ORIGINAL ARTICLE

PREVALENCE OF DENGUE IN PATIENTS PRESENTING TO A TERTIARY CARE HOSPITAL OF KARACHI

Gul Ahuja[1], Saba Shahnawaz[2], Sumera Sheikh[3], Adnan Zubairi[4], Kanaan Mansoor[1], Shanawer Khawaja[5], Zeerak Ahmed[4], Fatima Habib[1]*

[1]*Emergency Department, Ziauddin University Hospital, Karachi, Pakistan,*
[2]*Aga Khan University Hospital, Karachi, Pakistan,*
[3]*Departemt of Hematology, Ziauddin Hospital, Karachi, Pakistan,*
[4]*Department of Pathology, Ziauddin University Hospital, Karachi, Pakistan,*
[5]*Ziauddin University, Karachi, Pakistan.*

ABSTRACT

Background: Dengue is a mosquito borne disease with worldwide distribution which has become endemic in certain regions of Pakistan and has given rise to a few epidemics. Infection with the Dengue virus can manifest itself as a severe, non-fatal viral syndrome or a rapidly progressive and a commonly fatal hemorrhagic fever. This study was conducted to investigate the prevalence of Dengue fever in the urban region of Karachi, Pakistan.

Methods: This retrospective, cross-sectional study was conducted at the Ziauddin Hospital System comprising of three hospitals catering to various socio- economic strata of the society. 823 samples were collected from the hematology and microbiology department of the hospital and the Dengue NS 1 antigen ELISA test was performed. Patients of all age and both genders were included.

Results: 823 patients were included in this study, out of which 32.1% (264) were found to have sera positive for Dengue IgM. Division according to sex demonstrated a predominance of males at 70.8% (n=177) while affected females accounted for 29.2% (n= 77). The most susceptible age group was found to be 30-39 years of age.

Conclusion: The inhabitants of Karachi face a high probability of contracting this disease due to the unsanitary living conditions and lack of basic amenities .This study has shown the prevalence of Dengue to be higher in Karachi than in other cities of Pakistan, therefore effectual methods of prevention and control are the need of the hour.

KEY WORDS: Dengue fever, prevalence, NS1 antigen, Pakistan

INTRODUCTION

Dengue is a disease of viral origin which in recent years has become endemic throughout the tropical regions of the world with frequent cyclical epidemic episodes[1].Flavivirus is the causative agent of this disease via its four different serotypes; DEN-1, DEN-2, DEN-3 and DEN-4.These are transmitted by the bite of a mosquito, principally through Aedes aeqypti (A. aegypti), the most common vector[2]. Apart from Aedes aegypti there are two other vectors gaining importance namely A. Albopictus and A.Polynesiensis[2]. Dengue manifests itself through a spectrum of clinical symptoms: alternating from an asymptomatic, undifferentiated mild fever, dengue fever, to dengue hemorrhagic fever with or without shock (DSS), which is a potentially fatal illness typified by plasma leakage secondary to increased vascular permeability. The lack of antiviral modalities or vaccines to prevent dengue is its bane. At the febrile stage, patients most commonly experience headache, malaise, rash, weakness, chills, aches and pains, and gastrointestinal disturbances. Physical examinations often show flushing of the face, lethargy, irritability (amongst young children), abdominal pain, hepatomegaly and petechial hemorrhages. Both forms of the disease, dengue hemorrhagic fever and dengue shock syndrome have increased in frequency throughout the past decade[3].

Corresponding Author: ***Kanaan Mansoor****

A regional analysis of the Western Pacific region in 2011 by the WHO, illustrated that a total of 244,880 cases of dengue were reported of which 839 died. Within Asia, the numbers of reported cases were highest in the Philippines and more than a thousand cases were reported from the Marshall Islands and the Federated States of Micronesia.42 cases were reported in New Zealand and 17% of the total cases were reported from Thailand, Indonesia and Malaysia[4].

It is evident that the whole country is prone to a Dengue epidemic in one way or the other through the fluctuating trends of climate. Owing to Pakistan's subtropical location along with it's climatic suitability for vectors, many vector borne diseases such as malaria, leishmaniasis, Crimean-Congo hemorrhagic fever, dengue haemorrhagic fever, West Nile virus, Japanese encephalitis and scrub typhus have been reported here[5,6]. Before 2006, Dengue Fever was not as common in Pakistan and it was mainly localized in the southern part of the country, specially the port city of Karachi, however soon it rapidly proliferated in other regions of the country. This can partially be attributed to increased human mobility, for instance due to internally displaced people. Frequent trade and travel amongst areas where dengue fever is prevalent has led to rapid proliferation as well [7]. In Pakistan the first outbreak of DF was observed in 1994 [9] and sporadic cases of suspected dengue infection were reported in the years to follow. According to the WHO, dengue is spreading rapidly in Pakistan. This can be attributed in part to the occurrence of natural calamities, like earthquakes and floods which lead to the destruction of infrastructure as well as affect the health status of the general population.

