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Epidemiological Analysis of Dengue among Patients Visiting Lady Reading Hospital, Peshawar, in 2023

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ABSTRACT

Background: Dengue is a mosquito-borne viral infection that has become endemic in many regions of Pakistan and represents a major public health concern in Khyber Pakhtunkhwa (KPK). Increasing case numbers in recent years highlight the need for updated regional data. This study aimed to assess the pattern of dengue infection among patients tested at Lady Reading Hospital (LRH), Peshawar, during 2023. **Methods:** A retrospective study was conducted using secondary data extracted from LRH laboratory and admission records. All patients referred for dengue testing between January and December 2023 were included. Information such as age, sex, district of residence, and dengue test results (NS1 antigen by ELISA) was recorded and analyzed. Data were categorized into five age groups to observe age-related variation. **Results:** A total of 2004 patients were tested for dengue in 2023, of which 600 (29.9%) were positive and 1404 (70.1%) were negative. Males accounted for 379 (63.2%) positive cases, while females accounted for 221 (36.8%). Most patients belonged to the 0–20 year age group (44.8%), followed by the 21–40 year group (41.3%), indicating a higher burden in younger individuals. Patients were referred from multiple districts of KPK, with Peshawar contributing 71.8% of all tested cases, reflecting both high local transmission and the role of LRH as a major tertiary care center **Conclusion:** Dengue remains a significant public health issue in Khyber Pakhtunkhwa, with the highest burden observed among males and individuals aged 0–20 years. The predominance of cases from Peshawar underscores the need for strengthened vector control, enhanced public awareness, and improved surveillance across the province. Effective preventive measures are essential to reduce disease transmission and mitigate future outbreaks.

INTRODUCTION

Dengue fever is a mosquito-borne viral infection transmitted primarily through the bite of *Aedesaegypti* mosquitoes, a highly adaptive vector that thrives in tropical and subtropical regions of the world (Guzman & Harris, 2015). The dengue virus (DENV), a member of the *Flaviviridae* family, consists of four antigenically distinct serotypes (DENV-1 to DENV-4), and infection with one serotype does not provide long-term immunity against the others, allowing repeated infections throughout life (Messer et al., 2003). Clinically, dengue presents with a spectrum ranging from mild febrile illness to severe manifestations, including dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS), which can lead to life-threatening complications if not properly managed (Simmons et al., 2012). The incubation period typically ranges from 4 to 10 days after the bite of an infected mosquito, and symptoms may escalate rapidly during the critical phase.Globally, dengue has become one of the most rapidly spreading vector-borne viral diseases, with cases reported in more than 100 countries. The World Health Organization estimates that nearly half of the world's population is at risk of dengue infection, with approximately 390 million infections occurring annually (WHO, 2023). Climate change, rapid urban expansion, poor waste management, and increasing international travel have contributed to the widening distribution of both mosquito vectors and dengue virus transmission (Bhatt et al., 2013). In endemic regions across Asia, South America, and the Western Pacific, dengue imposes a tremendous health and economic burden, increasing hospitalization rates and straining healthcare systems, particularly during seasonal outbreaks.Pakistan has experienced repeated dengue epidemics over the past two

decades, driven by favorable climatic conditions, unplanned urbanization, and gaps in vector control initiatives. Large-scale outbreaks have been documented in Karachi, Lahore, Rawalpindi, Islamabad, and other urban centers (Khan et al., 2014). The 2011 Lahore epidemic was particularly severe, resulting in tens of thousands of confirmed cases and highlighting major challenges in disease surveillance, case management, and environmental control. Following this, dengue has become a persistent public health problem throughout the country, with annual outbreaks reported across all provinces. Socioeconomic factors, inadequate sanitation, and water storage practices continue to support *Aedes* breeding, while human mobility contributes to interprovincial spread of the virus.

