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Impact of a simple educational intervention on awareness regarding cardiovascular disease among school-going adolescents in a rural area of Bengaluru district, India

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Abstract:

BACKGROUND: Cardiovascular disease (CVD) is the number one cause of death in India. Atherosclerosis begins in the second decade of life; thus, preventive efforts beginning in adolescence are crucial. Yet, there are no national or regional school-based educational programs in India for the prevention of CVD. We aimed to assess the impact of a simple educational intervention on the awareness regarding CVD among school-going adolescents in a rural area of Bengaluru.

MATERIALS AND METHODS: This study was conducted using a convenience sample of school-going adolescents of classes 8, 9, and 10 in three schools in a rural area of Anekal subdistrict, Bengaluru, with a sample size of 170. A standardized, validated questionnaire testing CVD awareness was administered, followed by a simple lecture with audio-visual aids on key aspects of CVD. Three weeks later, the same questionnaire was administered to the same students. The results were then analyzed using appropriate descriptive (mean, percentage) and inferential analyses (Chi-square, paired *t*-test).

RESULTS: The mean (SD) age was 14.5 (1.0) years, and 54% (*n* = 100) were boys. 75% (139) belonged to privately funded schools. 23% (43) belonged to class 8, 37% (69) to class 9, and 40% (74) to class 10. The mean (SD) total score on baseline assessment was 27.4 (9.3) out of 100, with girls and students of private schools scoring higher. The mean (SD) post-test total score was 48.5 (15.7), with significant increases in all domains of awareness, and in all categories of students.

DISCUSSION: Awareness regarding CVD among adolescents from rural Bengaluru was poor, highlighting the need for educational interventions to aid preventive efforts. A simple educational intervention resulted in significant improvements in CVD awareness, even after 3 weeks.

Keywords:

Adolescent health, atherosclerosis, health education, healthy lifestyle, heart diseases, primary prevention

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Introduction

India is a hotbed of cardiovascular disease (CVD), which contributes to almost one-third of all deaths in the country.[1] Due to the state of epidemiologic transition of the country, Western cardiovascular risk factors have steadily become more prevalent, resulting in a rising trend in atherosclerotic heart disease. This is superimposed on the already heavy burden of diseases classical of developing countries, such as rheumatic heart disease. Therefore, India is likely to become the epicenter of CVD in the world.[1,2] Added to this concern is the fact that Indians are more likely to develop risk

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factors for CVD at an earlier age, are likely to develop CVD at an earlier age, and are likely to develop CVD in its more severe form, compared to other ethnicities.[3,4]

Primary prevention can prevent CVD, delay its onset, and reduce its severity. The process of atherosclerosis has been demonstrated to begin in the second decade of life itself.[5,6] Further, cardiovascular risk factors are best controlled with early efforts. So, primary prevention should target adolescents.[7,8] Good health awareness remains key to preventive efforts.[7,8] Low health literacy has been associated with an increased cardiovascular risk. Educating the population regarding CVD in the formative years of their childhood may enable them to adopt healthy habits, delaying and preventing CVD. Further, they may pass on this knowledge to their children, leading to even greater benefits for the population and economy. Thus, interventions to improve awareness are central to CVD prevention.

To our knowledge, our study is the first from South India that evaluates CVD awareness, as well as the impact of an educational intervention to improve CVD awareness, in this crucial population. Therefore, we sought to demonstrate the efficacy of a simple school-based educational program to improve awareness regarding CVD among school-going adolescents in a rural area of Bengaluru, India.

Materials and Methods

Study design and setting

This educational interventional study was conducted from October to November 2021, in the rural areas of Anekal subdistrict, Bengaluru, India. Three school headmasters agreed to participate in the study—two from privately funded schools, and one from a government-funded one.

Study participants and sampling

Students currently studying in classes 8, 9, and 10, aged 12–16 years, who gave written assent, were eligible. Students who were absent from one of the study sessions were excluded. A convenience sample was used, with a calculated sample size of 170. This was calculated using the pre-intervention and post-intervention scores found by Ray *et al*.[7] in West Bengal, India—41.1 ± 10.5 and 48.1 ± 16.9. The mean difference was 7.0, the pooled standard deviation was 13.7, the confidence interval was 95%, the power was 90%, and the ratio of sample size was 1.

Data collection tools and technique

The study consisted of three steps— a pre-test, an educational class, and a post-test using the same questionnaire.

On the day of the pre-test, sociodemographic details of each student and their family were collected, as well as details regarding CVD risk factors of the student's family members. To assess CVD awareness, a questionnaire developed and validated by Ray *et al*. in West Bengal, India, was used. This consisted of 20 questions with six broad domains: (1) the concept and definition of coronary artery disease (CAD), (2) the prevalence and impact of CAD on individuals and society, (3) risk factors for CVD including age, sex, family history, diabetes, hypertension, high cholesterol, and smoking, (4) the importance of a healthy lifestyle, (5) the importance of a healthy lifestyle to the society, and (6) benefits of a healthy lifestyle, other than CVD. Some questions had a single correct answer, whereas others had multiple correct answers. Each question was worth five points, for a maximum total score of 100 points. The questionnaire had both English and translated face-validated Kannada versions.

