Original Research Article

Impact of Health Education Intervention in Dengue Prevention Among School Children of North Karnataka

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ABSTRACT

Introduction: Dengue fever has emerged as an important public health problem. WHO estimated that 50-100 million cases occur annually. Children are more affected by the disease. If children are educated at an early age, they can bring about behavioural change, which will help reduce mosquito breeding places.

Objectives: To assess the baseline knowledge, attitude and practice regarding dengue and to evaluate a change in the knowledge, attitude and practice regarding dengue following health education intervention.

Materials and Methods: A before-and-after non-randomized pre-post health education intervention study done for 6 months from Jan-Jun 2025. 200 school students from 8th-10th were included in the study following consent. A structured questionnaire was used to collect the data, and health education was given to all the students regularly and the change was assessed in post-test. Data was analyzed using appropriate tests.

Results: 45.5% students in the pre-test had knowledge on the biting period of mosquitoes and it increased to 100% following health education. Almost all the students had a positive attitude towards dengue control, and they were motivated by health education, which was observed in applying the practice measures. 93.5% students in the post-test reported they participated in the dengue control activities (p <0.001).

Conclusion: The current study shows that health education plays a much better role in influencing the young minds to control dengue. Students will have a receptive mind and gain a better awareness of dengue and its prevention help control dengue in the family and community.

Keywords: Dengue, prevention, health education, knowledge, practice

INTRODUCTION

Dengue fever has emerged as an important public health problem. It is classified as an emerging or re-emerging disease.[1] It is expanding in many countries with high morbidity and mortality, making it a significant viral disease. [2] WHO estimated that 50-100 million cases occur every year. The disease is endemic in many countries, and South East Asia is more affected.[3] Dengue fever occurs predominantly in urban areas. But the risk of disease transmission to

the rural areas should also be considered.[4] Children are more affected by the disease. If children are educated at an early age, they bring about a behavioural change. They can even bring changes at the family and school level, which will help in reducing mosquito breeding places.[5] Children spend most of the time in the school environment, and the chances of transmission of the disease are higher. Therefore, schools are selected for health promotion and disease prevention activities.[6]

At present, treatment for dengue fever is only symptomatic, and the available vaccine does not provide equal protection against all four serotypes. Therefore, the primary prevention depends on controlling mosquitoes and reducing human-mosquito contact to reduce transmission. With all the above deficiencies along with the dengue epidemic season, the study was undertaken among school children in a rural area to create awareness and control the disease with an objective to assess the baseline knowledge, attitude and practice regarding dengue and to evaluate a change in the knowledge, attitude and practice regarding dengue following health education intervention.

MATERIALS & METHODS

A before-and-after non-Randomized educational intervention study was conducted in Seemikeri, a rural area of North Karnataka, about 8 km from Bagalkot city. The study participants were high school students. The students of 8th, 9th and 10th standard who were present on the day were included in the study. The students who were not willing to participate in the study and those who were absent during the intervention and post-test were excluded from the study. The study was conducted for 6 months from January to June 2025. Ethical clearance was obtained. Sample size estimation was done using open epi software version 2.3.1. According to the study conducted by Swati Alok,[5] the Proportion of students who responded correctly for vectors in dengue transmission before intervention is 19.7% (P_1), and the proportion of students who responded correctly for vectors for dengue transmission after intervention was 35.24 % (P_2). At a 95% confidence level and 80% power of the study, α (two-tailed) = 0.050 level. β = 0.200 and 80% of power of the study. The standard normal deviate for α is Z_α = 1.960, and the standard normal deviate for β is Z_β = 0.84.

Using the formula: $n = \dfrac{(Z_{\frac{\alpha}{2}} + Z_\beta)^2 [P_1(1-P_1) + P_2(1-P_2)]}{(P_1 - P_2)^2}$

where, n = sample size, z = z-score; P_1 and P_2 are expected proportions in each group; $Z_{\alpha/2}$ is the critical value for the significance level α. For 95% confidence level (α = 0.05), this value is 1.960; Z_β = z score corresponding to the desired power. For 80% power level, this value is 0.840;

The sample size estimated was 126, and adding 10% for attrition, the sample size came to be 138.6, which could be rounded off to 200. All the 200 students who were present at the time of study were considered for the study after being evaluated through inclusion and exclusion criteria.

