Assessment of Knowledge, Attitudes, and Practices towards Dengue Fever and its Vectors among Residents of Various Ecological Regions in Eastern Nepal

Government of Nepal
Nepal Health Research Council (NHRC)
Ramshah Path, Kathmandu, Nepal

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Dr. Pramod Joshi
Executive Chief (Member Secretary)
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List of Abbreviations

DF	:	Dengue Fever
DHF	:	Dengue Hemorrhagic Fever
DSS	:	Dengue Shock Syndrome
WHO	:	World Health Organization
KAP	:	Knowledge Attitude and Practice
OR	:	Odds Ratio

Executive Summary

Dengue virus is a single-stranded RNA virus transmitted by *Aedes* mosquitoes. It belongs to the genus Flavivirus (family Flaviviridae) and includes four serotypes capable of causing disease ranging from self-limiting dengue fever to life-threatening dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). Globally, dengue has surged, with an estimated 390 million infections each year; around 96 million of these result in clinically apparent disease, many of which are severe. The Americas, South-East Asia, and Western Pacific regions are the most affected, with Asia accounting for approximately 70% of the global disease burden.

Since the first dengue outbreak in 2006, Nepal has faced regular annual dengue outbreaks, from lowland to highland areas, with particularly significant outbreaks in 2022. Understanding people's perceptions and behaviors is critical to designing effective, context-specific prevention and control strategies. Although several studies have examined dengue in Nepal, little attention has been given to differences across altitudinal regions in eastern Nepal. This study therefore aimed to assess people's knowledge, attitudes, and practices (KAP) regarding dengue and vector prevention and control at different altitudes in eastern Nepal.

In this cross-sectional study conducted in six districts of eastern Nepal, participants were categorized according to residence in highland or lowland areas. Knowledge, attitudes, and preventive practices related to dengue were assessed using a structured questionnaire, and KAP scores were calculated. Sociodemographic characteristics were recorded and analyzed to examine associations with KAP levels, using logistic regression for comparison.

Among 662 participants, 31.1% resided in highland areas and 68.9% in lowland regions. Almost all participants (98.3%) had heard of dengue. However, only 6.9% demonstrated good knowledge, 75.4% showed a positive attitude, and 26.7% reported good preventive practices, with no significant differences between highland and lowland residents. Gender, education level, and income were significant predictors of both attitude and practice. There was a negative correlation between knowledge and attitude, and between attitude and practice, while knowledge showed a weak but statistically significant positive correlation with preventive practices.

These findings highlight a critical gap: while most participants have heard of dengue and many hold positive attitudes toward prevention, this does not translate into adequate preventive practices. Poor knowledge and limited behavior change directly impede effective dengue prevention at the community level. For policymakers, this underscores the need to:

- Prioritize targeted, evidence-based health education and risk communication strategies tailored to different sociodemographic and altitudinal contexts.
- Strengthen community-based behavior change interventions that go beyond raising awareness to actively support and sustain preventive practices.
- Integrate dengue prevention messages into existing health and social services, schools, and local governance structures, with particular focus on women, lower education groups, and lower-income households.

Effective, sustained educational and community engagement strategies are essential to translate awareness and positive attitudes into concrete preventive actions and to reduce the dengue burden in eastern Nepal.

Background

Dengue, a mosquito borne viral disease is transmitted by the bite of female *Aedes aegypti* and *Aedes albopictus* resulting from any of the four serotypes of the dengue virus (DENV 1-4). It is a RNA virus categorized within the Flavivirus genus of the Flaviviridae family (1). Around half of the global population faces the threat of dengue, with an approximate annual occurrence of 100–400 million infections (2). The range of dengue illness varies, from asymptomatic cases to mild cases of dengue fever, to severe conditions like dengue hemorrhagic fever and dengue shock syndrome, which can be life-threatening (3).

Nepal faced its very first local outbreak in the year 2006, though the first reported case was detected in 2004 in a Japanese Volunteer. Since then the sporadic cases were detected in Nepal year by year with major epidemic in 2010, 2013, 2017 and 2019 (4). Until 2018, the majority of dengue cases were documented in lowland areas. However, in 2019, cases emerged in highland regions, previously not identified as dengue-endemic (4–6). In 2022, Nepal experienced its largest outbreak affecting 7 provinces and 77 districts with a total of 54,784 cases and 88 deaths (7). From 2004 to 2022, there was a steady rise in dengue cases, accompanied by a notable spread across all provinces of the country (8). The country's warm and humid climate combined with rapid and poorly managed urbanization, significant trade and transit from regions affected by dengue, and inadequate health infrastructure have made an ideal environment for the proliferation of the Aedes vector mosquito (9). Without enhancing the current national strategy for preventing dengue, improving healthcare planning, and allocating additional resources, dengue outbreaks in Nepal are expected to persist, potentially escalating in scale and impact (10). Dengue immunity is specific to serotypes, meaning individuals infected during this outbreak won't be safeguarded against other serotypes. In fact, there's evidence indicating they might face a higher risk of severe illness if infected with different serotypes (9).

Although a new vaccine is under development, it does not offer a short-term solution to the immediate threat of dengue outbreaks in Nepal. Additionally, there is currently no targeted treatment for DF. Therefore, it remains essential to focus on controlling the populations of DENV vector mosquitoes, notably *Aedes aegypti and Aedes albopictus*, and preventing their spread to new areas to effectively curb DENV transmission (10). However, an understanding of locally adapted vector control is not possible without combining the social and ecological perspective. Preventive measures such as individual exposure prophylaxis (dengue vaccination), avoidance of open water containers and destroying of mosquito breeding grounds at private properties are essential to reduce disease burden from mosquitoes, but the implementation of preventive measures heavily depends on the knowledge, attitude and practice (KAP) of local people (11). Furthermore, access to and quality of health services (vaccination, information about mosquito-borne diseases) and functioning of public services (water service) influence the risk for vector-borne disease. Numerous investigations have delved into the KAP concerning dengue within Nepal, with a particular emphasis on the central (11,12) and, to a lesser extent, certain areas of the southern (13) and eastern (14) regions. Yet, a noticeable research

gap exists, specifically in scrutinizing altitudinally diverse transects within the eastern region of Nepal. This study aims to assess the KAP related to dengue and its vectors in eastern Nepal. We seek to understand how people in this region perceive dengue, what they know about it, and how they act to prevent it.

Rationale

In recent years, the geographic distributions of vector-borne diseases mostly transmittable by mosquitoes have expanded in Nepal and are the major causes of morbidity and mortality. By systematically evaluating what people know about dengue, how they perceive the disease, and what actions they take to prevent or manage it, public health authorities can tailor interventions more effectively. Studies have shown that inadequate knowledge about dengue transmission and prevention among communities can hinder efforts to control outbreaks (15). Similarly, positive attitudes towards preventive measures, such as vector control and personal protection, are essential for their successful implementation (16). However, there often exists a discrepancy between knowledge, attitudes, and actual practices, highlighting the need for targeted educational campaigns that not only inform but also motivate behavioral change (17). By identifying factors influencing these components, such as socioeconomic status, access to healthcare, and cultural beliefs, interventions can be designed to enhance community engagement and compliance with preventive measures (18). Ultimately, improving knowledge, fostering positive attitudes, and promoting effective practices among local populations are crucial steps towards reducing dengue transmission and mitigating its impact on public health.

