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Original Research Article

Risk factors associated with the outbreak of dengue fever in children in the capital city of Bangladesh

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ABSTRACT

Background: Environmental and climatic situations become the risk factors of dengue outbreak. However, the socio–epidemiological and behavioral association with the disease is least explored. The study aims to identify the social and ecological factors as well as public awareness associated with emerging dengue in the capital city of Bangladesh.
Methods: This observational study was conducted in the Department of Pediatrics of Anwer Khan Modern Medical College Hospital (AKMMCH), Dhaka, Bangladesh during the period from 4 April, 2019 to 9 September, 2019.
Results: In total 105 cases from the groups completed the study. More than half 68.57% found dengue hemorrhagic fever (DHF) fever patients and the least of the 31.43% found dengue shock syndrome (DSS) patients. From the record of personal and hygiene history identified as risk factors of the study, people on the day time mosquito bites found 78.10% positive and 21.90% negative. As well as on using mosquito coils (66.67%) found negative and 33.33% found positive. Use of repellents 88.57% found negative and 11.43% found positive. Remove the stagnant water source 91.43% found negative and 8.57% found positive. Using spray for the insecticide 85.71% had a negative reply and 14.29% had replied positively. On dumping the garbage 88.57% found negative and 11.43% found positive. Again, in home gardening, 84.76% had negative in reply and 15.24% had positive in reply.
Conclusions: Personal and hygiene factors play important roles in dengue outbreaks in the capital city of Bangladesh.

Keywords: Dengue fever, Dengue hemorrhagic fever, Dengue shock syndrome, Mosquito-borne diseases, Pediatric dengue

INTRODUCTION

Dengue, a neglected tropical vector-borne disease. It has become a challenge to the public health system in the world. The estimated dengue burden in the globe is nearly 390 million from 120 countries.[1] However, these estimates can be higher due to the large number of under-reporting and non-symptomatic cases. In Bangladesh, South Asia, dengue fever was first reported in 1964 but became a disease of public health significance from 2000 onwards. Dengue fever is an acute viral disease caused by four distinct serotypes. Dengue is caused by one of four related viruses: Dengue virus 1, 2, 3 and 4. For this reason, a person can be infected with a dengue virus as many as four times in his or her lifetime, dengue viruses can be transmitted between humans by the mosquito Aedes aegypti. Statistics provided by the World Health Organization (WHO) have shown that only nine countries experienced severe dengue epidemics before 1970. Recent research, however, has revealed that the number of countries with severe dengue epidemics now exceeds 100 and that the actual number of dengue fever cases has reached approximately 390 million, among which 500,000 patients required hospital admission because of severe infection.[2] In Asian and American countries where dengue is endemic, the effect of dengue is approximately

1300 disability-adjusted life years per million populations, this effect is highly similar to the disease burden of related childhood and tropical diseases, including tuberculosis.[3] In Bangladesh, the first outbreak, the sudden increase in occurrences of a disease when cases are in excess of normal expectancy for the location or season, of dengue fever was documented in 1964 in Dhaka; the first epidemic of DHF occurred in mid-2000, when 5,551 dengue infections were reported from Dhaka, Chittagong and Khulna cities, occurring mainly among adults; the case fatality rate was reported 1.7% with 93 deaths reported by Rahman et al.[4]

The 2019 dengue outbreak in Bangladesh is a nationwide occurrence of dengue fever in Bangladesh that began primarily in April 2019 and is still ongoing.[5] Understanding the risk factors for dengue virus infection is necessary to control this disease effectively. Environmental factors, such as heavy rainfall and global warming and factors based on the awareness and knowledge of dengue prevention measures are also responsible for drastic reductions in dengue transmission.[6,7] Several macroscopic descriptive studies have been performed to explore the risk factors for dengue virus infection and to provide a basis for formulating control strategies in several countries. These studies have obtained considerable information on the group level and climate factors but limited information on personal protective measures.[8,9]

Living or travelling to a region of the world where the infection is endemic is a risk factor for the disease. The presence of water-holding containers in and around the home needed for the mosquitoes to complete their development sustains the reservoir for the disease and is a risk factor. Risk factors for severe disease include being a neonate or young child, female sex, high body mass index, viral load, genetic polymorphisms and previous infection with DENV-1 if the patient contracts DENV-2 or DENV-3. Diabetes and asthma are risk factors for a fatal disease.

