Effectiveness of Basic Life Support Training on Level of Knowledge and Competency among Undergraduate Nursing Students

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Abstract

A significant number of cardiac arrests can be anticipated and prevented through careful observation, prevention, and timely intervention for pre-arrest conditions. As the nursing profession is intrinsically linked to clinical judgment, it is crucial for nursing students to not only provide the required support to their patients during critical moments but also adopt an efficient and effective approach in their clinical practice. The acquisition of BLS training will facilitate the ability of undergraduate nursing students to promptly identify various life-threatening emergencies and initiate appropriate measures to save the victim's life. A pre-experimental pretest-posttest design was adopted for this study to evaluate the effectiveness of competency-based training on basic life support on undergraduate nursing students' knowledge and competency. The study population comprised 213 undergraduate nursing students from various colleges of nursing in Tamil Nadu. The research instruments used in this study encompassed a self-structured questionnaire to collect demographic data from undergraduate nursing students, a knowledge questionnaire, and an Adult one-rescuer competency checklist to evaluate their competency. The obtained mean difference knowledge score of 8.52 exhibited a statistically significant difference at a very high level, as indicated by a P 0.001. The assessment of competency among undergraduate nursing students on the BLS demonstrated that almost all the nursing students achieved a high level of competency (93.9%) in performing Cardiopulmonary Resuscitation. A positive correlation was observed between knowledge and competency, with a Pearson correlation coefficient (r) of 0.295. This correlation was determined to be statistically significant at P<0.001 level. The observed positive correlation suggested that there is a direct relationship between the increase in knowledge and the improvement in competency levels of students in basic life support. The results of this study concluded that the implementation of a competency-based training program in Cardiopulmonary Resuscitation proved beneficial for undergraduate nursing students by enhancing their cognitive and psychomotor abilities.

INTRODUCTION

Clinical Cardiovascular diseases (CVDs) have significantly risen to become the primary contributor to mortality worldwide [1]. The estimated number of deaths resulting from cardiovascular diseases was reported at approximately 17.9 million, accounting for approximately 32% of the total global mortality rate, according to the World Health Organization (WHO) in 2019. Among the reported deaths, a significant majority of 85% were due to heart attacks and strokes [2]. CVD has emerged as the predominant cause of mortality across all regions of India. India accounted for 63% of the total deaths caused by non-communicable diseases (NCDs), of which 27% were attributed to CVDs, as per the WHO report [2]. The research conducted in the Global Burden of Disease study revealed that in India, cardiovascular diseases (CVDs), specifically ischemic heart disease, account for a significant portion of the total mortalities, affecting approximately one out of every four individuals. Moreover, the age-specific mortality rate for CVD is estimated at 272 per 100,000 individuals within the Indian population, surpassing the global average of 235 [3].

Cardiac arrest is the abrupt cessation of cardiac functioning, leading to a state of unresponsiveness, the absence of breathing, and the absence of circulation in the affected individual. Sudden cardiac death (SCD) is characterized as the occurrence of death resulting from cardiac etiologies, wherein the time and modality aspects of death are sudden, occurring within one hour after the onset of prodromal symptoms. This event may occur in individuals with or without pre-existing cardiac conditions [4]. Based on empirical evidence and statistical data provided by

the American Heart Association (AHA), it is evident that a significant proportion, varying between 75-80%, of cardiac arrests occur within the domestic setting [5]. Approximately 95% of individuals who experience sudden cardiac arrest may die prior to reaching the medical facility, with clinical evidence demonstrating that brain death commences within a time frame of four to six minutes subsequent to the occurrence of cardiac arrest. A study was conducted to review In-hospital cardiac arrest, which is a sudden event caused by respiratory or circulatory conditions in hospitalized patients. It indicated that the occurrence of cardiac arrest within a healthcare facility is prevalent and is associated with a considerably high mortality rate [6].

A significant number of cardiac arrests can be anticipated and prevented through careful observation, prevention, and timely intervention for pre-arrest conditions. The fundamental practice of Basic Life Support (BLS) serves as the cornerstone of the rescue of lives following cardiac arrest [7]. According to the American Red Cross, Basic Life Support (BLS) refers to the medical assistance given to individuals experiencing cardiac arrest, respiratory distress, or an obstructed airway. This form of care is administered by first responders, healthcare providers, and public safety professionals [8]. Quick recognition of cardiac arrest, prompt activation of the resuscitation team, expeditious initiation of cardiopulmonary resuscitation (CPR), and timely administration of defibrillation are critical factors contributing to the survival of victims [7]. Promptly administering CPR after cardiac arrest has the possibility of doubling or even tripling the chances of survival [9].

