

Analysis of some socio-demographic factors related to df/dhf outbreak in dhaka city

M.G. Sharower and M.A. Latif¹

Department of Public Health, North South University, Dhaka, ¹Department of Entomology, Sher-e-Bangla Agricultural University, Dhaka.

Abstract: A survey was conducted among residents of Dhaka regarding knowledge, attitude and behaviour (KAB) on dengue (DF) and dengue haemorrhagic fever (DHF) from August to October, 2016, starting from the first recognized outbreak of DF/DHF in Bangladesh. A random sample of more than 9,000 houses was visited by survey teams throughout the city. More than 99% of people living in the city had heard about dengue and 95% knew that the disease was transmitted by mosquito bites; 93.5% knew that the dengue-transmitting mosquito bit during daytime, and 52.1% knew that this mosquito bred in containers. Nearly 60% of slum-dwellers could not spend any money to buy commercially-available aerosols/coils for their houses, while the rest 40% could spend very little money for this purpose. About 10% of people living in independent houses and multistoreyed buildings spent more than US\$ 40 for mosquito control budgets per month (equivalent to a week's salary for most workers in Bangladesh). In the slum areas and in semi-permanent (semi-pucca) houses, earthen jars and drums, common sources of *Aedes aegypti* breeding, were frequently used for storing water. In more upscale, independent houses where mosquito density was higher, rooftop concrete water tanks were more common. Two-thirds of city-dwellers thought that both government and citizens should be responsible for mosquito control.

Key words: Dengue, DHF, Socio-demographic factors, Bangladesh.

Introduction

While dengue haemorrhagic fever (DHF) was suspected to be the cause of 'Dacca fever' in 1964 (Aziz et al.,2009), no outbreaks of DHF were recognized and confirmed before July 2000. Between July and December 2000 more than 4,000 hospitalized cases in Dhaka (earlier named as Dacca) were reported with more than 80 deaths. *Aedes aegypti* and *Aedes albopictus*, the two known vectors of dengue (DF), breed in and around human dwellings (Kettle, 2004). Therefore, for Aedes control, community participation is a necessary prerequisite (Bera et al.,2013; Sein, 2009). A participatory mosquito control campaign could not be successful without assessing and modifying the attitudes and behaviours of members of the community. So, we conducted a knowledge, attitude and behaviour (KAB) survey among some of the residents of Dhaka on (DF) and (DHF) from August-October 2006, during the first recognized dengue outbreak in the city.

Materials and Methods

We conducted comprehensive surveillance of the breeding sites for Aedes in Dhaka from August-October 2016. As part of the Aedes surveillance in Dhaka city, we developed a questionnaire to assess the knowledge, attitude and behaviour of residents regarding DF/DHF. After pretesting, a final version of the questionnaire was developed, which was used throughout the survey period. The questionnaire had two parts. The first part contained information about the address, type of house and occupation of the household head. The second part of the questionnaire gathered information about the knowledge, attitude and behaviour of the residents. The surveyors administered the questionnaire form, printed in Bengali (the national language).

Survey teams, composed of two or three members, visited at least 100 houses in each of all the 90 wards (administrative units) in Dhaka. The surveyors were either current or former students of the Department of Zoology of various universities in Bangladesh.

In each ward, various types of houses were identified. The households were classified into independent, multi-storeyed, semi-pucca and slum. The semi-pucca houses have concrete floors, brick walls, and corrugated tin-sheet

roofs; they are semipermanent houses, found mostly in the peripheral expanding areas of the city. The slums are purely temporary accommodations (made of split bamboo walls and roofs) for very poor, mostly landless people, who migrate from rural areas to the city in search of work. These people usually occupy government-owned barren land within the city, kept for future construction purposes. The inhabitants are rickshaw-pullers, day labourers and workers of garment and other factories (in this paper all these categories of people are classified as workers). In slum areas, one family often lives in a very small thatched house (usually less than 100 square feet area). There is no water supply or proper sanitation system. In contrast, affluent people occupy independent houses with sizes ranging from 4,000 to 15,000 sq. ft. area.

