A study to evaluate the effectiveness of simulation training on knowledge and practice of Cardio Pulmonary Resuscitation(CPR) among traffic police at mangaluru.

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Abstract

Background: Cardio Pulmonary Resuscitation (CPR) indicates that 'Cardio' means 'the Heart' and 'Pulmonary' means 'the Lung'. Resuscitation is the medical term that means 'revive' or bring back to life. Cardiac arrest is more common than expected and can happen to anyone who suffers from the cardiac disease at any time. Cardio Vascular Disease (CVD) is a group of disorders, heart disease is the world's largest killer, and about 17.9 million lives every year, concerning every twenty-nine seconds die in India because of a heart attack. Objective: To assess the pre-test and post-test of knowledge and practice among traffic police. To find the effectiveness of simulation training on knowledge and practice regarding CPR among traffic police. To find out the relationship between simulation training between knowledge and practice among traffic police. Method: A quasi-experimental pre-test post-test research design was adopted. A simple random sampling technique was used to select the samples among 60 traffic police at the commissioner police office, Mangalore, India. Results: Among 60 samples in the pre-test, the majority of 48 (80%) had poor knowledge, 12 (20%) were average knowledge and none of the samples had good knowledge, whereas post-test of knowledge level 39 (65%) had good knowledge, 19 (32%) had average knowledge and 2 (3%) had poor knowledge, enhancement 48.67% and practice 60 (100%) had poor practice and none of the samples had a good practice. Whereas post-test 55 (92%) had a good practice and 5 (8%) had poor practice, enhancement of 52.78%. The post-test standard deviation of knowledge was 21.73±3.54 and the practice mean score with a standard deviation was 26.86±1.2 whereas (r=0.89). Discussion: Hence, the study concluded that the administration of simulation training was very effective in the improvement of knowledge and which improves the practice level of Cardio Pulmonary Resuscitation (CPR) among traffic police.

Introduction

Cardio Pulmonary Resuscitation (CPR) is a lifesaving procedure that is useful in various medical emergencies condition, where the victim is unresponsiveness has no breathing and no heartbeats, the American Heart Association (AHA) 2020 guideline recommended that every person don't need any formal training to begin the cardiopulmonary resuscitation with chest compressions. The chain of survival is refer to a series of actions that are properly accomplished and reduces the death rate associated with cardiac arrest, it consists the various component such as early recognition- of cardiac arrest and activation of the emergency response system, early CPR with an emphasis on chest compressions, rapid defibrillation- to restore the heart function, early advanced cardiac life support, advanced post-cardiac arrest care and recovery are the final link of the chain of survival.

The new development in the CPR guideline is a change in the basic life support sequence of steps from A-B-C (airway-breathing-compression) to C-A-B (compression-airway-breathing) for adults and also chest compression (hand only). The person who performed CPR at the sighting site is called the 'first responder [1] and since it is usually done by non-medical personnel, knowledge of CPR training may spread to the general public. The first responder is a police officer, firefighter, security officer, and security guard who are likely to frequently contact these emergency patients or to be asked for help first in case of sudden cardiac arrest. In developed countries, the education system for the first responders is well prepared, but the community emergency medical law does not define the concept of the first responder. Among the subjects of education, there are traffic police officers who are engaged in road traffic safety work. It is known that the survival rate of cardiac arrest patients is improved when CPR is performed

rapidly by witnesses in the event of cardiac arrest. Whereas, if basic lifesaving is provided at the sighting site after 8 minutes or more, the success rate of CPR will reduce the mortality rate. The goal of CPR is to allow cardiac arrest patients to receive treatment based on the most recent medical knowledge that is constantly present, with the concept of a chain of survival. American Heart Association (AHA) recommended early and high-quality chest compressions with artificial ventilation. The person who is unresponsiveness has no respiration or abnormal respiration (agonal breathing) and has no pulse for example cardiopulmonary arrest. The rescuer may offer artificial ventilation by either breathing into the person's mouth or nose (mouth-to-mouth resuscitation). Chest compression and respiration ratio is about (30:2) in adults and has to complete five cycles in 2 minutes. The chest compressions for adults are between five cm (2.0 inches) to six cm (2.4 inches) deep and at a rate of a hundred to one hundred twenty (100-120) per minute.

