

Effectiveness of Basic Life Support Training Among School and College Students: An Interventional Study

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Abstract

Background: Sudden cardiac arrest remains a leading cause of preventable death worldwide, and survival depends critically on the speed and quality of bystander basic life support (BLS) before emergency medical services arrive. While BLS training has been extensively studied among healthcare students, evidence on its effectiveness among non-health-science students across different educational levels remains limited. This study aimed to evaluate the effectiveness of structured BLS training on the knowledge and attitude of higher secondary, undergraduate, and postgraduate students. **Material and Methods:** This interventional study was conducted among 314 students from one higher secondary school and two colleges in Kerala, India, following Institutional Ethics Committee approval. Participation was voluntary. A structured questionnaire and the American Heart Association adult CPR and AED skills checklist were administered before and immediately after a three-hour hands-on BLS training session, along with a feedback survey. The Wilcoxon signed-rank test was used for pre-post comparisons and the Kruskal-Wallis test with Tukey post-hoc analysis for between-group comparisons, given the non-normal distribution of scores. **Results:** Knowledge and attitude scores improved significantly after training across all three educational groups ($p < 0.0001$ for knowledge; $p < 0.05$ for attitude in each group). The increase in attitude score was significantly greater among undergraduates than higher secondary ($p < 0.0001$) or postgraduate ($p = 0.011$) students, while the knowledge gain differed significantly only between undergraduate and postgraduate groups ($p = 0.018$). Over 95% of participants across all groups rated the training favorably and supported its inclusion in the academic curriculum. **Conclusion:** Structured BLS training significantly improves knowledge and attitude toward cardiopulmonary resuscitation among students regardless of educational background, supporting its incorporation into school and college curricula.

Keywords: Basic life support; cardiopulmonary resuscitation; students; health education; emergency training.

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INTRODUCTION

Cardiovascular disease accounts for an estimated 17.3 million deaths globally each year, with sudden cardiac arrest remaining among the leading causes of death and disability worldwide.^[1] Survival after cardiopulmonary arrest is time-critical: each minute of delay in initiating cardiopulmonary resuscitation (CPR) reduces survival by approximately 10%, and unaddressed arrest carries a mortality of 80–85%.^[2] The American Heart Association (AHA), the foremost authority in resuscitation science, periodically updates its guidelines to reflect current evidence.^[2-4]

Basic life support (BLS) — prompt recognition of cardiac arrest, initiation of high-quality CPR, and early defibrillation using an automated external defibrillator (AED) — forms the foundation of survival for out-of-hospital cardiac arrest. Because perfusion to the heart, brain, and other vital organs deteriorates irreversibly within minutes of arrest, the presence of a trained bystander willing and able to act before professional help arrives is often the single greatest determinant of outcome.^[5-8]

A substantial body of literature has examined BLS training among medical, nursing, and allied health science students,

healthcare staff, and lay adults, generally demonstrating significant gains in knowledge, skill, and willingness to act following training. Comparatively fewer studies have examined school-going adolescents,^[9,10] and to our knowledge, none have specifically evaluated the effectiveness of BLS training among non-health-science college students or compared outcomes across higher secondary, undergraduate, and postgraduate educational levels within a single cohort. This gap is relevant because the case for embedding BLS training in general academic curricula — rather than restricting it to health science programs — depends on demonstrating consistent benefit across these varied educational stages.

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We therefore conducted an interventional study to assess the effectiveness of hands-on BLS training on the knowledge and attitude of students from higher secondary, undergraduate, and postgraduate backgrounds in Kerala, India, and to evaluate participants' perception of the training with a view toward informing curricular policy.

MATERIALS AND METHODS

This interventional study was conducted between March and April 2023 among students at three institutions in Kerala, India — Amrita Vocational Higher Secondary School (Konni), St. Joseph's College of Communication (Changanassery), and St. Mary's College (Thiruvalla) — following approval from the Institutional Ethics Committee of Believers Church Medical College Hospital (IEC Study No. JEC/2023/03/332, approved 09 March 2023). Participation was entirely voluntary.