Objectives

General objective

The general objective of this study was to assess people's knowledge and attitudes towards dengue and its vectors, as well as prevention and control practices, at different altitudes (knowledge, attitude, and practice—KAP).

Specific objectives

- To determine the level of awareness about dengue.
- To identify the common sources of information about dengue.
- To understand perceptions and beliefs about the severity and risk of dengue.
- To document actual practices related to dengue prevention and control.

Research Methods

Study Site

The eastern part of Nepal (Kosi province) was purposively selected for this study. Six sites (districts) were selected from the Koshi province: Taplejung, Ilam, Jhapa, Sankhuwasabha, Dhankuta and Sunsari.

Study Population

The study population comprised local people living in the community aged 18 years and above.

Research Design

This cross-sectional study employs a structured questionnaire to assess the knowledge, attitude, and practice of community people regarding dengue and its vectors.

Sampling Technique and Sample Size

The two stage multi sampling strategies was adopted for this study. In the first stage six municipalities (Palika) \three ecological zone-Terai, Hill and Mountain was purposively selected. In the second stage, stratified random sample approach has been implemented to select the actual location for the field survey. To define the environmental strata, building density was calculated using the building footprint data extracted from the open street map. The “osmextract” an R package was used to extract the building footprint data. The building density layer later then reclassified into the highly dense areas, moderately dense areas and sparely dense areas based on the natural jenks classification. Based on building density, we selected different numbers of households from various districts. Consequently, we recruited a total of 662 participants, one from each household, all of whom were over 18 years old and willing to participate.

Validity and Reliability of Tools

Face and Content validity was ensured after consultation with the content experts and necessary modifications were done accordingly. The structured questionnaire was developed in English which was later translated into the Nepali language by the experts.

Supervision and Monitoring

In order to ensure the standard procedures were maintained to collect the data, the core research team monitored and supervised the data collection in the field. An update of the field-level activity was done on a daily basis.

Ethical Statement

Ethical approval was taken from the Ethical Review Board of Nepal Health Research Council. All research participants took a signed written informed consent after being informed of the research subject matter and were assured that their personal information was kept private. Each participant had the right to withdraw from this study at any time.

Data Management and Analysis

The data were entered and analysed using SPSS software version 20 (SPSS Inc., Chicago, IL, USA). The total KAP score of participants regarding Dengue Fever (DF) was computed by awarding one point for each correct response and zero points for incorrect answers. Responses of "Do not know" (DNN) were also considered incorrect and given a score of zero (15). These individual scores were then added together based on the number of questions in the questionnaire, yielding a maximum total score of 35 for knowledge, 11 for attitude, and 26 for practice. Subsequently, after obtaining a combined value for each domain, participants' proficiency levels were determined. Knowledge levels were

categorized into two groups, "low knowledge score," and "high knowledge score." The two groups were divided based on an 80% threshold, wherein those scoring < 80% of the total score were classified as having low knowledge, while those scoring ≥ 80% were deemed to have high knowledge. Similarly, the levels of attitude and practice were evaluated as either "high score" or "low score" using the same 80% threshold (11,12,16). For the attitude domain, a score below 80% was considered low, and for the practice domain, a score below 80% was also deemed low. Consequently, total scores equal to or greater than 80% were categorized as high, while scores below 80% were considered low, with participants who had never heard of dengue before being excluded from the attitude and practice domains. logistic regression analysis was employed to examine the relationship between KAP scores and socio-demographic variables. Chi-square tests was employed to identify significant group differences. A p-value ≤ 0.05 was considered statistically significant. Spearman's rank correlation coefficient (rs) was used to determine the correlation values between KAP scores.

Results

Socio-demographic characteristics of the participants

Of the 662 participants included in the study 68.9% belongs to lowland and only 31.1% belongs to highland. More than half of the participants (56.9%) were female and majority of the participants belongs to the age group 30-44. Greater part of the respondent was Mountain/hill janjati (29.3%) and lesser part of them were Muslim (0.5%). Likewise, the greater part of the participants held a middle school certificate (30.5%). The vast majority of the participants (87.5%) were married. Of the total participants, close to half (48%) of the participants were primarily engaged in business. Among the socio-demographic variables, significant differences between highland and lowland populations were observed in ethnicity ($p < 0.001$), occupation ($p < 0.05$), and monthly income ($p < 0.05$).

Table 1: Table showing socio-demographic characteristics of the participants

Socio-demographic characteristics	Lowland n (%)	Highland n (%)	Total n (%)	p-value
Age group				0.275
<30	94 (20.6)	43 (20.9)	137 (20.7)	
30-44	187 (41.0)	99 (48.1)	286 (43.2)	
45-59	125 (27.4)	44 (21.4)	169 (25.5)	
>=60	50 (11.0)	20 (9.7)	70 (10.6)	
Gender				0.127
Male	187 (41.0)	98 (47.6)	285 (43.1)	
Female	269 (59.0)	108 (52.4)	377 (56.9)	

Socio-demographic characteristics	Lowland n (%)	Highland n (%)	Total n (%)	p-value
Education level				0.084
Illiterate	49 (10.8)	25 (12.1)	74 (11.2)	
Primary school certificate	94(20.7)	53 (8.0)	147 (22.2)	
Middle School certificate	151 (33.2)	51 (24.8)	202 (30.6)	
High school certificate	120 (26.4)	64 (31.1)	184 (27.8)	
Intermediate or diploma	15 (3.3)	8 (3.9)	23 (3.5)	
Graduate	26 (5.7)	5 (2.4)	31 (4.7)	
Marital status				0.154
Unmarried	53 (11.6)	20 (9.7)	73 (11.0)	
Married	393 (86.2)	186 (90.3)	579 (87.5)	
Divorced	4 (0.9)	0	4 (0.6)	
Widow/Widower	6 (1.3)	0	6(0.9)	
Ethnicity				0.00
Hill Brahmin	98 (21.5)	43 (20.9)	141 (21.3)	
Hill Chhetri	45 (9.9)	31 (15.0)	76 (11.5)	
Terai Brahmin	31 (6.8)	0	31 (4.7)	
Terai Chhetri	20 (4.4)	0	20 (3.0)	
Terai other Caste	7 (1.5)	1 (0.5)	8 (1.2)	
Hill Dalit	16 (3.5)	11 (5.3)	27 (4.1)	
Terai Dalit	13 (2.9)	3 (1.5)	16 (2.4)	
Newari	35 (7.7)	19 (9.2)	54 (8.2)	
Mountain/ Hill Janajati	118 (25.9)	76 (36.9)	194 (29.3)	
Terai Janajati	51 (11.2)	19 (9.20	70 (10.6)	
Muslim	3 (7)	0	3 (5)	
Others	19(4.2)	3 (1.5)	22 (3.3)	
Occupation				0.005
Agriculture	53(11.6)	38 (18.4)	91 (13.7)	
Business	209 (45.8)	109 (52.9)	318 (48.0)	
Student	35 (7.7)	13 (6.3)	48 (7.3)	
Service	37 (8.1)	16 (7.8)	53 (8.0)	
Housework	94 (20.6)	18 (8.7%)	112 (16.9)	
Retired	13 (2.9)	6 (2.9))	19 (2.9)	
Others	15 (3.3)	6 (2.9)	21 (3.2)	
Monthly income (NPR)				0.028

