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Assessment of knowledge and skills of cardiopulmonary resuscitation among health workers at Nakuru County Referral Hospital

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ABSTRACT

Background: Cardiopulmonary resuscitation is critical in the emergency healthcare settings. Effective cardiopulmonary resuscitation improves the patients' outcomes hence reducing mortality related to cardiac arrest. The aim of the study was to assess the knowledge and skills of cardiopulmonary resuscitation among health workers at Nakuru County Referral Hospital.

Methods: The study adopted an analytic cross-sectional design. A census sampling technique was used to recruit respondents in the study. Questionnaires and checklists were used to collect data. Chi-square tests and multiple regression analysis were done to determine the significant association between demographic characteristics, knowledge and skills of cardiopulmonary resuscitation.

Results: The study found that slightly above half 54.3% (n=88) of the respondents had low knowledge on cardiopulmonary resuscitation. Results revealed that age of respondent (p=0.038) and level of education (p=0.000) were significant. Cross tabulation showed that older respondents (>40 years) and those with a high level of education (degree and or masters) were more two and three times more likely to have a high knowledge of cardiopulmonary resuscitation. The study found out that majority 61.1% (n=99) of the respondents had poor CPR practice. Cross tabulation showed that respondents with high knowledge were four times (OR=4.303) more likely to have good practice.

Conclusions: The study concluded that the performance of cardiopulmonary resuscitation is attributable to low CPR knowledge. The study recommends that more emphasis be placed on continuous professional development, and supervision be done after training to ensure that health workers follow the recommended guidelines.

Keywords: Cardiopulmonary resuscitation, Health workers, Outcomes, Return of spontaneous circulation

INTRODUCTION

Cardiac arrest (CA) has proven to be among the most challenging health issues worldwide. Emergency cases of cardiac arrest are the leading causes of deaths globally. An estimated 300 000 to 370 000 people die of CA, 50% of the deaths are related to cardiovascular diseases.¹

Due to the alarming rate of deaths that are related to cardiac disease, the American Heart Association (AHA) set a target of reducing deaths due to CA to 38% through the adoption of new Cardiopulmonary resuscitation (CPR) guidelines that are used today. In cases of cardiac and

respiratory arrest, prompt initiation of CPR is very vital as it will increase the chances of the patients' survival.² CPR refers to a sequential chain of measures taken to save and maintain the quality of life of a patient following CA.³ The 2015 guidelines were aimed at ensuring that CPR is uniformly and effectively performed. The guidelines inform that the rescuer first recognizes a cardiac arrest and then activates the emergency response system. The rescuer then defibrillates the patient with 120-200 J of energy for biphasic defibrillators and 360 J for monophasic defibrillators if available. In case the defibrillator is not available at the time of the arrest, the rescuer can proceed with chest compressions.⁴ The carotid pulse is checked for

a period of less than 10 seconds and if absent, chest compressions are initiated immediately. The compressions are done 5 cm or 2 inches deep to achieve 100-120 beats per minute and allow chest recoil alternative with breaths at a 30:2 ratio. According to these guidelines, interruptions during chest compressions should be minimized as much as possible and ventilations made appropriate to avoid the risks associated with hyperventilation. Finally, post-cardiac arrest care is given to the patients if they achieve Return of spontaneous circulation (ROSC).⁴

In post cardiac arrest care ventilation and oxygenation are optimized, hypotension and hypothermia are corrected and the patient is closely monitored to reduce chances of post-resuscitation complications such as physical disability and brain damage due to lack of oxygen supply to the brain if the resuscitation was not initiated early enough.⁴

Basic Life Support (BLS), is very important in managing the patients as it is aimed at maintaining the airways, supporting breathing and circulation.⁵ Research has confirmed that early detection of cardiopulmonary arrest and early initiation of CPR greatly influence the outcomes of CPR therefore, the WHO recommends that CPR is initiated within the first 3 minutes of an arrest to increase the chances of survival and reduce complication related to cardiac arrest.⁶

