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Comparison of the Conventional and Hands-only Cardiopulmonary Resuscitation Skills Performance of Some Nigerian University Students

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Abstract **Introduction:** There could be debates on the preference of either hands-only CPR or conventional CPR for effective bystander CPR provision for out-of-hospital cardiac arrest (OHCA) victims. While many countries have tried to provide some information on this, the situation is different in Nigeria. This study aimed at comparing the CPR skills performances of two cohorts of participants after training them on either of these two CPR training techniques. **Materials and Method:** A randomized experimental trial involving two cohorts of 70 participants each, having 54(77.1%) females and 16(22.9%) males and mean ages of 21.26 ± 2.92 (SD) and 21.17 + 2.59 (SD) for hands-only and conventional CPR training groups, respectively was carried out. The participants were undergraduates of a Nigerian University who were randomly divided into two groups – a group had hands-only CPR training while the other had conventional CPR. After training, both were asked to carry out bystander CPR on simulated out-of-hospital cardiac arrest (OHCA) victims using manikins while an AHA-certified instructor assessed their CPR skills. Data analysis was done using both descriptive and paired samples t-test statistics. **Results:** Both groups showed satisfactory CPR skills with majority having 80%-100% excellent CPR skills performances. No statistically significant difference was found in the CPR skills of the participants in the two groups ($P > 0.05$). **Conclusion:** Both CPR training techniques have shown to be adequate in producing the needed bystander CPR skills.

Keywords Comparison, Hands-only CPR, Conventional CPR, Nigeria

1. Introduction

The effectiveness of both conventional and hands-only cardiopulmonary resuscitation (CPR) techniques in training potential bystander CPR providers in readiness for the management of out-of-hospital cardiac arrests (OHCA) has been documented [1-12]. It has also been recommended that laypersons could be trained in hands-only CPR as an alternative to the conventional method because of the reservation many people have about mouth-to-mouth ventilation [9-11].

While there are studies globally on the two methods of bystander CPR because of the growing importance of the public health burden of OHCA [5, 7, 13-20], there is no single report comparing the effectiveness of the hands-only CPR and the standard CPR from Nigeria hitherto. In fact, despite the growing importance of bystander CPR globally, Nigerian Government is yet to come up with any serious policy on bystander CPR in the country. Meanwhile, many countries of the world have incorporated bystander CPR training into their various schools' curricula [21-23]. Related studies from Nigeria on bystander CPR skills have been on the conventional method only [24-30].

There is need for more data on bystander CPR in Nigeria in preparation for the expected incorporation of CPR teaching and training into the Nigerian schools' curricula as in many developed economies of the world. It is known that the challenge of out-of-hospital cardiac arrests (OHCA) is not limited to the industrialised countries of the world which calls for concerted effort in increasing the number of potential bystander CPR providers in every community [2-4].

Therefore, this study aimed at comparing the CPR skills performances of two groups of University undergraduate students trained on the hands-only CPR and those trained on the conventional CPR techniques. It was hypothesized that there would be no statistically significant difference in the CPR skills performances of the two groups after their respective trainings.

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2. Materials and Methods

2.1. Study Design

A randomized experimental study involving two cohorts - seventy (70) participants in the hands-only cardiopulmonary resuscitation training group and another seventy (70) in the conventional (standard) group was carried out. The participants are 200-Level undergraduate Physical and Health Education students in the Department of Human Kinetics and Health Education, Faculty of Education, University of Port Harcourt, Port Harcourt, Nigeria.

The study took place in March, 2018. The participants were asked to pick blindly from a ballot box having equal numbers for both groups (hands-only and conventional CPR training techniques). The trainings were the first exposures to CPR training the participants had.

The study population was admitted in the Department of Human Kinetics and Health Education in 2016 and are studying to graduate with Bachelor of Education Degree (majoring in either Health Education or Human Kinetics). They are being trained primarily to become teachers in primary and secondary schools. These student teachers are from different parts of Nigeria.

The following null hypothesis were generated and tested:

Ho1: that there would be no statistically significant difference in the CPR skills performances of the two groups after their respective trainings.

2.2. Stage 1 (Pre-training)

A questionnaire containing a section for the demographic data of the participants and a section having the modified AHA 'Skills Evaluation Guide' to assess their pre-training cardiopulmonary resuscitation skills was used. Prior to the trainings on CPR, the two groups of participants were shown scenarios of victims of cardiac arrest using the manikins and were asked to demonstrate what they would do in such situations to save the lives through cardiopulmonary resuscitation The group on hands-only CPR was asked not to give mouth-to-mouth ventilation while the conventional (standard) group was asked to give mouth-to-mouth ventilation as part of the attempts to resuscitate the victim.

