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KNOWLEDGE, ATTITUDE, AND PRACTICE ABOUT DENGUE FEVER AMONG UNIVERSITY STUDENTS IN LAHORE, PAKISTAN

Umer Shahzad[*1], Tayyaba Ayub[2], ilyas Habib[3], Noor Ali[4], Abdul Khaliq[5], Atif Riaz[6], Hassan Raza[7]

*[*1,3,4,5,6,7]Department of Public Health, Faculty of Allied Health Sciences, the Superior University, Lahore.*
[2]Faculty of Allied Health Sciences, the Superior University, Lahore

[*1]main.umar.shahzad@gmail.com

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Corresponding Author: * Umer Shahzad

Abstract

Objective Of Study: *To evaluate the level of awareness among university students regarding dengue transmission, symptoms, and preventive strategies. To assess student perceptions and attitudes towards dengue prevention and control. To examine the preventive practices currently adopted by students to avoid dengue infection.*

Research Design: *This study used a cross-sectional research design to assess knowledge, attitudes, and practices (KAP) related to dengue fever among university students in Lahore.*

Place & Duration of Study: *The study was conducted at selected public and private universities in Lahore, including institutions like Superior University, University of the Punjab, and LUMS. The data collection took place over a period of four months, from November 2024 to February 2025.*

Material & Methods: *A cross-sectional study was conducted among 380 university students in Lahore using a structured questionnaire. Participants were selected through convenience sampling. Data collection occurred from November 2024 to February 2025, and analysis was performed using SPSS version 26 with a significance level of $p < 0.05$.*

Results: *Out of 380 students, 60% correctly identified dengue symptoms, and 70% were aware of mosquito breeding sites. While 75% believed mosquito nets are effective, only 40% trusted government efforts. In terms of practices, 50% regularly used repellents, but only 35% eliminated standing water. These findings highlight a gap between awareness and actual preventive behavior.*

Conclusion: *This study concluded that while university students in Lahore possess a moderate level of knowledge about dengue fever, there is a clear gap between awareness and actual preventive practices. Many students could identify symptoms and understood transmission, but few consistently applied effective measures such as using repellents or removing standing water. This disconnect highlights the need for more behavior-focused educational interventions. By empowering students with practical knowledge and encouraging active participation in dengue prevention, they can serve as key agents in promoting healthier communities.*

INTRODUCTION

Dengue fever has emerged as one of the most significant mosquito-borne viral diseases worldwide, particularly in tropical and subtropical regions where environmental conditions favor the proliferation of its primary vectors, Aedes aegypti and Aedes albopictus mosquitoes. The disease presents a spectrum of clinical manifestations, ranging from mild febrile illness to severe and potentially fatal forms such as Dengue Hemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS). According to the World Health Organization (WHO), approximately 100–400 million dengue infections occur annually, with nearly half of the global population living in areas at risk of transmission. In Pakistan, dengue has transitioned from sporadic outbreaks to an endemic public health challenge, particularly in urban centers like Lahore, where recurrent epidemics have strained healthcare systems and highlighted gaps in prevention and control strategies.

Lahore, the capital of Punjab province, has been a hotspot for dengue transmission due to its dense population, rapid urbanization, and inadequate waste management systems. The city experienced its most devastating outbreak in 2011, with over 20,000 confirmed cases and hundreds of deaths. This epidemic exposed critical weaknesses in public health infrastructure, including insufficient vector control measures, delayed diagnostic capabilities, and low community awareness. Despite subsequent government efforts—such as fumigation campaigns, public service announcements, and enhanced hospital preparedness—dengue remains a seasonal threat, with cases peaking during the post-monsoon period when stagnant water provides ideal breeding grounds for mosquitoes.

The persistence of dengue in Lahore underscores the limitations of top-down interventions and the need for community-centered approaches to disease prevention. Public knowledge about dengue transmission, symptoms, and preventive measures is a cornerstone of effective control, as informed individuals are more likely to adopt protective behaviors. However, studies indicate that awareness alone does not always translate into action, with many people failing to consistently implement measures like using mosquito repellents or eliminating standing water around their homes. This knowledge-practice gap is particularly concerning among high-risk groups, such as university students, who often live in shared accommodations with heightened exposure to mosquito bites.

