

# Assessment of Knowledge and Impact of Training on Cardiopulmonary Resuscitation among the Registered Nurses in a Tertiary Care Hospital

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## Abstract

**Context:** Cardiac arrest whether in the hospital or outside hospital is considered as a major medical emergency and it should be treated immediately. The survival and outcome of a cardiac arrest depends on the early initiation of BLS. The nurses are expected to update their knowledge as per BLS-AHA guidelines to ensure timely recognition of cardiac arrest and to initiate the chain of survival as early as possible. **Aims:** To evaluate the knowledge about cardiopulmonary resuscitation among nurses before and after the formal certified CPR training program in a tertiary care hospital. **Material and Methods:** It is a cross sectional descriptive study and it was conducted by the department of Anaesthesiology by involving the Nurses at Melmaruvathur Adhiparasakthi Institute of Medical sciences and Research from February to March 2018. Totally 186 nurses were consented from various workplace and different educational status for this study. A validated and pre-tested questionnaires which contains 20 questions which evaluated the knowledge, attitude and practices towards the cardiopulmonary resuscitation (CPR) was distributed to the nurses for pretest and posttest after training. The correct answer score assigned was 1 and wrong answer score was 0 thus making the total score as 20. **Results:** Among the total 186 nurses 98.92% (n=184) were females and 1.08% (n=2) were males. Majority were between the age group of 26 to 30 years and their working experience ranging from 2 to 10 years. Many of the participants 45.7% (n=85) had no formal training in CPR and (n=101) 54.3% had undergone CPR training during their study period. 118 (63.44%) nurses had studied B.Sc nursing and 68 (36.56%) were Diploma in nursing. Among them 113 (60.75%) were working in medical and surgical ward, 22 (11.83%) in casualty, 30 (16.13%) in ICU, 21 (11.29%) in OT. The mean±SD of the overall total knowledge score was 42.37±4.8 and 67.1±3.37 in pre and post test respectively there was significant improvement and association between the total scores in pretest and post test (P<0.05) and also there was a strong association between the workplace and the total scores (p<0.0001). **Conclusion:** In conclusion the Knowledge practices and attitude of the participants regarding CPR were low before training and found adequate after training. Thus, more educational interventions and training programs should be provided periodically among the nurses.

**Keywords:** Basic Life Support (BLS); Cardiopulmonary Resuscitation(CPR); Training; Knowledge; Nurses.

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## Introduction

The most important critical component of basic life support is cardio pulmonary resuscitation

(CPR). It along with defibrillation is the first line response for the cardiac arrest patient. The CPR includes delivering high quality chest compression, opening the airway and maintaining the oxygenation in blood circulation [1].

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Cardiovascular disease is a leading cause of mortality and it accounts to 30% worldwide [1]. The peak age of sudden cardiac arrest is between 45 and 75 years [2]. The incidence of cardio vascular disease increases even in HIV patients due to antiretroviral therapy since it increases the risk of atherosclerosis and coronary artery disease which leads to cardiac arrest [2-4].

Early cardio pulmonary resuscitation (CPR) of cardiac arrest patients leads to facilitates the survival. All the health care professionals should have adequate knowledge about CPR and it should be done only by skilled, trained and knowledgeable person. Health care professional especially nurses knowledge about CPR varies in developed countries [5]. Many studies done in CPR in USA, UK revealed the low level of knowledge and skills about CPR among the nurses.

Nursing personnel should be aware of the significance of BLS in life threatening situation because most of the time physician may not be available near the patient and hence the nurses should be capable to do the CPR in emergency situation. (marzooq - H 2009) has done a study to assess nurses skills in CPR [6,7]. Preusch et al. [8] and Kalhori et al. [9] reported that based on the 2005 guidelines for the CPR nurses knowledge on CPR is low. Passali et al. reported that the level of awareness regarding basic life support (BLS) and advanced life support (ALS) principles among nurses and doctors of Greece not sufficient [10]. And also a delay in drug administration due to insufficient knowledge of the staff on medication was reported in some studies [11].

