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Original Article

Knowledge of Basic Life Support among Doctors and Nurses Attending a Refresher Course in a Teaching Hospital in Southwest Nigeria

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Abstract

Background: Poor knowledge of Basic Life Support (BLS) can lead to hesitation in delivering prompt intervention, thus increasing mortality in people with cardiac arrest. We set out to determine level of knowledge of Basic Life Support among doctors and nurses working in a teaching hospital in Nigeria.

Methodology: Self-administered questionnaires were employed in a descriptive, cross-sectional study to assess knowledge of doctors and nurses. The overall knowledge score and, separate scores for doctors and nurses were calculated. Data was analyzed using IBM SPSS version 20.

Results: Two hundred and fifty participants (18-59) years were evaluated. There were more females (153, 61.2%) and more nurses (149, 59.8%). Sixty (24%) of the participants had received at least one previous BLS training. One hundred and one (40.4%) participants scored ≥50%. The overall average score was 43.6%. The average score for doctors and nurses were 45.1% and 42.7% respectively. Knowledge in some domains were very low viz: sequence in cardiopulmonary resuscitation (2.8%), compression-to-breath ratio (2.8%) and compression rate (32.3%). There was no significant difference in knowledge score by profession, gender, previous exposure to BLS training, number of years post-qualified and number of years in service.

Conclusion: Healthcare workers in Nigeria have poor knowledge of BLS. They require training and re-training in BLS via creative and innovative means that are best suited for resource poor countries.

Keywords: Basic Life Support; Cardiopulmonary Resuscitation; Knowledge; Healthcare Workers; Training; Nigeria.

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Introduction

Basic Life Support (BLS) generally refers to the type of care that first responders, healthcare providers and public safety professionals provide to anyone who is experiencing cardiac arrest, respiratory distress or an obstructed airway.[1] It requires knowledge and skill in cardiopulmonary resuscitation (CPR), use of automated external defibrillator (AED) and relief of airway obstruction in patients of every age.[1]

BLS is part of subjects taught in Nigerian medical training institutions but skilfulness in BLS is not considered a mandatory requirement for qualification as a professional nurse or physician. However, proficiency in BLS is highly desirable for doctors, nurses and other healthcare workers as they would most likely be the first to be called on in cases of cardiac arrest either within the hospital or in the community.[2] In a survey conducted among healthcare workers in South-south of Nigeria, 52.8% of them had been involved in CPR.[3]This is an important finding because unlike developed countries where there are intermediate healthcare workers (paramedics) supported by highly efficient ambulances, airbus and other highly developed technologies who act as the first responders, healthcare workers in Nigeria find themselves playing the combined roles of first responders and hospital staff.

Cardiac arrest can occur within the hospital setting (aka In-Hospital Cardiac Arrest) and in the community (aka Out-of-Hospital Cardiac Arrest). Generally, there is little documentation on how common these categories of events are. However, in the United States of America (USA), the incidence of IHCA ranges between 1 and 5 events per 1,000 hospital admissions or 0.175 events per bed annually while an estimated 424,000 cases of OHCAs are seen each year.[4-6] As cardiac arrest can occur within and outside the hospital setting, it is necessary for healthcare workers to be proficient in BLS in order to improve the chances of survival for victims of cardiac arrest, especially in countries where they are likely to act as first responders. It has been advocated that poor-quality CPR should be considered a preventable harm.[7]According to Alanazi et al, the presence of a person with knowledge to perform CPR is one of the two critical components of a successful resuscitation.[8] Poor knowledge can lead to hesitation in delivering BLS, a factor which in seconds can contribute greatly to mortality from delay in applying BLS.[9]

For every minute without CPR and defibrillation, chances of survival decrease by 7-10%.[10]

It is a statement of fact that HCWs are expected to have knowledge of BLS.[11] In order to determine level of knowledge among doctors and nurses in a modern-day teaching hospital, we set out to conduct this study.

