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Age, Gender and School Class and Retention of Cardiopulmonary Resuscitation Knowledge among Secondary School Students in Nigeria

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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ABSTRACT

Background/Aim of Study: Cardiopulmonary resuscitation (CPR) is an important element in the "chain of survival" for the treatment of victims of cardiac arrest. Bystander CPR is a strong predictor of long term survival and bystanders with previous CPR training are more likely to perform CPR. This study aimed at assessing the CPR knowledge retention six weeks after the initial training, as well as the influence of age, gender and school class on CPR knowledge.
Study Design: Quasi-experimental study design was used.
Place and Duration of the Study: Department of Human Kinetics and Health Education, Faculty of Education, University of Port Harcourt between October and December, 2012.
Methodology: A group of students selected from different schools had pre-training, training programme, post-training and retest assessments of their CPR knowledge. Modified AHA form was used in data collation. Video-tapes, songs, power points lectures and hands-on using manikin were employed during the teaching.
Results: The students significantly retained CPR knowledge six weeks after training ($P < 0.05$), while age, gender and school class did not have any significant influence on CPR knowledge ($P > 0.05$).

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Conclusion: The Nigerian students can serve as a reliable target in increasing the number of bystanders for positive public health impact, and their age, gender and school class might not matter in their CPR knowledge acquisition and retention.

Keywords: CPR Knowledge retention; secondary school students; Nigeria.

1. INTRODUCTION

Knowledge is a familiarity, awareness or understanding of someone or something, such as facts, information, description, or a skill, which is acquired through experience or education by perceiving, discovering, or learning [1]. Knowledge, can refer to a theoretical or practical understanding of a subject. It can be implicit (as with practical skill or expertise) or explicit (as with the theoretical understanding of a subject); it can be more or less formal or systematic [1,2]. Acquisition of knowledge involves complex cognitive processes: perception, communication, association and reasoning [1,3].

Cardiopulmonary resuscitation is a combination of rescue breaths and chest compressions which are intended to re-establish cardiac function and blood circulation in an individual who has suffered cardiac or respiratory arrest [4,5]. The updated guidelines on CPR still recommended the bystander CPR especially using the compression-only type for untrained rescuers [6].

In 2001, the International Liaison Committee on Resuscitation (ILCR) strongly recommended that instruction in CPR be incorporated as a standard part of the school curriculum [7]. This will act as part of their preparation for response to medical emergencies both in the school and at home. It is believed that on a long term basis, children trained in CPR will contribute significantly to the number of adults trained in any community [7]. There is now increasing emphasis on hands-only CPR, [8] which aims at taking care of the mouth-to-mouth breathing that is a setback to the performance of bystander CPR.

Accordingly, reports [9-12] show that many countries have implemented the recommendation of the International Liaison Committee on Resuscitation (ILCR) but the situation is different in Nigerian schools. The Iowa's experience [13] has shown increased percentage of high schools involved in CPR training programmes from 81% in 2011 when the law on CPR training was passed in that State to 96% in 2015.

The ability of children, even those in the kindergarten, to learn and offer emergency services has been documented [13,14]. Bollig et al. [13] concluded that children aged 4-5 years can learn basic First aid and that First aid training should start in kindergarten. According to the systematic review by Plant and Taylor, [15] the effect of physical factors such as child age, gender and basal metabolic rate (BMR), academic tress at school and social background on performance of CPR has been variable.

As one of the attempts to see the possibility of introducing the teaching of CPR into the Nigerian secondary school system, this study aimed at assessing the level of the knowledge of CPR that a group of secondary school students in Rivers State, Nigeria could retain six weeks after their initial exposure to the teaching of CPR, and the possible effect of age, gender and school class on this. The null hypotheses were: (1) that they would not have significant CPR knowledge retention after six weeks of the initial CPR teaching; and (2) that age, gender and school class would not have any significant influence on the CPR knowledge acquisition and retention by the students.

2. MATERIALS AND METHODS

Quasi-experimental design was adopted in the conduct of this study among four purposively selected secondary schools in Obio/Akpor Local Government Area of Rivers State of Nigeria. The data was collected in stages: pre-training, post training (immediately after training) and six weeks later (retention stage).

2.1 Stage 1 (Pre-training)

The level of the knowledge of CPR among 400 selected secondary school students were assessed using a seven item modified self structured questionnaire. The participants were asked to pick the most appropriate answer in responding to the questions.

2.2 Stage 2 (Training and Immediate Post-training)

Teaching was carried out for 135 minutes using power points, modified AHA "Be The Beat" Video clips, Rap Songs on CPR (see appendices A, B and C). Immediately after training in each school,

questionnaire were administered to the students and retrieved after they had responded to the questions on their own.

