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Assessment of awareness on basic life support among healthcare workers in a tertiary care teaching hospital in northern region of India

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Abstract

Background Basic Life Support (BLS) serves as the basis for preserving lives following cardiac arrest, especially considering that heart disease ranks as the leading cause of death and constitutes a silent epidemic within the Indian population. Ischemic Heart Disease (IHD) stands out as the primary global cause of mortality, concurrently contributing significantly to the loss of disability-adjusted life years (DALYs). Hence it is crucial for healthcare workers (HCW) to have substantial knowledge and awareness of BLS to help patients when they need it the most. This study aimed to assess the awareness on BLS among HCWs in a tertiary care teaching hospital.

Methods A cross-sectional study was conducted among HCWs in a tertiary care teaching hospital. A self-administered questionnaire was developed to assess knowledge on key BLS components, including cardiopulmonary resuscitation (CPR) techniques, use of an automated external defibrillator (AED), and the chain of survival. Data were analyzed using descriptive statistics and chi-square tests.

Results Out of 206 responders, 60 were doctors, 122 were nursing staff and 24 were technicians. None of the responders have complete knowledge of basic life support, 58.8% mean percentage of knowledge. There was a significant difference in BLS knowledge between different professional groups, with doctors scoring higher than nurses and paramedics ($p < 0.001$).

Conclusion Even though healthcare professionals receive BLS training at a high rate, there remains a knowledge and retention gap in BLS abilities. Regular skills practice and updated training is recommended to enhance BLS proficiency.

Keywords Automated external defibrillator, Cardiopulmonary resuscitation, Healthcare worker, Ischemic heart disease, Medical emergency, Mortality

1 Background

Basic Life Support (BLS) serves as the basis for preserving lives following cardiac arrest, especially considering that heart disease ranks as the leading cause of death and constitutes a silent epidemic within the Indian population [1]. Ischemic Heart Disease (IHD) stands out as the primary global cause of mortality, concurrently contributing

significantly to the loss of disability-adjusted life years (DALYs). Cardiovascular diseases (CVD) remain a leading cause of mortality worldwide. As of the most recent data, ischemic heart disease is the primary cause of CVD mortality globally, with an age-standardized rate of 108.8 deaths per 100,000 people. Following closely are conditions like Intra-Cerebral Hemorrhage and Ischemic Stroke. High systolic blood pressure is a significant contributor to CVD-related disability-adjusted life years (DALYs), accounting for 2,564.9 per 100,000 globally [2].

India has seen a rise in CVD incidence, with ischemic heart disease and stroke being major contributors. The age-standardized CVD mortality rate and DALYs continue to highlight the urgent need for effective public health strategies and interventions to manage and reduce the burden of these diseases. Based on 2021 data, ischemic heart disease significantly impacts health in India. It contributes to a high number of DALYs, with almost 2900 years of healthy life lost per 100,000 people due to disability caused by this condition.

While tertiary care teaching hospitals manage critically ill patients and their healthcare workers (HCWs) are on the frontline of emergency response, BLS knowledge extends beyond these settings. Early intervention by bystanders with CPR and AEDs is crucial for improving Outside Hospital Cardiac Arrest (OHCA) survival rates. HCWs with a strong foundation in BLS can not only initiate life-saving interventions in the hospital but also serve as educators and advocates for bystander CPR training in the community. Hence it is crucial for healthcare workers to have substantial knowledge of BLS to help patients when they need it the most [2]. Healthcare workers should be aware of cardiopulmonary resuscitation (CPR), competence in operating automated defibrillators (AED), and the ability to address airway obstructions caused by foreign bodies. In addition, it includes the first assessment, rescue breathing methods such mouth-to-mouth ventilation, chest compressions, and airway management [3].

