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# Household survey on public awareness and attitudes toward dengue infection in rural Tamil Nadu, South India

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## Abstract:

**BACKGROUND:** Dengue is the most common life-threatening arboviral infection contributing to 92 million infections worldwide. India alone contributes for 34% of the global burden. Success of dengue control depends largely on adequate knowledge and good practices of preventive measures. However, there is a need to find the existing awareness among the general population, especially in rural areas. Thus, our present study was done to determine the awareness, attitude, and practice measures regarding dengue fever in rural Tamil Nadu.

**MATERIALS AND METHODS:** A community-based cross-sectional survey was done among 303 individuals belonging to the selected village in rural Tamil Nadu during November 2016. Information regarding sociodemographic details and awareness, attitude, and practice toward dengue were collected using a semi-structured questionnaire. Adequacy of knowledge and attitude was summarized as proportion with 95% confidence interval.

**RESULTS:** Among 303 participants, 204 (67.3%) were above 30 years of age; 196 (64.6%) were females; 255 (84.1%) were ever married; 149 (49.1%) were employed and most of them 93 (30.6%) were educated up to secondary level; 103 (33.9%) belonged to the Class 4 socioeconomic status. About 33.3% (95% confidence interval [CI]: 28.2–38.8) of the study participants had adequate knowledge and 56.1% (95% CI: 50.5–61.6) had positive attitude toward dengue prevention. About 57.7% (95% CI: 52.1–63.2) were practicing preventive measures.

**CONCLUSION:** The current study found that only one-third of the participants had adequate knowledge regarding dengue but more than half of them had positive attitude toward dengue prevention and practicing mosquito control measures. Hence, large-scale information, education, and communication campaigns need to be done at frequent intervals for rural population.

## Keywords:

Awareness, dengue, mosquito control

## Introduction

Dengue, a major public health threat globally, is a vector-borne disease caused by arbovirus infection. It is the most common arbovirus infection globally, with transmission occurring in at least 128 countries and as many as 4 billion people at risk. The WHO has estimated that nearly 5 lakh people worldwide with severe form of dengue

require hospitalization each year, out of which 2.5% of the people dies.<sup>[1]</sup> It is estimated that 92 million apparent dengue infections occurs globally, of which 70% burden of infections is contributed by the Asian countries. India alone contributes for about 34% of the global burden of dengue.<sup>[2]</sup> Since 2001, trend of dengue cases has been increasing significantly in India. Initially, it was limited only to fewer states in India. However, currently,

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dengue infection has become prevalent in almost all the states and union territories.<sup>[3]</sup>

Although dengue was considered as urban or semi-urban disease, recently it is becoming endemic in rural areas as well.<sup>[4]</sup> Sudden rise in the burden may be attributed to the changes in environmental factors, urbanization, and inadequate vector control measures.<sup>[5]</sup> To understand the morbidity and mortality burdens due to dengue and also for optimal utilization of resources in dengue control, knowledge regarding geographical distribution and burden of dengue is essential.

In India, both *Aedes aegypti* and *Aedes albopictus* are the main vectors for dengue transmission.<sup>[6]</sup> It can manifest clinically as a mild fever or severe dengue hemorrhagic fever. In the most severe form, it can even present as dengue shock syndrome that can threaten the patient's life through increased vascular permeability and shock.

Dengvaxia (R), a live-attenuated tetravalent vaccine, has been developed and is under phase three evaluation in many countries. In India, it is still not approved due to lack of sufficient clinical trials.<sup>[7]</sup> Although it can cause life-threatening illness, it can be easily prevented by following certain control measures. The success of dengue control depends largely on adequate knowledge and good practices of preventive measures of the targeted population. Involving community through educational campaigns and mass media can be an effective approach in preventing the infection. Effective reduction in mosquito breeding sites has been achieved by providing community education, rather than mere spraying of insecticides alone.<sup>[8]</sup>

Hence, in order to reduce the burden of dengue, the sole preventive method is to enhance the knowledge, improve the attitude and practice of the specific control measures. First, there is a need to find out the existing awareness regarding dengue among the general population, especially in rural areas as there has been increase in burden of disease in the recent past. Thus, our present study was aimed at describing the knowledge, attitude, and practice (KAP) measures regarding dengue fever among the rural population of Tamil Nadu, India.