Centre for Disease Control and Prevention (CDC) 2016 to 2017 in the United States for every 36 seconds an individual dies from cardiovascular disease. Every year about 659,000 people in the United States die due to heart attack. One individual in every four deaths occurs due to a heart attack. In 2019, 360,900 deaths occur due to the most common type of coronary heart disease in the United States [2].

American Heart Association (AHA) calculated that coronary heart disease 3,30,000 die in a year, among them about 2,50,000 deaths occur out of hospital cardiac arrest. Out-of-hospital cardiac arrest (OHCA)is a major public health problem worldwide. Cardiac disease is reported for about 55,0000 of the 927,000 adults who die as a result of cardiovascular disease. Cardiac arrest (also known as cardiopulmonary arrest and circulatory arrest) is the cessation of normal circulation of the blood because of dysfunction due to the contraction of the heart. Whereas if treated early cardiac arrest can be prevented [3].

India has the highest burden of Cardio Vascular Disease (CVD) worldwide. 2020 CDC, the most common heart disease of coronary heart disease, and about 382,820 people are killed by heart disease. Coronary Artery Disease (CAD) is about 20.1 million adults suffering from old CAD. Death 2 in 10 happen in adult less than 65year from CAD [4].

Cardio Vascular Disease (CVD) is a group of disorders that includes coronary cardiac disease, cerebrovascular disease, peripheral arterial disease, and congenital heart disease. Whereas cardiopulmonary conditions like severe allergic reaction, asphyxia, choking, drug reaction or overdoses, electrical shock, exposure to cold, severe shock, and coma disturb blood circulation, where a person may go to unresponsive and sudden cardiac arrest [5].

In India Hospital, Cardiac Arrest (OHCA) is one of the leading causes of death. The victim who underwent cardiac arrest has the golden time of 4-6 minutes before the cell of the brain begins to deteriorate, which as it is most important that breathing and circulation be restored within this time frame to prevent biological death from sudden cardiac arrest.

Sudden Cardiac Death (SCD) is an unexpected death due to a heart condition, which may occur within one hour of onset symptoms. Cardiac arrest is a leading cause of death in western countries (15-20%) and is responsible for most cardiovascular diseases. The sudden cardiac death rate is high as compared to western countries due to insufficient knowledge and practice, lack of emergency medical personnel training, and lack of Emergency Medical Service (EMS) protocol of CPR among bystanders in the community. Bystander cardiopulmonary resuscitation is the most important contributing factor to improved OHCA survival. Bystanders having adequate CPR knowledge and practice is a key factor in performing CPR [6].

A quasi-experimental research study was conducted on a study to assess the effectiveness of structured teaching programs on knowledge and practice regarding adult cardiopulmonary resuscitation among traffic police in Nadiad city. A stratified random sampling technique was used to collect 60 samples, pre-experimental one-group pre-test, and post-test design was adapted for this study. The outcome of the result finding showed that the post-test mean and standard deviation was 9.73 ± 3.85 effectiveness of structured teaching on CPR paired t-test value was 19.56 which concluded that structured teaching program was effective in knowledge among traffic police [7].

An experimental study was conducted on the effect of basic life support training on the first responsive police officer, in Korea. A simple random technique was used to collect 20 samples, and samples were divided into two groups experimental group and a control group. The results findings showed that the total mean score and standard deviation were 4.70±0.97 in the experimental group and the control group 3.84±0.73. The experimental group's first aid responsive test score is 3.736 which concluded that theory and practice education of CPR is more effective in improving the clinical performance among police officers [8].

