



Cardiopulmonary Resuscitation Skills of Some Nigerian Primary and Secondary Schools Teachers

Adedamola Olutoyin Onyeaso^{1*} and Onyedikachi Oluferanmi Onyeaso²

¹*Department of Human Kinetics and Health Education, Faculty of Education, University of Port Harcourt, Port Harcourt, Nigeria.*

²*Department of Community Medicine, Faculty of Clinical Sciences, College of Health Sciences, University of Port Harcourt, Port Harcourt, Nigeria.*

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 data collection and the analyses of the study. Both authors read and approved the final manuscript.

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ABSTRACT

Background/Aim of Study: Training of primary and secondary schools teachers on cardiopulmonary resuscitation (CPR) has received the support of the international community for the purposes of increasing potential bystander CPR providers for out-of-hospital cardiac arrests and teaching of the school children the same, but the situation is different in Nigeria. This study aimed at assessing the CPR skills of a group of Nigerian teachers.

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 in September 2016.

Methodology: A group of Nigerian primary and secondary schools teachers who came for further education at the University of Port Harcourt, Port Harcourt, Nigeria had their pre-training and post-

*Corresponding author: E-mail: adedamola.onyeaso@uniport.edu.ng, aonyeaso@yahoo.com;

training CPR skills assessed by a certified CPR instructor. The training was based on the American Heart Association (AHA) conventional CPR teaching standard and a modified AHA CPR Skills Evaluation Guide was used in the data collation.

Results: Although the pre-training CPR skills of the teachers were very poor, they significantly improved after the training ($P < 0.05$).

Conclusion: Nigerian primary and secondary schools teachers could serve as potential bystander CPR providers, as well as instructors to the children and the public, if well exposed as in advanced parts of the world.

Keywords: CPR skills; primary and secondary schools; teachers; Nigeria.

1. INTRODUCTION

Teaching and training of primary and secondary schools children in cardiopulmonary resuscitation (CPR) has been receiving increasing global attention for some years now [1-21]. Meanwhile, the story is not the same with Nigeria. It was just recently that the advocacy for this in Nigeria started with the first published data [22-24].

The important role of school teachers in achieving the goal of training school children as potential bystander CPR providers in out-of-hospital cardiac arrest (OHCA) situations has been documented [25-30]. In our determined drive to ensure that Nigeria follows the rest of the world in this meaningful crusade, there is need for more work involving the teachers in Nigeria who will eventually be part of this advocacy and successful implementation of the goal.

All school children should be taught how to perform CPR and should be made aware of how to use an automated external defibrillator [31]. According to Bohn et al. [32], after a 60-minute CPR-training update, teachers were able to provide courses successfully. Recent Nigerian reports have recommended the incorporation of CPR teaching and training into the curricula of Nigerian primary and secondary schools, as well as the training of the teachers [22-24,33,34].

This study is further justified by the fact that the present Nigerian School Health Programme needs further improvement. It will be useful to both the School Health Education and School Health Services. Teachers trained in CPR will be very useful also in emergency situations in schools such as in cardiac arrest affecting a child or staff in the school premises.

This study aimed at assessing the CPR skills of some Nigerian primary and secondary schools teachers. It was hypothesized that: 1. the pre-training CPR skills of the teachers would not be

poor; 2. their post-training CPR skills would not be statistically significantly different from their pre-training CPR skills.

2. MATERIALS AND METHODS

A cohort study involving forty five (45) Post National Certificate of Education (Post NCE) teachers, who are pursuing Bachelor degree in Education majoring in Human Kinetics and Health Education, that came for their long vacation studies in the Faculty of Education of the University of Port Harcourt, Nigeria was carried out. The forty five teachers were involved in this study but four (4) of them were not available for the post-training assessment stage of the study, giving the final cohort of 41 participants.

The study took place in September 2016. The participants are teachers from various primary and secondary schools in different States of Nigeria. This convenience sample was made up of those who belong to the Department of Human Kinetics and Health Education in the 2016 set of Post- NCE teachers in the Faculty of Education that came for their degree programme. Since the participants naturally came for their part time continuous education programme from different parts of the country, it was a fairly representative.

The following null hypotheses were generated and tested:

Ho1: That the pre-training CPR skills of the teachers would not be poor.

Ho2: That their post-training CPR skills would not be significantly different from their pre-training CPR skills.