Studies show that healthcare workers knowledge and competence levels vary even though BLS is widely accepted as being important [3, 4]. Furthermore, there may be gaps in knowledge regarding specific CPR techniques and proper use of AED, which can potentially delay effective response during emergencies. Several barriers to effective BLS training were identified in previous studies, including limited access to training programs, time constraints, and lack of institutional support. Additionally, HCWs may experience a decline in BLS skills and knowledge over time if they do not regularly practice these skills. Therefore, ongoing education and practical training are essential to maintain a high level of readiness among HCWs [4].

This study aimed to assess BLS knowledge among healthcare workers in a tertiary care teaching hospital to identify gaps, evaluate training effectiveness, and highlight areas for improvement.

2 Methodology

2.1 Study design and participants

A cross-sectional observational study was conducted at the Tertiary Care Teaching Hospital of North India. The study period was from May to September, 2024. The sample size was calculated based on the proportion of healthcare workers (HCWs) aware of Basic Life Support (BLS), assuming a prevalence (P %) of 50%, an error margin of 10%, and a confidence interval (CI) of 99%. Using these parameters, the required sample size

was determined to be 170 participants. However, the sample size was increased to 200 participants to ensure adequate representation across categories. This included 60 doctors, 120 nurses, and 20 technicians.

Ethical clearance was obtained from the hospital's ethics committee (Ethical Approval No: HIMS/E-1/2024/77). Prior to the involvement in the study, written informed consent was obtained from all participants.

2.1.1 Inclusion & exclusion criteria

The study included those Healthcare workers (doctors, nurses, and paramedics) employed at the hospital for at least six months and who provided written informed consent. Exclusion criteria encompassed healthcare workers on leave during the study period, participants who never had experienced BLS training, incomplete or partially filled forms and individuals who did not consent to participate. Out of 250 healthcare workers approached, 206 were included in the study, and 44 were excluded based on the exclusion criteria.

2.2 Study tool

The modified study tool consisted of a structured pre-validated close ended questionnaire with three sections will be used as a study tool for this study. Section 1 includes the informed consent form, while Sect. 2 comprises the socio-demographic profile. Section 3 is dedicated to questions related to knowledge of Basic Life Support (BLS) questions, totaling 25 in number. The tool was designed on a basis of review of existing literature and in accordance with the latest American Heart Association (AHA) guidelines for Basic Life Support (BLS). The questionnaire underwent expert panel review, comprising three senior clinicians and two BLS trainers, to ensure content validity. Additionally, pilot testing was conducted with 15 healthcare workers to evaluate clarity, reliability, and consistency before the final survey was administered. The socio-demographic section gathered essential information about the participants, including: age, gender, profession, experience and BLS Training History. The knowledge section evaluated participants' BLS knowledge through multiple-choice questions, grouped into categories: Chest compressions, Rescue breathing, AED usage, and Choking management. Each knowledge-related question was scored on a dichotomous scale, where the correct answer was awarded one point and incorrect answers received zero. This ensured that the total score for each question was one. Hence, each domain was assigned a maximum possible score of 20. In this study participants' knowledge was categorized based on a simple threshold: >50% score, indicates a sufficient level of knowledge and < 50% score, indicates an insufficient level of knowledge [5].

2.3 Data collection

A 'universal sampling technique was used to collect the data as all eligible participants were included from the hospital's workforce, including doctors, nurses and paramedics. Questionnaire was explained to the participants before collecting the data. Each participant was informed about the importance of the research, the procedures involved, and how the data would be used. Printed questionnaires were distributed to participants, taking approximately 15 minutes to complete.

2.4 Statistical analysis

Data were entered into IBM SPSS Statistics for Windows, version 20 for analysis. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were used to summarize demographic data. Inferential statistics were applied for categorical variables, such as Chi-square tests and the Kolmogorov–Smirnov test was used to assess the normality of the data distribution. Since the data did not follow a normal distribution, when comparing more than two groups, the Kruskal–Wallis test was applied and the Mann–Whitney U test was used for comparing the scores between two groups. Statistical significance was considered when the p-value was less than <0.05. Additionally, Multivariate logistic regression was performed to analyze the factors associated with adequate BLS knowledge, providing insights into the influence of various demographic and training-related variables on the outcomes.

