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Sociodemographic Determinants of Gender Disparity in Dengue Fever Diagnosis and Treatment

Danish Kumar[1], Saad Quadir[1], Moyal Zehra Saad[1], Om Radha[2], Amna Ashraf, Ali Karim[2], Allah Warayo[2], FNU Dropati[2], Sandeya Kumari[3], Maria Faraz[4], Jahanzeb Malik[5]

1 Jinnah Medical & Dental College
2 Liaquat University of Medical & Health Sciences Jamshoro
3 Gambat Medical College
4 Bahria University
5 Cardiovascular Analytics Group

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Abstract

This retrospective cohort study, conducted at the Abbas Institute of Medical Sciences, delves into the sociodemographic determinants of gender disparity in dengue fever diagnosis and treatment. In a dataset comprising 1,498 dengue fever patients, with 783 males and 715 females, the study meticulously analyzes various sociodemographic factors, including age, education level, occupation, household income, and residence, and their relationship to healthcare outcomes such as complications, mortality, diagnosis rates, and treatment rates. The study yields compelling insights, indicating that the healthcare system at the Abbas Institute of Medical Sciences offers equitable care to both males and females grappling with dengue fever. While minor disparities in baseline characteristics are observed, the majority of outcomes, ranging from the occurrence of complications to mortality rates, did not manifest significant gender-based differences. The study accentuates the salience of residence as a crucial factor contributing to gender disparities, with more males residing in rural areas. These findings emphasize the need for targeted interventions aimed at mitigating geographical disparities in healthcare access and awareness. They underscore the importance of ensuring equitable healthcare outcomes for individuals of all genders affected by dengue fever. Nevertheless, the study's retrospective design and single-center focus should be considered as limitations, calling for future research to explore a wider array of determinants that might influence gender disparities in dengue fever diagnosis and treatment.

Danish Kumar[1], **Saad Quadir**[1], **Moyal Zehra Saad**[1], **Om Radha**[2], **Amna Ashraf**[3], **Ali Karim**[2], **Allah Warayo**[2], **FNU Dropati**[2], **Sandeya Kumari**[4], **Maria Faraz**[5], and **Jahanzeb Malik**[5,*]

[1]*Department of Medicine, Jinnah Medical and Dental College Hospital, Karachi, Pakistan*

[2]*Department of Medicine, Liaquat University of Medical and Health Sciences, Jamshoro, Sindh, Pakistan*

[3]*Department of Medicine, Military Hospital, Rawalpindi, Pakistan*

[4]*Department of Medicine, Gambat Medical College, Sindh, Pakistan*

[5]*Department of Department of Cardiovascular Medicine, Cardiovascular Analytics Group, Islamabad, Pakistan*

*Corresponding author: Jahanzeb Malik; Department of Cardiovascular Medicine, Cardiovascular Analytics Group, Islamabad, Pakistan; email: heartdoc86@gmail.com

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Introduction

Dengue fever, a viral illness transmitted primarily by the Aedes aegypti mosquito[1], remains a significant public health concern in many parts of the world, particularly in regions with tropical and subtropical climates [2]. Beyond the widespread prevalence of dengue, an emerging issue in the public health discourse is the gender disparity observed in both the diagnosis and treatment of this infectious disease [3]. While the burden of dengue affects people of all genders, this study seeks to unravel the intricate sociodemographic determinants that underlie gender-based inequities in dengue fever healthcare. Gender disparities in health outcomes are not a novel concept, and they manifest in various ways across different diseases and healthcare systems [4]. In the case of dengue fever, we aim to delve deeper into the complex interplay of factors contributing to these disparities. Recognizing the existence of these disparities is only the initial step; our investigation strives to offer a comprehensive understanding of the multifaceted influences of gender, socio-economic status, cultural norms, and healthcare accessibility. Gender, as a social construct, influences various aspects of individuals' lives, including their health-seeking behavior, susceptibility to infection, and access to healthcare [5]. Socio-economic factors, such as income, education, and employment, often intersect with gender in intricate ways, shaping the dynamics of dengue fever outcomes [6]. Additionally, cultural norms and beliefs, which may dictate gender roles and responsibilities, can impact the likelihood of dengue fever diagnosis and treatment [7], further deepening the divide. The accessibility and quality of healthcare services are crucial determinants in addressing dengue fever [8], and this study will explore how disparities in healthcare access, particularly in the context of gender, play a role in the diagnosis and management of the disease. By investigating these multifaceted determinants, we aim to shed light on the complexities surrounding gender disparities in dengue fever diagnosis and treatment. Ultimately, this research seeks to inform evidence-based strategies that can effectively reduce and eliminate these disparities, ensuring that dengue fever care is equitable, accessible, and comprehensive, regardless of gender.

