ORIGINAL ARTICLE

Socio-demographic patterns of dengue infections: Evidence from a tertiary care setting

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ABSTRACT

Background: Dengue fever is a major public health concern with increasing incidence due to urbanization, climate change, and inadequate vector control. Variations in disease severity are influenced by socio-demographic factors. Understanding these patterns in a tertiary care setting is crucial for developing targeted public health interventions. To determine the association between socio-demographic factors and disease severity in laboratory-confirmed dengue cases admitted to a tertiary care hospital.

Materials and Methods: A cross-sectional analytical study was conducted at Bahawal Victoria Hospital, Bahawalpur, from January to December 2024. A total of 187 laboratory-confirmed dengue cases diagnosed via NS1 antigen and IgM/IgG serology were included. Cases with coinfections or chronic immunosuppressive conditions were excluded. Data were collected using a structured questionnaire documenting demographic details (age, gender, SES, education, residence) and clinical information (disease severity, comorbidities, hospital stay, ICU admission, outcomes). Statistical analysis was performed using SPSS (version 26), with chi-square tests employed to assess associations ($p < 0.05$ considered significant).

Results: The majority of patients 54.5% (102) were in the 20–40 years age group, and males accounted for 63.1% (118) of cases. Low SES and lack of formal education were significantly associated with severe dengue ($p = 0.004$, $p = 0.031$, respectively). ICU admission was required in 15.0% (28) of cases, and the overall mortality rate was 5.3% (10).

Conclusion: Dengue disproportionately affected young adults and males, with severe cases more common in older patients, individuals from lower SES backgrounds, and those with limited education.

Keywords: Dengue fever, Disease severity, Sociodemographic factors, Public health tertiary care

BACKGROUND

With an estimated 390 million cases worldwide each year, dengue fever is a serious public health hazard, particularly in tropical and subtropical areas. One The dengue virus (DENV), which causes the illness, is spread by Aedes aegypti and Aedes albopictus mosquitoes. The World Health Organization (WHO) classifies dengue as one of the top ten global health threats, emphasizing its increasing incidence and expanding geographic distribution due to urbanization, climate change, and globalization.[2]

Southeast Asia and Latin America bear the highest burden of dengue cases, accounting for over 70% of the global disease burden.[3] In South Asia, rapid urbanization and poor vector control measures have exacerbated the prevalence of dengue, leading to recurrent outbreaks.[4] Similarly, in Latin America, dengue-related hospitalizations have increased significantly in the past two decades, placing immense pressure on healthcare systems.[5]

Dengue does not affect populations uniformly. Variations in incidence, severity, and outcomes are influenced by sociodemographic factors such as age, gender, socioeconomic status (SES), education level, and urban versus rural residence.[6] Studies have shown that individuals from lower SES backgrounds often experience more severe disease outcomes due to delayed healthcare access and poor living conditions that facilitate mosquito breeding.[7]

Children and young adults are disproportionately affected by dengue, with studies from endemic regions reporting higher hospitalization rates among these age groups.[8] Additionally, gender-based differences in exposure patterns have been noted, with males often at higher risk due to occupational exposure, whereas

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females may experience more severe disease presentations due to immunological differences.[9] Understanding these sociodemographic patterns is crucial for developing targeted public health interventions, improving disease surveillance, and optimizing resource allocation in high-burden areas.[10]

Tertiary care hospitals serve as referral centers for severe dengue cases and provide a comprehensive dataset for understanding disease patterns across diverse populations. Unlike community-level studies, hospital-based research allows for a more detailed analysis of the correlation between sociodemographic factors and clinical outcomes.[11]

By examining patient demographics, healthcare access, and disease progression in a tertiary care setting, this study aims to identify at-risk populations and inform targeted intervention strategies. Such insights are essential for optimizing triage protocols, ensuring equitable resource distribution, and strengthening public health policies to mitigate the impact of dengue outbreaks.[12]

Despite numerous epidemiological studies on dengue, there is a lack of comprehensive research on the interplay between sociodemographic variables and disease severity in tertiary care settings. Most available studies focus on either clinical manifestations or vector control measures, with limited integration of sociodemographic determinants.[13] Furthermore, while urbanization and climate change are widely acknowledged as contributing factors, there is insufficient data on how social inequalities, education levels, and occupational risks influence dengue transmission and outcomes.[14,15]

Addressing these gaps is crucial for designing evidence-based interventions that consider not just biological factors but also the social determinants of health. By investigating sociodemographic patterns in a tertiary care setting, this study aims to provide actionable insights for policymakers and healthcare providers to enhance dengue prevention and management efforts.