The study aims to evaluate the potential risk factors behind dengue fever and also recommend specific approaches for preventing dengue virus fever.

Objectives

We evaluated potential risk factors, including personal life activities, environmental sanitation, housing situation, living conditions, mosquito protection status and residential surroundings to identify additional risk factors for dengue fever on the individual level and to recommend specific approaches for preventing dengue fever.

METHODS

This observational study was conducted in the Department of Pediatrics of Anwer Khan Modern Medical College Hospital (AKMMCH), Dhaka, Bangladesh during the period from 4 April, 2019 to 9 September, 2019.

Inclusive criteria and exclusion criteria

Febrile patients aged 1-15 year of both genders were included and enrolled the data in the data collecting form. The patients included only who were enrolled for dengue fever in the hospital.

Questionnaire

Data were collected depending on three criteria; these were demographic situations (gender, age), past illness and family history, personal and hygiene history. We observed the dengue fever patients' one kind of lifestyle and tried to find out the causes behind the illness.

Data analysis

A data sheet was provided by the hospital for collecting some personal, family and hygiene status. As the study patients were children so their parents filled up those issues. After a data sheet collected under this issue contained 105 respondents. Data were analyzed by using MS-Excel-2016.

Ethical issues

Discussion of the dangers of dengue and its likely outcome to the person and the community involved should be taken into account but may alter with the control group so it was not taken into account.

RESULTS

From the datasheet of 105 patients, the demographic variables as gender found maximum 59.05% male patients and others are 40.95% female (Figure 1). That means males suffered from dengue diseases more.

According to the age of the study patients' maximum found in 0-5 age range and it's about 59 (56.19%) after then 6-10 years found 38 (36.19%) and lowest study people found in 11-15 years 8 (7.62%) (Figure 2). From the study people, we try to classify dengue fever more than half 72 (68.57%) found non-severe dengue fever patients and least of them 33 (31.43%) found severe dengue fever patients (Table 1).

From all dengue patients in this step, we try to identify H/O past illness and family history. From the variables on previous illness maximum found negative 94 (89.52%) and 11 (10.48%). Again, in family diseases maximum found in negative 90 (85.71%) and 15 (14.29%) found positive there the point is the severe dengue patients' maximum found from positive. We try to find contagious for dengue fever by seeing diseases when in locality or school and maximum found negative 75 (71.43%) and 30

(28.57%) were positive. Now the previous H/O associated illness respectably maximum 69 (65.71%) had normal fever, then 12 (11.43%) had typhoid, pneumonia 11 (10.48%), epilepsy 7 (6.67%), 4 (3.81%) had others diseases (mumps, enteric fever, food poisoning etc.) and 2 (1.90%) had thalassemia (Table 2).

From the record of personal and hygiene history of the study people on the day time mosquito bite found 82 (78.10%) positive and 23 (21.90%) found negative. As well as on using mosquito coil 70 (66.67%) found negative and 35 (33.33%) found positive.

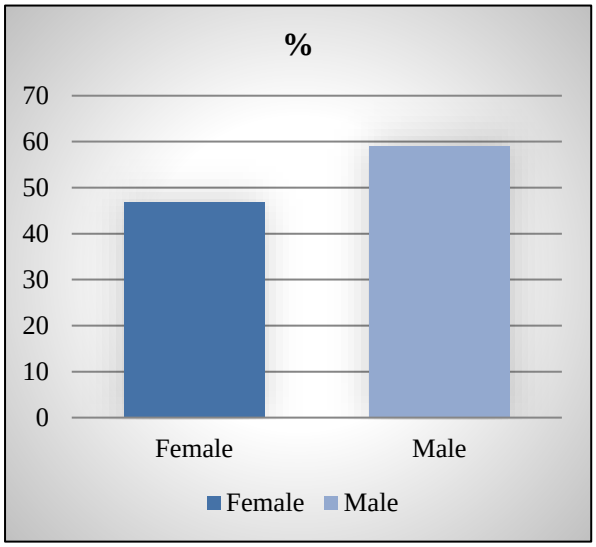

Figure 1: Distribute the study people according to gender (N=105).