The Skills Evaluation Guide (SEG) was used to score their pre-training CPR skills while the questionnaire was used to obtain the demographic data of the participants. However, the participants had no meaningful idea of what to do at this stage. Therefore, this report concentrates on the post-training CPR skills assessments of the two groups.

2.3. Stage 2 (Training and Immediate Post-training)

The teaching on CPR was carried out for 60 minutes using American Heart Association (AHA) CPR guideline. Their skills were evaluated using modified AHA Evaluation Guide involving four domains for the conventional technique – 1. Scene Safety & Call for Help (S); 2. Chest Compressions (C); 3. Airway / Rescue Breaths and 4. Cycle / min & Placement of victim in the correct Recovery Position (R). The assessment of the CPR skills in the hands-only technique group involved the other domains except the Airway / Rescue Breaths (ventilation) domain (See Appendix). After the CPR teaching and training session, they were then asked to individually attend to the same scenario given to them before the training and they were scored by the lead researcher.

The lead researcher, who is an American Heart Association (AHA)-certified CPR instructor, assessed the post-training CPR skills of the participants. The lead researcher was assisted in the teaching and training of the participants by two Assistants who were previously certified by the Nigerian Red Cross Association. The trainings of the two groups took place simultaneously. The process of training and assessment of their CPR skills after the trainings took about 6 hours.

2.4. Determination of Good and Poor CPR Skills

For both groups, CPR skills of 50% and above were considered good CPR skills while any score less than that was regarded as poor.

2.5. Statistical Analysis

The Statistical Package for Social Sciences (SPSS) was used to analyze the data. In addition to descriptive statistics, one sample and two sample T-tests statistics were employed in the analysis and testing of the null hypothesis with significance level set at $P< 0.05$.

Ethics and Participants Consent

The participants were very pleased to be part of the study and gave their consent. It was not considered necessary to write for Institutional Consent as the work was very relevant to the participants' course work on 'Safety Education and First Aids'.

3. Results

The mean ages of the two cohorts were 21.26 ± 2.92 (SD) and 21.17 + 2.59 (SD) for hands-only and conventional CPR training groups, respectively. Both groups had 54 (77.1%) females and 16 (22.9%) males each.

Table 1 shows the comparison of the post-training CPR skills of the participants in the two training groups, which reveals similar pattern in their CPR skills in the three common domains assessed.

The mean CPR skills with their standard deviations in the assessed three CPR skills domains for the two groups are also shown in Table 2.

The Paired Samples T Test analysis of the CPR skills of two training groups is shown in Table 3 which reveals the acceptance of the null hypothesis. This confirms that there was no statistically significant difference in the CPR skills performances of the two cohort groups after their respective trainings.

Table 1. Comparison of the CPR skills performances of the participants in the different domains for both training groups

CPR Skills	Hands-only CPR Group		Conventional CPR Group	
	Score	No	Score	No
Scene Safety & Call for help (SS)	2	1	2	2
	3	6	3	5
	4	48	4	39
	5	15	5	24
		70		70
Compression (CC)	2	1	2	4
	3	3	3	3
	4	46	4	28
	5	20	5	35
		70		70
Airway & Breathing (AB)	-	-	2	8
	-	-	3	16
	-	-	4	29
	-	-	5	17
	-	-		70
Cycle/min & Recovery Position (CRP)	2	2	2	3
	3	5	3	4
	4	43	4	38
	5	20	5	25
		70		70

Note: Scores of 2, 3, 4 and 5 mean 40%, 60%, 80% and 100% of the required CPR skills, respectively

Table 2. Descriptive statistics showing the mean and standard deviations of the CPR skills of the participants in the three domains common to the two training groups

	N	Minimum	Maximum	Mean	Std. Deviation
SS1	70	2.00	5.00	4.1000	.59344
CC1	70	2.00	5.00	4.2143	.58713
CRP1	70	2.00	5.00	4.1571	.67321
SS2	70	2.00	5.00	4.2143	.69975
CC2	70	2.00	5.00	4.3429	.81447
CRP2	70	2.00	5.00	4.2143	.74001
ValidN	70				

Note: SS1, CC1, CRP1 stand for Scene Safety & Call for Help, Chest Compressions, and Cycle / min & Placement of victim in the correct Recovery Position for the Hands-only CPR group, respectively while the SS2, CC2 and CRP2 stand for the respective skills domains in the conventional CPR group.