## Materials and Methods

A community-based cross-sectional study was carried out among the individuals residing in the Nallavur village of Tamil Nadu. Nallavur village is located in the Villupuram district of Tamilnadu. The study was conducted during the month of November 2017. All the individuals belonging to the age group of 15 years and above were included in the study.

The sample size was calculated by OpenEpi (v 3.01 updated on 2013, USA) using the anticipated proportion of inadequate knowledge regarding dengue as 30%, with absolute precision of 5% and 95% confidence interval. Final sample size was calculated to be 323. However, 303 participants responded to the questionnaire.

Household was taken as a sampling unit and individual as a study unit. There were totally 992 households in the area of study. Systematic random sampling was employed to select the households from the village. Then, the individual to be interviewed from households was selected using a KISH table. Households which were locked even after three visits were excluded from the study.

Initially, a meeting was conducted with the village leaders to get permission to conduct the study. The purpose and motive of the study was explained to the village leaders before starting the study. Training doctors in tertiary care center were chosen as data collectors. They were sensitized regarding the objectives of the study, confidentiality of information, participant's right and informed consent, and were also trained to administer the questionnaire. Data were then collected among the selected individuals after obtaining informed consent. Purpose and procedure involved in the study were explained before the administration of questionnaire. Participants were also assured regarding the confidentiality of the information.

Semi-structured questionnaire was used for collecting information about the following four sections; first section included information regarding sociodemographic variables such as age, gender, education, occupation, marital status, and socioeconomic status (classified based on modified BG Prasad classification using per capita monthly income – Class I  $\geq 6254$ , Class II – 3127–6253, Class III 1876–3126, Class IV 938–1875, and Class V  $<938$  rupees); second section comprised information regarding adequacy of knowledge regarding dengue assessed through three domains: ever heard about dengue, modes of transmission, and availability of treatment. It also contained questions regarding source of information, advice by health-care worker, and clinical symptoms of dengue; third section contained information regarding attitude toward dengue fever which was assessed through two domains “willingness to prevent stagnation of water and willingness to use personal protective measures;” fourth section consisted of information regarding practice measures related to dengue; Since there was no standard questionnaire to assess the awareness, attitude and practice toward dengue, we self-made the questionnaire with above-mentioned domains through thorough literature search and standardized for our research in local language by forward translation, expert panel back

translation, and pretesting of the questionnaire. The reliability of the questionnaire was calculated after the study and the Cronbach’s alpha (reliability coefficient) value was found to be 0.71 for awareness section and 0.74 for attitude section. Principal investigator of the study supervised the data collection procedure by reviewing all questionnaires at the end of each day and also addressed any issue faced by the data collectors.

Data were entered into EpiData v 3.01 software (EpiData association, Odense, Denmark) and analysis was done using SPSS version 19.0 Continuous variables were summarized as mean (standard deviation). Adequacy of knowledge and attitude toward dengue was summarized as proportion with 95% confidence interval. Bivariate analysis (Chi-square test/Fisher exact test) was used to find the association of sociodemographic factors with knowledge adequacy and attitude toward dengue. Determinants of knowledge adequacy and attitude toward dengue (Independent effects) were identified using multivariable analysis (log-binomial regression), age, gender, education, occupation, marital status, and socioeconomic status as explanatory variables. Unadjusted and adjusted prevalence ratio (PR) ratio with 95% confidence interval (CI) was calculated.  $P < 0.05$  was considered statistically significant.  $P$  value up to 0.20 was considered into the regression model.

### Results

There were totally 323 individuals belonging to the age group of 15 years and above in the study setting was contacted to participate in the study. In total, 303 (93.8% response rate) responded completely to the questionnaire. Twenty individuals who did not completely respond to the questionnaire were excluded.

