

Cardiopulmonary Resuscitation Knowledge in a Nigerian University Students after a Conventional and Hands-Only CPR Training Programmes

Adedamola Olutoyin Onyeaso^{1,*}, Chukwudi Ochi Onyeaso²

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

²Department of Child Dental Health, Faculty of Dentistry College of Health Sciences, University of Port Harcourt / University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria

Abstract Introduction: Lack of adequate knowledge has been a major reason for fear and unwillingness by many laypersons across the globe to provide bystander CPR while the training technique could be an important factor in knowledge acquisition. This study aimed at assessing the pre-training and post-training theoretical CPR knowledge of two cohorts of Nigerian University students. **Materials and Methods:** A quasi-experimental study design was used involving two cohorts of 70 participants each. During the pre-training stage, both the compression-only and the conventional CPR groups were asked to respond to the self-administered questionnaire containing nine (9) questions on theoretical CPR knowledge. After the respective CPR trainings, they were given the same questionnaire to respond to the same questions. The data was analysed using descriptive, student's t-test statistics, as well as the analysis of variance (ANOVA) with the statistical significance set as $P < 0.05$. **Results:** Both the hands-only and conventional CPR groups had very statistically significant improvements in their post-training theoretical knowledge of bystander CPR ($P < 0.001$), while no statistically significant difference was found in the post-training theoretical knowledge of the participants in the two groups ($P > 0.05$). **Conclusion:** Both CPR training methods were found very effective in imparting bystander CPR knowledge to the participants while none proved superior to the other. **Recommendation:** More related studies are needed in other parts of Nigeria.

Keywords Gender, Association, Hands-only and Conventional bystander CPR, Nigeria

1. Introduction

Considering the growing global public health burden of sudden cardiac arrest in today's world especially in out-of-hospital cases, and the need for immediate initiation of high-quality cardiopulmonary resuscitation (CPR) which has been reported to significantly increase survival rate of such victims, there is need to train young people in the art and science of bystander CPR for the overall and long-term benefits of our communities [1-5].

The death rate from out-of-hospital cardiac arrests (OHCA) in America, Europe, Asian and Middle East are not in any way encouraging and many of these deaths are not unconnected with poor bystander CPR provision for the victims [6-9].

However, central to effective bystander CPR provision for

victims of OHCA is the ability of bystanders, who are often medically untrained, to provide the needed services in such emergency situations. Meanwhile, laypersons cannot provide this important emergency service when they have poor knowledge of what is expected of them. It is also known that OHCA is not limited to developed nations but equally occur in many developing economies [10-12]. Therefore, both developed and developing nations are expected to be ready for this important public health concern. Unlike many countries of the world, Nigeria is presently ill-prepared for this.

Although there are few related recent reports from Nigeria on knowledge of bystander cardiopulmonary resuscitation [13-19], there is still need for more data on this subject in our advocacy effort for the incorporation of bystander CPR teaching and training into the Nigerian schools' curricula. The University students are a good target group for the success of this advocacy as potential future secondary school teachers and policy makers in our country.

Therefore, this study aimed at assessing the pre-training and post-training theoretical knowledge of cardiopulmonary resuscitation (CPR) among a group of university students at the University of Port Harcourt, Port Harcourt, Nigeria.

* Corresponding author:

adedamola.onyeaso@uniport.edu.ng (Adedamola Olutoyin Onyeaso)

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We hypothesized that: (1) there would be no statistically significant difference between the pre-training and post-training CPR knowledge of the students after the conventional CPR training; (2) there would be no statistically significant difference between the pre-training and post-training CPR knowledge of the students after the hands-only CPR training; and (3) there would be no statistically significant difference in the post-training theoretical knowledge of the two cohorts.

2. Materials and Methods

2.1. Research Design

This study was carried out using a quasi-experimental cohorts design – one cohort was exposed to the conventional CPR training while the other cohort was taught hands-only CPR technique. However, both cohorts were taught together during the theoretical teaching before the different hands-on sessions.