Table 3. The Paired Samples T Test analysis of the CPR skills of two training groups

	Paired Differences					t	df	Sig(2-tailed)
	Mean	Std. Deviation	Std.Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Paired SS2-SS1	.11429	.86045	.10284	-.09088	.31945	1.111	69	.270
Paired CC2-CC1	.12857	.99158	.11852	-.10786	.36501	1.085	69	.282
Paired RP2-RP1	.05714	1.03400	.12359	-.18941	.30369	0.462	69	.645

4. Discussion

This present comparative study on the effectiveness of the hands-only and conventional (standard) CPR trainings techniques has shown that there is no statistically significant difference in the two training techniques. To the best knowledge of the authors, this study being the first ever report comparing these two bystander cardiopulmonary resuscitation (CPR) training techniques in Nigeria, has provided a baseline data for further research works in the country.

In a related prospective cohort study that involved all out-of-hospital cardiac arrest (OHCA) patients attended to by emergency medical service (EMS) providers in Singapore, it was found that patients were more likely to survive with any form of bystander CPR than without, which emphasised the importance of chest compressions for OHCA patients [16]. Similarly, Olasveengen et al [17], in a retrospective study, reported that patients who received chest compression from bystanders did not have a worse outcome than patients who received standard CPR. Much earlier in Sweden, Bohm et al [18] reported that there was no significant difference in 1-month survival between a standard CPR programme with chest compression plus mouth-mouth ventilation and with compression only.

In a nationwide, prospective, population-based study in Japan, it was reported that for prolonged OHCA of cardiac origin, conventional CPR with rescue breathing provided incremental benefit compared with either no CPR or compression-only CPR, but the absolute survival was low regardless of type of CPR [15]. Similarly, Ogawa et al [31] reported in another nationwide population based observational study that conventional CPR was associated with better outcomes than chest compression only for selected patients with out-of-hospital cardiopulmonary arrest, such as those with arrests of non-cardiac origin and younger people, and people in whom there was delay in the start of CPR. Our present Nigerian study which used simulation based on manikins did not consider such varying factors.

On quality of CPR, our study has shown very encouraging quality as most of the participants had CPR skills scores of between 80% and 100%. Nishiyama et al [12] reported that chest compressions with appropriate depth decreased more rapidly during chest compression-only CPR than conventional CPR with the recommendation that CPR providers should change their roles every 1 minute to maintain the quality of chest compressions during chest compression-only CPR. In this present Nigerian study, 66(94.3%) of the participants in the hands-only CPR cohort had chest compressions considered as excellent (80% - 100%) as against 63(90%) of those in the conventional CPR cohort.

Strengths and Limitations of the present Nigerian Study

This study has the strength of having the participants being fairly very representative of the youths from Nigeria because they were drawn from various parts of country due to the undergraduate Admission Policy in Nigerian Universities which requires a good spread from every State in Nigeria in every undergraduate programme. Secondly, the participants are good potential teachers in the Nigerian school system who can serve in future not only as potential bystander cardiopulmonary resuscitation (CPR) providers in schools and the communities but would serve as trainers of the school children who in turn can serve as secondary trainers and thereby increase the number of potential bystander CPR providers in our communities. However, a major limitation of this study is that it was carried out by simulating OHCA situations using manikins which are not exactly the same in real life cases and as such the results must be interpreted with some caution.

5. Conclusions

This first comparative Nigerian study on hands-only CPR and conventional CPR has revealed that both CPR training techniques were adequate in producing the needed bystander CPR skills in the participants.

6. Recommendations

Similar studies are encouraged in other parts of Nigeria as it increases both awareness of the importance of bystander CPR in the country and the need for Nigeria Governments to give it the necessary attention in Nigerian schools' curricula.

Appendix

SKILL EVALUATION GUIDE

Skill	Performed Steps	Obtainable Score	Obtained Score
Scene Safety & Call for help	1. Ensure safety	1	
	2. Check for response	1	
	3. Call for help	1	
	4. Check for breath warm	1	
	5. Check for breath sound & chest movement	1	
	TOTAL	**5**	
Compression	6. Heal of Hand	1	
	7. Centre of the chest	1	
	8. Push hard	1	
	9. Push fast	1	
	10. Chest Recoil	1	
	TOTAL	**5**	
Airway & Breathing	11. Head tilt back & Chin lift	1	
	12. Pinch nose	1	
	13. M to M	1	
	14. Lasting 1 sec	1	
	15. Chest rise	1	
	TOTAL	**5**	
Cycle/min & Recovery Position	16. 30/2 (80/min)	1	
	17. Body turned left	1	
	18. Left hand below head	1	
	19. Left leg straight	1	
	20. Right leg folded backward	1	
	TOTAL	**5**	
	GRAND TOTAL	**20**	

NAME / SERIAL NUMBER ----------
SEX / AGE: ----------
MATRICULATION NO: ----------
NAME OF SCHOOL / STATE----------
INSTRUCTOR'S REMARK: ----------
DATE: ----------

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