

Dengue Awareness Among Medical Students Of Public Sector Colleges, Lahore; A Comparative Cross-Sectional Study.

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ABSTRACT

BACKGROUND & OBJECTIVE: Dengue is one of the most rapidly spreading viral disease transmitted by mosquito bite to human. In Pakistan, where dengue outbreaks have been a concern, increasing dengue awareness among medical students is vital. The objective of this study was to assess the current level of awareness about dengue, focusing related knowledge and practices.

METHODOLOGY: This cross-sectional comparative study was conducted among 222 fourth year medical students selected through convenient sampling from six public sector medical colleges of Lahore. All those who were present at the time of data collection and were willing to participate were included but participants with incomplete responses were excluded from study. Data entry and analysis was done using SPSS version 27. A Pearson chi-square test of independence was conducted to evaluate the relationship between gender and dengue awareness scores. An independent-samples t-test was conducted to determine whether overall dengue knowledge scores differed significantly between day scholars and hostelite. A one-way analysis of variance (ANOVA) was conducted to evaluate differences in dengue awareness scores across six medical institutions in Lahore. A p-value of less than 0.05 was considered statistically significant scoring system was developed using all of the 27 questions of our online questionnaire, giving each correct question 1 score and incorrect as 0 score. $\geq 75\%$ score considered as High level of awareness.

RESULTS: Descriptive analysis of the 27-point dengue awareness scale showed almost identical awareness scores among male and female students. The scores in both groups ranged from 13.50 to 27.00, with an interquartile range of 4.50. For residential status, day scholars had a mean awareness score of 21.98 ± 2.81 and Hostelite had a mean score of 21.96 ± 3.26 . No statistically significant association was found between gender and dengue awareness; similarly residential status was not significantly associated with dengue awareness. Although the mean awareness scores varied between institutions, ranging from 20.39 ± 4.01 at Fatima Jinnah Medical University to 23.18 ± 2.41 at Shaikh Khalifa Bin Zayed Medical and Dental College, this difference did not reach statistical significance.

CONCLUSION: This multi-center study demonstrated high baseline dengue awareness among undergraduate medical students across public medical colleges in Lahore. Knowledge levels were uniform across demographic subgroups, showing no statistically significant differences by gender, or residential status. Although the mean awareness scores varied between institutions, this difference did not reach statistical significance. The difference of highest percentage of high level of awareness amongst different institute's emphasis need for more comprehensive sharing of information.

KEY WORDS: Dengue, Students, Medical, Practice, Disease Vectors, Health Education.

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INTRODUCTION

Dengue is one of the most rapidly spreading mosquito-borne viral diseases affecting humans. It remains a persistent global health threat, with an estimated 50–100 million cases of dengue fever and approximately 500,000 cases of dengue haemorrhagic fever occurring annually, resulting in nearly 24,000 deaths. The disease is particularly prevalent in tropical and subtropical regions.¹ Approximately two-fifths of the world's population lives in areas at risk of dengue fever.²

Dengue is endemic in several tropical and

subtropical countries, including Pakistan. A sudden increase in dengue cases was reported in Karachi in 2005. In 2012, approximately 16,580 cases and 257 deaths were reported in Lahore, while around 5,000 cases and 60 deaths occurred in other regions of Pakistan.³

Dengue is caused by the dengue virus, a member of the family Flaviviridae. Four serotypes of the virus have been identified: DENV-1, DENV-2, DENV-3, and DENV-4. The virus is transmitted to humans primarily through the bites of infected *Aedes aegypti* and *Aedes albopictus* mosquitoes. Dengue commonly presents with high-grade fever, severe headache, myalgia, bone pain, retro-orbital pain, skin rash, nausea, vomiting, and thrombocytopenia. Some patients develop dengue haemorrhagic fever, which may manifest as haematuria, gastrointestinal bleeding, gingival bleeding, or epistaxis. If left untreated, severe dengue may progress to dengue shock syndrome and death.⁴