Nurses are the most important members in health care system and they need to know the basic skills and experience that are needed to do CPR. Many literature quoted that sudden cardiac arrest can be treated by a timely given CPR and it is consider to be an important medical emergency technique. The important elements of understanding and acquiring the knowledge and skills by the nurses are frequent training programs for the nurses. Also the american heart association (AHA) revised the CPR guidelines in the year 2010 and hence the nurses should update their knowledge on CPR to ensure quality patient care Hence the aim of this study is to evaluate the knowledge about cardiopulmonary resuscitation among nurses before and after the formal certified CPR training program.

## Materials and Methods

### Study Design

This is a cross sectional descriptive study

conducted by the department of Anaesthesiology at Melmaruvathur adhiparasakthi Institute of Medical sciences and Research-Tertiary care hospital in Tamilnadu, South India from February to March 2018, Data was collected from the participants using pre-tested, validated and self administered questionnaires which evaluated the knowledge towards the cardiopulmonary resuscitation (CPR) among nurses.

### Study Subjects

The subjects were the nurses who were working in various departments. They either had a Bachelor's degree (B.Sc) or Diploma in nursing and Midwifery .

### Inclusion and Exclusion Criteria

All the nurses on duty who were volunteered and given consent to participate were included and the nurses on leave or duty off were excluded from the study.

### Method of data collection

A questionnaire form comprising of 20 multiple choice questions on BLS which were framed by getting an expert opinion was used as the data collection tool. It was distributed to the Nursing staffs who agreed to participate in this study and given adequate time about 30 minutes to answer these questions. The socio-demographic characteristics of the nurses such as Age, educational degree ((B.sc or Diploma in nursing) , working stations and previous knowledge and training towards cardiopulmonary resuscitation (CPR) were also analysed. After that the investigator conducted a training programs which includes video demonstration and explanation about CPR procedure and hands on demonstration and again the same questionnaire was given to the participants to answer the correct responses. The correct answer score assigned was 1 and wrong answer score was 0 thus making the total score as 20. A total of 186 nurses who were included in the study. And the nurses were informed for not writing their names on the questionnaire.

### Statistical Analysis

The data obtained were analysed by using graph pad prism 5.0 software. The data were presented as percentage, mean, standard deviation (SD). The p value < 0.05 was considered as statistically significant.

**Results**

Nurses were assessed for their knowledge on Cardiopulmonary resuscitation by using self-structured questionnaire before and after CPR training. The observed results showed out of 186 respondents 98.92% (n=184) were females and 1.08% (n=2) were males. Majority were between the age group of 26 to 30 years [Table 1] and their working experience ranging from 2 to 10 years. As many of the participants 45.7% (n=85) had no formal training

in CPR and (n=101) 54.3% had undergone CPR training during their study period, 118 (63.44%) nurses had studied B.Sc nursing and 68 (36.56%) were Midwifery and Diploma in nursing. Among them 113 (60.75%) were working in medical and surgical ward, 22 (11.83%) in casualty, 30 (16.13%) in ICU, 21 (11.29%) in OT [Table 2]. The lowest score assessed in the questionnaire was 2 in pretest and 7 in post test after training and it was statistically significant  $p < 0.0001$  with the mean score out of 20 questionnaire was 8.47 and 13.41 in pre and post test respectively [Table 3].

