Awareness, Attitudes, and Preventive Practices Toward Dengue Fever Control among the general population in Jeddah, Saudi Arabia: A cross-sectional Study.

ABSTRACT:

Background: Dengue fever remains a growing public health concern in endemic and emerging settings, with effective control largely dependent on community awareness and preventive behaviors. This study aimed to assess knowledge, attitudes, and preventive practices (KAP) regarding dengue fever among residents of Jeddah, Saudi Arabia, and to examine their association with sociodemographic characteristics.

Methods: A cross-sectional survey was conducted in Jeddah from October 2025 to March 2026 among adult Arabic-speaking residents aged ≥18 years. Data were collected using a structured, self-administered questionnaire based on the KAP framework, distributed both online and through community-based public health campaigns across different districts of the city. KAP scores were analyzed, and associations with sociodemographic variables were assessed using comparative statistics, correlation analysis, and logistic regression.

Results: A total of 387 participants were included. Overall, 52.7% demonstrated poor knowledge, 44.2% had negative attitudes, and 59.2% exhibited moderate preventive practices. Although most participants recognized dengue as a mosquito-borne viral disease, substantial misconceptions persisted regarding mosquito behavior, breeding sites, and disease management. Healthcare affiliation was significantly associated with higher knowledge ($P<0.001$), while lower educational attainment was associated with more negative attitudes ($P=0.023$). No significant differences were observed across most sociodemographic variables for KAP scores. Knowledge showed a weak but significant positive correlation with preventive practices ($r= 0.215$, $P<0.001$), whereas attitudes showed a very weak negative correlation with practices ($r= -0.148$, $P=0.003$). Notably, residence in Central Jeddah was associated with negative attitudes toward dengue prevention (OR=1.737, 95% CI: 1.053-2.865).

Conclusions: The study reveals persistent gaps in dengue-related knowledge, attitudes, and preventive practices among Jeddah residents, with weak translation of knowledge into behavior. Findings highlight the need for integrated, behavior-focused public health strategies that go beyond knowledge dissemination, with particular emphasis on enhancing risk

perception, promoting community responsibility, and tailoring interventions to populations with lower educational attainment and specific urban districts.

Keywords: Attitude; Community awareness; Dengue fever; Knowledge; Practice; Public health education; Saudi Arabia; Vector control.

Introduction

Dengue fever is one of the most common mosquito-borne viral diseases worldwide. It represents a major public health challenge, particularly in tropical and subtropical regions, and imposes substantial healthcare and economic burdens. The disease is caused by the dengue virus and is transmitted to humans mainly through the bites of infected *Aedes aegypti* and *Aedes albopictus* mosquitoes. Clinical manifestations range from asymptomatic infection to classical dengue fever, characterized by high fever, severe headache, myalgia, arthralgia, and skin rash. In severe cases, the disease may progress to hemorrhage, shock, organ failure, and death (1-3).

Dengue fever influences millions of individuals every year worldwide, and its global incidence has increased substantially over recent decades. This is mainly attributed to rapid urbanization, population growth, climate change, international travel, and inadequate vector-control measures (4). The burden of dengue fever has also risen in the Middle East, including Saudi Arabia, where climatic and environmental conditions support mosquito breeding and disease transmission. Jeddah, one of the largest cities in Saudi Arabia, has experienced recurrent dengue outbreaks and sustained transmission over the past two decades (5,6). Previous epidemiological studies conducted in Jeddah have shown that dengue distribution is influenced by several environmental and socioeconomic factors, highlighting the persistence of dengue transmission within the city (7).

Effective prevention and control of dengue fever rely heavily on community awareness and adherence to preventive measures that reduce mosquito breeding and limit mosquito exposure. Public knowledge, attitudes, and preventive practices are therefore essential for controlling disease transmission. The Knowledge, Attitude, and Practice (KAP) framework is widely used to evaluate community understanding and behaviors related to infectious diseases. It also helps identify misconceptions and behavioral gaps that may weaken prevention and control efforts (8-10).

Previous studies in Saudi Arabia have shown variability in public knowledge, attitudes, and preventive practices regarding dengue fever. A cross-sectional study from the Western region of Saudi Arabia reported relatively good levels of knowledge and attitudes. However, preventive practices were suboptimal. The study also identified significant associations between KAP levels and sociodemographic factors, particularly education and employment status (11). In the Jazan region, a community-based study revealed inadequate preventive

practices and persistent gaps in dengue-related knowledge. These findings were associated with poor understanding of mosquito breeding sites and weak engagement in vector control activities (12).

Despite dengue fever remaining a critical public health concern in Jeddah, there is a notable lack of current data regarding local awareness and prevention habits. Earlier research involving diverse groups, such as the general public(13), students, educators (14), and primary healthcare visitors (15), has highlighted persistent deficiencies in both community knowledge and the consistent application of preventive measures. Hence, there is a need to assess current public perceptions and identify gaps in knowledge and behaviors for designing effective health education campaigns and strengthening community-based dengue prevention programs. Therefore, the present study aimed to assess awareness, attitudes, and preventive practices regarding dengue fever among residents of Jeddah, Saudi Arabia, and to examine the association between sociodemographic characteristics and levels of knowledge, attitudes, and preventive practices toward dengue fever.

Methods

Study design, settings, and duration

This cross-sectional survey study was conducted in Jeddah, Saudi Arabia, to assess awareness, attitudes, and preventive practices related to dengue fever among the general population. The study was conducted from October 2025 to March 2026.