Patients and Methods

Study design and location

This was a descriptive, cross-sectional study conducted at the University of Medical Sciences Teaching Hospital (UNIMEDTH), Ondo State, Nigeria in February 2020 during a tuition-free one-day hands-on training on BLS co-hosted by the hospital and Caring Heart Foundation, a United Kingdom based non-profit charity organization.

UNIMEDTH is a 470-bedded multi-complex hospital located in Southwest Nigeria in West Africa. It provides speciality and subspecialty care in Medicine, Surgery, Paediatrics, Obstetrics and Gynaecology, Mental Health, Intensive Care, Infectious Diseases, Community Medicine, Dental Health, Nutrition and Dietetics, Physiotherapy, Medical Social Work and Family Medicine.

Study population

Participants included medical doctors and nurses in attendance who gave consent to participate in filling out the questionnaires. The doctors ranged from Junior Residents to Senior Consultants while the nurses ranged from Nursing Officers to Nurses Managers and Directors.

Research tool and scoring method

A self-administered questionnaire derived from the America Heart Association Basic Life Support for Healthcare Providers12 was developed to assess knowledge of participants as a pre-test before commencement of the training. All participants started and finished at the same time in a period of 10 minutes.

The first section of the questionnaire took care of the biometrics of each respondent which include age range, profession, gender, highest professional qualification, number of years after graduation and number of years in service. The second part comprised of 17 questions. Questions 1 and 2 determined the most current date each participant received formal training in BLS. Questions 3 to 17 were used to determine knowledge of BLS. Questions 3 and 4 were multiple choice wile questions 5 to 17 were best response. All questions were weighted equally with a score of 1 for each correct response. There was no negative marking. The minimum attainable score was zero while the maximum was 20. The performance of the candidates were graded into (a) pass if they scored between 10 and 20 (≥50%) (b) fail if they scored between 0 and 9. A second scoring method was

employed for the purpose of comparing performance with previous studies that used AHA guidelines as template for knowledge assessment: poor (for a score of <7), fair (8-14), excellent (15-20).

Ethical consideration

Ethical approval was obtained from the Research and Ethics Committee of the University of Medical Sciences, Ondo State. Informed consent was obtained from each participant before administration of the questionnaires. All questionnaires were coded (without names) and confidentiality of responses was ensured throughout the study.

Data analysis

Data generated was analyzed using the Statistical Package for Social Sciences (SPSS) version 20.0. (SPSS Inc., Chicago, IL, USA). Results were presented in tables and charts. Univariate analysis was used in the description of demographic characteristics of the study population and responses to the questionnaire. Discrete variables were presented as frequency and percentages. Chi-square test was used to determine the significance of observed differences for categorical variables. Student's t-test was used to compare mean knowledge scores within subgroup. P <0.05 were considered statistically significant.

Results

The study included 250 participants aged between 18 and 59 years. Ninety-seven (38.8%) were males and 153 (61.2%) were females. One hundred and one (40.2%) were doctors and 149 (59.8%) were nurses. Eighty-three (33.2%) were within the age range of 18-25 years, 122 (48.8%) were within 30-39 years, 36 (14.4%) were within 40-49 years and 9 (3.6%) were within 50-59 years. Majority of respondents (50.3%) had been post-qualified for 1-5 years; 6-10 years (30.4%), and 11-32 years (19.3%) as shown in figure 1. Duration of practice is as shown in figure 2: 1-5 years (51%), 6-10 years (28%), 11-32 years (20%).

Sixty (24%) of the participants had received a minimum of one previous certified training on Basic Life Support in the period between 2009 and 2019. The number of trained personnel per annum is as shown in table 1. The proportion of trained personnel per profession were 19 (18.8%) doctors and 41 (27.5%) nurses. There were proportionately higher number of formally trained male doctors (15; 78.9%) and female nurses (38; 92.6%) as shown in table 1. Recently trained personnel (2015-19) were 35 (58.3%) in number while those who had trained between 2009 and 2014 were 25 (41.7%).

