



Research Article

Knowledge, Attitude, and Preventive Practice Regarding Dengue Fever among the High-risk Population in Nepal

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Abstract

Introduction: Dengue, transmitted by Aedes mosquitoes, has been endemic in Nepal, especially in the tropical lowlands since 2004. This study examined Knowledge, Attitude, and Practice (KAP) levels regarding dengue fever among high-risk populations in Nepal's Terai lowlands. **Method:** A descriptive cross-sectional survey was conducted in specific wards of Biratnagar and Birgunj Metropolitan Cities. 280 purposively selected households were surveyed using a rigorously pre-tested KAP questionnaire, translated to ensure integrity. Data, collected from May to August 2018 through household interviews and inspections for mosquito breeding sites, was verified, cleaned, and analyzed with SPSS version 20, utilizing descriptive and inferential statistics to assess dengue prevention behaviors. **Results:** The survey in Biratnagar and Birgunj revealed moderate dengue prevention knowledge (mean score 54.20, SD 16.50) and variable practice scores (mean 66.80, SD 17.30). Positive attitudes were prevalent (87.9% in Biratnagar, 92.9% in Birgunj). Knowledge positively correlated with attitudes (0.324) and practices (0.318), while attitudes and practices also showed a positive correlation (0.356), highlighting the interdependence of these factors. **Conclusion:** The study highlights a positive association between knowledge, attitudes, and practices, indicating that improving one aspect can beneficially influence others. Despite moderate knowledge and practices, and positive attitudes among respondents, variability suggests a need for targeted interventions. The similarity in KAP levels between Biratnagar and Birgunj implies that similar strategies can be effectively applied across both cities. Future efforts should identify factors influencing these variations to tailor interventions for comprehensive dengue management and prevention.

Keywords: Attitude; Dengue Fever; High-risk Population; Knowledge and Preventive Practice.

Introduction

Dengue fever is caused by the dengue virus and is transmitted primarily by infected female Aedes aegypti

mosquitoes is a rapidly expanding infection prevalent in tropical and subtropical regions. It poses significant public health challenges worldwide, notably increasing disability

and mortality rates and straining healthcare systems (Abbasi *et al.*, 2016; Gupta, Tuladhar, Kurmi, & Das Manandhar, 2018; Handel *et al.*, 2016). This mosquito-borne viral infection manifests as a severe flu-like illness, sometimes progressing to severe dengue, a potentially fatal complication. Its incidence has surged 30-fold in the last five decades, with an estimated 50-100 million infections annually across over 100 endemic countries, exposing nearly half of the global population to risk (WHO, 2017). Dengue's life cycle involves mosquitoes as vectors and humans as primary hosts and sources of infection (WHO, 2017)), with the disease endemic in over 100 countries across WHO regions, particularly affecting the Americas, Southeast Asia, and Western Pacific regions (WHO, 2017; WHO Media Centre, 2023)

It has become endemic across most provinces of Nepal, initially detected in 2004, initially linked to travel history to neighboring India, and Indigenous cases have since been reported (Department of Health services, 2018)). The incidence of dengue has increased, especially in the tropical lowlands and subtropical hilly areas, including the capital, Kathmandu. The period from 2006 to 2022 witnessed multiple outbreaks, with significant episodes in 2006 and 2010, highlighting the disease's persistent spread across various districts. Entomological studies conducted between 2006 and 2010 identified *A. aegypti* in five peri-urban regions of the Terai, confirming local transmission. Although the number of cases fluctuated between 2012 and 2015, yearly outbreaks continued, peaking in 2019 when the disease impacted 68 of the 77 districts, with nearly 18,000 cases reported (Department of Health Services, 2024). The COVID-19 pandemic in 2020-2021 saw a temporary decline in cases; however, 2022 marked the largest outbreak recorded in Nepal, with over 56,000 cases and 88 fatalities. Dengue now represents a major health challenge throughout Nepal, with endemic transmission reported year-round in all districts. Efforts to mitigate dengue mortality are ongoing, as outlined in national health strategies (Department of Health Services, 2024).

The national primary goal is to diminish the morbidity and mortality associated with dengue fever, dengue hemorrhagic fever (DHF), and dengue shock syndrome (DSS). The objectives set to achieve this goal include the development of an integrated vector management (IVM) approach to prevent and control dengue transmission, enhancing capacities for diagnosis and case management of dengue and its severe forms, intensifying health education along with information, education, and communication (IEC) activities, and bolstering the surveillance system for better prediction, early detection, and rapid response to dengue outbreaks. Strategically, the approach encompasses early detection, diagnosis, management, and reporting of dengue cases, regular monitoring through the Early Warning and Response System (EWARS), conducting

mosquito vector surveillance in municipalities, and implementing an integrated vector control strategy that combines multiple tactics aimed at containment and source reduction of the mosquito vector (Department of Health Services, 2024).

