Epidemiological and Clinical Presentation of Dengue Infection in the Gadap region of Karachi. A survey based study

ABSTRACT:

Introduction: Dengue fever has emerged as a major arboviral disease with a significant impact on the disease burden in tropical countries.

Aim: The goal of this study was to look at the clinical and laboratory profiles of dengue infection.

Methodology: During 2018 and 2019;., a cross-sectional study was conducted to investigate the epidemiological and clinical features of dengue fever in the Gadap region of Karachi, Pakistan.

Results: Positive cases were reported during the study period, which spanned the months of August to December following the monsoon season. Among the 200 positive patients, 160 had dengue fever (DF) and 40 had dengue hemorrhagic fever (DHF) (male 160 and female 40). Fever was the most common symptom, followed by Arthralgia/Myalgia, Headache, and Vomiting. Patients with Dengue Hemorrhagic Fever had a higher rate of haemorrhage. Thrombocytopenia and leucopenia were discovered to be common laboratory findings in patients with Dengue fever and Dengue hemorrhagic fever.

Conclusion: Clinical and laboratory characteristics of dengue cases studied could be used to identify patients at risk of severe dengue fever early on.

INTRODUCTION:

Dengue fever is an acute arthropod-borne viral illness that has a significant socioeconomic and disease burden in several tropical and subtropical regions. It is the most common arboviral disease worldwide (1). Aedes mosquitoes transmit the disease, and over 3 billion people live in Aedes-infested areas (2). The condition is now endemic in over hundred countries across Africa, United states, the Eastern Mediterranean, South East Asia, and the Western Pacific (3). It has become a major international public health concern in recent years, with an increasing incidence detected primarily in urban and semi-urban areas. Severe dengue fever has now become a leading cause of morbidity and mortality in many regions, particularly in Asian and Latin American countries (4, 5).

Pakistan is a sub - tropical country that is a hotspot for many vector-borne diseases, including dengue fever. It is a rapidly spreading infectious disease in this region. In Pakistan, four dengue serotypes are present and circulating throughout the year, with the peak outbreak occurring between September and November during the post-monsoon season (6).

In 1994, the dengue virus made its first appearance in Pakistan's busy city of Karachi (7). Similarly, 4,500 cases were reported in 2005, but by 2010, the number of dengue cases had risen to 21,204 (8). Fever-related deaths were not limited to the poor; in fact, some very high-profile individuals, such as the secretary of government and members of legislative assemblies, died as a result of dengue fever (9).

The government implemented a comprehensive dengue control policy to limit the spread of dengue fever, reduce human deaths, and prevent its recurrence in the future. The policy is built around the concepts of "prevention" and "cure." Dengue control efforts included providing diagnosis and treatment facilities for dengue fever at all health centres, as well as mobilising communities to raise awareness and adopt precautionary measures (9).

The disease is now endemic in Pakistan, awareness of dengue virus infection remains limited, necessitating a nationwide comprehensive analysis of epidemiological and clinical data. Such information will also be useful in establishing a dengue fever prevention programme in Pakistan.

The purpose of this study was to look at the clinical and laboratory profiles of dengue infection in patients and to see if there were any new insights into the outbreak.

Material and Methods:

The study included patients aged 16 and up who were diagnosed with dengue during the disease's outbreak from January 2018 to December 2019. 200 patients who attended the Fatima Hospital of Baqai Medical University were near Gadap district of Karachi.

It is a cross-sectional research. The case was defined based on a suitable clinical history and physical examination depending on WHO criteria, which was confirmed by a positive NS1 antigen or dengue IgM antibodies (rapid test, SD Bioline) or a PCR method to identify dengue virus serotype. Using primers and probes for each dengue serotype from 1 to 4, the PCR can detect dengue virus serotyping. All participants were determined in accordance with WHO guidelines from 2009.

Patients were identified with DF if they had a fever for 2–7 days and two or more of the following symptoms: 1) headache, 2) retro-orbital pain, 3) myalgia/arthralgia, rash, 4) hemorrhagic manifestations (petechiae and positive tourniquet test), and 5) leukopenia.

Patients with DHF were differentiated from those with DF if they had (1) a fever lasting 2–7 days; (2) one or more hemorrhagic representations (positive tourniquet test, petechia, purpura, bleeding from mucous membranes, injection sites, or other sites); (3) thrombocytopenia; and (4) indications of plasma leakage.