Mean age of the study participants was 42.19 + 16.9 years; sociodemographic characteristics of the study participants are described in Table 1. More than two-third, 204 (67.3%), were above 30 years of age; majority 196 (64.6%) were females; 255 (84.1%) were ever married; almost half of the participants 149 (49.1%) were employed and most of them 93 (30.6%) were educated up to secondary level; one-third 103 (33.9%) belonged to the Class 4 socioeconomic status according to the modified BG Prasad scale 2016.

The awareness of the participants about dengue fever was assessed based on their knowledge on three domains: ever heard about dengue, modes of transmission, and availability of treatment. Knowledge scoring was given based on the number of questions answered in each domain. The participants were said to have adequate knowledge only if they answered to all the three domains correctly. We have found that two-third

201 (66.3%) of the participants have ever heard about dengue, more than half 159 (52.3%) knew the modes of transmission and more than one-third 115 (37.9%) knew the availability of treatment for dengue. However, only one-third 101 (33.3% 95% CI: 28.2–38.8) of the study participants had adequate knowledge regarding all the three domains; [Table 2] One-third, 101 (33.3), of the study participants reported media as the source of information regarding dengue; while only 54 (17.8) reported that they received advice from the health-care worker. Almost half 147 (47.8%) reported fever to be the most common clinical symptom of dengue.

Table 3 depicts the attitude of the study participants toward prevention of dengue infection. Of 303 study participants, 184 (60.7%) were willing to prevent stagnation and 176 (58.1%) were willing to use personal

**Table 1: Sociodemographic characteristics of the study participants residing in the selected rural village of Tamil Nadu, South India (n=303)**

Sociodemographic characteristics	Category	Frequency, n (%)
Age group in years	≤30	99 (32.6)
	>30	204 (67.4)
Gender	Male	107 (35.4)
	Female	196 (64.6)
Marital status	Never married	48 (15.8)
	Ever married	255 (84.2)
Education	No formal education	87 (28.7)
	Primary	34 (11.2)
	Secondary	93 (30.6)
	Higher secondary	40 (13.2)
	Graduate	49 (16.1)
Occupation	Employed	149 (49.2)
	Unemployed*	154 (50.8)
Socioeconomic status	Class 1	53 (17.4)
	Class 2	65 (21.4)
	Class 3	68 (22.4)
	Class 4	103 (34.0)
	Class 5	14 (4.8)

\*Includes homemakers, pensioners, and students

**Table 2: Knowledge regarding dengue infection based on three domains among the study participants belonging to selected village of rural Tamil Nadu, South India (n=303)**

Knowledge regarding dengue infection	Category	Frequency, n (%)
Ever heard about dengue	Yes	201 (66.3)
	No	102 (33.7)
Mode of transmission	Mosquito bite	159 (52.3)
	Aerosol	42 (14.0)
	Do not know	102 (33.7)
Availability of treatment	Aware	115 (37.9)
	Not aware	188 (62.1)
Overall knowledge	Adequate	101 (33.3)
	Inadequate	202 (66.7)

protective measures against mosquito biting. More than half 170 (56.1% 95% CI: 50.5–61.6) of the study participants were found to have willingness to practice both the preventive measures and have positive attitude toward prevention of dengue infection.

Practice of mosquito control measures was assessed through direct observation during house visit. More than half 175 (57.7%) were practicing mosquito control measures, out of which majority were using mosquito coils in their households. Of the total 303

participants, 43 (14.2%) of them had history of fever in past 3 months. Among them, more than three-fourth, 34 (79.1%) participants sought health facility for their treatment.

Association of sociodemographic characteristics with knowledge adequacy regarding dengue is shown in Table 4. Age group more than 30 years (PR=1.59  $P = 0.004$ ), graduates (PR = 2.99  $P < 0.0001$ ), participants belonging to lower socioeconomic status (PR = 3.09  $P = 0.001$ ), and received advice from health-care worker (PR = 1.94  $P < 0.0001$ ) were found to have higher knowledge adequacy regarding dengue. Females, unemployed and unmarried individuals were also found to have higher knowledge adequacy, but it was found to be statistically insignificant. In adjusted analysis, graduates (aPR = 4.03  $P = 0.003$ ), participants belonging to lower socioeconomic status (aPR = 5.39  $P = 0.01$ ), and received advice from health-care worker (aPR = 1.78  $P < 0.0001$ ) were found to have higher knowledge adequacy.

