ORIGINAL ARTICLE

OUTBREAK OF DENGUE FEVER IN LAHORE: STUDY OF RISK FACTORS

Fatima Mukhtar, Mohammad Salim*, Arsalan Farooq**

Department of Community Medicine, Lahore Medical & Dental College, *Ayub Medical College, Abbottabad, **North Medical Ward, Mayo Hospital, Lahore, Pakistan

Background: Dengue fever is a rapidly emerging arthropod born viral disease threatening to become an international public health problem. Approximately 500,000 people suffer from dengue haemorrhagic fever and dengue shock syndrome with 20,000 deaths annually. Objective of this study was to look into the risk factors associated with the development of dengue fever. **Methods:** This cross-sectional descriptive study was conducted on patients admitted in various hospitals of Lahore with suspected Dengue fever. Data was collected on a questionnaire from 109 conveniently selected patients. **Results:** Mean age of the patients was 34±16.5 years, and majority (80, 73.4%) were male. Seropositivity for dengue was found in 78 (71.5%). The study did not find significant statistical association of seropositivity with demographic variables. However, source of water supply was found associated with dengue seropositivity (p=0.002). **Conclusion:** Source of water is a determinant of contracting dengue fever owing to it a breeding media for mosquitoes. All other phenomena associated with use of water and sanitation needs to be part of long term control of dengue that will also contribute to controlling other diseases with the same determinants.

Keywords: Dengue fever, dengue haemorrhagic fever, dengue shock syndrome, water sources, epidemic

INTRODUCTION

Dengue is a fast spreading arthropod borne viral disease associated with a significant public health impact. Dengue fever had a sporadic distribution in the 19th century and nine countries around the world reported dengue epidemics in the year 1970. Since then the global epidemiology of the disease has changed rapidly. Today approximately 500,000 patients suffer from dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS), whereas, 20,000 succumb to the disease annually. The disease is endemic in 100 countries with 25 million people at risk in the tropical and sub tropical regions.[1] The global burden of the disease is suspected to parallel that of malaria and tuberculosis, imposing grave economic challenges for communities and governments.[2]

In Pakistan, the first serologically confirmed case of dengue fever was reported in the city of Karachi in 1994.[3] The numbers of cases have subsequently increased from 4,500 cases reported in Karachi in 2005 to 21,204 cases in the country in 2010. Lahore alone confirmed 14,000 cases and 300 deaths from dengue fever in 2011. Some people believe that these figures do not depict the actual burden of disease in the country, the true burden being more than reported.[4]

The aetiological agent of dengue fever is the dengue virus having four distinct but antigenically related serotypes. Infection with one serotype does not provide immunity against the other serotypes, rather puts the individual at a greater risk to develop DHF and DSS if the infection is contracted subsequently.[1] Severe manifestations of the disease are also influenced by the age of the patient and his genetic predisposition.[5]

In addition to the increasing severity of the disease, it is also becoming more explosive in nature. Many factors have been identified for this pattern of the disease. Some of them include a lack of political will to prevent and control the disease, paucity of funds to implement preventive strategies, unavailability of piped water supply, increase in international travel, and the lack of effective solid waste management favouring the unchecked growth of the larval habitats.[6]

In order to design and employ effective preventive and control strategies against the disease, it is necessary to identify the risk factors of the disease prevailing in the country to have targeted approach. This study was conducted to determine the risk factors associated with dengue fever in admitted patients during dengue epidemic.

METHODOLOGY

This cross-sectional descriptive study was carried out during the autumn 2011 at various public and private hospitals of Lahore. Approval of the hospital administration was obtained before approaching the patients. Patients were selected through convenience sampling, admitted in medical wards with suspected dengue fever. Data was collected from the patients after obtaining informed consent. Where the age was less than 15 years, informed consent was obtained from respective parents/guardians. Confidentiality of information was assured and ensured. Critically ill patients were excluded from the study. A pre-tested questionnaire was used to collect the data about demographic variables, presence of empty plot/piece of land/pond around the house, location of house, screening of windows, empty containers in house,

source of water supply, type of dengue contact, patients' usage of mosquito coils/nets/repellents, water pans for animals around the house, patients contact with dengue patient; and presence of co-morbidities like hypertension, allergy, asthma, and diabetes, laboratory test results.