Table 2 showed that 101 (40.4%) participants scored ≥50%. The average score for all participants (overall average score) was 43.6%. The average score for doctors and nurses were 45.1% and 42.7% respectively. The overall mean score was 8.73±3.03 for all participants. The mean score for doctors was 9.01±3.25 while the mean score for nurses was 8.54±2.87. The mean score was 8.98±3.15 for males and 8.57±2.96 for females. The mean score for recently trained participants was 8.54±3.30 while their counterparts scored 8.16±2.25.

In terms of specific domains, the number of participants who gave the correct answer to specific questions are as shown in table 3; components of BLS (40.8%), laymen administering BLS (47%), health assistants administering BLS (44.2%), sequence in CPR (2.8%), compression to breath ratio (2.8%), compression rate (32.3%), If you suspect an injury, how to open the victim's airway in case of injury (15.1%),the purpose of 1 second breaths just making the chest rise when ventilating a victim (20.7%), hand placement when doing chest compressions on a child (49%), When do you shock a child or infant with an AED (39.8%). More than 2/3rd (69.7%) of respondents knows the two ways to open the victim's airway, 77.3% know what to do if the chest does not rise when you give a breath after clearing the airway and 54.6% know where best to check for the pulse on a child during CPR.

Table 4 showed that there was no significant difference in knowledge score by profession, gender, previous exposure to BLS training, number of years post-qualified and number of years in service.

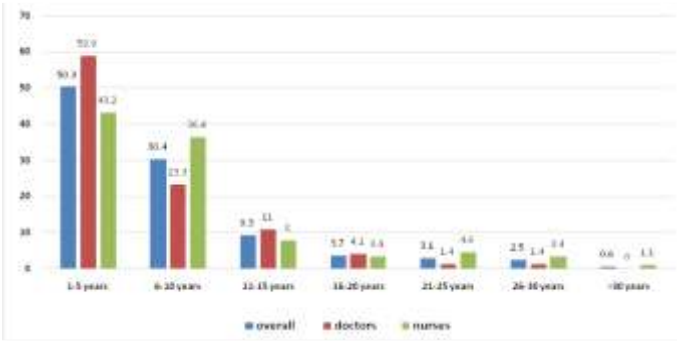

Figure 1: Number of years after qualification for doctors and nurses

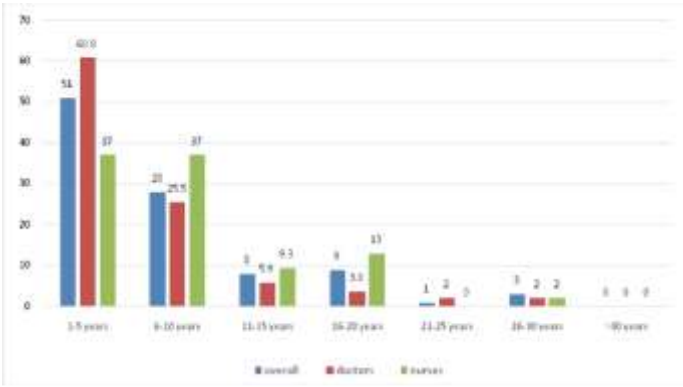

Figure 2: Number of years in practice for doctor and nurses (in percentage)

Table 1: Number of participants with previous training in Basic life Support

Year	Doctors		Nurses		Total	Percent
	Male	Female	Male	Female		
2009	0	0	0	1	1	1.7%
2010	1	0	0	0	1	1.7%
2011	0	0	1	0	1	1.7%
2012	0	0	0	2	2	3.4%
2013	0	1	0	13	14	23.3%
2014	0	1	1	5	7	11.7%
2015	1	0	0	3	4	6.7%
2016	4	2	0	3	9	15%
2017	2	0	0	2	4	6.7%
2018	2	0	0	4	6	10%
2019	5	0	1	5	11	18.3%
Total	15	4	3	38	60	100%
Proportion trained	19/101 18.8%		41/149 27.5%		60/250 24%	