2.2. Population of the Study

The two groups (cohorts) were part of the larger 200-Level students of the Department of Human Kinetics and Health Education in the Faculty of Education of the University of Port Harcourt. The students were admitted into the Department in 2016. Although not all the thirty-six (36) States in Nigeria are represented in the sample, but due to the Admission Policy in all the Federal Universities in Nigeria which ensures that candidates from all the six (6) Geo-political Regions in the country are fairly admitted into every programme, the participants gave a very fair representation of the different States in Nigeria.

2.3. Stage 1 (Pre-training Phase)

Before CPR teaching and trainings, one hundred and forty (140) copies of a self-administered questionnaire on their knowledge of cardiopulmonary resuscitation (CPR) was distributed to assess the pre-training CPR theoretical

knowledge of the participants - seventy (70) in the hands-only cohort and another seventy (70) in the conventional CPR group. Nine questions on bystander CPR were captured in the questionnaire (Appendix).

2.4. Stage 2 (Immediate Post-training Phase)

Immediately after the teaching and trainings on bystander CPR, another one hundred and forty (140) copies of the same questionnaire were given to the same participants to answer the same questions on CPR which they answered before the teaching and training sessions. All the participants in the two groups responded to the questions again.

2.5. Determination of Good and Poor CPR theoretical Knowledge

For each of the nine (9) questions on CPR knowledge, a score of 50% was considered good while any score less than that was considered as poor CPR theoretical knowledge the following null hypotheses were generated and tested:

Ho1: That there would be no statistically significant difference between the pre-training and post-training CPR knowledge of the students after the hands-only CPR training

Ho2: That there would be no statistically significant difference between the pre-training and post-training CPR knowledge of the students after the conventional CPR training

Ho3: That there would be no statistically significant differences in the post-training theoretical knowledge of the two cohorts.

2.6. Data Analysis

The Statistical Package for Social Sciences (SPSS Version 20) was used to analyse the data. In addition to descriptive statistics, the data was analyzed using the paired samples T-test at $P < 0.05$ level of significance.

3. Results

Table 1. Frequency distribution of the pre-and post-training CPR knowledge of the participants in the two cohort groups

	HANDS-ONLY				CONVENTIONAL			
	PRE-TRAINING		POST TRAINING		PRE-TRAINING		POST TRAINING	
	Correct knowledge	Wrong Knowledge	Correct knowledge	Wrong knowledge	Correct knowledge	Wrong knowledge	Correct knowledge	Wrong knowledge
1	23(32.9%)	47(67.1%)	54(77.1%)	16(22.9%)	27(38.6%)	43(61.4%)	53(75.7%)	17(24.3%)
2	9(12.9%)	61(87.1%)	69(98.6%)	1(1.4%)	17(24.3%)	53(75.7%)	68(97.1%)	2(2.9%)
3	23(32.9%)	47(67.1%)	55(78.6%)	15(21.4%)	23(32.9%)	47(67.1%)	53(75.7%)	17(24.3%)
4	23(32.9%)	47(67.1%)	65(92.9%)	5(7.1%)	24(34.3%)	46(65.7%)	65(92.9%)	5(7.1%)
5	22(31.4%)	48(68.6%)	52(74.3%)	18(25.7%)	19(27.1%)	51(72.9%)	53(75.7%)	17(24.3%)
6	23(32.9%)	47(67.1%)	53(75.7%)	17(24.3%)	26(37.1%)	44(62.9%)	52(74.3%)	18(25.7%)
7	26(37.1%)	44(62.9%)	53(75.7%)	17(24.3%)	16(22.9%)	54(77.1%)	57(81.4%)	13(18.6%)
8	16(22.9%)	54(77.1%)	63(90.0%)	7(10.0%)	20(28.6%)	50(71.4%)	58(82.9%)	12(17.1%)
9	25(35.7%)	45(64.3%)	69(98.6%)	1(1.4%)	15(21.4%)	55(78.6%)	70(100%)	-