Diagnostic laboratory findings:

Thrombocytopenia was described as a platelet count from less than 150,000 cells/mm3 blood. Leucopenia was identified as a leukocyte count of less than 4.5 cells/mm3. Hemoglobin (Hb) concentrations less than 13 and 12 g/L were considered low in males and females, respectively. Elevated values of alanine aminotransferase (ALT) and aspartate aminotransferase (AST) were 45 U/ml and 36 U/ml, respectively.

Statistical Analysis:

SPSS statistical version 21 was used for all statistical analyses. For each categorical variable, descriptive statistics such as frequency and percentages were recorded. To assess statistical differences in categorical variables between groups, the chi-square (2) test was used. A value of 0.05 was deemed significant.

RESULTS:

Among 200 patients, 160 were diagnosed with Dengue Fever (DF) and 40 were diagnosed with Dengue hemorrhagic Fever (DHF). Dengue Fever patients were 80.6 % male and 19.4 % female, while Dengue Hemorrhagic Fever patients were 77.5 % males and 22.5 % females.

Clinical Signs and Symptoms

High grade fever was present in 80% of the 160 Dengue fever patients, followed by Arthralgia/myalgia (77.5 %), headache (75 %), nausea/vomiting (65%), rash (15 %), and retro-orbital pain (26.9 %) whereas in 40 Dengue hemorrhagic patient, high grade fever was present in 85% of the 160 Dengue fever patients, followed by rash (82.5%), Arthralgia/myalgia (80%), headache (72.5%), nausea/vomiting (55%), and retro-orbital pain (62.5 %).

The most common symptoms observed were high grade fever, headache, myalgia/arthralgia, and vomiting, but they did not differ significantly between DF and DHF patients. Skin rash and peri-orbital pain, on the other hand, were significantly ($p<0.05$) different in DHF.

Patients with Dengue fever (160) presented with various types of hemorrhage, including hematemesis (17.5 %), hematuria (15 %), and epistaxis (11%), whereas most of the patients with Dengue hemorrhagic fever (40) presented with hemorrhage, including epistaxis (77.5%), hematuria (80%), and hematemesis (65%). When hemorrhage was compared between two groups, a significant difference was observed in all types of hemorrhage ($p<0.001$), with patients suffering from dengue hemorrhagic fever suffering from more hemorrhage than patients suffering from dengue fever.

Majority of the patients with Dengue fever (92.5%) and Dengue Hemorrhagic Fever (90%) presented with thrombocytopenia at time of admission. Low hemoglobin and leucopenia were found in 45% and 86.9 % of DF patient, while 72.5 % and 82.5 % of DHF patients, respectively. ALT was found to be elevated in 52% and 70% and AST was elevated in 61.2% and 82.5% of

the DF and DHF patients respectively. When the patients' laboratory results were compared, a significant difference in hemoglobin, AST, and ALT levels was found.

**Table 1: Characteristics of Dengue Fever (DF) and Dengue Hemorrhagic Fever (DHF) Patients**

CHARACTERSTICS	DF n = 160	DHF n = 40	p- value
1. Demographics			
• Age in years (Mean ± SD)	31.3 ± 9.1	26.4 ± 8.6	-
• Gender			
Male	129 (80.6)	31 (77.5)	0.21
Female	31 (19.4)	9 (22.5)	
2. Clinical features			
• High grade fever	128 (80)	34 (85)	0.47
• Headache	120 (75)	29 (72.5)	0.74
• Arthralgia/ Myalgia	124 (77.5)	32 (80)	0.73
• Nausea/Vomiting	104 (65)	22 (55)	0.24
• Skin Rash	24 (15)	33 (82.5)	<0.001
• Retro-orbital pain	43 (26.9)	25 (62.5)	<0.001
3. Hemorrhages			
• Epistaxis	18 (11.2)	31 (77.5)	<0.001
• Melena / hematuria	24 (15)	32 (80)	<0.001
• Hematemesis	28 (17.5)	26 (65)	<0.001
4. Laboratory Findings			
• Thrombocytopenia (admission)	148 (92.5)	36 (90)	0.60
• Hemoglobin (low)	72 (45)	29 (72.5)	0.003
• Leucopenia	111 (69.3)	26 (65)	0.59
• ALT (Elevated)	84 (52)	28 (70)	0.04
• AST (Elevated)	98 (61.2)	33 (82.5)	0.01