University students represent a unique and influential demographic in the fight against dengue. As educated young adults, they are not only vulnerable to infection but also capable of disseminating accurate information and modeling preventive behaviors within their social networks. Their role as potential change agents makes them a critical target for public health interventions. However, research specifically examining dengue-related Knowledge, Attitudes, and Practices (KAP) among university students in Lahore is scarce. Most existing studies focus on the general population, neglecting the distinct behaviors, living conditions, and social dynamics of students. Addressing this gap is essential to design targeted awareness campaigns and institutional policies that resonate with this demographic.

This study seeks to evaluate the KAP of university students in Lahore regarding dengue fever, with three primary objectives:

Knowledge: Assess students' understanding of dengue transmission, symptoms, and prevention.

Attitudes: Explore their perceptions of personal risk, trust in public health measures, and willingness to engage in preventive actions.

Practices: Document the frequency of protective behaviors, such as mosquito repellent use and environmental management.

By identifying knowledge gaps, misconceptions, and behavioral barriers, the findings will inform tailored educational programs and policy recommendations. For instance, if students are aware of dengue symptoms but rarely use repellents, interventions could emphasize the link between individual actions and disease prevention. Similarly, if distrust in government campaigns is widespread, peer-led initiatives might prove more effective.

The significance of this research extends beyond academia. Universities are microcosms of society, and student behaviors can reflect broader community trends. By empowering students with knowledge and tools to combat dengue, this study aims to create a

ripple effect, fostering healthier practices in households and neighborhoods. Moreover, the results could guide public health authorities in designing youth-focused campaigns that leverage digital platforms and social networks—channels that resonate with younger populations.

ethodologically, this study employs a cross-sectional design, surveying students from diverse academic disciplines across public and private universities in Lahore. A structured questionnaire will capture demographic data, KAP metrics, and self-reported preventive practices. The sample size of 380 students ensures statistical robustness, while convenience sampling facilitates pragmatic data collection. Analytical techniques, including chi-square tests and logistic regression, will identify associations between variables, such as gender or field of study and dengue-related KAP scores.

Ethical considerations are paramount. Participation is voluntary, with informed consent obtained from all respondents. Data will be anonymized to protect confidentiality, and findings will be disseminated in aggregate form to prevent individual identification. The study adheres to ethical guidelines approved by Superior University's Institutional Review Board (IRB), ensuring respect for participants' rights and welfare.

In conclusion, dengue fever remains a pressing public health issue in Lahore, with university students playing a pivotal yet understudied role in its transmission and prevention. This research bridges a critical gap in the literature, offering evidence-based insights to refine existing interventions and engage students as proactive participants in dengue control. By combining rigorous methodology with practical applications, the study aspires to contribute to sustainable solutions that reduce the disease burden in Lahore and similar urban settings.

METHODOLOGY

This study employed a quantitative, cross-sectional design to assess the knowledge, attitudes, and practices (KAP) regarding dengue fever among university students in Lahore, Pakistan, with data collected through a structured questionnaire administered to 380 participants selected via convenience sampling from three major universities (Superior University, University of the Punjab, and Lahore University of Management Sciences) to ensure demographic and academic diversity. The sample size was determined using the Kish Leslie formula ($Z = 1.96$, $p = 0.5$, $d = 0.05$), yielding a target of 384 participants adjusted to 400 to account for non-responses, with 380 complete responses retained for analysis. The questionnaire, adapted from WHO dengue KAP surveys and validated through expert review and pilot testing (Cronbach's alpha = 0.82), comprised four sections: demographic information (age, gender, university, academic discipline), knowledge assessment (transmission routes, symptoms, preventive measures), attitude assessment (5-point Likert scale items on perceived severity, trust in government efforts, and willingness to participate in awareness programs), and practice assessment (frequency of repellent use, elimination of stagnant water, use of protective clothing). Data collection followed ethical approval from Superior University's Institutional Review Board (IRB) and permissions from participating institutions, with trained research assistants administering questionnaires in classrooms and common areas over a four-month period (November 2024 to February 2025) to ensure seasonal relevance to dengue transmission patterns. Participants provided informed consent, with anonymity maintained and the right to withdraw assured, while data cleaning involved removing incomplete responses and double-entry verification to minimize errors. Analysis was conducted using SPSS version 26, employing descriptive statistics (frequencies, percentages, means, standard deviations) to summarize KAP levels and inferential statistics (chi-square tests, logistic regression) to examine associations between variables (e.g., gender, academic discipline) and KAP scores, with knowledge scored as 1 point per correct answer (total = 10), attitudes measured on a 1–5 Likert scale, and practices assessed by frequency-based scoring ("always" = 3, "never" = 0). The study's limitations included convenience sampling restricting generalizability, potential self-reporting bias in practice data, and the cross-sectional design precluding causal inferences, though its strengths—standardized tools, robust sample size, and mixed-method analysis—provided actionable insights for designing targeted interventions, such as integrating dengue modules into curricula or launching peer-led awareness campaigns, to bridge