The dissemination of dengue fever in Pakistan is aided by its overcrowded cities, unsafe drinking water and inadequate sanitation facilities. The high influx of refugees also aids in the spread of this disease. This study aims to analyze prevalence of dengue fever in the city of Karachi.

METHODS

This retrospective, cross-sectional study was commenced at three different branches of Dr. Ziauddin hospitals in Karachi, namely Ziauddin Clifton campus, Ziauddin Kemari Campus and Ziauddin Nazimabad Campus. These campuses cater to various socio- economic tiers of the society. The data was collected from the Hematology and Microbiology department of the Dr. Ziauddin Hospitals. Inclusion criteria for this study were people presenting with symptoms of dengue fever such as high grade fever lasting for more than two days, rash after the onset of fever, muscle and joint pain and head ache. Patients of all age and both genders were included. Patients who had a rash or headache without fever were excluded.
The total number of samples collected during the study period were 823. These were collected in clotted yellow plain vacutainer tubes. Dengue NS-1 antigen test was done to check the antigen status of the patient. This test allows rapid detection on the first day of fever before the appearance of antibodies (IgM). This method of detection is through enzyme linked immunosorbent assay (ELISA). Dia. Pro diagnostic bioprobes Dengue virus IgM kits were used for this test; the sensitivity for IgM antibodies is 90% while the specificity of the kit is 98%. This study was done for the purpose of educating and creating awareness regarding the prevalence of dengue.

All variables were entered into SPSS (Statistical Package for Social Sciences) version 20.0 and the mean age with standard deviation, the prevalence, age and sex relationship were calculated for patients who had tested positive for Dengus NS -1.

RESULTS AND DISCUSSION

Table: 1 The Age and Sex Relationship of Dengue affected patients

	Sex		
Age group	Male (n=187)	Female (n=77)	Total
0 - 9	n=6 (2.27%)	n=8(3.03%)	n=14 (5.3%)
10 - 19	n=5 (1.89%)	n=7 (2.65%)	n=12 (4.54%)
20 - 29	n=25 (9.46%)	n=23 (8.71%)	n=48 (18.18%)
30 - 39	n=42 (15.9%)	n=22 (8.33%)	n=64 (24.24%)
40 - 49	n=42 (15.9%)	n=4 (1.15%)	n=46 (17.42%)
50 - 59	n=31(11.74%)	n=8 (3.03%)	n=39 (14.77%)
60 - 69	n=26 (9.84%)	n=4 (1.51%)	n=30 (11.36%)
70 - 79	n=8 (3.03%)	n=1 (0.37%)	n=9 (3.41%)
80 - 89	n=1 (0.37%)	n=0 (0%)	n=1 (0.37%)
90 above	n=1 (0.37%)	n=0 (0%)	n=1 (0.37%)
TOTAL	n=187 (70.8%)	n=77 (29.2%)	n=264(100%)

In recent years Dengue has become a vice for Pakistan which, despite the government's relentless efforts has not yet been controlled. Dengue virus belongs to the genus Flavivirus and comprises four different serotypes; (DEN 1- DEN 4). Infection from one of the four serotypes confers lifelong immunity to that specific serotype but there is cross immunity to the other serotypes for a few months only [8]. Consecutive infection with two different serotypes culminates in severe disease, characterized as DHF[8]. Although all four serotypes namely, DEN-1, DEN-2, DEN-3, and DEN-4 of this virus have been reported to cause this infection but serotypes DEN-2 and DEN-3 have emerged as the major causative serotypes in humans world-wide as well as in Pakistan[9]. The WHO defined DHF (Dengue Hemorrhagic Fever) as an acute febrile disease caused by one of the 4 serotypes of Dengue viruses and characterized by a bleeding diathesis which evolves to shock, DSS (Dengue Shock Syndrome). When Dengue first emerged in Karachi as an epidemic, collected samples had to be sent to Singapore for analysis due to the lack of serotyping facilities at that moment in time. Out of the 16 samples sent to Singapore, 15 were positive for IgM against Dengue virus[10].

Dengue is widely existent among the tropical and sub-tropical countries of the world. It estimated that 2.5 billion people in approximately 100 countries are at a risk of contracting this disease (http://apps.who.int/ iris/bitstreamz/10665/75303/1/9789241504034_eng.pdf). (http://www.who.int/mediacentre/factsheets/ fs117/en/.)

