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Practice of cardiopulmonary resuscitation among health care providers in a tertiary health centre in a semi−urban setting

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ABSTRACT

Objectives: To assess the basic knowledge of cardiopulmonary resuscitation (CPR) among health workers in a tertiary health facility in a semi-rural county.

Methods: A questionnaire based, cross sectional study involving health care professionals was performed in Federal Medical Centre, Birnin Kudu, Jigawa State, Nigeria from April to July 2017. A purposive sampling method was adopted for subject selection. A pretested self-administered questionnaire was distributed; this included knowledge on basic life support; participation in basic life supportand outcomes. It was adopted from the American Heart Association guidelines for CPR and emergency cardiac care.

Results: One hundred and two respondents were recruited (40 doctors and 62 nurses). There were 50 males (49%) and 52 females (51%). Their age ranged from 23 to 54 years with mean of (34.9± 7.4) years. Only 20% of the respondents were aware of circulation, airway and circulation in adult resuscitation; however, 61.0% of all respondents were aware of airway, breathing and circulation of resuscitation in children. Furthermore, only 10% of the respondents were aware of the correct steps of single rescuer resuscitation. Their knowledge was poor about chest compression and ventilation for both adult and children resuscitation. The overall knowledge score ranged from 0.0% to 100% with mean knowledge score of (21.2±18.6)%. The date of last training about CPR had no relationship with the knowledge scores (χ^2=2.951, P=0.300). The cadre of the respondents (doctors and nurses) had no relationship with their knowledge score (χ^2=0.100, P=0.633 for doctors and nurses; χ^2=7.074, P=0.225 for doctors cadre; χ^2=3.868, P=0.677 for nurses cadre) respectively.

Conclusions: The knowledge about CPR among health workers is poor; furthermore, the last date of training about CPR and the cadre of staffs have no relationship with knowledge of CPR.

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1. Introduction

Basic life support (BLS) in cardiopulmonary resuscitation (CPR) consists of chest compressions and assisted ventilation to maintain circulation and oxygenation during resuscitation. CPR does not require specialized equipment. It is contraindicated only on very few instances when there is a do-not-resuscitate order; or when the attending physician believes the outcome of such resuscitation will be associated with profound morbidity based on clinical judgment, such as severe neurologic defect (vegetative state). BLS is the bedrock of effective resuscitation, and health providers should be acquainted with the knowledge. However, the current situation is not optimistic. Marzooq *et al.*[1] from Bahrain, Ragavan[2] *et al*. from South Africa and Sadoh *et al.*[3] from Nigeria all documented the poor knowledge about BLS among health professionals. About 500 000 people die annually in the United State of America[4-6] from cardiac arrest related events. Effective BLS during resuscitation could significantly improve the survival rate[7,8]. Therefore, this study seeks to determine the knowledge about CPR among medical professionals in our tertiary hospital, and to promote more trainings involving CPR if the knowledge gaps are identified.

2. Materials and methods

2.1. Study site

The hospital is located in Birnin Kudu which is the headquarter of Birnin Kudu Local Government Area of Jigawa state North-western Nigeria. It provides healthcare services to patients from the study area and neighboring local governments of Kano state and beyond.

This is a cross sectional study involving health care professionals in Federal Medical Centre, Birnin Kudu, Jigawa State, Nigeria conducted from April to July 2017. A purposive sampling method was adopted for the subject selection.

2.2. Sample size calculation

Sample size shall be determined using the formula[9]: $(Z_{1-\alpha/2})^2 \times P(1-P)/d^2$.

$Z_{1-\alpha/2}$ =standard normal variate, which is 1.96 at 95% confidence interval. P=expected proportion of health worker with good knowledge of CPR, based from previous study was 11.7%[10]. d= margin of error, which was chosen as 5 based on findings from previous studies. So the result should be: $1.96^2 \times 0.117 \times 0.883/0.05^2 = 159$.

The population of health workers in our institution during the period of the study was less than 10 000, therefore the actual sample size calculated was: $n/1+n/N$[9] [n=calculated sample size; N= health professional available for recruitment into the study (200)], 159/1+159/200 =88.

Additional 14 health workers were added making an attrition rate of 15%, bring the sample size to 102.

Convenient sampling method was adopted; however 40 doctors and 62 nurses were consecutively selected (ratio of 1:1.6) (Figure 1).

2.3. Inclusion and exclusion criteria

The subjects who declined consent or were not at work during the study period were excluded.