Table 2: Knowledge score of participants

A. Scoring with pass mark set to ≥10 correct responses				
Pass mark set to ≥10 (maximum = 20)	Overall performance N (%)	Doctors N (%)	Nurses N (%)	P value (Chi square)
10-20	101 (40.4%)	42 (41.6%)	59 (39.6%)	0.427 (0.099)
0-9	149 (59.6%)	59 (58.4%)	90 (60.4%)	
Total	250 (100%)	101	149	
B. Scoring with pass mark set to ≥15 correct responses				
Pass mark set to ≥15	N (%)	N (%)	N (%)	P value (Likelihood ratio)*
15-20 (≥75%)	8 (3.2%)	6 (5.9%)	2 (1.3%)	
8-14 (40-70%)	146 (58.4%)	57 (56.4%)	89 (59.7%)	0.130 (4.088)
<8 (<40%)	96 (38.4%)	38 (37.6%)	58 (38.9%)	
Total	250 (100%)	101	149	

*Likelihood ratio is applied when at least one cell has expected count <5

Table 3: Correct and incorrect responses by participants

Questions	Correct responses			
	Overall	Doctors	Nurses	P value
Basic Life Support includes the following (a) cardiopulmonary resuscitation (b) use of Automated Electronic defibrillator (c) administration of intra-cardiac adrenalin (d) administration of intravenous infusion (e) bleeding control (f) none (g) all of the above	40.8%	31.6%	56.1%	<0.01
The following can provide Basic Life Support (a) laymen	47%	55.4%	41.6%	0.021
The following can provide Basic Life Support (b) health attendant	44.2%	57.4%	35.6%	0.001
The following can provide Basic Life Support (c) doctor	66.1%	78.2%	58.4%	0.003
The following can provide Basic Life Support (d) nurses	70.9%	71.3%	71.1%	0.040
Steps in Basic Life Support [a]CPR comprises of (a) airway, breathing and circulation (b) circulation, airway and breathing (c) compressions, airway and breathing (d) breathing, circulation and airway (e) breathing, airway and circulation (f) none	2.8%	1%	4%	0.338
Compression to breath ratio is (a) 15 to 2 (b) 24 to 2 (c) 30 to 1 (d) 15 to 1 (e) 30 to 2 (f) none	4.8%	6.9%	3.4%	0.411
What are 2 ways to open the victim's airway? (a) Head tilt-chin lift and jaw thrust (b) chin lift and jaw thrust (c) head drop and jaw thrust (d) neck extension and jaw thrust	69.7%	70.3%	69.8%	0.968
What is the rate of compressions for adults, children and infants? (a) At least 50/minute (b) at least 120/minute (c) at least 100/minute (d) at least 60/minute (e) at least 72/minute (f) none	32.3%	33.7%	31.5%	0.310
What is happening when you notice the abdomen rising on your victim as you breathe? (a) victim is coming round and will soon be fine (b) you are giving effective air delivery (c) you are giving too much volume or too forceful rescue breaths (d) airway is adequately maintained (e) none	28.7%	29.7%	28.2%	0.628
After clearing the airway, if the chest does not rise when you give a breath, what should you do? (a) there is no hope for victim so give up [b]CPR (b) it is an indication for use of ventilator (c) get a stronger person to deliver the breaths (d) reposition the head and try again (e) none	77.3%	87.1%	71.1%	0.003
If you suspect an injury, how do you open the victim's airway? (a) use a tongue depressor (b) do not open the airway manually (c) call for the Intensivist to perform this (d) jaw thrust (e) jaw thrust and gentle head tilt (f) none	15.1%	22.8%	10.1%	0.018
In [b]CPR, where best do you check for the pulse on a child? (a) femoral artery (b) radial artery (c) carotid artery (d) temporal artery (e) brachial artery	54.6%	62.4%	49.7%	0.060
What is the purpose of 1 second breaths just making the chest rise when ventilating a victim? (a) to avoid chest muscle weakness (b) to prevent over-oxygenation (c) to decrease gastric inflation (d) to ensure the rescuer does not get tired (e) none	20.7%	21.8%	20.1%	0.204
Where do you place your hands when doing chest compressions on a child? (a) epigastrum just below the xyphisternum (b) right side of the chest (c) over the umbilicus (d) center of the victim's bare chest between the nipples (e) over the liver area (f) none	49%	55.4%	45%	0.254
When do you shock a child or infant with an [c]AED? (a) when the most senior Paediatrician is around (b) as soon as the AED is available (c) when the Anaesthetist or Intensivist is around (d) none	39.8%	40.6%	12.1%	0.920