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Previous research has demonstrated inadequate knowledge of dengue among first-year MBBS students.⁵ Similarly, awareness among fourth-year MBBS students at Nishtar Medical University, Multan, was found to be unsatisfactory. Although all respondents reported having heard of dengue fever, only 47.95% correctly identified its causative agent and 39% were aware of appropriate treatment strategies.⁵ In contrast, another study reported good knowledge and positive attitudes among undergraduate students at KIST Medical College and Teaching Hospital. Approximately 98% of participants knew that dengue was preventable, while 96.4% correctly understood its mode of transmission. Nevertheless, important knowledge gaps remained regarding dengue serotypes and mosquito-breeding sites.⁶

Despite adequate knowledge in some areas, students' preventive practices concerning dengue control have generally remained unsatisfactory. However, preventive-practice scores were higher among students who had personally experienced dengue or whose roommates or family members had previously contracted the disease.⁷ A study assessing knowledge, attitudes, and perceptions among university students in interior Sindh found that approximately half of the participants were unable to identify the dengue vector, its physical appearance, breeding sites, or usual biting time.⁸ Another study identified gaps in participants' knowledge regarding mosquito-biting times, the need to avoid aspirin, and the appropriate management of dengue infection.⁹

Despite multiple public-health initiatives to control dengue transmission, considerable deficiencies persist in knowledge, attitudes, and preventive practices, particularly in developing countries such as Pakistan.⁵ These deficiencies are especially concerning among medical students because, as future healthcare professionals, they will have an important role in clinical management, disease prevention, patient education, and community awareness. In Pakistan and other developing countries where dengue and malaria are endemic, clinical diagnosis and treatment may rely heavily on physical examination because of limited access to laboratory facilities.¹⁰

Effective control of *Aedes aegypti*, the principal vector of dengue, depends largely on eliminating mosquito-breeding sites and reducing potential sources of stagnant water. Therefore, adequate knowledge of mosquito breeding habitats is essential among healthcare professionals, teachers, students, children, and the wider community to reduce dengue transmission effectively.¹¹

Although public-health campaigns have made significant efforts to improve dengue awareness and prevention, important gaps in knowledge, attitudes, and preventive practices may persist among medical students in raising awareness about dengue, there is still a lack of clarity on how well this knowledge is being applied in practice. Knowledge, attitudes, and practices (KAP) surveys are essential tools to evaluate the effectiveness of

these campaigns and help design future interventions. The current study is designed to assess the current level of awareness about dengue, focusing related knowledge and practice among 4th-year MBBS students in government medical colleges in Lahore. As future frontline workers in hospitals, these students need a comprehensive understanding of the disease to protect themselves and educate the public. By exploring their awareness, we can identify areas where educational strategies need improvement and develop more effective control programs.

Operational Definitions:

Awareness: knowledge of 4th-year MBBS students regarding various aspects of dengue fever, including its symptoms, transmission routes, prevention methods, and treatment options and practices. This will be measured through a structured questionnaire assessing their understanding of these elements.

Levels of Awareness Based on number of points secured out of total 27 points divided in three categories. Low awareness level <14 points (50% or less), Average awareness level 14-20 points (51%-74%) and High awareness level >20 points (75% and more).¹²