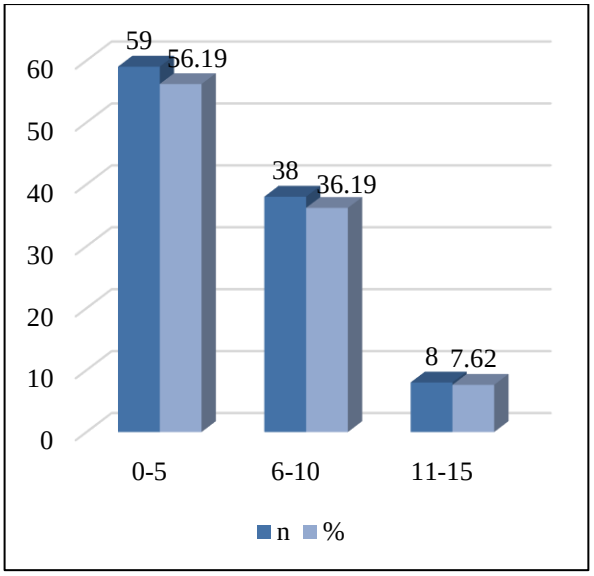

Figure 2: Distribute the study people according to their age (N=105).

Use of repellants 93 (88.57%) found negative and 12 (11.43%) found positive. Remove of stagnant water source 96 (91.43%) found negative and 9 (8.57%) found positive. Use spray for the insecticide 90 (85.71%) had negative reply and 15 (14.29%) had replied positive. On dumping the garbage 93 (88.57%) found negative and 12 (11.43%) found positive.

Again, in home gardening 89 (84.76%) had negative in reply and 16 (15.24%) had positive in reply. Lastly, taking antibiotics 83 (79.05%) had negative and 22 (20.95%) had positive (Table 3).

Table 1: Study people classification of dengue fever (N=105).

Classification of dengue	N	%
DHF	72	68.57
DSS	33	31.43

Table 2: Association of dengue fever with H/O past illness and family history of the study patients (N=105).

H/O past illness & family history		N	%
Previous illness	Yes	11	10.48
	No	94	89.52
Diseases in family	Yes	15	14.29
	No	90	85.71
Diseases when in locality or school	Yes	30	28.57
	No	75	71.43
Previous H/O associated illness	Typhoid	12	11.43
	Epilepsy	7	6.67
	Pneumonia	11	10.48
	Thalassemia	2	1.90
	Normal Fever	69	65.71
	others	4	3.81

Table 3: Recorded personal and hygiene history of the study people (N=105).

Personal and hygiene history		N	%
Day time Mosquito	Yes	82	78.10
	No	23	21.90
Using mosquito coil	Yes	35	33.33
	No	70	66.67
Using bed nets	Yes	29	27.62
	No	76	72.38
Using repellents	Yes	12	11.43
	No	93	88.57
Removing stagnant water source	Yes	9	8.57
	No	96	91.43
Spraying insecticide	Yes	15	14.29
	No	90	85.71
Garbage damping	Yes	12	11.43
	No	93	88.57
Home gardening	Yes	16	15.24
	No	89	84.76
Taking antibiotics	Yes	22	20.95
	No	83	79.05

DISCUSSION

From the data sheet of 105 patients the demographic variables of gender found maximum 59.05% male patients and others are 40.95% female. That mean male had high risk in dengue diseases. According to the age of the study patients' maximum found in 0-5 age range and it's about 59 (56.19%) after then 6-10 years found 38 (36.19%) and the lowest study people found in 11-15 years 8 (7.62%). That means the littles had more risk than the others. From the study people we try to classify dengue fever more than half 72 (68.57%) found non-severe dengue fever patients and lest of them 33 (31.43%) found severe dengue fever patients. From all dengue patients in this step, we try to identify H/O past illness and family history.

From the variables on previous illness maximum found negative 94 (89.52%) and 11 (10.48%) found positive. Again, in family diseases maximum found in negative 90 (85.71%) and 15 (14.29%) found positive but there the point is the severe dengue patients' maximum found from positive. We found contagious dengue fever by seeing diseases when in locality or school and maximum found negative 75 (71.43%) and 30 (28.57%) were positive.