Research has shown that there is a high chance for patients to achieve ROSC and the quality of life thereafter is improved if CPR is effectively conducted.² Many approaches have been adopted to improve the quality of CPR provided to patients to improve their survival. Despite the many efforts towards CPR, its success is still poor. The quality of life of those who survive remain poor. The poor outcomes are attributed to the neurological impairments that ultimately affect the patients' physical, psychological and social functioning.⁷

A study done in England revealed that, out of the 828 patients who had undergone CPR only 162 patients who are estimated at 20% survived right to discharge. Among those who survived to discharge, 5 of them went to a vegetative state, and 51 of them died few days following discharge. In the UK, out of the 948 patients who were resuscitated only 32.2% were discharged home and 24.5% of the ones discharged died within the same year of discharge.⁸ In the US, a study revealed that (29%) of the patients were discharged home following cardiopulmonary resuscitation and only (54%) survived to 31 months following discharge.⁹

According to the resuscitation registry in the US, only 17.0% of the total cases of CA survive after CPR until they are discharged out of the hospital. These trends cannot be explained in the sub-Saharan region for lack of documented information to enlighten the public about the problem. Similarly, very few studies have been done about CPR in Kenya. 10 The few that have been conducted have majorly focused on paediatrics cardiopulmonary

resuscitation.¹¹ At Nakuru County Referral Hospital, it has been observed that as much as CPR is performed, health workers do not follow the recommended guidelines that are prescribed by AHA and there is no documented data on the incidence and outcomes of cardiac arrest. Despite the fact that effective CPR is important in the clinical setup, factors that determine CPR remain unexplored. This study therefore seeks to assess the knowledge and skills of cardiopulmonary resuscitation among health care providers at Nakuru County Referral Hospital.

METHODS

The study adopted an analytic cross-sectional design with both qualitative and quantitative studies were incorporated. Triangulation was used to validate the finding. The study was carried out at Nakuru County Hospital critical care unit, high dependence unit (HDU), accident and emergency department, medical, surgical, theatre and paediatrics wards for a period of 2 months. All health care providers who have worked in the department for more than 6 months were considered for the study. All students and personnel on internship were excluded from the study. A census sampling technique was adopted that included 175 respondents. Self-administered questionnaires were used to collective quantitative data and checklists for quantitative data. Respondents who answered correctly on 5 or more questions were categorized as having 'high' knowledge of CPR while those who correctly answered 4 or less were classified as having low knowledge. Respondents who correctly performed 6 or more items in the CPR observational checklist were classified as having good practice while those who only performed 5 or less skills correctly were classified as having poor practice. Data analysis was done using SPSS computer software, version 24 for descriptive analysis that generated frequencies, percentages and tabulations. Chi-square tests and multiple regression analysis were done to determine the significant association between knowledge, skills and demographic characteristics of the respondents.

RESULTS

A total of 162 health workers working at Nakuru County Hospital participated in the study. This represented a 92% response rate.

Sociodemographic characteristics of respondents

Data on the respondents' gender, age, level of education, profession and department was collected. As presented in Table 1 below, results showed that majority 6 [9.1%, (n=112)] were females. This may be attributed to the fact that majority (67.3%) of the respondents in the study were nurses, a profession where females are the majority. On age, 36.4% (n=59) of the respondents were aged between 18-29 years while those aged between 30 and 39 years accounted for 32.1% (n=52) of the sample. The mean age was 32 years. This result suggests that the vast majority of respondents were young (<40 years). Slightly above half

52.8% (n=85) of the respondents had acquired a diploma in nursing while 31.7% (n=51) had acquired a bachelor's degree. The vast majority 89.5% (n=145) of respondents were nurses. A quarter 25.9% (n=42) worked in the

medical ward while 24.7% (n=40) worked in the surgical ward. This shows that respondents in the study were well spread out across the various departments in the study site.

Table 1: Sociodemographic characteristics of respondents.