Eligibility criteria

Adult residents of Jeddah aged 18 years or older who were Arabic speakers and willing to participate were included. Alternatively, individuals who were not residents of Jeddah, were younger than 18 years of age, or were non-Arabic speakers were excluded from the study.

Sample size and sampling technique

The sample size was calculated using Epi Info software (Centers for Disease Control and Prevention, CDC, USA), based on data from a previous study conducted in the Western Region of Saudi Arabia (11), which reported that 40% of participants had good knowledge and preventive practices regarding dengue fever. With a 95% confidence level and a 5% margin of error, the minimum required sample size was determined to be 369 participants. A convenience sampling technique was subsequently used to recruit participants until the required sample size was achieved.

Data collection

Data were collected using a self-administered questionnaire designed according to the KAP framework to assess community awareness and preventive behaviors regarding dengue fever. We utilized a hybrid approach, collecting data through both online and in-person methods. The questionnaire was distributed electronically through social media platforms and was also administered during public health and community campaigns in different areas of Jeddah, including the northern, southern, eastern, western, and central regions. This approach was used to improve response rates and increase the diversity of the study sample.

Study instrument

Data were collected using a structured self-administered questionnaire adapted from a previously published study conducted in Malaysia that assessed knowledge, attitudes, and preventive practices regarding dengue fever prevention (16). Permission to use and translate the questionnaire into Arabic was obtained from the original authors.

The questionnaire was developed according to the KAP framework and consisted of four main sections. The **first section** assessed participants' socio-demographic characteristics, including age, gender, nationality, educational level, marital status, region, and duration of residence in Jeddah, as well as whether the participant was studying or working in the healthcare field. The **second section** evaluated participants' knowledge regarding dengue fever, including its mode of transmission, clinical manifestations, mosquito-related characteristics, and preventive measures. The **third section** assessed attitudes toward dengue fever and its prevention using a series of statements addressing perceptions of disease severity, perceived susceptibility to infection, effectiveness of preventive measures, personal responsibility toward mosquito control, and willingness to participate in community-based dengue prevention activities. The **fourth section** evaluated preventive practices related to dengue fever, including elimination of mosquito breeding grounds, use of insecticide sprays and mosquito repellents, wearing protective clothing during outdoor activities, and use of mosquito nets during sleep. One item assessing the presence of mosquito larvae in the residential or working environment was included in the practice score as an indicator of environmental control. This item was reverse-coded so that lower exposure to larvae corresponded to better preventive practices. In addition, participants were asked about their main sources of information regarding dengue fever and dengue prevention.

Validity and reliability of the study instrument

The questionnaire was translated into Arabic by the researchers. To ensure content validity, the translated Arabic version was reviewed by two public health professionals who evaluated the relevance of the questionnaire items, linguistic clarity, conceptual accuracy, and cultural appropriateness for the Saudi population. Their comments and recommendations were incorporated to refine the wording and improve the comprehensibility of the final version before data collection.

A pilot study was subsequently conducted on approximately 15 participants from the target population to assess the clarity, readability, and comprehensibility of the questionnaire items. Based on participant feedback, unclear or ambiguous items were revised before starting the main data collection process. Data obtained from the pilot study were not included in the final statistical analysis. Approximately two weeks were allocated for conducting the pilot testing and implementing the necessary modifications.

The internal consistency reliability of the knowledge, attitude, and practice items was assessed using Cronbach's alpha coefficient. The questionnaire demonstrated acceptable internal consistency, with Cronbach's alpha values of ≥0.7, indicating adequate reliability of the instrument for measuring the intended constructs of knowledge, attitudes, and preventive practices regarding dengue fever.

Ethical considerations

The study was conducted after obtaining ethical approval from the Institutional Review Board (IRB) of the Saudi Board of Preventive Medicine, Ministry of Health. Participation in the study was voluntary, and participants were informed of their right to withdraw from the study at any stage without any consequences. Electronic informed consent was obtained from participants before completing the online questionnaire, while verbal consent was obtained from participants recruited during public awareness campaigns. No personal identifiers were collected. All collected data were handled confidentially and stored securely on a password-protected device accessible only to the principal researcher.

Statistical analysis

Data were coded, entered, and analyzed using IBM SPSS Statistics for Windows, version 27 (IBM Corp., Armonk, NY, USA). Categorical variables were summarized as frequencies and percentages. The normality of continuous variables was assessed using the Shapiro–Wilk test in addition to visual assessment of histograms and boxplots. Since the numerical variables were normally distributed, they were presented as mean ± standard deviation. Knowledge scores were calculated by assigning one point for each correct response, yielding a total possible score ranging from 0 to 11. Based on Bloom's cutoff criteria, knowledge levels were categorized into poor (<60%), moderate (60–79%), and good (≥80%). For logistic regression analysis, knowledge levels were further dichotomized into poor versus non-poor knowledge. Attitude was assessed using six items measured on a 5-point Likert scale, with a total possible score ranging from 6 to 30. Negatively worded statements were reverse-coded before analysis. Attitude levels were categorized according to Bloom's cutoff criteria into negative (<60%), neutral (60–79%), and positive (≥80%). For regression analysis, attitudes were dichotomized into negative versus neutral/positive attitudes. Preventive practice scores were calculated by assigning scores of 1, 2, and 3 for responses of "never," "sometimes," and "usually," respectively, across six items, resulting in a total score ranging from 6 to 18. Comparisons of knowledge, attitude, and practice scores according to sociodemographic characteristics were performed using the

Independent Samples t-test or one-way analysis of variance (ANOVA), as appropriate. Pearson correlation analysis was used to examine correlations between knowledge, attitude, and practice scores, and the results were expressed as Pearson's correlation coefficients (r). Univariate logistic regression analyses were conducted to identify factors associated with poor knowledge and negative attitudes toward dengue fever. The results were presented as odds ratios with corresponding 95% confidence intervals. A p-value of <0.05 was considered statistically significant.

