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Theoretical Knowledge of Cardiopulmonary Resuscitation among Some Nigerian Primary and Secondary School Teachers

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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 and the analyses of the study. Both authors were involved in the literature review, read and approved the final manuscript.

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ABSTRACT

Background / Aim of Study: Although the teaching of cardiopulmonary resuscitation (CPR) to of primary and secondary schools teachers is highly recommended and practiced internationally for the purposes of increasing potential lay person bystander CPR providers for out-of-hospital cardiac arrests, effective management of emergency situations in schools as well as teaching of the school children the same, Nigeria is yet to move in this direction. This study aimed at assessing the pre-training and post-training CPR theoretical knowledge of a group of Nigerian teachers.
Study Design: Cohort quasi-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-

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training CPR theoretical knowledge assessed by a certified CPR instructor. The training was based on the American Heart Association (AHA) conventional CPR teaching standard and a questionnaire was used in the data collation.
Results: Although the pre-training CPR theoretical knowledge of the teachers was very poor, there was statistically significant improvement after the training (P = .000)
Conclusion: Nigerian primary and secondary schools teachers hold promise as potential CPR instructors for school children and public, if well exposed as in advanced parts of the world.

Keywords: CPR theoretical knowledge; primary and secondary schools; teachers; Nigeria.

1. INTRODUCTION

The knowledge, teaching and practice of cardiopulmonary resuscitation (CPR) are being encouraged among teachers in both primary and secondary schools globally [1-7]. The important role of school teachers in the training of school children in CPR as potential bystander CPR providers for out-of-hospital cardiac attacks (OHCA) is well known [2,8-10].

Following the recommendation of the International Liaison Committee on Resuscitation in 2003, the American Heart Association (AHA) recommended that schools should establish a goal to train every teacher in CPR and first aid as a part of their preparation for a response to medical emergencies on campus [11]. Most States in the USA where it is required, they are doing it as part of teacher certification or re-certification (School CPR). There is enough evidence to show that teachers' role is central in the successful outcome of training schoolchildren in CPR for the purpose of increasing potential bystanders in out-of-hospital cardiac arrest (OHCA) cases, as well in managing children in schools who might be victims of cardiac arrest [3,12]. Even when there is existing legislation in support of incorporating teaching and training on CPR, teachers' lack of adequate knowledge of CPR, among other things, have been documented as one of the barriers to expected good outcome [12,13-15].

In an attempt to improve the content of the curricula of Nigerian primary and secondary schools, few previous research efforts recommended the introduction of CPR [16-20]. Meanwhile, this can only be effective if the teachers themselves are adequately prepared to be part of this new innovation in line with the rest of the world. It is known that before getting involved in the practical skills of CPR training and practice, the theoretical knowledge of CPR must be established.

Therefore, this study aimed at assessing the level of the theoretical knowledge of CPR by a group of Nigerian teachers before and after exposing them to CPR teaching and training. It was hypothesized that: (1) their pre-training CPR knowledge would not be poor; (2) that their post-training CPR knowledge would not be statistically significantly better than their pre-training knowledge.

2. MATERIALS AND METHODS

As part of a larger study, this 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 theoretical knowledge of CPR by the teachers would not be poor.
Ho2: That their post-training CPR theoretical knowledge of the teachers would not be statistically significantly better than their pre-training CPR knowledge.

2.1 Study Design

The quasi-experimental study design was used for this study. The current report is on the theoretical cardiopulmonary knowledge of the participants excluding the practical CPR skills of the participants.

2.2 Stage 1 (Pre-training)

A questionnaire containing a section for the demographic data of the participants and a section having 7-item questions on CPR to assess their pre-training cardiopulmonary resuscitation theoretical knowledge was used.

2.3 Stage 2 (Training and Post-training Assessment)

Teaching was carried out using American Heart Association (AHA) CPR guideline which is available online. Their post-training theoretical knowledge of CPR was also tested using the same questionnaire after the teaching and training on CPR (Appendix). The conventional CPR technique using the manikins for their hands-on session was used. The power point teaching and training with their practical sessions took about 4 hours.

2.4 Determination of Poor and Good CPR Theoretical Knowledge

For the seven (7) questions on CPR knowledge, those who scored four (4) questions and above correctly were considered 'good theoretical CPR knowledge' while any score less than that was considered 'poor CPR knowledge'.