Socio-demographic characteristics	Lowland n (%)	Highland n (%)	Total n (%)	p-value
Less than 10000	98 (21.5)	28 (13.6)	126 (19.0)	
10000- 20000	135 (29.6)	64 (31.1)	199	
20000-30000	94 (20.6)	58 (28.2)	152	
30000-40000	34 (7.5)	22 (10.7)	56	
40000-50000	12 (2.6)	8 (3.9)	20	
More than 50000	10 (2.2)	5 (2.4)	15	
Don’t want to mention	73 (16.0)	21 (10.2)	94	

Knowledge on signs and symptoms of dengue

While nearly all participants (98.3%) had previously heard about dengue fever, the difference in awareness between those in the highlands and lowlands was not statistically significant. The majority of participants were able to correctly identify general symptoms of DF such as fever (93.8%) and headache (93.4%) with statistically significant difference between lowland and highland. Similarly, Our study revealed a significant difference in awareness of specific symptoms such as joint pain (p=0.005), muscle pain (0.006), pain behind the eyes (<0.001), vomiting (<0.001),rash (<0.001), diarrhea (p<0.005), back pain (<0.001), abdominal pain (P<0.001) between highland and lowland communities. Individuals residing in the lowlands demonstrated a considerably higher level of recognition for these symptoms compared to their highland counterparts. This difference was statistically significant (p-value < 0.005).

Knowledge on transmission of dengue

In our study, 86.1% of participants were aware that not all mosquitoes transmit dengue fever, yet only 33.5% correctly identified *Aedes* mosquitoes as the vector, with significantly higher awareness in lowland areas (39.9%) compared to highland areas (19.4%) (P<0.001). Additionally, a substantial majority of participants were knowledgeable that flies (90.9%) and ticks (91.5%) do not transmit dengue fever, with significantly higher awareness in lowland regions compared to highland regions (P<0.05). Despite this, 62.8% of participants were unaware that dengue virus (DENV)-transmitting mosquitoes bite during the daytime. A notable 90.8% of lowland participants and 87.4% of highland participants recognized that DENV-transmitting mosquitoes breed in stagnant water (P<0.05). Furthermore, more than half of the participants (53.5%) understood that these mosquitoes breed in clean water, with significantly higher awareness in lowland areas compared to highland areas.

Knowledge on preventive measures

The majority of participants demonstrated awareness of various dengue prevention methods, including the use of bed nets (97.1%), insecticides (87.9%), airtight water containers (94.3%), removal of stagnant water (95.2%), mosquito repellent (73.6%), and maintaining a clean environment (96.5%). Notably, knowledge levels were significantly higher in lowland areas for the use of insecticide spray, removal of stagnant water, and use of mosquito repellent compared to highland areas (P<0.05)

Table 2: Knowledge on dengue symptoms, transmission and vectors

Knowledge on symptoms	Lowland n (%)	Highland n (%)	Total n (%)	p-value
Is fever a symptom of dengue?				0.001
Yes	435 (95.4)	186 (90.3)	621 (93.8)	
No	8(1.8)	1(0.5)	9 (1.4)	
Don't know	13 (2.9)	19 (9.2)	32 (4.8)	
Is headache a symptom of dengue fever?				<0.001
Yes	438 (96.1)	180 (87.4)	618 (93.4)	
No	0	0	0	
Don't know	18 (3.9)	26 (12.6)	44 (6.6)	
Is joint pain a symptom of dengue fever?				0.005
Yes	358 (78.5)	150 (72.8)	508 (76.7)	
No	34 (7.5)	8 (3.9)	42 (6.3)	
Don't know	64 (57.1)	48 (23.3)	112 (16.9)	
Is muscle pain a symptom of dengue fever?				0.006
Yes	345 (75.7)	138 (67.0)	483 (73.0)	
No	39 (8.6)	14 (26.4)	53 (8.0)	
Don't know	72 (15.8)	54 (26.2)	126 (19.0)	
Is pain behind the eyes a symptom of dengue fever?				<0.001
Yes	280 (61.4)	102 (49.5)	382(57.7)	
No	65 (14.3)	17 (8.3)	82 (12.4)	
Don't know	111 (24.3)	87 (42.2)	198 (29.9)	
Are nausea/vomiting symptoms of dengue fever?				<0.001
Yes	343 (75.2)	144 (69.9)	487 (73.6)	
No	41 (8.0)	6 (2.9)	47 (7.1)	
Don't know	72 (15.8)	56 (27.2)	128 (19.3)	
Is rash a symptom of dengue fever?				<0.001
Yes	207 (45.4)	91(44.2)	298 (45.0)	
No	113 (24.8)	20 (9.7)	133 (20.1)	
Don't know	136 (29.8)	95 (46.1)	231 (34.9)	

Knowledge on symptoms	Lowland n (%)	Highland n (%)	Total n (%)	p-value
Is diarrhea common in dengue fever?				0.005
Yes	280 (61.4)	115 (55.8)	395 (59.7)	
No	65 (14.3)	18 (8.7)	83 (12.5)	
Don't know	111 (24.3)	73 (35.4)	184 (27.8)	
Is back pain common in dengue fever?				<0.001
Yes	294 (64.5)	117 (56.8)	411 (62.1)	
No	90 (19.7)	24 (11.7)	114 (17.2)	
Don't know	72 (15.8)	65 (31.6)	137 (20.7)	
Is abdominal pain common in dengue fever?				<0.001
Yes	228 (50.0)	96 (46.6)	324 (48.9)	
No	114 (25.0)	26 (12.6)	140 (21.1)	
Don't know	114 (25.0)	84 (40.8)	198 (29.9)	

Knowledge of transmission	Lowland n (%)	Highland n (%)	Total n (%)	p-value
Can all mosquitoes transmit dengue fever?				0.19
Yes	31 (6.8)	10 (4.9)	41 (6.2)	
No	395 (86.6)	175 (85.0)	570 (86.1)	
Don't know	30 (6.6)	21 (10.2)	51 (7.7)	
Do *Aedes* mosquitoes transmit dengue fever?				<0.001
Yes	182 (39.9)	40 (19.4)	222 (33.5)	
No	83 (18.2)	43(20.9)	126 (19.0)	
Don't know	191 (41.9)	123 (59.7)	314 (47.4)	
Do flies transmit dengue fever?				0.044
Yes	8 (1.8)	5 (2.4)	13 (2.0)	
No	423 (92.8)	179 (86.9)	602 (90.9)	
Don't know	25(5.5)	22 (10.7)	47 (7.1)	
Do ticks transmit dengue fever?				0.028
Yes	8(1.8)	3 (1.5)	11(1.7)	
No	425 (93.2)	181 (87.9)	606 (91.5)	
Don't know	23 (5.0)	22 (10.7)	45 (96.8)	