3 Results

The demographic profile of the participants showcases a varied composition across different categories. A significant portion of respondents falls within the age range of 25–35 years (52%), followed by those aged 35–45 years (41%), with a smaller percentage of participants aged 45 and above (7%). The gender distribution reveals a higher number of females (55%) compared to males (45%). Regarding occupation, nurses constitute the largest group at 59%, while.

doctors and paramedics account for 29% and 12%, respectively. Furthermore, more than half of the participants graduated within the past five years (53%), and a notable majority received their training through internal programs (67%) instead of from the American Heart Association (AHA) (33%) (Table 1).

The overall definitive knowledge of Basic Life Support (BLS) among healthcare workers stands at about 58.8%. Doctors had the highest knowledge at 68%, while nurses scored 56%, reflecting a good understanding of essential concepts. Paramedics showed the lowest knowledge at 42%, highlighting the need for additional training. Participants generally performed well on key questions, with 82% correctly identifying the

Table 1 Socio-demographic characteristics of participants

Characteristics	Frequency (%)
Age	
25–34	108 (52%)
35–44	84 (41%)
45 or older	14 (7%)
Gender	
Female	114 (55%)
Male	92 (45%)
Occupation	
Doctor	60 (29%)
Nurse	122 (59%)
Paramedic	24 (12%)
Years of Experience	
Less than 5 years	110 (53%)
More than 5 years	96 (47%)
Source of training	
AHA	68 (33%)
Hospital designed internal training	138 (67%)

