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Awareness about basic life support among undergraduate medical students before and after clinical exposure in a tertiary care hospital attached to a medical school in South India

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ABSTRACT

Background: Knowledge of basic life support (BLS) is one of the life-saving measures that every medical undergraduate student must possess. **Aims and Objectives:** This study focused on knowing the level of knowledge in fresh medical undergraduate entrants (knowledge A [KA]) and 3rdyear students with clinical exposure but no BLS training (knowledge B [KB]). We also assessed the knowledge in 1st-year students (retention A [RA]) soon after foundation course and compared it with retained knowledge after 6 months (retention B [RB]). **Materials and Methods:** This non-randomized multigroup cross-sectional study was done on medical undergraduate students in a tertiary care hospital attached to a medical school in South India. A validated questionnaire with 25 questions assessing knowledge of BLS was formulated and administered to 508 medical students. **Results:** After analyzing data in SPSS V24, the mean scores in KA and KB were 11.03 ± 4.33 and 13.95 ± 5.43, respectively, with a $P < 0.001$ which was significant. Although both the scores were >50%, clinical exposure had some effect on mean scores in medical undergraduates. Mean scores in RA and RB were 23.16 ± 5.09 and 16.17 ± 6.97, respectively, with $P < 0.001$ which was significant, implying less retention of knowledge in RB 6 months after BLS training. **Conclusion:** A foundation course introduced into the medical curriculum is essential and refresher courses should be conducted frequently to retain the knowledge of BLS as daily academic commitments can prevent retention of BLS knowledge.

Key words: Basic life support; BLS training; Cardiac arrest; Cardiopulmonary resuscitation; Medical undergraduates; Questionnaires

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INTRODUCTION

Unanticipated cardiac arrest is one of the leading causes of death worldwide and basic life support (BLS) knowledge and application will go a long way in improving health care and reducing mortality.[1] Medical undergraduate students are expected to be competent in BLS which is part of the medical curriculum. In the year 2020, the National Medical Council of India (NMC) revamped the syllabus of medical teaching. As part of the new curriculum, it is mandatory for all the undergraduate students to go through a foundation course comprising community health, ethics, professional development, and BLS.

India with its population demands and health care needs should develop a medical fraternity competent in emergency management and BLS to improve health infrastructure and reduce mortality. Adequate knowledge and awareness about

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BLS is vital to ensure that medical students can perform life-saving measures both in the hospital as well as outside hospital scenarios.[2] Availability of specialists at all times is difficult given the volume of patients requiring medical care. We need to train our students and other junior doctors to deal with such emergency care before specialized care is given. The quality of education and training programs of BLS are other critical factors in improving the effectiveness of resuscitation.[3] The knowledge soon after the training will be undiluted and easy to reproduce, hence the trainee is likely to remember and answer the post-test questionnaire adequately. The likelihood of applying the same knowledge in practical scenarios and implementing their knowledge may become less after students encounter a range of subjects and hectic academic schedules throughout their course.

The chances of encountering cardiac arrest during medical training are more likely during the clinical postings. The level of BLS knowledge might vary in students who are fresh entrants to medical courses compared to students with exposure to clinical subjects. The start of their clinical training and actual examination of patients will make them apply their theoretical knowledge, enabling them to deal with clinical situations.

Aims and objectives

Our aim was to compare the knowledge the knowledge of BLS in fresh entrants to the medical course with undergraduates who are exposed to clinical subjects and who have not undergone the foundation course.

Our secondary objective was to determine the retention of knowledge in undergraduates 6 months after the BLS training. We wanted to study whether other academic activities affect the retention of knowledge after 6 months and compare it with fresh entrants just after they have undergone the foundation course. This will help determine the frequency of refresher courses on BLS.

MATERIALS AND METHODS

This analytical multi-group cross-sectional study was conducted from March 2021 to September 2021 in a tertiary care hospital after the approval of the institutional ethical committee (RRMCH-IEC/20/2021). The CTRI registration number was CTRI/2021/03/032113. A total of 508 medical undergraduates (1st year and 3rd year) were included in the survey.

Data collection

A self-administered questionnaire was set up to evaluate the knowledge of BLS according to updated 2020 guidelines laid down by the American Heart Association. A questionnaire was validated by two qualified personnel; one of them was a qualified BLS/ACLS trainer. A pilot test was conducted with 20 undergraduate students to check the feasibility of the questionnaire. The adult BLS questionnaire included 25 questions in the English language related to patient assessment, calling for help, precautions related to the scene, emergency aid number, chest compression, and airway management. All questions were multiple choice or true/false questions.