A minimum sample size of 94 participants per institution was estimated based on a baseline prevalence of 10% of CPR skill, and odds ratio of 2 for acquisition after training, 90% power and a 5% type I error. Initially, 334 students were recruited using convenience sampling, of which 20 students had already taken the BLS training, leaving the analytic sample of 314 students (109 higher secondary, 99 undergraduate and 106 post graduate students).

The students who were more than 15 years old, and willing to participate were included as eligible participants and those

who had already taken part in BLS training were excluded. Three hours of hands-on training using adult and child manikins for hands-only CPR and relief of choking were followed by a brief orientation by AHA's BLS trainers, who also administered a structured questionnaire and the AHA adult CPR and AED skills checklist to assess baseline interest, knowledge and skill. The same questionnaire and checklist was administered immediately after training, along with a feedback survey to gauge the perceived quality of the training and level of confidence.

Microsoft Excel software was used for the data presentation, and SPSS version 20.0 was used for their analysis. Frequencies and percentages are used for categorical variables, and mean ± standard deviation for continuous variables. As scores were non-normally distributed, Wilcoxon signed-rank tests were conducted to determine pre-to-post training differences in each group and the Kruskal-Wallis tests with Tukey post hoc analysis were conducted to compare the magnitude of change across the three different educational groups. The p value of < 0.05 was deemed as statistically significant.

RESULTS

Of 334 students initially enrolled, 314 (94.0%) met inclusion criteria and completed the study: 109 (34.7%) from the higher secondary school, 99 (31.5%) undergraduates, and 106 (33.8%) postgraduates. The cohort had a mean age of 20.3 ± 3.9 years (range 15–33) and a near-even gender distribution (53.5% male, 46.5% female) [Table 1].

Table 1: Baseline characteristics of the study population (N=314)

Characteristic	Value
Age, mean ± SD (years)	20.3 ± 3.9 (range 15–33)
Male, n (%)	168 (53.5%)
Female, n (%)	146 (46.5%)
Higher secondary, n (%)	109 (34.7%)
Undergraduate, n (%)	99 (31.5%)
Postgraduate, n (%)	106 (33.8%)

Attitude toward BLS, scored on a 5-point scale, improved significantly after training in all three groups (Wilcoxon signed-rank test, p<0.05 for all comparisons; [Table 2]). The magnitude of improvement, however, differed significantly between groups (Kruskal-Wallis, p<0.0001): the mean increase was greatest among undergraduates (1.28 ± 1.27), followed by postgraduates (0.87 ± 1.28) and higher

secondary students (0.39 ± 1.27). Post-hoc analysis confirmed that the undergraduate group's gain was significantly greater than that of both higher secondary (p<0.0001) and postgraduate (p=0.011) students, while the difference between higher secondary and postgraduate students was not significant (p=0.172).

Table 2: Effect of BLS training on attitude scores by educational group (Wilcoxon signed-rank test)

Group	Pre-test (Mean±SD)	Post-test (Mean±SD)	p-value
Higher Secondary	2.78 ± 0.95	3.98 ± 0.79	<0.0001
Undergraduate	2.77 ± 1.09	3.13 ± 1.18	0.009
Postgraduate	3.01 ± 0.92	3.90 ± 0.96	<0.0001

Knowledge scores, derived from a 10-item assessment, also improved significantly after training across all groups (Wilcoxon signed-rank test, p<0.0001 for all comparisons; [Table 3]), with mean scores rising from 2.8–3.7 pre-training to 8.7–8.8 post-training. The magnitude of improvement

differed modestly but significantly between groups (Kruskal-Wallis, p=0.016), with post-hoc analysis identifying a significant difference only between undergraduate and postgraduate students (p=0.018).

