



Association of Age and Gender with Simulated Cardiopulmonary Resuscitation Skills Performance in Some Nigerian Student Teachers

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Authors' contributions

This work was carried out in collaboration between the two 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, literature searches and the analyses of the study. The two authors read and approved the final manuscript.

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ABSTRACT

Background: The importance of teachers in bystander cardiopulmonary resuscitation (CPR) and the varying influences of demographics such as age and gender in its effectiveness have been documented. Contributions from Nigerian researchers on bystander CPR are very limited. This study aimed at assessing the association between CPR skills and age and gender of future Nigeria teachers.

Methods: A quasi-experimental cohort study involving 41 males and 41 females aged 17 -28 years was carried out in June 2017. The post-training CPR skills of the participants were assessed by one American Heart Association-trained instructor using a modified AHA Evaluation Guide involving four components: Scene Safety & Call for Help (SS); Chest Compressions (CC); Airway & Rescue

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Breaths (RB); and Cycle / min & Placement of victim in the correct Recovery Position (CR). The data was analysed using descriptive and parametric statistics with p-value < 0.05.

Results: Male participants generally had better chest compressions skills which were not statistically significant ($p > 0.05$). No statistically significant association was found between CPR skills and gender ($p > 0.05$), as well as for age except for the scene safety / call for help domain which had significant association with age ($p = 0.003$).

Conclusion: No age and gender associations were found with the different CPR skills except the significant association found between age and the scene safety / call for help domain.

Keywords: Age; gender; bystander CPR skills; student teachers; Nigeria.

1. INTRODUCTION

The public health challenge of effectively managing out-of-hospital cardiac arrest (OHCA) victims has been well documented with varying degrees of survival rates [1-12].

There is need to increase the number of available and effective potential bystander CPR providers in our communities so as to have the desired satisfactory survival outcomes in out-of-hospital cardiac arrest (OHCA) cases.

Realizing that the shortage of CPR instructors has been one of the limiting factors to increasing the number of potentially available bystander CPR providers in many communities, there is increasing support globally for school teachers to be trained in CPR. It is believed that this will help them to train the school children as well as serve as bystander CPR providers both in the school environment and in the larger society [13-20]. However, certain characteristics, especially age and gender, of layperson CPR providers have been reported to be associated with varying effects on the quality of cardiopulmonary resuscitation provision [21-24].

Nigeria is yet to follow the global trend in the area of creating sufficient awareness and training of lay rescuers especially in the school system. Therefore, Nigeria is in need of basic relevant data in the bystander CPR which is known to be very important in the chain of survival. Only two related studies on age and gender have been reported among Nigerian secondary school students before now [25,26]. Recently, there were other related Nigerian studies involving university students [27-31]. Okonta and Okoh [27] reported no significant sex relationship with the CPR knowledge of the participants, and the other studies [28,29] showed encouraging positive attitudes of the participants towards learning and practising CPR. Meanwhile, Onyeaso and Onyeaso [30,31] reported more impressive post-training CPR skills among

student teachers compared to practising professional teachers.

Meanwhile, the public health challenge of cardiac arrest and OHCA is known to affect both the developed and developing countries of the world with even reported significant relationship between living in a poor neighbourhoods and out-of-hospital cardiac arrests incidence and survival outcomes [32-37].

In our attempt to contribute to this important subject in a growing economy like Nigeria, we aimed at investigating the relationship between age and gender of the student teachers and their CPR skills performance. It was hypothesized that: 1. the female student teachers would have generally statistically significantly poorer CPR skills; 2.the female student teachers would have statistically significantly poorer chest compression skill; 3. there would be no statistically significant relationship between age and CPR skills performance.

2. MATERIALS AND METHODS

The substantial part of the methodology for this study is as previously reported by Onyeaso and Onyeaso [38]. A quasi-experimental study was conducted involving a cohort group of 152 200-Level student teachers in the Department of Human Kinetics and Health Education, Faculty of Education, University of Port Harcourt, Nigeria. A questionnaire containing 10-item questions testing attitude towards cardiopulmonary resuscitation (CPR) was served to all the participants before training them on CPR and after. The responses of the participants to the self-administered questionnaire before and after CPR training were collated and analysed. One hundred and fifty (150) copies of the questionnaire were properly filled and collected at the end of the pre-training and post-training exercise, giving a response rate of 98.68%.