The questionnaire was divided into two parts based on difficulty level. There was only one correct answer and was awarded 1 mark for easy and 2 marks for difficult questions. There were 16 easy questions and 9 questions with higher difficulty with a total score summing up to 34. Saramma et al., in their study, took 60% as cutoff marks for the knowledge test and 80% for the performance test with an aggregate of 70% as an adequate score for passing.[4] In our study, only knowledge was assessed and scores >75% were considered adequate knowledge of BLS and 26 out of 36 marks were taken as adequate knowledge to pass. Scoring was further categorized into four groups 0–8 (<25%), 9–17 (25–50%), 17–25 (50–75%), 26–34 (75–100%).

This questionnaire was administered to fresh medical undergraduate entrants before the BLS training (Group-Knowledge A [KA]) and compared with medical students with clinical exposure but without BLS training - 3rd year undergraduates (Group-Knowledge B [KB]). The time permitted to answer the questions was 7 min. BLS training for undergraduate medical students consisted of 8 h of intensive theory and practical training. Post-training evaluation was done for fresh entrants immediately after completion of training (Group- Retention A [RA]) and 6 months after their initial BLS training to check the retention of knowledge with the same questionnaire (Group- Retention B [RB]). Before data collection instructions were given orally and informed consent was sought. An incomplete or omitted answer was deemed as wrong.

Data were entered into MS Excel and analyzed in SPSS V24. Descriptive statistics were represented with percentages, median, and mean with standard deviation. Shapiro–Wilk test was applied to find normality. Chi-square test, and independent t-test were calculated. $P<0.05$ was considered statistically significant.

We also performed analysis in R statistical package, version 4.0 to create histograms and to compare the distributions of these four data sets, we created their box plots.

RESULTS

The number of undergraduates in Group KA and KB was 238 and 270, number of students in RA and RB was 236 and 238, respectively. There were two dropouts in the RA group. Table 1 displays minimum, maximum, median, and mean scores with standard deviation in each group. Mean scores in the KA and KB were 11.03±4.33 and 13.95±5.43. In the box plot in Figure 1, the marks of 3rd-year students KB were on average higher than the marks of Group KA (both untrained). Wilcoxon rank sum test for independent samples to compare the means was also done. This was a one-sided test, with a significance level fixed at 0.05. This test gave a *P*-value of 1.89×10^{-9} which shows that the difference in the performance of students with clinical exposure is significantly higher than the fresh medical entrants when both of them have not taken the training.

Mean scores in RA and RB were 25.31±5.26 and 16.17±6.97 (Table 1). The distribution of marks in the RA group shows a significant difference from the distribution of the RB group. We performed the two-sample Wilcoxon Rank sum test on independent samples to compare the means of RA and RB mark sets. As expected, this resulted in a $P<10^{-16}$.

The number of candidates scoring <75% and >75% in each group is given in Table 2. The number of candidates who scored <75% in KA was 238 (100%) and in KB 262 (97%). The *P* value between KA and KB was 0.007 which was significant. This indicates their poor knowledge without BLS training but there was some influence of clinical exposure over scores in KB. In RA 176 (74.57%) students passed and 60 (25.43%) students failed. In RB 25 (11%) students passed and 213 (89%) failed. The p-value between RA and RB was <0.001 which was significant. This indicates though the students retained the knowledge 6 months after the training the volume of retention was significantly less. We also compared the adequacy of knowledge between KB and RB. The *P* value between KB and RB was <0.001 which was significant. This indicates 6 months after the course the 1st year undergraduates (RB) knew more than 3rd year undergraduates without BLS training (KB).

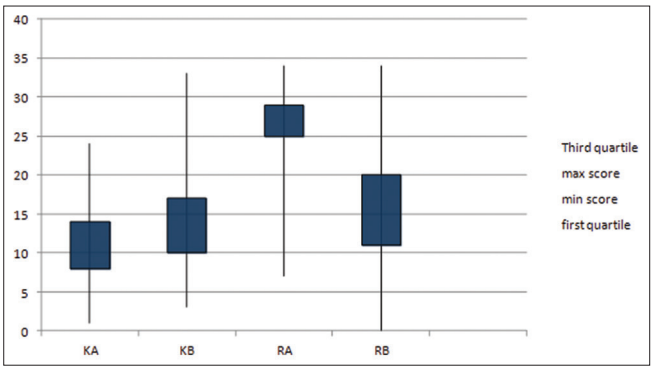

Figure 1: Box plot chart showing distributions of four data sets with marks depicting the level of knowledge and retention in each group

The data were also classified according to scores as shown in Table 3 and Figure 2. In Group KA, 92.4% of students scored marks below 50% compared to 77.4% in Group KB. In both groups, more than 50% of students scored <50%. In group RA 87.28% of students scored marks above 50% compared to 40.8% in RB. This clearly demonstrates the poor retention of knowledge in undergraduates 6 months after their training.