*AHA: American Heart Association

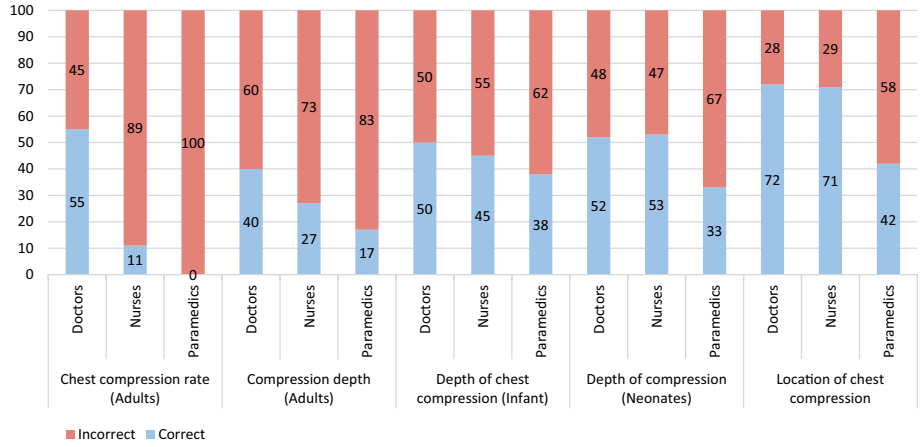

Fig. 1 Knowledge about Chest Compressions

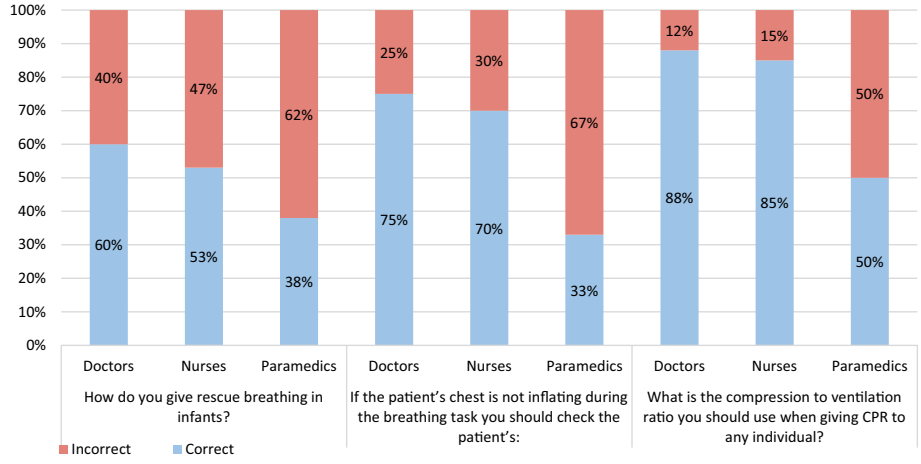

Fig. 2 Knowledge on Rescue Breathing & Ventilation

compression-to-ventilation ratio and 84% recognizing the meaning of AED, although only 23% accurately responded regarding the recommended chest compression rate (Figs. 1, 2, 3, 4 and 5)

The combined results from the Mann-Whitney U Test and the Kruskal-Wallis Test highlight significant differences in Basic Life Support (BLS) knowledge among healthcare professionals. In the Mann-Whitney U Test, doctors demonstrated a higher mean rank (122.71) compared to nurses (76.15) and paramedics (12.92), with U statistics indicating significant differences $p < 0.001$ for doctors vs. nurses; $p < 0.001$ for doctors vs. paramedics; $p < 0.001$ for nurses vs. paramedics). The Kruskal-Wallis Test confirmed these findings, with an overall Chi-Square of 78.95 ($p < 0.001$) indicating significant differences in knowledge levels among doctors, nurses, and paramedics across a total of 206 participants (Table 2).

Healthcare workers with less than five years of experience, have a mean knowledge score of 11.6 (SD = 2.3), while those with more than five years averaged 12.8 (SD = 2.4). However, p-value of 0.173 indicates that there is no statistical difference between these groups. Additionally, knowledge scores for various training periods did not show significant differences, with all p-values exceeding 0.05; for instance, the period 2019–2020 had