However, the final cohort sample for this report was reduced to eighty two (82) participants due

to the need to have the same number of male and female participants – 41 male and 41 female.

This study took place in June 2017. The sample comprises students admitted in 2015 who are studying to graduate with Bachelor degrees in either Human Kinetics or Health Education. The researchers generated and tested the following null hypotheses:

- Ho1:** The female student teachers would have generally statistically significantly poorer CPR skills than the male student teachers
- Ho2:** The female student teachers would have statistically significantly poorer chest compression skills
- Ho3:** There would be no statistically significant relationship between age and CPR skills performance.

2.1 Stage 1 (Pre-training)

The assessment sheet containing a section for the demographic data of the participants and a section having the four (4) CPR skills domains for the assessment of the skills was used. The scenario of victims of cardiac arrest was simulated using the manikins and the participants were asked to carry out CPR skills to show how they could help the victims. Their CPR skills were evaluated using modified AHA Evaluation Guide involving four components – (1) Scene Safety & Call for Help (SS), (2) Chest Compressions (CC), (3) Airway & Rescue Breaths (RB) and (4) Cycle / min & Placement of victim in the correct Recovery Position (CR) (Appendix).

2.2 Stage 2 (Post-training)

Teaching was carried out for 60 minutes using the American Heart Association (AHA) CPR Guideline which is available online. After the CPR teaching and training of the participants using the manikins for their hands-on session, each of them was asked again to carry out the CPR skills on the manikins unassisted as in the pre-training stage while the same principal researcher scored them. The process of training them on hands-on and the re-assessment took another 4 hours.

2.3 Determination of Poor and Good CPR Skills

None of the participants had received any form of CPR training before this study and they generally

had very poor pre-training CPR skills. Therefore, this report is based on their post-training CPR skills only. 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 data was collated and statistically analyzed using the Statistical Package for Social Sciences (SPSS). Descriptive statistics (frequencies, means) as well as the Paired T-tests and one-way ANOVA were used in the analysis with P-value set at 0.05.

3. RESULTS

Table 1 shows the distribution of gender and CPR skills percentage scores in the different skills domains with generally similar pattern seen in both sexes. The male participants showed better chest compression skill as seen in the 60% and 80% categories.

The means of the CPR skills in both genders are shown in Table 2 with comparable values.

Table 3 shows the rejection of the first and second null hypotheses as no statistically significant gender difference was seen in any of the CPR skills domains ($P > 0.05$).

Table 4 generally shows better CPR skills in the younger age group (17-20 years).

Table 5 shows rejection of the third hypothesis in relation to scene safety and call for help as significant age relationship with the scene safety and call for help (SS2) skill was seen ($P = .003$). However, the third null hypothesis was accepted for the other CPR skills domains ($P > .05$).

4. DISCUSSION

To the best of the authors knowledge, this first quasi-experimental Nigerian study on the association of age and sex of student teachers with CPR skills has shown that sex of the future Nigerian teachers had no significant association with the CPR skills but observed significant association between age of the participants and the Scene Safety and Call for Help domain (SS) CPR skills ($p < 0.01$).

In the only two related earlier Nigerian studies [25,26], age was found to have statistically

significant influence on the attitude of the secondary school students towards cardiopulmonary resuscitation (CPR) while gender and school class did not one report [25]. Meanwhile, in the other report on CPR skills [26], neither age nor gender had any statistically significant influence on cardiopulmonary resuscitation skills. The present Nigerian study on student teachers has shown a statistically significant association between age and CPR skills in relation to scene safety and call for help

(p = 003) but no significant association with age for the other CPR skills (p > .05).