Table 2. The Paired Samples T-test analysis of the difference between the post-training and the pre-training CPR knowledge of the participants in hands-only CPR group

		Paired Differences					t	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	HPOK1 - HPREK1	.44286	.50031	.05980	.32356	.56215	7.406	69	.000
Pair 2	HPOK2 - HPREK2	.85714	.35245	.04213	.77310	.94118	20.347	69	.000
Pair 3	HPOK3 - HPREK3	.45714	.50176	.05997	.33750	.57678	7.623	69	.000
Pair 4	HPOK4 - HPREK4	.60000	.49344	.05898	.48234	.71766	10.173	69	.000
Pair 5	HPOK5 - HPREK5	.42857	.49844	.05958	.30972	.54742	7.194	69	.000
Pair 6	HPOK6 - HPREK6	.42857	.49844	.05958	.30972	.54742	7.194	69	.000
Pair 7	HPOK7 - HPREK7	.38571	.49028	.05860	.26881	.50262	6.582	69	.000
Pair 8	HP OK8 - HPREK8	.67143	.47309	.05654	.55863	.78423	11.874	69	.000
Pair 9	HPOK9 - HPREK9	.62857	.48668	.05817	.51253	.74462	10.806	69	.000

Table 3. The Paired Samples T-test analysis of the difference between the post-training and the pre-training CPR knowledge of the participants in conventional CPR group

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	CPOK1 - CPREK1	.37143	.74545	.08910	.19368	.54917	4.169	69	.000
Pair 2	CPOK2 - CPREK2	.72857	.47917	.05727	.61432	.84283	12.721	69	.000
Pair	CPOK3 - CPREK3	.42857	.71366	.08530	.25840	.59874	5.024	69	.000
Pair 4	CPOK4 - CPREK4	.58571	.55149	.06592	.45422	.71721	8.886	69	.000
Pair 5	CPOK5 - CPREK5	.48571	.67551	.08074	.32464	.64678	6.016	69	.000
Pair 6	CPOK6 - CPREK6	.37143	.70549	.08432	.20321	.53965	4.405	69	.000
Pair 7	CPOK7 - CPREK7	.58571	.62538	.07475	.43660	.73483	7.836	69	.000
Pair 8	CPOK8 - CPREK8	.54286	.62983	.07528	.39268	.69304	7.211	69	.000
Pair 9	CPOK9 - CPREK9	.75714	.46425	.05549	.64645	.86784	13.645	69	.000

Key: HPOK (Hands-only post-training knowledge), HPREK (Hands-only pre-training knowledge), CPOK (Conventional post-training knowledge), CPREK (Conventional pre-training knowledge)

Table 4. The Paired Samples T-test analysis of the difference in post-training CPR knowledge in the hands- only CPR and the conventional CPR groups

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	CPOK1 - HPOK1	-.01429	.57717	.06899	-.15191	.12334	-.207	69	.837
Pair 2	CPOK2 - HPOK2	-.01429	.20802	.02486	-.06389	.03531	-.575	69	.567
Pair 3	CPOK3 - HPOK3	-.02857	.65875	.07874	-.18565	.12850	-.363	69	.718
Pair 4	CPOK4 - HPOK4	.00000	.38069	.04550	-.09077	.09077	.000	69	1.000
Pair 5	CPOK5 - HPOK5	.01429	.60176	.07192	-.12920	.15777	.199	69	.843
Pair 6	CPOK6 - HPOK6	-.01429	.60176	.07192	-.15777	.12920	-.199	69	.843
Pair 7	CPOK7 - HPOK7	.05714	.50750	.06066	-.06387	.17815	.942	69	.349
Pair 8	CPOK8 - HPOK8	-.07143	.39274	.04694	-.16507	.02222	-1.522	69	.133
Pair 9	CPOK9 - HPOK9	-.01429	.20802	.02486	-.06389	.03531	-.575	69	.567

The frequency distribution of the pre-and post-training CPR knowledge of the participants in the two cohort groups is presented in Table 1 above. The participants in both

cohorts generally had poor pre-training CPR knowledge and impressive post-training CPR knowledge. This shows the rejection of the first null hypothesis.

