

Risk Factors and Preventive Practices Related to Dengue Fever in Urban Communities: A Community-Based Study

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Received: 01-06-2026 / Revised: 15-07-2026 / Accepted: 21-08-2026

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Conflict of interest: Nil

Abstract

Background: Dengue fever is an important mosquito-borne viral disease in India, particularly in densely populated urban settlements where inadequate water storage, poor drainage, accumulation of solid waste and limited environmental sanitation can facilitate *Aedes* breeding. Household knowledge and preventive practices are important components of dengue control, but a persistent gap may exist between awareness and actual preventive behaviour.

Objective: To assess the risk factors associated with dengue fever and evaluate preventive practices among residents of urban slums of Darbhanga, Bihar.

Methods: A community-based cross-sectional study was conducted among 500 residents of selected urban slum areas of Darbhanga from June 2021 to December 2021. Participants were selected using a multistage sampling technique. Information regarding socio-demographic characteristics, household environmental conditions, dengue-related knowledge and preventive practices was collected using a pretested structured questionnaire. Household-level risk factors included water storage, uncovered containers, stagnant water, drainage conditions, solid-waste accumulation, mosquito breeding sites and use of mosquito-control measures. Data were analysed using SPSS version 26.0. Categorical variables were expressed as frequency and percentage, and associations were assessed using the chi-square test or Fisher's exact test. A p-value <0.05 was considered statistically significant.

Results: Among 500 participants, 184 (36.8%) reported a previous history of dengue or dengue-like febrile illness. Uncovered water-storage containers, stagnant water around the house, inadequate drainage, irregular garbage disposal and absence of routine breeding-site inspection were significantly associated with previous dengue illness (p<0.05). Regular removal of stagnant water was reported by 61.0%, covering of water containers by 64.4%, and regular use of mosquito repellents by 58.8% of participants. Good preventive practice was significantly associated with higher educational attainment and better dengue knowledge (p<0.001).

Conclusion: Environmental conditions and household behaviours were important factors associated with dengue risk in the surveyed urban slum population. Although awareness was relatively high, preventive practices were inconsistent. Community-based health education, source reduction, improved drainage and regular household vector surveillance should be strengthened in urban slum areas of Darbhanga.

Keywords: Dengue Fever; *Aedes Aegypti*; Urban Slum; Risk Factors; Preventive Practices; Community; Vector Control; Darbhanga.

DOI: 10.25258/ijcpr.18.9.188

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Introduction

Dengue is one of the most important mosquito-borne viral infections affecting tropical and subtropical populations. It is transmitted predominantly by infected *Aedes aegypti* and, to a lesser extent, *Aedes albopictus*. The disease ranges from an uncomplicated febrile illness to severe dengue with plasma leakage, bleeding, shock and organ involvement. Rapid urbanisation, population

growth, inadequate sanitation, climate variability and increasing human mobility have contributed to the persistence and expansion of dengue transmission. Recent evidence indicates that dengue prevention depends not only on vector-control programmes but also on household-level environmental management and community participation [1]. Urban slums represent

particularly vulnerable settings because of high population density, intermittent water supply, storage of water in household containers, inadequate drainage and irregular solid-waste disposal. These conditions can create multiple artificial breeding sites for *Aedes* mosquitoes. Studies from Indian urban communities have demonstrated associations between dengue occurrence and environmental factors such as water storage, drainage characteristics, and garbage disposal and nearby construction or waste-collection sites [2].

Behavioural factors are equally important. Regular emptying and cleaning of water containers, covering stored water, elimination of stagnant water, use of mosquito repellents, screening of houses and participation in community-cleaning activities can reduce opportunities for mosquito breeding and human-vector contact.

However, knowledge does not necessarily translate into appropriate preventive behaviour. A 2025 systematic review of Asian households found that although knowledge and attitudes towards dengue were often satisfactory, preventive practices remained inconsistent [3].

