
Perceived benefits					0.000**					0.618					0.000**
Low level	71	38.6	113	61.4		38	55.1	31	44.9		50	27.8	130	72.2	
High level	53	22.3	185	77.7		63	58.9	44	41.1		30	13	200	87	
Perceived barriers					0.469					0.003*					0.152
Low level	51	27.6	134	72.4		33	44.6	41	55.4		30	16.4	153	83.6	
High level	73	30.8	164	69.2		68	66.7	34	33.3		50	22	177	78	
Perceived self-efficacy					0.169					0.946					0.042*
Low level	64	32.7	132	67.3		49	57.6	36	42.4		45	23.8	144	76.2	
High level	60	26.5	166	73.5		52	57.1	39	42.9		35	15.8	186	84.2	

Note: *p-value <0.05; ** p-value<0.001; # Fisher Exact Test

Table 4. Summary table of analysis results of three dependent variables

Independent variables	Analysis results of dependent variables					
	Practice 1		Practice 2		Practice 3	
	Personal protective measures		Environmental control practices		Treatment seeking practice	
	Bi-variate	Multi-variate	Bi-variate	Multi-variate	Bi-variate	Multi-variate
Economic status	A	-	-	-	A	
Number of household members	A	A	-	-	-	
Level of knowledge	A	-	-	-	-	
Level of perceived susceptibility	A	-	-	-	-	-
Level of perceived severity	SA	SA	A	A	SA	SA
Level of perceived benefits	SA	-	-	-	SA	-
Level of perceived barriers	-	-	A	A	-	A
Level of perceived self-efficacy	-	-	-	-	A	

Note: A= Significant Association (p<0.05); SA= Strongly Significant Association (p<0.001)

showed no statistically significant association with any variable of modifying factors, perceived susceptibility, perceived benefits, perceived self-efficacy among variables of perceptions towards malaria, and cues to malaria preventive practices. In addition, treatment seeking practice showed no statistically significant association with any variable of socio-demographic and household characteristics, level of knowledge, perceived susceptibility and perceived barriers among perceptions towards malaria and cues to malaria preventive practices. (Some data of insignificant associations are not shown in table)

The significant bivariate associations are shown in Table 3. Personal protective measures, had statistically significant associations positively with levels of knowledge and perceived susceptibility at *p*-value < 0.05 level, perceived severity and perceived benefits at p value < 0.001 level and negatively with economic status (*p*-value= 0.033) and number of household members (*p*-value= 0.005). Environmental control measures had negatively statistically significant associations with perceived severity (*p*-value =0.039) and perceived barriers (*p*-value =0.003). Treatment seeking practice had positively statistically significant associations with economic status and level of perceived self-efficacy at *p*-value < 0.05 level and levels of perceived severity and perceived benefits at *p*-value < 0.001.

Table 4, comparing bivariate with multivariate analysis shows that personal protective measures maintained their statistically significant associations with, two variables, namely, number of household members and level of perceived severity and lost their significant associations with other four variables. Respondents who had more than four number of children under-five were 0.545 times less likely to adopt good malaria personal protective practices than those with four or fewer family members (AOR=0.545, 95%CI=0.343-0.868, *p*-value=0.010). Respondents with high level of perceived severity were 3.248 times more likely to adopt good malaria personal protective practices than those with low level (AOR=3.248, 95%CI=1.973-5.348, *p*-value <0.001). Environmental control practices maintained all their statistically significant associations with perceived severity and perceived barriers. Respondents with high level of perceived severity were 0.46 times less likely to adopt good environmental control practices (AOR=0.460, 95%CI=0.225-0.944, *p*-value=0.034). Respondents with high level of perceived barriers were 0.356 times less likely to adopt good environmental control practices than those with low level (AOR=0.356, 95%CI=0.182-0.707, *p*-value=0.003). Treatment seeking practice held only its statistically significant association with perceived severity and lost its

association with other three variables. However, perceived barriers become statistically significant with treatment seeking practice. Respondents with high perceived severity were 6.642 times more likely to adopt good malaria treatment seeking practice than those with low perceived severity (AOR=6.642, 95%CI=3.480-12.675, *p*-value=0.000). Finally, respondents with high perceived barriers are 0.548 times less likely to do good malaria treatment seeking practice than those with low perceived barriers (AOR=0.548, 95%CI=0.310-0.970, *p*-value=0.039).