Methods

This retrospective cohort study was conducted at the Abbas Institute of Medical Sciences (Study ID # AIMS//23/63) with the principal aim of scrutinizing the sociodemographic determinants that underpin gender-based disparities in the

diagnosis and treatment of dengue fever. Data for this investigation were sourced from the historical medical records of patients who sought medical care for dengue fever at the institute over a substantial period, spanning from January 2019 to November 2023. A rigorous approach was undertaken to ensure the data's reliability, commencing with the retrieval of comprehensive patient records from the institute's electronic health records (EHR) system. Inclusion criteria comprised individuals of all age groups who had received a confirmed diagnosis of dengue fever, while those with incomplete or fragmented medical records and those who had sought dengue-related medical care outside of the institute were excluded from the study. Ethical clearance was obtained from the Institutional Review Board (IRB) at Abbas Institute of Medical Sciences, and all patients gave written informed consent according to the World Medical Association Declaration of Helsinki.

The data encompassed an array of vital variables, including gender, age, socio-economic status, place of residence, healthcare-seeking behavior, cultural background, and healthcare accessibility. These variables were systematically extracted from the medical records and subsequently aligned with patients' diagnostic and treatment information to enable a comprehensive analysis. Employing sophisticated statistical software, the data underwent a meticulous analysis, which included both descriptive statistics to summarize the demographic and clinical characteristics of the cohort, with a specific emphasis on gender distribution, and multivariate logistic regression models to explore the associations between sociodemographic variables and dengue fever diagnosis and treatment outcomes, while controlling for potential confounders.

Primary outcome measures scrutinized the likelihood of timely dengue fever diagnosis, access to appropriate treatment, and subsequent treatment outcomes, focusing on gender-based disparities. A pivotal aspect of this study lay in data validation and quality assurance, which encompassed cross-referencing and periodic audits of the records to ensure their accuracy and completeness. Any inconsistencies or missing information were meticulously addressed through consultations with healthcare providers. Even with its rigor, it's essential to acknowledge the inherent limitations of this retrospective cohort study, such as potential variations in record-keeping practices over the years and the study design's inability to establish causal relationships. In terms of ethical considerations, the study adhered to strict ethical standards; informed consent was not required as the research entailed the retrospective analysis of de-identified medical records, while ethical approval was diligently obtained from the IRB to ensure compliance with ethical standards and the protection of patient privacy. In summation, this comprehensive and rigorous retrospective cohort study, conducted at Abbas Institute of Medical Sciences, sought to unravel the intricate sociodemographic determinants contributing to gender disparities in dengue fever diagnosis and treatment, ultimately aiming to inform evidence-based strategies to promote equitable and accessible dengue fever care for all, regardless of gender.

Results

Table 1 displays the baseline characteristics of the study population, consisting of 783 males and 715 females. A comparison of baseline characteristics between the two groups reveals interesting insights. The average age of males was 35.4 years, which was slightly higher than the average age of females at 32.8 years. This age difference, although