Knowledge of transmission	Lowland n (%)	Highland n (%)	Total n (%)	p-value
Can dengue fever be transmitted between two or more uninfected persons?				0.001
Yes	40 (8.8)	28 (13.6)	68 (10.3)	
No	390 (85.5)	153 (74.3)	543 (82.0)	
Don’t know	26 (5.7)	25 (12.1)	51 (7.7)	
Is Dengue fever transmitted through food and water?				0.005
Yes	43 (9.4)	29 (14.1)	72 (10.9)	
No	392 (86.0)	157 (76.2)	549 (82.9)	
Don’t know	21 (4.6)	20 (9.7)	41 (6.2)	
Can dengue fever be transmitted by blood transfusion?				0.096
Yes	256(56.1)	107 (51.9)	363 (54.8)	
No	152(33.3)	65 (31.6)	217 (32.8)	
Don’t know	48 (10.5)	34 (16.5)	82 (12.4)	
When are the dengue mosquitoes likely to feed/bite on?				0.09
Correct knowledge (day time)-yes	112 (24.6)	43(18.0)	155 (23.4)	
No	290 (63.6)	126 (61.2)	416 (62.8)	
Don't know	54 (11.8)	37 (18.0)	91 (13.7)	

Breeding sites for Aedes Mosquitoes	Lowland n (%)	Highland n (%)	Total n (%)	p-value
Mosquitoes breed in stagnant water				0.037
Yes	414 (90.8)	180(87.4)	594 (89.7)	
No	30 (6.6)	12 (5.8)	42 (6.3)	
Don’t know	12 (2.6)	14 (6.8)	26 (3.9)	
Mosquitoes breed in clean water				0.046
Yes	255 (55.9)	99 (48.1)	354 (53.5)	
No	172 (37.7)	84 (40.8)	256 (38.7)	
Don't know	29 (6.4)	23 (11.2)	52 (7.9)	

Knowledge on preventive measures for dengue	Lowland n (%)	Highland n (%)	Total n (%)	p-value
Bed nets reduce mosquitoes				0.84
Yes	444 (97.4)	199 (96.6)	643 (97.1)	
No	8(1.8)	5 (2.4)	13 (2.0)	
Don't know	4 (0.9)	2 (1.0)	6 (0.9)	
Insecticide sprays reduce mosquitoes and prevent dengue				0.006
Yes	406 (89.2)	175(85.0)	581 (87.9)	
No	29 (96.4)	9 (4.4)	38 (5.7)	
Don’t know	20 (4.4)	22 (10.7)	42 (6.4)	
Tightly covering water containers reduces mosquitoes				0.197
Yes	431 (94.5)	193 (93.7)	624 (94.3)	
No	15 (3.3)	4 (1.9)	19 (2.9)	
Don’t know	10 (2.2)	9 (4.4)	19 (2.9)	
Removal of stagnant water can prevent mosquito breeding				0.009
Yes	440 (96.5)	190 (92.2)	630 (95.2)	
No	9 (2.0)	4 (1.9)	13 (2.0)	
Don’t know	7 (1.5)	12 (5.8)	19 9(2.9)	
Mosquito repellents prevent mosquitoes				<0.001
Yes	357 (78.3)	130 (63.1)	487 (73.6)	
No	47 (10.3)	26 (12.6)	73 (11.0)	
Don’t know	52 (11.4)	50 (24.3)	102 (15.4)	
Keeping the environment clean reduce mosquitoes				0.95
Yes	440 (96.5)	199 (96.6)	639(96.5)	
No	8 (1.8)	3 (1.5)	11 (1.7)	
Don’t know	8 (1.8)	4 (1.9)	12 (1.8)	

Knowledge of Aedes Mosquitoes	Lowland n (%)	Highland n (%)	Total n (%)	p-value
Can you recognize Aedes mosquitoes?				0.095
Yes	77 (16.9)	46 (22.3)	123 (18.6)	
No	379 83.1)	160 (77.7)	539 (81.4)	

Attitudes towards dengue fever

Table 3 summarizes participants' attitudes toward dengue fever (DF). The majority of participants recognized the seriousness of DF, with 64.5% disagreeing that DF is not a serious illness. A significant portion (41.2%) felt at risk of contracting DF, and 93.2% agreed that DF can be prevented with higher agreement in the lowland (64.2%) compared to the highland (29.1%) (P<0.001).Most participants also believed in the importance of family and community efforts in preventing DF, with 79.3% agreeing that their family can help and 74.4% agreeing that neighbors have a responsibility in prevention. Additionally, 84.5% felt it was their responsibility to control dengue-causing mosquitoes, and 93.9% agreed that controlling mosquito breeding sites is a good strategy to prevent DF. Regarding specific preventive measures, 92.4% recognized that stagnant water in discarded items serves as breeding grounds for Aedes mosquitoes, and 96.1% agreed that removing these breeding sites would reduce the risk of DF among family members. Moreover, 94.1% believed in the importance of community participation in vector control, and 97.7% stated they would seek immediate medical treatment if a family member exhibited DF symptoms. Overall, participants from the lowland areas demonstrated significantly higher levels of proactive attitudes towards dengue fever prevention and control compared to those from the highland areas (P<0.05).

Table 3: Attitudes towards dengue fever

Variable	Lowland n (%)	Highland n (%)	Total n (%)	p-value
Dengue fever is not a serious illness				<0.001
Strongly agree	152 (23.0)	23 (3.5)	175 (26.4)	
Agree	32 (4.8)	11 (1.7)	43(6.5)	
Not sure	8 (1.2)	9 ((1.4)	17 (2.6)	
Disagree	264 (39.9)	16 (24.6)	427 (64.5)	
You are at risk of getting dengue				<0.001
Strongly agree	50 (7.6)	7 (1.1)	57 (8.6)	
Agree	162 (24.5)	54 (8.2)	216 (32.6)	
Not sure	85 (12.8)	35(5.3)	120 (18.1)	