Variables	Category	Frequency (N)	Percent (%)
Gender	Male	50	30.9
Genuer	Female	112	69.1
	18-29	59	36.4
A go (voorg)	30-39	52	32.1
Age (years)	40-49	31	19.1
	50-59	20	12.3
	Diploma	85	52.8
Education	Higher diploma	17	10.6
Education	Degree	51	31.7
	Masters	8	5
	Nurse	145	89.5
Profession	Clinical officers	4	2.5
FTOTESSION	Medical officers	8	4.9
	Anaesthetists	5	3.1
	ICU	30	18.5
	Medical ward	42	25.9
Donoutmont	Surgical ward	40	24.7
Department	Accident	28	17.3
	Paediatrics	9	5.6
	Theatre	13	8.0

Respondents knowledge on cardiopulmonary resuscitation

The study sought to determine the level of knowledge of cardiopulmonary resuscitation among health workers at Nakuru County Referral Hospital. Knowledge was assessed by posing a series of questions to respondents on cardiopulmonary resuscitation as shown in Table 2. The results showed that there was a gap in knowledge among health workers regarding operating AEDs. Majority 65.8%, (n=104) gave correct response on indication of defibrillation as ventricular fibrillation, while 35.8%, (n=54) gave correct response on the steps of defibrillation as: check the pulse, attach electrodes, and analyze rhythm, shock patient. Cross tabulation results showed that there was a gap in knowledge among health workers regarding operating AEDs. Results showed that slightly above half 50.6%, (n=82) of the respondents indicated the correct ratio of chest compressions to breaths i.e. 30:2.

Slightly less than a half 3.8%, (n=70) indicated correctly that the location of chest compressions should be mid chest. Majority 62.5% (n=100) gave correct response on the depth of chest compression (pressing down 2 inches with each chest compression) while 30%, (n=48) gave incorrect response as 5 inches.

Majority 78.4%, (n=127) of the respondents rightly indicated that one should watch for chest rise as a way of telling if ventilations are going into a victim. Respondents who answered correctly on 5 or more questions in Table 2 were categorized as having high knowledge of CPR while those who correctly answered 4 or less were classified as having low knowledge. ^{12,13}

Table 3 shows that slightly above half 54.3% (n=88) had low knowledge on cardiopulmonary resuscitation.

Table 2: Respondents knowledge on CPR.

Questions	Responses	Frequency (N)	Percent (%)
T II di CAED	With a sinus rhythm	3	1.9
	Asystole	4	2.5
Indications of AED	In ventricular fibrillation	104	65.8
	Pulseless electrical activity	47	29.7
Operating an AED	Power on the AED, attach the electrode pads, shock the analyse the rhythm	17	11.3
	Power the AED, attach electrode pads, analyse rhythm, clear the patient, deliver shock	71	47
	Attach electrode pads, check pulse, shock patient, analyse rhythm	9	6

Continued.

Questions	Responses	Frequency (N)	Percent (%)
	Check pulse, attach electrodes, and analyse rhythm, shock patient	54	35.8
Chest	15:1	31	19.1
compressions ratio	15:2	39	24.1
compressions ratio	30:2	82	50.6
	Left side of the chest	30	18.8
Location of chest	Right side of the chest	5	3.1
compression	Mid chest	70	43.8
	Lower half of the sternum	55	34.4
	2 inches	100	62.5
Size of press downs	5 inches	48	30
-	0.5 inches	12	7.5
II4. 4.11 46	Watch for chest rise	127	78.4
How to tell if ventilations are	Watch for abdominal rise	19	12.2
going into a victim	Listen for air going through the airway	4	2.6
going into a victim	Listen for the victim exhaling air	6	3.8
E	1 cycle	21	13.3
Frequency of	2 cycles	69	43.7
switching roles	5 cycles	66	41.8
among rescuers	10 cycles	2	1.3

Table 3: Summary of the respondents knowledge on CPR.

