Research Journal of Applied Sciences 11 (9): 772-775, 2016
ISSN: 1815-932X
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Financial Burden of Dengue on Household: An Empirical Study in Seremban District, Malaysia

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Abstract: Dengue infection has become an important and serious public health concern in Malaysia during the past few decades. The disease is predominant in urban areas where majority of the country's total population resides. However, there is limited research in assessing financial burden of the disease on household in the country. The aim of this study is to quantify financial losses faced by the households due to dengue infection in Seremban district, Malaysia. The study conducted a survey based on personal (i.e., face to face) interview to obtain primary data. A total of 120 dengue patients registered at the Tuanku Ja'afar Hospital in Seremban were interviewed by using a standardized questionnaire. The findings revealed that the age-specific incidence rate was highest (25.1%) among the young adult group (i.e., 16-25 years of age) indicating that they are the most vulnerable group to dengue infection. The study found that households spend every month, on average, USD3.92 (MYR12.33) to buy preventive products such as insecticides aerosol spray, mosquito repellent, mosquito coils, mats, etc. Expenses on insecticides aerosol spray constitute the greatest portion (nearly 62%) of the total monthly expenditure for preventive measures. The household's total average cost of treatment per dengue case was estimated at USD37.26 (MYR118.00). The analyses revealed that 24.10% of the total cost for treatment is attributed to the cost for medical care (USD8.98) which includes expenses on consultation with doctors, diagnosis and medicines. On the other hand, non-medical expenses (i.e., transportation, food, drinks and so on) represent the largest share (nearly 76%) of the total treatment cost. Findings of the study suggest that a single episode of dengue places sizeable financial burden to household, especially in terms of treatment cost. Estimates of costs of dengue at household level are crucial to inform policy-makers about financial burden of the disease and may assist in implementing more effective control strategies to minimize the ongoing burden of the disease in the country.

Key words: Dengue, financial burden, household, Seremban, Malaysia

INTRODUCTION

Dengue is a major cause of morbidity and mortality in most tropical and subtropical regions of the world (Huy *et al*., 2009). The disease is mostly found in urban and semi-urban areas of the endemic regions. Southeast Asia and the Western Pacific regions are particularly vulnerable to dengue due to high population growth, rapid urbanization and high densities of the main mosquito vector, *Aedes aegypti* (Suaya *et al*., 2007). In recent years, dengue hemorrhagic fever has become a leading cause of hospitalization and death among children in most of the Asian countries. The disease imposes sizeable economic burden at household level in the endemic regions.

Dengue is currently a highly endemic disease in Malaysia. The warm and humid tropical climate is favourable for the Aedes mosquitoes to breed and survive. Moreover, rapid industrialization and economic growth have resulted in massive infrastructure

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development and improper solid-waste disposal which provide fertile grounds for Aedes breeding and the rise of dengue transmission in the country (Teng and Singh, 2001; Kwa, 2008). The incidence of dengue fever and dengue hemorrhagic fever in Malaysia has increased steadily during the last decade (Azami *et al*., 2011). The dengue incidence is prevalent throughout the country with the highest incidence among the most developed and densely populated territories and states. The disease is predominant in urban areas where majority of the country's total population resides. However, a recent study reveals that dengue has spread from urban city centers to the more rural populations of Malaysia, including to the forest fringe areas where majority of the aboriginal populations resides.

This study aims to examine household's financial impact of dengue in terms of out-of-pocket expenditures for seeking treatment care in Seremban, Malaysia. The study also attempts to quantify expenditures on preventive measures for dengue by the households.

MATERIALS AND METHODS

Seremban is one of the seven districts of the Malaysian state of Negeri Sembilan. It is the capital of the state and occupies an area of 950.53 km^2 of land. Seremban is the 16th most populated city in Malaysia with total population of 555,935. The population of the district comprises several ethnic groups viz. Malays and Bumiputeras (52%), Chinese (24%), Indians (16%) and others (8%). There are five hospitals of which one is government and four private. In addition, there are 11 public health centres serving various zones of the district. Seremban is one of the most affected districts by dengue infections in Malaysia.