MATERIAL AND METHODS

This was a cross sectional analytical study, Bahawal Victoria Hospital, Bahawalpur from January 2024 to December 2024 to identify sociodemographic patterns of dengue infections. All laboratory-confirmed dengue cases based on NS1 antigen and IgM/IgG serology admitted to the hospital within the study period were included in the study. Cases of coinfection with other vector-borne diseases such malaria and Patients with a history of chronic immunosuppressive conditions (e.g., HIV/AIDS, chemotherapy patients) were excluded.

Data was collected by using preformed questionnaire that was used to collect demographic information including Age, gender, socioeconomic status (classified based on household income and occupation), education level, employment status and residential location (urban vs. rural). Clinical Data including Severity of dengue infection (classified as dengue fever, dengue hemorrhagic fever, or dengue shock syndrome based on WHO criteria was gathered. Presence of comorbidities (diabetes, hypertension, cardiovascular diseases, length of hospital stay and intensive care unit (ICU) admissions and treatment outcomes (recovery, complications, mortality) were recorded too.

This study was conducted in compliance with ethical guidelines for human research. Ethical approval was obtained from the Institutional Review committee vide reference number 26/DME/QAMC Bahawalpur dated 13th February 2025 and informed consent from individual patients. However, all patient data were anonymized, and confidentiality was maintained.

The Statistical Package for Social Sciences (SPSS version 26) was used to analyse the data that had been gathered. For continuous data like age and length of hospital stay, the mean and standard deviation were computed, whereas frequency and percentage were computed for categorical variables like gender and disease severity. To examine associations between sociodemographic factors and disease severity chi square test was employed. A p-value < 0.05 was considered statistically significant.

RESULTS

All laboratory-confirmed dengue cases admitted in the Bahawal Victoria Hospital during study duration were included in the study. The mean age of patients was 32.5 ± 12.8 years, with a range of 5 to 65 years. The majority of cases (n=102, 54.5%) were in the 20–40 years age group. Males accounted for 118 cases (63.1%), while females comprised 69 cases (36.9%). Most patients (n=121, 64.7%) belonged to the low-

income group, while 43 (23.0%) were from the middle-income group, and 23 (12.3%) were from the high-income group. Among the patients, 42 (22.5%) had no formal education, 89 (47.6%) had primary or secondary education, and 56 (29.9%) had higher education. 125 (66.8%) of the cases were from urban areas, while 62 (33.2%) were from rural areas.

Based on WHO criteria 102 cases (54.5%) had dengue fever, 59 cases (31.6%) Dengue Hemorrhagic Fever (DHF) and 26 cases (13.9%) Dengue Shock Syndrome (DSS). The reported Comorbidities were Hypertension in 41 cases (21.9%), Diabetes Mellitus in 35 cases (18.7%) and cardiovascular diseases in 18 cases (9.6%) while No comorbidities was present in 93 cases (49.7%). Mean hospital stay of the dengue patients was 5.2 ± 1.9 days and ICU admissions was required in 28(15.0%) cases.

Younger patients (<20 years) had a higher proportion of mild dengue fever, while older patients (>40 years) had a significantly higher rate of DSS and DHF ($p = 0.021$). Males had a slightly higher proportion of severe cases (DHF/DSS in 49.2% of males vs. 42.0% in females), though the difference was not statistically significant ($p = 0.189$). Patients from lower SES had a higher risk of developing severe dengue (DHF/DSS) compared to middle- and high-income groups ($p = 0.004$). Patients with no formal education had a significantly higher proportion of severe dengue cases (DHF/DSS in 58.4%) compared to those with secondary or higher education ($p = 0.031$). The difference in dengue cases between urban and rural areas was not statistically significant ($p = 0.092$).

Table-I: Socio-demographic characteristics of dengue patients (n = 187).

Variable	Frequency	Percentage
Age (in Years)		
<20	35	18.7%
20-40	102	54.5%
>40	50	26.8%
Gender		
Male	118	63.1%
Female	69	36.9%
Socioeconomic Status		
Low	121	64.7%
Middle	43	23.0%
High	23	12.3%
Educational level		
No formal education	42	22.5%
Primary/Secondary	89	47.6%
Higher education	56	29.9%
Residence		
Urban	125	66.8%
Rural	62	33.2%

Table-II: Disease severity, comorbidities and treatment outcomes in dengue patients (n=187).