Cardio Pulmonary Resuscitation (CPR) indicates that 'Cardio' means 'the Heart' and 'Pulmonary' means 'the Lung.' Resuscitation is the medical term that means 'revive' or bring back to life. Cardiopulmonary resuscitation may help a person who has no breathing and has no heart beating to save a life. Cardiac arrest is the one that reduces blood flow to the body may lead to tissue perfusion and affect the multi-organ system including the heart and brain, whereas defibrillation and other means of basic life support are not given or resuscitated immediately the victim will die. In the community setting, it takes time to reach the medical team during that time victim can only rely upon CPR given by the bystander. CPR has a different method that introduces chest compression and an Automated External Defibrillator (AED). The substantial burden of responsibility lies on the bystander who needs to deliver the CPR in a way of simple technique [9].

Cardio Pulmonary Resuscitation (CPR) is a lifesaving procedure that is useful in the various medical emergencies condition, where the victim is unresponsiveness has no breathing and no heartbeat the American Heart Association (AHA) 2020 guideline recommended that every person

don't need any formal training to begin the cardiopulmonary resuscitation with chest compressions. The chain of survival is refer to a series of actions that are properly accomplished and reduces the death rate associated with cardiac arrest, it consists the various component such as early recognition- of cardiac arrest and activation of the emergency response system, early CPR with an emphasis on chest compressions, rapid defibrillation- to restore the heart function, early advanced cardiac life support, advanced post-cardiac arrest care and recovery are the final link of the chain of survival. The new development in the CPR guideline is a change in the basic life support sequence of steps from A-B-C (Airway-Breathing-Compression) to C-A-B (Compression-Airway-Breathing) for adults and also chest compression (hand only) [10].

Need of study

Heart disease is the world's largest killer it is 17.9 million lives every year, concerning each twenty-nine seconds dies in India because of a heart attack. American Heart Association train more than 12 million people in CPR yearly and instructed American on the skill to perform CPR by a bystander. Cardiac arrest is more common than expected it can happen to anyone who suffers from the cardiac disease at any time. About 3,83,000 out of hospital sudden cardiac arrest occurs in a year, and about 88% of cardiac arrest happened at home [11].

The incidence of OHCA is most often seen in homes at 70%, followed by public settings at 18.8% and nursing homes at 11.2%. Sudden out-of-hospital cardiac arrest is the most time-critical emergency it is an important issue in the pre-hospital management of cardiac arrest. Cardiopulmonary resuscitation is successful and relies on a strong chain of survival with the community, dispatch centre, ambulance, and health care members in the hospital working together. Early cardiopulmonary resuscitation and defibrillator have the greatest impact on survival. Especially if CPR is administered immediately soon after cardiac arrest, can double or triple a person's chance of survival rate, and due to cardiac arrest about 90% of people die who experience an out of the hospital [12].

A cross-sectional study was conducted on knowledge, training, and willingness to perform bystander cardiopulmonary resuscitation among university students in Chongqing, China. A stratified random sampling technique was used to collect the 1128 samples. The study revealed a total of 47.2% of respondents were willing to provide simple assistance and 34.1% indicated their willingness to perform bystander CPR. The study concluded that CPR knowledge and training rate was low among students and willingness to participate in training and perform bystander CPR was also low hence it was recommended to individuals to include it in the school curriculum and reshape the social and public culture to improve bystander CPR performance[13].

A cross-sectional study was conducted on awareness of basic life support and cardiopulmonary resuscitation among female secondary school students in a government school in Riyadh. A simple random technique was used to collect 1224 samples. The study result found that more than 50% of the students 54.8% did not have information about BLS and 82.6% felt

their knowledge about BLS was insufficient and only 38.5% believes BLS courses should be mandatory. The study concluded that female secondary school students' knowledge and awareness of BLS and CPR was found to be insufficient, it recommended that BLS and CPR need to be included as part of the curriculum [14].