We also observed the effectiveness of BLS training by comparing the scores of KA and RA. The marks of 1st-year students after the training are substantially higher than that before training, as expected. This is also reflected in the significant difference in their means (25.31 against 11.03) as noted in Table 1.

DISCUSSION

Cardiopulmonary resuscitation (CPR) is the backbone of the emergency health-care system, knowledge of which is imperative to prevent sudden cardiac death due to cardiac arrest. Over a period of time the CPR guidelines were revised and structured into current resuscitative protocols by a team of experts.[5] Latest guidelines for CPR and emergency cardiac care were released in 2020 by the American Heart Association. Acquiring the knowledge and training to support ventilation and chest compressions helps in the survival of the patient till experienced health-care professionals arrive.[6] Many studies have been conducted regarding awareness of BLS among medical, dental, and paramedical students.[1-5] Some have studied attitudes and knowledge among interns, postgraduates, and

Table 1: Minimum, maximum, median, and mean scores of knowledge with standard deviation in each group

Group	Minimum score	First quartile	Median	Third quartile	Max score	Mean	Standard deviation
Knowledge A	1.0	8.0	11.0	14.0	24.0	11.03	4.33
Knowledge B	3.0	10.0	13.0	17.0	33.0	13.95	5.43
Retention A	7.0	25.0	27.0	29.0	34.0	25.31	5.26
Retention B	0	11.0	16.0	20	34	16.2	6.97

Table 2: Comparison of the adequacy of knowledge between groups

Score	Knowledge A		Knowledge B		Retention A		Retention B	
	No of students	% of candidates	No of students	% of candidates	No of students	% of candidates	No of students	% of candidates
<75% - inadequate knowledge	238	100	262	97	60	25.43	213	89
>75- adequate knowledge	0	0	8	3	176	74.57	25	11
Total	238	100	270	100	236	100	238	100

Table 3: Counts and percentages of marks obtained by the candidates in each group according to categorical scoring

Score	Knowledge A		Knowledge B		Retention A		Retention B	
	No of students	% of candidates	No of students	% of candidates	No of students	% of candidates	No of students	% of candidates
≤25%	70	29.4	38	14.1%	2	0.8	32	13.4
25–50%	150	63.0	171	63.3	28	11.9	109	45.8
50–75%	18	7.6	53	19.6	30	12.71	72	30.3
75%	0	0.0	8	3.0	176	74.57	25	10.5
Total	238	100.0	270	100.0	236	100.0	238	100.0

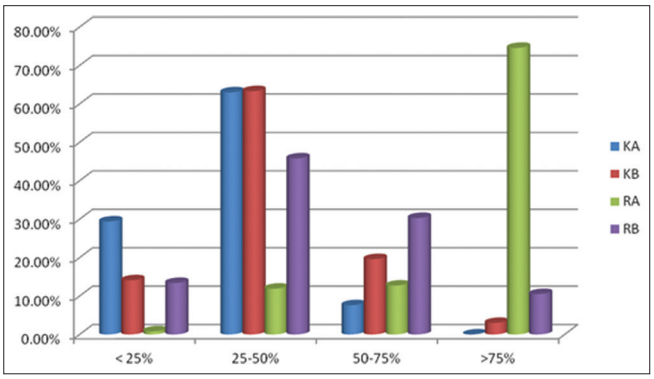

Figure 2: Frequency distribution of marks in all the groups

medical professionals.[5-8] We have confined this study to find out the knowledge among the medical undergraduates of varying seniority. We tried to determine whether clinical exposure improves knowledge of BLS. We compared the knowledge of the fresh entrants with their seniors both having no training in BLS. Our secondary objective was to determine retention 6 months after BLS training.

The cutoff percentage to determine the adequacy of knowledge in the AHA instructor course test is 84%. 80% is considered adequate knowledge for BLS exams conducted by AHA-recognized training center. However, candidates have several attempts to clear the course. Saramma et al., in their study, took an aggregate of 80% as adequate knowledge of BLS.[4] With this background we decided 75% was adequate BLS knowledge for our study.