Meissner et al. [39] observed no differences between the overall BLS performance of boys and girls in their study. The mean learning effect was also not related to gender; boys and girls improved with 5.3 ± 2.8 and 5.5 ± 2.7 points, respectively. However, they observed a significant difference in the depth of chest compressions depending on gender with more

Table 1. Gender and CPR skills percentage scores in the different skills domains

Domain	Gender	CPR skills percentage scores in each domain						Total
		0 (0%)	1(20%)	2 (40%)	3 (60%)	4 (80%)	5 (100%)	
SS2	F	---	3 (6.1%)	---	7 (14.3%)	12 (24.5%)	27 (55.1%)	49(100%)
	M	1(2.0%)	---	3 (6.1%)	13(26.5%)	11 (22.4%)	21 (42.9%)	49(100%)
CC2	F	---	3 (6.1%)	6(12.2%)	4 (8.2%)	8 (16.3%)	28(57.1%)	49(100%)
	M	1(2.0%)	1(2.0%)	3 (6.1%)	6 (12.2%)	11 (22.4%)	27 (55.1%)	49(100%)
RB2	F	---	1(2.0%)	1(2.0%)	8 (16.3%)	16 (32.7%)	23 (46.9%)	49(100%)
	M	---	1(2.0%)	2 (4.1%)	7 (14.3%)	16 (32.7%)	23 (46.9%)	49(100%)
CR2	F	---	3 (6.1%)	1 (2.0%)	5 (10.2%)	10(20.4%)	29 (59.2%)	49(100%)
	M	---	3 (6.1%)	---	5 (10.2%)	12 (24.5%)	29 (59.2%)	49(100%)

Note: SS2: Scene Safety & Call for Help (Post-training stage); CC2: Chest Compressions (Post-training stage); RB2: Airway & Rescue Breaths (Post-training stage); CR2: Cycle / min & Placement of victim in the correct Recovery Position (Post-training stage)

Table 2. Gender and the means of CPR skills across the different domains

		Mean	Standard deviation	Standard. error mean
SS2	Female	4.2245	1.10426	.15775
	Male	3.9592	1.13577	.16225
CC2	Female	4.0612	1.31352	.18765
	Male	4.1633	1.19630	.17090
RB2	Female	4.2041	.93496	.13357
	Male	4.1837	.97197	.13885
CR2	Female	4.2041	1.22440	.17491
	Male	4.3061	1.08405	.15486

Note: SS2: Scene Safety & Call for Help (Post-training stage); CC2: Chest Compressions (Post-training stage); RB2: Airway & Rescue Breaths (Post-training stage); CR2: Cycle / min & Placement of victim in the correct Recovery Position (Post-training stage)

Table 3. The test of the gender differences in the CPR skills domains using the paired t-test

		Paired Differences				T	df	Sig. (2-tailed)	
		Mean	Standard deviation	Standard error mean	95% confidence interval of the difference				
					Lower				Upper
Paired Female SS2-Male SS2		.26531	1.53807	.21972	-.17648	.70709	1.207	48	.233
Paired Female CC2 -Male CC2		-.10204	1.85118	.26445	-.63376	.42968	-.386	48	.701
Paired Female RB2-Male RB2		.02041	1.43599	.20514	-.39206	.43287	.099	48	.921
Paired Female CR2-Male CR2		-.10204	1.66139	.23734	-.57925	.37517	-.430	48	.669

p > 0.05

Note: SS2: Scene Safety & Call for Help (Post-training stage); CC2: Chest Compressions (Post-training stage); RB2: Airway & Rescue Breaths (Post-training stage); CR2: Cycle / min & Placement of victim in the correct Recovery Position (Post-training stage)

Table 4. Age and CPR skills percentage scores of the participants in the different skills domains

Domain	Age	CPR skills percentage scores in each domain					Total	
		0 (0%)	1(20%)	2 (40%)	3 (60%)	4 (80%)		5 (100%)
SS2	17-20 years	---	3(5.4%)	1(1.8%)	9(16.1%)	14(25.0%)	29(51.8%)	56(100%)
	21-28 years	1 (1.8%)	---	2 (3.6%)	11 (19.6%)	9 (16.1%)	19(33.9%)	42 (100%)
CC2	17-20 years	---	4(7.1%)	6(10.7%)	6(10.7%)	9 (16.1%)	31(55.4%)	56(100%)
	21-28 years	1(1.8%)	---	3(5.4%)	4(7.1%)	10(17.9%)	24(42.9%)	42 (100%)
RB2	17-20 years	---	1(1.8%)	2 (3.6%)	10(17.9%)	17(30.4%)	26(46.4%)	56(100%)
	21-28 years	---	1(1.8%)	1(1.8%)	5(8.9%)	15(26.8%)	20(35.7%)	42 (100%)
CR2	17-20 years	---	5(8.9%)	1(1.8%)	4(7.1%)	12(21.4%)	34(60.7%)	56(100%)
	21-28 years	---	2(3.6%)	---	6(10.7%)	10(17.9%)	24(42.9%)	42 (100%)