The authors themselves collected the data which was analysed using SPSS-16.0.

RESULTS

A total of 109 patients admitted in the various hospitals of Lahore with a suspected dengue fever were studied. The mean age of the subjects was 34±16.5 years with a range 5–80 years, and 80 (73%) were male. Seropositivity (IgM) was found in 78 (72%) of the patients. Most of the patients (76%) were from 16 to 50 years. As shown in Table-1, the study did not find significant association between dengue fever and gender, educational qualification, occupation, marital status and age. The factor associated with a higher risk of dengue fever was identified as source of water supply i.e. piped water vs. water storage vessels (p=0.002) (Table-2)

Table-1: Seropositivity (IgM) by demographics

Demographics	IgM Status		Total (n=109)	p
	Negative (n=31)	Positive (n=78)		
Age group				
Up to 15	0 (0.0%)	8 (100.0%)	8	0.088
16-30	12 (24.5%)	37 (75.5%)	49	
31-50	11 (32.4%)	23 (67.6%)	34	
51-65	7 (53.8%)	6 (46.2%)	13	
Above 65	1 (20.0%)	4 (80.0%)	5	
Patients gender				
Male	22 (27.5%)	58 (72.5%)	80	0.718
Female	9 (31.0%)	20 (69.0%)	29	
Income Group (Rupees)				
No Income	11 (26.2%)	31 (73.8%)	42	0.843
up to 5000	3 (18.8%)	13 (81.2%)	16	
5001 to 10000	9 (30.0%)	21 (70.0%)	30	
10001to 25000	5 (38.5%)	8 (61.5%)	13	
25001to 50000	2 (33.3%)	4 (66.7%)	6	
More than 50000	1 (50.0%)	1 (50.0%)	2	
Marital status				
Married	20 (31.2%)	44 (68.8)	64	0.529
Un-married	20 (23.3%)	44 (76.7%)	64	
Divorced/widowed	1 (50.0%)	1 (50.0%)	2	
Occupation				
Housewife	5 (29.4%)	12 (70.6%)	17	0.268
Student	2 (16.7%)	10 (83.3%)	12	
Vocational	10 (40.0%)	15 (60.0%)	25	
Labourer	3 (16.7%)	15 (83.3%)	18	
Professional	2 (16.7%)	10 (83.3%)	12	
Business	4 (36.4%)	7 (63.6%)	11	
Farmer	1 (100.0%)	0 (0.0%)	1	
Others	1 (100.0%)	0 (0.0%)	1	
None	3 (25.0%)	9 (75.0%)	12	
Educational Status				
Illiterate	9 (21.4%)	33 (78.6%)	42	0.120
Primary	0 (0.0%)	6 (100.0%)	6	
Middle	4 (40.0%)	6 (60.0%)	10	
Matriculation	14 (48.3%)	15 (51.7%)	29	
Intermediate	1 (16.7%)	5 (63.3%)	6	
BA	1 (11.1%)	8 (88.9%)	9	
Masters	1 (33.3%)	2 (66.7%)	3	
Postgraduate	1 (25%)	3 (75%)	4	