A 20-item pretested semi-structured questionnaire was utilized to collect the pre-test data from the students following the written consent from the teachers and parents of the children, and prior permission from the school authorities and teachers to avoid disturbance in the school routine. The questionnaire was constructed by reviewing the Government training booklets of Primary Health Care Medical Officers and other past literature. Then, further reviewed by the experts of dengue prevention and control and necessary changes were made as per the suggestions of the experts and approval was taken. The questionnaire consisted of Socio-demographic data, knowledge regarding the dengue mosquito, breeding habits, and prevention measures were undertaken along with questions on the attitude regarding the change that can be undertaken to reduce the transmission of dengue. Practice questions on dengue prevention steps were considered for the study. Health education intervention was given following the pre-test.

Clarification of doubts was done by the resource person. Health education included a briefing using a PowerPoint presentation, interactive sessions, a poster and a video demonstration, so that they can better understand. Health education to the students was given fortnightly for 3 months, and the change in the post-test was assessed using the same questionnaire.

Statistical Analysis

Data collected was entered in the MS Excel sheet and analyzed using SPSS version 20. Descriptive data were expressed in the form of frequencies and proportions. Continuous variables were expressed in the form of mean and standard deviation. Inferential statistics was performed using χ^2 test, and p-value <0.05 was considered significant.

RESULT

Among the 200 school students who participated in the study, 74% were from urban and 26% were from rural backgrounds, with 51% boys and 49% girls. The age group of the students were between 13 and 16 years. There were 32.5% students within the 14-year age group, 34.5% in the 14-15 years age group and 33.0% were above the 15-year age group. Knowledge regarding dengue fever, the mosquito responsible for transmission, habits of the mosquito were asked, and results were noted in Table 1.

The current study revealed that all the participants knew dengue fever as a communicable disease. Further, it was observed that 84.5% participants knew how dengue fever spreads, and it rose to 98.5% after health education intervention, which was found to be statistically significant (p <0.001). 45.5% students only knew mosquitoes were responsible for spreading dengue was biting in the daytime, and it increased to 100% following the health education intervention (p <0.001). Similarly, 38.0% participants knew how to identify the dengue mosquito, and it rose to 97.0% following health education intervention, which was statistically significant (p <0.001) as depicted in Table 1a.

Further, some more knowledge was assessed using a few more questions. It was noted, 29.0% participants knew all the symptoms of dengue, and was increased to 97.0% following intervention through health education. 29.5% participants knew all the complications of dengue, and it rose to 95.5%; similarly, only 19.0% of the participants had knowledge on how to prevent dengue during pre-test, and this proportion increased to 98.0% following health education intervention. Breeding places of the mosquito were known by 12.0% of the participants only, and following health education, it rose to 100%. All these changes were statistically significant (p <0.001) as depicted in Table 1b.

Table 1a: Table showing the assessment of knowledge in the study participants on dengue

Knowledge Questions	Pre test		Post test		p value*
	Correct N (%)	Wrong N (%)	Correct N (%)	Wrong N (%)	
Dengue fever is one of the communicable diseases	200 (100.0)	00 (00.0)	200 (100.0)	00 (00.0)	-
How dengue fever spreads?	169 (84.5)	31 (15.5)	197 (98.5)	03 (01.5)	0.0000005
When does the mosquito of dengue bites?	91 (45.5)	109 (54.5)	200 (100.0)	00 (00.0)	<0.001
How to identify the dengue mosquito?	76 (38.0)	124 (62.0)	194 (97.0)	06 (03.0)	<0.001

χ^2 test applied, p value in bold are significant

Table 1b: Table showing the knowledge on dengue symptoms, complications and prevention in the study participants