Now the previous H/O associated illness respectively maximum 69 (65.71%) had a fever which is not categorized, then 12 (11.43%) had typhoid in previous, pneumonia 11 (10.48%), epilepsy had 7 (6.67%), 4 (3.81%) had others diseases (mumps, enteric fever, food poisoning etc.) and 2 (1.90%) had faced thalassemia. Environmental factors as the risk factor of dengue are well established in different countries.[10-13] From our record of personal and hygiene history of the study, people on the day time mosquito bite found 82 (78.10%) positive and 23 (21.90%) found negative. As well as using mosquito coils 70 (66.67%) found negative and 35 (33.33%) found positive. Use of repellents 93 (88.57%) found negative and 12 (11.43%) found positive. Remove of stagnant water source 96 (91.43%) found negative and 9 (8.57%) found positive. This is close to the other study as the non-association of the container breeding sites could have two possible explanations. One, there could be a lack of knowledge in understanding the 'container breeding' sites. Even though the researchers explained the participants with examples, still, the under-reporting could have been because of the knowledge gap.[14,15] Again in our study using a spray for the insecticide 90 (85.71%) had a negative reply and 15 (14.29%) had replied positively. On dumping the garbage 93 (88.57%) were found negative and 12 (11.43%) were found positive.

Again, in home gardening 89 (84.76%) had negative in reply and 16 (15.24%) had positive in reply. Lastly, taking antibiotics 83 (79.05%) had negative and 22 (20.95%) positive. Another study there identifies a factor that unorganized and unstructured urbanization as most of the participants were from the peri-urban area, the environmental sanitation conditions are often neglected as our capital Dhaka City.

Thus, the presence of container breeding sites in surrounding areas instead of the house of the participants could have been overlooked and under-reported. We did find similar responses among school children in our previous study.[16] Presence of breeding sites and their association necessitates a comprehensive prevention strategy for stopping the dengue spread, which is supported by the findings from our study.

Vanwambeke et al and Kenneson et al, reported that the use of mosquito nets reduced the risk of dengue virus infection.[17,18] However, similar to Tsuzuki et al and Loroñopino et al, we failed to find a relationship between the use of mosquito nets and the likelihood of dengue virus infection.[19,20] The lack of a relationship between this variable and dengue virus infection may be attributed to the following: Mosquito nets are usually used at night. However, A. aegypti is active during the day, especially in the early morning and late afternoon.[21] Other studies found that mosquito nets play a protective role in preventing dengue virus infection in rural settings.[22] However, we recruited our study population from urban areas. The good living environment in urban areas, for example, the popularity of air-conditioning and mosquito killing facilities, reduced the demand for mosquito nets.

Nevertheless, based on our local experience and some studies' results, we recommend using mosquito nets not only at night but also during the day.[18,23,24] Andersson et al and Roberto et al, reported that the government's ability and capacity to control the dengue vector has crucial effects on dengue transmission.[25,26] Community neighborhood committees and City Corporation Mayor in the capital city of Bangladesh have organized numerous health remediation activities under the supervision of the relevant health agent or the Centers for disease control and prevention given the high incidence of dengue fever in recent years.[27]

These activities have considerably improved the residential living environment and reduced mosquito breeding and may account for the lack of the statistical significance of the variables of domestic sewage disposal, garbage management and residential surroundings in this study. The public health ministry consciousness of the observation committee must be strengthened because the government will be unable to establish a sound prevention system against dengue fever despite having a good macro-control system in place if it lacks the support of the masses.

Our study wasn't a blinded study so patient bias was present along with observer bias in subjective recording and the one of the limitations of this observational study is, in view of small sample size we could not do multivariate analysis. Thus, generalization of the risk factor needs caution because of the change in dengue virus circulation in the capital city.

CONCLUSION

Our study focused on residents in communities with mild or asymptomatic dengue virus infection rather than on patients with severe clinical symptoms to explore the risk factors for dengue virus infection in Capital city of Bangladesh because the former sample is highly representative. We try to find out the individual risk factors behind dengue fever. This information is beneficial for avoiding infection by the dengue virus. We also provided evidence and a basis for the development of measures for dengue fever prevention and control.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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