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The Skills of Cardiopulmonary Resuscitation in Some Professional and Student Teachers Compared

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Authors' contributions

This work was carried out in collaboration between both authors. Author AOO designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Author OOO was involved in the logistics, the literature search and analyses of the study. The two authors read and approved the final manuscript.

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ABSTRACT

Background/Aim of Study: Training of practising professional and student teachers in CPR is very central, if the idea of introducing CPR training in Nigerian school system and by extension possibly the number of bystander CPR providers for OHCA in line with the international standard will ever be effective. The objective of this study was to compare the skills of CPR of some practising professional and undergraduate student teachers in Nigeria.
Study Design: Cohort experimental study
Place and Duration of the Study: Department of Human Kinetics and Health Education, Faculty of Education, University of Port Harcourt between September, 2016 and June, 2017.
Methodology: Two cohorts of some practising professional teachers and undergraduate students (each having 41 participants) were recruited into the study. The cohorts were differently exposed to identical scenarios of carrying out CPR skills on cardiac arrest victims simulated using manikins

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before CPR training and after. Their pre-training and post-training skills in CPR were assessed by a certified CPR instructor. The training was in line with the American Heart Association (AHA) conventional CPR teaching standard and the data collation was done using a modified AHA CPR Skills Evaluation Guide.

Results: Their pre-training CPR skills were significantly comparably poor (P >.05), but the undergraduate student teachers significantly had better post-training CPR skills than the practising professional teachers (P <.001).

Conclusion: Although the professional and student teachers had significantly poor CPR skills before training, their post-training skills in CPR were improved significantly and the student teachers significantly improved better in the post-training CPR skills than the practising professional teachers.

Keywords: CPR skills; schools; teachers; Nigeria.

1. INTRODUCTION

There is a global acceptance that cardiopulmonary resuscitation should be taught in schools and school teachers should play pivotal roles in the training of school children in CPR for the purposes of having potential bystander CPR providers for out-of-hospital cardiac arrests (OHCA) in school environments as well as in the larger communities [1-23].

According to an earlier report [4], the ventilation differences between physicians and teachers revealed that teachers needed more attention in their future CPR trainings with regards to mouth to mouth ventilation. Meanwhile, when the facilitators were compared, teachers were found to be effective in providing training in CPR and the emergency physicians could not provide better results in resuscitation for the pupils [4].

Although most developed nations of the globe have incorporated cardiopulmonary resuscitation training in their schools curricula in line with the recommendation of the International Liaison Committee on Resuscitation (ILCOR), Nigeria is yet to do so. There is need to intensify the advocacy and provision of some relevant basic data for a possible eventual take off and effective and efficient implementation of this worthwhile life-saving programme in the Nigerian educational system. Recently, some related Nigerian studies have been reported [24-29].

In an effort to assist in guiding the policymakers with information in this important subject and fill the observed knowledge gap, the authors decided to compare the cardiopulmonary resuscitation skills of some professional practising teachers and those of some undergraduate student teachers in Nigeria. The following hypotheses were made: 1. there would no difference in the skills of CPR before training between the professional and student teachers that would be significant; and 2. that any difference in the post-training CPR skills of the two groups would not be statistically significant.

2. MATERIALS AND METHODS

The study design was a quasi-experimental one having two cohorts (one involving 41 practising professional teachers and another of 41 undergraduate student teachers) was carried out. The practising professional teachers were drawn from the holders of the National Certificate of Education (NCE) who came for their Sandwich Programmes in the Department of Human Kinetics and Health Education in the Faculty of Education, University of Port Harcourt. The student teachers were 200 level undergraduate students in the same Department.

The study was conducted between September, 2016 and June, 2017. While the practising teachers came from various secondary and primary schools in the different parts of Nigeria, the undergraduate student teachers were selected from different states in Nigeria during the previous year University Admission exercise. These convenience samples were then considered fairly representative because the professional teachers came from different States in Nigeria and the students were admitted into the University through an established process that ensures fair representation of students from all the States in Nigeria. The CPR skills of the participants were assessed before and after the CPR training. The two cohorts were matched for sex but not age.

Both the practising teachers and student teachers cohort groups had 9 (21.95%) male and 32(78.05%) female each with age ranges of 20-

50 years for the practicing professional teachers and 18-28 years for the student teachers. All the participants accepted that they had never previously had any teaching / training on cardiopulmonary resuscitation.

The following null hypotheses were generated and tested:

- **Ho1**: There would be no significant difference in the pre-training CPR skills between the professional teachers and the student teachers; and
- **Ho2**: There would be no significant difference in the post-training CPR skills of the two groups.

The detailed procedure given below in the CPR skills assessments of the two groups is as reported by Onyeaso and Onyeaso [29,30].