An estimated 50 million people are infected worldwide, of which half a million people are diagnosed with DHF and there are 20,000 deaths. South Asian countries carry a high burden of Dengue Fever and Dengue Hemorrhagic Fever and are faced with frequent cyclical epidemics[11].All four serotypes are freely circulating globally[12]. Between 2001 and 2008 there were more than a million cases in Cambodia, Malaysia, Philippines and Vietnam[15.]

Dengue is not new to Pakistan therefore many studies have been done on its prevalence but most of them focus in the province of Punjab, whereas the city of Karachi has been experiencing a rise in the numbers of Dengue cases. A prevalence report from Punjab, Pakistan, with a sample size of 11,283 patients for the year of 2011, delineated values as high as 18.3% in Data Ghanj Bakhsh Town to as low as 1.5% in Wagha Town[1]. Our study shows the prevalence of Dengue in Karachi to be a startling 32.1% (n=264), from a sample size of 823 patients. Amongst the positive cases, division according to sex demonstrated a male predominance, making up for 70.8% (n=177)of the total while females accounted for 29.2% (n= 77) .This gender pattern was similar to what Ali et al reported in 2015, showing 69.11 % males and 30.88 % females. Tahir et al (2010) observed the prevalence of Dengue in Lahore to be around 58.55% in males whilst 41.44% of the cases were females[14]. Mehmood et al 2009 reported that male to female ratio of Dengue in Pakistan to be 1.25:1[15], reinforcing the high male to female ratio observed amongst our study as well as others from Pakistan. This relationship was also observed by a Malaysian study [16] as well as a report by the WHO , comparing male- female differences in the number of reported Dengue fever cases amongst Asian countries[17] with the proportion of males shown to be significantly greater (p<0•001) than that of females, for all age groups.

An important reason for the reduced number of cases amongst females could be that be it summer or winter, females of this region mostly don the traditional "kameez " which consists of numerous flairs and folds of cloth, often accompanied by full sleeves , a long trouser and a "dupatta" which mostly covers the head or is draped around the neck . Covering oneself optimizes protection from being bitten by mosquitoes and has been documented as a major preventive measure which should be strongly emphasized (http://wonder.cdc.gov/wonder/prevguid/p0000443/p0000443).

The higher percentage of cases amongst males could also be attributed to the role of males as the chief bread earners, who are out and about at work during the mid-morning or early afternoon thus exposing them to the Aedes mosquito at its peak biting time.

DHF has been considered as a disease of the paediatric population and is now one of the leading causes of hospitalization and death among children18. However, reports from Singapore, Indonesia, Bangladesh and Thailand[19-21] indicate a rise in the incidence of Dengue amongst older age groups. Our study exhibited that patients lying in the age group of 30-39 years were most affected, making up for 24.2% (n=64) of the total cases positive for Dengue. Cases reported in Lahore by Ali et al in 2015 showed that patients who were most affected belonged to the age group of 21-30 years, comprising 23.1% of the total cases[1]. Reports from Faisalabad in 2011 showed the age group of 21-30 years to constitute 38% of the total cases[22].A brief report based on the epidemiology of dengue fever in Pakistan showed that the mean age amongst patients is 32 years [23] while our research shows that the mean age was 37.95 ± 16.32. Reports from other endemic countries are also in concordance with this observation. From India, Gupta et al 2006 [23] presented the maximum number of cases to occur between the ages of 21 and 30 years and similarly data from the 2005 outbreak in Singapore showed that it was predominantly young adults who were affected by DHF[24]. The age and sex relationship of dengue is shown in table 1.The age distribution

presented shows that the evident trend is similar to researches done previously in Faisalabad and Lahore.

CONCLUSION

Karachi is the largest city of the province Sindh, Pakistan, populated by more than 15 million population who are mostly living in poorly built houses under unsanitary conditions, lacking basic facilities such as clean water and a waste disposal system. This study has shown the prevalence of Dengue is higher in Karachi than other cities such as Lahore and Faisalabad, therefore further studies are warranted on a larger scale to locate disease infested pockets in the city so that a stronger initiative can be made to prevent further spread of this virus. A local surveillance and disease notification program is required, so that the number of patients with suspected DHF from different hospitals in the city can be ascertained for a more accurate report. The health department should act quickly and develop a systematic approach towards prevention and control. A coordinated surveillance system and an effective disease prevention programme should be launched, targeting vector control via chemical or environmental measures, along with mass education of the community to seek medical help as soon as possible. Family physicians/general practitioners' knowledge regarding dengue should be fortified so they learn to recognize the warning signs and reduce the number of misdiagnosed cases.