In hospital settings, BLS will be administered by various cadres of healthcare professionals, encompassing both medical and paramedical personnel. Nurses often assume the role of primary responders due to their extensive presence and close proximity to patients in healthcare settings, thereby serving as the initial identifiers of in-hospital cardiac arrests. Competency-based education and training is a structured form of instruction aimed at students, with a particular emphasis on the development of targeted skills or competencies [10]. This approach enables students to attain the requisite knowledge and skills necessary to effectively execute a given procedure in accordance with established standards [11]. Competency-based training programs are of paramount importance for undergraduate nursing students, as they significantly contribute to the enrichment of their competency in the provision of emergency care services [12]. Hence, it would be advantageous for nursing students to possess comprehensive knowledge and skills in CPR to strengthen their clinical practice.

1.1 Need For The Study

The cultivation of professional competency in nursing students constitutes a primary objective within the realm of nursing education [13]. The field of nursing education is interlinked with the numerous stressors encountered by nursing students within the emergency department. As a result, it is crucial for students within this discipline to acquire the essential abilities to alleviate stress, anxiety, and adverse emotions. As the nursing profession is intrinsically linked to clinical judgment, it is crucial for students to not only provide the required support for their patients during critical moments but also adopt an efficient and effective approach in their practice.

The study findings indicated nursing students possessed an average level of knowledge in regard to basic life support, necessitating the utilization of simulated activities and role-playing exercises as effective learning tools to enhance their learning experience [14]. The outcomes of an additional study indicated that trained students exhibited better levels of knowledge, skills, and attitudes in comparison to their untrained counterparts in relation to BLS [15]. Furthermore, another study revealed that students are in need of further knowledge and skills pertaining to CPR in order to effectively execute life-saving measures on a victim [16]. One of the study findings illustrated that nursing students demonstrated a good level of knowledge pertaining to CPR. However, it is imperative that current training programs be periodically executed to enhance their skills in CPR [17].

In order to effectively and expeditiously respond to occurrences of cardiac arrest, it is crucial for nursing professionals to possess competency, preparedness, and up-to-date knowledge regarding life-saving interventions, often necessitating periodic CPR training. The approach of nurses and nursing students plays a vital role in timely and effective responses to cardiac emergencies [12]. Henceforth, BLS training will aid undergraduate nursing students in the identification of numerous life-threatening emergency conditions that may lead to cardiac arrest. This training will equip students with the skills to provide effective chest compressions, ensure the application of high-quality critical concepts, deliver adequate ventilation, and rapidly use an AED to increase the chance of survival for cardiac arrest victims. Therefore, the acquisition of BLS training will facilitate the ability of

undergraduate nursing students to promptly identify various life-threatening emergencies and initiate appropriate measures to save the victim's life.

1.2 Objectives

a. To assess the pretest and posttest knowledge levels on basic life support in undergraduate nursing students

b. To evaluate the effectiveness of training on Cardiopulmonary Resuscitation among undergraduate nursing students

c. To find the correlation between knowledge and competency in Cardiopulmonary Resuscitation among undergraduate nursing students

d. To determine the association between the demographic variables and the posttest level of knowledge on basic life support and competency in Cardiopulmonary Resuscitation among undergraduate nursing students.

1.3 Hypothesis

H1: There is a significant difference in the posttest knowledge and skill in performing CPR among undergraduate students.

METHODS

The conceptual framework utilized in this research was based on Modified Ludwig Von Bertanloffy's General System. A pre-experimental pretest-posttest design was adopted for this study to evaluate the efficacy of competency-based training on basic life support among undergraduate nursing students' knowledge and competency. The study population comprised 213 undergraduate nursing students from various colleges of nursing, who were enrolled in Basic Life Support (BLS) course training provided by Impetus Healthcare Skills.