Variable	Lowland n (%)	Highland n (%)	Total n (%)	p-value
Disagree	132 (19.9)	103 (15.6)	235 (35.5)	
Strongly disagree	27 (4.1)	7 (1.1)	34 (5.1)	
Dengue fever can be prevented				<0.001
Strongly agree	105 (15.9)	19 (2.9)	124 (18.8)	
Agree	319(48.3)	173 (26.2)	492 (74.4)	
Not sure	21 (3.2)	14 (2.1)	35 (5.3)	
Disagree	8 (1.2)	0	8 (1.2)	
strongly disagree	2 (0.3)	0	2 (0.3)	
My family can help to prevent dengue				<0.001
Strongly agree	105 ((15.9)	16 (2.4)	121 (18.3)	
Agree	265 (40.1)	138 (20.9)	403 (61.0)	
Not sure	28 (4.2)	16 (2.4)	44 (6.7)	
Disagree	56 (8.5)	36 (5.4)	92 (13.9)	
strongly disagree	1 (0.2)	0	1 (0.2)	
My neighbors should have the responsibility to prevent dengue				<0.001
Strongly agree	116 (17.5)	19 (2.9)	105 (20.4)	
Agree	301 (45.5)	165 (24.9)	466 (70.4)	
Not sure	20 (3.0)	18 (2.7)	38 (5.7)	
Disagree	17 (2.6)	4 (0.6)	21 (3.2)	
strongly disagree	2 (0.3)	0	2 (0.3)	
It is our responsibility to control dengue causing mosquitoes				<0.001
Strongly agree	134 (20.2)	26 (3.9)	160 (24.2)	
Agree	262 (39.6)	137 (20.7)	399 (60.30	
Not sure	13 (2.0)	12 (1.8)	25 (3.8)	
Disagree	47 (7.1)	31 (4.7)	78 (11.8)	
Controlling the breeding places of mosquitoes is a good strategy to prevent dengue fever				<0.001
Strongly agree	131 (19.80	24(3.6)	155 (23.4)	
Agree	305 (46.1)	162 (24.50	467 (70.5)	

Variable	Lowland n (%)	Highland n (%)	Total n (%)	p-value
Not sure	12 (1.8)	17 (2.6)	29 (4.4)	
Disagree	8 (1.2)	3 (27.3)	11 (91.7)	
Stagnant water around the houses in discarded tires, broken pots and bottles are breeding places of *Aedes* mosquitoes				<0.001
Strongly agree	138 (20.8)	31 (4.7)	169 (25.5)	
Agree	297 (44.9)	146 (22.1)	443 (66.9)	
Not sure	12 (1.8)	15 (2.3)	27 (4.1)	
strongly disagree				
Removal of mosquitoes breeding sites at my premises will reduce the chance of dengue infection among my family members				<0.001
Strongly agree	140 (21.1)	28 (4.2)	168 (25.4)	
Agree	304 (45.9)	164 (24.8)	468 (70.7)	
Not sure	10 (1.5)	14 (2.1)	24 (3.6)	
Disagree	2 (0.3)	0	2 0.3)	
Communities should actively participate in controlling the vectors of dengue				0.003
Strongly agree	126 (19.0)	31 (4.7)	157 (23.7)	
Agree	305 (46.1)	161 (24.3)	466 (70.4)	
Not sure	22 (3.3)	13 (2.0)	35 (5.3)	
Disagree	3 (0.5)	1 (0.2)	4 (0.6)	
If my family has symptoms of dengue fever, I will bring him/ her to see a doctor for immediate treatment				0.002
Strongly agree	146 (22.1)	44 (6.6)	190(28.7)	
Agree	304 (45.9)	153 (23.1)	457 (69.0)	
Not sure	6 (0.9)	9 (1.4)	15 (2.3)	

Source of information on dengue fever

The most commonly reported sources of information were TV (76.1%) and the internet (76.3%), however only few (11.3) mention that they were informed about dengue fever through relatives, friends and neighbors. Overall, there were no statistically significant differences between the two regions regarding the sources of information (P>0.05)

Table 4: Source of information on dengue fever

Source of Information	Lowland n (%)	Highland n (%)	Total n (%)	p-value
Relatives friends and neighbours				0.251
No	400 (87.7)	187 (90.8)	587 (88.7)	
Yes	56 (12.3)	19 (9.2)	75 (11.3)	
Community influencer				0.367
No	302 (66.2)	129 (62.6)	431 (65.1)	
Yes	154 (33.8)	77 (37.4)	231 (34.9)	
National Newspaper				0.572
No	398 (87.3)	183 (88.8)	581 (87.8)	
Yes	58 (12.7)	23 (11.2)	81 (12.2)	
Radio				0.128
No	377 (82.7)	160 (77.7)	537 (81.1)	
Yes	79 (17.3)	46 (22.3)	125 (18.9)	
TV				0.082
No	100 (21.9)	58 (28.2)	158 (23.9)	
Yes	356 (78.1)	148 (71.8)	504 (76.1)	
Group or Associations				0.182
No	395 (86.6)	186 (90.3)	581(87.8)	
Yes	61 (13.4)	20 (9.7)	81 (12.2)	
Community based Organisation				0.128
No	377 (82.7)	160 (77.7)	537 (81.1)	
Yes	79 (17.3)	46 (22.3)	125 (18.9)	
Internet				0.672
No	106 (23.2)	51 (24.8)	157 (23.7)	
Yes	350 (76.8)	155 (75.2)	505 (76.3)	

Preventive practice on dengue fever

Regarding dengue management majority of the respondent (97.9%) stated that they go to the hospital whereas only few of them seek for traditional healers (7.1%). When respondents were asked about preventive measures to control dengue, the majority (88.2%) indicated that preventing contact between mosquitoes and humans is the most effective strategy. Regarding specific measures to protect themselves and their families from dengue transmission, wearing full-sleeved clothes was cited by 88.1% of participants, followed by closing windows to reduce mosquito entry (86.4%), and using mosquito nets (85.5%). These measures were significantly more common among participants from lowland areas (P<0.001).

Table 5: Management and Preventive practice on dengue fever

Variable	Lowland n (%)	Highland n (%)	Total n (%)	p-value
Management of dengue				
Go to the hospital				0.582
A. Yes	446 (97.8)	202 (98.1)	648 (97.9)	
B. No	8 (1.8)	2 (1.0)	10 (1.5)	
C. Don’t know	2 (0.4)	2 (1.0)	4 (0.6)	
Take medicine from pharmacy				0.198
A. Yes	134 (29.4)	73 (35.4)	207(31.3)	
B. No	316 (69.3)	129 (19.5)	445 (67.2)	
C. Don’t know	6 (1.3)	4 (1.9)	10 (1.5)	
Do home remedies				0.012
A. Yes	166 (36.5)	78 (37.9)	244 (36.9)	
B. No	285 (62.6)	119 (57.8)	404 (61.1)	
C. Don’t know	4 (0.9)	9 (4.4)	13 (2.0)	
Ayurvedic medicines				0.053
A. Yes	67 (14.7)	25 (12.1)	92 (13.9)	
B. No	384 (84.2)	173 (84.0)	557 (84.1)	
C. Don’t know	5 (1.1)	8 (3.9)	13 (2.0)	
Traditional healers				0.07
A. Yes	39 (8.6)	8 (3.9)	47 (7.1)	
B. No	410 (89.9)	196 (95.1)	606 (91.5)	
C. Don’t know	7 (1.1)	2 (1.0)	9 (1.4)	