**Table 1:** Demographic details of Registered Nurses

		Frequency	Percentage
Gender	Female	184	98.92
	Male	2	1.08
Age	Less than 25	49	26.34
	26-30	101	54.30
	31-35	15	8.06
	36-40	9	4.84
	41-45	7	3.76
	>46	5	2.69

**Table 2:** Professional Education and Experience and Place of work of Registered Nurses

		Frequency	Percentage
Education	B.Sc Nursing	118	63.44
	Diploma in Nursing and Midwifery	68	36.56
Experience	< 2 years	7	3.76
	2-4	123	66.13
	5-7	37	19.89
	8-12	8	4.30
	>12	11	5.91
Place of work	Medical and surgical ward	113	60.75
	Casualty	22	11.83
	ICU	30	16.13
	OT	21	11.29

**Table 3:** Highest and lowest score in pre test and Post test

	Pre test		Post test	
	Lowest score	Highest score	Lowest score	Highest score
Overall	2	16	7	19
Based on Qualification				
B. Sc	6	18	8	19
Diploma in Nursing and Midwifery	2	11	7	19
Based on place of work				
Ward (113)	2	10	7	19
Casualty(22)	9	15	10	19
ICU(30)	10	18	11	19
OT(21)	9	12	12	17

Comparison of the nurses total scores with their educational status that is B.Sc nursing and Diploma in nursing, the mean  $\pm$ SD of the overall total scores was  $8.47 \pm 0.212$  in pretest and  $13.41 \pm 0.204$  in post test and there was a strong association between the knowledge scores and educational status of the participants and it was statistically significant  $p < 0.0001$  [Table 4]. Likewise in comparison with the workplace regarding the knowledge and attitude about cardiopulmonary resuscitation there was a lacunae in the nurses who were working in the ward and OT followed by casualty and ICU nurses and it was correctly pointed out here by conducting the training sessions in CPR with pre and post test and it was found to be statistically significant with  $p < 0.0001$  it was depicted in [Table 4].

*Responses of the Nurses to Individual Questions*

A high percentage 82.6% of the nurses knew about the depth of the chest compression in an adult. However only 54.5% nurses knew the component

of CPR. Regarding the basic knowledge and identification of cardiac arrest the nurses should know how and where to check pulse for an adults and infants, where to move a patient to perform appropriate CPR and where the rescuer should be and how long the CPR can be performed fortunately the mean of  $53.42 \pm 6.8$  had an adequate knowledge in pretest and was improved to the mean of  $74.30 \pm 1.6$  which was a drastic responses obtained after an effective training session and similar to this findings the knowledge and attitude regarding chest compression, maintenance of airway and breathing and finally choking and its management had an excellent responses with the mean of  $63.18 \pm 4.9$ ,  $67.08 \pm 3.5$ ,  $63.86 \pm 3.5$  in post test respectively in comparison with poor performance in pretest with the mean of  $36.12 \pm 4.1$ ,  $40.00 \pm 4.1$  and  $39.94 \pm 4.2$  respectively. The details of the nurses responses in pre and post test of the individual questionnaire are listed in [Table 5] and it was statistically significant  $p < 0.05$ .

**Table 4:** Mean and the Standard deviation of Pretest and Post test score based on their Qualification & place of work

	Pre test	Post test	p value [significant if P < 0.05]
Overall	8.47 $\pm$ 0.212	13.41 $\pm$ 0.204	P < 0.0001
<b>Based on Qualification</b>			
B. Sc	10.08 $\pm$ 0.280	14.12 $\pm$ 0.279	P < 0.0001
Diploma in Nursing and Midwifery	6.67 $\pm$ 0.279	13.29 $\pm$ 0.373	P < 0.0001
<b>Based on place of work</b>			
Ward	6.75 $\pm$ 0.162	13.12 $\pm$ 0.273	P < 0.0001
Casualty	11.73 $\pm$ 0.384	14.59 $\pm$ 0.608	P < 0.0001
ICU	13.47 $\pm$ 0.411	15.70 $\pm$ 0.368	P < 0.0001
OT	10.38 $\pm$ 0.200	14.10 $\pm$ 0.307	P < 0.0001