In Khyber Pakhtunkhwa (KP), dengue has emerged as a significant health concern in recent years. A major outbreak in Swat in 2013 resulted in high morbidity and mortality, indicating that dengue transmission had expanded beyond the traditional endemic zones of Pakistan (Ali et al., 2013). In 2017, Peshawar experienced one of the most severe outbreaks in the province's history, with tens of thousands of confirmed patients, further emphasizing the vulnerability of the region (Ali et al., 2019). Lady Reading Hospital (LRH), being the largest tertiary-care hospital in Peshawar, plays a pivotal role in diagnosing and managing dengue cases from across the province. Due to its central location and referral status, LRH receives patients from numerous districts within KP, including Peshawar, Charsadda, Mardan, Abbottabad, Kohat, and Swat. Importantly, the hospital also receives dengue-suspected individuals from adjoining regions beyond KP, such as Attock (Punjab) and Astore (Gilgit-Baltistan), expanding its catchment area beyond provincial boundaries.

Despite repeated outbreaks and growing case numbers, recent hospital-based epidemiological data from Peshawar remain limited. Understanding current dengue patterns is crucial because transmission intensity can change yearly due to climate variations, vector density, human movement, and environmental conditions. Hospital-based datasets, such as those from LRH, provide valuable insight into the age groups, genders, and geographical areas most affected during specific seasons, especially in regions where community-level surveillance may be insufficient (Shepard et al., 2016). Such data are essential for guiding targeted vector control strategies, public health interventions, and efficient resource allocation by local authorities. Updated information is also vital to track shifts in disease burden after the major 2017 KP outbreak and to evaluate whether younger age groups continue to be disproportionately affected.

Given this background, updated epidemiological analysis is necessary to assess the current dengue situation in Peshawar and surrounding districts. Lady Reading Hospital, due to its role as a major diagnostic and referral center, provides a unique opportunity to examine dengue patterns across a wide geographic catchment area. The hospital's 2023 records include patients from multiple districts of KP, as well as neighboring areas such as Attock and Astore, offering a comprehensive view of dengue distribution among individuals seeking diagnostic testing.

Therefore, this study aimed to describe the epidemiological pattern of dengue virus infection among patients tested at Lady Reading Hospital, Peshawar, during 2023. The analysis focuses on age-specific, sex-specific, and district-wise distribution of dengue-positive and dengue-negative individuals, providing updated evidence to support dengue control strategies in Peshawar, Khyber Pakhtunkhwa, and surrounding regions.

MATERIAL AND METHODS

The Study Aim

The aim of the study was to determine the knowledge regarding to dengue and awareness and practice among dengue patient.

Study Area

The study was performed in Khyber Pakhtunkhwa previously known as N.W.F.P the North West province of Pakistan according to 2023 census, its total is 101,741 km^2 (39,282 sq mi) and the population is 40,856,097KPK is the North part of Pakistan and is one of the most legendary places on earth. The province shares boundaries with Afghanistan to the North West Gilgit Baltistan to the North West, ex-federal Administrative tribal area (EX FATA) the west and North South, Azad and Jamu Kashmir the East, Baluchistan to the South and Islamabad capital of the country and Punjab to the South east Khyber Pakhtunkhwa is the highest impotent populated region of the country (Pakistan Bureau of Statistics, 2017) Pashtuns from the major part of the population followed by smaller group such as Hindokowans, Gujjars, Chatrallis, and dards.

Inclusion Criteria

The patients have clinically diagnosed dengue positive, they have symptoms of fever, muscles pain and nausea, cutaneous and mucocutaneous hemorrhagic manifestation and also show NSI positivity by use of ELISA.

Data Collection

The present study only those people were considered from KPK who visited the Lady Reading Hospital Peshawar from January 2023 to December 2023 referred by doctors or having some problems to perform tests for dengue disease the data was obtained from records and registers/filled forms, of the LRH with the permission of Hospital Head including the patient's gender, age, location, and dengue test status (positive and negative).

Clinical Manifestations

The indoor patients admitted in Lady Reading Hospital were investigated for various signs and symptoms examples fever, body aches, nausea, vomiting diarrhea, gums bleeding and bleeding of nose, skin rashes animals contact history, and platelet count at admission.

Data Entry and Statistical Analysis

The data was taken in pdf form, the data was enter and coded in excel. The data obtained in the current study was analyzed on the basis of geographical distribution in 26 districts of KPK (Peshawar, Charsadda, Mardan, Abbottabad, Bajaur, Attock, Bannu, Chitral, Astore, Dera Ismail Khan, Hangu, Karak, Khyber, Kohat, Kurram, Lucky Marwat, Lower Dir, Upper Dir, Mansehra, Mohmand, Nowshera, N. Waziristan, S. Waziristan, Swabi, Swat and Malakand).