The person who performed CPR at the sighting site is called the 'First Responder', and since it is usually done by non-medical personnel, knowledge of CPR training may spread to the general public. The first responder is a police officer, firefighter, security officer, and security guard who are likely to be frequently contacting these emergency patients or to be asked for help first in case of sudden cardiac arrest. In developed countries, the education system for the first responders is well prepared, but the community emergency medical law does not define the concept of the first responder. Among the subjects of education, there are traffic police officers who are engaged in road traffic safety work. It is known that the survival rate of cardiac arrest patients is improved when CPR is performed rapidly by witnesses in the event of cardiac arrest. Whereas, if basic lifesaving is provided at the sighting site after 8 minutes or more, the success rate of CPR will reduce the mortality rate. The goal of CPR is to allow cardiac arrest patients to receive treatment based on the most recent medical knowledge that is constantly present, with the concept of chain of survival [15].

American Heart Association (AHA) recommended early and high-quality chest compressions with artificial ventilation. The person who is unresponsiveness has no respiration or abnormal respiration (agonal breathing) and has no pulse for example cardiopulmonary arrest (Figure1). The rescuer may offer artificial ventilation by either breathing into the person's mouth or nose (mouth-to-mouth resuscitation). Chest compression and respiration ratio is about (30:2) in adults and have to complete five cycles in 2 minutes. The chest compressions for adults are between five cm (2.0 inches) to six cm (2.4 inches) deep and at a rate of a hundred to one hundred twenty (100-120) per minute [16].

The World Health Federation reports that less than 1% of Indians would presently know how to provide cardiopulmonary resuscitation to cardiac arrest victims. Indians remain behind in the global growth to learn about cardiopulmonary resuscitation and other many countries across the world are training laypersons such as in schools, universities and workplaces, police, and traffic police regarding pulmonary resuscitation to save the life of cardiac arrest. The trained to perform cardiopulmonary resuscitation can make a difference in the life and death of a person **(Figure 2).** In light of the above, the investigator found it desirable to conduct cardiopulmonary resuscitation simulation training among bystanders to update their knowledge and improve their practice. The preferred way to learn CPR is to practice cardiopulmonary resuscitation. One of the first responses was considered to be traffic police; hence investigator felt that traffic police need to be trained with adequate knowledge in CPR guidelines and steps to perform CPR in meeting the emergency needs of the general public. Whereas hospital data rates can be reduced and survival rates can be increased.
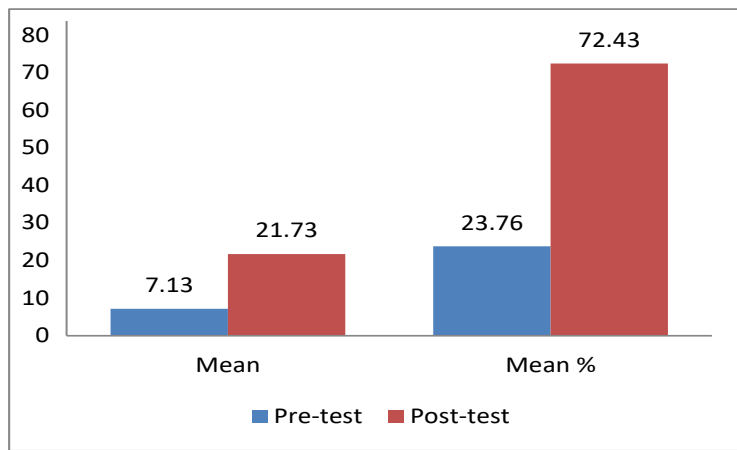
Figure 1. Mean and mean percentage of knowledge.
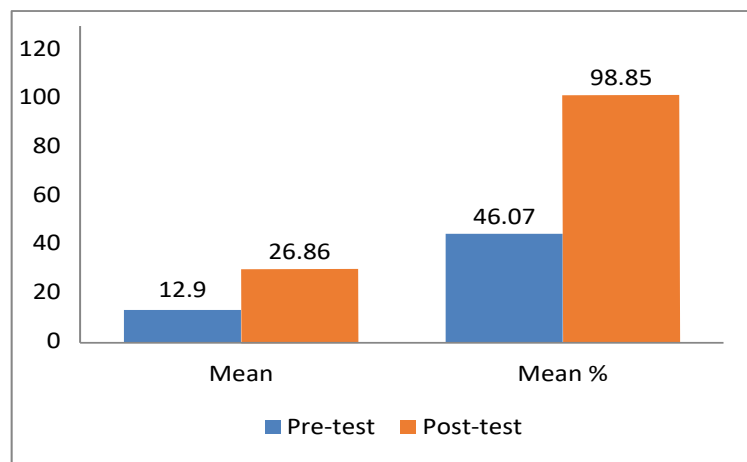
Figure 2. Mean percentage pre-test and post-test practice among traffic police.