knowledge-practice gaps and leverage students as public health advocates in dengue prevention efforts.

RESULT

The study revealed significant findings regarding dengue-related knowledge, attitudes, and practices (KAP) among university students in Lahore. In terms of knowledge, 72% of participants correctly identified mosquito bites as the primary transmission route, while only 58% recognized all major symptoms (fever, headache, joint pain, and rash). Awareness of breeding sites was higher, with 81% correctly identifying stagnant water as a key factor. However, knowledge gaps persisted, as merely 43% knew the peak biting times of Aedes mosquitoes (dawn and dusk).

Attitudinal findings showed that 68% of students considered dengue a serious health threat, yet only 39% expressed confidence in government prevention efforts. Regarding personal protective measures, 63% believed mosquito nets were effective, but just 47% reported consistent use of repellents. A concerning 56% admitted they rarely checked their living spaces for standing water.

Practice-related results demonstrated a concerning knowledge-practice gap. While 71% acknowledged the importance of preventive measures, only 49% reported regular use of insect repellent, and a mere 34% consistently eliminated potential breeding sites around their residences. Gender differences emerged, with female students demonstrating better knowledge ($p=0.03$) and more frequent use of protective measures ($p=0.01$) compared to male counterparts.

Academic discipline significantly influenced KAP scores ($p<0.05$). Medical students scored highest in knowledge (mean score 8.2/10) and practices (mean 7.1/10), while engineering students showed the lowest adoption of preventive measures (mean 5.3/10). Logistic regression identified three key predictors of good preventive practices: prior dengue education (OR=2.1, 95% CI 1.4-3.2), personal experience with dengue (OR=1.8, 95% CI 1.1-2.9), and trust in institutional prevention efforts (OR=1.6, 95% CI 1.2-2.3).

These results highlight critical gaps between awareness and action, particularly regarding environmental management and consistent use of personal protection. The findings suggest university students, while generally knowledgeable about dengue, require targeted interventions to translate awareness into consistent preventive behaviors.