In our study, the mean scores for BLS knowledge in KA were 11.09±4.33 and KB was 13.95±5.43 with the scoring range being 0–34 (Table 1). The mean scores of both groups were <17 (50% of the score). The *P* value on comparison of mean scores between KA and KB was <0.001 which was significant and showed clinical exposure in the KB group resulted in improved mean scores. Nevertheless, this was not sufficient to improve the overall score which was still <50%. Saquib et al., studied knowledge of BLS among medical, dental, nursing, and pharmacy interns.[1] Mean score about knowledge of BLS among all groups was 4.02±1.56 with a scoring range 0–7. Mean scores in the above study were more than 50%, unlike the results we got in our study. The results of the study by Aroor et al., determining the knowledge among undergraduate, interns, and post graduate medical, dental, and nursing students were comparable to our study.[5] Mean score of knowledge was 1.22±0.91 with score 0–4 which was <50%. They confined themselves to assessing the knowledge of the entire population of medical, dental, and nursing students. Kose et al., tested knowledge of BLS in nursing students where the mean score was 14.12±7.73 with a score range of 0–35 which was also comparable to our study.[2] A study in Pakistan to determine BLS knowledge in dentists, doctors, and nurses revealed that 58.3% of individuals scored <50%.[8]

The mean score for retention of knowledge in RB was 16.17±6.97 which was lower than 25.43±5.26 in RA (Table 1). Furthermore, the *P* value on comparison of mean scores was <0.001 which was significant. This shows a significant reduction in knowledge 6 months after BLS training in RB. De Ruijter et al., studied the retention of BLS in medical undergraduates in the Netherlands for

two consecutive years after BLS training was done.[9] After assessing the knowledge 1 year post-training, a refresher course was conducted, and follow-up was done again at 2 years. The score range to determine BLS knowledge was −30–10 points. Soon after training the median score was 4 with interquartile range (IQR) 2–5. After 1 year, it reduced to -9 with IQR −14–−3. This was similar to our study where we found a decrease in mean score 6 months after training. The median score after 2nd year was −5 with IQR −10–2 in the study done by de Ruijter et al., which was better than the previous score owing to the refresher course. Srivilaithon et al., conducted BLS knowledge retention in 2nd year medical students 6 months after training.[10] Mean score soon after training was 12.2±1.52 as against 10.83±1.95 6 months afterward. Our findings were also consistent with the above study.

Requirement for adequate knowledge was 75% in our study and KA had 0 students and KB had 8 students who had adequate knowledge of BLS. This shows that the foundation course introduced by NMC was a step in the right direction. On comparing retention of knowledge, RB 11% passed compared to 74.57% in RA showing a drastic reduction in knowledge after 6 months and the need for refresher courses. We allowed only one attempt to answer the questionnaire and no time was given for preparation. Students were asked to attempt the questionnaire soon after the foundation course whilst they were not even familiar with some of the terminologies. This could also be the reason why only 74.5% passed. de Ruijter et al., found that 18% passed after 1 year and 32% passed after 2 years after a refresher course.[9] Srivilaithon et al., detected a reduction in knowledge by 1.29 folds in 6 months.[10]

We also compared the adequacy of knowledge between KB and RB. Percentages of candidates who scored >75% in KB and RB were 3% and 11%, respectively (Table 2). This shows BLS training was more effective in improving the score than clinical exposure. The groups without prior BLS knowledge scored poorly even with clinical exposure. The candidates scoring <50% in KA and KB were 92.4% and 77.4%, respectively, showing a lack of knowledge of BLS in medical undergraduate students. Clinical training has minimal effect in improving knowledge of BLS. Majority of students scored well soon after BLS training (86.7% of candidates scoring >50% in RA). However, 6 months after BLS training the candidates scoring >50% in RB were 40.8%. Refresher courses conducted frequently may improve retention of BLS knowledge.

Limitations of the study

Our study was unique as we were trying to determine the influence of clinical exposure on BLS knowledge. We also tried to determine whether undergraduate students with clinical exposure had more knowledge compared to undergraduates 6 months after BLS training. Our limitations were that we could only assess theoretical knowledge but not practical skills. We were only able to assess the knowledge of medical students. We were able to determine the need for refresher courses but not the frequency.

CONCLUSION

The BLS training included in the foundation course for fresh entrant medical undergraduates is necessary and only clinical exposure does not ensure BLS knowledge and skills. Refresher courses are needed after initial BLS training till completion of the course.

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