Indian studies have similarly reported gaps between awareness and actual preventive practices among urban and slum populations. Community-based interventions in Delhi and Pune have demonstrated that structured education and community participation can improve dengue-related knowledge and preventive behaviour. Darbhanga is an important urban centre in northeastern Bihar, with densely populated settlements where environmental and socioeconomic conditions may influence mosquito breeding and dengue transmission. However, community-level information concerning dengue-related risk factors and preventive practices in urban slum populations of Darbhanga remains limited [4].

Therefore, the present study was undertaken to assess household and behavioural risk factors associated with dengue and to evaluate preventive practices among residents of selected urban slums of Darbhanga from June 2021 to December 2021.

Objectives

1. To assess the socio-demographic characteristics of residents of selected urban slums of Darbhanga.
2. To identify household and environmental risk factors associated with dengue fever.
3. To assess dengue-related knowledge and preventive practices.
4. To determine the association between knowledge, socio-demographic factors and preventive practices.

Materials and Methods

Study design and setting: A community-based cross-sectional study was conducted among urban communities of Darbhanga.

Study period: The study was conducted from June 2021 to December 2021.

Study population: The study population comprised adult residents aged ≥ 18 years who had been residing in the selected urban slum area for at least six months.

Sample size: A total of 500 participants were included in the study.

Sampling technique: A multistage sampling technique was used. Selected urban slum areas were identified in consultation with local health authorities. Households were selected systematically from the identified areas, and one eligible adult participant was interviewed from each selected household.

Inclusion criteria

- Adults aged ≥ 18 years.
- Residents of the selected urban slum for ≥ 6 months.
- Individuals willing to participate.
- Individuals capable of providing reliable information regarding household practices.

Exclusion criteria

- Visitors and temporary residents.
- Individuals unwilling to participate.
- Participants unable to complete the questionnaire.

Data collection: A pretested, structured questionnaire was administered through face-to-face interviews. The questionnaire consisted of four sections:

1. Socio-demographic characteristics.
2. Previous history of dengue/dengue-like illness.
3. Household and environmental risk factors.
4. Dengue-related knowledge and preventive practices.

Household observations were also made regarding water-storage practices, stagnant water, drainage, waste accumulation and potential mosquito breeding sites.

Assessment of knowledge: Knowledge was assessed using questions concerning:

- Cause and transmission of dengue.
- Vector responsible for transmission.
- Common breeding sites.
- Mosquito biting behaviour.
- Common symptoms.
- Warning signs.

- Methods of prevention.

Participants were classified as having good knowledge when they achieved $\geq 60\%$ of the total knowledge score and poor/moderate knowledge when they scored $< 60\%$.

Assessment of preventive practices

Preventive practices included:

- Covering water-storage containers.
- Regular emptying and cleaning of containers.
- Removal of stagnant water.
- Proper disposal of solid waste.
- Use of mosquito repellents.
- Use of mosquito nets.
- Wearing protective clothing.
- Household inspection for mosquito breeding sites.

- Participation in community cleanliness activities.

A practice score $\geq 60\%$ was considered good preventive practice.

Statistical analysis: Data were entered into Microsoft Excel and analysed using SPSS version 26.0.

Continuous variables were expressed as mean $\pm$ SD and categorical variables as frequency and percentage. Associations between categorical variables were evaluated using the chi-square test or Fisher's exact test. A p-value < 0.05 was considered statistically significant.

Results

Table 1: Socio-demographic characteristics of study participants (n=500)

Variable	Category	n	%
Age	18–30 years	146	29.2
	31–45 years	182	36.4
	46–60 years	118	23.6
	>60 years	54	10.8
Sex	Male	268	53.6
	Female	232	46.4
Education	Illiterate	96	19.2
	Primary	142	28.4
	Secondary	168	33.6
	Higher secondary/graduate	94	18.8
Occupation	Daily wage worker	156	31.2
	Homemaker	132	26.4
	Self-employed	82	16.4
	Salaried	64	12.8
	Other	66	13.2
Monthly household income	<₹10,000	214	42.8
	₹10,000–20,000	196	39.2
	>₹20,000	90	18.0

The largest proportion of participants belonged to the 31–45-year age group (36.4%). Males constituted 53.6% of the study population. Nearly half of the participants had primary or no formal education.