Table 5 shows the association between sociodemographic factors and attitude toward prevention of dengue.

**Table 3: Attitude toward prevention of dengue based on two domains among the study participants belonging to selected village of rural Tamil Nadu (n=303)**

Attitude toward dengue prevention	Category	Frequency, n (%)
Willingness to use personal prophylactic measure against mosquito bite	Yes	176 (58.1)
	No	127 (41.9)
Willingness to prevent stagnation of water	Yes	184 (60.7)
	No	119 (39.3)
Overall attitude	Negative	133 (43.8)
	Positive	170 (56.2)

**Table 4: Association of sociodemographic characteristics with knowledge regarding dengue infection determined based on three domains among the study participants belonging to selected village of rural Tamil Nadu (n=303)**

Sociodemographic characteristics	n	Adequate knowledge (n=101), n (%)	Unadjusted PR (95% CI)	P	Adjusted PR (95% CI)	P
Age group (years)						
≤30	99	44 (44.4)	1.59 (1.16-2.17)	0.004	1.32 (0.63-2.75)	0.45
>30	204	57 (27.9)	Reference	-	Reference	-
Gender						
Male	107	33 (30.8)	Reference	-	-	-
Female	196	68 (34.6)	1.12 (0.80-1.58)	0.50	-	-
Educational status						
No formal education	87	16 (18.4)	Reference	-	Reference	-
Primary	34	9 (26.4)	1.43 (0.70-2.93)	0.31	1.43 (0.54-3.74)	0.46
Secondary	93	31 (33.3)	1.81 (1.06-3.07)	0.02	1.82 (0.87-3.80)	0.11
Higher secondary	40	18 (45)	2.44 (1.39-4.28)	0.002	2.74 (1.04-7.20)	0.04
Graduate	49	27 (55.1)	2.99 (1.80-4.99)	<0.0001	4.03 (1.60-10.14)	0.003
Occupation						
Employed	149	46 (30.8)	Reference	-	-	-
Unemployed*	154	55 (35.7)	1.15 (0.83-1.59)	0.37	-	-
Marital status						
Married	242	79 (32.6)	2.12 (0.58-7.69)	0.25	1.47 (0.30-7.21)	0.63
Single	48	20 (41.6)	2.70 (0.72-10.11)	0.13	1.21 (0.20-7.19)	0.83
Widowed	13	2 (15.4)	Reference	-	Reference	-
Socioeconomic status						
Class 1	53	11 (20.7)	Reference	-	Reference	-
Class 2	65	33 (39.7)	1.55 (0.82-2.93)	0.17	1.69 (0.70-4.05)	0.23
Class 3	68	21 (32.3)	1.91 (1.04-3.49)	0.03	2.05 (0.87-4.83)	0.09
Class 4	103	27 (39.7)	1.54 (0.85-2.80)	0.15	1.62 (0.72-3.64)	0.24
Class 5	14	9 (64.2)	3.09 (1.60-5.96)	0.001	5.39 (1.43-20.33)	0.01
Advice from health care worker						
Yes	54	30 (55.6)	1.94 (1.43-2.65)	<0.0001	1.78 (1.30-2.44)	<0.0001
No	249	71 (28.5)	Reference	-	Reference	-

\*Includes homemakers, pensioners, and students. PR=Prevalence ratio, CI=Confidence interval



**Table 5: Association of sociodemographic characteristics with attitude toward prevention of dengue infection determined based on two domains among the study participants belonging to selected village of rural Tamil Nadu, n=303**

