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Effect of basic life support training among health care providers at a tertiary level hospital in Nepal

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ABSTRACT

Introduction: Basic life support (BLS) is a fundamental skill used to restore cardiac, pulmonary, and cerebral circulation through cardiopulmonary resuscitation (CPR) in patients with cardiac arrest, ideally within seconds of the incident or trauma. The survival of cardiac arrest victims depends on early recognition and high-quality CPR, which requires the knowledge, practice, and confidence of the BLS provider.

Objective: This study aimed to assess the effect of a BLS training program among health care providers at a tertiary hospital.

Methodology: This study was conducted at Dhulikhel Hospital, Kathmandu University, from 2021 November to 2022 December on 294 health care professionals who underwent an 8-hour-long video-based BLS training program using census sampling. Knowledge related to BLS was assessed before and after the training using a quasi-experimental study design. Furthermore, the attitude and perceived confidence of the participants were also evaluated.

Result: There was a significant increase in the participant's mean knowledge score following the BLS training program (mean pre-training score (SD): 9.97 (2.29), mean post-training score:15.04 (0.88), $p < 0.0001$). Post-training feedback showed that the participants had a positive attitude toward BLS and were confident in their ability to perform CPR.

Conclusion: After the training, the participants demonstrated improved knowledge, attitude, and perceived confidence scores. Regular BLS training for health care providers will contribute to preventing mortality and morbidity related to cardiac arrest.

Keywords: basic life support (BLS); cardiac arrest; cardiopulmonary resuscitation (CPR); knowledge; training.

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INTRODUCTION

Cardiac arrest is a major public health concern characterised by a sudden onset of loss of heart's function, respiration, and consciousness.[1] In-hospital cardiac arrest (IHCA) is a common event among hospitalised patients, associated with high morbidity and mortality rate.[2] Basic life support (BLS) is a fundamental emergency skill for preserving cardiopulmonary and cerebral function while reducing long-term morbidity.[3,4]

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High-quality cardio-pulmonary resuscitation (CPR) and prompt defibrillation within three to five minutes after collapse significantly improves survival rate reaching to 75% among out-of-hospital cardiac arrest caused by ventricular fibrillation (VF).[5,6] Similarly, optimal chest compression in IHCA can enhance 30-day survival rates by 40%.[7,8] High-income countries have improved survival outcomes through advancements in emergency response systems, increased awareness, and structured BLS training.[9,10] However, middle- and low-income countries still face high mortality rates due to cardiac arrest.[11] Globally, simulation-based training is implemented to reduce medical errors and management. However, it is not same with Nepal. In response, Dhulikhel hospital has initiated regular BLS training for health care workers and non-medical persons. Despite the importance of BLS, there is limited information on its awareness among Nepali health care workers.[12-14] This study aimed to assess the impact of BLS training on knowledge, attitudes, and perceived confidence among health care workers in a tertiary care centre.

METHODOLOGY

This was a quasi-experimental study with a one-group pretest-posttest model. The study was conducted in the Simulation and Interactive Learning Centre (SILC) of Dhulikhel hospital, Kathmandu University Hospital, from 2021 November to 2022 December, with the frequency of BLS training sessions once a month.

Health care providers working in various departments of, Dhulikhel hospital were included in the study. The study employed total population sampling (census) over one year. On average, 85-100% of participants attended each training session. Those unable to attend the scheduled sessions were approached individually and encouraged to participate in subsequent training sessions. The inclusion criteria were health care professionals receiving BLS training at Dhulikhel Hospital, Kathmandu University Hospital during the study period. Trainees with incomplete evaluation forms after BLS training and those without consent were excluded from the study. Ethical approval was obtained from the Kathmandu University School of Medical Sciences Institutional Review Committee (Reference number: 267/19). Verbal and written consent was taken from all the participants.

