

Cardio-Pulmonary- Resuscitation (CPR) skill acquisition among adult bystander (drivers & conductors) of public transport system

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Abstract: *Introduction:* A critical step for significant improvements in survival of outside hospital cardiac arrest (OHCA) is bystander cardiopulmonary resuscitation (b-CPR). Though ample videos of CPR demonstrations are freely available on the internet there is no evidence in literature to verify if these videos transform to practice among bystanders. *Objective:* To determine and compare effect of three different techniques of teaching CPR; instructional video teaching, lecture with hands on demonstration and a combination of both methods in CPR skill acquisition. *Methodology:* A Pre-Post study was conducted among 90 drivers and conductors of Public Transport system who were randomly assigned to Group 1(video instruction of 2 minutes duration), Group 2 (PPT lectures with Hands-on CPR demonstration on a manikin on one to one basis) and Group 3 (a mix of video, power-point presentation and practice on manikin) of 30 participants each. A pre-tested, pre designed questionnaire was used in the pre, immediate and delayed post-test containing 8 demographic questions and 27 questions regarding CPR. *Results:* The baseline knowledge of participants in all the 3 groups was with mean score of 11.87, 10.70 and 11.10 respectively (of the 27 questions regarding CPR). Scores of all the groups increased following intervention (23.03, 23.27 and 25.53). Retention test after one month revealed that Group 1 scored 12.47, Group 2- 21.40 and Group 3 the scores were maintained at 25.53. The group which received combination methods had retained the skills learned even after 1 month. *Conclusion:* Combination intervention is the ideal technique of teaching CPR, where both knowledge and skills are developed and retained.

Keywords: Bystanders, CPR, Instructional Video.

Introduction

In India, roughly about 7 lakh Sudden Cardiac arrest (SCA) occur every year [1]. Almost 88 percent of cardiac arrests i.e. four out of five occur at home [2-3]. Recognizing cardiac arrest early is the key to survival. Chances reduce by 7-10 percent for every min a patient suffers Cardiac arrest. [2,4]. The survival rate of outside hospital cardiac death is only about 7-8 percent [3-5]. A lifesaving procedure for a victim of SCA or respiratory arrest is CPR [6].

Lay persons/ bystanders or medical and paramedical professionals can perform CPR [7]. Chances of surviving a cardiac arrest outside hospital, can be increased significantly by the delivering effective b-CPR [8]. A critical step

associated with significant improvements in survival for OHCA is b-CPR, if commenced within 6 mins [6-7]. Initial resuscitation the victim undergoes before shifting to healthcare facility, and not just how fast a patient is shifted, also makes a big difference [2]. Rates of b-CPR globally, are reported to be in the range of 1 per cent to 44 percent. In OHSCA, between 14% to 45% laypersons in the US attempt CPR, of which only around half of b-CPR is performed properly and the effectiveness of this CPR is variable [6]. The Knowledge of SCA and CPR skills in the community is not known. Almost 80% Americans do not know CPR; according to AHA [4]. About 98% Indian population does not know CPR according to one survey [5].

CPR is taught to health care professionals at hospitals to improve the response and increase the survival of SCA patients, but not to the laypersons in the community [8]. The availability of professionals to provide hands-on, lecture based CPR demonstration is limited. Lectures and hands on courses require time, money and logistics [9]. Video demonstrations of the CPR procedure (online/ internet) are easily available, which can be used to reach larger number of people. It does not need any additional equipment (manikin) and is not reliant on trained professional instructor [10]. Also, instructional videos help users to refresh the training at their convenience and as repeatedly as required. However there is no evidence in Indian literature to verify if these videos actually transform to practice. Hence this study will find out which method of instruction, i.e., lecture with hands on demonstration, video demonstration only or both: lecture with hands on demonstration and video demonstration, is more effective in terms of skill acquisition and retention.

Material and Methods

A three group, Pre-Post study was conducted among Drivers and conductors of Karnataka State Road Transport Corporation (KSRTC) in a city in India, from August 2019 to February 2020. A sample size of 90 with 30 participants in each group was decided, as 30 is considered an ideal number for a single group, for conducting any Hands-on skill training workshop by Todd et.al [11-13]. Drivers and conductors of KSRTC who can read and write English and are willing to participate were included study and randomly assigned to one of the 3 groups. Workers who remain absent on the day of intervention (video clip and lecture with hands on demonstration) and those who do not consent to participate were not included.