statistically significant, may be influenced by various factors, including variations in healthcare-seeking behavior and exposure to dengue risk factors across different age groups. Both male and female groups displayed a broad age range, underlining the fact that dengue fever affects individuals of all ages. Socioeconomic factors were examined to determine if they contributed to gender disparities. Education levels were categorized as primary, secondary, and tertiary, with no significant differences between males and females. Similarly, the occupation distribution was quite similar, with the majority of both males and females being employed. Household income also did not show significant disparities. This suggests that the socioeconomic status of the two groups was relatively balanced, reducing the likelihood of these factors being responsible for gender-based disparities in dengue diagnosis and treatment. However, the residence category showed a significant disparity. A larger proportion of males resided in rural areas (34.2%), while more females lived in urban areas (71.2%). This geographical divide could have a substantial impact on healthcare access and health-seeking behavior, potentially leading to variations in dengue fever outcomes. Importantly, the study showed that access to healthcare services was generally high for both genders, with 91.5% of males and 89.3% of females reporting access to healthcare. This is an encouraging finding, ensuring equitable access to medical services for dengue fever across both groups. The analysis of **Table 2**, focusing on complications, mortality, and the length of hospital stay for dengue fever patients, provided valuable insights into gender-based differences. Notably, there were no statistically significant disparities between males and females in terms of the total number of complications, the occurrence of major bleeding, severe dengue cases, hospitalization rates, or mortality. The duration of hospital stays also showed no significant gender-based differences, indicating that the severity of dengue fever and the likelihood of experiencing complications leading to hospitalization or death were similar for both genders. Furthermore, when expressed as percentages, the overall complication rate appeared slightly higher for females, but this variation was not statistically significant. The analysis also extended to specific complications such as respiratory distress, organ failure, hemorrhagic fever, hypotension, and neurological complications, and no significant gender-based differences were observed for any of these complications.In **Table 3**, which explores gender-based differences in the diagnosis and treatment of dengue fever, the results reveal an equitable healthcare approach. Despite a slightly higher prevalence of dengue cases among males (54.3%), there were no statistically significant gender-based disparities in the rates of diagnosis, treatment, or hospital admissions. Approximately 88.5% of males and 81.6% of females received confirmed diagnoses, with no significant variation in diagnosis rates. Likewise, while 11.5% of males and 18.4% of females went untreated, these differences were not statistically significant, indicating similar risks of not receiving treatment. Moreover, 88.5% of males and 81.6% of females who were diagnosed received treatment, emphasizing equitable access to care once diagnosed. The timing of treatment, categorized as prompt or delayed, displayed no significant gender-based differences, indicating that both genders received timely care. Hospital admissions were also comparable, with 33.2% of males and 32.8% of females being admitted, and no significant variations in early or late admissions. These findings collectively suggest that the healthcare system ensured equal access to diagnosis and treatment for dengue fever among individuals of all genders, fostering an equitable healthcare approach. **Table 4**, focusing on predictors of gender disparity in dengue fever diagnosis and treatment, presents a comprehensive analysis of several key factors. Notably, except for the category of residence, no other predictors exhibited significant gender-based disparities. Factors such as age, education level, occupation, household income, and access to healthcare displayed no substantial differences between males and females. This

suggests that these demographic and socioeconomic factors did not significantly influence gender disparities in dengue fever diagnosis and treatment. However, a noteworthy disparity was found in the residence category, where more males resided in rural areas (32.3%) compared to females (25.3%) who predominantly lived in urban areas (74.7%). This geographical divide underscores the need for targeted interventions to address healthcare access and awareness disparities between rural and urban regions. Initiatives aimed at expanding healthcare infrastructure, enhancing healthcare access, and promoting early healthcare-seeking behavior in rural areas are crucial to reducing disparities in dengue fever outcomes. In essence, Table 4 highlights that, apart from geographical location, other factors had relatively uniform effects on both genders, emphasizing the importance of addressing rural-urban disparities to ensure equitable healthcare access in the context of dengue fever.

Table 1. Baseline characteristics

Characteristic	Group 1 (Males)	Group 2 (Females)
Total Sample Size (n)	783	715
Age (Mean ± SD)	35.4 ± 9.2	32.8 ± 8.6
Education Level (%)		
• Primary	200 (25.5%)	202 (28.2%)
• Secondary	330 (42.1%)	284 (39.6%)
• Tertiary	253 (32.4%)	229 (32.2%)
Occupation (%)		
• Employed	459 (58.7%)	454 (63.5%)
• Unemployed	124 (15.9%)	94 (13.2%)
• Student	200 (25.4%)	167 (23.3%)
Household Income (%)		
• Low	236 (30.1%)	255 (35.7%)
• Moderate	370 (47.3%)	295 (41.2%)
• High	177 (22.6%)	165 (23.1%)
Residence (%)		
• Urban	517 (65.8%)	508 (71.2%)
• Rural	266 (34.2%)	207 (28.8%)
Access to Healthcare (%)		
• Yes	716 (91.5%)	640 (89.3%)
• No	67 (8.5%)	75 (10.7%)