2.1 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. The AHA Evaluation Guide involved four components – (1) Scene Safety & Call for Help, (2) Chest Compressions, (3) Airway & Rescue Breaths and (4) Cycle/min & Placement of victim in the correct Recovery Position (see Appendix). Using the Skills Evaluation Guide (SEG), the practising professional and student teachers' pre-training skills were scored while the questionnaire was applied to obtain the demographic data of the participants. The participants in the cohorts were independently exposed to the scenarios of collapsed victims of cardiac arrests simulated using using manikins and were asked to demonstrate what to do to resuscitate such victims before the CPR training. The principal investigator (AHA-trained instructor) scored all of them.

2.2 Stage 2 (Training and Immediate Post-training)

Teaching took 60 minutes and was done in line with the established CPR guideline [31]. Their skills were again evaluated using the same modified AHA 'Skills Evaluation Guide' to assess their post-training cardiopulmonary resuscitation skills. Immediately after training the participants on the conventional CPR technique using the manikins for their hands-on session, each participant was exposed to the same scenarios of simulated collapsed victims of cardiac arrests as in the pre-training stage. They were unassisted while the same principal investigator scored them on the four components indicated above. The same scenarios before the CPR training were repeated after the training. The process of training them on hands-on and assessment took another 3 hours for each group but not on the same day.

Five (5) certified Red Cross instructors assisted the principal investigator in the hands-on training sessions after the theoretical CPR lectures. The participants were divided into four groups. Each group had two mats spread at the centre while the instructor demonstrated the procedures before each participant had his/her hands-on experience one after another. The training was interactive as the participants had opportunities to ask questions and received clarifications when they were not sure.

2.3 Determination of Poor and Good CPR Skills

For each of the four (4) domains of the CPR skills, 50% is considered acceptable. Percentage scores less than that was considered 'Poor CPR Skills.' 'Good CPR skills' were those from 50% and above.

2.4 Statistical Analysis

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

3. RESULTS

Table 1 shows the means as well as the standard deviations for the pre- and post- training CPR skills scores of the two groups in the four (4) domains assessed.

Tables 2a and 2b provide the summaries of the pre-training and post-training CPR skills domains for the practising professional and student teachers, respectively.

Table 3 shows the testing of the first null hypothesis with its rejection, meaning that though

both cohorts had poor CPR skills before training, the practising professional teachers still had significantly better pre-training CPR skills than the student teachers (P <.001).

Table 4 shows the second null hypothesis was also rejected, which means that the post-training CPR skills of the students was significantly better than that of the practising teachers (P = .001).

Table 1. Descriptive statistics showing the CPR skills means with standard deviations for the two cohort groups

Period of assessment	Cohorts	N	Mean	St. deviation	Std. error mean
Pre-training	Practising teachers	41	4.2439	.43477	.06790
	Student teachers	41	2.4146	.77381	.12085
Post-training	Practising teachers	41	16.0000	1.50000	.23426
	Student teachers	41	17.3171	2.12649	.33210

Table 2a. The summary of pre-training CPR skills domains of the two cohorts of participants compared

	Practising teachers				Student teachers			
Score (%)	S1	C1	B1	R1	S1	C1	B1	R1
0(0)					29	1	4	34
1(20)	39	39	37	39	12	38	37	6
2(40)	2	2	4	2		2	-	1
3(60)								
4(80)								
5(100)								

Note: No participants in both cohorts had 'good CPR skills' as none had up to 50%

Table 2b. The summary of post-training CPR skills domains of the two cohorts of participants compared

	Practicing teachers				Student teachers			
Score (%)	S2	C2	B2	R2	S2	C2	B2	R2
0(0)								
1(20)					1	1		2
2(40)					1	1	4	1
3(60)	18	11	13	22	4	4	5	4
4(80)	22	23	25	18	9	10	15	10
5(100)	1	7	3	1	26	25	17	24

Note: The figures inside the table for each component of CPR skills represent the number of participants that have such percentage skills. All the practising professional teachers had good CPR skills because all scored 60% and above while 11(6.71%) student teachers had 'poor CPR skills' after the CPR training but 153 (93.29%) had 'good CPR skills' with 92 (82.63%) having 100% scores.

Table 3. The One-Sample T-test statistical analysis of the pre-training skills of the cohorts

	Test value=0					
	t	df	Sig.(2-tailed)	Mean difference	95% confidence interval of the difference	
					Lower	Upper
Pre training student Teachers CPR skills	19.981	40	.000	2.41463	2.1704	2.6589
Pre training practising Teachers CPR skills	62.503	40	.000	4.24390	4.1067	4.3811

P = 000

Table 4. The one sample t-test statistical analysis of the post-training CPR skills

	T	df	Sig. (2-tailed)	Mean difference	95% confidence interval of the difference	
					Upper	Lower
Post- training student Teachers	52.144	40	.000	17.31707	16.6459	17.9883
Post-training practising Teacher	68.300	40	.000	16.00000	15.5265	16.4735

P = 000

Table 5 shows that the CPR skills improvements from pre-training stages for both the practising and student teachers to the post-training stages were very statistically significant (P < 0.001).

