Aedes larval indices and the occurrence of Dengue Haemorrhagic Fever in urban community of Thanlyin Township

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Abstract –*A cross-sectional study was conducted in urban community of Thanlyin Township, Yangon Region during 2014 to determine Aedes larval indices and the occurrence of Dengue Haemorrhagic Fever (DHF) within past one year. A total of 327 households and 1491 members were included in the study. Aedes larval indices detected in this study were 25.7% for house index, 15.5% for container index and 48.0% for Breteau index. The occurrence of DHF among households and family members were 2.1% (95% CI: 0.9%, 4.4%) and 0.6% (95% CI: 0.3%, 1.1%), respectively. The occurrence was highest among 5 to 14 years age-group. No case was reported among persons with equal or more than 60 years of age. Mortality and case fatality rates were 0% during study period. Larval positivity among households was significantly related to sufficiency of family income and number of water container they have. Surveillance and control procedures for both DHF and vector should be intensified in urban area. Awareness and participation of the community in prevention and control of DHF should also be raised. Socioeconomic status as well as proper water supply and storage should be improved in urban area.*

Keywords –*Aedes larval indices, DHF, Urban community, Yangon*

INTRODUCTION

Dengue Haemorrhagic Fever (DHF) still causes major public health problem among South-East Asian countries including Myanmar [1] – [8]. In Myanmar, annual morbidity reported is about 10,000 to 15,000 cases and case fatality rate varies from 0.2% to 6.3% [8], [9]. Worldwide, 2.5 billion people (or) 40% of the world's population are at risk of contracting dengue infections. An estimated number of 50 million dengue infections including 500,000 cases of DHF occur in every year throughout the world [3], [10], [11].Moreover, the incidence of DHF is on rising trend [2], [3],[12]. This increasing trend will likely to continue into 21st century resulting in significant health and socioeconomic burden [13] – [15].

This disease is caused by the dengue viruses, a *Flavivirus* that is transmitted principally by *Aedes aegypti* mosquito. *Aedes* mosquito lives in proximity to houses and breeds in all kinds of water containers [11], [12]. Therefore, the occurrence and spread of DHF is related to environmental sanitation, housing status and adequacy of water supply [11].There are no specific treatment and vaccine for dengue infection until now. Without having specific treatment and vaccine, vector control is the only way to prevent DHF.

Knowledge on relationship between larval positivity and socioeconomic characteristics of households would help improve the effectiveness of vector control. Besides, changing political and economic system leads to rapid urbanization in Myanmar. Rapid and unsystematic urbanization enhances the transmission of DHF [2]. So, the present study was conducted to explore the information on the occurrence of DHF and its vector, and the relationship between Aedes larval positivity and socioeconomic characteristics of households in an urban area.This study would help prevention and control of DHF in an urban area of Myanmar by providing some useful information on *Aedes* larval indices, the occurrence of DHF and the socioeconomic determinants of the larval positivity.

OBJECTIVES OF THE STUDY

The purpose of the study was to determine *Aedes* larval indices, the occurrence of DHF within past one year, and relationship between larval positivity and characteristics of respondents and households in terms of sex, educational attainment, occupation and household's income among urban community of Thanlyin Township, Yangon Region, Myanmar during 2014.

MATERIALS AND METHODS

Cross-sectional study design was used in this study. Sample size calculation was done using Epi-info version 7. Larval positivity among households was estimated as 20% [1]. Therefore, the required number of households to be studied was 246 with 95% confidence level and 5% precision. Multi-staged systematic random sampling procedure was applied. Four wards out of ten were selected randomly at first. Then households were selected using systematic random sampling procedure. Heads of the selected households were invited to take part in the study. Inclusion criteria employed in selecting the respondents were all households' heads who are more than 18 years of age, who give consent to take part in the study and who are willing to disclose monthly household's income. Altogether 327 households' heads were recruited into the study. Face-to-face interview and observation methods were utilized in data collection.

The information on occurrence of DHF among households' members within past one year was based on self-report of the respondents. This information was confirmed by observing hospital or clinic record. Larval survey was done according to the WHO standard guideline [16], [17] by well-trained data collectors supervised by local health staff and investigators. All water containers situated both inside and outside of each household were inspected for the presence or absence of *Aedes* larvae.

Socioeconomic and demographic characteristics of the respondents and their households were regarded as explanatory variables for the positivity of larva in the household. Education status was classified into primary (up to grade 5), secondary (grade 6 to 11) and tertiary (university level and graduates). Average monthly household's income was divided into two groups; sufficient and insufficient based on self-report of the respondents.

The present study was approved by the research and ethic committee of the University of Medicine 1, Yangon, Myanmar.

Larval Indices

Three larval indices such as Breteau index (BI), container index (CI) and house index (HI) were calculated as follows [4], [11], [18]:

$$\text{Breteau index} = \frac{\text{No. of positive containers}}{\text{No. of houses inspected}} \times 100$$

$$\text{Container index} = \frac{\text{No. of positive containers}}{\text{No. of containers inspected}} \times 100$$

$$\text{House index} = \frac{\text{No. of houses with positive container(s)}}{\text{No. of houses inspected}} \times 100$$

Statistical Analysis

Data entry and analysis were done using STATA 11.0 statistical package. Proportion with 95% confidence interval was used to determine the occurrence of DHF. Multivariate logistic regression analysis with backward deletion procedure was applied in assessing the relationship between respondents' and their familial characteristics, and larval positivity in the house.

RESULTS AND DISCUSSION

A total of 327 households and 1491 members were included in this study. Socioeconomic and demographic characteristics of households' heads and their families are described in Table 1.