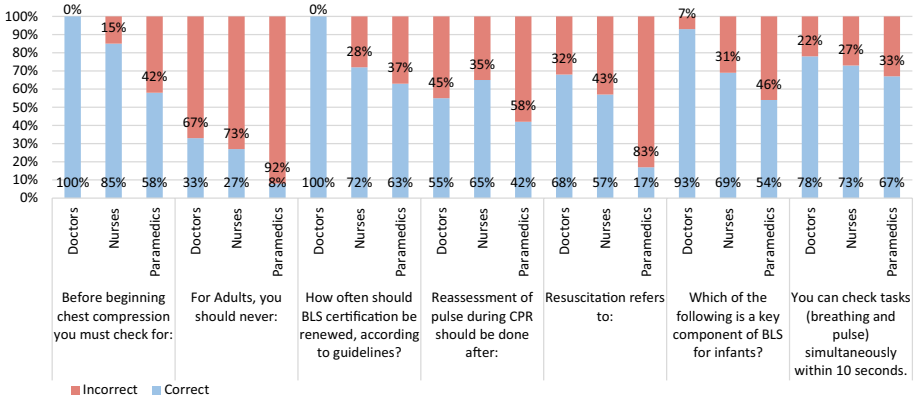

Fig. 3 Knowledge on Skills of BLS

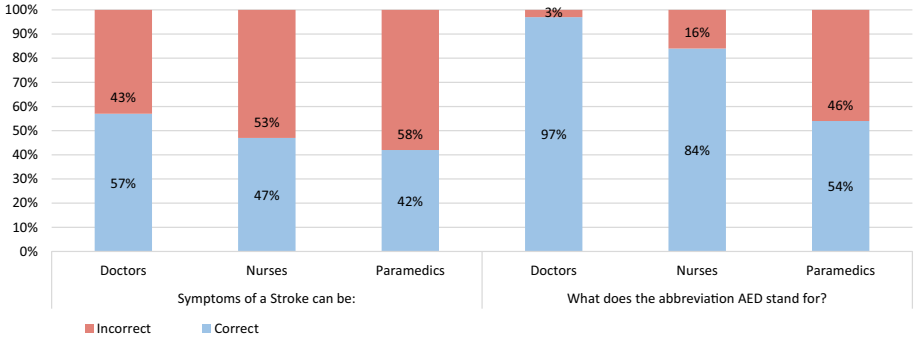

Fig. 4 Knowledge on use of AED and Stroke

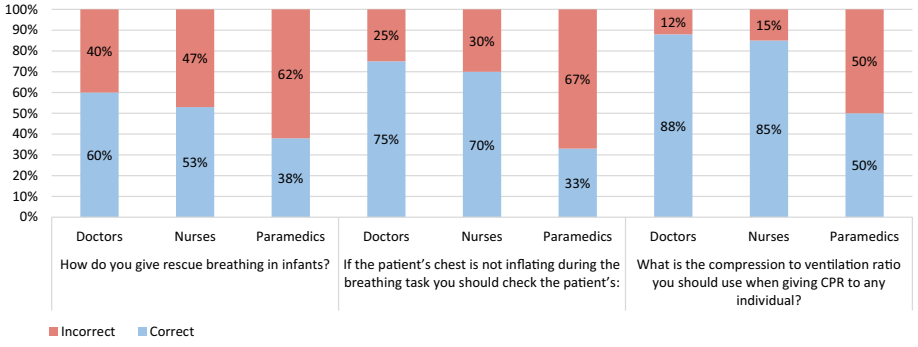

Fig. 5 Knowledge on Choking & Special Scenarios

Table 2 Comparison of basic life support knowledge among healthcare professionals

Pairwise Comparison	*N*	Mean Rank	U Statistic	Asymptotic Sig. (*p*-value)
Doctors vs. Nurses	182	Doctors: 122.71, Nurses: 76.15	U = 1721.500	#$p < 0.001$
Doctors vs. Paramedics	84	Doctors: 54.33, Paramedics: 12.92	U = 5.000	#$p < 0.001$
Nurses vs. Paramedics	146	Nurses: 83.82, Paramedics: 21.04	U = 287.500	#$p < 0.001$
Overall Comparison (Doctors, Nurses, Paramedics)			Chi-Square = 78.95	df = 2 *$p < 0.001$
Doctors	60	Mean Rank: 146.54		
Nurses	122	Mean Rank: 98.47		
Paramedics	24	Mean Rank: 21.46		

$p < 0.05$ is statically significant; df: degree of freedom, # Mann-Whitney U Test, * Kruskal-Wallis Test

Table 3 Factors influencing knowledge of basic life support among healthcare workers

Factor		*N*	Mean	SD	*p*-value
Years of Experience	less than 5 Years	134	11.6	2.3	$p=0.173$
	More than 5 years	72	12.8	2.4	
Period of Training	2019–2020	26	11.81	3.16	$p=0.284$
	2020–2021	70	12.19	1.94	
	2021–2022	64	11.58	2.61	
	2022–2023	46	11.37	2.20	
Source of training	AHA	68	13.37	2.06	$p=0.000$
	Internal	138	10.98	2.15	

*N: Number of participants; SD: Standard Deviation; AHA: American Heart association

Table 4 Multivariate logistic regression across scoring categories by gender and age group

Category	Score Range				Adjusted OR (Exp(B))	*P*-value	95% CI for Adjusted OR
	< 50% score		> 50% score				
	n	%	*n*	%			
Gender							
Female	26	24.1%	88	81.5%	1.00	0.18	0.4–2.5
Male	31	36.9%	61	72.6%	-		-
Age (years)							
25–34	31	28.7%	77	71.3%	-	0.47	-
35–44	24	28.6%	60	71.4%	1.08		0.5–2.2
45 and older	2	14.3%	12	85.7%	0.83		0.4–1.3
Total	57	27.7%	149	72.3%	-	-	-

*OR: Odds Ratio; CI: Confidence Interval

a p-value of 0.284. In contrast, a significant difference was noted regarding the source of training; healthcare workers trained by the American Heart Association (AHA) achieved an average score of 13.37 (SD = 2.06), which was significantly higher than the 10.98 (SD = 2.15) recorded by those who received internal training ($p=0.000$). This highlights the effectiveness of AHA training in enhancing BLS knowledge among healthcare professionals (Table 3).