Methods and Materials

A quantitative approach quasi-experimental one-group pre-test post-test design was used. A simple random sampling technique was used to select the 60 traffic police. The focus of the study was to determine the effectiveness of simulation training on knowledge and practice regarding Cardio Pulmonary Resuscitation (CPR) among traffic police in a selected area in Mangalore. The prepared tool was given to the experts like interventional cardiology and nursing professors of the medical-surgical nursing department from different institutions. The investigator selected a probability simple random sampling technique to select traffic police who are in the commissioner of the police office, Mangalore. Prior informed consent was obtained from the authority and participants. The pre-test was conducted using the interview method for sociodemographic variables and knowledge was assessed using by self-structured semi-prepared knowledge questionnaire and practice was assessed using by semi-prepared observational checklist, around 20-30 minutes had taken time to respond to the tool. Administered simulation training based on the AHA steps and guidelines of Cardio Pulmonary Resuscitation (CPR) by lecture cum discussion method for around 30 minutes and simulation training was demonstrated using a CPR mannequin for around 1 hour 30 minutes. The booklet based on the AHA guideline and steps of CPR was distributed to each traffic police for the reference and practice of CPR in an emergency. After a week post-test was conducted for the same subjects using a self-structured semi-prepared knowledge questionnaire to assess the knowledge level and each sample are requested to do a demonstration of the steps of CPR guidelines with help of a CPR mannequin by using the semi-prepared observational checklist, practice level was assessed.

Table 1. shows that there was a significant Association found with selected socio-demographic variables like designation. There was no significant association found with other socio-demographic variables such as gender, age in years, marital status, educational qualification, monthly income, work experience, previously attended CPR, and sources of information on CPR. As the designation was significant association with the knowledge level of traffic police. Hence, the research hypothesis H4 was accepted.

Table 2. There was a significant association found with a selected socio-demographic variable like age in a year. There was no significant association found with other socio-demographic variables such as gender, marital status, educational qualification, designation, monthly income, work experience, previously attended CPR, and sources of information on CPR. The age in the year was a significant association with the practice level of traffic police. Hence, the research hypothesis H5 was accepted.

Table 1. Association between the post-test knowledge with socio-demographic variable.

Variables	Knowledge level				N=60	
	Good	Average	Poor	df	X²value	Inference
1. Gender						
Male	24	14	1	2	0.54	NS
female	13	8	0			
2. Age in years						
20-30	27	15	0			
31-40	8	5	0	6	4.217	NS
41-50	2	2	0			
>50	0	0	1			
3. Marital status						
Married	15	8	1			
Unmarried	22	14	0	6	4.7	NS
Divorce	0	0	0			
Widow	0	0	0			
4. Education qualification						
SSLC	0	0	0			
PUC	9	2	1	6	4.19	NS
UG/Diploma	26	19	0			
PG/ Above	2	1	0			
5. Designation						
Constable	34	18	0			
ASI	1	2	1	6	17.74	S
PSI	2	2	0			
PI	0	0	0			
6. Monthly income						
20000-25000	5	2	0			
25001-30000	18	7	0	6	3.47	NS
30001-35000	9	10	0			
>35001	5	3	1			
7. Work experience						
Less than 6 months	0	1	0			
6month - 1 year	5	2	0	6	3.11	NS
1 year to 2 years	5	1	0			
More than 2 years	26	19	1			
8.Exposure to CPR						
Yes	2	2	0	2	0.36	NS
No	35	20	1			
9.Sources of information						
Health care worker	2	0	0			
Text book	0	1	0			
Mass media	0	1	0	8	3.43	NS
Other	0	0	0			
No information	37	18	1			