RESULTS

In Lady Reading Hospital in year 2023, 2004 dengue test were performed in which 1172(58.48%) male cases and 832(41.51%) female cases were reported. In 1172 male cases 379 were positive cases and 793 were negative cases. In 832 female 211 Cases were positive cases and 611 were negative cases reported. It shows that dengue rate is higher in male as compare to female.

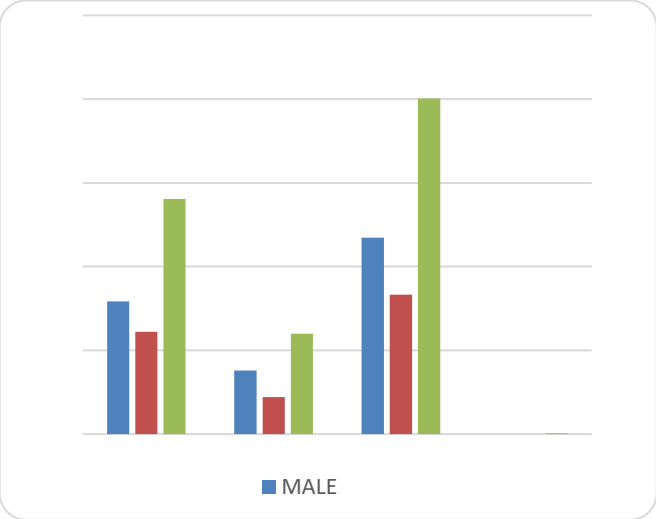
Table 1

Positive and Negative Percentage in Male and Female

Cases	Gender		
Positive/Negative	**Male**	**Female**	**Total**
Negative	793(56.48%)	611(43.51%)	1404(100)
Positive	379(63.16%)	221(36.83%)	600(100)
Total	1172(58.48%)	832(41.51%)	2004(100)

Figure 1

Gender Wise Percentage of Positive and Negative Cases



The collected data were divided into five age groups out of total registered patients 898(44.81%), out of 898 patients 275 were positive cases and 623 were negative cases, from age group 0-20 years. 828(41.31%) cases from age 21-40 years, out of 828 cases 242 were positive cases and 586 were negative cases. From age 41-60 years there were 228 cases, out of 228 cases 65 were positive cases and 163 were negative cases. From age 61-80 years there were 46 cases recorded, out of 46 cases 18 cases were positive and 28 cases were negative. From age 81- 100 years there were 4 cases recorded, out of four cases 1 case is positive and 3 cases were Negative.

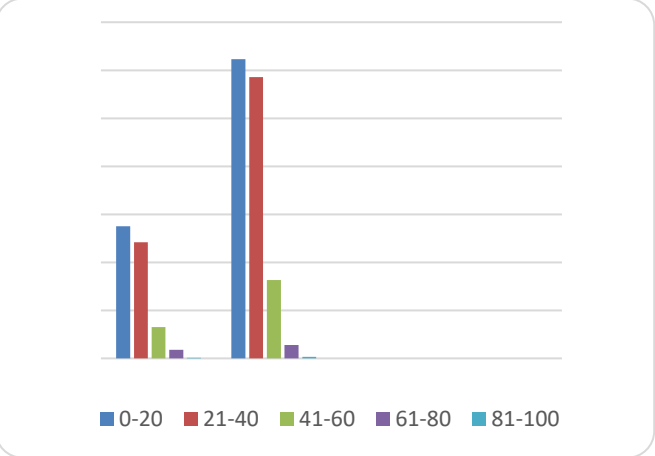
Table2

Age Groups Wise Prevalence of Dengue in Percentage

POS/NEG	0-20	21-40	41-60	61-80	81-100	TOTAL
Positive	275 (45.83%)	242 (40.33%)	65 (10.83%)	18 (3%)	1 (0.16%)	600 (100%)
Negative	623 (44.37)	586 (41.73%)	163 (11.60%)	28 (1.99%)	3 (0,21%)	1404 (100%)
Total	898 (44.81)	828 (41.31%)	228 (11.37%)	46 (2.297%)	4 (0.28%)	2004 (100%)