Personal interview was conducted to collect primary data regarding socioeconomic and demographic characteristics, treatment costs for dengue illness and treatment related other costs and cost of preventive measures for mosquito bites. A structured questionnaire was used to interview the dengue patients. The study population consisted of dengue patients admitted to the Tuanku Ja'afar Hospital (formerly known as Seremban General Hospital), Seremban as well as ambulatory patients from the outpatient ward/department of the hospital. Patients were selected consecutively at random without previous knowledge of the economical status of the patient's family. The survey was conducted from November 2010 to February 2011. All costs were recorded in Malaysian Ringgit (MYR) and later converted to approximate value in US Dollars (USD) as per the exchange rate of December 1st, 2010 (MYR 1 = US$0.317). Summary descriptive statistics viz. summation, mean, standard deviation, percentage, maximum and minimum value and ratios were applied to analyze the data.

Ethical considerations: The study was approved the Medical Research Ethics Committee (MREC), Ministry of Health, Malaysia (MREC Code No. NMRR-11-730-9099). The study did not provide any financial or other benefits to the respondents and their families to participate in the survey.

RESULTS AND DISCUSSION

Socio-demographic profile of the study patients: A total of 120 patients with confirmed dengue illness were analyzed. Table 1 describes the socio-demographic characteristics of the interviewed dengue patients. The table shows that nearly two thirds (65.8%) of the study patients were male. Among the patients, 56% were married and 44% single. Almost all of the households (98%) participating in the survey resided in the urban areas, only 2% in rural areas. It was found that the number of dengue cases was significantly higher among the malay ethnic groups (50%) and lower among the Indians (21%). The surveyed patients represented a wide range of household characteristics measured as their level of education. The findings show that a lower portion of the respondents (5.8%) has no formal education. Majority of the study participants (78%) has completed primary and secondary school. Only a minority of the respondents (1.7%) has completed university education.

Table 1: Socio-demographic characteristics of dengue patients, Seremban District, Malaysia, 2011

Characteristics	No. (n = 120)	%
Gender		
Male	79	65.8
Female	41	34.2
Marital status		
Single	53	44
Married	67	56
Residential status		
Urban	118	98
Rural	2	2
Ethnicity		
Malay	60	50
Chinese	35	29
Indian	25	21
Educational status		
No formal schooling	7	5.8
UPSR/Primary school	12	10
PMR/Lower secondary school	38	31.7
SPM/ O-Level	42	35
STPM/A-Level	2	1.7
Certificate/Diploma	17	14.2
Graduate	2	1.7

Table 2: Distribution of dengue patients according to economic activity, Seremban District, Malaysia, 2011

Economic activity	No. (n = 120)	%
Economically active		
Public sector employee	13	10.8
Private sector employee	38	31.7
Person engaged in trading	11	9.2
Economically inactive		
Student	31	25.8
Retired	4	3.3
Housewife	10	8.3
Unemployed	7	5.8
Others (pre-school child)	6	5.0
Total	120	100%

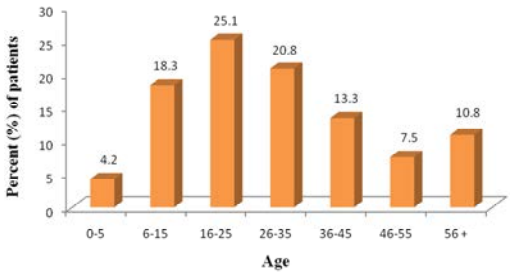

Fig. 1: Age distribution of the respondents, Seremban District, Malaysia

Table 2 shows the distribution of the study participants according to economic activity. It was found that more than half (51.7%) of the total respondents involved in income generating activities. Of the economically active individuals, a greater portion (31.7%) worked in private sector. A total of 10.8% of the economically active individuals were the public sector employee. The remaining 9.2% engaged in business. On the other hand, a greater portion (25.8%) of the economically inactive respondents was the primary as well as secondary school students. The remaining 22.4% of the non-income generating individuals belonged to retired person, housewife, unemployed and pre-school child.

Age distribution of the study patients is shown in Fig. 1. The findings reveal the lowest incidence rate (4.2%) among the infants of the 0-5 year's age group. Of the total respondents, on average, 18% was between 6-15 year of age. It was found that the age-specific incidence rate was highest (25.1%) in the young adult of the 16-25 year age group indicating that they are the most vulnerable group to dengue infection. The age group of 26-35 year (i.e., adult group) had the second highest incidence rate (20.8%) followed by the age group of 36-45 year which consisted of 13.3% of the total respondents. It is important to note that on a collective basis, majority of the study patients (67%) were income generating and potentially income generating people (16-55 year of age). However, the study found that a significantly lower proportion (7.5%) of the study participants were the people of middle-age group (46-55 year). On the other hand, the proportion of dengue infection among the older aged people (56 year and above) was higher (10.8%) as compared to the middle-age group.