Knowledge (multiple answers considered)	Pre test N (%)	Post test N (%)	p value
Dengue symptoms a. Fever	159 (79.5)	02 (01.0)	<0.001

b. Pain in muscles and bones	05 (02.5)	00 (00.0)	
c. Severe headache	38 (19.0)	04 (02.0)	
d. Vomiting	29 (14.5)	04 (02.0)	
e. Retro-orbital pain	08 (04.0)	02 (01.0)	
f. All of the above	58 (29.0)	194 (97.0)	
g. Don't' know	47 (23.5)	00 (00.0)	
Complications of dengue, if untreated			<0.001
a. Bleeding	06 (03.0)	00 (00.0)	
b. Lowered blood pressure	18 (09.0)	08 (04.0)	
c. Organ failure	05 (02.5)	00 (00.0)	
d. Death	39 (19.5)	10 (05.0)	
e. All of the above	59 (29.5)	191 (95.5)	
f. Don't know	52 (26.0)	00 (00.0)	
Prevention of dengue			<0.001
a. Avoiding the stagnation of water	24 (12.0)	03 (01.5)	
b. Closing opened water tank	15 (07.5)	04 (02.0)	
c. Using curtains for windows and doors	124 (62.0)	04 (02.0)	
d. Using mosquito repellants and creams	99 (49.5)	02 (01.0)	
e. All of the above	38 (19.0)	197 (98.5)	
f. Don't know	18 (09.0)	00 (00.0)	
Breeding places of mosquito			<0.001
a. Flower pots	69 (34.5)	00 (00.0)	
b. Unused tyres	98 (49.0)	00 (00.0)	
c. Broken glasses	18 (09.0)	00 (00.0)	
d. Coconut shells	59 (29.5)	00 (00.0)	
e. All of the above	24 (12.0)	200(100.0)	
f. Don't know	18 (09.0)	00 (00.0)	

χ2 test applied, p value in bold are significant

Table 2: Table showing the attitude and practice of the study participants in the pre and post-test towards dengue prevention

Attitude towards prevention of disease transmission	Pre test N (%)	Post test N (%)	p value*
Cleaning the breeding sites of mosquitoes is the responsibility of			
a. My responsibility	25 (12.5)	10 (05.0)	
b. Everyone's responsibility	88 (44.0)	55 (27.5)	<0.001
c. Both the above	77 (38.5)	135 (67.5)	
d. Don't know	10 (05.0)	00 (00.0)	
Can everyone together can prevent dengue fever			
a. Yes	137 (68.5)	200 (100.0)	<0.001
b. No	63 (31.5)	00 (00.0)	
Are you ready to utilize the strategies to prevent dengue fever			
a. Yes	188 (94.0)	200 (100.0)	0.0004
b. No	12 (06.0)	00 (00.0)	
Will you take the responsibility to inform the responsible person regarding stagnation of water			
a. Yes	173 (87.5)	200 (100.0)	<0.001
b. No	27 (13.5)	00 (00.0)	
Practicing strategies to control dengue	**Pre test N (%)**	**Post test N (%)**	**p value***
Do you utilize any strategy to control dengue			< 0.0001
a. Yes	94 (47.0)	200 (100.0)	
b. No	106 (53.0)	00 (00.0)	
If utilized, then what strategies utilized to prevent dengue			< 0.0001
a. Avoiding stagnation of water	08 (04.0)	03 (01.5)	
b. Closing opened water tank	06 (03.0)	04 (02.0)	
c. Using curtains for doors and windows	57 (28.5)	04 (02.0)	
d. Using mosquito repellants and creams	14 (07.0)	02 (01.0)	
e. All of the above	32 (16.0)	197 (98.5)	

Do you participate in activities of dengue control and mosquito control a. Yes b. No	 48 (24.0) 152 (76.0)	 187 (93.5) 13 (06.5)	< 0.0001
Do you consult doctor immediately if anyone in home was suffering from symptoms of dengue a. Yes b. No	 137 (68.5) 63 (31.5)	 187 (93.5) 13 (06.5)	< 0.0001