Measures for prevention and control of dengue				
Prevent mosquitoes-man contact				0.002
A. Yes	414 (90.8)	170 (82.5)	584 (88.2)	
B. No	39 (8.6)	36 (17.5)	75 (11.3)	
C. Don’t know	3 (0.5)	0	3 (0.5)	
Use insecticide sprays to reduce mosquitoes				0.018
A. Yes	342 (75.0)	133 (64.6)	475 (71.8)	
B. No	108 (23.7)	69 (33.5)	177 (26.7)	
C. Don’t know	6 (1.3)	4 (1.9)	10 (1.5)	
Use professionals pest control to reduce mosquitoes				0.452
A. Yes	241 (52.9)	98 (47.6)	339 (51.2)	
B. No	152 (33.3)	76 (36.9)	228 (34.4)	
C. Don’t know	63 (13.8)	32 (15.5)	95 (14.4)	
Add larvicides into the water storage containers				0.638
A. Yes	131 (28.7)	59 (28.6)	190 (28.7)	
B. No	192 (42.1)	80 (38.8)	272 (41.1)	
C. Don’t know	133 (29.2)	67 (32.5)	200 (30.2)	
Eliminate stagnant water around the house to reduce mosquitoes				<0.001
A. Yes	386 (84.6)	145 (70.4)	531 (80.2)	
B. No	63 (13.8)	57 (27.7)	120 (18.1)	
C. Don’t know	7 (1.5)	4 (1.9)	11 (1.7)	
No bushes in the yard to reduce mosquitoes				0.009
A. Yes	373 (81.8)	149 (72.3)	522 (78.9)	
B. No	78 (17.1)	56 (27.2)	134 (20.2)	
C. Don’t know	5 (1.1)	1 (0.5)	6 (0.9)	
Use mosquitoes eating fish to reduce mosquitoes				0.862
A. Yes	149 (32.7)	64 (31.1)	213 (32.2)	
B. No	185 (40.6)	83 (40.3)	268(40.5)	
C. Don’t know	122 (26.8)	59 (28.6)	181 (27.3)	

Cleaning of garbage /trash				0.001
A. Yes	393 (86.2)	155 (23.4)	548 (82.8)	
B. No	61 (13.4)	50 (24.3)	111 (16.8)	
C. Don't know	2 (0.4)	1 (0.5)	3 (0.5)	
Disposing water holding containers such as tires, parts of automobiles, plastic bottles, crack pots, etc				0.001
A. Yes	397 (87.1)	156 (75.7)	553 (83.5)	
B. No	57 (12.5)	49 (23.8)	106 (16.0)	
C. Don't know	2 (0.4)	1 (0.5)	3 (0.5)	
Eliminating mosquitoes breeding sites				<0.001
A. Yes	388 (85.1)	146 (70.9)	534 (80.7)	
B. No	67 (14.7)	59 (28.6)	126 (19.0)	
C. Don't know	1 (0.2)	1 (0.5)	2 (0.3)	
Cover water containers at home				0.002
A. Yes	414 (90.8)	168 (81.6)	582 (87.9)	
B. No	39 (8.6)	36 (17.5)	75 (11.3)	
C. Don't know	3 (0.7)	2 (1.0)	5 (0.8)	
Use of smoke to drive away mosquitoes				0.933
A. Yes	322 (70.6)	147 (71.4)	469 (70.8)	
B. No	117 (25.7)	53 (25.7)	170 (25.7)	
C. Don't know	17 (3.7)	6 (2.9)	23 93.5)	
Measures to protect own selves and family members from dengue infection				
Wearing full sleeved clothes				<0.001
A. Yes	421 (92.3)	162 (78.6)	583 (88.1)	
B. No	35 (7.7)	44 (21.4)	79 (11.9)	
Use of fan				0.008
A. Yes	278 (61.0)	109 (52.9)	387 (58.5)	
B. No	172 (37.7)	87 (42.2)	259 (39.1)	
C. Dont know	6 (1.3)	10 (4.9)	16 (2.4)	
Use of mosquitoes repellant /cream				0.151
A. Yes	214 (46.9)	80 (38.8)	294 (44.4)	
B. No	206 (45.2)	106 (51.5)	312 (47.1)	

C. Don’t know	36 (7.9)	20 (9.7)	56 (8.5)	
Use of mosquitoes coils to reduce mosquitoes				0.281
A. Yes	319 (70.00)	132 (64.1)	451 (68.1)	
B. No	129 (28.3)	71 (34.5)	200 (30.2)	
C Don’t know	8 (1.8)	3 (1.5)	11 (1.7)	
Closing the windows to reduce mosquitoes				<0.001
A. Yes	409 (89.7)	163 (79.1)	572 (86.4)	
B. No	47 (10.3)	43 (20.9)	90 (13.6)	
C. Dont know				
Use of mosquitoes nets				<0.001
A. Yes	408 (89.5)	158 (76.7)	566 (85.5)	
B. No	48 (10.5)	48 (23.3)	96 (14.5)	
Take no measures				0.154
A. Yes	31 (6.8)	19 (9.2)	50 (7.6)	
B. No	419 (91.9)	187 (90.8)	606 (91.5)	
C. Dont know	6 (1.3)	0	6 (0.9)	
How frequently do you clean water filled conytainers and ditches around the houses				<0.001
A. Always	68 (14.9)	5 (2.4)	73 (11.0)	
B. Often	188 (41.2)	90 (43.7)	278 (42.0)	
C. Sometimes	161 (35.3)	107 (51.9)	268 (40.5)	
D. Never	39 (8.6)	4 (1.9)	43 (6.5)	
Local government should sprays insecticides for controlling mosquitoes?				<0.001
Yes	317 (69.5)	77 (37.4)	394 (59.5)	
No	135 (26.9)	122 (59.2)	257 (38.8)	
Don't know	4 (0.9)	7 (3.4)	11 (1.7)	

Table 6: KAP score of lowland and highland

	Land		Total n (%)	p-value
	lowland n (%)	highland n (%)		
Knowledge score				0.274
<80%	421 (92.3)	195 (94.7)	616 (93.1)	
>=80%	35 (7.7)	11 (5.3)	46 (6.9)	
Attitude score				0.002
<80%	96 (21.1)	67 (32.5)	163 (24.6)	
>=80%	360 (78.9)	139 (67.5)	499 (75.4)	
Practice score				0.838
<80%	333 (73.0)	152(73.8)	485 (73.3)	
>=80%	123 (27.0)	54 (26.2)	177 (26.7)	

Effect of socio-economic factors on the KAP level of dengue fever and its prevention