[a]cardiopulmonary resuscitation, [b]Basic Life Support, [c]Automated Electronic Defibrillator

Table 4: Test of association between knowledge score and variables among participants

Parameter	Knowledge score		Total	P value (Chi square)
	10-20	0-9		
Profession				
Doctors	42 (41.6%)	59 (58.4%)	101 (100%)	0.427 (0.099)
Nurses	59 (39.6%)	90 (60.4%)	149 (100%)	
Total	101 (40.4%)	149 (59.6%)		
Gender				
Male	40 (41.2%)	57 (58.8%)	97 (100%)	0.466 (0.046)
Female	61 (39.9%)	92 (60.1%)	153 (100%)	
Total	101 (40.4%)	149 (59.6%)	250	
Previous [a]BLS training				
Yes	19 (5.9%)	41 (56.4%)	60 (100%)	0.075 (2.501)
No	82 (1.3%)	108 (59.7%)	190 (100%)	
Total	101 (40.4%)	149 (59.6%)	250	
Recent training vs old training				
Doctors	12 (34.3%)	23 (65.7%)	35 (100%)	0.410 (0.266)
Nurses	7 (28%)	18 (72%)	25 (100%)	
Total	19 (31.7%)	41 (68.3%)		
Number of years after qualification				
1-10 years	(41.2%)	(58.8%)	(100%)	0.354 (0.343)
11-32 years	(35.5%)	(64.5%)	(100%)	
Total	19 (40.1%)	(59.9%)		
Number of years in practice				
1-10 years	(41.8%)	(58.2%)	35 (100%)	0.199 (1.215)
11-32 years	(28.6%)	(71.4%)	25 (100%)	
Total	(39%)	(61%)		

[a]Basic Life Support

Discussion

A low fraction of doctors and nurses (24%) had received formal BLS training before our study. This is much lower when compared to reports found elsewhere among medical staff in Pakistan (47.1%) and among House Officers in Nigeria (31.4%).[13-14]

The general performance of participants was poor as seen in their mean score (8.73±3.03) with nearly two-third scoring below 50%. This outcome is similar to findings in other studies.[13,15] The overall score of 43.6% compares with 41.7% found by Irfan et al in Pakistan and higher than 15.2% that was found among students and medical personnel in India.[13,16]

The performance of nurses in our study was poor even though their mean score was better than their counterparts in a Rwandan referral hospital (8.54±2.87 v 5.72±2.466).16 It is worthy to note that both sets of nurses were subjected to questions drawn from the AHA guidelines.

The fraction of physicians with a pass was slightly higher than the nurses (41.6% v 39.6%) even though it was not statistically significant. A similar pattern was demonstrated by Irfan et al.[13]

When we looked at those who gave ≥15 correct answers out of 20, only 3.2% achieved a minimum score of 75%. This is approximately in tandem with the outcome of the studies from other third world countries. For instance, Kaihula et al demonstrated that 3.7% (13 out of 350 participants) scored above 75% while Irfan et al showed that less than 2 percent of healthcare workforce in Pakistan exceeded the 80% cut off set by the AHA and Nambiar et al demonstrated that 4.3% of them exceeded 80% in North Kerala, India.[13,18-19]