Table 2 shows the Paired Samples T-test analysis of the differences between the post-training and the pre-training CPR knowledge of the participants in hands-only CPR group. The analysis reveals very statistically significant differences in the pre-training and post-training CPR knowledge in all the items examined ($P < 0.001$). The second null hypothesis is also rejected.

Table 3 provides the Paired Samples T-test analysis of the differences between the post-training and the pre-training CPR knowledge of the participants in conventional CPR group, showing very statistically significant differences in the CPR knowledge ($P < 0.001$).

The Paired Samples T-test analysis of the difference in post-training CPR knowledge in the hands-only CPR and the conventional CPR groups is shown in Table 4 below with no statistically significant differences revealed ($P > 0.05$). This shows the acceptance of the third null hypothesis.

4. Discussion

The present Nigerian study on the theoretical knowledge of cardiopulmonary resuscitation (CPR) after both hands-only and conventional CPR trainings have shown statistically significant improvement on the theoretical knowledge of bystander CPR by the participants in both groups. Meanwhile, no statistically significant difference in the post-training theoretical knowledge of the participants in the two groups was observed.

The result of the present Nigerian study is comparable to those of few related earlier reports from Nigeria [13-16, 18]. These very significant improvements in CPR knowledge after CPR trainings should be seen as positive and encouraging finding for a developing economy like Nigeria. Lack of adequate CPR knowledge has been one of the major reasons for fear and unwillingness to attempt bystander CPR by laypersons in emergency situations and even poor outcomes of bystander CPR efforts generally, especially among low income environments [20].

According to Mpotos et al [20], 61% of the teachers interviewed felt incapable and unwilling to teach CPR because of their perceived lack of knowledge to do so despite their previous exposure to CPR teaching. Sasson et al [12] reported that patients who had an out-of-hospital cardiac arrest in low-income black neighbourhoods were less likely to receive bystander-initiated CPR than those in high-income white neighbourhoods.

In that report by Sasson et al [12], they defined low-income and high-income neighbourhoods as those census tracts in which the median annual household income was less than \$40,000 and \$40,000 or more, respectively. Comparing the Nigerian environment where the present study and the earlier reports [13-16, 18] were carried out and the criteria for categorization of low-income and high-income neighbourhoods used by Sasson et al [12], it becomes very clear that the Nigerian environment can obviously be considered as a low-income one. In addition,

schools are believed to be a good target area in the promotion of bystander CPR through teaching and training with the obvious effective secondary multiplier effects [20-24].

It is interesting to note that there were no statistically significant differences in the post-training CPR knowledge of participants between the two cohorts. This means that their theoretical knowledge of CPR was not influenced by the type of CPR training technique used (whether the conventional or the hands-only CPR).

It suggests that the hands-only CPR technique could be encouraged more in our environment without the participants losing out in knowledge considering the fact that some previous reports showed that among Nigerian participants in bystander CPR training and other parts of the globe were not comfortable with mouth-to-mouth CPR [14, 25-29].

In fact, there is increasing evidence that compression-only (hands-only) CPR is very effective in out-of-hospital cardiac arrest (OHCA) victims [28, 30]. Bobrow et al [28], in their study concluded that among patients with out-of-hospital cardiac arrest, layperson compression-only CPR was associated with increased survival compared with conventional CPR and no bystander CPR in the setting with public endorsement of chest compression-only CPR.

According to Tsegaye et al [29], with theoretical knowledge, a healthcare professional may be able to perform CPR sufficiently. They reported that among the medical students studied, lack of training, poor exposure time to CPR training and inadequate information were significantly associated with their inability to practice CPR. Of course, they lack confidence and willingness to practice CPR. They concluded that training was a significant factor which reinforces students to initiate CPR.

Strengths and Limitations of this Study

The two cohorts used in this study were drawn from a fairly representative of the Nigerian youths as they came from various States in the country but is limited by the fact that the study was based on simulated OHCA using manikins in their practical trainings outside the video and power-point teachings.