Several studies across different regions have evaluated the knowledge, attitudes, and practices (KAP) regarding dengue fever, highlighting varying levels of awareness and preventive behaviors. In Chittoor, India, a significant majority of urban slum dwellers acknowledged mosquitoes as disease vectors and utilized preventive measures like repellents, though only a moderate proportion could identify breeding sites (Nagoor *et al.*, 2017). In contrast, a study in Aceh, Indonesia, found that while nearly half of the participants had good knowledge of dengue, fewer demonstrated effective preventive practices and positive correlations were noted between knowledge, attitudes, and practices (Harapan *et al.*, 2018). Similarly, in Karachi, Pakistan, despite moderate knowledge levels, actual preventive practices were less satisfactory, as assessed using the Health Belief Model (Siddiqui, Ghazal, Bibi, Ahmed, & Sajjad, 2016). Meanwhile, in Nepal, a community-based survey showed low comprehensive knowledge about dengue despite a high level of initial awareness, with geographical variations significantly affecting knowledge levels (Dhimal *et al.*, 2014). These studies collectively suggest that while awareness of dengue is often high, there is a crucial need for targeted educational interventions that enhance both the depth of knowledge and the adoption of effective preventive practices.

This study endeavours to evaluate knowledge, attitudes, and practices (KAP) related to dengue among high-risk populations in Biratnagar and Birgunj, both recognized as dengue-prevalent areas in Nepal. It aims to evaluate how much the communities know about dengue, their attitudes towards its prevention and management, and the practices they adopt to mitigate it. The research also seeks to compare these aspects between the two cities and analyze the interrelationships among the KAP components to gauge the effectiveness of existing dengue interventions in these regions. With no definitive treatment or vaccine available, the World Health Organization advocates for preventive measures centered on disseminating knowledge about dengue and its preventive strategies to the populace (WHO Media Centre, 2023). Despite ongoing efforts to combat the dengue virus, national survey data indicate a persistent rise in its prevalence (Abbasi *et al.*, 2016). Consequently, prioritizing primordial and primary prevention emerges as a cost-effective approach for dengue control. To achieve this, acquiring baseline data regarding the community's understanding and implementation of dengue preventive measures becomes imperative. Subsequently, the insights gleaned from this study will inform the development of information, education, and communication (IEC)

materials, as well as behavior change communication (BCC) programs aimed at bolstering dengue prevention and control efforts across Nepal.

Method

The study investigated the KAP level of dengue fever, among high-risk populations focusing on the Terai lowlands, a region bordering the Indian state of Bihar, identified as a primary entry route from India into Nepal. This area is recognized for harboring the *Aedes* mosquito, which transmits dengue fever and has been associated with the introduction of the DENV-2 strain into Nepal (Pandey *et al.*, 2008). Dengue remains a significant public health issue in this region (Shah *et al.*, 2012). The survey commenced with the identification of dengue-prevalent areas by the district public health office, leading to the selection of specific wards in Biratnagar and Birgunj Metropolitan Cities. Wards 1 and 2 in Biratnagar and wards 2, 3, and 16 in Birgunj were chosen for data collection. In each selected ward, 56 households were purposively sampled, and interviews were conducted with the household heads or, if unavailable, with another adult member.

The sample comprised 280 households from the two cities. The study utilized a Knowledge, Attitude, and Practice (KAP) questionnaire, previously employed in Nepal and adapted for research (Dhimal *et al.*, 2014). The questionnaire was translated into Nepali and back into English to preserve the integrity of the questions. Pre-testing was done in Biratnagar ward no 1 with 10% of respondents, leading to necessary adjustments to the questionnaire.

The instrument was valid and reliable, with Cronbach's Alpha coefficients of 0.82, 0.70, and 0.71 for the KAP domains, respectively (Dhimal *et al.*, 2014). Ethical clearance was taken from the Institutional Ethical Review Board, and administrative permissions were obtained from the respective wards. The interviews emphasized voluntary participation, allowing respondents the freedom to withdraw at any time.

Data collection took place from May to August 2018, with each question asked sequentially to minimize bias. Observations for potential mosquito breeding sites were

also conducted. Data accuracy was maintained through immediate verification of the completed questionnaires for completeness and consistency. The data was then cleaned, entered into SPSS version 20, and analyzed using both descriptive and inferential statistical methods.