Sociodemographic characteristics	n	Positive attitude (n=170), n (%)	Unadjusted PR (95% CI)	P	Adjusted PR (95% CI)	P
Age group (years)						
≤30	99	61 (61.6)	1.15 (0.94-1.41)	0.16	1.26 (0.85-1.49)	0.21
>30	204	109 (53.4)	Reference	-	Reference	-
Gender						
Male	107	48 (44.9)	Reference	-	Reference	-
Female	196	122 (62.2)	1.38 (1.09-1.75)	0.002	1.48 (1.15-1.89)	0.004
Educational status						
No formal education	87	37 (42.5)	Reference	-	Reference	-
Primary	34	14 (41.2)	0.97 (0.60-1.54)	0.89	1.01 (0.63-1.61)	0.95
Secondary	93	58 (62.4)	1.46 (1.09-1.96)	0.01	1.64 (1.24-2.18)	0.001
Higher secondary	40	28 (70.0)	1.64 (1.19-2.26)	0.002	2.14 (1.65-2.79)	<0.0001
Graduate	49	33 (67.3)	1.58 (1.15-2.16)	0.004	1.78 (1.28-2.47)	0.001
Occupation						
Employed	149	76 (51.0)	Reference	-	Reference	-
Unemployed*	154	94 (61.0)	1.19 (0.97-1.46)	0.07	1.01 (0.82-1.25)	0.88
Marital status						
Married	242	139 (57.4)	1.14 (0.84-1.55)	0.37	-	-
Single	48	24 (50.0)	1.07 (0.60-1.91)	0.80	-	-
Widowed	13	7 (53.8)	Reference	-	-	-
Socioeconomic status						
Class 1	53	26 (49.1)	Reference	-	Reference	-
Class 2	65	42 (64.6)	1.31 (0.94-1.83)	0.10	1.25 (0.70-1.44)	0.28
Class 3	68	45 (66.2)	1.34 (0.97-1.86)	0.07	1.12 (0.87-1.83)	0.11
Class 4	103	47 (45.6)	0.93 (0.66-1.31)	0.68	1.55 (0.72-1.78)	0.80
Class 5	14	10 (71.4)	1.45 (0.94-2.23)	0.08	1.39 (0.92-1.68)	0.10
Advice from health care worker						
Yes	54	40 (74.1)	1.41 (1.16-1.72)	0.003	1.33 (1.08-1.66)	0.01
No	249	130 (52.2)	Reference	-	Reference	-

\*Includes homemakers, pensioners, and students. PR=Prevalence ratio, CI=Confidence interval

Female gender (PR – 1.38  $P = 0.007$ ), participants with education up to higher secondary (PR – 1.64  $P = 0.002$ ), and motivated by health-care worker (PR – 1.41  $P = 0.003$ ) were found to have more positive attitude toward dengue prevention. Age group <30 years, participants who were unemployed and belonging to lower socioeconomic status were also found to have higher positive attitude. However, none of them found to be statistically significant. Adjusted analysis also showed that female gender (aPR – 1.48  $P = 0.002$ ), individuals with educational qualification up to higher secondary (aPR – 2.14  $P < 0.0001$ ), and received advice from health-care worker (aPR-1.33  $P = 0.01$ ) had more positive attitude toward dengue prevention.

## Discussion

This community-based cross-sectional study was done to assess the awareness and attitude toward dengue infection among the rural population in Tamil Nadu, South India. The current study showed that one-third (33%) of the study participants had adequate knowledge regarding dengue infection and

more than half (56.1%) had positive attitude toward preventing the dengue infection. Graduates (aPR – 4.03), participants belonging to lower socioeconomic status (aPR-5.39) and received advice from health-care worker (aPR – 1.78) were found to be the determinants of knowledge adequacy; while female gender (aPR – 1.48), individuals with educational qualification up to higher secondary (aPR – 2.14) and motivated by health worker (aPR-1.33) were the predictors of positive attitude toward dengue prevention.

Studies around the world reported varying proportion of dengue awareness among the rural population. Studies done in developing countries like Yemen (93.7%) and Nepal (77%) reported higher prevalence of awareness regarding dengue fever which was in contrast to the current study findings.<sup>[8,9]</sup> The study done in India, especially in South India also reported higher proportion of dengue awareness.<sup>[10]</sup> Lower level of awareness among the study participants can be attributed to the lack of involvement of health professionals in conducting awareness campaigns for the rural population.