Dengue Fever (DF), Dengue Hemorrhagic Fever (DHF), Alanine Aminotransferase (ALT) Aspartate aminotransferase (AST).
Chi square test
p- value < 0.05 considered significant

Figure 1: Distribution of Dengue Fever and Dengue Hemorrhagic Fever cases
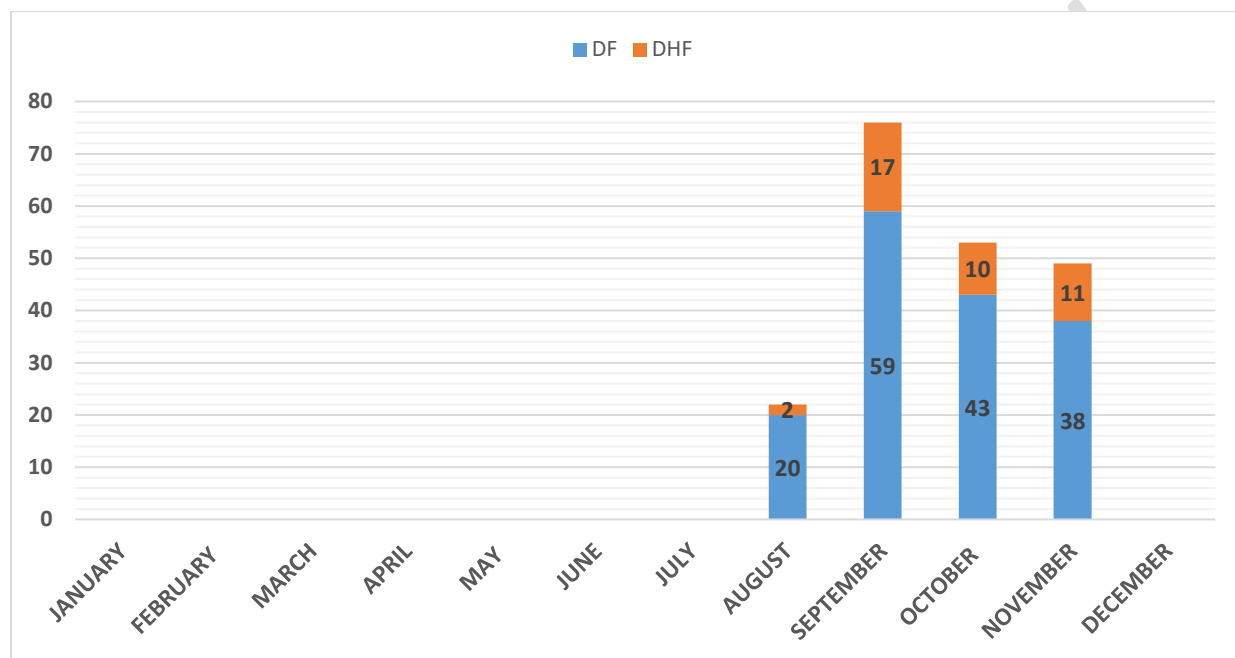
Month-by-month distribution showed a gradual increase in cases beginning in August DF 20 (%), DHF 2 (%), with peaks in September 59 (%) DF, 17 (%) DHF, and November 38 (%) DF, 11 (%) DFH, followed by a decline.

DISCUSSION:

The dengue virus has impacted 50% of the global population, making it a serious public health concern, particularly in tropical countries (10). Karachi is by far Pakistan's largest city and the capital of the Sindh province. Large cities have significant complexities in managing different departments, as seen in Karachi, where pollution (air and land) is the norm. Karachi has suffered from frequent rolling blackouts and a lack of proper waste disposal. Furthermore, excessive rainfall and poor sanitation make this one of the world's worst-maintained metro areas, and it serves as a perfect breeding for mosquitos. There is also lack of capacity to deal with

emergencies like dengue fever(11). It was mostly found in open rural areas like Gadap, which are on the outskirts of Karachi's metropolitan areas (12).

The characteristics of the dengue disease epidemic are effected by complex relationships between virus, vector, and host, as well as being highly dependent on climatic and environmental conditions (13).