Research instruments utilized in this study consisted of a self-structured questionnaire that was employed to gather demographic information from undergraduate nursing students. A structured knowledge questionnaire was administered in order to assess the student's knowledge, while the Adult One Rescuer competency checklist was employed to evaluate their competencies. The knowledge questionnaire consisted of a total of fifteen multiple-choice questions. Each question was assigned a numerical value of one for a correct reply, with no score assigned to an incorrect response The Knowledge score was categorized into three grades based on the obtained knowledge scores. If the score was below 50%, it was graded as inadequate knowledge; the score between 51 and 75% was graded as moderately adequate knowledge; and the score above 75% was graded as adequate knowledge. The reliability coefficient of the research instrument was determined to be 0.88.

The Adult One Rescuer CPR competency checklist comprised four components, namely Assessment and Activation, Adult Compressions, Adult Breaths, and Adult High-quality CPR. The skill checklist is comprised of fifteen items, where each skill component is assigned a binary score of "1" if performed completely and a score of "0" if it is either not performed or performed incompletely. The scoring system categorized the level of competency into four grades: Needs remediation (<50%), Satisfactory (50–60%), Good (61–80%), and Excellent (>80%). The skill checklist was found to be highly reliable, with r = 0.98.

4.1 Data collection

A pre-test was administered for the duration of 15 minutes to undergraduate nursing students in order to evaluate their current knowledge level pertaining to BLS. The training focusing on BLS competencies was administered to a group comprising approximately 28–30 students in each batch. The competency-based training session consisted of video-based content with hands-on training on CPR for duration of eight hours. In this study, task trainers (Little Annie Adult CPR Manikins) for CPR and an Automated External Defibrillator (AED) were used for conducting competency-based training. The competency-based training was implemented in a systematic manner. The initial segment of the training focused on the assessment of the victim's signs of cardiac arrest and the activation of the emergency medical system, followed subsequently by training on chest compressions and

breathing techniques. The final aspect of the training encompassed an extensive overview of the sequence of steps involved in adult rescuer CPR.

Instructional information pertaining to the operation of an automated external defibrillator, as well as the appropriate techniques for relieving adult choking, was also provided. The students were diligently engaged in the practice of all the facets of Basic Life Support training, persevering until the attainment of a high level of competence, demonstrating confidence, and having the ability to perform without any errors. Subsequent to their completion of training, the nursing students underwent a post-assessment to evaluate their level of knowledge and competence. The collected data was subsequently organized into tabular format and subjected to analysis.

RESULTS

The results of the study in Table 1 revealed that a major proportion of the students in the pretest displayed inadequate knowledge (82.2%) regarding BLS, whereas, in the posttest, a significantly larger proportion of the students (97.7%) demonstrated a substantial improvement and achieved adequate levels of knowledge on BLS.

Table 1: Distribution of level of knowledge on Basic Life Support in undergraduate nursing students

Level of Knowledge	Pretest		Posttest	
	n	%	n	%
Inadequate Knowledge	175	82.2	-	-
Moderately adequate knowledge	37	17.4	5	2.3
Adequate Knowledge	1	0.4	208	97.7

The inferred results in Figure 1 indicated that the pretest average knowledge score was 5.48, while the mean knowledge score increased to 14.00 in the posttest. The obtained mean difference score of 8.52 exhibited a statistically significant difference at a very high level, as indicated by a $P \leq 0.001$. Consequently, it can be inferred that understanding basic life support significantly contributed to the improvement of knowledge among undergraduate nursing students.
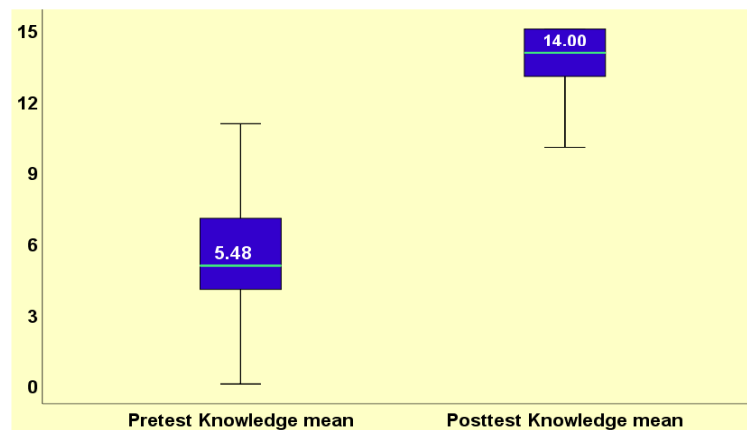

Figure 1: Comparison of BLS knowledge means in pretest and posttest

The study findings in Table 2 demonstrated that nearly all the undergraduate nursing students achieved a high level of competency (93.9%), thereby indicating that the training program had a substantial impact on improving the CPR skills of the nursing students.