METHODOLOGY

This cross-sectional comparative study was conducted among 222 fourth year medical students of six public sector medical colleges of Lahore after ethical clearance with reference number 00-40-A-2024 dated 6th June, 2024. Data was collected in the month of June 2024 to July 2024 from those who were present at the time of data collection and were willing to participate using Convenient sampling. Students with incomplete responses were excluded from study. Data was gathered using a structured, self-administered questionnaire developed following an extensive literature review and guidelines from the World Health Organization (WHO) and local health authorities. The tool was face-validated by a panel of public health experts, and content validity was confirmed. A pilot study was conducted on 10% of the sample size (excluded from the final analysis) to ensure clarity, yielding a Cronbach's alpha of 0.7. Sample size was estimated by using 95% confidence level, 5% margin of error with $P = \text{proportion}$ 81% using finite population correction (FPC) formula $n = Z^2 \times p(1-p) / d^2 + Z^2 \times p(1-p) / 2 \times N$.² Based on this calculation, the required sample size among a population of 1,400 students was determined to be 203 with 9% no responses, we gathered data from 222 participants. Data analysis was performed using SPSS version 27. Frequencies and percentages were computed for categorical variables. Data were presented in the form of tables. A score of $\geq 75\%$ was used to define high awareness, consistent with.¹² A Pearson chi-square test of significance was conducted to evaluate the relationship between gender and dengue awareness scores. An independent-samples t-test was conducted to determine whether overall dengue knowledge scores differed

significantly between day scholars and hostelite. A one-way analysis of variance (ANOVA) was conducted to evaluate differences in dengue awareness scores across six medical institutions in Lahore. A p-value of less than 0.05 was considered statistically significant., scoring system was developed using all of the 27 questions of our online questionnaire, giving each correct question 1 score and incorrect as 0 score. $\geq 75\%$ score considered as High level of awareness.

RESULTS

A total of 222 participants were included in the study. The gender distribution was equal, with 111 males (50.0%) and 111 females (50.0%). Majority Participants were from Ameer ud din Medical College, Lahore (75 students, 38.8%) (Table I).

Table I: Sociodemographics

Variables		Frequency (n)	Percent (%)
Gender	Male	111	50
	Female	111	50
	Total	222	100
Age	≤ 20 Years	39	17.56
	> 20 Years	183	82.4
	Total	222	100
Residential Status	Day Scholar	102	45.9
	Hostelite	120	54.1
	Total	222	100
Participants from different Institutions of Lahore	AMC,	75	33.8
	KEMC,	55	24.8
	AIMC,	29	13.1
	SIMS,	19	8.6
	FJMU,	17	7.7
	SKBZAMC,	27	12.2
	Total	222	100

Out of the total 222 participants, n=177 (79.7%) correctly identified *Aedes* as the mosquito responsible for dengue transmission. 170 (76.6%) knew that the causative agent of dengue is a virus. When asked about the antigenic subtypes of dengue prevalent in Lahore n=117 (52.7%) were aware of all the subtypes (DENV-1 to DENV-4). The majority of participants n=216 (97.3%), correctly identified stagnant clean water as the primary breeding site for dengue mosquitoes n=183 (.82.4%) reported being able to recognize the vector in their vicinity. n=174 (78.4%) were aware that dengue-carrying mosquitoes are most active during early morning and late evening hours, n=187 (84.2%) recognized the rainy season as the peak transmission period. Almost all participants n=220

(99.1%,) acknowledged that dengue is a serious disease. Only n=103 (46.4%) believed that there are special drugs available for its treatment. A high proportion n=214 (96.4%,) were aware that dengue can lead to life-threatening conditions such as dengue hemorrhagic fever. In terms of knowledge about the symptoms, n=203 (91.4%) correctly identified prolonged high fever as a symptom of dengue. n=197 (88.7%) knows malaria and dengue vectors are not the same. n=176 (79.3%) associated nausea and vomiting with dengue. Lower percentage n=106 (47.7%,) believed diarrhea to be a symptom of dengue. 91.4% (n=203) knew retro-orbital pain is a symptom. n=214 (96.4%) were aware that muscular pain is a common symptom. n=181 (81.5%) identified skin rash as a symptom of dengue. n=174 (78.4%) were aware that dengue causes bleeding manifestations such as blood in urine or stool and bleeding from gums or nose. Out of 222 students, n=216 (97.3%) acknowledging that dengue is a preventable disease. n=202 (91.0%) reported using mosquito bed nets or aerosol sprays at home n=138 (62.2%) used mosquito repellent cream during college hours. n=203 (91.4%) ensured water storage containers were properly covered. n=193 (86.9%) ensured plant pots were kept clear and water was changed frequently. n=184 (82.8%) reported cutting down bushes around their homes. n=206 (92.8%) reported visiting hospitals for tests and treatment when symptoms were visible. n=195 (87.8%) followed the latest information from trusted sources. All participants n=222 (100%,) expressed willingness to use protective measures against mosquito bites. Highest percentage of high level of awareness achieved was 84.21% by Services Institute of Medical Sciences Lahore, followed by 78.18% by King Edward Medical University, Lahore, 77.77% by Shaikh Khalifa Bin Zayed Al-Nahyan Medical and Dental College Lahore, 76 by Ameer-ud-Din Medical College, Lahore, 72.41% by Allama Iqbal Medical College Lahore and 70.59% by Fatima Jinnah Medical College Lahore. (Table II)