A printed proforma was used to collect data which comprised three parts. Part one gathered participants' demographic information including their designation, any previous training experience in BLS, and any previous experience with CPR and AED. Part two was a self-designed questionnaire that measured knowledge of BLS. The questionnaire was prepared by the BLS instructors based on the 2015 Heart and Stroke BLS and the 2020 American Heart Association guidelines.[15,16] Correct answers were rated one point, and incorrect answers were rated zero points. The minimum score that can be obtained from the questionnaire was zero, and the maximum score was 16. Higher knowledge questionnaire scores indicated better knowledge about basic life support practices. Part three assessed the perceived attitudes and confidence of participants, using a five-point Likert scale of one to five ranging from strong disagreement to strong agreement. A panel of independent experts verified the validity of the content of the questionnaire. After the development of the questionnaire, it was pilot-tested. Suggestions were collected from the trainers as well as the trainees and amendments were made to the questionnaire.

Health care providers from different departments were invited to participate in the study using posters containing the program information. The self-designed proforma was used to collect the research data. The pre-training survey was conducted just before the BLS training and the post-training survey was conducted after the completion of training on the same day. The training sessions were conducted by instructors certified by the American Heart Association (AHA) and/or the Heart and Stroke Foundation Canada. The course consisted of a theoretical (four-hours) as well as a practical (four-hours) component. The theoretical component consisted of a video demonstration on adult BLS, child BLS, infant BLS, respiratory arrest, and choking followed by brief elaborations by the facilitator and practice on a mannequin with an instructor-student ratio of one to six. Practical components were scene safety, identification of Cardiac arrest victim, activation of the Emergency response system, high-quality CPR, Rescue breathing, and Automated External Defibrillator for all ages excluding newborns and neonates. Class instruction materials were standardised across all classes. The students' knowledge was assessed before and after the BLS training with the help of a self-designed questionnaire. All the surveys were administered in hard copy format and collected at the end of the training session. Data was analysed using the Stata Statistical Software (Stata Statistical Software Release 17; College Station; TX: StataCorp. LLC). Continuous variables were described as mean, 95% confidence interval, standard deviation (SD), and range whereas categorical variables were reported as frequencies and percentages. Paired t-test was used to assess the difference in the knowledge scores before and after the BLS training. A p-value of less than 0.05 was considered statistically significant.

RESULT

Out of 320 health care workers, who completed the BLS training at Dhulikhel Hospital, Kathmandu University Hospital, a total of 294 health care workers participated in the study. Among the participants, 117 ((39.8%) were medical interns, 112 (38.2%) were nurses and paramedics, 58 (19.7%) clinicians, and seven were research assistants. There were 196 (66.7%) female and 98 (33.3%) male participants. The mean age of the participants was 25.6 years, with a standard deviation of ± 3.5 years (Table 1).

A few respondents 33 (11.2 %) had received prior BLS training and few had some experience with CPR 23(7.8%) and AED Nine (3.1%). According to the pre-training survey, 153 (52%) of the participants stated that they were able to perform CPR before the training. The remaining were hesitant to perform CPR with a lack of confidence in their skills 114 (80.8%) being the common reason. Most of the nurses/paramedics 51 (45.5%) and medical interns 44 (39.3%) were not confident in performing CPR (Table 2).

On the pre-training assessment, participants showed insufficient knowledge regarding the initiation of BLS. Only 59.9% answered the correct initial approach to unresponsive patients and 49.7% could identify the correct component of the chain of survival in cardiac arrest. The full form of 'BLS' was correctly recalled by 46.5% of the participants. There was inadequate knowledge regarding hand placement in CPR, depth of compression, and infant CPR technique. However, most participants correctly responded to questions on pulse assessment (91.5%), rate of chest compression (77.9%), depth of compression (70.4%), and ratio of compression to ventilation (80.6%). Details of the questions included in the assessment (Table 3.)

Paired t-test was performed, which showed that the knowledge score of the participants regarding BLS significantly improved after the training (p-value <0.0001, Table 4).