Table 2: Distribution of level of competency pertaining to Cardiopulmonary Resuscitation in undergraduate nursing students

Level of competency	Frequency	Percentage
Excellent	200	93.9
Good	13	6.1
Satisfactory	-	-
Needs remediation	--	-

The research findings indicate that the overall mean score for competency in CPR was determined to be 14.17. Additionally, the average scores for each component of CPR were analyzed; the assessment and activation component demonstrated a mean score of 5.71, while the adult compressions, adult breaths, and Adult high-quality CPR components displayed mean scores of 3.75, 2.85, and 1.84, respectively, as displayed in figure 2. This outcome suggested that training programs centered on competency were successful in enhancing the skill levels of students, thus proving to be highly effective.
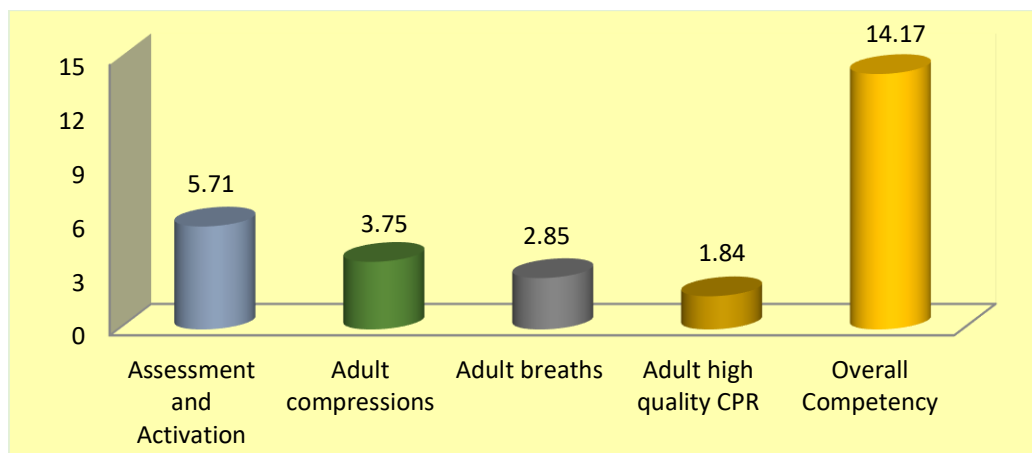
Figure 2: Mean scores of CPR Competency components

The statistical analysis employed in this study involved the computation of the Karl Pearson Correlation Coefficient to examine the relationship between the post-test knowledge score and the post-test competency score. A positive correlation was observed between knowledge and competency, with a Pearson correlation coefficient (r) of 0.295. This correlation was determined to be statistically significant at $P < 0.001$ level. The observed positive correlation suggested that there is a direct relationship between the increase in knowledge and the improvement in competency levels of students in basic life support.

Table 3: Correlation of knowledge with competency in basic life support among undergraduate nursing students

BLS	Mean	SD	Pearson's correlation
Knowledge	14.00	1.151	**r=0.295***

Competency	14.17	0.928

The present study revealed a statistically significant association between age (P<0.05) and year of study (P<0.005) and the level of competence pertaining to basic life support. However, the analysis did not reveal any statistically significant association between the other demographic variables and the level of knowledge pertaining to basic life support.

DISCUSSION

The American Heart Association (AHA) guidelines for 2020–2021 have highlighted the significance of executing chest compressions with optimal quality as the key factor impacting favourable outcomes during the resuscitation of adult individuals [7]. The recognition of the paramount importance of continuous and contemporary training for nursing students is steadily growing within academic circles, as it plays a pivotal role in promoting the well-being and recovery of victims affected by adverse events. The identification of a training methodology that yields the most significant outcomes, ensuring the retention of knowledge and skill among rescuers, assumes particular significance in this context.