2.4. Survey tool

A pretested self-administered questionnaire was distributed

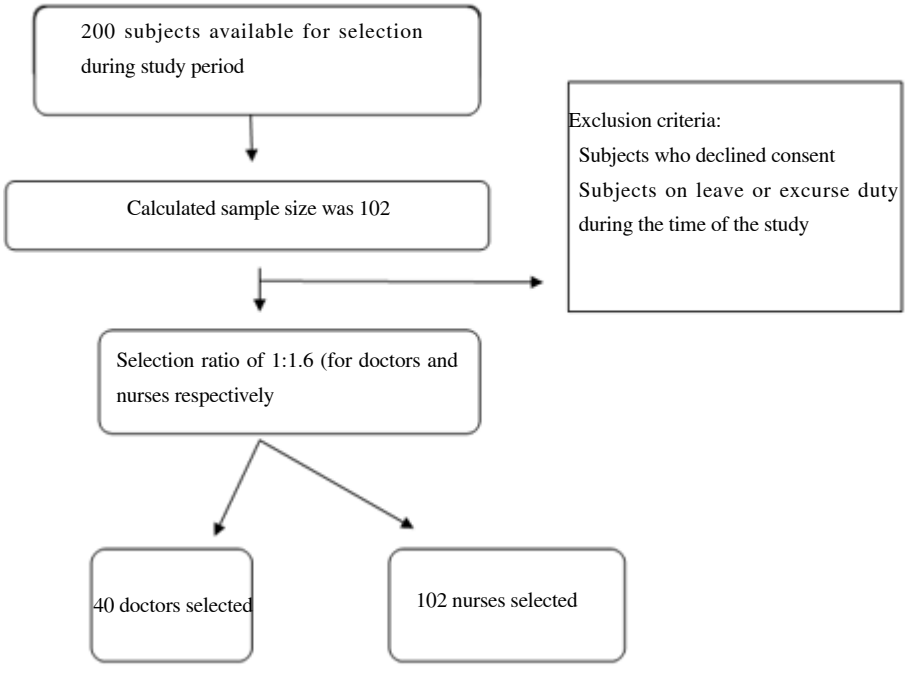

Figure 1. Flow chart of subject selection.

including the knowledge about BLS and the participation in BLS and the outcomes. The questionnaire was developed in English language, and was adopted under the American Heart Association (AHA) guidelines for CPR and emergency cardiac care[11-13]. The questions were based on the AHA BLS courses, and were pretested among 10 volunteers to ascertain the internal consistency; and a Cronbach's alpha value of 0.75 was obtained. A minimum score of 84% was defined as adequate knowledge as was outlined in the AHA BLS courses[11-13].

2.5. Ethical approval

Permission to conduct the study was obtained from the Human Research and Ethics Committee of Federal Medical Centre, Birnin Kudu, Jigawa State, Nigeria on the 28th of November, 2016 (FMC/BKD/CLN/HREC/136- HREC/009/2016).

2.6. Statistical analysis

All data obtained were analyzed using SPSS version 16. (SPSS Inc. Illinois Chicago, United State of America). Qualitative variables were summarized as frequencies, percentages while quantitative variables were summarized as means ± standard deviations while the chi square (χ^2) was used to test for associations between variables; and P value < 0.05 was considered statistically significant.

3. Results

3.1. Demographic characteristics

One hundred and two respondents were recruited for this study (40 doctors and 62 nurses). There were 50 males (49%) and 52 females (51%), including 34 (85%) male doctors and 6(15%) female doctors; 16 (25.8%) male nurses and 46 (74.2%) female nurses. The age ranged from 23 to 54 years with mean of (34.9±7.4) years; the age range of the doctors was from 24 years to 50 years with mean of (32.8±6.4) years, while the age range of the nurses was 23 to 54 years with mean (36.2±7.8) years. Overall working experiences ranged from 1 to 30 years with mean of (8.6+7.0) years; the working experience of the doctors was from 1 to 15 years with mean of (4.2±2.4) years, while the working experience of the nurses ranged from 2 to 30 years with mean of (11.5±6.9) years.

There were 19(47.5%) house officers, 12(30.0%) medical officers, 6(15.0%) senior medical officers, 1 (2.5%) principal medical officer and 2 (5.0%) consultants; while the nurses were: 18 (29.0%) nursing officers, 20 (32.3%) senior nursing officers, 12 (19.4%) principal nursing officers, 6 (9.7%) assistant chief nursing officers and 6 (9.7%) chief nursing officers. The staff distribution is as presented in Table 1; those of the dental, ear, nose and throat, and paediatrics were most represented followed by those from the surgery department.

Table 1. Department distribution [*n* (%)].