Informed consent was taken from all the participants. Ethical clearance was obtained from Institutional Ethics Committee (I.E.C.) of J.N.M.C. KLE Academy of Higher Education and Research, Belagavi. Utmost care was taken to maintain privacy and confidentiality of participants by not disclosing the name of the participants and the Institution. Pilot study, on 10 participants (i.e.10% of the sample size) was conducted among employees of KSRTC of another District (not same as target population)

and not included in the main study. Validation of the questionnaire was done and necessary modifications were made. Investigator/data collectors were trained in a Tertiary care Hospital at a workshop On First Aid and CPR, with lecture and hands on. The questionnaire was discussed in detail among all the data collectors and any difficulties were resolved. All the participants received a pre-test (8 demographic questions and 27 questions regarding CPR).

Group-1: Instructional video group (n=30). Participants were randomly allocated to receive CPR training instruction by video training. The video instruction was of 2 min duration, keeping in mind the average duration of most videos available on the internet easily accessed by the general public.

Group-2: Lecture with hands-on training (n=30). The lecture with Hands-on was conducted with the help of a power point presentation to the participants and demonstration of the CPR on a manikin and every participant was taught asked to demonstrate on the manikin and,

Group-3: combination of both methods i.e. video instruction and lecture with hands-on (n=30), was shown the video and power-point presentation followed by the hands on demonstration and practice on the manikin.

Following the intervention, all participants were given an immediate post-test using the same questionnaire that was used in the pre-test. After a period of one month all the participants were contacted again and post-test was repeated using the same instrument.

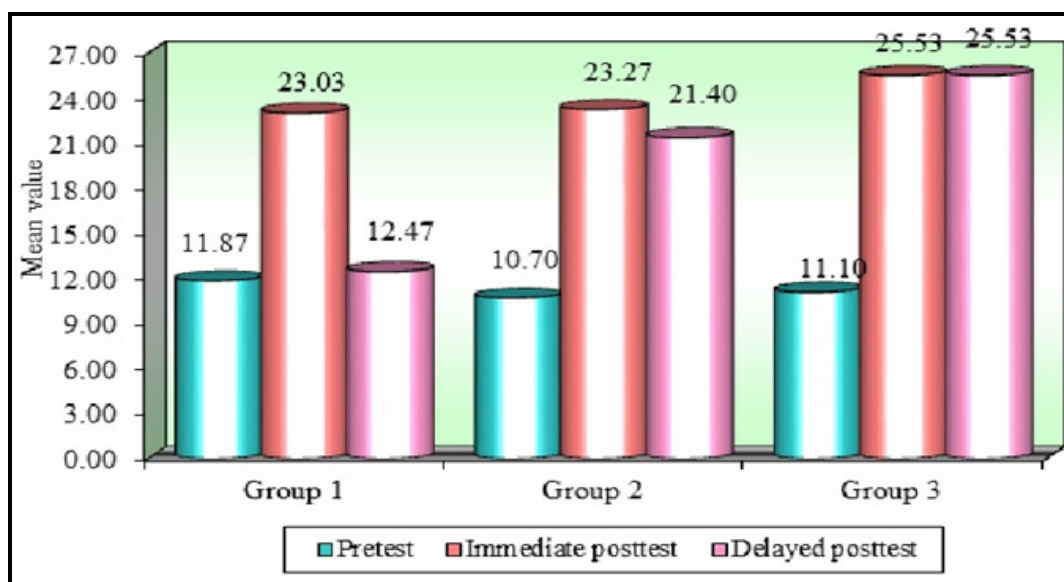
Results

The Age of the participants ranged between 30 – 60 years .The composition of Group 1 and Group 2 is similar with maximum no. of participants in the 40- 49 years (16). In Group 3 majority of the participants were in the age group of 30-39 years (18). Only Group 3 had female participants, whereas the composition of group 1 and 2 is similar. Out of 90 participants, 80 (88.8%) were Hindus and 10 (11.11 %) belonged to other religions. Of the total 90 participants, 12 participants earned <2

lakhs (13.3%), 46 participants earned 2.1 to 3 lakhs (44.4%), 12 participants -3.1 to 4 lakhs (13.3%) and 20 participants > 4 lakhs (22.22%) annually. Maximum participants were educated upto PUC (56.66%), secondary were 26.61% and graduates were 16.6%. The baseline knowledge of the participants in the 3 groups was similar with mean score of 11.87, 10.70 and 11.10

respectively. The test scores of all the 3 groups following intervention increased to 23.03, 23.27 and 25.53 (Figure 1). Retention test after one month revealed that in Group 1 scores dropped to about 1% more than pre-test levels (12.47), in Group 2 decrease was about 2% (21.40), in Group 3 the scores were maintained to 25.53.

Fig-1: Pre-test, immediate and delayed post-test knowledge scores in three groups



Statistical Analysis: Knowledge scores by one way ANOVA demonstrated a statistically significant difference in the immediate test and delayed test with f ratio of 4.2680 (p value of 0.0170) and 89.9580 (p value of 0.0001) respectively (table 1), indicating the effectiveness

of the intervention in increasing the knowledge in all 3 groups irrespective of the method of demonstration of CPR (video assisted teaching, lecture with hands-on demonstration or a combination of both methods).