Figure 2

Age Wise Distribution



Dengue Prevalence in Different Localities of KPK Province

In lady Reading Hospital in year 2023, 2004 test were perform, out of these 76(3.82%) cases were reported from Abbottabad, 38(1.96%) were reported from Attock, Astore 55(2.74%), Bajaur 8(0.39%), Bannu 9(0.44%), Charsadda 67(3.34%), Chitral 46(2.29%), Dera Ismail Khan 4(0.12%), Hangu 47(2.34%), Karak 21(1.04%), Khyber 30(1.49%), Kohat 17(0.84%), Kurram 7(0.34%), Lucky Marwat 4(0.26%), Lower Dir 12(0.59%), Mansehra 16(0.79%), Mardan 29(1.44%), Mohmand 8(0.42%), N. Waziristan 1(0.04%), Nowshera 19(0.94%), Peshawar 1438(71.75%), S. Waziristan3(0.14%), Swabi 2(0.09%), Swat 22(1.09%), Malakand 18(0.89%), Upper Dir 7(0.39%).

Table 3

City Wise Distribution

S.No	City	Frequency	Percent $\left(\frac{x}{TOTAL} \times 100\right)$	Cummulative Frequency
1	Abbottabad	76	3.82	3.83
2	Attack	38	1.96	5.79
3	Astore	55	2.74	8.53
4	Bajaur	8	0.39	8.92
5	Bannu	9	0.44	9.36
6	Charsadda	67	3.34	12.7
7	Chitral	46	2.29	14.99
8	Dera Ismail Khan	4	0.12	15.11
9	Hangu	47	2.34	17.45
10	Karrak	21	1.04	18.49
11	Khyber	30	1.49	19.98
12	Kohat	17	0.84	20.82
13	Kurram	7	0.34	21.16
14	LakkiMarwat	4	0.26	21.42
15	Lower Dir	12	0.59	22.01
16	Mansehra	16	0.79	22.8
17	Mardan	29	1.44	24.24
18	Mohmand	8	0.42	24.66
18	N. Waziristan	1	0.04	24.7
20	Nowshera	19	0.94	25.64
21	Peshawar	1438	71.75	97.39
22	S. Waziristan	3	0.14	97.53
23	Swabi	2	0.09	97.62
24	Swat	22	1.09	98.71
25	Malakand	18	0.89	99.6
26	Upper Dir	7	0.39	100
TOTAL		2004		

Figure 3
City Wise Distribution

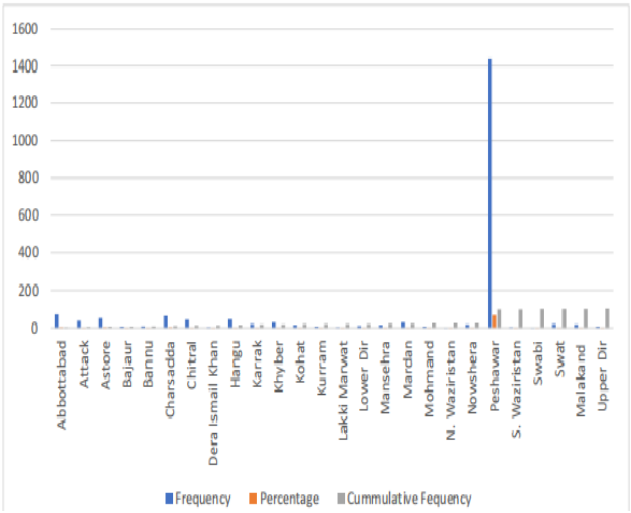


Table 4
Dengue Prevalence in Central Districts in KPK

City	Frequency	Percentage (%)	Cumulative Frequency (%)
Khyber	30	1.49	19.96
Charsadda	67	3.34	12.70
Mardan	29	1.44	24.24
Swabi	2	0.09	97.62
Nowshera	19	0.94	25.64
Attock	38	1.96	5.79

Table 5
Dengue Prevalence in Southern Districts of KPK

City	Frequency	Percentage (%)	Cumulative Frequency (%)
Kohat	17	0.84	20.82
N. Waziristan	1	0.04	24.7
S. Waziristan	3	0.14	97.53
Lucky Marwat	4	0.26	21.42
D.I.Khan	4	0.12	15.11
Hangu	47	2.34	17.45
Karak	21	1.04	18.49
Kurram	7	0.34	21.16
Bannu	9	0.44	9.36