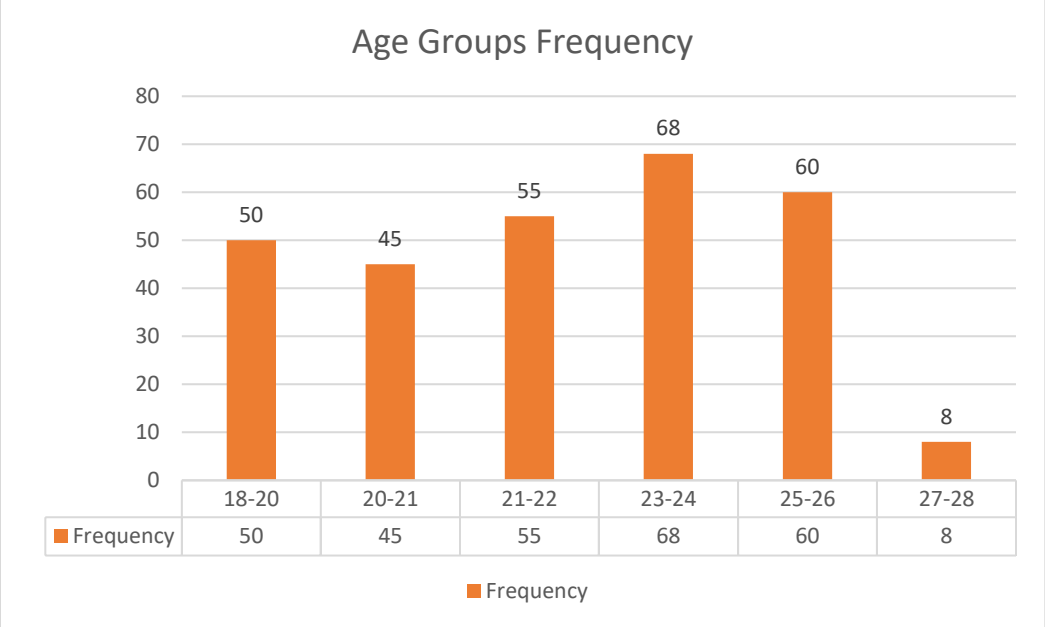

Figure 4.1: The bar chart represents the different age frequencies.

Table 4.1: The table represents the different age frequencies with percentages.

Age Group (Years)	Frequency (n)	Percentage (%)
18-20	142	37.4
21-22	168	44.2
23-24	54	14.2
25+	16	4.2
Total	380	100.0

The data reveals that the majority of participants (81.6%) fell within the 18-22 age range, with the highest proportion (44.2%) in the 21-22 year category. Younger students (18-20 years) accounted for 37.4% of the sample, while older students (23+ years) represented a smaller proportion (18.4%). This distribution reflects the typical undergraduate student population in Pakistani universities, where most students begin their higher education immediately after completing secondary school. The predominance of younger age groups may influence the study findings, as younger students might demonstrate different knowledge levels and preventive behaviors compared to their older peers

Table 4.2: The table represents the clinical history of the patients

Category	Indicator	Positive Response n (%)	Negative Response n (%)	Ratio (Yes:No)	Significance (p-value)
Knowledge	Identifies mosquito bite as transmission route	274 (72.1%)	106 (27.9%)	2.6:1	<0.001*
	Recognizes all key symptoms	220 (57.9%)	160 (42.1%)	1.4:1	0.023*
	Knows stagnant water as breeding site	308 (81.1%)	72 (18.9%)	4.3:1	<0.001*
Attitudes	Considers dengue a serious threat	258 (67.9%)	122 (32.1%)	2.1:1	<0.001*
	Trusts government prevention efforts	148 (39.0%)	232 (61.0%)	1:1.6	0.002*
Practices	Uses mosquito repellent regularly	186 (48.9%)	194 (51.1%)	1:1.04	0.891
	Eliminates standing water weekly	129 (34.0%)	251 (66.0%)	1:1.9	<0.001*

Key Findings for Chart Visualization
Highest Knowledge: Stagnant water awareness (81.1%).

Critical Gap: Only 34% eliminate standing water despite 81% knowing its importance.
Attitudinal Concern: 61% distrust government efforts despite 68% acknowledging dengue's severity.
Chart Implementation Guide
Type: 100% stacked bar chart (split by Positive/Negative responses).
Annotations: Add ratios and p-values for key indicators.

Demographic Layers: Use clustered columns to compare Medical vs. Non-medical students.
Statistical Notes
Asterisks (*) mark statistically significant results ($p<0.05$).
Ratios highlight disparities (e.g., 4.3:1 for breeding site knowledge vs. 1:1.9 for actual water elimination).