Table-1: Comparison of three groups (1, 2, 3) with pre-test, immediate and delayed post-test knowledge scores by one way ANOVA

Time points	Sources of variation	Sum of Squares	df	Mean Square	F-value	p-value
Pre-test	Between Groups	21.09	2	10.54	0.5830	0.5600
	Within Groups	1572.47	87	18.07		
	Total	1593.56	89			
Immediate	Between Groups	114.42	2	57.21	4.2680	0.0170*
	Within Groups	1166.30	87	13.41		
	Total	1280.72	89			
Delayed/ post-test	Between Groups	2676.27	2	1338.13	89.9580	0.0001*
	Within Groups	1294.13	87	14.88		
	Total	3970.40	89			

*p<0.05 indicates significant

Table-2: Comparison of three groups (1, 2, 3) with changes in knowledge from pre-test to immediate and delayed/post-test scores by one way ANOVA

Changes from	Sources of variation	Sum of Squares	df	Mean Square	F-value	p-value
Pre-test to Immediate	Between Groups	161.16	2	80.58	3.0760	0.0500*
	Within Groups	2278.90	87	26.19		
	Total	2440.06	89			
Pre-test to Delayed test	Between Groups	3073.09	2	1536.54	86.1970	0.0001*
	Within Groups	1550.87	87	17.83		
	Total	4623.96	89			
Immediate to delayed	Between Groups	1908.29	2	954.14	107.4110	0.0001*
	Within Groups	772.83	87	8.88		
	Total	2681.12	89			

*p<0.05 indicates significant

Comparison of three groups (1, 2, 3) with changes in knowledge from pre-test to immediate and delayed/post-test scores was done by one way ANOVA (table 2). A significant difference was observed between and within groups with f value of 3.0760 (p value 0.0500), Pre-test to Delayed test values for between and within groups with f value of 86.1970 (p value 0.0001), Immediate to delayed test values for between and within groups with f value of 107.4110 (p value 0.0001) indicating that the knowledge scores increased from pre to immediate and the change in scores from immediate to delayed test and the method of teaching does have a statistically significant difference in the outcomes of the knowledge scores of the participants.

Test scores increased following any type of intervention, but dropped back to base line in Group 1 after one month showing that it creates temporary awareness but not skills. Whereas the group which received combination methods had retained the skills learned even after 1 month.

Discussion

Several researches have been conducted in the past few years to test the efficiency of CPR skill teaching methods. A study at METU Turkey (2010) among ninety university students concluded traditional and case-based instruction groups had better CPR performance than video self-instruction group [14]. In 2006, a study conducted in Seattle area high school students, aiming to compare the efficacy of classroom

learning of CPR, interactive-computer training and a mixed pattern. The outcome was that classroom learning or a mixed pattern is more efficient in CPR training among high school students [10].

Twenty-four volunteers (12- not-trained and 12- certified in CPR) in a parallel design study with pre/post-test to evaluate CPR skills - compression rate, depth, hand position, release and hands off time was conducted in 2016. A video demo and skill practice on a mannequin improved skills, as it allows a tactile learning component at no cost and no advance preparation especially in untrained participants [15]. A study conducted in 2009, compared computer based CPR training to traditional / classroom training among 64 UG students. It was concluded that CPR training based on computer and traditional classroom-based training were same in knowledge outcomes but was not as effective in developing quality CPR performance [16].

In a prospective randomized single-blind controlled trial conducted in Hong Kong (2010) to compare VSI CPR to TCI in laypersons, the immediate and after 1 year, passing rate between the two groups was same suggesting that Video instruction CPR performance is just as good as conventional training [17]. In 2014, a study concerning emergency skills teaching, either by learning on video or face-to-face teaching, found no

difference in efficacy of both training methods and also equal confidence to both training methods by the participants [18].

There are many studies among subjects where CPR training either by VSI/ e-learning or by classroom learning/traditional courses have been compared, no difference was observed in both groups performance as for knowledge and skills, higher scores were recorded in group of VSI/e-learning training in a few studies and a few other studies concluded that participants in traditional courses performed better. Among laypersons/ bystanders in the community, combination intervention, i.e. video demonstration plus lecture with hand on demonstration is the ideal method of instruction where both knowledge and skills are developed and retained. Videos provide the

advantages of being accessible to repeated viewing and refreshing the knowledge as and when required by the participants at their will and free time. Hands on demonstrations give the practical real life scenario giving proper instruction regarding the placement of the hands, amount of force/pressure, depth and rate of chest compressions which are important and necessary components of successful CPR, as the successful outcomes depend on the quality of CPR performed.

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