Results

Table 1 presents the findings related to respondents' knowledge, attitudes, and practices regarding dengue fever. Each characteristic is measured on a scale, with different ranges indicating the minimum, maximum, mean, and standard deviation of the respondents' responses.

Knowledge: The respondents' knowledge regarding dengue fever ranges from a minimum score of 4.00 to a maximum of 92.00. The mean knowledge score is 54.20, indicating a moderate level of knowledge among the respondents. The standard deviation of 16.50 suggests considerable variability in the knowledge levels among the respondents, with some having significantly higher or lower knowledge scores than the mean.

Attitude: The respondents' attitudes towards dengue fever range from a minimum score of 0.00 to a maximum of 100.00. The mean attitude score is 74.10, indicating a generally positive attitude toward dengue fever prevention and management. However, the standard deviation of 16.60 suggests that there is variability in attitudes among the respondents, with some holding more extreme attitudes than others.

Practice: The respondents' practices related to dengue fever range from a minimum score of 5.00 to a maximum of 100.00. The mean practice score is 66.80, indicating moderate adherence to dengue prevention and control measures among the respondents. The standard deviation of 17.30 suggests variability in practices among respondents, with some exhibiting more consistent adherence to preventive measures than others.

Overall, the findings suggest that while respondents generally have moderate knowledge, positive attitudes, and moderate practices regarding dengue fever, there is variability among individuals in each of these aspects.

Table 1: Respondents Knowledge, Attitudes &Practice Regarding Dengue Fever (n=280)

Characteristics	Minimum	Maximum	Mean	Std. Deviation
Knowledge	4.00	92.00	54.20	16.50
Attitude	0.00	100.00	74.10	16.60
Practice	5.00	100.00	66.80	17.30

Table 2 presents a comparison of knowledge, attitude, and practice regarding dengue fever among high-risk populations in Birgunj and Biratnagar. The table provides details on the distribution of respondents based on their knowledge level, practice level, and attitude score, along with corresponding p-values indicating the significance of the differences between the two locations.

Knowledge Level

In Biratnagar, the survey revealed that 132 respondents, comprising 94.3% of the sample, had poor knowledge about dengue fever, while only 8 respondents, accounting for 5.7% of the sample, demonstrated good knowledge. Similarly, in Birgunj, the majority of respondents, 129 individuals (92.1%), exhibited poor knowledge, while a smaller proportion, 11 respondents (7.9%), possessed good knowledge regarding dengue fever. The study encompassed 140 respondents in each location. Statistical analysis indicated that the p-value (0.476) did not show a significant difference in knowledge levels between Birgunj and Biratnagar.

Practice Level

The survey findings from Biratnagar revealed that a majority of respondents, totaling 101 individuals (72.1%), exhibited poor practices concerning dengue fever prevention, whereas 39 respondents (27.9%) demonstrated good practices. Similarly, in Birgunj, the data showed that

94 respondents (67.1%) had poor practices, while 46 respondents (32.9%) showcased good practices in dengue fever prevention. Each location was represented by 140 respondents. Upon statistical analysis, the p-value (0.363) suggested no significant difference in practice levels between Birgunj and Biratnagar.

Attitude Score

The survey conducted in Biratnagar revealed that 17 respondents (12.1%) displayed a negative attitude towards dengue fever, whereas a majority of 123 respondents (87.9%) exhibited a positive attitude. Similarly, in Birgunj, the data indicated that 10 respondents (7.1%) held a negative attitude, while 130 respondents (92.9%) showed a positive attitude towards dengue fever. Each location was represented by 140 respondents. The statistical analysis, with a calculated p-value of 0.156, indicated no significant difference in attitude scores between Birgunj and Biratnagar.

Overall, the findings indicate that there are similarities in knowledge, practice, and attitude regarding dengue fever between the high-risk populations of Birgunj and Biratnagar. Despite some differences in the proportions, the p-values suggest that these differences are not statistically significant. It implies that both locations might require similar interventions and strategies to address dengue fever effectively.