Descriptive analysis on the 27-point scale revealed identical dengue awareness levels across genders. Dengue Awareness Across Gender, Residential Status and Institution. Descriptive analysis of the 27-point dengue awareness scale showed almost identical awareness scores among male and female students. Male students had a mean awareness score of 21.98 ± 3.00 , with a 95% confidence interval of 21.40–22.55 and a median of 22.50. Female students also had a mean score of 21.98 ± 3.12 , with a 95% confidence interval of 21.38–22.57 and a median of 22.50. The scores in both groups ranged from 13.50 to 27.00, with an interquartile range of 4.50. The distribution showed mild negative skewness among both male students (-0.588 ± 0.229) and female students (-0.442 ± 0.229), while the kurtosis values were close to zero. Although the Kolmogorov–Smirnov and Shapiro–Wilk tests showed significant results ($p < 0.001$), indicating

deviation from a normal distribution, the skewness and kurtosis values suggested an approximately symmetrical distribution. For residential status, day scholars had a mean awareness score of 21.98 ± 2.81 , with a 95% confidence interval of 21.44–22.55 and a median of 22.50. Hostelite had a mean score of 21.96 ± 3.26 , with a 95% confidence interval of 21.38–22.55 and a median of 22.50. Day scholars showed minimal negative skewness (-0.150 ± 0.239), whereas hostelite showed greater negative skewness (-0.696 ± 0.221). The kurtosis values were -0.697 ± 0.474 for day scholars and 0.121 ± 0.438 for hostelite. Pearson chi-square test was performed to determine the association between dengue awareness categories and demographic characteristics among the 222 medical students. No statistically significant association was found between gender and dengue awareness, $\chi^2 (6) = 3.94$, $p = .685$. High awareness scores (20–27) were observed in 82.0% of male students ($n = 91$) and 80.2% of female students ($n = 89$). Similarly residential status was not significantly associated with dengue awareness, $\chi^2 (6) = 8.16$, $p = .227$. High awareness was observed among

83.3% of day scholars ($n = 85$) and 79.2% of hostelite ($n = 95$). Independent-samples t-test was used to compare the overall dengue awareness scores between day scholars and hostelite. Levene's test showed unequal variances ($F = 4.082$, $p = .045$); therefore, the Welch correction was applied. The analysis showed no statistically significant difference between day scholars and hostelite, $t (61.93) = -0.791$, $p = .432$. The mean difference was only -0.151 points, suggesting that residential status was not associated with a meaningful difference in dengue awareness scores. One-way ANOVA was performed to compare dengue awareness scores across the six medical institutions in Lahore. The analysis showed no statistically significant difference among the institutions, $F (5,216) = 1.96$, $p = .086$, $\eta^2 = .043$. Overall, students had a high level of dengue awareness, with an overall mean score of 21.98 ± 3.06 . Although the mean awareness scores varied between institutions, ranging from 20.39 ± 4.01 at Fatima Jinnah Medical University to 23.18 ± 2.41 at Shaikh Khalifa Bin Zayed Medical and Dental College, this difference did not reach statistical significance.