When examining gender and age in the multivariate logistic regression analysis, no statistically significant differences were observed in knowledge levels across gender or age groups. However, female participants and those over 45 years old had slightly higher knowledge, though the odds ratio did not indicate significant differences (Table 4)

4 Discussion

This study's main goal is to assess healthcare professionals' current knowledge of Basic Life Support (BLS) in a tertiary care teaching hospital. It attempts provide insights into the efficacy of current training programs and identify areas for development by evaluating BLS competency and finding factors that contribute to proficiency. The results provide a framework for improving life-saving abilities through focused interventions and uniform training for all healthcare professions.

With a mean score of 58.8%, this study indicated that healthcare personnel in an academic medical center had low knowledge of BLS. The results align with a study conducted out in Pakistan, which indicated that healthcare workers had a comparable knowledge level of BLS at 58.3%. The study also revealed that a number of Healthcare Professions, including physicians and supporting staff, lacked adequate BLS knowledge,

highlighting the necessity of formal training programs to close these knowledge gaps [6]. Poudel et al.'s similar study from 2023 discovered that healthcare personnel typically lack enough knowledge about BLS, despite it being essential for efficient emergency response [7].

Among medical professionals, doctors had the highest knowledge level at 68%, much exceeding that of nurses (56%), and paramedics (42%). This discrepancy emphasizes the importance it is to provide specific training for various professional groups. Other research revealed similar results, emphasizing that physicians generally have greater knowledge of emergency procedures than other healthcare professionals [8–12].

Another influential element was experience, indicates significant impact on knowledge levels. The mean score for professionals with more than five years of experience was 12.8; the score for those with less experience was 11.6. This result is in opposition to Aroor et al. (2020) research, which found a correlation between higher BLS knowledge and more clinical experience. The findings of research by Chaudhary et al. (2018), however, which showed that healthcare personnel frequently experience a deterioration in BLS knowledge and skills without regular retraining, emphasize the significance of ongoing education and refreshers for preserving BLS skills [13, 14]

The results of the study show that healthcare professionals' knowledge and proficiency in Basic Life Support (BLS) are significantly influenced by the training program they received [10–13] With mean scores of 13.37 vs. 10.98 ($p < 0.001$), participants trained by the American Heart Association (AHA) showed considerably greater understanding than those instructed internally. This supports other research that indicates the development of life-saving abilities requires structured, excellent training programs such as those provided by the American Heart Association. Standardized training ensures a higher retention of BLS skills than informal internal training, according to other research [10, 13]. The difference in BLS awareness between participants trained by the American Heart Association (AHA) and those trained internally can be attributed to variations in standardization, content depth, and training methodology. AHA training follows evidence-based, internationally recognized guidelines and incorporates high-quality CPR techniques, AED use, team dynamics, and scenario-based simulations with real-time feedback, all of which enhance skill acquisition and retention. In contrast, internal training programs are often variable in structure and content, may lack advanced simulation tools, and are usually limited to institutional protocols with less frequent updates. These factors likely contribute to the higher knowledge, confidence, and preparedness observed in AHA-trained individuals. This highlights the need for hospitals to either adopt standardized training programs or enhance internal training by incorporating best practices from accredited models to ensure consistent and effective BLS education.