REFERENCES

1. Ali, G. Zahra, H. Ali, B.N.Khan. Prevalence of dengue fever during 2011-2012 in Punjab. J Anim Plant Sci 2015 ; 25 (3); 348-354
2. Nasreen S, Arshad M, Ashraf M. The epidemiology of dengue fever in district Faisalabad Pakistan. Int J.Sc Res. 2015; 5(3):1-6.
3. Khursheed M. Khan U, Ejaz K. A comparison of who guideline issued in 1997, 2009 for dengue fever single centre experience J Pak Med Assoc.2013;63(6):670-4
4. Yuzo Arima, Zoe Rebecca Edelstein, Hwi Kwang Han,Tamano Matsui. Epidemiologic update on the dengue situation in the Western Pacific Region, 2011. Western Pac Surveill Response J. 2013; 4(2):47-54.
5. Sugamata M, Ahmed A, Kono R, Takasu T. Seroepidemiological studies of infections with Japanese encephalitis, West Nile and dengue viruses in Karachi-Pakistan in the year 1985: a neuroviro-patho-epidemio-entomological study.Karachi encephalitis survey team secretarial, 2nd official report. Karachi; Karachi Encephalitis Survey Team Secretariat; 1987. P. 22-26.
6.Anonymous. Country Report Pakistan. Vector-borne diseases in Pakistan. In: Inter-country workshop on developing a regional strategy for integrated vector management for malaria and other vector-borne diseases. Islamabad: Directorate of Malaria Control, Government of Pakistan; 2003. Khartoum, Sudan.
7. Rasheed SB, Butlin RK, Boots M. A review of dengue as an emerging disease in Pakistan. Public Health. 2013; 127(1):11-7.
8. Bhatia R, Aditya P, Sunyoto T. Changing Epidemiology of dengue in South East Asia. WHO South-East Asia J Public Health 2013; 2:23-7.
9. Fatima Z1, Idrees M, Bajwa MA, Tahir Z, Ullah O, Zia MQ,et al. Serotype and genotype analysis of dengue virus by sequencing followed by phylogenetic analysis using samples from three mini outbreaks-2007-2009 in Pakistan. BMC Microbiol. 2011; 11:200.
10. Jazibeh A. Qureshi, Nasreen J notta, Naseem Salahuddin, Javaid A. Khan. An Epidemic of Dengue Fever in Karachi- Associated Clincal Manifestations. JPMA. 1997; 47(7):178-81.
11. Guha-Sapir D, Schimmer B. Dengue fever: new paradigms for a changing epidemiology. Emerg Themes Epidemiol 2005;2:1
12. Rodhain F, Rosen L. Mosquito vectors and dengue virus-vector relationships. In: Gubler Dj, Kuno G, editors. Dengue and Dengue Hemorrhagic Fever. New York: CAB International; 1997. pp. 45-60
13. Kumaria R. Correlation of disease spectrum among four dengue serotypes: a five year hospital based study from India. Brazilian Journal of Infectious Diseases 2010; 14:141-6
14. Tahir Z., S. Hafeez, A. Chaudhry .Spatial and seasonal variation of dengue fever in Lahore 2008. Biomedica 2010; 26: 166-72.
15. K.Mehmood, T.Jameel, F. Aslam, M.Tahir Incidence of dengue haemorrhagic fever in local population of Lahore, Pakistan. Biomedica, 2009; 25: 93–96.
16. Mohd-Zaki AH, Brett J, Ismail E, L'Azou M. Epidemiology of dengue disease in Malaysia (2000-2012): a systematic literature review. PLoS Negl Trop Dis. 2014; 8(11): 3159.
17. Anker M, Arima Y. Male-female differences in the number of reported incident dengue fever cases in six Asian countries. Western Pac Surveill Response J. 2011; 2(2):17-23.
18. haemorrhagic fever: Current issues and future research. Asia-Oceanian. J Pediatr Child Health 2002; 1:122.
19. Siripen Kalayanarooj, Clinical Manifestations and Management of Dengue/DHF/DSS. Trop Med Health. 2011; 39(4): 83–87.
20. Chareonsook O, Foy HM, Teeraratkul A, Silarug N. Changing epidemiology of dengue haemorrhagic fever in Thailand. Epidemiol Infect 1999; 122: 1616.
21. Nasreen S, Arshan M, Ashraf M, Raza A, Mustafa B. The epidemiology of dengue fever in district Faisalabad, Pakistan. IJSRP.2015; 5(3): 1-6
22. Jahan F, et al. Clinical and biochemical characteristics of suspected dengue fever in an ambulatory care family medical clinic, Aga Khan University,

Karachi, Pakistan. Dengue Bulletin; 2011; 35: 59-64.
23. 10. Gupta E, Dar L, Kapoor G, Broor S. The changing epidemiology of dengue in Delhi, India. Virol J 2006; 3:92.
24. Low JGH, Ooi EE, Tolfvenstam T, Lew YS, Hibberd ML, Ng LC, et al. Early Dengue infection and outcome study (EDEN) - Study design preliminary findings. Ann Acad Med Singapore 2006; 35: 783-9.