Discussion

This study assessed malaria preventive practices among caregivers for under-five children and their associations. Most of the respondents had good malaria preventive practice for personal protective measures and for treatment seeking practice. These results may be due to intensive malaria control implementation by the VBDC team and other malaria projects which operate fixed and mobile clinics, and provide malaria volunteers in villages of Ngapudaw Township, Ayeyarwady Myanmar – all under the control of National Malaria Control Program. However, poor environmental control practices among over half of respondents may be due to less awareness regarding the effectiveness of these preventive practices because they are uncommon in Myanmar compared to the use of LLINs [10].

The positively statistically significant associations of personal protective measures with level of knowledge was in agreement with a study in rural southwestern Nigeria conducted among 274 caregivers of under-five children in which knowledge was a determinant for the use of malaria preventive measures among respondents [33]. The positively statistically significant associations of personal protective measures with perceived susceptibility, and strongly significant associations of perceived severity and perceived benefits were expected as theorized in the health belief model [34]. Respondents with high perceived susceptibility, severity and benefits regarding personal protective measures, were more likely to adopt good malaria personal protective practices. The statistically significant negative association of economic status with personal protective measures may be due to the fact that LLINs are available to everybody free of charge since 2012 and therefore used more extensively by participants in the lowest quintiles. The statistically significant negative association of number of household members with personal protective measures may be explained because the more number of family members the caregivers had, the busier they were and had less time to adopt personal protective measures for their under-five children. The negatively statistically significant association of environmental control practices with perceived severity is consistent with the findings of a cross-sectional study on a comparable prevention practice for diarrhea among caregivers of under-five children in Indonesia [35]. This negative association can be explained by the greater role played by cues to action compared to perceived severity in predicting behavior according to the health believe model [36]. In our study, even though the variable cues to action was not statistically significantly associated with malaria preventive practice, it was very common among our respondents. In addition, 77.3% among the 75 respondents, who had good malaria preventive practice for environmental control measures also had high cues to malaria preventive practices. The negatively statistically significant association of environmental control practices with perceived barriers can be explained by health belief model where the lower the barriers, the more preventive practices are adopted [34]. The positively statistically significant association of treatment seeking practice with economic status was expected and supported by findings in a Nigeria's mother study where mothers with lower wealth index were less likely to seek prompt malaria treatment than higher wealth index

mothers [33]. The positively statistically significant association of treatment seeking practice with perceived susceptibility, severity and benefits were expected and predicted by the health belief model. The association of treatment seeking practice with perceived susceptibility is consistent with the above quoted study among Indonesian caregivers [35]. The association of treatment seeking practice with perceived benefits was similar to the finding in the cross-sectional study among caregivers of under-five children in Mandura district, West Ethiopia [12].

In multivariate analysis, two variables for personal protective measures, (number of household members and level of perceived severity) two variables for environmental control practices (perceived severity, and perceived barriers) and one variable for treatment seeking practice, (perceived severity) maintained their statistically significant associations as in bivariate analysis. In contrast, perceived barriers become significant for treatment seeking practice while they were not in bivariate analysis. These results may be explained because these variables are stronger predictors of malaria preventive practices than other variables. Removing exposure to source of information (external cues to actions), perceived barrier becomes significant and explanation was also supported by the "Health Belief Model as an Explanatory Framework" in reference [36].

A study strength is that this is the first one in Myanmar, assessing malaria preventive practices among caregivers of under-five children, using the health belief model, a high number of variables and looking at their associations. However, there are some limitations. The study results cannot be generalized to all caregivers of under-five children in Myanmar and cannot explain cause / effect relationships given its cross sectional design. The self-reported answers may be subject to recall and social desirability biases. Finally, some knowledge contamination from one village to another may have taken place because respondents received correct knowledge related answers immediately after the interviews and they may have shared this knowledge to other caregivers not yet interviewed.

The findings of our study could provide some recommendations for program managers and researchers. Community based program like Participatory Rural Appraisal (PRA) should be investigated by researcher and if effective, would be adopted by program managers because the good level of knowledge is associated to, poor preventive practices of environmental control measures and a PRA approach may overcome this discrepancy. Further research should also be done using qualitative methods to understand the reasons behind poor practice on environmental sanitation in malaria prevention among caregivers of under-five children.

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