Table 1. Characteristics of Respondents and Households

Variables	Frequency (n=327)	Percent
Sex		
Female	60	18.4
Male	267	81.6
Education		
Primary	87	26.6
Secondary	186	56.9
Tertiary	54	16.5
Occupation		
Present	241	73.7
Absent	86	26.3
Household's Income		
Insufficient	187	57.2
Sufficient	140	42.8

Mean (sd) ages = 47.2 (14.9) years; Mean (sd) family members = 5 (2); Median (range) family income = 100,000 (6,000 – 2,000,000) kyats

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The annual occurrence of DHF among households and their members are shown in Table 2. There was no death. So, mortality and case fatality rates were 0% in this area during study period.

Table 2.The Annual Occurrence of DHF

Variables (n)	No. of Cases	Percent	95% CI
Households (327)	7	2.1	0.9, 4.4
Members (1491)	9	0.6	0.3, 1.1
Age-group in years			
< 5 (85)	1	1.2	0.03, 6.4
5 – 14 (222)	6	2.7	1.0, 5.8
15 – 59 (1008)	2	0.2	0.02, 0.7
≥ 60 (176)	0	0.0	-

The annual occurrence of DHF among study population was higher than Union figure [9]. This may be due to poor environmental sanitary status of study area that could lead to high vector density compared to average status of the country. It is supported by the findings of high larval indices in the study area (Table 3).The annual occurrence of DHF was highest among 5-14 years age-group. Similar finding was also reported by the Department of Public Health, Myanmar [19] and a study done in Thailand [20]. However, ages of the majority of DHF cases lied between 15 and 34 years in an Indian study [6].

Aedes larval indices are summarized in Table 3. The present study was carried out during dry season (February and March). Therefore, most of the water containers inspected were situated in the houses.

Table 3. Status of Larval Positivity and Indices

Variables (n)	No. positive for Larva	Percent
Houses (327)	84	25.7
Containers (1010)	157	15.5
HI = 25.7%, CI = 15.5%, BI = 48.0%		

The larval indices observed in this study were comparable to those found in previous studies done in Myanmar and Thailand [21]-[24]. However, studies conducted in Indonesia [25] and Southern India [6] reported much higher indices whereas a study done in New Delhi, India [4] reported much lower values. These discrepancies may be due to differences in time of study, study area whether urban or rural, or socioeconomic and environmental sanitary status among study populations. Risk of DHF transmission in an area can be classified as high if HI is ≥ 10, BI ≥ 50, or low when HI is ≤ 1, BI ≤ 5 [24]. Based on these criteria, the study area (i.e., urban area of Thanlyin Township) could have moderate to high risk of DHF transmission. This might be the reason of having higher proportion of annual DHF occurrence than the National average that is less than 0.03% [9].

Multivariate logistic regression analysis was applied to assess the relationship between socioeconomic and demographic characteristics of households' heads and their families, and larval positivity among households. Table 4 shows the results of logistic regression analysis.

Table 4. Results of Logistic Regression Analysis

Variables	Univariate		Multivariate	
	OR_{crude} (95% CI)	p-value	$OR_{adjusted}$ (95% CI)	p-value
Age*	1.0 (0.9, 1.1)	0.799		
Sex*				
Female	Reference			
Male	1.2 (0.6, 2.3)	0.644		
Education*				
Primary	Reference			
Secondary	0.8 (0.5, 1.5)	0.545		
Tertiary	0.7 (0.3, 1.6)	0.394		
Occupation*				
Present	Reference			
Absent	0.9 (0.5, 1.6)	0.754		
[1]H/O DHF*				
Present	Reference			
Absent	0.5 (0.1, 2.1)	0.305		
Income				
Insufficient	Reference		Reference	
Sufficient	0.5 (0.3, 0.9)	0.023	0.6 (0.3, 0.9)	0.036
Number of containers	1.3 (1.2, 1.5)	0.000	1.3 (1.2, 1.5)	0.000

**Not included in the final model.[1]H/O DHF = Occurrence of DHF among households' members within past one year.*

Although sex and education status were reported as significant predictors of larval positivity in a study conducted in Thailand [20], these variables did not show any statistically significant relationship in the present study. This may be due to inadequate sample size to detect the association in the present study. Besides, differences in age and sex distribution (or) socioeconomic status of populations, (or) differences in study area (or) time of study between two studies could explain this inconsistent finding.

Sufficiency of family income and number of containers in a household were significantly related to

larval positivity. Availability or adequacy of water supply would be jeopardized by insufficient income. Subsequently, inadequacy or unavailability of water supply may lead to possession of more water containers. The more numbers of water container a household had, the more likely to be improper storage of water. This might explain the significant association between larval positivity, and sufficiency of family income and number of water container in a household. The present study also revealed that the number of water containers among households positive for Aedes larva was significantly higher than that of households with no larva (3.8±0.2 versus 2.8±0.1, p = 0.000). Aside from this, differences in level of health knowledge (or) awareness on DHF between/among population groups might also be responsible for this finding.

CONCLUSION AND RECOMMENDATION

The occurrence of DHF and *Aedes* larval indices in urban community is high. Therefore, surveillance and control activities for DHF and its vector should be intensified, especially in urban area. Community's awareness, knowledge and practice on prevention and control of DHF should also be enhanced. Socioeconomic status as well as proper water supply and storage should be improved in urban area. Moreover, further study with increased sample size should be conducted in both urban and rural communities.

LIMITATIONS OF THE STUDY

The present study is not free from limitations that should be considered in interpreting the results. This study was carried out in an urban area. The sample size may be too few to detect the significant relationship between larval positivity and some important variables such as educational status of household's head. Information on household's income was solely based on self report of the household's head.

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