In consultation with city officials, local ward councillors and ward secretaries, an estimated proportion of each type of house in each ward was determined. The surveyors also estimated the approximate number of each type of house in each ward. On the basis of these two methods, a final set of proportions of different types of houses for each ward was generated, and this list was used to select a representative sample of house types in each ward.

In each ward, 10 geographical "centres" were identified where the surveyors started their day's work. Survey "centres" were selected so that they were evenly distributed throughout each ward. Thus, 10 "centres" were pinpointed on the map of the ward before starting the survey work. Around each "centre", 10 households, adjacent to the "centre", were surveyed. The surveyors introduced themselves to the residents of each selected house, explained the reason for their visit, and finally one of the surveyors interviewed a responsible person, preferably the household head, using a standardized data collection form. Information gathered was entered into SPSS for analysis.

Results

The largest number of houses surveyed were multistoreyed buildings (39.5%), followed by semi-pucca house (30.5%), and independent houses (20.6%). Only 8.3% of the houses were slum-type (Table 1). Overall, each residence housed an average of 6.5 persons. Table 2

shows that more than 99% of the respondents had heard about DF/DHF during the survey period. More than 90% of the respondents knew that dengue was transmitted by mosquito bites. While it was commonly recognized that the dengue transmitting mosquito bites during daytime, only 52% of the people overall knew that this mosquito breeds in containers; 23.5% of workers were aware of this fact as compared with 64% of the professionals.

About 50% of the residents thought that destroying the breeding places was important in controlling dengue (Table 3). More than 52% of the people surveyed thought that the use of insecticide-treated nets could be helpful, even though 93.5% knew that the mosquito vector, *Aedes aegypti*, bites during daytime.

Table 1. Different types of houses surveyed with information about the number of occupants in each house

Type of houses	Number of households	Percentage of households	Average number of occupants per house
Independent	1945	20.6	7.16
Multistoreyed	3736	39.5	6.33
Semi-pacca	2887	30.5	6.63
Slum	787	8.3	5.69
Others	93	1.0	5.33
Total	9462	100	6.54

Table 2. Knowledge of city-dwellers regarding transmission of DF/DHF

Occupation	Total number responded	Percentage of people who had the following knowledge		
		Dengue transmitted by mosquito bites***	Behaviour of <i>Aedes aegypti</i>	
			Bites during daytime***	Breeds in containers***
Bussiness	3577	95.1	93.3	50.3
Service	3119	5.5	94.8	54.5
Retired	765	97.3	95.2	63.7
Worker	519	89.6	85.9	23.5
House wife	507	93.5	94.9	50.5
Professionals	505	97.4	93.7	63.8
Students	42	95.2	92.8	48.6
Others	249	91.2	92.8	48.6
Total	9283	95.0	93.5	52.1

***Chi-square test by occupation: P<0.001 1More than 99% of the city-dwellers had heard about DF/DHF 2Including officials, clerks and other employees 3Including factory workers, drivers, day labourers, etc.

Table 3. Knowledge of residents concerning methods for prevention and control of DF/DHF

Occupation	% of people having some knowledge of mosquitoes control	Proportion (%) of people who think that DF/DHF can be prevented by					
		Using Mosquito net ¹	Spraying aerosol ²	Using coil ³	Using smoke ⁴	Destroying breeding habitat ⁵	Other means ⁶
Bussiness	86.8	49.7	35.5	45.4	3.5	47.1	6.9
Service	90.6	57.3	37.6	47.3	4.7	52.0	5.3
Retired	93.6	51.4	41.9	43.4	4.6	55.2	6.4
Worker*	69.9	65.2	8.6	52.5	4.4	35.6	11.3
House wife	90.1	53.9	37.3	43.6	6.1	52.2	5.9
Professionals	93.9	41.4	42.2	33.5	6.5	61.4	9.9
Students	100	40.4	35.7	42.9	7.1	81.0	0
Others	86.7	50.5	35.2	48.1	1.4	42.1	10.6
Total	88.3	52.9	36.1	45.5	4.4	50.2	6.7

Chi-square test by occupation: 1= P<0.001, 2= P<0.001, 3= P<0.001, 4= P<0.005, 5= P<0.001, 6 = P<0.001 †Including officials, clerks and other employees ‡Including factory workers, drivers, day labourers, etc.