Department	Doctors	Nurses	Total
Surgery	13 (32.5%)	0 (0.0%)	13 (12.7%)
Medicine	3 (7.5%)	2 (3.2%)	5 (4.9%)
Paediatrics	13 (32.5%)	8 (12.9%)	21 (20.6%)
Obstetrics&gynaecology	4(10.0%)	2(3.2%)	6 (5.9%)
Dental, ear, nose & throat	7 (17.5%)	50 (80.6%)	57 (55.9%)

3.2. Training on CPR

Sixty-three (61.8%) of all the respondents had heard of CPR (33 doctors and 30 nurses), while 39 (38.2%) subjects had not (7 doctors and 32 nurses); therefore among the doctors, 33 (82.5%) doctors were aware of CPR, while 7 (17.5%) were not; while among the nurses, 30 (48.4%) nurses were aware of CPR while 32 (51.6%) were not. A total of 36.5% of the respondents had their last training on CPR between 1-3 years before commencement of this study and mainly during their school days (54.0%). Sixty-three respondents reported benefitting from their training on CPR (Table 2).

3.3. Knowledge on CPR

Thirty-eight (37.3%) respondents were aware of single rescuer resuscitation, while 64 (62.7%) were not; 50% of doctors were aware and 50% unaware of single rescuer resuscitation; however, 18 (29.0%) of the nurses were aware but 44 (71.0%) were unaware. Fifty-five (54.5%) respondents had seen a defibrillator, while 47 (45.5%) had not. Among those who had seen a defibrillator, 29 (52.7%) were doctors, while 26 (47.2%) were nurses. Furthermore among those who had not seen a defibrillator, 10 (21.3%) were doctors while 37 (78.7%) were nurses. Among those who had seen a defibrillator, only 11 (20.0%) of the respondents had ever operated a defibrillator, while 44 (80.0%) had not. Among doctors (29) who had ever seen a defibrillator, only 4 (13.8%) of them had ever operated a defibrillator, while 25 (86.2%) had not; while among the 26 nurses who had seen a defibrillator only 7 (26.9%) nurses had operated a defibrillator, and 19 (73.1%) had not. Only 20 (19.6%) of all the respondents were aware of the sequence of circulation, airway, breathing (CAB) sequencing in adult resuscitation; this poor understanding was witnessed in 10 doctors (25%)

Table 2. Time and place of training on CPR [*n* (%)].

Variables	Doctors	Nurses	Total
Time of training			
<1	9 (27.3%)	4 (13.3%)	13 (20.6%)
1–3	14 (42.4%)	9 (30.0%)	23 (36.5%)
4–5	4 (12.1%)	8 (26.7%)	12 (9.0%)
>5	6 (18.2%)	9 (30.0%)	15 (23.8%)
Place of training			
School	18 (54.5%)	16 (53.3%)	34 (54.0%)
Hospital	8 (24.2%)	5 (16.7%)	13 (20.6%)
CME	6 (18.2%)	9 (30.0%)	15 (23.8%)
Others	1 (3.0%)	0 (00.0%)	1 (1.6%)

Table 3. Knowledge of cardiopulmonary resuscitation [*n* (%)].

Cardiopulmonary resuscitation	Doctors	Nurses	Both
Adult resuscitation			
ABC	28 (70.0%)	36 (58.1%)	64 (62.8%)
CAB	10 (25.0%)	10 (16.1%)	20 (19.6%)
Not sure	2(5.0%)	16 (25.8%)	18 (17.6%)
Children resuscitation			
ABC	25 (62.5%)	36 (58.1%)	61 (59.8%)
CAB	11 (27.5%)	9 (14.5%)	20 (19.6%)
Not sure	4 (10.0%)	17 (27.4%)	21 (20.6%)
Single rescuer			
Correct	1 (5.0%)	1 (5.6%)	2 (5.2%)
Incorrect	19 (95.0%)	15 (83.3%)	34 (89.5%)
Not sure	0 (0.0%)	2 (11.1%)	2 (5.3%)
Compression and ventilation adults			
Correct	12 (30.0%)	6 (9.7%)	18 (17.6%)
Incorrect	25 (62.5%)	26 (41.9%)	51 (50.0%)
Not sure	3 (7.5%)	30 (48.4%)	33 (32.4%)
Compression and ventilation children			
Correct	4 (10.0%)	1 (1.6%)	5 (5.0%)
Incorrect	32 (80.0%)	32 (51.6%)	64 (62.7%)
Not sure	4 (10.0%)	29 (46.8%)	33 (32.3%)

ABC: airway, breathing and circulation; CAB: circulation, airway and circulation.

and 10 nurses (16.1%) sub-group. However 61 (59.80%) of all respondents were aware of airway, breathing and circulation (ABC) sequencing of resuscitation in children; a fair response was noted in both the doctors and nurses subgroups. Furthermore among the 38 respondents who were aware of single rescuer resuscitation, only 5.2% of the respondents reported the steps correctly, and this observation was similar in both subgroups. Again their knowledge about chest compression and ventilation was poor for both adult and children resuscitation (Table 3).

3.4. Knowledge score on CPR

The mean knowledge score was (21.2±18.6)%; the mean knowledge score of the doctors was (26.5±19.9)%; while the mean knowledge score of the nurses was (17.7±7.0)%. Knowledge score of the respondents was generally poor, majority (98%) of them scoring below 84% (Table 4).