Responses	Frequency (N)	Percent (%)
High knowledge	74	45.7
Low knowledge	88	54.3
Total	345	100

Association of demographic characteristics and CPR knowledge

The researcher sought to find out the association of demographic characteristics of respondents and their knowledge on cardiopulmonary resuscitation. Chi-square tests were therefore conducted. Results in Table 4 shows that age of respondents (p=0.038) and level of education (p=0.000) were significantly associated with older respondents (>40 years) and those with a high level of

education (degree and or masters) were two and three times more likely to have a high knowledge on cardiopulmonary resuscitation. Significant values in bivariate analysis were included in a regression analysis to find out the most significant. Results showed that neither age nor education were significant in the regression analysis. The beta coefficient however showed that education (β =0.201) affected the CPR knowledge more than the respondents' age (β =0.145). (Table 5).

Table 4: Association of demographic characteristics and CPR knowledge.

Characteristics	Value	df	Asymp. Sig. (2-sided)	Odds ratio
Gender	15.237	9	0.085	1.229
Age	17.757	9	0.038*	2.008
Level of education	63.189	15	0.000*	3.194
Profession	13.382	9	0.146	0885

^{*}Significant at 95% CI.

Table 5: Multivariate analysis of demographic characteristics and CPR knowledge.

Model	Unstandar	dized coefficients	Standard coefficients	t	Sig.
	В	Std. error	Beta		
Constant	1.002	0.282		3.550	0.001
Age	0.145	0.110	0.145	1.320	0.190
Education	0.201	0.113	0.195	1.778	0.079

Respondents CPR practice

The study sought to assess the practice of cardiopulmonary resuscitation among health workers at Nakuru County Hospital. Skills was assessed was through a CPR checklist which had 10 items. Results showed that majority 75.3% (n=122) checked patient responsiveness 63% (n=102) located the hand position for chest compression 68.5% (n=111) delivered first chest compression at correct rate and 72.8% (n=118) of the respondents gave two breaths. However, results also show that 59.9% (n=97) did not scan for chest movement, 64.2%, (n=104) did not activate the emergency response team and get the automated external

defibrillator and neither did they direct other rescuers to activate the emergency response team and get the automated external defibrillator. Similarly, 61.1% (n=99) did not check carotid pulse for between 5-10 seconds, while 51.2% (n=83) did not deliver second cycle of chest compression at correct hand position. Regarding breaths and chest compressions, 54.3%, (n=88) did not give two breaths and 50.6% (n=82) did not deliver the third cycle of chest compression of adequate depth and complete chest recoil. Respondents who correctly performed 6 or ore items in the CPR checklist were classified as having good practice while those who only performed 5 or less were classified as having poor practice. The study revealed that majority 61.1% (n=99) had poor CPR practice (Table 7).

Table 6: Respondents CPR practice.

Critical performance steps			No	
		%	N	%
Checks patient responsiveness (taps and shouts "Are you alright")	122	75.3	40	24.7
Scans chest for movement (5-10 seconds)	65	40.1	97	59.9
Activates the emergency response team and gets the automated external defibrillator				
or directs the rescuer to activates the emergency response team and gets the automated	58	35.8	104	64.2
external defibrillator				
Check carotid pulse (5-10 seconds)	63	38.9	99	61.1
Bares patient's chest and locates the hand position	102	63.0	60	37.0
Delivers first chest compression at correct rate (acceptable: 18 seconds or less for 30	111	68.5	51	31.5
compressions)				
Give two breaths (one second each)	118	72.8	44	27.2
Deliver second cycle of chest compression at correct hand position (acceptable: greater than 23 of 30 compressions)	79	48.8	83	51.2
Give two breaths (one second each) with visible chest rise.	74	45.7	88	54.3
Deliver the third cycle of chest compression of adequate depth and complete chest recoil (acceptable: greater than 23 of 30 compressions)	80	49.4	82	50.6

Table 7: Respondents CPR practice.

Responses	Frequency (N)	Percent (%)
High knowledge	63	38.9
Low knowledge	99	61.1
Total	345	100

The researcher sought to find out if there was an association between demographic characteristics of respondents and CPR practice. Results showed that there was a significant relationship between respondents' level of education and CPR practice (p=0.011). Cross tabulation showed that respondents with higher education (degree and or masters) were three times more likely to have good CPR practice (Table 8). The researcher also sought to find out if there was an association between respondents' CPR

knowledge and their CPR practice. There was a significant relationship between CPR knowledge and CPR practice (p=0.006). Cross tabulation showed that respondents with high knowledge were four times (OR=4.303) more likely to have good practice. The null hypothesis is therefore rejected and the study concludes that there is a significant relationship between knowledge and skills of CPR and effective cardiopulmonary resuscitation among health workers at Nakuru County Referral Hospital.