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 Skills Evaluation Guide (SEG) was used to score the teachers' pre-training skills while the questionnaire was used to obtain the demographic data of the participants and their theoretical knowledge of CPR.

2.2 Stage 2 (Training and Immediate Post-training)

Teaching was carried out for 60 minutes using American Heart Association (AHA) CPR guideline which is available online. Their skills were evaluated using modified AHA Evaluation Guide involving 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 (Appendix). Immediately after training the participants on the conventional CPR technique using the manikins for their hands-on session, each of them was asked to carry out the CPR skills on the manikins unassisted while the principal researcher scored them. The process of training them on hands-on and assessment took another 3 hours.

2.3 Determination of Poor and Good CPR Skills

For each of the four (4) domains of the CPR skills, 50% is considered acceptable and any score less than that is considered poor CPR Skills while 50% and above is good CPR skills.

2.4 Statistical Analysis

The Statistical Package for Social Sciences (SPSS) was used to analyze the data. In addition to descriptive statistics, chi-square test and two sample T-test statistics were employed in the

analysis and testing of the null hypotheses with significance level set at $P < 0.05$.

3. RESULTS

The demographic data of the final cohort studied was as follows: 9 (21.95%) male and 36 (78.05%) female with age range of 20-50 years. Thirty eight (38) of the participants were within the age range of 31 to 40, two (2) were within 20 and 30 years while only one (1) belong to the 41 and 50 age range. All the participants accepted that they had never previously had any teaching / training on CPR.

Below is Table 1 showing the pre- and post-training CPR skills scores in the four (4) domains assessed in the forty-one (41) participants with all of them having poor pre-training CPR skills (40% and below). Meanwhile, all the participants improved to good CPR skills with 60% to 100% scores. Seven (7) participants improved to 100% in the chest compression domain and three (3) in rescue breath domain. The chi-square statistic confirmed that the post-training CPR skills in all the four domains were significantly improved or better than the pre-training skills.

Shown in Table 2 below is the distribution of the mean scores for the CPR skills of the teachers before and after training on CPR skills. This result shows that the teachers' pre-training CPR skills were very poor which improved tremendously after the training with very impressive percentage gains in the various CPR skills.

Table 3 shows the rejection of the first null hypothesis which confirms that the pre-training CPR skills of the group of Nigerian teachers was significantly very poor ($P = 0.000$).

Table 1. The CPR skills performance of the participants in the four domains expressed in percentage against the number of participants in each domain

Percentage scores	Number of participants							
	Pre-training CPR skills in the four domains				Post-training CPR skills in the four domains			
	S1	C1	B1	R1	S2	C2	B2	R2
0(0%)	-	1	1	1	-	-	-	-
1(20%)	38	35	34	37	-	-	-	-
2(40%)	3	5	6	3	-	-	-	-
3(60%)	-	-	-	-	17	10	12	21
4(80%)	-	-	-	-	23	24	26	19
5(100%)	-	-	-	-	1	7	3	1

Note: No participant scored up to 50% in the pre-training CPR skills assessment, meaning that all of them had poor pre-training CPR skills. Meanwhile, all of them had good post-training CPR skills with 60% and above scores in the four domains

Table 2. Pre and post test cardiopulmonary resuscitation skills of the Nigerian teachers

Variables	n	Pretest (\bar{x})	Post test (\bar{x})	Gain (\bar{x}) gain	% Gain
SCH	41	1.04	3.58	2.53	70.67
CC	41	1.04	3.90	2.85	73.07
RB	41	1.09	3.75	2.65	70.66
PRP	41	1.04	3.48	2.43	69.82

Table 3. Test statistics showing the significantly poor pre-training CPR skills of the Nigerian teachers

	Safety & call for help	Chest compression	Rescue breaths	Cycle/min & placement in recovery position
Chi-Square	33.390 ^a	33.390 ^a	26.561 ^a	33.390 ^a
df	1	1	1	1
Asymp. Sig.	.000	.000	.000	.000

Table 4. Paired samples statistical analysis of the post and pre-training skills of the Nigerian teachers

	Mean	Std. deviation	Std. error mean	95% Confidence interval of the difference		t	df	Sig. (2-tailed)
				Lower	Upper			
				Post & Pre Safety, Call for Help	2.53659			
Post & Pre Chest Compressions	2.85366	.69141	.10798	2.63542	3.07189	26.428	40	.000
Post & Pre Rescue Breaths	2.65854	.57488	.08978	2.47708	2.83999	29.611	40	.000
Post & Pre Placement on Recovery Position	2.43902	.50243	.07847	2.28044	2.59761	31.083	40	.000

Above is Table 4 showing the rejection of the second null hypothesis which means that the difference in the post-training CPR skills of the same Nigerian teachers is significantly better than their pre-training CPR skills ($P = 0.000$).