Results

This study included 387 adults residing in Jeddah City. More than half (53.2%) were aged 30-49 years, while 23.8% were aged 50 years or older and 23.0% were aged 18-29 years. Females constituted approximately two-thirds (66.9%) of the study population. Most (76.5%) of them were Saudi nationals. More than half (52.7%) of the respondents held a bachelor's degree, followed by high school education (27.1%). Concerning marital status, the majority of participants were married (62.8%), whereas 30.7% were single and 6.5% were divorced or widowed. The geographical distribution of the participants within Jeddah showed a higher representation from North Jeddah (35.9%), while participants from South, East, and Central Jeddah each represented 20.2% of the sample. Additionally, most participants (84.2%) had lived in Jeddah for more than five years. Only 15.5% of the participants reported working or studying in the healthcare field **(Table 1).**

Table 2 shows the participants' knowledge regarding dengue fever. The overall mean knowledge score was 6.3 ± 1.8, with scores ranging from 0 to 11, corresponding to 57.3% of the maximum score, indicating an overall low to moderate level of knowledge among participants. Responses to individual items explored that most participants correctly identified dengue as a viral disease transmitted by mosquitoes (93.3%). A high proportion also recognized that dengue fever can be prevented by removing mosquito breeding sites (84.5%), and that mosquito bites can be avoided by using insect repellents or mosquito nets (86.8%). In addition, 80.4% correctly identified fever, joint pain, and rash as common symptoms of dengue fever, while 74.7% knew that dengue can be transmitted between people through mosquito bites. Moderate levels of knowledge were observed regarding mosquito-related preventive measures. Approximately 61.8% correctly recognized that not all mosquito species transmit dengue, and the same proportion identified that wearing light-colored clothing covering the body may help protect against mosquito bites. However, several misconceptions and knowledge gaps were identified. Only 38.0% of participants knew that only female mosquitoes bite and suck blood. Furthermore, only 12.4% correctly identified that dengue-transmitting mosquitoes usually bite during the daytime. A major misconception regarding mosquito breeding habitats was identified, where a very small proportion (3.1%) correctly answered that mosquitoes do not exclusively lay eggs in stagnant and dirty water. Additionally, only 28.9% correctly recognized that dengue cannot be treated solely by taking paracetamol.

Table 3 demonstrates the participants' attitudes and practices toward dengue fever and its prevention. The overall mean attitude score was 18.0 ± 6.0, with scores ranging from 7 to 30,

corresponding to 60% of the maximum possible score, indicating a borderline moderate level of attitude among the participants. At the item level, approximately 38.0% agreed that dengue fever is a serious disease that may lead to death, while 37.7% disagreed and 24.3% remained neutral. Less than one-quarter (21.5%) believed that they were personally at risk of contracting dengue fever, whereas 45.5% did not perceive themselves to be at risk. Nearly half (48.6%) of the respondents agreed that following preventive measures could protect them from dengue infection, and 53.2% believed that removing mosquito breeding sites reduces the likelihood of infection. However, 55.0% agreed with the statement that removing mosquito breeding sites was not their responsibility. Regarding community engagement, only 32.3% reported willingness to participate in public activities related to dengue control, while 41.6% expressed negative attitudes toward such participation.

Regarding preventive practices toward Dengue fever, the overall mean preventive practice score was 12.0 ± 2.3, with scores ranging from 7 to 18, equivalent to 66.7% of the maximum score, demonstrating a moderate level of preventive practices among participants. Only 16.8% of participants reported usually eliminating mosquito breeding grounds, whereas 47.3% reported never doing so. Most participants (58.9%) sometimes used insecticide sprays to kill mosquitoes, while 25.3% reported regular use. Similarly, 47.8% sometimes used insect repellent creams, liquids, or sprays during outdoor activities, and 23.3% usually used them. With respect to protective behaviors, 32.3% of participants usually wore covered, brightly colored clothing during outdoor activities, whereas 49.1% did so only sometimes. The use of mosquito nets during sleep was relatively low, with 59.9% reporting never using them and only 18.3% reporting regular use. Additionally, most participants (68.7%) reported never observing mosquito larvae in their residential or working areas, while 12.1% reported usually noticing mosquito larvae.

Figure 1 summarizes the levels of knowledge, attitudes, and preventive practices regarding dengue fever. More than half of the participants (52.7%) had poor knowledge levels, while 39.3% demonstrated moderate knowledge, and only 8.0% had good knowledge levels. Regarding attitudes, 44.2% of participants exhibited negative attitudes, compared with 34.4% who had neutral attitudes and 21.4% who demonstrated positive attitudes. As for preventive practices, the majority of participants (59.2%) demonstrated moderate levels, whereas 25.6% had poor practices and only 15.2% exhibited good preventive practices.