3.5. Influence of department and time of training on knowledge score

Majority of respondents from all department had poor knowledge score, and only paediatrics and obstetrics and gynaecology recorded a score of 100%, but the difference was not statistically significant (χ^2=7.448. P=0.098). Furthermore, the time of training had no relationship with the knowledge score (χ^2=2.951, P=0.300) (Table 5).

Table 4. Knowledge score [*n* (%)].

Knowledge score	Doctors	Nurses	Total
<50	36(90.0%)	60(96.8%)	96(94.1%)
50–83	3(7.5%)	1(1.6%)	4(3.9%)
>84	1(2.5%)	1(1.6%)	2(2.0%)
Total	40(100.0%)	62(100.0%)	102(100.0%)

Table 5. Relationship of department and time of training of the respondents with their knowledge score (*n*).

Variables	Knowledge score		Total
	<84	>84	
Department			
Medicine	13	0	13
Surgery	5	0	5
Paediatrics	20	1	21
Obstetrics&gynaecology	5	1	6
Others	57	0	57
Training			
<1	13	0	13
1–2	23	0	23
3–4	11	1	12
>5	14	1	15

Table 6. Relationship of the staff cadre with knowledge score.

Cadre	Knowledge score		Total
	<84	>84	
Doctors	39	1	40
Nurses	61	1	62
Doctors cadre			
House officer	19	0	19
Medical officer	11	0	12
Senior officer	5	1	6
Principal officer	1	0	1
Consultant	2	0	2
Nurses cadre			
Nursing officer	17	1	18
Senior officer	20	0	20
Principal officer	12	0	12
Associate chief officer	6	0	6
Chief officer	6	0	6

3.6. Influence of status of respondents on knowledge score

The knowledge scores of the doctors, and nurses were generally poor irrespective of their cadre; however, these observations were not statistically significant (χ^2=0.100, P=0.633 for doctors and nurses; χ^2=7.074, P=0.225 for doctors cadre; χ^2=3.868, P=0.677 for nurses cadre) (Table 6).

4. Discussion

The overall knowledge about CPR among respondents is poor in this study, and the similar results have been reported in previous reports by Sadoh *et al.*[3], and Olajumoke *et al.*[10], which were observed mostly among nurses. In our study, only 61.8% of respondents had training on CPR, higher than 40% reported by Olajumoke *et al.*[10]. It is still worrisome, for this means clearly 39.2% of respondents were either not involved in resuscitation or they were not doing CPR correctly. Furthermore, the majority had their last CPR training while they were students, with limited hands-on exposure. This is against the AHA guideline which recommends frequent training and retraining of healthcare providers. According to 2015 updated guideline, even a 2-yearly retraining was sub-optimal in achieving the desired skill and confidence required for efficient CPR[14].

Awareness of common resuscitative procedures such as single rescuer resuscitation, use of defibrillator was generally poor; only 20% of respondents had ever operated a defibrillator which was lower than the 30% reported by Olajumoke *et al*.[10].

The 2010 AHA guideline changed the BLS sequence of CPR and emergency cardiovascular care from the traditional ABC to CAB in adult resuscitation, therefore laying greater emphasis on chest compression and early defibrillation[15,16]. However, our study showed that majority of respondents were not aware of this change six years after, and this observation was similar to that reported by Sadoh *et al*.[3] way back in 2009; they noted that most healthcare professionals (88.3%) were unaware of the AHA 2005 guideline on CPR. Therefore, there is need for regular certification and recertification of healthcare professionals. This requirement should be considered as a prerequisite for registration of annual practicing license to ensure strict compliance, so it should be taken seriously.

The knowledge mean scores of both doctors and nurses were generally poor irrespective of their cadre, time of training on CPR, and department of practice, which was similar to previous reports [17,18]. Olajumoke *et al*.[10] reported that younger doctors had better knowledge of CPR and the use of defibrillators. However, Bankole *et al*.[19] in their study observed that the cadre of their participant did not significantly influence their knowledge score. But Cowie [20] reported consultants to have the lowest knowledge score.

This study was questionnaire based, and the practical aspect of CPR was not assessed. The respondents had a poor theoretical base which would have resulted in poor clinical performance; furthermore, the convenience sampling method adopted could have introduced systematic bias.

Based on our findings, we advice there should be a regular structured CPR educational programme, which should be didactic and hands-on based. It will ensure that the appropriate skills are developed and the confidence to execute the procedure during an emergency. Furthermore, health institutions should have certified CPR instructors who will routinely organized effective programmes.

The poor knowledge of CPR among the respondents raises concern of patient safety, and health providers need certification and regular recertification on proficiency on CPR.

Conflict of interest statement

The authors report no conflict of interest.

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