Table 4. Measures taken by city-dwellers to kill mosquitoes in their houses within one month prior to the survey

House type	Proportion (%) of people who took the following measures:					
	Purchased insecticides for mosquito control***	Sprayed insecticides ***	Spent >US\$ 10 for insecticides ***	Spent US\$ 210 for insecticides ***	Had no expenditure on insecticides ***	Took measures other than the use of insecticides ***
Independent	76.1	78.5	10.9	49.5	23.3	37.0
Multistoreyed	78.1	80.6	9.4	51.8	20.6	31.9
Semi-pacca	67.4	70.2	3.1	38.2	30.2	30.9
Slum	40.5	41.5	0.1	12.2	59.2	19.8
Others	52.7	53.8	11.8	26.9	50.5	29.0
Total	71.1	73.5	7.8	49.6	27.6	31.6

***Chi-square test by house type: P<0.001

More than 70% of the residents purchased commercially-available aerosols/ coils to kill or drive away mosquitoes in their houses (Table 4). Among the inhabitants of independent houses and multistoreyed buildings, the

insecticide gadgets purchase rate was more than 75%, while among the slum-dwellers, the rate was only 40%. About 10% of the people living in independent houses and multistoreyed buildings spent more than US\$ 10 per

month for mosquito control, while another 50% spent US\$ 2 -10 per month for this purpose. Among the slum-dwellers, 40% spent less than US\$ 10; which included 28% spending less than US\$ 2. Nearly 60% of the slum-dwellers did not spend any money for mosquito control even during the peak Aedes season.

More than 75% of the residents had piped water facilities (Table 5). A water storage system was present in 77% of the houses. Overhead water tanks were present at 72% of the multistoreyed buildings and 47% of the independent

houses. Earthen jars were used in 34% and 17% of the slum houses and semi-pucca houses respectively. Drums were used in 20.5% and 23% of the slum houses and semi-pucca houses respectively. In independent houses, earthen jars (6.8%) and drums (12.5%) were seldom used. The residents were asked whom they thought to be responsible for mosquito control in the city. Most of the respondents (66.5%) replied that both the government and city residents were responsible (Table 6).

Table 5. Water storage system in different types of houses in Dhaka city

House type	% of houses having water storage system***	Proportion (%) of houses having the following types of water storage				
		Underground ***	Overhead tank***	Earthen jar***	Drum ***	Others ***
Independent	77.7	37.2	46.5	6.8	12.5	4.6
Multistoreyed	88.6	51.0	71.8	3.6	11.0	3.7
Semi-pucca	65.5	19.6	12.0	16.7	23.4	14.9
Slum	62.3	6.0	0.8	34.3	20.5	21.9
Others	61.3	18.3	34.4	7.5	9.7	12.9
Total	76.8	34.5	42.0	10.9	15.9	8.9

***Chi-square test by house type: P<0.001, Note: 77.3% respondents reported that they had piped water facilities in their houses, Table 6. Attitude of residents towards responsibility for mosquito control

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Occupation	Responsible agencies or people (%)				
	Government ¹	People living in the city ²	Both Govt. and people ³	NGO ⁴	Others ⁵
Bussiness	22.7	11.8	65.1	0.2	0.7
Service	18.7	11.2	69.1	0.3	1.4
Retired	22.6	8.0	68.8	0.1	1.3
Worker*	32.0	16.4	49.9	0	1.7
House wife	21.5	7.9	71.2	0.2	0.2
Professionals	18.8	7.1	73.1	0	1.8
Students	9.5	9.5	81.0	0	0
Others	27.3	14.5	56.2	0	2.4
Total	21.6	11.1	66.5	0.2	1.1