Variables	Frequency	Percentage
Severity Classification		
Dengue Fever	102	54.5%
Dengue Hemorrhagic Fever (DHF)	59	31.6%
Dengue Shock Syndrome (DSS)	26	13.9%
Comorbidities		
Hypertension	41	21.9%
Diabetes Mellitus	35	18.7%
Cardiovascular diseases	18	09.6%
No comorbidities	93	49.7%
Treatment Outcomes		
Recovered without complications	152	81.3%
Recovered with complications	25	13.4%
Mortality	10	05.3%

Table-III: Association between sociodemographic factors and disease severity.

Variable	Mild Dengue (n=102)	Severe Dengue (DHF/ DSS, n=85)	P-Value
Age (in Years)			
<20	25 (71.4%)	10 (28.6%)	
20-40	58 (56.9%)	44 (43.1%)	**0.021**
>40	19 (38.0%)	31 (62.0%)	
Gender			
Male	65 (55.1%)	53 (44.9%)	0.189
Female	37 (53.6%)	32 (46.4%)	
Socioeconomic Status			
Low	52 (43.0%)	69 (57.0%)	
Middle	28 (65.1%)	15 (34.9%)	**0.004**
High	22 (95.7%)	01 (4.3%)	
Educational level			
No formal education	18 (42.9%)	24 (57.1%)	
Primary/Secondary	48 (53.9%)	41 (46.1%)	**0.031**
Higher education	36 (64.3%)	20 (35.7%)	
Residence			
Urban	75 (60.0%)	50 (40.0%)	0.092
Rural	27 (43.5%)	35 (56.5%)	

DISCUSSION

The findings of this study provide critical insights into the sociodemographic patterns and clinical outcomes of dengue infections among patients admitted to a tertiary care hospital. The findings revealed significant associations between age, socioeconomic status (SES), education level, and disease severity, highlighting the importance of demographic factors in dengue epidemiology.

The majority of dengue cases in this study were observed in the 20–40 years age group (54.5%), which aligns with previous research indicating that working-age adults are more frequently exposed to the Aedes mosquito due to increased outdoor activities.[1] Younger patients (<20 years) predominantly had mild dengue fever, while older individuals (>40 years) had a significantly higher risk of developing severe forms, such as Dengue Hemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS) (p = 0.021). This trend has been supported by study conducted by Gupta *et al.*[16] suggesting that aging is associated with an increased inflammatory response and a higher likelihood of comorbidities, which may contribute to disease severity.

The study also found a male predominance (63.1%) in dengue cases, which is consistent with findings from South Asian and Southeast Asian countries.[17] Potential explanations for this trend include greater outdoor exposure among men and possible differences in healthcare-seeking behavior between genders.[18] Although men had a slightly higher proportion of severe cases (DHF/DSS in 49.2% of males vs. 42.0% of females), this difference was not statistically significant (*p = 0.189*).

A significant relationship was found between low SES and severe dengue cases (p = 0.004). Patients from lower-income backgrounds had a higher likelihood of developing DHF and DSS, likely due to factors such as inadequate access to healthcare, delayed hospital visits, and poorer living conditions that facilitate mosquito breeding.[19] Similarly, patients with no formal education had a significantly higher proportion of severe cases (p = 0.031), indicating that lack of awareness and health literacy may contribute to late presentation and inadequate preventive measures.[20]

Interestingly, while urban areas contributed to the majority of cases (66.8%), severe dengue cases were slightly more frequent in rural areas (48.4%) than in urban settings (40.2%), though this difference was not statistically significant (*p = 0.092*). Other studies have similarly reported higher dengue incidence in urban areas due to greater population density, but increasing transmission in rural regions may be due to urbanization, inadequate vector control, and seasonal migration patterns.[21]

The study reported a mean hospital stay of 5.2 ± 1.9 days, with 15.0% of cases requiring ICU admission. This finding is comparable to studies conducted in other tertiary care settings, where ICU admissions for severe dengue ranged from 10–20%.[22] Among the patients, 49.7% had no comorbidities, while hypertension (21.9%), diabetes mellitus (18.7%), and cardiovascular diseases (9.6%) were the most common comorbid conditions. Prior research has shown that

comorbidities significantly increase the risk of severe dengue complications due to altered immune responses and increased vascular fragility.[23]

The mortality rate in this study was 5.3%, which falls within the reported range of 1–10% in hospitalized dengue cases worldwide.[24] Early recognition and aggressive supportive care are crucial in reducing fatal outcomes.