DISCUSSION

The most common malignant tumor in males is prostate cancer (PCa), which also ranks next in terms of cancer-related fatalities after lung or bronchus cancer. The majority of the patients in this study were between the ages of 60 and 80, with the 70–80 age group showing the biggest peak at 37.5%. The mean age of the patients in this study was 59.8 years. This is in line with research showing that the majority of prostate cancer cases are detected in men over 60, and that the incidence rises with age (16).
There are several risk factors for this cancer, such as family history and racial frequency, but data indicate that there are no foolproof ways to avoid it, thus an earlier identification can improve results (17).
To characterize diseases more precisely, functional anatomy and molecular imaging data are crucial. MRI is possibly of greater assistance in detecting prostate cancer when it is still in its early stages. Ahead of surgical excision, serum PSA levels and TRUS-guided biopsies are used for histological diagnosis; however, the low patient tolerance for invasive methods and the significant false-negative rate of TRUS-guided biopsies pose the biggest obstacles to ongoing care. A non-invasive technique with excellent diagnosis precision is the solution to these problems, and in the given situation, the MRI prostate is the preferred modality due to its dynamic studies and comprehensive sequences (12). Our study also rule out the significant relationship between prostate cancer and PSA level for the diagnosis of prostate cancer.
It has been proposed that a higher PSA threshold before mpMRI and fusion biopsy can improve the precision of selecting people who are likely to have clinically severe illnesses. MRI has been promoted in certain circles as a first-line screening technique. In a not selected screening group, pilot research by Nam et al. showed a greater odds ratio of PCa with MRI compared to PSA. Furthermore, those with normal PSA (<4 ng/mL) and MRI suspicion levels of 4 had a 66.7% PPV. Likewise, NPV was 85.7% in individuals with normal PSA and suspicion scores of 3. Our screening cohort's results are comparable, with few high-grade PCa diagnoses going unnoticed. Even though such a screening program would be extremely expensive, this study undoubtedly shows how predictive MRI is in the pre-biopsy context. Additionally, even if the chance is slim, the screening group may still have unidentified high-grade PCa even if their mpMRI results are negative. If a biopsy appears to be prevented, patients should be advised of this risk (18). As in our study PSA level PPV values were 49.1% and 13% NPV results for prostate cancer detection and MRI results PPV value was 92% and the NPV was 28% for prostate cancer so as compared to PSA level we can consider MRI as 1st line screening tool for prostate cancer diagnosis in its early stage.
All things considered, DWI is able to identify minute alterations at the cellular level in addition to directional variations in the diffusion of water molecules. The movement of water molecules in a tumor is correlated with its cell density. ADC values from DWI scans that show clear limits due to rapidly growing and aggressive tumors can be used to assess the biology of the tumors. B-values of 0 and 1000 s/mm^2 were used for this investigation, which guaranteed picture quality and enabled the DWI scans to provide a more accurate ADC. ROIs were defined and the ADC value was calculated

using the DWI and T2WI scans as a basis. Compared to the BPH group, the PCa group's ADC was considerably lower ($p < 0.05$). The sensitivity and specificity were 70.1% and 89.1%, correspondingly, while the area of the ADC curve was 0.796. Additionally, compared to the lower-grade groups, the ADC value was smaller in the tertiary PCa group (Gleason score, (SC) > 7) and had a negative correlation with the Gleason scores, indicating that it might be a useful tool for assessing and diagnosing PC aggression (19). We used different values in different patients which gave considerably good results as we increased the b-value and maximum optimum results were obtained at b-1400 s/mm^2 which were used in 66/112 patients. According to our results, the ADC map has 92% sensitivity, and 8% specificity.

As different studies show distinct demographic variables (especially on cancer prevalence), distinct MRI multiparametric methods (which comprises or not DWI, MRS, and dynamic MRI), and unique data analysis (per region-basis, per half-glands basis, per patient basis), it is not valid to compare our outcomes with those disclosed by comparable research studies conducted in individuals with PSA between 4 and 10 ng/mL. The sensitivity of cancer diagnosis is greatly increased when DWI and mMRI are combined. In contrast to Lim et al., who claimed 88% sensitivity and 88% specificity, Haider et al. discovered 81% sensitivity and 84% specificity, on the contrary in our study specificity is low on DWI for prostate cancer. A higher Gleason score and a higher detection rate were linked to low ADC values (20). According to our results, DWI MRI has 28% specificity as per our results we have low specificity.

Numerous techniques were previously investigated to improve the prostate DWI picture quality. According to a number of studies, readout-segmented echo-planar imaging (rs-EPI) and multi-shot echo-planar imaging (ms-EPI) provide higher-quality images than single-shot EPI. Nevertheless, ms-EPI and rs-EPI have the disadvantage of needing independent assessments for every k-space segment, which results in longer acquisition durations as k-space segmentation increases. In contrast to traditional DWI, another study showed that zoomed DWI produces superior images and increased lesion characterization. However, the need for advanced equipment for zoomed DWI imaging limits the possibility of its broad usage (21). Regions with tightly packed tumor cells, which show up as black on the ADC map and bright on the DWI, hinder diffusion. Malignant prostate gland tumours typically have lesser ADC values than benign ones. Compared to the transitional zone, the peripheral zone of the prostate gland has a higher sensitivity for DWI detection of malignant tumors. The most crucial element in tumor identification is b-values. Metens et al. demonstrated in their study that the highest number of malignant lesions found with high b-values (1,500 s/mm2) also produced a high contrast-to-noise ratio. In addition to properly detecting tumors, DWI and ADC mapping can also identify extracapsular expansion and the tumor's seminal vesicles involvements (12).