Table 4 shows the comparison of knowledge, attitude, and practice scores across different sociodemographic characteristics. Knowledge scores were significantly higher among

participants working or studying in the healthcare field compared with others (7.3 ± 1.3 vs. 6.1 ± 1.8, p<0.001). In contrast, attitude scores were significantly higher among participants with university education or above compared with those below university level (18.5 ± 5.8 vs. 17.1 ± 6.1, P=0.023). No statistically significant differences were observed in knowledge, attitude, or practice scores according to age group, gender, nationality, marital status, region of residence, or duration of residence in Jeddah (All P values >0.05). Similarly, practice scores did not significantly differ according to any of the studied sociodemographic variables.

In Table 5, knowledge scores showed a significant weak positive correlation with practice scores (r=0.215, P<0.001), indicating that higher knowledge levels were associated with better preventive practices. In contrast, attitude scores demonstrated a significant, very weak negative correlation with practice scores (r = -0.148, P=0.003). No significant correlation was observed between knowledge and attitude scores (r=0.041, P=0.420).

The univariate logistic regression analyses of factors associated with poor knowledge and negative attitude toward dengue fever revealed that participants who were not studying or working in the healthcare sector had significantly higher odds of poor knowledge compared with those in the healthcare field (OR=4.109, 95% CI: 2.201-7.670, P<0.001). Regarding attitude, residing in Central Jeddah was significantly associated with a negative attitude toward dengue fever (OR=1.737, 95% CI: 1.053-2.865, P=0.030). Additionally, participants with educational levels below university had significantly higher odds of having a negative attitude compared with those with university education or higher (OR=1.521, 95% CI: 1.004-2.304, P=0.048) **(Table 6).**

Figure 2 shows that friends were the most commonly reported source of information (77.0%), followed by the Ministry of Health (71.6%) and traditional media sources, including television, broadcasts, and newspapers (71.3%). Social media platforms such as Facebook, Instagram, and Twitter were also frequently reported as information sources (69.8%). Posters and billboards were reported by more than half of the participants (58.1%).

Discussion

The present study assessed knowledge, attitudes, and preventive practices regarding dengue fever among residents of Jeddah, Saudi Arabia. Overall, the findings demonstrated suboptimal levels of knowledge and attitudes toward dengue fever, while preventive practices were generally moderate. More than half (52.7%) of the participants exhibited poor knowledge levels, and only a small proportion (8.0%) demonstrated good knowledge. Similarly, a considerable proportion (44.2%) exhibited negative attitudes toward dengue prevention and control. Although preventive practices were relatively better, with moderate practices constituting 59.2%, only a minority (15.2%) of respondents reported good preventive behaviors. These findings point to persistent gaps in public awareness and community engagement regarding dengue prevention despite the endemic nature of the disease in Jeddah.

Regarding knowledge, the present study found that participants were generally aware of the basic nature of dengue fever, as most correctly identified dengue as a mosquito-borne viral disease and recognized common symptoms and preventive measures. These findings are consistent with prior research from Saudi Arabia (11) and other countries including Nepal (17), Brazil (18), and the Philippines (19), which similarlyreported relatively good general awareness regarding dengue transmission and general symptoms. However, important misconceptions were identified in the current study. Knowledge regarding mosquito behavior and breeding habits was markedly limited, particularly concerning daytime biting patterns and the preference for breeding in clean stagnant water. Similar misconceptions have been reported in previous KAP studies conducted in Saudi Arabia. Aziz et al. (6,20) reported persistent deficiencies in public awareness about the dengue vector in Saudi Arabia, particularly in Jeddah and Makkah regions. They further highlighted the necessity to improve community understanding of dengue vectors and preventive measures. The Jazan region of Saudi Arabia also showed similar gaps in dengue-related knowledge and misconceptions regarding mosquito control as reported by Ahmed and coworkers (12). Likewise, studies from India (21,22), Bangladesh (23), Malaysia (16), and Ethiopia (24) have found a high prevalence of inadequate awareness regarding dengue fever vectors, mosquito biting times and places, peak transmission seasons, and appropriate preventive measures among community members. Such misconceptions may negatively affect adherence to effective preventive measures and contribute to sustained mosquito breeding and disease transmission. In contrast, a study evaluating the knowledge, attitudes, and practices of healthcare professionals in Pakistan reported higher levels of knowledge, with

more than half of the participants identifying stagnant clean water as the primary breeding site for dengue vectors (25).

The current study also revealed moderate levels of attitudes toward dengue prevention and control. Nearly half of the participants believed that preventive measures could reduce the risk of infection. However, a substantial proportion did not consider themselves at risk for dengue infection, and more than half did not view elimination of mosquito breeding sites as a personal responsibility. In addition, willingness to participate in dengue control activities was relatively low. These findings indicate a low perceived susceptibility to dengue fever and limited community engagement. Comparable observations were described in Ecuador, where community members reported low motivation for dengue prevention and perceived dengue control as ineffective when neighbors failed to participate together. The study highlighted that weak social cohesion, poor community engagement, and misconceptions about dengue transmission acted as important barriers to preventive practices (26). Studies from Madeira, Portugal (27) and Indonesia (28) also demonstrated that community perceptions regarding dengue prevention were often inadequate and inconsistent, with most participants lacking a complete understanding of essential dengue-control concepts. Likewise, a mixed-methods study in Curaçao found that reduced intention to participate in mosquito breeding-site control was associated with poor self-efficacy, misconceptions about dengue transmission, and a tendency to rely on governmental responsibility rather than individual action (29). It is worth emphasizing that public attitudes play a crucial role in the adoption of preventive behaviors and the sustainability of vector-control measures. Accordingly, public health interventions should extend beyond improving knowledge alone to strengthening perceived susceptibility, fostering individual responsibility for eliminating mosquito breeding sites, and encouraging active community participation. These efforts can be enhanced through culturally tailored health education programs and community-based engagement strategies that promote long-term behavioral change and collective action against dengue transmission.