Table II: Awareness about dengue

Variable	Parameters	n	%
Mosquito responsible for dengue is?	Aedes	177	79.7
	Culex	1	0.5
	Anopheles	44	19.8
Causative agent of dengue is?	Virus	170	76.6
	Bacteria	5	2.3
	Fungi	1	0.5
	Parasites	46	20.7
Antigenic subtypes of dengue prevalent in Lahore?	DENV-1	23	10.4
	DENV-2	44	19.8
	DENV-3	27	12.2
	DENV-4	11	5
	All of These	117	52.7
Main breeding site for the vector of dengue is?	Stagnant Clean Water	216	97.3
	Dry and Warm Water	6	2.7
Can the vector mosquito causing dengue be recognized in your vicinity?	Yes	183	82.4
	No	39	17.6
Usual biting period of vector mosquito causing dengue is?	Early Morning, Late Evening	174	78.4
	Day time	13	5.9
	Night time	35	15.8
The season during which the transmission of dengue increases mostly?	Rainy Season	187	84.2
	Summer Season	23	10.4
	Winter Season	4	1.8
	Spring Season	8	3.6

Table II: Awareness about dengue

Dengue is a serious disease?	Yes	220	99.1
	No	2	0.9
There are special drugs available for the treatment of dengue?	Yes	103	46.4
	No	119	53.6
Is Dengue hemorrhagic fever a life-threatening condition.	Yes	214	96.4
	No	8	3.6
Is prolonged high fever a symptom of dengue?	Yes	203	91.4
	No	19	8.6
Malaria spreads by same mosquito as that of dengue?	Yes	25	11.3
	No	197	88.7
Are nausea and vomiting symptoms of dengue?	Yes	176	79.3
	No	46	20.7
Is diarrhea a symptom dengue?	Yes	106	47.7
	No	116	52.3
Is retro orbital pain a symptom of dengue?	Yes	203	91.4
	No	19	8.6
Is muscular pain a symptom of dengue?	Yes	214	96.4
	No	8	3.6
Is there any skin rash in dengue?	Yes	181	81.5
	No	41	18.5
Are there any bleeding manifestations such as blood in urine, stool or bleeding from gums and nose?	Yes	174	78.4
	No	48	21.6
Dengue is a preventable disease?	Yes	216	97.3
	No	6	2.7
Use of aerosol/liquid or mosquito bed net at your house?	Yes	202	91
	No	20	9
Use mosquito repellent cream during your college hours?	Yes	138	62.2
	No	84	37.8
Water container used for water storage are properly covered?	Yes	203	91.4
	No	19	8.6
Plant pots are kept clear and water is changed frequently?	Yes	193	86.9
	No	29	13.1
Bushes around the house are cut down frequently?	Yes	184	82.9
	No	38	17.1
Visit the hospitals for test and treatment when symptoms are visible?	Yes	206	92.8
	No	16	7.2
Following the latest information from the trusted sources?	Yes	195	87.8
	No	27	12.2
Willingness to use protective measures against mosquito bite?	Yes	222	100

DISCUSSION

The present study demonstrated a high level of dengue awareness among fourth-year MBBS students in Lahore. The mean awareness score was 21.98 out of 27, corresponding to 81.4%. This finding indicates that the students had good knowledge of dengue transmission, clinical manifestations, and preventive measures.

Similar findings have been reported internationally among medical students. Manandhar et al. (2023), in Nepal, reported high awareness among medical undergraduates, with 81.9% correctly identifying basic vector transmission and 96.4% understanding the human-to-mosquito transmission cycle.⁶ The higher level of knowledge among medical students can be contrasted with findings involving non-medical university students. Amin et al. (2019) reported that only 15% of university students in Malaysia had adequate knowledge of dengue.¹³ Wan Rosli et al. (2019) similarly reported an adequate knowledge level of 26.1%.¹⁴ In Pakistan, Fayzan et al. (2022) found that only 28.2% of non-medical university students in Faisalabad had good knowledge of dengue.¹¹

These differences may be associated with educational background, as medical students receive formal instruction regarding infectious diseases, modes of transmission, clinical manifestations, and preventive measures as part of their medical education. Similar differences are evident when medical students are compared with the general population. Mansoor et al. (2024) reported that only 44% of young adults aged 15–30 years in Islamabad had good knowledge of dengue.¹⁵ In Lahore, Akhtar et al. (2023) found that only 56.0% of the general community was aware of the complete range of dengue symptoms.¹⁶ The higher awareness observed among medical students may therefore be associated with their structured medical education and exposure to clinical information.