Post-training feedback was collected in the form of responses to 11 statements to assess the attitudes and perceived confidence regarding BLS as well as attitudes toward the training program. Participants were found to have a positive attitude toward CPR and were confident in their ability to perform CPR (Table 5). Furthermore, respondents mostly agreed that the training program should be provided to hospital staff and included as a part of the medical course curriculum.

The results indicated a statistically significant difference in knowledge after training, indicating knowledge levels after BLS training significantly differed between the designation categories, suggesting that designation influences the effectiveness of BLS training. There is significant difference in the test statistics between clinicians and intern medical doctors as well as nurses and paramedics and intern medical doctors. (Table 6 and 7)

Table 1: Demographic variables and previous experiences of the participants

Variables	n (%)
Age	
Mean ± SD (25.6 ± 3.5)	
Gender	
Male	98 (33.3)
Female	196 (66.7)
Designation	
Medical interns	117 (39.8)
Nurses and Paramedics	112 (38.2)
Clinician	58 (19.7)
Research Assistant	7 (2.4)
Previous BLS training	
Yes	33 (11.2)
No	261 (88.8)
Some experience with CPR	
Yes	23 (7.8)
No	271 (92.2)
Some experience with AED	
Yes	9 (3.1)
No	285 (96.9)
Able to perform CPR	
Yes	153 (52)
No	141 (48)
Reason for not performing CPR	
Not confident	114 (80.8)
Fear of causing further harm to the patient	17 (12.1)
Fear of taking responsibilities	6 (4.3)
Others-not familiar	4 (2.8)

Table 2: Participants designation and reason for not performing CPR

Reason for not performing CPR	Designations			
	Clinician n (%)	Nurse and Paramedics n (%)	Medical Interns n (%)	Research Assistant n (%)
Not Confident	13 (11.6)	51 (45.5)	44 (39.3)	4 (3.6)
Fear of causing harm to the patient	2 (11.8)	7 (41.2)	7 (41.2)	1 (5.9)
Fear of taking responsibilities	1 (16.7)	1 (16.7)	3 (59.0)	1 (16.7)
Other-not familiar	1 (20.0)	3 (60.0)	1 (20.0)	0

Table 3: Distribution of Knowledge regarding BLS

SN	Statement	Pre BLS Correct answers n (%)	Post BLS Correct answers n (%)
1	If you first see somebody unresponsive and lying in the road, what would be your initial appropriate approach?	176 (59.9)	292 (99.3)
2	During a ward round, suppose you found out that a patient is unresponsive, not breathing and the carotid pulses are not palpable. What will you do after you call for help?	167 (56.9)	285 (96.9)
3	What is the 1st link in the chain of survival in an in-Hospital cardiac arrest scenario?	146 (49.7)	285 (96.9)
4	Where do you feel for a pulse in an adult cardiac arrest victim?	269 (91.5)	293 (99.7)
5	What is the maximum amount of time you should take to check for the presence pulse?	187 (63.6)	287 (97.6)
6	What is the ideal rate of chest compression in all ages?	229 (77.9)	290 (98.6)
7	Where should your hands be placed while performing CPR?	144 (49)	173 (58.8)
8	What is the proper depth of chest compression when performing CPR on an Child?	207 (70.4)	285 (96.9)
9	What is the proper depth of chest compression when performing CPR on an infant?	89 (30.3)	267 (90.8)
10	What is the proper ratio of chest compressions to ventilation when performing CPR on an adult?	268 (91.2)	293 (99.7)
11	What is the proper ratio of chest compressions to ventilation when performing two-rescuer infant CPR?	237 (80.6)	291 (99.0)
12	What should you do when an infant victim has a pulse of more than 60/min but is not breathing?	126 (42.9)	279 (94.9)
13	What should you do after the AED prompts "analysing the rhythm"?	182 (61.9)	294 (100.0)
14	What is the full form of BLS?	134 (45.6)	294 (100.0)
15	What is the full form of CPR?	205 (69.7)	234 (79.6)
16	What is the full form of AED?	168 (57.1)	278 (94.6)