Table 3: Distribution of dengue patients according to economic activity, Seremban District, Malaysia, 2011

Economic activity	No. (n = 120)	%
Economically active		
Public sector employee	13	10.8
Private sector employee	38	31.7
Person engaged in trading	11	9.2
Economically inactive		
Student	31	25.8
Retired	4	3.3
Housewife	10	8.3
Unemployed	7	5.8
Others (pre-school child)	6	5.0
Total	120	100

Table 4: Average expenditure for seeking treatment of per dengue case by the study households, Seremban District, Malaysia, 2011

Cost items	Mean (MYR)	Mean (USD)	SD[a]	Range (USD)
Cost for medical care	28.27	8.98	40.59	0.38-80.14
Transportation cost (patient)	41.24	13.11	14.21	6.36-25.44
Cost of food, drinks, etc., (patient and caregiver)	28.76	9.15	8.43	3.18-15.90
Cost of family members visiting patients	18.92	6.02	6.15	3.18-11.13
Total of average cost of treatment per case	117.19	37.26	9.16	6.02-13.11

[a]SD: Standard Deviation

Direct costs of dengue by the study households: The study calculated the out-of-pocket expenditure for seeking care by considering the patient-side cost of treatment for diagnosis, consultation with doctors, medicines, transportation, food and drinks and the cost of family members visiting the patients. Table 3 and 4 shows the distribution of average expenses for seeking treatment of per dengue case by the study households. The average household cost of per dengue case is approximately USD37.26 (MYR118.00). The findings reveal that the largest average single expense is the transportation cost (USD13.11). However, the average treatment cost of per dengue episode is comparatively lower (USD8.98) with a widely fluctuated range (USD0.38- 80.14). This is because seeking treatment in public health care facilities is free but the private health care facilities are expensive in the study area. The households also experience a sizeable amount of expenses for family members visiting the patients.

The study also took into consideration the cost of preventive measures by the study households. The household survey revealed that prevention cost is

Table 5: Monthly cost of prevention for dengue by the study households, Seremban District, Malaysia, 2011

Cost items	MYR	USD	SD[a]	Range (USD)
Insecticides aerosol spray	923.60	293.70	5.24	2.23-10.18
Mosquito repellent	55.60	17.68	6.59	2.16-6.36
Mosquito coils, mats, etc.	459.00	145.96	5.27	0.64-9.54
Other measures (i.e., electric bat)	41.50	13.20	3.55	3.18- 5.41
Total cost per month	1479.70	470.55	7.61	0.64- 12.72
Average cost per month	12.33	3.92	7.61	0.64- 12.72
Per capita cost/month[b]	2.49	0.80	-	-

[a]SD: Standard Deviation; [b]Total cost of prevention in a month is divided by the surveyed household size

relatively significant for the households. The average expenses incurred on prevention per month is shown in Table 5. It was found that households spend on average, USD3.92 (MYR12.33) per month on products such as aerosol spray, repellent, mosquito coils and so on to protect themselves against mosquito bites. About 62% of the total monthly expenditure on preventive measures was on insecticides aerosol spray. On the other hand, expenses on mosquito coils, mats, etc., contributed about 31% of the total monthly prevention costs by the households. Expenses on mosquito repellent per month were on the range of USD2.16- 6.36. The per capita cost of prevention in month by the study households is USD0.80 (MYR2.49).

CONCLUSION

The direct costs of dengue illness at the household level indicate the economic importance of the disease. Households face a sizeable amount of direct cash expenses to purchase preventive measures and seek treatment care for dengue. The average expenditure for seeking treatment care for a single episode of dengue is USD37.26 (MYR118.00). The households also spend, on average, USD3.92 (MYR12.33) per month on products such as insecticides aerosol spray, repellent, mosquito coils, mats, etc., to protect themselves against mosquito bites. The findings suggest that dengue places significant financial burden at household level in terms of out-of-pocket expenditures for seeking treatment care and preventive measures. Further studies are needed for a more accurate estimate of the expenses related to dengue fever at household as well as national level that might be helpful for the policy-makers to set health policy priorities to reduce the ongoing burden of the disease. Moreover, community participation and interagency cooperation are particularly required for effective and sustainable prevention and control of the disease.

ACKNOWLEDGEMENTS

This research is supported by the research grants (project code: DPP-2015-097 and XX-2014-008) led by Prof. Dr. Joy Jacqueline Pereira in Universiti Kebangsaan Malaysia (UKM), Bangi, Malaysia. The authors are thankful to the dengue patients and their family members who enrolled in the study for providing data and information.

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