The current study found that more than half (52.6%) of the study participants had knowledge regarding the mode of transmission of dengue. However, studies done in Chandigarh (89%) and Kanchipuram (72.6%) reported that higher proportion of participants knew mosquito as mode of transmission.<sup>[10,11]</sup> Studies done in other countries like Malaysia (77.5%) and Lao (61.4%) also reported similar findings.<sup>[12,13]</sup> However, contrast findings were found in a study done in Pune where only 40.4% were aware about the mode of transmission.<sup>[4]</sup> Good knowledge about the transmission of dengue is important to carry out preventive measures at individual, household, and community level.

The current study found that only 17.8% of the participants received advice from health-care professionals regarding dengue. However, studies done in other parts of India like Bihar (31%), Kanchipuram (38.3%), and Chandigarh (45.4%) reported contrast findings, in which health professionals were the major source of information.<sup>[10,11,14]</sup> Hence, the current study findings necessitate the involvement of health-care workers in providing appropriate health education regarding the clinical features and preventives measures for dengue infection at the lowest possible level of health care.

The current study showed that more than half of the individuals had positive attitude toward dengue prevention. However, studies done in Bihar and Laos reported contrast findings, in which almost three-fourth of the study population had positive attitude toward dengue prevention.<sup>[13,14]</sup> Findings regarding attitude and practice measures to prevent dengue were correlated as practice of mosquito control measures was also followed by more than half of the participants with majority using mosquito coils. However, studies done around India showed higher proportion of usage of personal prophylactic measures for mosquito control. Hence, motivation of the rural population needs to be done at frequent intervals in bringing about the behavioral change.

Education and advice from health-care professionals were found to be the major predictors of knowledge and attitude toward prevention of dengue infection. A study done in Colombia to find the association between level of education and KAP toward dengue also showed similar findings that individual with higher level of education had better knowledge, good attitude, and practice toward prevention of dengue.<sup>[15]</sup> Studies done in Asian countries such as Pakistan and Malaysia also showed similar findings.<sup>[16,17]</sup> Studies done around India also reported that advice from health-care professionals is important, especially among rural population, to develop adequate knowledge and positive attitude toward dengue prevention.

Major strength of the study was the community-based approach which will make representativeness of the population better. Higher response rate was another added strength to the study. The current study also reports the predictors for adequate knowledge and positive attitude toward dengue prevention. Screening camp was conducted at the end of the survey in the village to provide appropriate health services and awareness regarding dengue.

The limitations of the study include the use of self-constructed questionnaire and domains to differentiate the knowledge adequacy and attitude toward dengue infection. Generalization of this study is limited since it lacks sufficient evidence regarding male population. Cross-sectional design precludes the causal relationship between the knowledge and attitude toward dengue and its determinants, although significant association was found. Another limitation to consider was the administration of the questionnaire to the adult who was present at home at the time of visit for the survey, who was mostly women. However, the person who was surveyed had a prominent role in the activities carried out at home. Therefore, we expected that the sample interviewed would adequately represent the control practices of those communities.

The current study provides important baseline information regarding the awareness, attitude, and practice measures for the prevention of dengue among the rural population. This information is necessary to identify the target population and will help in planning the future awareness campaigns to such population. Hence, this information needs to be notified to the public health professionals for the development of appropriate strategies and strengthening of existing programs for the prevention of dengue.

The current study also highlights the gap that exists in health system to create awareness among rural population. Hence, support from health workers, especially grass root workers is important as they have frequent contact with the community members. Awareness campaigns and health education sessions need to be conducted at frequent intervals at primary health-care level. This study also highlights the need for further large-scale studies with qualitative approach to explore the barriers and facilitating factors in increasing the knowledge, attitude, and practice toward dengue infection.

## Conclusion

The current study found that only one-third of the participants had adequate knowledge regarding dengue but more than half of them were willing to practice

control measures for prevention of dengue. More than half of the participants were practicing mosquito control measures in their household. Education and advice from health professional was found to be the major predictors of adequate knowledge and positive attitude toward dengue prevention. Hence, large-scale information, education, and communication campaigns need to be done at frequent intervals for changing poor KAPs of the target populations to control dengue fever. In addition, there is a need for conducting future interventional studies to address the existing gaps in the knowledge, attitude, and practices related to the prevention of dengue fever.

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### Conflicts of interest

There are no conflicts of interest.

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