χ2 test applied, p value in bold are significant

The attitude of the participants about the dengue control was assessed, and it was observed that students were receptive towards the health education intervention. It was noted, students understood cleaning the breeding sites of mosquitoes was both themselves and all others as well, which was increased from 38.0% in the pre-test to 67.5% in the post-test. All the students came to think that all unitedly can prevent dengue by utilizing the strategies discussed in the health education intervention measures, as depicted in Table 2. Practice measures taken by the students were assessed in the pre-test, and it was observed that there was a significant change in the strategy utilized by them after health education; wherein, 47% students had some strategy in controlling dengue, and it was 100% in the post-test. Students had different strategies in controlling dengue, as shown in table 2, wherein 28.5% used curtains for doors and windows, 7.0% used mosquito repellents, 4.0% avoided stagnation of water, and 3.0% closed any open containers in containment of transmission of dengue. However, only 16.0% students utilized all these strategies in controlling dengue, and it increased to 98.0% in the post-test phase following sessions of health education, which was statistically significant, suggesting students understood the importance of utilizing the strategies altogether rather than alone in controlling dengue. It was observed that 42.0% students used to participate in the dengue controlling activities in the form of mosquito control, such as getting into active participation in schools and in community activities, which increased to 93.5% following health education. 24.0% students told they were consulted with a doctor in the time of illness with symptoms suggesting dengue, and following health education, it increased to 93.5% suggesting the practice of health-seeking behavior improved in their families. All the practice aspects regarding dengue control and health-seeking behavior were statistically significant, which showed students had developed good practice in controlling dengue.

DISCUSSION
The current study focused on the change in knowledge levels among the students on dengue and its control. The study was done on 200 students aged between 10 and 15 years, with 51% males and 49% females. It was observed that almost each age group were nearly in equal proportions, around 32.5% in the 13-14 years age, 34.5% in the 14-15 years age and 33% in the 15-16 years age group. Similar observations were noted from the study done by Usman HB et al,[7] in Jeddah, Saudi Arabia, in 2018, which showed that there were 51.8% boys and 48.2% girls. Most of them were from grade 12 (48.6%), followed by grade 10 (27.7%) and grade 11 (23.8%). A similar study was conducted in 2013 in Bengaluru by Krishnappa L, Gadicherla S, Chalageri VH and Jacob AM. [8] It was found that 20.8% were in class 8, 18.56% were in class 9 and 60.64% in class 10. The current study showed 74% students came from urban areas and 26% from rural areas. Educational status of the parents in the current study showed that, majority of the parents studied up to 10th standard, i.e., 56% followed by PUC/Diploma/ITI by 29.5%. It was noted, 3% parents did their primary schooling and 3% high schooling, and 6% were up to graduation. A bunch of 2.5% parents were

found to be illiterate. A study done by Krishnappa L, Gadicherla S, Chalageri VH and Jacob AM [8] in 2013 in Bengaluru found that 61.44% parents completed schooling and 11.92% were up to post metric level, and 26.64% parents were illiterates. This showed that the results were similar in schooling. However, contrasting results were noted in illiterates. This showed that the parents in the current study had better educational status.

The current study revealed that the participants had improvement in the knowledge following health education intervention, wherein the good knowledge rose from 45% to 98.5%.and it was statistically significant. It was noted, 84.5% participants knew the mode of spread of dengue, and it rose to 98.5% (p <0.01). Similarly, 45.5% participants knew the time of biting of the mosquito, and it increased to 100% following the intervention. 38% participants were able to identify the dengue mosquito, and after the health education, 97% participants were able to identify the dengue mosquito. It was also observed that 23.5% participants didn't know the symptoms of dengue, which was made to learned following the intervention, and there were none of the participants who didn't know the symptoms. Knowledge on complications of dengue was assessed, and it was noted few of them knew one or other complications like bleeding, decreased blood pressure and death. However, on intervention, it was found that 95.5% participants reported all the complications as discussed. Knowledge on dengue prevention was very limited among the participants, and it increased best after the intervention, such that 98.5% of them were able to say all the prevention methods against dengue. Only 12% participants were able to identify all the breeding places of dengue mosquito, and it rose to 100% following the intervention. In a study done by Ibrahim NK, Abalkhail B, Rady M and Al-Bar H in Jeddah [9] in 2009, it was found that, 57.7% fair/satisfactory knowledge score in the pre-test was increased to 99.8% in the post-test among the participants, which was statistically

significant. This was found to be similar to the current study findings. A study conducted by Abhirami R and Zuharah WF [10] in Penang observed that 92.6% students in the pre-test said dengue mosquitoes are not only day biters, and it improved with health education in the post-test by 87.7% which was not statistically significant. It was also observed that 94.7% students knew that dengue patients would have severe fever, headache, rashes and joint pain, which was improved to 98.8% following health education. This was found to be similar to the current study findings. Almost all students also said that dengue mosquitoes breed in stagnant water in empty containers, used tyres, and flower pots in the pre-test, and it attained 100% in the post-test following health education intervention, which showed that all students gained the required knowledge of dengue breeding as similar to the current study findings.