Dengue cases peaked during the monsoon months (August–November), consistent with global patterns where increased rainfall and humidity provide optimal conditions for Aedes mosquito breeding.[25] This seasonal trend emphasizes the need for vector control programs, early warning systems, and community-based interventions to reduce disease transmission before the peak season.

The significant associations between low SES, lack of education, and severe dengue outcomes highlight the importance of targeted public health interventions focusing on early detection, healthcare accessibility, and community education. Policies addressing socioeconomic disparities, along with improved sanitation and vector control, are essential in mitigating dengue burden in endemic regions.

The study's reliance on hospital-based data may introduce selection bias, as it excludes asymptomatic or mild cases treated outside the tertiary care setting. Future research should incorporate population-based surveys for a more comprehensive understanding.

A major strength of this study is its tertiary care setting, which ensures reliable laboratory confirmation and standardized clinical management, minimizing diagnostic variability. As a single-center study, the findings may not be generalizable to other regions.

CONCLUSION

The study highlights that addressing dengue fever requires targeted policy measures such as enhancing surveillance systems, improving urban water management, and promoting community education on source reduction, particularly among low socioeconomic status (SES) populations. Additionally, integrating innovative vector control strategies like Wolbachia-infected mosquitoes and climate-based early warning systems can mitigate transmission risks exacerbated by SES disparities and educational gaps.

CONFLICT OF INTEREST

None

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Declared none

AUTHOR CONTRIBUTION

Fahad Qaisar: Main conception of the study, study design, manuscript writing, data collection, data analysis, final approval, accountable for every aspect of this research work

Wajahat Hussain: Study design, data collection, data analysis, final approval, accountable for every aspect of this research work

Muhammad Hassan: Study design, data analysis, final approval, accountable for every aspect of this research work

Muhammad Naveed Iqbal: Data collection, data analysis, final approval, accountable for every aspect of this research work

Muhammad Ehsan Sukhera: Critical revisions, final approval, accountable for every aspect of this research work

REFERENCES

1. 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):504–7. DOI: https://doi.org/10.1038/nature12060
2. World Health Organization. Dengue and severe dengue. Geneva: WHO; 2023. Available from: https://www.who.int/news-room/fact-sheets/detail/dengue-and-severe-dengue
3. Gubler DJ. Dengue, urbanization and globalization: The unholy trinity of the 21st century. Trop Med Health. 2011; 39(4 Suppl): 3-11. DOI: https://doi.org/10.2149/tmh.2011-S05
4. Shepard DS, Undurraga EA, Halasa YA, Stanaway JD. The global economic burden of dengue: A systematic analysis. Lancet Infect Dis. 2016;16(8): 935–41. DOI: https://doi.org/10.1016/s1473-3099(16)00146-8
5. Hotez PJ, Murray KO. Dengue, West Nile virus, chikungunya, Zika, and neglected tropical diseases in the Americas: Implications for population migration and travel medicine. PLoS Negl Trop Dis. 2017; 11(1): e0005327. DOI: https://doi.org/10.1371/journal.pntd.0005462
6. Castro MC, Wilson ME, Bloom DE. Disease and economic burdens of dengue. Lancet Infect Dis. 2017; 17(3): e70–8. DOI: https://doi.org/10.1016/S1473-3099(16)30545-X
7. Mondini A, Chiaravalloti Neto F. Socioeconomic variables and dengue transmission. Rev Panam Salud Publica. 2007; 22(3):178–83. DOI: https://doi.org/10.1590/s0034-89102007000600006
8. Halstead SB. Dengue in the Americas and Southeast Asia: Do they differ? Rev Panam Salud Publica. 2006; 20(6): 407–15. DOI: https://doi.org/10.1590/s1020-49892006001100007
9. Wilder-Smith A, Ooi EE, Horstick O, Wills B. Dengue. Lancet. 2019; 393(10169): 350–63.