**Table 5:** Types of Questions and the Percentage of correct responses in pre and post test by the Nurses

	Pre test	Post test	Mean and SD pre test	Mean and SD post test	p value significant
<b>Basic knowledge and identification of cardiac arrest Over all</b>			42.37 $\pm$ 4.8	67.1 $\pm$ 3.37	yes P < 0.05
<b>A Basic knowledge and identification of cardiac arrest</b>					
1 Where should you check for a pulse in an adult?	66.8	76.6	53.42 $\pm$ 6.8	74.30 $\pm$ 1.6	yes P < 0.05
2 Where should you check for a pulse in an infant?	33.2	68.5			
3 In which of the following situations is moving a patient during CPR appropriate?	44.7	75.6			
4 Where the rescuer should be while performing CPR?	52.4	77.6			
5 Basic Life Support should be continued until?	70	73.2			
<b>B External cardiac compressions and AED</b>					
6 What is the correct depth of chest compressions in an adult?	46.5	82.6	36.12 $\pm$ 4.1	63.18 $\pm$ 4.9	yes P < 0.05
7 A child is not breathing but has a pulse rate of 30 per minute. The rescuers should?	25.5	58.5			
8 Early defibrillation for adults is important because?	31.8	58.8			
9 Where should you place your hands on the chest of a victim when you are performing chest compressions?	45.5	61.5			

		Pre test	Post test	Mean and SD pre test	Mean and SD post test	p value significant
10	Which of the following is NOT a component of high quality CPR?	31.3	54.5			
<b>C Maintenance of Airway and Breathing</b>						
11	A Victim probably has a neck injury. What is the correct way to open the airway?	49.6	69.2	40.00± 4.1	67.08± 3.5	yes P < 0.05
12	A Child is gasping for breath but has a pulse rate of 100 per minute. The rescuers should?	35.7	64.2			
13	How do you know that your rescue breath is effective?	29.7	55.8			
14	The best way to allow the chest to recoil after compression is to?	35.1	68.6			
15	The most common cause of airway obstruction in unresponsive adults is?	49.9	77.6			
<b>D Chocking and its management</b>						
16	A 50 year-old man who has been eating a mutton piece in a restaurant abruptly stands up and grabs his neck. The rescuer determines that the victim becomes unresponsive, then appropriate step is?	25.6	55.5	39.94 ± 4.2	63.86 ± 3.5	yes P < 0.05
17	An infant who had been choking is responsive and struggling for breath. The rescuer should?	37.9	60.8			
18	Effort to relieve choking should be stopped when?	47.8	71.6			
19	To relieve choking in a responsive child, you should perform?	49.2	72.8			
20	An infant who had been choking is unresponsive and no breathing. The rescuer should?	39.2	58.6			

The level of knowledge based on the questions before and after training showed that the highest defect in the knowledge before training regarding the infant CPR and what the rescuer should do in choking condition of the infants [Table 5] and it also showed that the overall mean level of knowledge before training was 42.37±4.8 average and insufficient and after training was 67.1±3.37 excellent and this was statistically significant  $p < 0.05$ . The results also showed that there was a positive correlation between pretest and post test knowledge scores ( $p < 0.0001$ ) and 82.6% of the respondents were very much satisfied with this training.

### Discussion

Cardiopulmonary resuscitation is associated with a higher percentage of patient survival [12]. Adequate knowledge is essential for nursing staff to give an effective CPR to save patient lives. This study emphasizes on the importance of CPR knowledge of the nurses in the hospital. This study revealed that the nurses had inadequate knowledge with the lowest score of 2 out of 20 questions that was 10% before CPR training session and obtained an adequate knowledge with the highest score of 19 out of 20 questions that was 95% after training and there was

a significant difference between the mean of scores of the pretest and post test. These findings indicate that it is imperative for nurses to get periodic, regular CPR training sessions and updating the CPR techniques and it is an inevitable professional requirements for all nurses working in hospitals. The nurses' knowledge were inadequate during pretest and this was concurrent with the study done by Madden et al. [13] in Ireland and Marzooq et al. [7] in Bahrain.