2.3 Stage 3 (Six Weeks after the Training)

Copies of the same questionnaire were given to the participants at the different schools six weeks later. The total number of questionnaires that had complete data on both immediate post-training and six weeks later were 644, having eliminated the wrongly filled ones and those who were at the post-training but not six weeks after the training.

Therefore, the final sample size was 322 research participants (students). The data generated were coded, tallied, scored and put into frequency distribution table. Descriptive statistics of mean and standard deviation were used to provide answers to the research questions. ANOVA and t-test were used to test the hypotheses at 0.05 significant levels.

2.4 The Independent Variables

In addition to dichotomizing the participants into male and female, they were grouped into two (12-15-year-olds and 16-19-year-olds) and the senior secondary school 1 (SS1) students and the senior secondary school 2 (SS2) students.

2.5 Permission for the Study

Permission for this study was obtained from the Rivers State Ministry of Education, Port Harcourt. This was followed up by obtaining permission from the authorities of the secondary schools involved in the study. Each participant was given a consent form to fill and for the parents. Only the students who gave their consent as well as their parents' that were allowed to participate in the study.

3. RESULTS

Three hundred and twenty two secondary schools students were taught Cardiopulmonary Resuscitation using video clips and power point for 135 minutes. Responses to the question items by the 322 research participants immediately after training and six weeks later are as follows (Table 1): 82.9% got the question on the first thing to do when they come across a collapsed person immediately after teaching while 68.0% got the same question correctly six weeks after training, 91.2% responded correctly to the question on why they would shake and tap a collapsed person immediately after training while 84.8% responded correctly six weeks after, 91.4% responded correctly to the question on action to use in opening the airway while 89.5% did six weeks after, 93.2% knew what to do in assessing the airway immediately after training while 92.2% got the same question correctly six weeks after, 94.8% knew what CPR acronym stands for and 94.0% remembered six weeks after, 78.0% responded correctly to the length of rescue breath and 71.8% responded correctly six weeks after. On chest compression to rescue breathe, 88.2% got the ratio of chest compression to rescue breathe immediately after training while77.0% got the same question correctly six weeks after.

Table 2 shows that Post-test mean score on question items on knowledge was 12.41, while the Retention-test mean score was 11.54, the mean loss being 86 (6.2%). This revealed slight drop in knowledge acquired six weeks after the training but the retained knowledge was still very significant.

Table 1. Level of CPR Knowledge among the secondary school students

		% Score immediate post- training	% Score Six weeks after training	% Loss
1.	First thing to do if a person collapsed	82.9	68.0	14.9
2.	Why would you shake and shout at a collapsed	91.6	84.8	6.8
3.	What action would you use to open airway	91.4	89.5	1.9
4.	what do you look for in assessing breathing	93.2	92.2	1.0
5.	What does CPR stands for	94.8	94.0	0.8
6.	For how long does a rescue breathe last?	78.0	71.7	6.3
7.	No of chest compression & rescue breath/cycle	88.2	77.0	11.2
	Cluster %	**88.6**	**82.4**	**6.2**

Table 3 shows the t-test analysis of the difference in the level of CPR knowledge among the selected secondary school students immediately after the training and six weeks after. From the table, the calculated t-value for post and retention tests on knowledge is 5.18. This value is greater than the t-critical table value of 1.96 at 0.05 significant level. The null hypothesis of no significant difference is, therefore, rejected.

Tables 4, 5 and 6 show the ANOVA test analyses of the CPR knowledge with respect to age, gender and school class among the selected secondary school students before training, immediately after the training and six weeks after. From the tables, the calculated F-values on knowledge are 2.48, 0.11 and 1.46 for age, gender and school class, respectively. These values are less than the respective F-critical values at 0.05 significant levels. This means that age, gender and school class do not have any statistically significant influence on CPR knowledge among the selected secondary school students before, immediately after training and six weeks after. Therefore, the null hypothesis for age, gender and school class is accepted.

4. DISCUSSION

It is believed that teaching of cardiopulmonary resuscitation as part of school curriculum would impact positively on public health [7,16]. The present study is the first documented in Nigerian school system on CPR knowledge retention by secondary school students.

Table 2. Post and Retention test of CPR Knowledge among the selected secondary school students

Variable	Post-test $\bar{x}$	Ret-test $\bar{x}$	$\bar{x}$ Loss
Knowledge (322)	12.4±2.05 (88.6%)	11.54±.2.54 (82.4%)	.86±3.01 (6.2%)

Table 3. Paired t-test analysis of the difference in the level of knowledge among the selected secondary school students (Post and retention-test)

Paired sample	$\bar{x}$	DF	t-cal	t-crit	p-value (2-tailed)	Decision
Post & Retention knowledge	.869 ±3.01	321	5.18	1,96	.000	Rejected

Significant at p < 0.05

Table 4. Influence of age on CPR knowledge (Pre, post and retention)