Table 4: Difference in the knowledge score regarding BLS before and after training

Variables	Pre-training mean ± SD	Post-training mean ± SD	p- value
BLS Knowledge Questionnaires Score	9.97 (2.29)	15.04 (0.88)	<0.0001*

p-value <0.05 significant *= paired t test

Table 5: Attitude and confidence of participants regarding BLS

SN	Statements	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly Agree n (%)
Attitude towards BLS						
1	I am willing to perform CPR in the hospital setting	2 (0.7)	0	0	96 (32.7)	196 (66.7)
2	I am willing to perform CPR in Out of hospital setting	2 (0.7)	0	3 (1)	100 (34)	189 (64.3)
3	If an AED is available, I would use it to attend a cardiac arrest victim	2 (0.7)	1 (0.3)	0	76 (25.8)	216 (73.2)
Perceived Confidence towards BLS						
1	I can perform CPR in real Cardiac Arrest victim	2 (0.7)	0	2 (0.7)	129 (43.8)	161 (54.8)
2	I can able to work as a member of the resuscitation team	2 (0.7)	0	2 (0.7)	122 (41.4)	167 (57.3)
3	I know how to use an AED machine	2 (0.7)	0	2 (0.7)	111 (37.8)	179 (60.9)
4	I am confident that I can use these skills to save the lives of cardiac arrest victim	2 (.7)	0	0	102 (34.7)	190 (64.6)
Attitudes towards the BLS training program						
1	The learning objective of the course was clear	3 (1)	0	0	76 (25.9)	215 (73.1)
2	BLS should be incorporated into the curriculum	2 (0.7)	1 (0.3)	2 (0.7)	50 (17)	239 (81.3)
3	All hospital staff should be trained in BLS	2 (0.7)	0	0	31 (10.5)	261 (88.8)
4	I agree that all hospitals and public places should be equipped with an AED	2 (0.7)	10 (.3)	3 (1)	65 (22.1)	223 (75.9)

Table 6: Distribution of knowledge before and after training

Distribution of BLS Knowledge	H-test	p-value
Before BLS training across Designation Category	6.131	1.05
After BLS Training across Designation Category	23.69	<0.001†

p-value significant <0.05† = Kruskal-Wallis H test

Table 7: Comparison of knowledge after BLS training by job category

Designations		Test statistics	p-value
Clinician	Nurse and Paramedics	-0.94	0.94
Clinician	Research Assistant	-8.21	0.8
Clinician	Intern Medical doctor	-47.06	0.0001†
Nurse and paramedics	Research Assistant	-7.27	0.82
Nurse and Paramedics	Intern Medical doctor	-46.12	0.0001†
Research Assistant	Intern Medical doctor	38.85	p=0.21

p-value significant <0.05 † = Kruskal-Wallis H test.

DISCUSSION

Many factors such as theoretical training, clinical practice, and personal experiences affect the knowledge and skills of health care workers regarding Basic Life Support (BLS).[17,18] Cardiac arrest can occur unexpectedly, making it crucial for health care providers to be proficient in these skills. Basic life support training has proven to effectively enhance health care workers' knowledge, practice, and confidence.[18,19] The present study which included both theoretical and video-based training shows that it can increase the knowledge and confidence among health care staff. Post-training feedback showed that the participants had a positive attitude toward BLS and were confident in their ability to perform high-quality Cardiopulmonary Resuscitation (CPR).