*S= significant, *NS= non-significant

Results

- In the present study distribution of 60 samples based on their socio-demographic variables showed that the majority of 39 (65%) samples were males, 42 (70%) belonged to the age group of (21-30)years, 43 (72%) were up to undergraduate, 38 (63%) samples were married, 51 (85%) were working as a constable, 24 (40) earning a salary of(25001-30000Rs),48 (80%) had experienced more than 2 years,56 (93%) were not taken any training on CPR. 56 (93%) didn't have any information about CPR.

- Pre-test knowledge level showed that among 60 samples 48 (80%) had poor knowledge, 12 (20%) had average knowledge and none of the samples had good knowledge regarding CPR. The post-test knowledge 39 (65%) had good knowledge, 19 (32%) had average knowledge, and the remaining 2 (3%) had poor knowledge of CPR. A pre-test practice level showed that 60 (100%) had poor practice and none of the traffic police had a good practice on CPR and the 91 post-test practice level shows that 55 (92%) had a good practice and 5 (8%) had a poor practice of CPR.

Table 2. Association between the post-test practice with socio-demographic variable.

Variables	Practice level			N=60	
	Good	Poor	df	X²value	Inference
1. Gender					
Male	35	4	1	2.24	NS
female	20	1			
2. Age in years					
20-30	35	2			
31-40	11	2	3	146.35	S
41-50	4	5			
>50	1	0			
3. Marital status					
Married	23	1			
Unmarried	34	2	3	0.16	NS
Divorce	0	0			
Widow	0	0			
4.Education qualification					
SSLC	0	0			
PUC	11	1	3	2.38	NS
UG/Diploma	40	5			
PG/ Above	3	0			
5. Designation					
Constable	50	2			
ASI	3	1	3	2.08	NS
PSI	4	0			
PI	0	0			
6. Monthly income					
20000-25000	7	0			
25001-30000	25	0	3	21.61	NS
30001-35000	15	4			
>35001	8	1			
7. Work experience					
Less than 6 months	0	1			
6 months - 1 year	6	1	3	3.7	NS
1 year to 2 years	6	0			
More than 2 years	43	3			
8. Exposure to CPR					
Yes	3	1	1	2.56	NS
No	54	2			
9. Sources of information					
Health care worker	2	0			
Textbook	0	1			
Mass media	1	0	4	15.54	NS
Other	0	0			
No information	52	4			

*S= significant, *NS= non-significant

- Data based on the post-test knowledge the mean score with standard deviation was 21.73±3.54 and mean score percentage was 72.43%, which was higher than the pre-test mean score with a standard deviation was 7.13±3.28 and mean score percentage was 23.76% which was lower than the post-test. The pre-test and post-test knowledge mean score difference was 14.31 and the enhancement score was 48.67. The pairedt test was found to be 130.09 which were significant at a 0.05 level. Therefore, the simulation training was effective to improve the knowledge among traffic police of Cardio Pulmonary Resuscitation (CPR). Hence, the formulated research hypothesis H_1 was accepted.