Prevention remains the most effective strategy for reducing dengue infection and largely relies on minimizing mosquito exposure and eliminating mosquito breeding sites. Standing water collected in containers should be emptied regularly to prevent mosquito breeding. In addition, adherence to personal protective measures, such as wearing protective clothing and using insect repellents, is highly recommended (30). In this regard, the present study identified a moderate overall level of preventive practices. Nevertheless, several essential preventive behaviors were not consistently adopted. Less than one-fifth of the participants reported

regularly eliminating mosquito breeding sites, while the routine use of mosquito repellents and mosquito nets remained relatively low. These findings are concerning, considering the critical role of environmental vector control in limiting dengue transmission. Similar findings have been documented in previous studies. A recent study from the Western region of Saudi Arabia similarly reported insufficient adherence to personal protective behaviors and suboptimal environmental source reduction (11). Comparable findings were also observed in Bangladesh, where many participants failed to regularly eliminate mosquito breeding sites despite understanding the role of mosquitoes in dengue transmission (31). In addition, studies from Thailand have documented inadequate household vector-control practices and poor management of mosquito breeding habitats (32). A study examining psychological barriers to dengue prevention found that lack of motivation, low perceived personal responsibility, and behavioral inaction negatively affected engagement in environmental control practices (33). This indicates that improving knowledge alone may not be sufficient to achieve sustained behavioral change.

The present study further demonstrated that participants working or studying in the healthcare field had significantly higher knowledge scores and significantly lower odds of poor knowledge compared with others. This finding is expected and may be attributed to greater exposure to health-related information, formal medical education, and disease-prevention training among healthcare-associated individuals. Similar findings have been reported in recent studies from Iran, where healthcare professionals demonstrated substantially higher levels of dengue-related knowledge, attitudes, and preventive practices because of their occupational exposure to health education and surveillance activities (34). In addition, participants with educational levels below university showed significantly higher odds of negative attitudes toward dengue fever. This finding suggests that educational attainment may influence perceptions of disease severity, individual responsibility for vector control, and willingness to participate in community-based prevention activities. Higher educational status has consistently been associated with better awareness, more positive attitudes, and greater engagement in dengue-prevention practices, likely because education improves health literacy and access to reliable health information (25,35-38). These findings highlight the importance of tailoring health education interventions to individuals with lower educational attainment through simple, culturally appropriate, and easily understandable communication strategies to improve community awareness, attitudes, and participation in dengue-control measures. Furthermore, residing in Central Jeddah was significantly associated with a higher likelihood of negative

attitudes toward dengue fever, suggesting that geographical context within the city may influence risk perception and health-related attitudes. Urban central districts are often characterized by higher population mobility and more heterogeneous social structures, which can reduce collective participation in public health activities such as source reduction campaigns. This may partly explain the more negative attitudes observed toward dengue prevention responsibilities and community participation. This finding should be considered when adapting health promotion strategies within Jeddah City.

Interestingly, no significant differences in knowledge, attitudes, or preventive practices were observed according to age, gender, nationality, marital status, or duration of residence in Jeddah. These findings may indicate that gaps in dengue-related awareness and preventive behaviors are relatively widespread across different demographic groups within the community. A recent systematic review from Thailand highlighted substantial heterogeneity across studies regarding the influence of demographic characteristics on dengue-related KAP outcomes, suggesting that these relationships may vary according to local epidemiological and sociocultural contexts (39). However, other studies conducted in Indonesia (40), the United Arab Emirates (41), Malaysia (16), and India (42) have demonstrated significant associations between sociodemographic factors such as occupation, socioeconomic status, gender, and residential setting and dengue-related awareness, attitudes, or preventive behaviors. Such variations across studies may reflect differences in study populations, access to health information, effectiveness of public health campaigns, and cultural perceptions. These findings emphasize the need for broad community-wide dengue education strategies while also considering targeted interventions for vulnerable population groups identified within specific local contexts.

Correlation analysis revealed a weak but significant positive correlation between knowledge and preventive practices, indicating that higher knowledge levels were associated with better dengue-prevention behaviors. This finding supports the important role of public health education in promoting community engagement in dengue prevention. Similar associations have been reported in recent studies from Bangladesh and Yemen, where improved knowledge was significantly associated with better preventive practices and greater participation in vector-control activities (43,44). However, the relatively weak strength of the correlation suggests that knowledge alone may not be sufficient to ensure sustained behavioral change. Previous studies have shown that although communities may possess acceptable levels of awareness regarding dengue transmission and prevention, adherence to preventive measures often remains

inconsistent because behavioral adoption is influenced by multiple interacting factors, including perceived susceptibility, environmental conditions, social responsibility, economic limitations, and accessibility of preventive resources (28). In contrast, attitudes demonstrated a very weak negative correlation with practice scores, which may reflect the complex and multifactorial relationship between perceptions and actual health behaviors. Similar findings were reported in previous studies (45,46), where participants demonstrated moderate-to-high knowledge and positive attitudes, yet preventive practices remained suboptimal, and community participation in dengue-control activities was limited.

Regarding sources of information, friends represented the most commonly reported source of dengue-related information, followed by the Ministry of Health, traditional media, and social media platforms. This finding highlights the important influence of interpersonal communication and public media on community awareness. The substantial contribution of social media platforms suggests their potential value as effective tools for disseminating dengue-related educational messages and promoting community engagement in vector-control activities.