In this study, the participants showed statistically significant improvement in their knowledge post-BLS training. This finding is consistent with other studies, like a study done in South Korea among nursing students which showed an increase in knowledge from the pretest score (7.98) to the post-test score (16.40), $p<0.001$.[20] A study done by Roshana et al in Nepal in 2018 among 576 participants showed that post BLS training improved knowledge among participant irrespective of their occupation.[21] Similarly, another study conducted among Palestinian nurses showed similar findings.[18] Studies have shown that participants with prior training demonstrate higher knowledge and perform well in post-training assessments.[22] This highlights the importance of repeated BLS training among health care professionals to improve the survival rate of in-hospital cardiac arrest.

A recent study conducted by Thapa et al. on frontline police responders in rural Nepal also reported increased knowledge scores on hands-on CPR and choking first aid.[23] Consistent with Moon and Hyun, we found that after BLS training participants developed positive attitudes and were more confident in their ability to perform CPR.[20] Another study that used online video lectures also revealed that 93.5% of trainees felt more confident about performing BLS after their training.[24] Therefore, the findings of this study suggest that BLS training and increased knowledge also impact the confidence to perform BLS.

A significant barrier to initiating CPR is a need for more confidence in BLS skills. In this study, lack of confidence was the most common reason that prevented participants from initiating CPR, which aligns with other studies that showed lack of training to be the main reason which in turn might be why they lack confidence.[25] Repeated training can positively influence the attitude of people towards CPR and the use of AEDs.[26] So, organizations should emphasise routine structured video-based training with hands-on sessions to boost health care providers' confidence, enabling them to manage cardiac arrest more effectively.

This study shows that clinicians' and nurses' and paramedics post-training knowledge of BLS was better than that of intern medical doctors. This could be due to clinicians and nurses and paramedics having more experience managing emergencies, applying BLS principles in real-life situations, and often being involved in active resuscitation, where quick decision-making skills are essential.[27]

The survival of a cardiac arrest patient heavily depends on the timely identification of the condition, early use of a defibrillator, and the provision of high-quality CPR. A study showed that most AED use is inadequate and only the timely use of AED significantly impacts the return of spontaneous circulation.[28] The first responder AED program conducted in Germany, which included training hospital staff on initiating resuscitation and using AED, could achieve a higher survival rate post-training.[29] This highlights the knowledge gap that exists among health care professionals and the need for repeated training that incorporates skill-based training as well. Current study indicated that more than 75% of participants felt confident using an Automated External Defibrillator (AED) if they had access to one. Bystander CPR and early use of an AED/defibrillator can increase survival of cardiac arrest.[30] Studies suggest that increased bystander CPR and AED/ defibrillator interventions can be achieved through educating the community and medical personnel and reinforcing the policies for placement of AEDs in public places from the government.[31] Thus, incorporating regular and standardized BLS training programs for all medical and non-medical staff, increasing the availability of AEDs, and improving pre-hospital care systems can significantly improve the survival rates and outcomes for cardiac arrest victims.

The strength of current study is that we have included all the health professionals from various departments. We have not only assessed their BLS knowledge, practice, and confidence but also explored their attitudes and opinions regarding BLS which is crucial for designing effective training programs. This study has various limitations as well. The study was conducted in one tertiary care centre which limits the generalizability of the findings. We could not find a validated tool to assess

BLS knowledge even with an extensive literature review so there is a need for a standard questionnaire to assess BLS knowledge.

Self-reporting bias is a notable limitation in this study as the responses may have been influenced by social desirability and personal perceptions, leading to potential over reporting or underreporting of certain knowledge, practices, and behaviors. Efforts were made to minimize this bias through clear instructions and anonymous data collection, but its complete elimination remains challenging, especially in self-reported data scenarios.

Further, we have not investigated how the BLS-trained graduates/providers would perform in the real-case scenario. Pre vs Post or the survival rate improvement would show the real impact of the BLS training program and could be our future direction of study.

CONCLUSION

This study showed that structured training can enhance the knowledge, attitude, and perceived confidence of health care professionals toward BLS for better management of cardiac arrest victims.

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