- The data explains that the post-test practice mean score with standard deviation was 26.86±1.2 and the mean score percentage was 98.85%. Which as pre-test mean score with standard deviation was 12.9±5.36 and the mean score percentage was 46.07% which was lower than the post-test practice. The overall results show that the pre-test and post-test practices mean score difference was 13.81 and the enhancement score was 52.78. The paired t test was found to be 31.4 which was significant at a 0.05 level. Therefore, the simulation training was effective to improve the practice among traffic police of Cardio Pulmonary Resuscitation (CPR). Hence, the formulated research hypothesis H_2 was accepted.

- The computed Karl Pearson's correlation coefficient was used to determine the correlation between post-test knowledge and practice score on CPR. There was a significant positive correlation was found between knowledge and practice 92 (r=0.89), which shows that knowledge improved the practice of CPR among traffic police. Hence the research hypothesis H_3 was accepted.

- Based on the association between post-test knowledge score among traffic police on CPR with selected socio-demographic variables. There was a significant association between knowledge and designation (p<0.005, 17.74) at a 0.05 level. Hence, the research hypothesis H_4 was accepted.

- Based on the association between post-test practice score among traffic police on CPR with selected socio-demographic variables. There was a significant association between knowledge and age in years (p<0.005, 146.35) at a 0.05 level. Hence, the research hypothesis H_5 was accepted.

Discussion

In knowledge post-test results reveals that among 60 traffic police 39 (65%) had good knowledge, 19 (32%) had adequate knowledge, and the remaining 2 (3%) were poor knowledge. In the 3 areas, like the anatomy of the heart and meaning of CPR, procedure, and general knowledge of CPR the overall post-test of knowledge mean score with standard deviation was 22.17±5.61, and the mean score percentage was 80%. The results show that simulation training was found to be effective.

The data on the post-test knowledge mean score with a standard deviation was 21.73±3.54 and mean score percentage was 72.43%, which was higher than the pre-test mean score with a standard deviation was 7.13±3.28 and mean score percentage was 23.76% which was lower than the post-test. The pre-test and post-test knowledge mean score difference was 14.31 and the enhancement score was 48.67. The paired t-test was found to be 130.09 which were significant at a 0.05 level. Therefore, the simulation training was effective to improve the knowledge among traffic police of Cardio Pulmonary Resuscitation (CPR). Hence, the formulated research hypothesis H_1 was accepted.

Regarding practice, post-test results reveal that among 60 traffic police majority of 55 (92%) had a good practice and 5 (8%) had poor knowledge about CPR on certain steps. In the 3 phases of CPR, the overall post-test of practice mean score with standard deviation was 24.28±1.5, and the mean score percentage was 96%. The above table reveals that simulation training with CPR mannequin was found to be effective, whereby practice level was improved among the samples.

The data on the post-test practice the mean score with standard deviation was 26.86±1.2 and the mean score percentage was 98.85%. which as the pre-test mean score with standard deviation was 12.9±5.36 and the mean score percentage was 46.07% which was lower than the post-test practice. The overall results show that the pre-test and post-test practice mean score difference was 13.81 and the enhancement score

was 52.78. The paired "t-test was found to be 31.4 which was significant at a 0.05 level". Therefore, the simulation training was effective to improve the practice of traffic police of Cardio Pulmonary Resuscitation (CPR). Hence, the formulated research hypothesis H_2 was accepted.

Conclusion

The present study supported by a quasi-experimental study was conducted to assess the effectiveness of a structured teaching program on knowledge and practice regarding adult cardiopulmonary resuscitation among 60 traffic police in Nadiad city. A stratified random sampling technique was used to select the samples. The study results showed that the pre-test knowledge mean score and standard deviation was 14.05± 4.18 and the mean percentage was 56.2%, whereas the mean and standard deviation for post-test knowledge was 21.11 + 3.07 and the mean percentage was 72.7% with the "t" value 19.56 and for practice „t" value was 9.41. The study concluded that the structured teaching program was effective in improving knowledge and practice regarding adult CPR among traffic police. the supportive study administered the structured teaching program which was found to be effective. The present study concluded that administered simulation training of CPR was found to be effective among traffic police.

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