5. Conclusions

This study has shown very statistically significant improvements in the theoretical post-training CPR knowledge of the participants in the both cohorts but no statistically significant difference in the post-trainings CPR theoretical knowledge of the participants in the two training techniques, meaning that no method of training produced superior impart of the theoretical knowledge but the two did significantly well.

6. Recommendations

- Related studies should be carried out in other parts of Nigeria so as to increase the number of bystander CPR

providers in the country.

- There is need for regular training and re-training of these potential bystander CPR providers in Nigeria because their confidence and ability to perform this emergency procedure will depend on their CPR theoretical knowledge which will inform their practical performance.

REFERENCES

- [1] Alsharari AO, Alduraywish A, Al-Zarea EA, Salmon NI, Sheikh MSA. Current Status of Knowledge about Cardiopulmonary Resuscitation among then University Students in the Northern Region of Saudi Arabia. *Cardiology Research and Practice* 2018 Article ID 3687472,9 pages <https://10.1155/2018/3687472>.
- [2] Sasson C, Rogers MA, Dahl J, Kellermann AL. Predictors of survival from out-of-hospital cardiac arrest: a systematic review and meta-analysis. *Circ Cardiovasc Qual Outcomes* 2010; 3:63-81.
- [3] Mawani M, Kadir MM, Azam I, et al. Epidemiology and outcomes of out-of-hospital cardiac arrest in a developing country-a multicenter cohort study. *BMC Emerg Med* 2016; 16:28.
- [4] Ahn KO, Shin SD, Suh GJ, et al. Epidemiology and outcomes from non-traumatic out-of-hospital cardiac arrest in Korea: a nationwide observational study. *Resuscitation* 2010; 81:97481.
- [5] Berdowski J, Berg RA, Tijssen JG, Koster RW. Global incidences of out-of-hospital cardiac arrest and survival rates: systematic review of 67 prospective studies. *Resuscitation* 2010; 81(11): 1479–1487.
- [6] Ong ME, Shin SD, De Souza NN, et al. Outcomes for out-of-hospital cardiac arrests across 7 countries in Asia: The Pan Asian Resuscitation Outcomes Study (PAROS). *Resuscitation* 2015; 96: 100–108.
- [7] Roger VL, Go AS, Lloyd-Jones DM, et al. Heart disease and stroke statistics - 2011 update: a report from the American Heart Association. *Circulation* 2011; 123(4): e18–e209.
- [8] Bin Salleeh H, Gabralla K, Leggio W, Al Aseri Z. Out-of-hospital adult cardiac arrests in a university hospital in central Saudi Arabia. *Saudi Medical Journal* 2015; 36 (9): 1071–1075.
- [9] Zhang S. Sudden cardiac death in China: current status and future perspectives. *Europace* 2015; 17(2): ii14–ii18.
- [10] Chiang WC, Ko PCI, Chang AM, Chen WT, Liu SSH, Huang YS, et al. Bystander –initiated CPR in an Asian metropolitan: Does the socioeconomic status matter? *Resuscitation* 2014; 85(1): 53-58.
- [11] Vaillancourt C, Lui A, De Maio VJ, Wells GA, Stiell IG. Socioeconomic status influences bystander CPR and survival rates for out-of-hospital cardiac arrest victims. *Resuscitation* 2008; 79(3): 417-423. DOI:10.1016/j.resuscitation.2008.07.012.
- [12] Sasson C, Magid DJ, Chan P, Root ED, McNally BF, Kellermann AL, Haukoos JS. Association of Neighborhood Characteristics with Bystander-initiated CPR. *N Engl J Med*. 2012; 367: 1607-1615.