Items	N	Sources of variation	Sum of square	Mean square	DF	F-Cal	F-crit	P-value	Decision
Knowledge	966	Between group	170.536	56.845	3				
		Within group	64304.011	66.844	962	2.48	2.61	.115	Accepted
		Group total	64474.547		965				

Significant at p < 0.05

Table 5. ANOVA analysis of influence of gender on knowledge (Pre, post and retention)

Items	N	Sources of variation	Sum of square	Mean square	DF	F-Cal	F-crit	p-value	Remark
Knowledge	966	Between group	.01	.015	1				
		Within group	1315.792	1.365	964	0.11	3.85	.224	Accepted
		Group total	1315.807		965				

Significant at p<0.05

Table 6. Influence of secondary school class on CPR knowledge (Pre, post and retention)

Items	N	Sources of variation	Sum of square	Mean square	DF	F-Cal	F-crit	P-value	Remark
Knowledge		Between group	98.049	98.049	1				
	966	Within group	64376.497	66.781	964	1.46	6.67	.226	Accepted
		Group total	64474.547		965				

Significant at $p < 0.05$

The present Nigerian study has demonstrated clearly that the secondary school students significantly retained their CPR knowledge after 6 weeks of the initial CPR training. In a similar quasi experimental study carried out in Pakistan by Naqvi et al. [17] reported that the children showed highly significant improvement in knowledge after CPR training and retention of knowledge of CPR after 3 months period. They concluded that CPR training should be provided to all school children after 6th grade. Other earlier reports have also supported the involvement of children of 6 years and above in CPR training [17-19]. On implementing CPR training in schools, it was reported [20] that 35, 000 Mini Anne manikins were distributed to 7th Grade School Children in Denmark and it was believed that the children would have gone on to use the kit at home to help 'instruct' their family member thereby achieving a multiplier effect of 2.5. Unlike the study by Naqvi et al. [17], the current Nigerian study had a reasonable sample size that could help in generalizing the outcome of the study.

According to the study in Northern Ireland by Connolly et al. [16] children instructed on CPR gave a significant increase in knowledge which remained significantly higher than comparable group of children that did not have similar training. The place of bystanders in the management of out of hospital cardiac arrest (OHCA) cannot be overemphasized. In a much earlier study by Kaye and Mancini [21], despite more training and experience of the medical doctors and registered nurses, their performance in CPR was comparable to laypersons performance.

In a study among undergraduate nursing students that equally employed quasi experimental time series design (pre-test, CPR training programme, post-test and retest phases) reported by Madden [22] showed that students' knowledge and skills were improved over their pre-training scores, which clearly indicated positive retention in CPR cognitive knowledge and psychomotor skills.

This study showed that there was no relationship between CPR knowledge and age, both age brackets had good knowledge retention. According to Lieberman et al. [23], the suitability of teaching CPR to young children may be debatable and that students in their mid-teens are mature enough to learn lifesaving skills, although better performance has been noted in older teenagers. Lester et al. [24] showed that children as young as eleven were capable of learning CPR. However, at eleven years old, such skills began to be lost rapidly after training [25]. The Austrian Red Cross had started lifesaving first aid training for children as young as eight [19].

Also, in this present study, the observed difference in gender was not statistically significant. In all, gender was not a predicting factor for acquiring CPR knowledge. This finding is in agreement with Miro et al. [26] who carried out a study in Spain describing 5-year experience of providing training in basic cardiopulmonary resuscitation (CPR) for students in Spanish obligatory secondary school education, including the percentage of satisfactory learning immediately after training and one year later. In their analysis of factors associated with satisfactory learning, they found out that gender was not one of the predictors of learning.

Likewise, there was no statistically significant difference in CPR knowledge among the participants with respect to the classes in school studied. Both SS1 and SS2 had good knowledge retention. This is in agreement with Liebermann et al. [23].

As a limitation of this study, the age brackets of the participants could have possibly introduced some bias on the influence of age on CPR knowledge acquisition and retention. May be

another study comparing this age group and older age groups could help to assess this further.

5. CONCLUSIONS

- The CPR knowledge retention of the Nigerian secondary school students six weeks after their first training remained significantly high.
- Secondary school students in Nigeria could serve as a very ready target for the promotion and training of more bystanders for out-of-hospital cardiac arrest management in Nigeria as they are more likely to learn and retain CPR knowledge.
- Age, gender and school class did not show any significant relationship (influence) with CPR knowledge.

6. RECOMMENDATION

The introduction of CPR teaching and training into the Nigerian School Curriculum should be encouraged and implemented as soon as possible. This is not only to keep pace with the international community but also considering the fact the country is becoming more and more sophisticated with many of the rich increasingly adopting the western lifestyle and the possible resultant effects on their cardiovascular health.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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