Thirty minutes were allotted to the pre-test. This was followed by a brief, twenty-minute standardized lecture with audio-visual aids by one of the investigators. The lecture consisted of Microsoft PowerPoint slides with educational pictures and videos, each being accompanied by a simple explanation understood by the students, in Kannada, by the investigators. Topics covered included (1) the burden of heart disease, both worldwide and in India, (2) the major risk factors for heart disease, including hypertension, diabetes, smoking, obesity, and sedentary lifestyle, (3) the impact of these risk factors on the body as a whole, besides heart disease, for example, stroke, kidney disease, and eye disease, (4) major preventive actions such as a healthy diet, regular exercise, weight loss, and avoidance of smoking and alcohol, (5) importance of a healthy population to the country. Three weeks later, in the post-test component, the same questionnaire was administered to the same set of students.

Data analysis

The students' demographic details and answers to the questionnaire were entered into EpiCollect and extracted into Microsoft Excel. All analysis was carried out on SPSS Version 21 (IBM). Continuous variables have been expressed as mean and standard deviation (SD) or median and interquartile range (IQR), and percentages. Pre-test and post-test scores of each participant were analyzed, using paired *t*-test. Satisfactory CVD awareness was defined as scoring > 50% (30 marks) in the total score of domains 3 and 4. Subgroup analyses based on the class of study, type of school (privately funded vs. government funded), sex, history of CVD in the family, and parental educational level were also performed.

Ethical considerations

This study was conducted after obtaining clearance from the Institutional Ethics Committee, St. John's

Medical College (Reference number – 421/2021). All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional or regional) and with the Helsinki Declaration of 1975, revised in 2000.

Results

A total of 186 children were included. 203 were present for the pre-test assessment, and 17 (8.4%) were excluded from final analysis after they missed the post-test assessment.

The mean (SD) age was 14.5 (1.0) years. 100 (53.8%) were boys. 43 (23.1%) belonged to class 8, 69 (37.1%) belonged to class 9, and 74 (39.8%) to class 10. 139 (74.7%) belonged to privately funded schools, whereas the remainder belonged to a government-funded one. 124 (66.7%) of the fathers, and 152 (75.2%) mothers had studied up to less than 10th class. 28 (15.1%) reported a history of heart disease in the family, either in their parents or grandparents. 67 (36.0%) reported hypertension, 48 (25.8%) reported diabetes mellitus, and 66 (35.5%) reported smoking in the family.

The mean (SD) pre-test score was 27.4 (9.4) out of 100. Only 48 (25.8%) were aware that CVD was the leading cause of death in developing countries such as India. Only 7 (3.8%) had satisfactory awareness in domains 3 and 4. Girls and students at private schools scored significantly higher on the pre-test assessment. There was no association between higher pre-test scores and the class of study, having at least one parent with education >10th class, or having a history of CVD in the family [Table 1].

The mean (SD) post-test score was 48.5 (15.7), which was a significant increase from the pre-test score ($P < 0.001$). 94 (50.5%) were aware that CVD was the leading cause of death in developing countries, such as India. Scores almost doubled in domains 3 and 4, regarding the risk factors and prevention of risk factors for CVD. All domains had statistically significant increases in scores, with scores doubling in domains 2 and 5, related to the burden of CVD, and the societal importance of a healthy lifestyle, respectively [Table 2].

Further, 92 (49.5%) had satisfactory post-test awareness in domains 3 and 4, regarding risk factors of CVD and their prevention. Significant increases in the total score were noted, regardless of the gender, school funding, or class of students [Table 3].

There were no statistically significant differences in the post-test scores between boys and girls ($P = 0.16$) or between private school students and government school students ($P = 0.65$). Eighth class students had significantly lower scores than senior students, particularly 9th class students ($P < 0.0001$, overall, $P < 0.0001$ between Eighth and 9th class, $P = 0.70$ between Eighth and 10th class, $P = 0.68$ between 9th and 10th class).

Table 1: Pre-test scores of participating students

Category	*n*	Score	*P*
Gender			
Male	100	25.93 (8.98)	0.0199
Female	86	29.12 (9.53)	
Class			
8	43	24.84 (9.80)	0.121
9	69	28.10 (9.05)	
10	74	28.25 (9.21)	
Type of school			
Private	139	29.13 (9.6)	<0.001
Government	47	22.32 (6.3)	
Parents' educational level			
One or both parents >10th class	68	27.89 (10.28)	0.63
Both parents <10th class	118	27.20 (9.42)	
Family history of CVD			
Yes	28	25.71 (8.79)	0.29
No	158	27.71 (9.44)	

Discussion

This study in a rural area of Bengaluru district found poor baseline awareness regarding CVD and great improvements in awareness three weeks after a simple educational intervention.