In the study done by Bakhsha et al. [14] and Rajeswaran L et al. [1] entitled the effect of CPR training on the knowledge of the healthcare nurses before training was very low which confirms the results of the present study before the training of the participants and also in Bakhsha's study it was observed that after training the level of knowledge was considerably increased.

In this study, the mean score of knowledge of the nurses after the training had a significant difference with the mean score of their knowledge before training ( $p < 0.05$ ). Davies and Madden proved the effect of retraining on CPR ability in their study [13].

Our findings indicate that participants in the age group of over 40 years performed worse than the younger age groups. This may be due to the fact that the older age group had inadequate exposure earlier in their career owing to a lack of training resources and CPR training opportunities. This finding is

similar to the findings from elsewhere that older health care providers obtained lower scores than younger health care providers during the course of being evaluated for their advance life support knowledge [15].

In our study, participants who underwent in-service education and CPR training performed better than nurses who never had any exposure to CPR training programmes. This is also supported by recent studies conducted in India [16] and in Brazil [17,18] where nurses with BLS training performed better than the nurses who never had any training.

Many authors had reported that nurses working in high-risk areas such as Intensive Care Unit (ICU) and nurses who work continuously with complicated and risky patients are more interested to develop and maintain their competence in CPR than other health care professionals [19]. Similar to these authors, nurses working in ICU included in our study also competent in CPR knowledge. The study also showed a highly statistically significant difference that was found between nurse's level of education and the total mean of CPR knowledge scores ( $P < 0.0001$ ). Nurses with a bachelor's degree had the highest mean (14.12) as observed by Marzooq [7] and To clarify, nurses with a diploma degree has only two years of experience that are slightly different from those in a bachelor's degree in nursing. A B.Sc nursing staffs on other hand, gets better opportunities to perform CPR. However, a nursing diploma will get only theoretical knowledge and they always will be lacking in trainings regarding CPR and first aid courses.

In a study conducted in Kenya, age, gender and work experience did not have any significant impact in CPR knowledge among nurses [20] and it was not concurrent with our present study. However, there are no large, well-conducted studies available in the literature describing the effect of gender in knowledge about resuscitation and thus future studies should evaluate gender differences in CPR performance.

Finally, the results of the current study after training with the post test assessment revealed a statistically significant differences between the ward nurses work and the total mean of CPR knowledge scores ( $p < 0.001$ ). ICU had the highest mean (15.70) followed by the Casualty with a mean of (14.59) and then by OT with a mean of (14.10) followed by medical and surgical ward nurses with a mean of (13.12). These findings not concurrent with the study done by Bajracharya and Nagarkotil et al. [21] it showed that only 2% of high-care unit nurses in their teaching hospital had sufficient knowledge of BLS and CPR. However, this study states that nurses working in

the ICU, Casualty are more exposed to critical situations (cardiac arrests, choking, etc.) and are expected to respond more quickly. As a result, nurses working in these wards are required to have a BLS license unlike those working in other wards. In addition, training and exposure to real situations increase both the knowledge and confidence of a nurse.

All nurses should attend mandatory CPR training to prevent deterioration in their CPR knowledge and skills. Frequently conducted CPR training skills could increase the survival rate of cardiac arrest victims [22]

### *Limitations*

The current study had few limitations that is only 50% of the nurses were included in this study thus leading to low response rate.

### **Conclusion**

The present study found that the nurses had inadequate knowledge regarding CPR techniques and it suggests the regular and periodic CPR training and education programs to nurses will refresh their knowledge and are crucial for updating the AHA guidelines regarding CPR techniques. Nurses are the integral part of the healthcare system and are perceived to be knowledgeable in providing care to the patients. Several studies revealed that the cognitive domain of nurses on CPR can be improved with in service training and education. The optimal frequency with which CPR training should be implemented atleast every 6 months, in order to avoid deterioration in nurses CPR knowledge and skills. Anesthesiologists must identify those nurses with inadequate knowledge and concentrating in educating them periodically.

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#### Key Messages

This study emphasis on periodic CPR training program for quality health care.

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