Table 6
Dengue Prevalence in Northern Districts of KPK

City	Frequency	Percentage (%)	Cumulative Frequency (%)
Bajaur	8	0.39	8.92
Chitral	46	2.29	14.99
Swat	22	1.09	98.71
Malakand	18	0.89	99.6
Lower Dir	12	0.59	22.01
Upper Dir	7	0.39	100
Mohmand	8	0.42	24.66

DISCUSSION

Dengue virus infection has become endemic in Pakistan, a pattern supported by long-term national epidemiological evidence summarized by (Haider et al., 2015). The prevalence of dengue has led to serious epidemics during the post-monsoon season, with the 2013 outbreak alone affecting more than 5 million people and causing over 500 deaths. Although the reported cases were over 20,000, the actual figures may have exceeded 700, indicating the gravity of the situation (Rasheed et al., 2013). The current study aimed to characterize the serotypes of the dengue virus, revealing a prevalence of 38%, a significant decrease compared to a 2012 epidemiological study in Lahore, which reported an 82% prevalence (Mukhtar et al., 2012). Notably, the highest incidence of Dengue Virus (DENV) occurred in the 5-25 years age group, comprising 44.81% of the cases. Interestingly, the teenage group exhibited a higher incidence, consistent with studies in different epidemic areas (Anderson, 2007), but contrary to findings in Singapore. Males showed a greater susceptibility to dengue infection (58.48%) than females (Sangkawibhaet al., 1984) aligning with patterns observed in subtropical and tropical regions globally (Suayaet al., 2009).

This gender difference may be attributed to varying outdoor activities, intellectual settings, and gender-specific contacts, although statistical significance was not established. The epidemic of DENV infection typically emerges in the post-monsoon season, aligning with studies conducted in both Pakistan and neighboring India (Afreen*et al*., 2014). Our study successfully serotyped 38% of the subjects, a lower percentage compared to the 2013 study in Lahore (82%). Serotype 2 dominated the current epidemic, accounting for 57% of infections, while serotype 3 had a 16% infection (Mukhtaret al., 2012). Concurrent infections with both serotypes 2 and 3 were found in 27% of subjects, differing from studies reporting all four serotypes. (Messer, 2003)

This study utilized extensive nested PCR and sequencing analysis, revealing that serotype 2 was the primary cause of the current epidemic, with serotype 3 present at a lower rate. The spread of serotype 2 raises concerns due to its higher contagiousness and the 38 increased risk of severe outcomes like Dengue Hemorrhagic Fever (DHF) or Dengue Shock Syndrome (DSS) in individuals previously infected with a different serotype. This phenomenon, known as antigenic sin, may pose significant challenges if the next year's outbreak is caused by a different dengue serotype (Halstead et al., 2005)

CONCLUSION

It is concluded that Khyber Pakhtunkhwa province of Pakistan is highly epidemic for dengue infection and male patients are more susceptible to infection as compare to female patients. Moreover, young age people were more affected compared to old age people. Our study strongly recommended that an awareness program, educative efforts and prevention this deadly infection up to some extent. A local surveillance and disease notification program is necessary to accurately ascertain the number of patients with suspected dengue hemorrhagic fever (DHF) across various hospitals in the city. The health department should respond promptly and develop a systematic approach to prevention and control. A coordinated surveillance system and an effective disease prevention program should be implemented, focusing on vector control through chemical or environmental measures, in conjunction with comprehensive community education to encourage individuals to seek medical assistance promptly. Additionally, it is essential to enhance the knowledge of family physicians and general practitioners regarding dengue cases.