Research has indicated that although medical professionals tend to have greater knowledge, many healthcare personnel still do not possess the necessary BLS skill. Our study shows similar findings with Chandrasekaran S. et al. and Matsuura H et al., indicating that many healthcare workers exhibit low knowledge of essential BLS skills such as performing chest compressions and responding quickly in emergency situations. Despite their medical background they lack confidence when it comes to executing basic life support (BLS) techniques like chest compressions and using automated external defibrillators (AEDs) [4, 15]

The findings of this study highlight significant gaps in the healthcare personnel' knowledge and proficiency in Basic Life Support (BLS) in a tertiary care teaching hospital. It was evident that across different occupational groups, with paramedics showing the lowest level of knowledge. This disparity emphasizes the necessity of focused educational initiatives. The study revealed a noteworthy observation, as 67% of the participants had to count on internal training programs. The results indicate that competency levels are directly influenced by the quality and structure of training, as evidenced by the considerable difference in knowledge scores (mean scores of 13.37 vs. 10.98, $p < 0.001$) between participants who received internal training and those trained by the American Heart Association (AHA). Our study supports previous research, including Chandrasekaran S et al. [4] which emphasized that healthcare personnel's knowledge of BLS is significantly improved by ongoing, systematic training, reinforcing the need for comprehensive training programs with defined curricula and best practices, such as those offered by the AHA.

The implementation of thorough training programs that place a high priority on practical experience and frequent updates is necessary in order to solve these weaknesses. It is believed that repeated training greatly improves knowledge retention and practical abilities is supported by research [16]. Moreover, BLS instruction can be standardized across healthcare professions by incorporating AHA standards into training courses, guaranteeing a consistent degree of skill [17, 18]. In order to improve outcomes, training in BLS should be required in the curricula of Indian teaching hospitals, as many resident physicians lack comprehensive knowledge of the subject.

Furthermore, requiring BLS certification for all healthcare personnel and holding retraining sessions every two years might greatly increase the general level of readiness to respond appropriately in an emergency [19, 20]. Healthcare organizations can promote a culture of safety and preparedness by implementing such measures, which will eventually improve patient outcomes in emergency circumstances.

5 Conclusion

The study highlights a concerning low level of Basic Life Support (BLS) knowledge among healthcare workers in a tertiary care teaching hospital, with the mean score of 58.8%. Significant discrepancies in knowledge were observed across different occupational groups, highlighting the need for modified training interventions. The source of training played a crucial role, participants received American Heart Association (AHA) training exhibits higher knowledge compared to those received Hospital design internal training. The findings emphasize the importance of standardized high quality training programs, such as those offered by the AHA and the need to strengthen and modify the internally design training programs to match the effectiveness of accredited external programs. Additionally, to ensure greater competency BLS training should be made a mandatory part of foundation courses for all healthcare workers.

6 Limitations

The study's limitations include the lack of follow-up assessments to gauge long-term BLS knowledge retention and its focus on a single tertiary care hospital, limiting generalizability. Excluding unavailable healthcare workers may have affected sample representativeness. Additionally, the study assessed only knowledge, not practical skills.

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Author contributions
Himadri M: proposed the study, Himadri M and Omkarnath S: drafted the manuscript, conducted data interpretation, Jethani SL: conceived the idea of study and reviewed the manuscript, Vaibhav B: contributed in data collection and literature review.

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Data availability
The datasets generated and/or analyzed during the current study are not publicly available but can be requested from the corresponding author.

Declarations

Ethics approval and consent to participate
Ethical clearance for this study was granted by the Ethics Committee of Swami Rama Himalayan University, under review number SRHU/HIMS/E-1/2024/77. The study protocol was conducted in accordance with the relevant guidelines and regulations, including the Declaration of Helsinki. The study's objectives were clearly explained to the participants, emphasizing their voluntary participation. Written informed consent was obtained from all participants prior to the start of the study, and only those who agreed were included. Participants were also informed of their right to withdraw or decline participation at any point during the study. All patient information was handled with confidentiality and used anonymously.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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