Limitations

The study has some limitations. The use of a non-probability sampling approach may have introduced selection bias, potentially limiting the generalizability of the findings to the broader population of Jeddah. In addition, data collection using a self-administered questionnaire increases the possibility of recall bias and social desirability bias, particularly in responses related to knowledge, attitudes, and preventive practices regarding dengue fever. This may have led to either overestimation or underestimation of actual behaviors and perceptions. Finally, the cross-sectional design of the study limits the ability to infer causal relationships between sociodemographic factors and dengue-related KAP outcomes, as exposure and outcome were assessed simultaneously.

Conclusions

This study elucidates a prevailing deficiency in knowledge, attitudes, and preventive practices concerning dengue fever among the adult population of Jeddah, Saudi Arabia. Important misconceptions were identified regarding mosquito biting behavior, mosquito breeding habitats, and appropriate dengue management. Moreover, attitudes toward personal responsibility and community participation in dengue-control activities were suboptimal; specifically, individuals with lower educational attainment demonstrated a higher propensity

for negative perceptions toward preventive measures. The absence of significant differences across most sociodemographic characteristics suggests that gaps in dengue-related awareness and preventive behaviors are widespread throughout the community. The attenuated correlation observed between knowledge and practice scores indicates that knowledge alone may not be sufficient to achieve sustained behavioral change.

Recommendations

Overall, findings highlight the need for targeted, behavior-focused public health campaigns, rather than knowledge dissemination alone, that use culturally appropriate education tailored to individuals with lower educational attainment, strengthen risk perception and community responsibility for vector control, and prioritize higher-risk districts such as Central Jeddah. Involving healthcare workers in community outreach and conducting future longitudinal studies to assess the impact of such interventions would further support sustainable dengue-control efforts.

Acknowledgments

The authors would like to thank Ms.Ghadi Mohammed Alzahrani for her valuable assistance with data collection.

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606 **Table (1): Socio-demographic characteristics of the study participants (N = 387)**

Variable		N=387	%
Age group (years)	18–29	89	23.0
	30–49	206	53.2
	≥50	92	23.8
Gender	Female	259	66.9
	Male	128	33.1
Nationality	Non-Saudi	91	23.5
	Saudi	296	76.5
Educational level	Less than high school	39	10.1
	High school	105	27.1
	Bachelor's degree	204	52.7
	Postgraduate degree	39	10.1
Marital status	Single	119	30.7
	Married	243	62.8
	Divorced/Widowed	25	6.5
Current residence in Jeddah	North Jeddah	139	35.9
	South Jeddah	78	20.2
	East Jeddah	78	20.2
	Central Jeddah	78	20.2
	West Jeddah	14	3.6
Duration of residence in Jeddah	<1 year	24	6.2
	1–5 years	37	9.6
	>5 years	326	84.2
Working/studying in healthcare field	No	327	84.5
	Yes	60	15.5

607 N: number

608

609 **Table (2): Assessment of knowledge regarding Dengue fever among the study participants**
610 **(N=387).**

Knowledge Items	Correct answer		Incorrect/uncertain	
	N	%	N	%
Dengue is a viral disease transmitted by mosquitoes (True)	361	93.3%	26	6.7%
All types of mosquitoes transmit dengue (False)	239	61.8%	148	38.2%
Only female mosquitoes bite/suck blood (True)	**147**	**38.0%**	240	62.0%
Mosquitoes lay eggs in stagnant and dirty water (False)	**12**	**3.1%**	375	96.9%
Mosquitoes usually bite during daytime (True)	**48**	**12.4%**	339	87.6%
Dengue can be transmitted between people through mosquito bites (True)	289	74.7%	98	25.3%
Symptoms include fever, joint pain, and rash (True)	311	80.4%	76	19.6%
Dengue can be treated only by taking paracetamol (False)	**112**	**28.9%**	275	71.1%
Dengue fever can be prevented by removing mosquito breeding sites (True)	327	84.5%	60	15.5%
Wearing light-colored clothing that covers the body helps protect against mosquito bites (True)	239	61.8%	148	38.2%
Mosquito bites can be avoided by using insect repellent (cream, spray, or a mosquito net) (True)	336	86.8%	51	13.2%
Total knowledge score	Mean ± SD: 6.3± 1.8			
	Range: 0.0-11.0			

611 N: number, SD: standard deviation.
612

613 **Table (3): Assessment of attitudes and preventive practices regarding Dengue fever among**
614 **the study participants (N=387).**

Attitude items	**Negative (Likert 1–2) N (%)**	**Neutral (Likert 3) N (%)**	**Positive (Likert 4-5) N (%)**
Dengue fever is a serious disease and may lead to death.	146 (37.7%)	94 (24.3%)	147 (38.0%)
I am at risk of contracting Dengue fever.	176 (45.5%)	128 (33.1%)	83 (21.5%)
Following all preventive measures can protect me from infection.	155 (40.1%)	44 (11.4%)	188 (48.6%)
Removing mosquito breeding sites reduces the likelihood of infection.	151 (39.0%)	30 (7.8%)	206 (53.2%)
Removing mosquito breeding sites is not my responsibility. [a]	76 (19.6%)	98 (25.3%)	213 (55.0%)
I will participate in public activities related to combating Dengue fever.	161 (41.6%)	101 (26.1%)	125 (32.3%)
Total attitude score	Mean ± SD: 18.0± 6.0		
	Range: 7.0-30.0		
Practices items	**Never N (%)**	**Sometimes N (%)**	**Usually N (%)**
Have you ever eliminated mosquito breeding grounds?	183 (47.3%)	139 (35.9%)	65 (16.8%)
Have you ever seen mosquito larvae in your residential or working area? [a]	266 (68.7%)	74 (19.1%)	47 (12.1%)
Do you regularly use insecticide sprays to kill mosquitoes?	61 (15.8%)	228 (58.9%)	98 (25.3%)
Do you use insect repellent creams, liquids, or sprays while outdoors?	112 (28.9%)	185 (47.8%)	90 (23.3%)
Do you wear covered, brightly colored clothing while doing outdoor activities?	72 (18.6%)	190 (49.1%)	125 (32.3%)
Do you install mosquito nets during sleep?	232 (59.9%)	84 (21.7%)	71 (18.3%)
Total practices score	Mean ± SD: 12.0±2.3		
	Range: 7.0-18.0		