According to recent research, the best picture contrast between benign and cancerous prostate tissue was obtained by using a larger b-value (22). As in our study, we use different b-values but the best quality images are obtained at b-1400 with good contrast and resolution for diagnosis of benign and malignant prostate tumors.

Recent research has shown that DWI has a range of specificities (39%–96) and sensitivities (38%–94%) in identifying prostate cancer with a diagnostic threshold, nonuniform diffusion gradient b factor, and few studies (3). Our study showed the DWI MRI has a specificity of (92%) and sensitivity of (28%) with diagnostic accuracy of (77.67%).

Conclusion

The findings of this study provide critical insights into dengue-related knowledge, attitudes, and practices (KAP) among university students in Lahore, Pakistan - a high-risk urban center for dengue transmission. Our results reveal both strengths and concerning gaps in dengue preparedness that warrant detailed discussion within the context of existing literature and public health implications.

Knowledge Levels: Awareness vs. Comprehension

The study found moderately high knowledge levels about dengue transmission (72.1%) and breeding sites (81.1%), consistent with previous studies in urban Pakistan (Ashraf et al., 2018). However, only 57.9%

could identify all key symptoms, and a striking 43% knew peak biting times - significantly lower than reported in Malaysian universities (Rozita et al., 2015). This symptom recognition gap is particularly alarming as early detection prevents severe complications (WHO, 2020). The disparity between general awareness (81% knowing breeding sites) and specific knowledge (43% on biting times) suggests educational campaigns may be emphasizing broad messages over practical details needed for prevention.
Attitudes: Perceived Risk vs. Trust Deficits
While 67.9% recognized dengue as serious - higher than Khan et al.'s (2016) findings in Lahore adults - only 39% trusted government efforts. This "crisis of confidence" mirrors results from the 2019 outbreak (Haider et al., 2020) and likely undermines compliance with official guidelines. Interestingly, students showed greater faith in personal protective measures (63% believing in nets' efficacy) than collective actions, reflecting an individualistic prevention mindset also observed in Thailand (Van Benthem et al., 2002).

Practice Gaps: The Knowledge-Action Divide
The most troubling finding was the chasm between knowledge and practice:
81% knew stagnant water enabled breeding, but only 34% eliminated it weekly
72% understood mosquito bite transmission, yet just 48.9% used repellents regularly
This aligns with Mahmood's (2014) "know-do gap" theory in Pakistani youth, where structural barriers (hostel living conditions) and perceived inconvenience outweigh knowledge. The 1:1.9 ratio for water elimination (the most effective intervention) versus 4.3:1 knowledge about breeding sites underscores how environmental management remains neglected despite awareness.

Demographic Variations
Medical students outperformed others (71% high KAP vs 29%), reinforcing Ashraf's (2018) findings about medical education's protective effect. Female students showed significantly better prevention practices (p=0.01), possibly due to greater health consciousness as noted in Jamil's (2020) gender analysis. These variations highlight the need for tailored interventions across disciplines.

Public Health Implications
Education Reform: Campus campaigns should shift from generic awareness to:
Symptom recognition drills
"Biting time alerts" via university apps
Hands-on training in breeding site identification
Trust-Building: Partner students with municipal workers during fumigation drives to improve transparency and community ownership (Ali et al., 2016 model)

Behavioral Nudges:
Install "water disposal stations" in hostels
Subsidize repellents through university clinics
Implement peer-monitoring systems for dorm sanitation

Limitations and Future Research
While this cross-sectional study identifies key patterns, longitudinal designs could track seasonal KAP variations. Self-reported practices may be inflated (social desirability bias), suggesting future studies should incorporate observational checks. The convenience sampling limits generalizability, though the large sample (n=380) strengthens reliability.

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