Table 2: Household and environmental risk factors for dengue (n=500)

Risk factor	Present n (%)	Previous dengue/dengue-like illness n (%)	p-value
Uncovered water-storage containers	218 (43.6)	101 (46.3)	<0.001
Stagnant water around house	176 (35.2)	86 (48.9)	<0.001
Open/poor drainage	241 (48.2)	104 (43.2)	0.002
Irregular garbage disposal	198 (39.6)	91 (46.0)	0.001
Visible mosquito breeding sites	154 (30.8)	79 (51.3)	<0.001
Water stored for >7 days	167 (33.4)	75 (44.9)	0.004
Nearby construction/waste accumulation	112 (22.4)	52 (46.4)	0.018
No routine household inspection	246 (49.2)	116 (47.2)	<0.001

Chi-square/Fisher's exact test.

Uncovered water-storage containers, stagnant water, poor drainage, irregular waste disposal and visible mosquito breeding sites showed significant associations with previous dengue/dengue-like illness.

Table 3: Dengue-related knowledge among participants (n=500)

Knowledge item	Correct response n (%)
Dengue is transmitted by mosquitoes	431 (86.2)
Aedes aegypti is an important vector	286 (57.2)
Mosquitoes can breed in household water containers	374 (74.8)
Stagnant water promotes mosquito breeding	398 (79.6)
Dengue mosquitoes commonly bite during daytime	274 (54.8)
Dengue can cause severe disease	407 (81.4)
Fever is a common symptom	459 (91.8)
Bleeding/abdominal pain may indicate warning signs	276 (55.2)
Covering water containers helps prevent dengue	386 (77.2)
Removing stagnant water helps prevent dengue	412 (82.4)

Overall, 326 participants (65.2%) had good dengue-related knowledge, whereas 174 (34.8%) had inadequate knowledge.

Table 4: Preventive practices among study participants (n=500)

Preventive practice	Regularly practiced n (%)
Covering water-storage containers	322 (64.4)
Emptying/cleaning containers regularly	309 (61.8)
Removing stagnant water	305 (61.0)
Proper disposal of household waste	287 (57.4)
Use of mosquito repellents	294 (58.8)
Use of mosquito coils/mats	316 (63.2)
Use of mosquito nets	271 (54.2)
Wearing full-sleeved clothing	228 (45.6)
Routine household breeding-site inspection	254 (50.8)
Participation in community cleanliness activities	218 (43.6)

Overall, 292 participants (58.4%) demonstrated good preventive practices, while 208 (41.6%) had inadequate preventive practices.

Table 5: Association of socio-demographic factors and knowledge with preventive practices (n=500)

Variable	Good practice n (%)	Poor practice n (%)	p-value
Education			<0.001
Illiterate/primary	107 (45.0)	131 (55.0)	
Secondary or above	185 (70.6)	77 (29.4)	
Knowledge level			
Good knowledge	224 (68.7)	102 (31.3)	<0.001
Poor knowledge	68 (39.1)	106 (60.9)	
Previous dengue history			
Present	126 (68.5)	58 (31.5)	0.001
Absent	166 (52.5)	150 (47.5)	
Household income			
<₹10,000	103 (48.1)	111 (51.9)	<0.001
₹10,000–20,000	128 (65.3)	68 (34.7)	
>₹20,000	61 (67.8)	29 (32.2)	

Good preventive practices were significantly more frequent among participants with higher educational attainment, better knowledge, previous dengue experience and higher household income ($p < 0.05$).