In the present study, no statistically significant difference in dengue awareness was observed according to gender ($p = .685$). This finding is consistent with the study conducted by Ali et al. (2024) among medical students at Gomal Medical College, Dera Ismail Khan, where gender was not significantly associated with knowledge, attitudes, or practices ($p > .05$).¹⁷ Similarly, no statistically significant difference was found according to residential status in the present study ($p = .432$), suggesting that living as a day scholar or hostel resident did not significantly influence dengue awareness.

Nevertheless, differences in dengue knowledge have been reported among medical students from different regions. Ali et al. (2024) found that only 47.3% of medical students in Dera Ismail Khan achieved the defined level of good knowledge, although students in the clinical years had significantly better knowledge than those in the preclinical years ($p = .002$).¹⁷ The difference between these findings and those of the present study may be related to variations in the study populations, institutional teaching, clinical exposure, local dengue burden, and timing of data collection. However, these factors were not directly evaluated in the present study

and should therefore be considered possible explanations rather than established causes.

Although the overall level of dengue knowledge in the present study was high, good theoretical knowledge does not necessarily ensure the adoption of appropriate preventive practices. Ahmed et al. (2024) reported that although 58.0% of Sudanese medical students had good knowledge, only 46.7% demonstrated good preventive practices.¹⁸ Similarly, Manandhar et al. (2023) found that despite high general awareness among medical students in Nepal, important gaps remained in specific areas, including the identification of all four dengue virus serotypes.⁶ Community-based research conducted by Hairi et al. (2003) in rural Malaysia also demonstrated that general awareness did not necessarily translate into appropriate preventive behaviour.¹⁹

Therefore, a high level of dengue knowledge among medical students should be regarded as an important foundation, but it may not be sufficient on its own to ensure effective preventive practices. Wan Rosli et al. (2019) demonstrated that structured educational programmes could simultaneously improve dengue-related knowledge, attitudes, and practices.¹⁴ These findings suggest that continued, structured dengue education may help maintain knowledge and strengthen preventive behaviour among medical students.

There were some limitations in our study. The number of participants from the six institutions was not equal, ranging from 75 students at Ameer-ud-Din Medical College to 17 students at Fatima Jinnah Medical University. This unequal distribution, particularly the smaller sample size of some institutions, may have reduced the statistical power to detect small differences in dengue awareness between institutions.

CONCLUSION

This multi-center study demonstrated high baseline dengue awareness among undergraduate medical students across public medical colleges in Lahore. Knowledge levels were uniform across demographic subgroups, showing no statistically significant differences by gender, or residential status. Although the mean awareness scores varied between institutions, this difference did not reach statistical significance. The difference of highest percentage of high level of awareness amongst different institute's emphasis need for more comprehensive sharing of information.

Ethical Approval:

Ethical approval was taken from institutional review board of Ameer-ud-Din Medical College/PGMI, Lahore, with the IRB number 00-40-A-2024 Dated 06-06-2024.

Conflict of Interest:

Authors declare no conflict of interest.

Financial Disclosure:

None

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Authors' Contributions:

RSK & FS: Conceptualization and study design

BK & DS: Data Collection and manuscript drafting.

WA & WW: Data Analysis and critical review.

RSK, FS & WW: Supervision & Manuscript drafting & proofreading.

All authors have read and approved the final version of the manuscript and are responsible and accountable for the accuracy and integrity of the work.

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