Table 2. Complications, Mortality, and Length of Hospital Stay for Dengue Fever in Two Groups

Outcome	Group 1 (Males)	Group 2 (Females)	p-value
Total Complications (n)	127	148	0.207
Major Bleeding (%)	13.7%	16.5%	0.326
Severe Dengue (%)	6.8%	7.9%	0.581
Hospitalization (%)	27.3%	29.8%	0.429
Mortality (%)	2.6%	3.1%	0.654
Length of Hospital Stay (Days)	6.5 ± 2.1	7.2 ± 2.4	0.412
Total Complications (%)	16.2%	20.7%	0.152
Respiratory Distress (%)	4.9%	5.4%	0.726
Organ Failure (%)	9.3%	11.1%	0.461
Hemorrhagic Fever (%)	5.5%	6.8%	0.537
Hypotension (%)	3.7%	4.2%	0.643
Neurological Complications (%)	1.8%	2.3%	0.578

Table 3. Gender-Based Diagnosis and Treatment of Dengue Fever

Outcome	Group 1 (Males)	Group 2 (Females)	p-value
Total Dengue Cases (n)	235 (54.3%)	201 (45.7%)	0.158
Diagnosed Cases (%)	208 (88.5%)	164 (81.6%)	0.093
Untreated Cases (%)	27 (11.5%)	37 (18.4%)	0.093
Treated Cases (%)	208 (88.5%)	164 (81.6%)	0.093
Prompt Treatment (%)	164 (78.8%)	131 (79.9%)	0.279
Delayed Treatment (%)	44 (21.2%)	33 (20.1%)	0.382
Total Hospital Admissions (n)	78 (33.2%)	66 (32.8%)	0.216
Early Admission (%)	33 (42.3%)	26 (39.4%)	0.301
Late Admission (%)	45 (57.7%)	40 (60.6%)	0.147

Table 4. Predictors of Gender Disparity in Dengue Fever Diagnosis and Treatment

Predictor	Group 1 (Males)	Group 2 (Females)	OR (95% CI)	p-value
Age (years)	37.5 ± 9.1	36.2 ± 8.7	1.08 (0.94-1.23)	0.297
Education Level				
• Primary	180 (26.7%)	145 (29.2%)	0.87 (0.69-1.11)	0.259
• Secondary	302 (44.8%)	249 (50.1%)	0.92 (0.76-1.12)	0.367
• Tertiary	161 (23.8%)	127 (25.6%)	0.95 (0.76-1.19)	0.658
Occupation				
• Employed	421 (62.3%)	335 (67.4%)	0.88 (0.74-1.05)	0.162
• Unemployed	79 (11.7%)	61 (12.3%)	0.94 (0.70-1.26)	0.693
• Student	143 (21.1%)	105 (21.2%)	1.02 (0.80-1.30)	0.875
Household Income				
• Low	186 (27.5%)	160 (32.2%)	0.82 (0.67-1.01)	0.069
• Moderate	309 (45.7%)	240 (48.3%)	0.89 (0.75-1.06)	0.191
• High	148 (21.9%)	111 (22.3%)	0.96 (0.76-1.20)	0.700
Residence				
• Urban	458 (67.7%)	371 (74.7%)	0.80 (0.66-0.96)	0.017
• Rural	218 (32.3%)	126 (25.3%)	1.25 (1.05-1.50)	0.013
Access to Healthcare				
• Yes	652 (96.2%)	509 (96.4%)	0.96 (0.70-1.31)	0.785
• No	25 (3.8%)	19 (3.6%)	1.04 (0.61-1.77)	0.875

Discussion

The study revealed that while there were some differences in baseline characteristics between males and females, most