Alarmingly, a very minute fraction of the respondents knew the correct order of CPR. This is far too low when compared to the outcome of a study among House Officers in Nigeria (2.8% v 37.1%).[14] Equally, the number of those who knew the compression-breath ratio was less than 5% compared to 53.7% found among House Officers.[13]

Contrary to reports from other studies, the number of participants who correctly answered questions on chest compression to breath ratio was abysmally low (2.8%). Indeed, Irfan et al, Aroor et al and Avabratha et al all reported over 50% success rates among participants in this particular knowledge domain.[13,20-21] The reason for these observations may be the higher degree of exposure to BLS in the different settings as shown earlier in the discussion.

There was no statistically significant difference in the overall knowledge score between doctors and nurses. However, there were significant differences in their specific knowledge domains with the doctors performing better in many important domains. The reasons for this may not be unconnected to the fact that doctors are often perceived to be generally more knowledgeable in performing CPR by the general public, patients and patient relatives. Indeed, in practice, nurses have been known to send for doctors to perform CPR without taking the necessary first steps.[22]

Gender did not play a role in determining knowledge of BLS in our study. Only one highly criticised, randomized simulator study conducted among fourth year medical students in Basel has ever indicated that females are less good at performing CPR when compared to their male counterparts.[23]

There was no significant difference in knowledge score between participants who had received previous BLS training and otherwise. This is in contrast to the report by Irfan et al and others.[13, 24-27]

Our findings are, in general, worrisome as it has been demonstrated that individuals who have developed knowledge and capacity derived from training are more likely to deliver lifesaving intervention to cardiac arrest victims and as noted earlier in the introductory section, delay in application of CPR could be fatal in such cases.[7, 9, 28]

We thus conclude that healthcare workers in Nigeria have poor knowledge of BLS and thus require training and re-training in BLS. In one study, majority of the participants admitted that lack of professional training contributed to lack of BLS knowledge.[29] Among a group of dental students in Nigeria, knowledge improved after training.[30] As shown by a number of studies, reinforcement of knowledge of BLS via training at regular intervals is beneficial to HCWs in retaining their skills.[19,23,31-32]

In Nigeria, one can presume that a harsh working condition, poor remuneration and lack of motivation may contribute to many doctors and nurses not going for the AHA BLS training or update courses as they have to pay out of pocket. This much has been alluded to by Adeloye et al in their seminal work on health workforce and governance.[33] In a study among nurses' managers in Botswana, lack of in-service CPR training was linked to shortage of manpower, overwork and subsequently lack of interest for in-service training.[34]

Under the current economic downturn in Nigeria and elsewhere, hospital managers need to think outside the box and set up a smooth-running cost effective system for transfer of knowledge and skill among staff. For instance, those who have received formal training can transfer skills to others through informal in-house training sessions pending the time fund will be available for sponsorship of other staff for formal, certified training. Institutions can collaborate with training and certifying bodies like the AHA for regular training of staff at a subsidized fee.

BLS and ACLS training materials may be acquired by health institutions for the purpose of setting up a BLS/ACLSskill acquisition laboratory where all staff can access resources for practice-oriented training. The skill acquisition laboratory may double as a revenue generating tool for such institutions if well managed and channelled for short courses in BLS/ACLS training for outsiders at a fee. At an individual level, medical staff may also acquire informal or semi-formal training via Video Assisted Training, webinars, Youtube and Apps on smart phones.

Another way is for institutions to mandate training in BLS for critical HCWs (usually the doctors and nurses) but should be willing to fund the training. For instance, in Singapore, all nursing staff who have direct contact with patients undergo a two year period of CPR certification in a simulated environment.[35] In Botswana, nurses' managers believed that annual mandatory CPR certification would help to enhance nurses' CPR competencies.[34] Whichever way one looks at it, BLS training is an essential skill set for all healthcare workers so all hands should be on deck to ensure capacity building in this direction for them.

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