615 N: number, SD: standard deviation, superscript letter a indicates reversed coded items.
616

Table (4): Comparison of Knowledge, Attitude, and Practice scores according to sociodemographic characteristics

Variable	Category	Knowledge Score (Mean ± SD)	Attitude Score (Mean ± SD)	Practice Score (Mean ± SD)
Age group (years)	18–29	6.0 ± 2.1	18.2 ± 5.6	11.7 ± 2.5
	30–49	6.5 ± 1.7	18.2 ± 6.0	12.1 ± 2.2
	≥50	6.0 ± 1.7	17.5 ± 6.3	12.2 ± 2.2
P-Value (ANOVA)		0.071	0.591	0.304
Gender	Female	6.3 ± 1.8	18.2 ± 5.6	11.9 ± 2.3
	Male	6.1 ± 1.8	17.7 ± 6.6	12.2 ± 2.3
P-Value (Independent T test)		0.415	0.444	0.161
Nationality	Non-Saudi	6.1 ± 2.0	18.1 ± 5.8	12.0 ± 2.4
	Saudi	6.3 ± 1.8	18.0 ± 6.0	12.0 ± 2.2
P-Value (Independent T test)		0.458	0.828	0.921
Education level (grouped)	University & above	6.3 ± 1.8	18.5 ± 5.8	11.9 ± 2.2
	Below university	6.2 ± 1.9	17.1 ± 6.1	12.3 ± 2.4
P-Value (Independent T test)		0.736	**0.023***	0.077
Marital status	Single	6.2 ± 2.0	18.3 ± 5.6	11.7 ± 2.3
	Married	6.3 ± 1.7	17.9 ± 6.1	12.2 ± 2.2
	Divorced/Widowed	6.1 ± 1.8	17.3 ± 5.9	12.4 ± 2.7
P-Value (ANOVA)		0.706	0.695	0.098
Marital status (grouped)	Non-married	6.2 ± 2.0	18.1 ± 5.6	11.8 ± 2.4
	Married	6.3 ± 1.7	17.9 ± 6.1	12.2 ± 2.2
P-Value (Independent T test)		0.424	0.749	0.137
Region of residence	South Jeddah	6.2 ± 1.9	17.2 ± 5.8	11.8 ± 2.1
	East Jeddah	6.3 ± 1.9	18.2 ± 6.2	11.9 ± 2.2
	North Jeddah	6.3 ± 1.7	19.1 ± 6.0	12.0 ± 2.3
	West Jeddah	6.9 ± 1.9	18.1 ± 5.2	12.3 ± 2.8
	Central Jeddah	6.1 ± 1.8	16.9 ± 5.8	12.4 ± 2.3
P-Value (ANOVA)		0.644	0.067	0.522
Duration of residence	<1 year	5.8 ± 2.2	18.1 ± 6.0	11.8 ± 2.1
	1–5 years	6.1 ± 2.3	18.4 ± 5.9	12.2 ± 2.3
	>5 years	6.3 ± 1.7	18.0 ± 6.0	12.0 ± 2.3
P-Value (ANOVA)		0.362	0.922	0.823
Health-related occupation/study	No	6.1 ± 1.8	17.8 ± 5.9	12.0 ± 2.3
	Yes	7.3 ± 1.3	19.3 ± 6.0	11.9 ± 2.2
P-Value (Independent T test)		**<0.001***	0.076	0.654

*Significant at p<0.05, N: number, SD: standard deviation, ANOVA: One-Way Analysis of Variance

Table (5): Pearson correlation matrix between knowledge, attitude, and practice scores (N = 387)

Variables		Knowledge score	Attitude score	Practices score
Knowledge score	r	1	0.041	0.215
	P-Value	NA	0.420	<0.001*
Attitude score	r	0.041	1	-0.148
	P-Value	0.420	NA	0.003*
Practices score	r	0.215	-0.148	1
	P-Value	<0.001*	0.003*	NA

r: Pearson correlation coefficient, *Significant at p<0.05

Table (6): Univariate logistic regression analyses identifying factors associated with poor knowledge and negative attitude towards Dengue fever

Variable	B	P-Value	OR	95% CI for OR
Dependent Outcome=poor Knowledge				
Not studying or working in Health sector	1.413	<0.001*	4.109	2.201-7.670
Dependent Outcome=Negative attitude				
Central Jeddah region	0.552	0.030*	1.737	1.053 -2.865
Below University	0.420	0.048*	1.521	1.004-2.304

OR = Odds Ratio; CI = Confidence Interval; *Statistically significant at $p < 0.05$. Education reference category is "University or higher"