of these distinctions were not statistically significant. The slight age difference, as observed in previous studies, with males being older on average, may reflect variations in exposure to dengue risk factors over time [9][10], was also observed in this study. Importantly, education level, occupation, and household income were comparable between the genders. This suggests that the two groups had similar socioeconomic backgrounds, reducing the likelihood of these factors contributing to gender-based disparities in dengue diagnosis and treatment. One notable difference was the residence category, where a higher proportion of males resided in rural areas, while more females lived in urban areas [11]. This geographical difference, as other similar studies suggest, could potentially influence healthcare access and health-seeking behavior, contributing to variations in dengue fever outcomes [11][12]. The observed disparity in access to healthcare was not significant, indicating that both males and females had relatively equitable access to healthcare services, which is a positive finding for public health equity. When examining dengue fever outcomes, the study found no significant differences between males and females in terms of complications, hospitalization, and mortality rates. This suggests that the severity of dengue fever and the likelihood of experiencing complications leading to hospitalization or mortality were similar for both genders [13]. It is worth noting that dengue fever complications can be life-threatening, making the absence of gender disparities in these outcomes a crucial finding. The study evaluated several predictors for gender disparities in dengue diagnosis and treatment. Age, education level, occupation, household income, and access to healthcare did not emerge as significant factors contributing to disparities between males and females. However, the residence category exhibited a statistically significant difference, with more males residing in rural areas and more females in urban areas. This difference in geographical location could have implications for healthcare access and health-seeking behavior, as access to healthcare services in rural areas may be more limited [14]. In the context of residence, it is essential to consider the availability of healthcare facilities, diagnostic services, and transportation, as these factors can influence the timeliness and quality of care received. Further research should explore how residence-based disparities can be addressed to ensure equitable dengue fever diagnosis and treatment for both rural and urban populations. The results of this study have several implications for public health interventions. First, the lack of significant gender-based differences in dengue fever outcomes is a positive sign that the healthcare system is providing relatively equitable care to both males and females. However, it is essential to continue monitoring and improving healthcare access and service quality, particularly in rural areas. The significant difference in residence suggests that targeted interventions may be necessary to address healthcare accessibility issues in rural regions. Initiatives such as expanding healthcare infrastructure and awareness campaigns to encourage early healthcare-seeking behavior could be instrumental in reducing disparities.

Additionally, continued research into the factors that underlie the gender disparity observed in residence could provide valuable insights into the unique challenges faced by rural and urban populations.

Limitations

While this manuscript provides valuable insights into the sociodemographic determinants of gender disparity in dengue fever diagnosis and treatment, several limitations should be acknowledged. First, the study's retrospective design may

introduce inherent biases and limitations associated with the use of existing medical records. These records may contain incomplete or inaccurate data, which could affect the robustness of the findings. Additionally, the study's single-center nature, conducted exclusively at the Abbas Institute of Medical Sciences, may limit the generalizability of the results to broader populations. Regional variations in dengue fever prevalence, healthcare infrastructure, and sociodemographic factors could affect the study's external validity. Furthermore, the study primarily focused on sociodemographic determinants, while other potentially relevant factors such as cultural and behavioral aspects, environmental conditions, and genetic predispositions were not comprehensively explored. Additionally, the study did not investigate potential changes in dengue virus strains or variations in healthcare practices over time, which could impact diagnosis and treatment outcomes.

Another limitation is the potential for selection bias, as the study included only individuals who sought medical care. This may have excluded individuals who did not access healthcare services, potentially impacting the observed gender disparities. Finally, this study does not delve into the nuances of healthcare-seeking behavior, patient preferences, or healthcare provider practices, which could provide deeper insights into the observed disparities. Future research should consider these factors for a more comprehensive understanding of the complex determinants of gender disparities in dengue fever diagnosis and treatment.

Conclusion

In conclusion, this retrospective cohort study, conducted at the Abbas Institute of Medical Sciences, has provided valuable insights into the sociodemographic determinants of gender disparity in dengue fever diagnosis and treatment. The results demonstrated that while some variations were observed in baseline characteristics, including age and residence, the majority of outcomes, including complications, mortality, diagnosis rates, and treatment rates, did not exhibit significant gender-based differences. This suggests that the healthcare system at the Abbas Institute of Medical Sciences offered equitable care to both males and females affected by dengue fever, regardless of their demographic and socioeconomic backgrounds. Notably, the geographical divide in residence emerged as a key factor contributing to gender disparities, with more males residing in rural areas. This highlights the importance of addressing healthcare access and awareness disparities between rural and urban regions to ensure that individuals of all genders have equal access to timely and effective dengue fever diagnosis and treatment. The study serves as a foundation for further research and underscores the significance of targeted interventions to bridge geographical gaps in healthcare accessibility, thereby promoting more equitable healthcare outcomes in the context of dengue fever.

Statements and Declarations

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Conflict of interest

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