Table 2: Comparison of Knowledge, Attitude, and Practice Regarding Dengue Fever among High-risk Population of Birgunj and Biratnagar (n=280)

Knowledge Level					
Place	Poor	Good	Total	Value	P-Value
Biratnagar	132 (94.3%)	8(5,7%)	140	0.506	0.476
Birgunj	129(92.1%)	11(7.9%)	140		
Total	261(93.2%)	19(6.8%)	280(100%)		
Practice Level					
	Poor	Good	Total	Value	P-Value
Biratnagar	101(72.1%)	39(27.9%)	140	0.828	0.363
Birgunj	94(67.1%)	46(32.9%)	140		
Total	195(69.6%)	85(30.4%)	280(100%)		
Attitude Score					
	Negative	Positive	Total	Value	P-Value
Biratnagar	17(12.1%)	123(87.9%)	140	2.008	0.156
Birgunj	10(7.1%)	130(92.9%)	140		
Total	27(9.6%)	253(90.4%)	280 (100.0%)		

Table 3: Correlations between knowledge Attitude & Practice (n=280)

	Knowledge score	Attitude score	Practice score
Knowledge score	1	.324**	.318**
Attitude score	.324**	1	.356**
Practice score	.318**	.356**	1

Pearson Correlation

Table 3 displays the correlations between knowledge, attitude, and practice scores related to dengue fever. These correlations are measured using Pearson correlation coefficients, which indicate the strength and direction of the relationship between each pair of variables. Here's a detailed breakdown of the findings.

The correlation analysis revealed several significant findings. Firstly, the correlation coefficient between knowledge scores and themselves, known as auto-correlation, was calculated as 1. This perfect correlation indicates the inherent relationship of the variable with itself. Additionally, the correlation coefficient between knowledge scores and attitude scores was found to be 0.324**, significant at the 0.01 level. Similarly, the correlation coefficient between knowledge scores and practice scores was determined to be 0.318**, also significant at the 0.01 level. These correlations suggest a moderate positive relationship between knowledge scores and both attitude and practice scores. Essentially, individuals with higher knowledge scores exhibited more positive attitudes and better practices concerning dengue fever prevention and control, as indicated by the data analysis.

Upon conducting a correlation analysis, notable findings emerged. Firstly, the correlation coefficient between attitude scores and knowledge scores was determined to be 0.324**, which was significant at the 0.01 level. This indicates a moderate positive relationship between attitudes and knowledge, aligning with previous observations. As anticipated in auto-correlation, the correlation coefficient between attitude scores and themselves was 1. Furthermore, the correlation coefficient between attitude scores and practice scores was calculated to be 0.356**, also significant at the 0.01 level. These correlations collectively suggest that individuals with more positive attitudes toward dengue fever prevention and control are likely to possess higher knowledge levels and demonstrate better preventive practices.

Upon analyzing the data, it was found that the correlation coefficient between practice scores and knowledge scores stood at 0.318**, a statistically significant value at the 0.01 level. This reaffirms the observed association between knowledge and practice in the context of dengue fever prevention and control. Similarly, the correlation coefficient between practice scores and attitude scores was determined to be 0.356**, also significant at the 0.01 level,

indicating a moderate positive relationship between these variables. Furthermore, the auto-correlation for practice scores was established to be 1. These results suggest that individuals exhibiting better practices concerning dengue fever prevention and control are more likely to possess higher levels of knowledge and maintain more positive attitudes towards such measures.

Overall, the correlations in Table 3 suggest that knowledge, attitude, and practice regarding dengue fever are positively associated with each other. This indicates that interventions targeting one aspect (e.g., improving knowledge) may have positive spillover effects on the other aspects (e.g., attitude and practice), emphasizing the importance of comprehensive approaches to dengue fever management and prevention.

Discussion

The research discussion on the Knowledge, Attitudes, and Practices (KAP) of dengue prevention among high-risk populations in Biratnagar and Birgunj, Nepal, provides insights into the current state of dengue management and identifies critical areas for intervention. The findings from this study suggest that while there is a general awareness and a moderately positive attitude toward dengue prevention, actual practices vary considerably among individuals. This variation is reflective of the broader challenges that public health programs often encounter in disease-endemic regions.

The findings across multiple studies reveal varying levels of knowledge, attitudes, and practices (KAP) regarding dengue fever in different high-risk populations, reflecting diverse geographical and socio-demographic contexts. For instance, (Nagoor *et al.*, 2017) reported that a significant portion of participants in the urban slums of Chittoor, India, recognized mosquitoes as disease vectors and actively used preventive measures like repellents and coils. Meanwhile, studies by (Harapan *et al.*, 2018) and (Siddiqui *et al.*, 2016) further support the positive correlation between higher knowledge levels and more proactive prevention attitudes and practices. These studies underscore the importance of tailored educational interventions that address local beliefs and misinformation to elevate knowledge levels effectively. Notably, the variability in KAP also points to the need for interventions that are customized to specific community needs and contexts, such as those implemented in Aceh, Indonesia, and Karachi, Pakistan, where socio-economic

and cultural factors significantly influence the effectiveness of dengue prevention strategies (Harapan *et al.*, 2018; Siddiqui *et al.*, 2016). Furthermore, studies like those by (Dhimal *et al.*, 2014) in Nepal and (Ibrahim *et al.*, 2020) in Jeddah emphasize the critical role of education in improving dengue prevention practices, particularly among younger populations and those with lower baseline knowledge levels. These findings collectively advocate for integrated public health approaches that enhance community engagement and utilize both education and resource distribution to combat dengue effectively across varied settings.