REFERENCES

1. Guzman MG, Harris E. Dengue. Lancet. 2015;385(9966):453–465. https://doi.org/10.1016/S0140-6736(14)60572-9
2. Messer WB, Gubler DJ, Harris E, Sivananthan K, de Silva AM. Emergence and global spread of a dengue serotype 3, subtype III virus. Emerg Infect Dis. 2003;9(7):800–809. https://doi.org/10.3201/eid0907.030089
3. Simmons CP, Farrar JJ, Nguyen VV, Wills B. Dengue. N Engl J Med. 2012;366(15):1423–1432. https://doi.org/10.1056/NEJMra1110265
4. World Health Organization. Dengue and severe dengue: Key facts. Geneva: WHO; 2023. https://www.who.int/news-room/fact-sheets/detail/dengue-and-severe-dengue
5. Bhatt S, Gething PW, Brady OJ, Messina JP, Farlow AW, Moyes CL, et al. The global distribution and burden of dengue. Nature. 2013;496(7446):504–507. https://doi.org/10.1038/nature12060
6. Khan IA, Abbas F. Managing dengue outbreak in Lahore, Pakistan: efficacy of government response and lessons for the future. J Health Manag. 2014;16(4):471–480. https://journals.sagepub.com/doi/abs/10.1177/0972063414550862
7. Ali A, Rehman HU, Nisar M, Rafique S, Ali S, Hussain A, et al. Seroepidemiology of dengue fever in Khyber Pakhtunkhwa, Pakistan. Int J Infect Dis. 2013;17(7):e518–e523. https://doi.org/10.1016/j.ijid.2013.02.011
8. Ali A, Fatima Z, Wahid B, Rafique S, Jamal M, Idrees M. Cosmopolitan A1 lineage of dengue virus serotype 2 is circulating in Pakistan. J Med Virol. 2019;91(11):1909–1917. https://doi.org/10.1002/jmv.25553
9. Shepard DS, Undurraga EA, Halasa YA, Stanaway JD. The global economic burden of dengue: a systematic analysis. Lancet Infect Dis. 2016;16(8):935–941. https://doi.org/10.1016/S1473-3099(16)00146-8
10. Pakistan Bureau of Statistics. Provincial Census Report: Khyber Pakhtunkhwa. Government of Pakistan; 2017. https://www.pbs.gov.pk/sites/default/files//tables/Population/KP.pdf
11. Rasheed SB, Butlin RK, Boots M. A review of dengue as an emerging disease in Pakistan. Public Health. 2013;127(1):11–17. https://doi.org/10.1016/j.puhe.2012.09.006
12. Haider A, Yousafzai MT, Qasim M, Khan MA, Zafar H, Samiullah M. Dengue fever in Pakistan: a paradigm shift; an update and review. J Infect DevCtries. 2015;9(6):576–585. https://doi.org/10.3855/jidc.6833
13. Mukhtar F, Salim M, Farooq A. Outbreak of dengue fever in Lahore: study of risk factors. J Ayub Med Coll Abbottabad. 2012;24(2):99–101. https://jamc.ayubmed.edu.pk/index.php/jamc/article/view/2282
14. Anderson KB, Chunsuttiwat S, Nisalak A, Mamee P, Libetthom S, Sa-ngasang A, et al. Burden of symptomatic dengue infection in children at primary school in Thailand: a prospective study. Lancet. 2007;369(9571):1452–1459. https://doi.org/10.1016/S0140-6736(07)60709-6
15. Sangkawibha N, Rojanasuphot S, Ahandrik S, Viriyapongse S, Jatanasen S, Salitul V, et al. Risk factors in dengue shock syndrome: a prospective epidemiologic study in Rayong, Thailand. Am J Epidemiol. 1984;120(5):653–669. https://pubmed.ncbi.nlm.nih.gov/6496444/
16. Suaya JA, Shepard DS, Siqueira JB Jr, Martelli CMT, Lum LCS, Tan LH, et al. Cost of dengue cases in eight countries in the Americas and Asia: a prospective study. Am J Trop Med Hyg. 2009;80(5):846–855. https://doi.org/10.4269/ajtmh.2009.09-0268
17. Afreen N, Deeba F, Naqvi I, Shareef M, Ahmed A, Broor S, et al. Molecular investigation of 2013 dengue fever outbreak from Delhi, India. PLoS Currents. 2014;6. https://pubmed.ncbi.nlm.nih.gov/25642369/
18. Halstead SB, Heinz FX, Barrett ADT, Roehrig JT. Dengue virus: molecular basis of cell entry and pathogenesis, 25–27 June 2003, Vienna, Austria. Vaccine. 2005;23(7):849–856. https://doi.org/10.1016/j.vaccine.2004.08.092