There are no data regarding CVD-related awareness among school-going adolescents in rural south India. Ray *et al*.,[6] who developed our questionnaire, found a mean score of 41% in their survey of almost 3,000 students in rural West Bengal, India. We found a much lower level of awareness (27%) compared to them, with less than 5% of our sample having satisfactory awareness regarding CVD risk factors and their prevention.

Educational interventions conducted in Western countries have been effective to improve awareness regarding CVD, and the attitudes and practices toward exercise and a healthy diet.[9-12] In India, Ray *et al*.[7] noted an increase in the mean score to 48% after administering their questionnaire soon after their brief educational intervention. Similarly, Yadav *et al*.[13] reported statistically significant increases in the knowledge of students of classes 6–8 regarding the signs and risk factors of heart attack and stroke, at both two weeks and three months, after a short class, followed by educational pamphlets kept in the school.[13] In our study, CVD-related awareness almost doubled, even with a gap of three weeks between the pre-test and post-test. This massive increase could, however, be

Table 2: Pre-test and post-test scores in each domain

Domain	Total score	Pre-test mean (SD)	Post-test mean (SD)	Absolute change	Relative change (%)	*P*
Concept of CAD	20	6.58 (4.43)	8.04 (4.18)	1.46	22.19	<0.001
Prevalence of CAD	10	2.45 (3.68)	5.51 (4.16)	3.06	124.89	<0.001
Risk factors for CVD	35	9.69 (4.03)	16.99 (6.05)	7.30	75.33	<0.001
Importance of a healthy lifestyle	25	6.70 (4.54)	13.17 (5.02)	6.47	96.57	<0.001
Societal benefits to a healthy lifestyle	5	1.27 (0.99)	2.73 (1.46)	1.46	114.96	<0.001
Benefits of a healthy lifestyle beyond CVD	5	1.21 (0.77)	2.16 (1.24)	0.95	78.51	<0.001
Total	100	27.41 (9.35)	48.52 (15.69)	21.11 (19.05)	129.84	<0.001

CAD=Coronary artery disease, CVD=Cardiovascular disease

Table 3: Comparison of pre-test and post-test scores of different categories of students

Category	Pre-test	Post-test	*P*
Gender			
Male	25.93 (8.98)	49.04 (15.97)	<0.001
Female	29.12 (9.53)	47.95 (15.43)	<0.001
Funding of school			
Private	29.13 (9.6)	48.85 (15.54)	<0.001
Government	22.32 (6.3)	47.64 (16.25)	<0.001
Class			
8	24.84 (9.80)	41.67 (13.99)	<0.001
9	28.10 (9.05)	53.84 (14.76)	<0.001
10	28.25 (9.21)	47.77 (15.96)	<0.001

due to the extremely low baseline awareness in our population.

India is currently in the early stages of a CVD pandemic.[14] The age-standardized death rates of CVD and the burden of major risk factors of obesity, diabetes mellitus, and hypertension, all remain higher than the global average. CVD contributes to 27.4% of all deaths,[1] which represents a massive absolute number given the size of India's population. Almost two-thirds of this population live in rural areas.[15] People in rural areas have been shown to suffer a greater rate of major as well as fatal cardiovascular events compared to urban areas,[16] making them a key target for preventive efforts. Further, patients with low-income levels, and low education levels have also been demonstrated to suffer from adverse cardiovascular outcomes.[17] It has also been projected that in the coming years, the burden of CVD and CVD risk factors in India is likely to disproportionately affect the poor.[18,19] As seen in our sample, where less than one-third of the children had one parent who completed 10th class, a significant proportion of rural India is poorly educated and belongs to the lower socioeconomic strata. Therefore, rural populations, particularly those of low socioeconomic status, such as our sample, would benefit the most from robust preventive practices.

Lack of knowledge and health literacy are key contributory factors to the development of CVD and its risk factors.[8,20] Thus, multifactorial lifestyle interventions, including education, can go a long way toward primary prevention.[21,22] Even preventative advice alone has been shown to produce great reductions in lifetime CVD risk.[23] An individual's risk of CVD is influenced by early lifestyle patterns, and the development of risk factors in childhood itself,[24] making school-aged children a seminal target for primary prevention. Unfortunately, to date, there are no national or state-based programs in India to educate school-going children regarding CVD and the importance of healthy lifestyles. Schools are an ideal setting for educational interventions due to their access to children throughout their development, the presence of key personnel, and links with the local community.[25] Well-designed, school-based programs are demonstrably effective in changing the health-related behavior of adolescents.[26,27] Increased awareness and adoption of healthy lifestyles will make a huge difference in the cardiovascular risk profile of this vulnerable group, reducing morbidity and mortality down the line.

Limitations and recommendations

One limitation of our study is the lack of long-term data regarding retention of the information given. However, our positive results suggest that even a simple class with audio-visual aids can be effective to disseminate crucial knowledge.

Conclusions

We found that the awareness regarding CVD among school-going adolescents in rural Bengaluru district was poor, but significantly improved by a simple educational intervention. The government and healthcare authorities would do well to initiate educational programs for school children, facilitated by school teachers, primary care physicians, and auxiliary health workers.

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Conflicts of interest

There are no conflicts of interest.

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