It was observed in the current study that 38.5% students in the pre-test had understood it was their responsibility as well as others' responsibility in cleaning the breeding sites. This was improved to 67.5% in the post-test period, and it was statistically significant. It was also noted; all the students have a positive attitude towards the change that can be taken to control and prevent the dengue transmission. A study from Penang by Abhirami R and Zuharah WF [10] found that 86.5% students agreed to the statement on the importance of removing stagnant water collections to prevent the transmission of dengue. However, the post-test was not recorded for the change in attitude. 84.3% students agreed about the importance of community participation in controlling dengue. Thus, it was understood, students have a positive attitude towards the dengue control. A study in Malaysia conducted by Wan Rosli WR, Abdul Rahman S, Parhar JK and Suhaimi MI [11] observed that, 85.9% students agreed to the statement that public has the most important role in dengue control in pre-test and it increased to 89.4% in the post-test which was near to the current study findings suggesting students understood it is

everyone's responsibility in preventing dengue. 92.9% students in the pre-test agreed that it is not the responsibility of the public health staff and local government to prevent dengue alone, and needs everyone's activity, which was seen to 94.1% in the post-test. This was similar to the current study, suggesting all are responsible for preventing dengue.

The current study also assessed the change in reported practice measures taken by students in controlling dengue. In the pre-test it was noted, nearly half of them i.e., 47.0% of them utilized or the other strategies in controlling dengue and it was observed that, among them, 28.5% said they used to close open water tanks, 7.0% used curtains for doors and windows, 4.0% avoided stagnation of water in their nearby surrounding by filling the ditches themselves. Following health education sessions and demonstrations, students endorsed some more ideas, and all the students utilized the strategies to control dengue, which was statistically significant. Thus, almost all, i.e., 98.5% students utilized all the methods, such as closing open water tanks, using curtains for doors and windows, using mosquito repellants and creams and also avoiding stagnation of water. This change was highly significant. In case of illness, 68.5% students said they consulted to the doctor in case of symptoms like fever, headache, which was similar to dengue. In a study done by Ibrahim NK, Abalkhail B, Rady M and Al-Bar H in Jeddah [9] in 2009, it was found that, 67.4% fair/satisfactory practice score in the pre-test was increased to 95.4% in the post-test among the participants, which was statistically significant. This was found to be similar to the current study findings. A study conducted by Wan Rosli WR, Abdul Rahman S, Parhar JK and Suhaimi MI [11] in Malaysia observed that 49.4% students in the pre-test reported they participated in community cleaning activities and following health education, this increased to 50.6% in the post-test. When compared to the current study, 24.3% students in the pre-test participated in the cleaning activities, and it rose to 94.3% in the

post-test, which was statistically significant. Wan Rosli WR and team [11] also reported 67.1% students in the pre-test used mosquito nets or coils at home in the pre-test and it increased to 69.4% in the post-test wherein, the current study showed the students utilized all the kinds of strategies such as using curtains for doors and windows, using mosquito coils, avoiding stagnation of water suggesting that health education played significant role in inculcating the young minds to get motivated and undergo community cleaning practices to prevent dengue transmission.

CONCLUSION
The current study shows that health education significantly impacts young minds in dengue control. After the intervention, awareness about mosquito breeding sources, dengue symptoms, and personal protection measures increased notably. These findings suggest that school-based health education is an effective, sustainable strategy for dengue prevention, as children can act as change agents by sharing this knowledge with their families and communities. Incorporating regular health education sessions into the school curriculum can thus play a crucial role in enhancing community-level dengue control and decreasing the disease burden.

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