This study reveals a presence of greater proportion of male than female among the effected patients. A recent study that examined dengue incidence in six Asian countries reported similar findings(14). Several other studies conducted in different parts of Asia found similar results (14-17). These findings point to a gender difference in dengue incidence, which could be attributed to dengue vector exposure or to an unknown factor. Surprisingly, the frequency of dengue disease in North America is reported in either equal proportions of males and females or in higher percentages of females (18, 19). Gender precision in dengue infection may have been influenced by social, cultural (women being protected), and exposure factors like appropriate body covering. Another reason for it might be gender imbalance in seeking healthcare (20).

There is conflicting evidence about the age of dengue patients. Previously, studies in Asia using surveillance data linked the age of affected patients to the disease severity. A study in Pakistan found a decrease in the `age of dengue patients from 2003 to 2007, with affected individuals ranging in age from 11 to 25 years (21). Another study conducted in different cities of Pakistan showed nearly similar results with the mean age being 31.3±14.0 years (22).

Seasonal variations influence DF in the South-Asian region, in which ideal conditions for vector survival and reproduction exist, particularly during the monsoons, since there is plentiful rainfall and high relative humidity, with daily temperatures between 27.9◦C to 35.7◦C. These weather conditions are ideal for mosquito reproduction (23, 24). In the current study, there had been a progressive increase in cases beginning in August, with a peak in September, October, November and a subsequent decline, indicating a post-monsoon infection, which has also been observed by others. A study conducted in Lahore observed an increase in dengue incidence from September to December, with a maximum in November. It appears that this weather in Pakistan is ideal for vector breeding, specifically Aedes aegyptei (21).

The most common symptom in dengue patients is Fever (25, 26), and the same was proved to be consistent in the current study, which was also consistent with previous research from Pakistan(27, 28). However, the World Health Organization (WHO) reports that the clinical characteristics of DF vary with age (29). Adults may experience either a mild febrile syndrome or the classic incapacitating disease, which includes an acute onset of high-grade fever, severe headache, peri-orbital pain, arthralgia/myalgia, and a rash (30, 31). DHF is a fatal disease marked by high fever, a tendency to bleed, and circulatory failure (31). Moreover, the frequency of symptoms and signs in the WHO classification schemes reduced significantly with increasing age of infection (32). Other symptoms in the current study included arthralgia/ myalgia, headache, nausea/vomiting, and rash, which are comparable to those reported by others, though their frequency varied (33, 34).

Thrombocytopenia is a common clinical finding in dengue infection and a low platelet count are currently used as diagnostic criteria for DHF. The cause of dengue thrombocytopenia is unknown, but it has been linked to decreased platelet production. In the current study, thrombocytopenia was observed in 92.5% and 90% of DF and DHF cases, respectively, and similar findings were reported in an Indian study (34). However, research by Singh et al. and Khan et al. found thrombocytopenia in 61.39 % and 73%of patients, respectively, which is lower than the current study (35, 36). Thrombocytopenia is a potential risk for haemorrhage, and the cut off point for preventative platelet transfusion in non-dengue patients is 10,000/mm3. 45 Platelet transfusion is only recommended in adults with underlying hypertension and serious thrombocytopenia (less than 10,000 cells/mm3), according to the WHO (37). Because there is no effective therapy for DHF/DSS, it has been proposed that patients with a hemorrhagic tendency and a platelet count of less than 20,000/mm3 could be empirically transfused platelets (38).

The current study found leucopenia in more than 65 percent of the cases. Many studies have found leucopenia, or a low white blood cell (WBC) count, in dengue patients (39, 40). A study mentioned leukopenia in dengue fever occur as a result of virus-induced breakdown or suppression of myeloid progenitor cells (41).

In present study low hemoglobin was more prominent in DHF.

The levels of Aspartate transaminase (AST) and Alanine transaminase (ALT) have been reported to be greater in severe dengue fever than in dengue hemorrhagic fever (42, 43). This suggests a

possible link between increased transaminase levels and disease severity. Surprisingly, the levels of liver enzymes were reported to be greater during the febrile and severe phases of dengue (43).

LIMITATION:

This study has small number of severe dengue cases. As a result, we have not examined how predictive early clinical or hematological parameters are in predicting the development of severe illness, which has been addressed elsewhere.

CONCLUSION:

The demographic, diagnostic, and laboratory characteristics of the cases of dengue fever studied can be used for the early diagnosis and management of patients at risk of serious dengue fever. Rash, periorbital puffiness, and elevated liver enzymes may be used to predict DHF. The month of the year identified in this study where dengue cases were reported more frequently could be targeted by policymakers, educators, and health professionals for dengue fever control in the city.

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