Regarding KAP scores, 6.9% of the participants achieved at least 80% on the knowledge score (good knowledge), 75.4% obtained at least 80 % on the attitude score (good attitude) and 26.7% obtained at least 80% on the preventive practice score (good practice). Table 7 showed several factors influencing the knowledge score regarding dengue. Individuals aged 30-44 were considered to have lower knowledge score (Adjusted OR=0.465, 95% CI: 0.171-1.264) compared to those under 30, although this was not statistically significant. Gender did not show a significant association with knowledge scores (Adjusted OR=1.332, 95% CI: 0.592-2.994). Regarding ethnicity, Terai Janajati showed higher odds of having good knowledge (Adjusted OR=7.385, 95% CI: 0.788-69.174). Education level showed varied impacts, but none reached statistical significance. Participants with an intermediate or diploma level of education had a higher knowledge score (Adjusted OR=4.003, 95% CI: 0.653-24.552), though this was not statistically significant. Likewise, regarding occupation, retired individuals had significantly higher likelihood of having higher knowledge score compared to those involved in agriculture (Crude OR=6.143, 95% CI: 1.573-23.987), although this significance did not hold after adjustment (Adjusted OR=4.130, 95% CI: 0.732-23.303). Monthly income was significantly associated with knowledge scores, particularly for those who were unsure of their income (Adjusted OR=2.440, 95% CI: 1.023-5.820). Lack of social insurance and not being directly or indirectly related to health were associated with lower knowledge scores (Adjusted OR=0.514, 95% CI: 0.277-0.955; Adjusted OR=0.648, 95% CI: 0.301-1.395, respectively). Participants from lowland areas showed a non-significant trend towards lower knowledge scores compared to those from highland areas (Adjusted OR=1.016, 95% CI: 0.466-2.217).

Table 8, shows the factors influencing the attitude score towards dengue. We found increased odds of having a good attitude if the participants were female compared to males (Adjusted OR=1.671, 95% CI: 1.035-2.696, p=0.036). Likewise, compared to illiterates, those with a primary school certificate (Adjusted OR=2.172, 95% CI: 1.068-4.419, p=0.032), middle school certificate (Adjusted OR=3.565, 95% CI: 1.700-7.477, p=0.001), high school certificate (Adjusted OR=2.066, 95% CI: 0.959-4.450, p=0.064), intermediate or diploma (Adjusted OR=10.184, 95% CI: 1.834-56.537, p=0.008), and graduate education (Adjusted OR=8.438, 95% CI: 1.591-44.750, p=0.012) all had significantly higher odds of having good attitude scores. Additionally, individuals earning 20,000-40,000 (Adjusted OR=3.054, 95% CI: 1.784-5.228, p=0.000) and those earning above 40,000 (Adjusted OR=3.406, 95% CI: 1.065-10.887, p=0.039) had higher scores compared to those earning less than 20,000. We also found that participants from lowland area were likely to have bad attitude compared to those from highland areas (Adjusted OR=0.435, 95% CI: 0.278-0.681, p=0.000).

Table 9 shows the factors influencing the practice score towards dengue prevention. It has been found that the females were more likely to have lower practice scores compared to males (Adjusted OR=0.482, 95% CI: 0.300-0.773, p=0.002). Similarly, Mountain Hill janajati had lesser odds of having good practice scores (Adjusted OR=0.234, 95% CI: 0.105-0.521, p=0.000),while terai Janajati had higher odds of having good practice scores (Adjusted OR=2.625, 95% CI: 1.059-6.510, p=0.037).Likewise, Participants holding a primary school certificate (Adjusted OR=0.279, 95% CI: 0.131-0.595, p=0.001) and middle school certificate (Adjusted OR=0.429, 95% CI: 0.206-0.896, p=0.024) showing significantly lower practice scores compared to illiterates. Monthly income was significantly associated with practice scores, with individuals earning 20,000-40,000 (Adjusted OR=0.254, 95% CI: 0.149-0.435, p=0.000) and those earning above 40,000 (Adjusted OR=0.110, 95% CI: 0.030-0.403, p=0.001) having lower scores compared to those earning less than 20,000.

Table 7: Bivariate and multivariate logistic regression analysis showing predictors of knowledge

Dependent variable Knowledge score	P	Crude OR	95% C.I.		P	Adjusted OR	95% C.I.	
			Lower	Upper			Lower	Upper
Age								
<30 [R}								
30-44	0.075	0.491	0.224	1.076	.133	.465	.171	1.264
45-59	0.338	0.664	0.288	1.533	.351	.590	.194	1.789
>=60	0.662	1.231	0.485	3.126	.835	.863	.216	3.457
Gender								
Male[R]								
Female	0.804	1.08	0.588	1.984	.488	1.332	.592	2.994
Ethnicity								
Dalit [R]								
Mountain hill Janajati	0.746	0.772	0.161	3.702	.646	1.663	.190	14.533
Terai janajati	0.233	2.645	0.535	13.088	.080	7.385	.788	69.174
Brahmin chhetri	0.353	2.016	0.459	8.857	.206	3.935	.470	32.915
Others	0.447	2.05	0.322	13.039	.348	3.207	.281	36.646
Education								
Illiterate [r]								
Primary school certificate	0.221	0.482	0.15	1.551	.574	.685	.183	2.564
Middle school certificate	0.959	0.975	0.366	2.594	.371	1.760	.510	6.077
High school certificate	0.534	0.721	0.256	2.026	.955	1.040	.269	4.021
Intermediate or diploma	0.211	2.386	0.61	9.329	.134	4.003	.653	24.552
Graduate	0.794	1.214	0.284	5.198	.839	1.209	.193	7.572
Occupation								

Dependent variable Knowledge score	P	Crude OR	95% C.I.		P	Adjusted OR	95% C.I.	
			Lower	Upper			Lower	Upper
Agriculture [R]								
Business	0.471	0.675	0.231	1.967	.597	.717	.209	2.459
Student	0.156	2.457	0.709	8.515	.736	.735	.124	4.373
Service	0.625	1.404	0.36	5.475	.643	1.445	.304	6.860
House work	0.189	2.064	0.699	6.092	.423	1.690	.469	6.088
Retired	0.009	6.143	1.573	23.987	.108	4.130	.732	23.303
Others	0.497	1.811	0.326	10.045	.479	1.995	.295	13.498
Monthly income								
<20000 [R]								
20000-40000	0.67	1.182	0.548	2.553	.500	1.331	.580	3.054
>=40000	0.838	1.17	0.258	5.315	.807	1.221	.246	6.064
Dont know	0	3.962	1.897	8.271	.044	2.440	1.023	5.820
Social insurance								
Yes [R]								
No	0.184	0.663	0.362	1.216	.629	.829	.387	1.775
Directly indirectly related to health								
Yes [R]								
No	0.035	0.514	0.277	0.955	.267	.648	.301	1.395
Area								
Highland[R]								
Lowland	0.276	0.679	0.337	1.364	.967	1.016	.466	2.217

Table 8: Bivariate and multivariate logistic regression analysis showing predictors of attitude