2.5 Statistical Analysis

The Statistical Package for Social Sciences (SPSS) was used to analyze the data. In addition to descriptive statistics, both one-sample 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 shows Table 1a with only one (2.4%) participant scoring 4 questions rightly. The rest had 3 and below right. Meanwhile, all the participants scored 5 and above questions correctly during post-training assessment (100% 'Good CPR knowledge'). Table 1b shows the means with the standard deviations of the pre-training and post-training CPR knowledge scores.

Table 2 shows the total number of participants with the right answers for the seven (7) questions during the CPR pre-training and post-training assessments.

The poorest improvement in CPR knowledge was seen in giving of rescue breaths (2 in pre-training and only 6 in post-training), followed by the knowledge of chest compressions (7 and 36 for pre-training and post-training, respectively).

Table 3 reveals a rejection of the first null hypothesis with the P value of .000. This statistically shows that the participants' pre-training CPR knowledge was poor.

Rejection of the second null hypothesis is shown in Table 4. This shows that the post-training theoretical knowledge of CPR of the participants is statistically better than their pre-training theoretical knowledge.

4. DISCUSSION

The present quasi-experimental Nigerian study has shown very poor pre-training CPR theoretical knowledge by the Nigerian teachers which significantly improved to good theoretical knowledge in the CPR post-training assessment. Similar poor pre-training CPR knowledge of teachers have been reported [2-4]. However, unlike the present Nigerian study where the participants had no previous training on CPR, the reports by Patsaki et al. [2] had 21% of the Flemish teachers with previous exposure to CPR training while Mpotos et al. [3] had 59% of the Greek teachers with previous CPR training. Al Enizi et al. [4] reported that despite the fact that 35.7% of their study population had previous CPR training, the average scores in their study did not show any difference between those who had previous CPR training and those who did not.

Table 1a. The pre-training and post-training CPR knowledge scores for all the participants

Participants	Right pre-training CPR knowledge scores	Right post-training CPR knowledge scores
1	3	7
2	3	5
3	3	5
4	3	6
5	2	4
6	3	4
7	3	5
8	3	6
9	3	5
10	3	6
11	2	6
12	2	6
13	3	5
14	3	7
15	3	7
16	1	5
17	3	5
18	3	5
19	3	6
20	3	6
21	4	5
22	3	4
23	3	4
24	2	3
25	3	6
26	3	7
27	3	5
28	3	5
29	3	4
30	2	5
31	3	6
32	3	5
33	1	5
34	2	6
35	1	5
36	3	6
37	2	5
38	3	4
39	3	6
40	3	5
41	1	5

Table 1b. The summary of the participants' pre-training and post-training CPR knowledge scores showing the means with the standard deviations

Descriptive statistics					
	N	Minimum	Maximum	Mean	Std. deviation
Pre-training knowledge	41	1.00	4.00	2.6585	.69317
Post-training knowledge	41	3.00	7.00	5.2927	.92854
Valid N (list wise)	41				

The effectiveness of school teachers in the CPR training of school children has been documented which underscores the importance of adequately preparing the teachers for this worthwhile function [21,22]. According to Cuijper et al. [21], training by medical students or physical education student teachers is non-inferior to training by a registered nurse, suggesting that

Table 2. The total number of participants with the right answers to the CPR questions

	Questions on cardiopulmonary resuscitation	Number of participants with the right pre-training CPR knowledge	Number of participants with the right post-training CPR knowledge
1	What is the first thing you should do if you come across a collapsed person	14	29
2	Why would you shake and shout at a collapsed person?	26	34
3	What action would you use to open the person's airway	12	34
4	When assessing a person's breathing, what do you look for?	25	38
5	What does CPR stand for?	23	38
6	When giving rescue breaths, for how long do you breathe into the person's mouth?	2	6
7	How many chest compressions and rescue breaths would you give per cycle of CPR?	7	36

Table 3. One-sample t-test analysis of the pre-training CPR knowledge of the participants

	Test value = 0					
	t	Df	Sig. (2-tailed)	Mean difference	95% Confidence Interval of the difference	
					Lower	Upper
Pre-training CPR knowledge	24.558	40	.000	2.65854	2.4397	2.8773

P < .001

Table 4. Paired sample t-test analysis of the difference between the post-training and pre-training CPR knowledge of the participants

		Paired samples test							
		Paired differences					t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% confidence interval of the difference				
					Lower	Upper			
Pair 1	Post-training knowledge – Pre-training knowledge	2.63415	1.06668	.16659	2.29746	2.97083	15.812	40	.000

P < .001

school teachers, student teachers and medical students can be recruited for CPR training in secondary schools. Meanwhile, Iserbyt et al. [22] showed that students taught by specialised content knowledge teachers spent more time practicing basic life support (BLS) (57% vs 30%), were less engaged in cognitive activities (29% vs 55%) and achieved a significantly higher BLS performance (62% vs 57%) compared to students taught by common content knowledge teachers, P <.05. Specialised content knowledge teachers on average gave more feedback (31 vs 19). They concluded that a 50-min workshop with a focus on specialised content knowledge impacted teachers' in-class behaviour, which in turn significantly improved students' BLS performance.