- [13] Onyeaso AO, Achalu EI. Knowledge of Cardiopulmonary Resuscitation among Some Secondary School Students in Nigeria. *J Educ Pract* 2014; 5(15): 180-183.
- [14] Onyeaso AO, Onyeaso CO. Nigerian Public Primary and Secondary School Teachers' Knowledge and Attitude towards Cardiopulmonary Resuscitation. *Int J Adv Res* 2016; 5(1): 89-95.
- [15] Onyeaso AO, Onyeaso OO. Knowledge of Cardiopulmonary Resuscitation among Student Teachers in Nigeria *J Health Sci* 2017; 7(5): 91-95.
- [16] Onyeaso AO, Onyeaso OO. Comparison of Practising and Student Teachers' Knowledge of Cardiopulmonary Resuscitation in Nigeria. *Public Health Research* 2017; 7(6): 143-147.
- [17] Onyeaso AO. Age, Gender and School Class and Retention of Cardiopulmonary Resuscitation Knowledge among Secondary School Students in Nigeria. *Br J Med Med Res (BJMMR)* 2016; 16(4): 1-7. DOI:10.9734/BJMMR/2016/26404.
- [18] Onyeaso AO, Onyeaso OO. Theoretical Knowledge of Cardiopulmonary Resuscitation among some Nigerian Primary and Secondary School Teachers. *Asian J Med Health* 2017; 6(4): 1-10.
- [19] Onyeaso AO, Onyeaso OO. Impact of Age and Sex on Bystander Cardiopulmonary Resuscitation Knowledge. *International Journal of Scientific Research and Management* 2017; 5(11):7510-7517.
- [20] Mpotos N, Vekeman E, Monsieurs K, Derese A, Valcke M. Knowledge and willingness to teach cardiopulmonary resuscitation: a survey among 4273 teachers. *Resuscitation* 2013; 84(4): 496-500.
- [21] Brown TB, Dias JA, Saini D, Shah RC, Cofield SS, Terndrup TE, Kaslow RA, Waterbor JW. Relationship between knowledge of cardiopulmonary resuscitation guidelines and performance. *Resuscitation* 2006; 69: 253-261.
- [22] Pkant N, Taylor K. How best to teach CPR to school children: A systematic review. *Resuscitation* 2013; 84(4): 415-421.
- [23] Naqvi S, Siddiqi R, Hussain SA, Batool H, Arshad H. School children training for basic life support. *J Coll Physicians Surg Pak* 2011; 21: 611-615.
- [24] Meissner TM, Kloppe C, Hanefeld C. Basic life support skills of high school students before and after cardiopulmonary resuscitation training. A longitudinal investigation. *Scand J Trauma Resusc Emerg Med* 2012; 14: 20-31.
- [25] Onyeaso AO, Imogie AO. Attitude towards Cardiopulmonary Resuscitation among Some Secondary School Students in Rivers State, Nigeria. *Br J Educ* 2014; 2(3): 37-43.
- [26] Boucek CD, Phrampus P, Lutz J, Dongilli T, Bircher NG. Willingness to perform mouth-to-mouth ventilation by healthcare providers: a survey. *Resuscitation* 2009; 80(8): 1000-1005.

849-53.

- [27] Wik L, Giammaria M, Frittelli W, Belli R, Chinaglia A, DeMichelis B, Ierna S, et al. Does the reluctance to perform mouth-to-mouth ventilation exist among emergency healthcare providers as first responders? *Ital Heart J Suppl* 2005; 6(2): 90-104.
- [28] Bobrow BJ, Spaite DW, Berg RA, Stolz U, Sanders AB, Kern KB, et al. Chest Compression-Only CPR by Lay Rescuers and Survival from Out-of-Hospital Cardiac Arrest. *JAMA* 2010; 304(13): 1447-1454.
- [29] Tsegaye W, Tesfaye M, Alemu M. Knowledge, Attitude and Practice of Cardiopulmonary Resuscitation and Associated factors in Ethiopian University Medical Students. *J Gen Pract* 2015; 3: 206. doi: 10.4172/2329-9126.1000206.
- [30] Onyeaso AO, Onyeaso CO. Chest Compression-only Cardiopulmonary Resuscitation in Nigerian University Students. *Am J Med Med Sci* 2018; 8(8): 213-218.