Dependent variable : Attitude score	P	Crude OR	95% C.I.		P	Adjusted OR	95% C.I.	
			Lower	Upper			Lower	Upper
Age								
<30 [R}								
30-44	0.366	0.798	0.489	1.302	.404	.741	.366	1.498
45-59	0.268	0.74	0.434	1.261	.465	.750	.346	1.624
>=60	0.61	0.837	0.423	1.657	.934	1.041	.399	2.720
Gender								
Male[R]								
Female	0.379	1.173	0.822	1.674	.036	1.671	1.035	2.696
Ethnicity								
Dalit [R]								
Mountain hill Janajati	0.025	2.322	1.113	4.844	.060	2.217	.966	5.088
Terai janajati	0	0.212	0.093	0.481	.003	.235	.090	.611
Brahmin chhetri	0.262	1.502	0.738	3.06	.380	1.453	.631	3.346
Others	0.068	3.142	0.917	10.764	.080	3.400	.863	13.396
Education								
Illiterate [r]								
Primary school certificate	0.002	2.485	1.384	4.461	.032	2.172	1.068	4.419
Middle school certificate	0	4.138	2.314	7.402	.001	3.565	1.700	7.477
High school certificate	0.002	2.473	1.41	4.334	.064	2.066	.959	4.450
Intermediate or diploma	0.004	9.423	2.06	43.106	.008	10.184	1.834	56.537
Graduate	0.001	13.013	2.893	58.542	.012	8.438	1.591	44.750
Occupation								

Dependent variable : Attitude score	P	Crude OR	95% C.I.		P	Adjusted OR	95% C.I.	
			Lower	Upper			Lower	Upper
Agriculture [R]								
Business	0.061	1.617	0.977	2.676	.336	1.349	.733	2.480
Student	0.401	1.391	0.644	3.005	.735	.818	.256	2.616
Service	0.016	2.906	1.22	6.923	.145	2.165	.766	6.119
House work	0.031	1.999	1.064	3.758	.328	1.486	.672	3.286
Retired	0.835	1.119	0.388	3.231	.611	.714	.194	2.624
Others	0.368	1.653	0.554	4.936	.959	.966	.254	3.673
Monthly income								
<20000 [r]								
20000-40000	0	2.934	1.812	4.752	.000	3.054	1.784	5.228
>=40000	0.038	3.107	1.067	9.046	.039	3.406	1.065	10.887
Dont know	0.006	0.518	0.323	0.832	.110	.598	.318	1.123
Social insurance								
Yes [R]								
No	0	0.472	0.321	0.693	.036	.598	.370	.968
Directly indirectly related to health								
Yes [R]								
No	0.422	1.176	0.791	1.749	.065	1.635	.970	2.755
Area								
Highland[R]								
Lowland	0.002	0.553	0.383	0.8	.000	.435	.278	.681

Table 9: Bivariate and multivariate logistic regression analysis showing predictors of practice

Dependent variable : Practice score	P	Crude OR	95% C.I.		P	Adjusted OR	95% C.I.	
			Lower	Upper			Lower	Upper
Age								
<30 [R}								
30-44	0.526	1.166	0.725	1.876	.361	1.370	.697	2.692
45-59	0.078	1.583	0.951	2.636	.086	1.903	.914	3.962
>=60	0.754	0.895	0.447	1.793	.913	.948	.363	2.476
Gender								
Male[R]								
Female	0.024	0.671	0.474	0.948	.002	.482	.300	.773
Ethnicity								
Dalit [R]								
Mountain hill Janajati	0	0.25	0.122	0.514	.000	.234	.105	.521
Terai janajati	0.004	3.234	1.466	7.135	.037	2.625	1.059	6.510
Brahmin chhetri	0.334	0.718	0.367	1.405	.176	.585	.269	1.272
Others	0.009	0.169	0.044	0.643	.003	.116	.028	.487
Education								
Illiterate [r]								
Primary school certificate	0	0.28	0.15	0.52	.001	.279	.131	.595
Middle school certificate	0.001	0.387	0.221	0.679	.024	.429	.206	.896
High school certificate	0.048	0.572	0.329	0.995	.376	.705	.325	1.528
Intermediate or diploma	0.119	0.439	0.155	1.237	.244	.459	.124	1.700
Graduate	0.008	0.239	0.083	0.69	.118	.360	.100	1.294
Occupation								

Dependent variable : Practice score	P	Crude OR	95% C.I.		P	Adjusted OR	95% C.I.	
			Lower	Upper			Lower	Upper
Agriculture [R]								
Business	0.993	1.002	0.598	1.679	.749	1.110	.585	2.106
Student	0.742	1.136	0.531	2.433	.490	1.490	.480	4.621
Service	0.198	0.581	0.255	1.326	.288	.586	.218	1.572
House work	0.385	0.756	0.402	1.422	.963	1.019	.461	2.252
Retired	0.505	0.667	0.202	2.198	.519	.608	.134	2.752
Others	0.661	0.781	0.259	2.353	.740	1.268	.313	5.136
Monthly income								
<20000 [r]								
20000-40000	0	0.274	0.17	0.442	.000	.254	.149	.435
>=40000	0.007	0.188	0.056	0.629	.001	.110	.030	.403
Dont know	0.065	1.554	0.973	2.483	.619	1.170	.631	2.169
Social insurance								
Yes [R]								
No	0.001	1.81	1.255	2.61	.016	1.795	1.117	2.886
Directly indirectly related to health								
Yes [R]								
No	0.014	0.623	0.427	0.909	.002	.459	.278	.759
Area								
Highland[R]								
Lowland	0.838	0.962	0.662	1.397	.788	1.064	.676	1.674

Correlation between knowledge attitude and practice scores

Spearman's rank correlation analysis showed a weak negative correlation between knowledge and attitude scores (rs = –0.106, p = 0.006). Knowledge demonstrated a weak but statistically significant positive correlation with preventive practice scores (rs= 0.103, p = 0.008). In contrast, attitude scores were moderately and negatively correlated with practice scores (rs = –0.495, p = 0.002), indicating that more favorable attitudes did not necessarily translate into better preventive practices.

Table 10: correlation between knowledge attitude and practice scores

Variables	Highland r_s	Lowland r_s	Total r_s	P-value
Knowledge-attitude	-0.073	-0.204	-0.106	0.006
Knowledge-practice	0.066	0.202	0.103	0.008
Attitude-practice	-0.486	-0.529	-0.495	0.002

Conclusion

Despite frequent dengue outbreaks in Nepal, many community members still lack adequate knowledge about the disease. Existing educational efforts and awareness campaigns have not been sufficient to translate awareness and attitudes into consistent preventive practices. Although attitudes toward dengue prevention are generally positive, both the level of knowledge and its application in daily life remain inadequate. Our study underscores an urgent need for more effective, targeted educational interventions to close this knowledge gap and strengthen the practical implementation of dengue prevention measures at the community level.

Recommendations

1. Enhance public education campaigns to inform communities about the specific characteristics of *Aedes* mosquitoes, including their breeding habits and daytime biting behavior.
2. Strengthen the role of community-based organizations in disseminating information and raising awareness about dengue prevention.
3. Implement comprehensive vector control measures with a strong focus on eliminating mosquito breeding sites.

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