4. DISCUSSION

Although the Nigerian primary and secondary schools teachers had very poor CPR skills before CPR training, their post training skills were significantly improved in all the domains assessed. All public school teachers are required to complete CPR training for their credentialing [35]. According to a Group Study report [36], lay resuscitation rate was less 30% with variations between countries and regions. There is no known documented rate in Nigeria but previous Nigerian reports have shown generally poor pre-training CPR skills that improved significantly after training [37,38].

The result of the current Nigerian study has revealed very impressive CPR skills

improvement which is to the similar previous report involving school children [37]. Comparison of the facilitator showed that teachers are capable of providing effective training in resuscitation [32]. It was expected that pupils taught by emergency physicians would achieve better results which was not found to be so [32]. This shows that teachers in Nigeria are potential bystander CPR providers and facilitators in teaching Nigerian students CPR skills.

Bohn et al. [32] in their study showed 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. Meanwhile, in this present Nigerian study, the performance of the teachers in ventilation including mouth-to-mouth ventilation was very satisfactory as in the other aspects of CPR skills. The earlier report on Nigerian teachers' attitude towards CPR including mouth-to-mouth ventilation was quite good and encouraging [14]. This performance could have been a reflection of

this positive attitude in another group of Nigerian teachers studied in this report.

Just like the other aspects of the CPR skills that were significantly poor before the CPR training which significantly improved after the training, chest compression by the participants in this study was adequate and effective. This is expected since they are all adults as Jones et al. [39] found out that children from 13-14-year-olds were able to apply adequate compression in about 45% of them. Even a previous Nigerian study [37] recorded adequate chest compressions among 12-19-year-olds.

In the present Nigerian study, the average percentage gain in the CPR skills was 71.01% which is satisfactory when compared with 33% to 90% recorded by Aaberg et al. [40]. It is important to note that theirs was self-reported skill unlike the present Nigerian study that was scored by an independent CPR Expect Instructor. Meanwhile, it is worthwhile to note a similar previous study among schoolchildren recorded a higher percentage skill gain of 92% compared to the present 71.01% among teachers. This finding seems to support an earlier report that age did not have any significant influence on the ability to learn and retain CPR knowledge [33].

Similar studies abroad [30,41,42] support the poor CPR skills of secondary school teachers found in this Nigerian study. According to Alharbi et al. [41], none of the few teachers who had received previous CPR training registered for a second course to refresh their memories. In our present Nigerian study, none of the teachers had any previous CPR training while 15.2% of teachers in Riyadh, Kingdom of Saudi Arabia [41] and 59% among Flemish teachers [29] had previous CPR training. Meanwhile, CPR is becoming mandatory for teachers in the USA with most of the States where it is required, they are doing it as part of teacher certification or re-certification [43].

Although with caution because the sample was not randomly selected, a major strength of this study is that the cohort is made up of teachers drawn from different States in Nigeria who came for their teaching degree programme which means that it is more of a representative sample. It is expected that this will help in spreading faster this message of teachers' involvement in CPR training and eventual potential bystander CPR providers for their students and the

community, as well as serving as CPR instructors for their students. However, the weakness of the study is the relatively small sample size.

5. CONCLUSION

- This group of Nigerian primary and secondary school teachers had very poor pre-training CPR skills which significantly changed positively after exposure to CPR training.
- Their performance seem to suggest they are promising potential CPR bystander providers and Instructors

6. RECOMMENDATION

- Training of Nigerian primary and secondary school teachers on CPR should be encouraged to increase potential bystander CPR providers and CPR instructors, in line with the international community.
- More similar studies among teachers should be carried out in Nigeria involving larger sample size.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the author(s).

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: -----

NAME OF SCHOOL / STATE-----

INSTRUCTOR'S REMARK: -----

DATE: -----

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