Discussion

The present community-based study assessed household risk factors, dengue-related knowledge and preventive practices among 500 residents of urban slums in Darbhanga.

The findings demonstrate that dengue risk in densely populated urban settlements is influenced by an interaction between environmental conditions and individual household behaviour. Uncovered water-storage containers, stagnant water, poor drainage, irregular garbage disposal and visible mosquito breeding sites were significantly associated with a previous history of dengue or dengue-like illness [5].

Water storage is particularly important in urban slum environments where intermittent or inadequate piped-water supply may compel

households to store water. Such containers can become productive breeding sites when they remain uncovered or are not emptied and cleaned regularly. Similar associations between water-storage practices, drainage, garbage management and dengue occurrence have been described in studies from urban India [6].

In the present study, 65.2% of participants demonstrated good knowledge. Most participants knew that dengue is mosquito-borne and that stagnant water facilitates mosquito breeding. However, more detailed knowledge was less common; only 57.2% correctly identified *Aedes aegypti* and 54.8% knew that dengue vectors commonly bite during the daytime. This pattern is consistent with recent systematic reviews showing that basic dengue awareness may be relatively high while knowledge of vector behaviour and specific breeding sites remains incomplete [7,8].

A knowledge-practice gap was also evident. Although 65.2% had good knowledge, only 58.4% demonstrated good preventive practices. Regular household breeding-site inspection and participation in community-cleaning activities were particularly low. This finding is important because mosquito control cannot rely solely on individual awareness; structural barriers such as inadequate drainage, water-supply problems and poor waste management also influence household behaviour [9]. Educational attainment was significantly associated with preventive practices.

Participants with secondary education or higher were more likely to demonstrate good preventive practices than those with no or primary education. Similarly, good knowledge was strongly associated with good practice. These findings support evidence from Indian and Asian studies indicating that improving knowledge while simultaneously facilitating practical behaviour change can strengthen dengue prevention [10].

Community-based intervention studies have demonstrated that structured education, household demonstrations and community participation can improve dengue-related knowledge and practices and reduce entomological indicators. Therefore, dengue control in Darbhanga's urban slums should combine health education with practical source-reduction measures, regular sanitation activities, improved waste disposal and community-level vector surveillance [11]. The study has some limitations. Its cross-sectional design limits causal interpretation, and history of dengue illness was partly dependent on participant recall. The study also did not include laboratory confirmation of all previous dengue episodes or systematic entomological surveillance of mosquito density. Nevertheless, the findings provide useful

community-level information regarding modifiable environmental and behavioural factors [12].

Conclusion

The study indicates that dengue prevention in urban slum communities requires simultaneous attention to environmental and behavioural determinants. Uncovered water containers, stagnant water, poor drainage, improper waste disposal and household breeding sites were significantly associated with reported dengue/dengue-like illness. Although most participants demonstrated reasonable knowledge, preventive practices were less consistent, indicating a knowledge-practice gap.

Higher education and better knowledge were associated with improved preventive behaviour. Regular household source reduction, proper water-container management, improved sanitation and drainage, community cleanliness activities and targeted health education should therefore be integrated into local dengue-control strategies in Darbhanga. Community health workers can play an important role in reinforcing household-level preventive practices.

Recommendations

1. Conduct regular household inspections for *Aedes* breeding sites.
2. Promote weekly emptying, cleaning and covering of water-storage containers.
3. Strengthen solid-waste collection and disposal in urban slum areas.
4. Improve drainage and eliminate persistent stagnant-water sites.
5. Conduct seasonal dengue-awareness campaigns before and during the monsoon.
6. Involve ASHA workers, urban health workers and community leaders in behaviour-change activities.
7. Encourage community-based cleanliness and source-reduction drives.
8. Strengthen early recognition of dengue warning signs and timely healthcare seeking.
9. Combine health education with practical demonstrations rather than relying only on information dissemination.
10. Establish routine entomological surveillance in identified high-risk urban settlements.

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