Table 3: Effect of BLS training on knowledge scores by educational group (Wilcoxon signed-rank test)

Group	Pre-test (Mean±SD)	Post-test (Mean±SD)	p-value
Higher Secondary	2.98 ± 1.65	8.73 ± 1.25	<0.0001

Undergraduate	2.83 ± 1.93	8.77 ± 1.41	<0.0001
Postgraduate	3.74 ± 1.53	8.83 ± 1.08	<0.0001

Before training, awareness of CPR was already near-universal among postgraduate students (100% had heard of CPR) and high among higher secondary (98.2%) and undergraduate (89.9%) students, though willingness to initiate CPR on an unresponsive stranger remained low across all groups (under 35% pre-training). Following training, willingness to act increased substantially in each group. Feedback was overwhelmingly positive: more than

95% of participants in every group found the training helpful, would recommend it to others, and felt they would respond appropriately in a real emergency as a result. A similarly high proportion (90.6–100%) supported incorporating BLS training into the academic curriculum, and the large majority across all groups (86.8–100%) found the training session easy to follow [Table 4].

Table 4: Feedback on BLS training, by educational group (% responding favorably)

Item	Higher Secondary	Undergraduate	Postgraduate
Found training helpful	98.2%	99.0%	100%
Would recommend to others	100%	100%	97.2%
Would respond in an emergency	99.1%	98.0%	93.4%
Believes public training would improve survival rates	95.4%	99.0%	100%
Content simple/clear enough for curriculum	98.2%	91.9%	94.3%
Would add BLS to academic curriculum	97.2%	92.9%	90.6%

DISCUSSION

This study demonstrates that a single structured, hands-on BLS training session produces statistically significant improvements in both knowledge and attitude toward cardiopulmonary resuscitation among students, irrespective of whether they come from a higher secondary, undergraduate, or postgraduate background. This finding extends prior work, which has largely focused on medical, nursing, and other health science learners, school-aged children,^[9,10] or lay adults,^[7] to a broader and previously under-studied population of non-health-science higher secondary and college students.

The consistency of improvement in knowledge across all three groups corroborates earlier reports that BLS training reliably raises knowledge regardless of the learner’s educational background.^[12,13] Similarly, the positive shift in attitude we observed mirrors findings by Albadi et al. among medical students in Oman and by Ghayeb among school teachers in Palestine, both of whom reported improved attitude and willingness toward BLS following training.^[8,11] Notably, undergraduates in our cohort showed the largest gain in attitude and a significantly greater gain than postgraduates. While the precise reason for this differential response cannot be established from our data, postgraduates more often attended training because they were instructed to by a superior rather than out of personal interest (70.8% versus 29.2% who attended voluntarily), which may partly explain their comparatively smaller shift in attitude. Higher secondary students, by contrast, were the most likely to attend out of personal interest (83.5%) but began with limited baseline exposure to structured CPR concepts, which may explain their comparatively smaller absolute gain despite high engagement.

Social media (51.4%) was the leading source of prior CPR awareness among higher secondary students, while postgraduate and undergraduate students more often cited television, newspapers, or films. This is consistent with prior observations that mass and social media represent an

important, low-cost channel for raising baseline community awareness of BLS even before formal training is delivered.^[8]

The near-universal favorable feedback we observed — with more than 95% of participants in every group endorsing the training and supporting its curricular inclusion — lends practical support to integrating a structured BLS module into school and college curricula, a recommendation echoed in studies from school-based and university settings elsewhere.^[13-18]

Limitations

This study has several limitations. First, participants with prior BLS training were excluded, precluding comparison between previously trained and naive learners, which earlier work suggests may itself influence baseline and post-training scores.⁶ Second, assessment was limited to immediately before and after training; without a delayed follow-up, we are unable to comment on knowledge or skill retention over time, which prior literature suggests declines within months without reinforcement.⁴⁵ Third, convenience sampling from three institutions in a single Indian state limits the generalizability of our findings to other geographic or sociocultural settings.

CONCLUSION

There were marked improvements in knowledge and attitude in a single structured, hands-on BLS training session, and the feedback was uniformly favourable, indicating that it was acceptable. The results of this work indicate that a structured BLS training program is a viable approach to strengthening the ability of the community to deal with OOHCA at various educational levels. It is suggested that further research be conducted to assess the retention of knowledge and skills over longer durations of follow up and to compare the effect of successive training cycles.

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Conflicts of interest

There are no conflicts of interest.

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