Table 8: Association of demographic characteristics and CPR practice.

Characteristics	Value	df	Asymp. Sig. (2-sided)	Odds ratio
Gender	10.766	5	0.056	0.101
Age (years)	5.236	3	0.155	0.154
Level of education	11.087	3	0.011*	3.307
Profession	4.969	3	0.175	0.111

^{*}Significant at 95% CI.

Table 9: Association of CPR knowledge and CPR practice.

Association	Value	df	Asymp. Sig. (2-sided)	Odds ratio
Pearson Chi-square	12.402	3	0.006	
Likelihood ratio	16.193	3	0.001	4 202
Linear-by-linear association	2.717	1	0.099	4.303
N of valid cases	175			

DISCUSSION

The first objective of the study sought to determine the level of knowledge of cardiopulmonary Resuscitation among health workers at Nakuru County Referral Hospital. The study found that that slightly above half 54.3% (n=88) had low knowledge on cardiopulmonary resuscitation. Respondents had poor knowledge regarding the proper steps for operating an AED, location of chest compression, chest compressions to breaths ratio and the frequency of switching roles among rescuers. The low knowledge may be attributed to lack of educate training and poor continuous professional development. Older respondents (>40 years) and those with a high level of education (degree and or masters) were more likely to have a high knowledge of cardiopulmonary resuscitation. This may be attributed to more experience among older respondents as well as more recent education and training among those with degrees and postgraduate degrees. This finding is in similar to findings that knowledge of CPR among Nigerian health workers was poor.¹⁴

The findings of this study is similar to a study conducted in Tanzania which revealed that there is poor knowledge and skills of CPR among the Health workers of all cadres. The finding is also related to a study which showed that the poor knowledge among Health workers in Nepal is attributed to lack of CPR training before employment, and lack of exposure at the clinical area hence contributing to the deterioration of the knowledge. The finding is however in contrast with a study in Ethiopia where about 93.3% of the respondents had good knowledge about CPR. 16

The second objective of the study assessed the practice of cardiopulmonary resuscitation among health workers at Nakuru County Referral Hospital. The findings revealed that majority (61.1%, (n=99) of the respondents in the study had poor CPR practice. The majority of respondents failed to scan chest for movement, activate the emergency response team, check carotid pulse and give two breaths. The poor CPR practice could be attributed to low knowledge among the respondents.

This finding is consistent to findings in Greece where nurses' CPR skill was noted to have gaps as the nurses failed to adhere to the recommended guidelines when performing CPR.⁵ The study is similar to a study in Botswana that revealed that there is poor knowledge and skills among the nurses, which contribute to their unwillingness to initiate CPR process.¹⁷

CONCLUSION

The study concluded that the level of knowledge of cardiopulmonary resuscitation among health workers at Nakuru County Hospital was low. Knowledge was found to be lacking in the areas of proper steps for operating an AED, location of chest compression, chest compressions to breaths ratio and the frequency of switching roles among rescuers. Respondents with diplomas and higher diplomas were more likely to have low knowledge. The low knowledge was significantly associated with poor CPR practice. The practice of cardiopulmonary resuscitation among health workers at Nakuru County Referral Hospital was low. Majority of respondents failed to scan chest for movement, activate the emergency response team, check carotid pulse and give two breaths as recommended. The poor practice of cardiopulmonary resuscitation among health workers is attributed to low CPR knowledge.

Recommendations

The study recommends that more emphasis should be placed on cardiopulmonary resuscitation in the continuous professional development.

Supervision of cardiopulmonary resuscitation among health workers at Nakuru County Hospital should be introduced after training to ensure that they are following recommendations. Further training should be conducted on gaps identified in the supervision.

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