Table-2: Seropositivity (IgM) and risk factors

Risk Factors	IgM Status		Total (n=109)	p
	negative (n=31)	positive (n=78)		
History of Hypertension				
Yes	5 (38.5%)	8(61.5%)	13	0.393
No	26 (27.1%)	70(72.9%)	96	
History of Diabetes				
Yes	6 (50%)	6(50%)	12	0.079
No	25 (25.8%)	72(74.2%)	97	
History of Asthma				
Yes	2 (50.0%)	2(50.0%)	4	0.330
No	29 (27.6%)	76(72.4%	105	
History of Allergy				
Yes	3 (60.0%)	2(40.0%)	5	0.109
No	28 (26.9%)	76(73.1%)	104	
Empty plot/ piece of land/ pond located around the house				
Yes	13 (22.0%)	46(78.0%)	59	0.107
No	18 (36.0%)	32(64.0%)	50	
location of house				
Near open market	10 (28.6%)	25(71.4%)	35	0.807
Near a public park	8 (33.3%)	16(66.7%)	24	
Near a green area	13 (26.0%)	37(74.0%)	50	
Screening of windows				
Yes	19 (30.2%)	44(69.8%)	63	0.642
No	12 (26.1%)	34(73.9%)	46	
Empty containers in house				
Yes	6 (20.7%)	23(79.3%)	29	0.438
No	25 (31.6%)	54(68.4%)	79	
unknown	0 (0.0%)	1(100.0%)	1	
Source of water supply				
piped water	25 (24.8%)	76(75.2%)	101	0.002*
water storage vessels	6 (75.0%)	2(25.0%)	8	
Type of dengue contact				
household member	4 (17.4%)	19(82.6%)	23	0.433
sex partner	2 (25.0%)	675.0%)	8	
Other	2 (20.0%)	8(80.0%)	10	
NA	23 (33.8%)	45(66.2%)	68	
Patients usage of mosquito coils/ nets/repellents				
Yes	13 (24.1%)	41(75.9%)	54	0.463
No	18 (33.3%)	36(66.7%)	54	
unknown	0 (0.0%)	1(100.0%)	1	
Water pans for animals around the house				
Yes	6 (31.6%)	13(68.4%)	19	0.739
No	25 (27.8%)	65(72.2%)	90	
Patients contact with dengue patient				
Yes	8 (19.5%)	33(80.5%)	41	0.109
No	23 (33.8%)	45(66.2%)	68	

DISCUSSION

Dengue has emerged as the most widely and rapidly spreading disease. The World Health Organization (WHO) fears it to become an international public health concern in the absence of appropriate and effective interventions.[7] The present study was conducted in the public and private hospitals of Lahore to determine the risk factors associated with dengue fever. Selected through convenience sampling, 109 patients admitted in the hospitals of Lahore with suspected dengue fever were studied. Among these, 78 (72%) patients were confirmed by positive serology (IgM) to have the disease. Majority of the patients were males and were in the age category of 16 to 50 years. A study conducted in Saudi Arabia by Khormi *et al*[8] showed similar results stating that individuals between the age of 16 and 60 years were more affected by dengue fever. The risk of infection was seen to increase with advancing age according to a study in Brazil.[9] This study showed no

significant statistical association between the gender and seropositivity to dengue. The seroprevalence of dengue fever was found to be the same among males and females according to Duncombe *et al*.[10] However according to a study by Montenegro[11] there was a predominance of male gender among the 14 patients being studied who died of dengue fever. This could be attributed to small sample size.

The present study looked at the association of dengue fever with source of water supply, i.e., piped water and water storage vessels. There was strong association ($p<0.05$) of dengue fever with piped water supply. However, results of a cohort study carried out in Vietnam are in variance to our study. They identified the absence of tap water to be strongly associated with dengue fever. This absence of tap water supply was assumed as a proxy for vector breeding site in their study. The other major source of water supply in their study population was open wells.[12] Our results revealing piped water supply to be risk for dengue fever as opposed to water storage vessel could be attributed to a small number (8 out of 109) of respondents using water storage vessels. In addition, detail about the source of water in the storage vessels was not obtained in this study nor was information regarding the vessel being covered or open.

Studies conducted around the world have identified numerous risk factors of dengue fever. Having mosquito larvae in water containers and the presence of a garden near the house were identified as factors associated with a high risk of dengue fever by a study conducted in Vietnam.[13] Taro farming and having water pans for animals in and around the house were highlighted as risk factors in Palau, Wetern Pacific.[14] In contrast our study didn't find any significant association between dengue fever and empty plot or pond located around the house, location of house, empty containers in the house, and water pans for animals around the house.

The presence of co-morbidities such as diabetes and allergies has been suggested as risk factors of the disease.[15] Our study showed no significant association between dengue fever and history of co-morbidities. A case control study conducted in Singapore found patients having hypertension and diabetes to be at a greater risk of dengue haemorrhagic fever.[16]

CONCLUSION

Use of water is a determinant of contracting dengue fever owing to it a breeding media for mosquitoes. All other phenomena associated with use of water and sanitation needs to be part of long term control of dengue that will also contribute to controlling other diseases with the same determinants.

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Address for Correspondence:

Dr. Fatima Mukhtar, Department of Community Medicine, Lahore Medical & Dental College, Lahore, Pakistan.
Residence: 7 Aziz Bhatti Road, Lahore Cantt., Lahore, Pakistan.
Email: fatimamukhtar@doctor.com