Chi-square test by occupation: 1=P<0.001, 2=P<0.001, 3=P<0.001, 4=P>0.05, 5=P<0.01 †Including officials, clerks and other employees

Discussion

In order to cope with massive urbanization, Dhaka is expanding both vertically and horizontally, resulting in a large number of multistoreyed buildings. On the other hand, in the peripheral expanding areas of the city, there are a lot of temporary "semi-pucca" houses. A large number of seminars, symposia and TV programmes about dengue were organized in the city before and during the time of our survey. Newspapers published features about dengue almost every day. Apparently, the mass media was effective at transmitting key information to the public. Residents were reasonably knowledgeable about the mechanism of the transmission of dengue. In contrast, in the surveys conducted in Myanmar, Indonesia and Brazil, 75%, 65% and 61% of the populations, respectively, knew that dengue was transmitted by mosquito bites (Suroso et al., 2015; Phong and Nam, 2009).

Most residents were aware about the daytime biting behaviour of denguetransmitting mosquitoes. By contrast, the public was not as knowledgeable about the mosquito's breeding behaviour. The most common mosquito in Dhaka, *Culex quinquefasciatus*, bred mostly in drains, and most people seemed to be aware of that fact. When our surveyors explained (after the survey was completed) that Aedes mosquitoes bred in containers, residents hesitated to believe this. Only when the surveyors collected mosquito larvae from drums and put them in small containers

covered with a piece of mosquito net so that the residents could see emerging adult mosquitoes in a few days, did the residents believe what the surveyors were reporting. So, it may be a challenge to change the attitudes about Aedes breeding among all residents. People who think that destroying of mosquito breeding places is the way to control DF/DHF is related to their knowledge about mosquito breeding behaviour. The highest proportion (69%) of the students and the lowest proportion (23.5%) of the workers knew that denguetransmitting mosquito breeds in containers (Table 2). Similarly, 81% of the students and 35.6% of the workers replied that destroying the breeding places was the way to control DF/DHF (Table 3). Very few low-wage earners (workers) thought that the use of aerosol insecticides would prevent dengue. This opinion probably reflects their economic status. Spraying aerosol is an expensive operation, which is beyond the capacity of a worker, who hardly earns more than US\$ 40-50 per month. While we did not ask about the income of the respondents, we could reliably assume what the family earned from the type of the house they lived in.

Among water storage containers, earthen jars and drums act as good breeding grounds for *Aedes aegypti* (Chowdhury et al., 2010). Among slums and semi-pucca houses, earthen jars and drums were frequently present, because there are no piped water facilities serving poorer areas. As semi-pucca houses are temporary structures,

people do not construct underground or rooftop water tanks, so they store water in temporary containers like drums and earthen jars. Based on our vector survey, independent houses in Dhaka were most likely to have high densities of *Aedes* mosquitoes (Fernandez and Martinez, 2010). It appears that rooftop concrete water containers are one of the main breeding sources in independent houses. In addition, almost all independent houses have empty backyards where coconut shells, broken bottles, tin cans, discarded utensils, etc., also provide very good breeding sources for *Aedes* in this type of house. Most *Aedes* mosquitoes breed within houses where the reach of government interventions is limited. The participation and cooperation of the public with government agencies is essential for *Aedes* control programmes. It was apparent from this study that the residents understood this dual responsibility. Thus, a carefully planned effort that includes education of residents on behaviours to reduce the breeding of mosquitoes and disease transmission, along with community control efforts, could be successful, assuming an effective intervention strategy could be identified. Novel approaches for effective vector control are needed. Community participation will be a crucial component for achieving success (Soedarmo and Suroso, 2014).

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