Recent research underscores the impact of educational interventions on dengue prevention outcomes. For instance, studies from other dengue-endemic areas like Brazil and Thailand have shown that increased community awareness and education lead to more proactive measures in mosquito control and personal protection, mirroring the positive correlations between knowledge, attitudes, and practices observed in our study (Jain *et al.*, 2014). These studies, similar to our findings, highlight that knowledge is not just a precursor but also a catalyst that enhances positive attitudes and effective practices, which are essential for reducing the incidence of dengue.

Moreover, the modest correlation coefficients in our study (knowledge and attitude at 0.324, knowledge and practice at 0.318) are in line with global research suggesting that while knowledge is a critical component, its translation into practice might require additional reinforcements through community engagement and sustained public health messaging. The relationship between attitudes and practices (0.356) further supports the hypothesis that positive attitudes toward dengue prevention can significantly bolster the implementation of effective practices. This is crucial in settings like Biratnagar and Birgunj, where the prevalence of dengue necessitates robust community-level interventions.

In line with global best practices, our analysis suggests that interventions in Biratnagar and Birgunj should not only be informative but also motivational, reinforcing positive attitudes and empowering communities with the skills and resources to implement effective dengue prevention strategies. Integrating these approaches with local cultural and social dynamics, as evidenced in successful programs from similar contexts, can enhance the effectiveness of these interventions, ensuring they are both accepted and sustained over time. Thus, our research not only aligns with the global understanding of health behavior dynamics in dengue prevention but also contributes to the evolving strategies for disease management in endemic regions, emphasizing the need for comprehensive, culturally tailored educational programs that address knowledge, attitudes, and practices in unison.

This analysis emphasizes the importance of comprehensive educational programs that simultaneously target improvements in knowledge, attitude, and practices. Given the current levels of practice and the associations identified, interventions that enhance knowledge and attitudes could have cascading positive effects on prevention practices. Such strategies should be tailored to address the specific needs and cultural contexts of Biratnagar and Birgunj, focusing on community-based education and involvement to increase the overall effectiveness of dengue fever management and prevention in these high-risk regions.

In Nepal, there are established national guidelines for the prevention, management, and control of dengue, including comprehensive, month-wise action plans tailored to dengue control and prevention. However, challenges remain, such as the low priority given to dengue control programs at the subnational level and inadequate training for health workers. Issues with underreporting or overreporting of cases, and the limitations of the Early Warning and Reporting System (EWARS) system in capturing cases tested outside designated sentinel sites, hamper accurate outbreak prediction (Department of Health Services, 2024). Other concerns include limited capacity for early detection and response, constrained entomological capacity and vector surveillance due to resource shortages, and the impact of climate change and urbanization on mosquito populations and dengue transmission. Additionally, there is limited engagement of non-health ministries in vector control, low community compliance, and insufficient multi-stakeholder engagement at local levels. The potential for sudden and unpredictable outbreaks also poses a risk of overwhelming healthcare systems and straining resources, compounded by a lack of dengue reporting from private healthcare institutions (Department of Health Services, 2024).

This study highlighted several key points that inform both the current understanding and future direction for dengue fever prevention strategies. While the research was limited by its focus on specific wards and the use of purposive sampling, which may affect the broader applicability of the findings, it demonstrates the need for comprehensive and tailored public health interventions. The moderate levels of knowledge and practice paired with generally positive attitudes present an opportunity to enhance dengue prevention efforts through integrated strategies that leverage this positive outlook. The similarity in responses between the two locations suggests that standardized approaches could be effective across similar settings. However, the variability observed within the communities indicates that interventions should also consider local nuances to maximize impact. Recommendations for future action include implementing holistic programs that address all aspects of dengue prevention—knowledge, attitudes, and practices—while continuing to research local factors

that can inform more customized strategies. This approach is expected to not only increase the effectiveness of interventions but also significantly reduce the incidence and impact of dengue fever in these regions.

Authors' Contribution

All authors contributed equally at all stages of research, data collection and manuscript preparation. Final form of manuscript was approved by all authors.

Conflict of Interest

No conflict of interest exists with the present publication.

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