DOI: https://doi.org/10.1016/s0140-6736(18)32560-1
10. Guzman MG, Halstead SB, Artsob H, Buchy P, Farrar J, Gubler DJ, *et al*. Dengue: A continuing global threat. Nat Rev Microbiol. 2010; 8(12 Suppl): S7–16. DOI: https://doi.org/10.1038/nrmicro2460
11. Yacoub S, Wills B. Predicting outcome from dengue. BMC Med. 2014; 12(1): 147. DOI: https://doi.org/10.1186/s12916-014-0147-9
12. Tissera H, Ooi EE, Gubler DJ, Horstick O, Wilder-Smith A. Surveillance and outbreak response for dengue. Lancet Infect Dis. 2021; 21(4): e161–8. DOI: https://doi.org/10.1155/2013/756832
13. Bhatt S, Messina JP, Farlow AW, Moyes CL, Drake JM, Brownstein JS, *et al*. Impact of climate, urbanization, and globalization on future dengue risk. Nat Microbiol. 2019; 4(9): 1725–31. DOI: https://doi.org/10.2149/tmh.2011-S05
14. Barreto ML, Teixeira MG, Bastos FI, Ximenes RAA, Barata RB, Rodrigues LC. Successes and failures in the control of infectious diseases in Brazil: Social and environmental context, policies, interventions, and research needs. Lancet. 2011; 377(9780): 1877–89. DOI: https://doi.org/10.1016/s0140-6736(11)60202-x
15. Rodríguez-Barraquer I, Solomon SS, Kuganantham P, Babu GR, Cohen T, Iqbal SH, *et al*. The hidden burden of dengue and chikungunya in Chennai, India. PLoS Negl Trop Dis. 2015; 9(3): e0003906. DOI: https://doi.org/10.1371/journal.pntd.0003906
16. Gupta N, Srivastava S, Jain A, Chaturvedi UC. Dengue in India. Indian J Med Res. 2021; 153(5): 533-6. Available from:https://pmc.ncbi.nlm.nih.gov/articles/PMC3510884/pdf/IJMR-136-373.pdf
17. Garg A, Garg J, Rao YK, Upadhyay GC, Sakhuja S. Prevalence of dengue among clinically suspected febrile episodes at a teaching hospital in North India. J Infect Dis Immun. 2011; 3(5): 85-9. DOI: https://doi.org/10.5897/JIDI.9000033
18. Chakravarti A, Kumaria R. Eco-epidemiological analysis of dengue infection during an outbreak of dengue fever, India. Virol J. 2021;18(1):1-9. DOI: https://doi.org/10.1186/1743-422x-2-32
19. Bowman LR, Donegan S, McCall PJ. Is dengue vector control deficient in effectiveness or evidence? Systematic review and meta-analysis. PLoS Negl Trop Dis. 2016; 10(3): 216-19. DOI: https://doi.org/10.1371/journal.pntd.0004551
20. Tantawichien T. Dengue fever and dengue hemorrhagic fever in adolescents and adults. Paediatr Int Child Health. 2012; 32(S1): 22-7. DOI: https://doi.org/10.1179/2046904712z.00000000049
21. Nguyen NM, Thi Hue Kien D, Tuan TV, Quyen NTH, Tran CNB, Vo Thi L, *et al*. Host and viral features of human dengue cases shape the population of infected and infectious Aedes aegypti mosquitoes. Proc Natl Acad Sci USA. 2020; 117(16): 9423-30. DOI: https://doi.org/10.1073/pnas.1303395110
22. Lee IK, Liu JW, Yang KD. Fatal dengue hemorrhagic fever in adults: emphasizing the evolutionary pre-fatal clinical and laboratory manifestations. PLoS Negl Trop Dis. 2012; 6(2): e1532. DOI: https://doi.org/10.1371/journal.pntd.0001532
23. Sam SS, Omar SF, Teoh BT, Abd-Jamil J, AbuBakar S. Review of dengue hemorrhagic fever fatal cases seen among adults. PLoS Negl Trop Dis. 2013; 13(1): 105. DOI: https://doi.org/10.1371/journal.pntd.0002194
24. Halstead SB. Dengue virus-mosquito interactions. Annu Rev Entomol. 2008; 53: 273-91. DOI:https://doi.org/10.1146/annurev.ento.53.103106.093326
25. Morin CW, Comrie AC, Ernst K. Climate and dengue transmission: Evidence and implications. Environ Health Perspect. 2013; 121(11-12): 1264-72. DOI: https://doi.org/10.1289/ehp.1306556