Note: SS2: Scene Safety & Call for Help (Post-training stage); CC2: Chest Compressions (Post-training stage); RB2: Airway & Rescue Breaths (Post-training stage); CR2: Cycle / min & Placement of victim in the correct Recovery Position (Post-training stage)

Table 5. The test of the effect of age on different CPR skills across the different domains using the One-way ANOVA

		Sums of square	Df	Mean square	F	Significance
SS2	Between Groups	31.230	10	3.123	2.988	.003
	Within Groups	90.944	87	1.045		
	Total	122.173	97			
CC2	Between Groups	5.432	10	.543	.323	.973
	Within Groups	146.333	87	1.682		
	Total	151.765	97			
RB2	Between Groups	8.302	10	.830	.914	.524
	Within Groups	79.015	87	.908		
	Total	87.316	97			
CR2	Between Groups	14.659	10	1.466	1.119	.357
	Within Groups	113.964	87	1.310		
	Total	128.622	97			

Note: SS2: Scene Safety & Call for Help (Post-training stage); CC2: Chest Compressions (Post-training stage); RB2: Airway & Rescue Breaths (Post-training stage); CR2: Cycle / min & Placement of victim in the correct Recovery Position (Post-training stage)

boys achieving better compressions than the girls. Their findings are comparable with the findings of the current Nigerian study because no significant gender differences were found in our study. However, the male participants had generally better chest compressions skills but it was not found statistically significant.

Jones et al. [40] reported that the children's ability to achieve an adequate depth of chest compression depended on their age and weight. The ability to provide the correct rate and to employ the correct hand position was similar across all the age ranges tested [40]. They also

found no association between pupils' age, sex, weight, or height and the average rate of chest compressions over the three minute period. The present Nigerian study revealed adequate chest compression across the ages generally but showed greater percentages of the younger age groups having better CPR skills across the domains and significant difference in relation to managing the scene safety and call for help (p = 0.003). It is documented that from 13-14 years of age, teaching full single rescuer cardiopulmonary resuscitation is recommended [40]. May be the younger age group could have shown generally better CPR skills because they were more

enthusiastic. Similarly, Wik et al. [41] reported that in out-of-hospital cardiac arrest situations, chest compressions were not delivered in half of the time, and most compressions were too shallow.

Although Mckenna and Glendon [42] have reported that variables such as age, sex, height, weight and practice on a manikin were not found to influence CPR performance, it is important to note that our study did not assess the weight and height of the participants to ascertain any possible impact of body mass index (BMI) on the observations made in this Nigerian study. However, one of the major strengths of this study is that the cohort sample is fairly representative in nature with regards to participants from fairly different parts of Nigeria.

5. LIMITATIONS OF THIS STUDY

First, the final sample size for this report is much lesser than the initial cohort sample because of some missing data and the need to have the same number of males and females participants. Secondly, we did not assess any possible impact of body mass index (weight and height) on the CPR skills of the participants especially the chest compressions.

6. CONCLUSION

No age and gender associations were found with the different CPR skills except the significant association found between the younger age group (17-20 years) and the scene safety / call for help domain. The generally better male chest compression skill observed in this study was not statistically significant.

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

Skills Evaluation Guide

Skills	Performed steps	Obtainable 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. Mouth- to- Mouth breathing	1	
14. Lasting 1 sec	1	
15. Chest rise	1	
Total 5		
Cycle/minute & 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 DEPARTMENT -----
 STATE OF ORIGIN-----
 INSTRUCTOR'S REMARK: -----
 DATE

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