This study illuminated that a significant number of students displayed insufficient knowledge in the pretest, but in the posttest, a considerably larger proportion of the students demonstrated a substantial improvement and achieved adequate levels of knowledge on the BLS. The study findings aligned with the research, which indicated that the mean pretest score surpasses the mean post-test score, with statistical significance. The implementation of blended learning yielded favourable outcomes in enhancing the level of knowledge among nursing students regarding BLS [18]. Furthermore, in conjunction with our study, the investigation carried out by another author indicated that the majority of nursing students acquired substantial knowledge and practice regarding CPR subsequent to the utilization of demonstration as a method of training [19].

The results of this current study were further substantiated by a quasi-experimental study that illustrated that prior to undergoing training, nursing students possessed only an average level of knowledge pertaining to BLS. However, subsequent to the completion of the training program, a significant improvement in the acquisition of BLS knowledge was observed [20]. Hence, the outcomes of the reviewed studies align with the results of this study. Consequently, the inclusion of competency-based BLS training plays a significant role in enhancing the knowledge of students pursuing a career in the field of nursing.

The results of this study illustrated that the assessment of competency among undergraduate nursing students on the BLS demonstrated that nearly all the students achieved an increased level of competency. This study's findings were substantiated by similar research findings, which demonstrated that training resulted in a significantly higher mean post-test practice score (23.00) in nursing students [21]. This study was also supported by the results obtained from the study, which indicated a remarkable rise in mean posttest practice scores in comparison to mean pretest practice scores. This difference was found to have a mean value of 4.9 and was determined to be statistically significant [22].

In alignment with the current study, the effect of BLS training on knowledge and practices among students in the fields of medicine and dentistry was investigated. Knowledge and skill retention were evaluated over a period of six months, using a retention test. During the preliminary assessment, the level of BLS awareness was mostly unsatisfactory. Students who attended a lecture and engaged in practical training observed significant knowledge acquisition and skill enhancement. There was a notable increase in retention rates in comparison to the pretest results, thereby emphasizing the indispensability of regular hands-on courses subsequent to BLS training [23].

Therefore, the outcomes of preceding research studies are congruous with the current study as they illustrated the effectiveness of the competency-based training approach in BLS in enhancing the competency levels of undergraduate nursing students, thereby demonstrating a high level of efficacy.

In this study, a positive correlation was observed between knowledge and competency, with a Pearson correlation coefficient (r) of 0.295. This correlation was determined to be statistically significant at P<0.001 level. The observed positive correlation suggested that there is a direct relationship between the increase in knowledge and the improvement in competency levels of students in basic life support. This research finding was corroborated

by a study that demonstrated a statistically significant enhancement in both theoretical knowledge and practical skills following completion of BLS training, as indicated by (P<0.001) [24].

According to the research findings and an exhaustive review conducted, it has been established that there is a pressing need for undergraduate nursing students to augment their knowledge and competency levels pertaining to BLS. The implementation of competency-based training exhibits the capacity to optimize individuals' competency and understanding of CPR, enabling them to practice with the necessary skillset essential for efficient management of emergency conditions in the clinical environment.

CONCLUSION

Competency-based training on Basic Life Support evaluated the nursing student's strengths and weaknesses on various components, thereby facilitating the development of personalized learning plans for each student catering to their specific learning requirements. The present study focused on the provision of hands-on training in regard to high quality CPR, which improved the cognitive and psychomotor skills of nursing students and contributed to the development of confidence and the ability to overcome fear while performing CPR. In order to enhance their clinical competencies and mitigate potential risks to patients, it is imperative for undergraduate nursing students to undergo competency-based training in Basic Life Support (BLS) before commencing their practical training in hospital settings.

Recommendations

- The utilization of competency-based training, in conjunction with hands-on clinical experience, can facilitate the development of a positive attitude among undergraduate nursing students towards the effective execution of CPR skills. Furthermore, diligent supervision of nursing students during their practical training can effectively mitigate mistakes and ensure the well-being and safety of patients.

- Incorporate regular intervals of Basic Life Support (BLS) training within the nursing education program, as this approach can enhance the efficacy of the implementation of CPR skills during both practical training and emergency scenarios.

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Ethical approval for this study was obtained from the Institutional Ethics Committee.

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