4. DISCUSSION

This first Nigerian quasi-experimental study comparing the cardiopulmonary resuscitation (CPR) skills of practising professional and students (undergraduate) teachers has revealed significantly comparable poor CPR skills before training for both groups which significantly improved for both but with significantly better CPR skills of the student teachers. This is a very interesting discovery because the potential future teachers have shown better grasp of the CPR skills which gives a hope of better prospect for the incorporation of CPR training into the Nigerian schools.

In a related comparative study involving two types of facilitators (emergency physicians and school teachers) showed that teachers are capable of providing effective training in resuscitation [4]. In fact, it was expected that pupils/students who were taught by emergency physicians would achieve better results but that was not the case [4]. This shows that not only those teachers in Nigeria are potential bystander CPR providers and facilitators in teaching Nigerian students CPR skills but the future teachers are even more promising.

Report by Al Enizi et al. [8] showed that in Al Qassim, school teachers lacked training in CPR and hence had no knowledge or skills but they were willing to attend future CPR training programmes if available because they want to serve their communities better. According to Alharbi et al. [2], the few teachers who had received previous CPR training did not register for a second course to refresh their memories. Similarly, the Nigerian professional and student teachers involved in the current report had no previous training in cardiopulmonary resuscitation and their impressive performance speaks of their willingness and interest in bystander CPR.

In a similar study [4] it was reported that the differences in ventilation performance between the physician and teachers suggested that future training for teachers would need more attention in the practice of mouth-to-mouth ventilation. The present Nigerian comparative study showed a relatively satisfactory cardiopulmonary

Table 5. The Paired Sample T-test statistical analysis of the pre-training and post-training CPR skills of the cohorts

	Paired differences					t	df	Sig.(2-tailed)
	Mean	Std. deviation	Std. error mean	95% confidence interval of the difference				
				Lower	Upper			
Practising teachers post-pre Training	11.75610	1.46254	.22841	11.29446	12.21773	51.469	40	.000
Student teachers post –pre training	14.90244	2.13078	.33277	14.22988	15.57400	44.783	40	.000

P < 0.001

resuscitation skills performance by both the professional teachers in all the various CPR skills domains.

Worthy of note is that the professional teachers in this cohort experimental study were generally older than the student teachers (20-50 year-olds as against 18-28 year-olds) and the two groups had similar cardiopulmonary resuscitation (CPR) skills before training but the student teachers had statistically significant better improvement in cardiopulmonary resuscitation (CPR) skills. This present finding seems to support an earlier report that showed that neither age and gender nor did school class have any significant effect on CPR skills acquisition of some secondary school students in Nigeria [32]. However, CPR skills performance and competence have been reported to be determined by the level of cardiopulmonary resuscitation (CPR) training students had received [33]. According to Kipsang and Bruce [32], registered nursing personnel that had received Advanced Life Support (ALS) training performed better in CPR than those who received Basic Life Support (BLS) training. They eventually recommended that all nurses enrolling for advanced nursing courses should have ALS training. Meanwhile, ALS training is not necessary for layperson bystander CPR providers which are the target for secondary school children and teachers.

In another related study between nurses and nursing students [34], 53% had studied resuscitation during the last 6 months while 7% had never participated in resuscitation teaching but before the testing, 55% of the participants estimated that their resuscitation skills were good but then there were varying poor percentages of different CPR skills competencies. According to Meissner et al. [14], before the training, 29.5% of the participants performed chest compressions as compared to 99.2% post-training ($P < .05$).In the present Nigerian study, no practising teacher nor student teacher could score pass mark in chest compression pre-training training but post-training 26.83%, 56.10%, 17.07% of the professional teachers scored 60%, 80% and 100%, respectively in chest compressions while 9.76%, 24.39%, and 60.98% of these potential future teachers scored 60%, 80%, and 100%, respectively in chest compressions. This means that 100% of the professional teachers and 95.13% of the student teachers in the present Nigerian study could carry out chest compressions after training. These results are comparable to the results reported by Meissner et al. [14].

4.1 Limitations of the Study

Although the sample could be said to be fairly representative in nature, being a convenience sample does limits the possibility of generalizing the findings for the entire Nigerian professional and student teachers. In addition, the CPR skills of the participants reported here might not be exactly the same when faced with real life situations of cardiac arrests cases.

5. CONCLUSION

The current Nigerian comparative study has shown that although the two groups significantly had poor pre-training CPR skills, their post-training skills in CPR were significantly improved and the student teachers had significantly better post-training CPR skills than the practising professional teachers.

6. RECOMMENDATION

Similar studies need to be done in other regions of the country so as to confirm the present findings, as well as increasing the awareness and advocacy for incorporation of cardiopulmonary resuscitation (CPR) training in Nigerian schools as previously suggested.

CONSENT

As per international standard or University standard, each participant's consent is documented by the authors.

ETHICAL APPROVAL

It is not applicable. There was no need for Institutional Ethical Approval because the procedure was completely non-invasive.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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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	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: ----------
Practising Teacher / Student Teacher -- ----------
Name of School / State----------
Instructor's Remark: ----------
Date: ---------- -

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