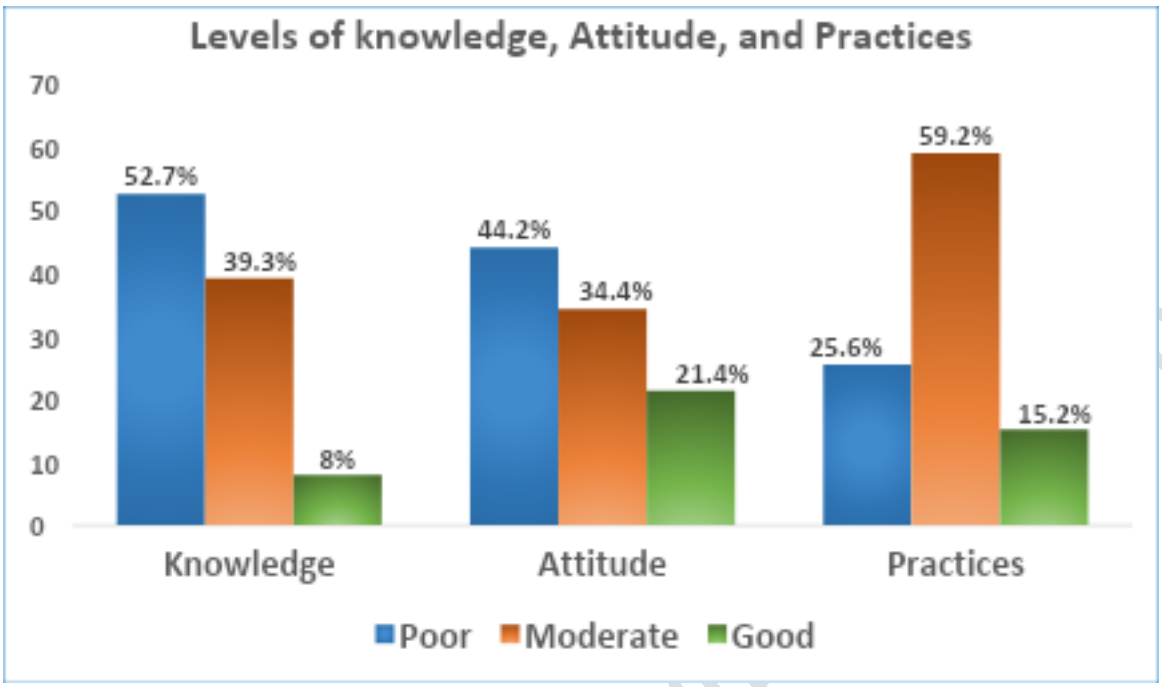

Figure 1. Distribution of knowledge, attitude, and practices levels among the study participants.

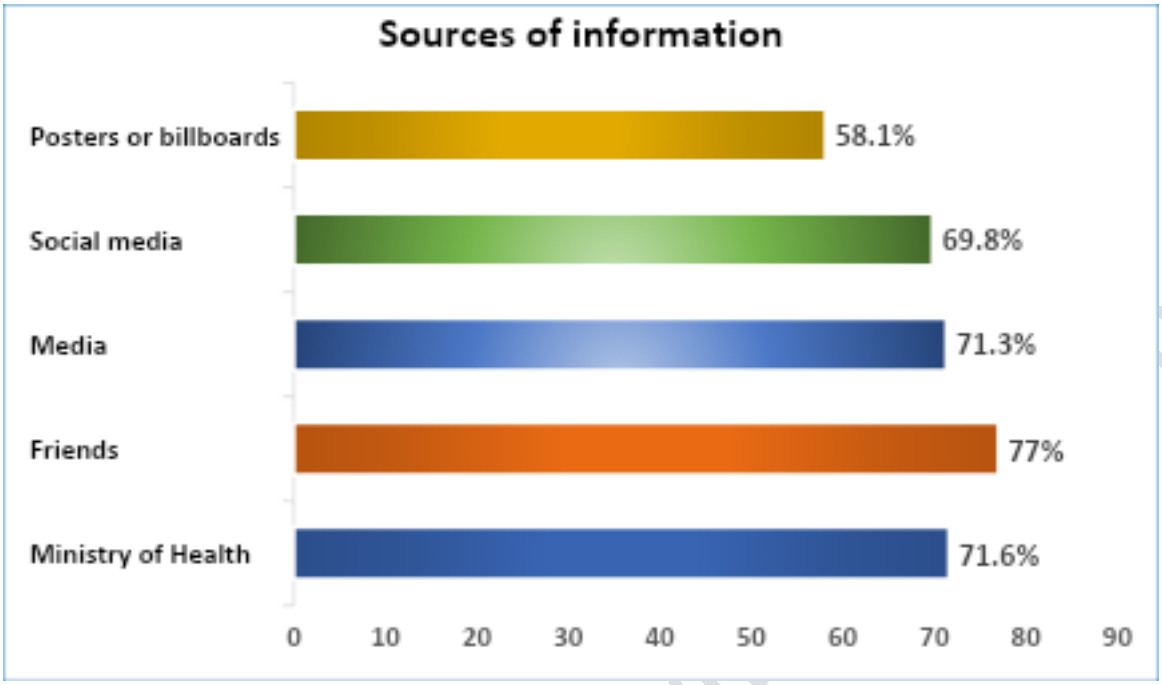

Figure 2. Distribution of sources of information about dengue fever among study participants (media: TV, broadcast, newspapers; social media: Facebook, Instagram, Twitter).