In a similar study carried out in Spain, Navarro-Paton et al. [23] assessed the effectiveness of the three teaching programmes for CPR training - traditional course, an audio-visual approach and feedback devices and concluded that the feedback devices gave the best outcome. The

present Nigerian study, being one of the earliest CPR studies involving primary and secondary school teachers, combined all the programmes. Considering the enormous work ahead in Nigerian school CPR programme, future Nigerian studies would like to explore the possibility of ascertaining the best CPR training programme in terms of speed and best outcome for the purpose of recommending such in school CPR training.

In one of the earliest studies on CPR training among Nigerian secondary school students [16], it was reported that their pre-training CPR knowledge was only 8.9% but during the post-training it improved significantly to 88.6%. The present Nigerian study on teachers with 2.4% poor pre-training CPR knowledge and 100% post-training 'good CPR knowledge' is comparable to that of the school children.

Meanwhile, it was observed that the least improvement in the CPR skills was found in the giving of rescue breaths (mouth-to-mouth breathing). It could be that the participants found it difficult to come to terms with the idea of giving mouth-to-mouth breathing to a victim of cardiac arrest. In fact, although an earlier Nigerian study involving secondary school students reported generally good attitude of the students to CPR , the least percentage score among the various questions on CPR was still on giving of mouth-to-mouth breathing [24]. That report showed that the Nigerian secondary school students' attitude to mouth-to-mouth was relatively not very good. According to Geddes and Rundell [25], in view of the present day state of cardiopulmonary resuscitation (CPR), they recommended a need for rethink concerning CPR with regards to mouth-to-mouth breathing. They reported that there is increasing reluctance among untrained rescuers, nurses, physicians, firemen, and policemen to perform mouth-to-mouth breathing.

Although the present Nigerian study sample is fairly representative but it has the weakness of being relatively small in size. However, it must be noted that the nature of the CPR teaching does not encourage a large sample size so as to make it more manageable while future studies would involve more teachers.

5. CONCLUSION

Despite the very poor pre-training theoretical CPR knowledge of the Nigerian primary and secondary schools' teachers, the CPR training given to them significantly improved their post-training theoretical CPR knowledge.

6. RECOMMENDATIONS

- As we had previously recommended, CPR training should be incorporated into the primary and secondary schools' curricula in Nigeria
- Nigerian teachers should be taught CPR not only to prepare them for the work of training the children but to make them effective as lay bystanders in emergency situations in schools and the Nigerian communities where many of the citizens do not have the CPR knowledge
- There is need for more studies in the different parts of the country involving larger sample sizes.

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

Questionnaire on CPR

Section A: Personal Data

Please tick as it applies to you.

1. Gender : Male: ☐ Female: ☐

2 Age in Years: ----------

3. Official status at workplace----------

4. Name of workplace: ----------

5. For how long have you been teaching? ----------

6. In which state is your work place? ----------

7. As a sandwich student, please state your department here in Uniport----------
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Section B

Concerning a collapsed victim, please tick only one option in questions 10 to 16 below

8. What is the first thing you should do if you come across a collapsed person?

- ♦ Call an ambulance
- ♦ Try to get the person to respond to you
- ♦ Check to see if the person is breathing normally

9. Why would you shake and shout at a collapsed person?

- ♦ To open the airway
- ♦ To restart the heart
- ♦ To check for response

10. What action would you use to open the person's airway?

- ♦ Tilt the head back and lift the chin
- ♦ Tilt the head and push the chin down
- ♦ Tilt the head down and turn the chin to the right

11. When assessing a person's breathing, what do you look for?

- ♦ Chest movement
- ♦ Movement of the eyes
- ♦ Movement of nose

12. What does CPR stand for?

- ♦ Call Respond React
- ♦ Cardiopulmonary Resuscitation
- ♦ Citizen Please Respond

13. When giving rescue breaths, for how long do you breathe into the person's mouth?

- 1 second
- 5 seconds
- 10 seconds

14. How many chest compressions and rescue breaths would you give per cycle of CPR?

- 20 presses and one breath
- 30 presses and two breaths
- 30 presses and three breaths

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