Effect of Cardiopulmonary Resuscitation Training on Knowledge and Perceived Skills Confidence among Nurses at Kilimanjaro Christian Medical Centre, Kilimanjaro, Tanzania

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MSc Nursing (Critical Care and Trauma) Dissertation
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Department of Clinical Nursing

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EFFECT OF CARDIOPULMONARY RESUSCITATION ON KNOWLEDGE AND PERCEIVED SKILLS CONFIDENCE AMONG NURSES AT KILIMANJARO CHRISTIAN MEDICAL CENTRE, KILIMANJARO, TANZANIA

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CERTIFICATION

The undersigned certify that She has read and hereby recommend for evaluation by Muhimbili University of Health and Allied Sciences a dissertation entitled **Effect of Cardiopulmonary Resuscitation Training on Knowledge and Perceived Skills Confidence among Nurses at Kilimanjaro Christian Medical Centre, Kilimanjaro, Tanzania** in partial fulfillment of the requirements for the degree of Master of Science in Nursing (Critical Care and Trauma) of Muhimbili University of Health and Allied Sciences.

_____

Professor Lilian T. Mselle

(Supervisor)

Date_____

_____

Dr. Menti Ndile

(Co-supervisor)

Date: _____

DECLARATION AND COPYRIGHT

I Salome Joseph**,** I declare that this dissertation/thesis entitled is my own original work and it has not been presented and will not be presented to any other University for a similar or any other degree award.

Signature……. Date……

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.

DEDICATION

This dissertation is dedicated to all Nurses working in hospital setting

ABSTRACT

Background of The Study: Almost 33% of the Tanzanians have been affected with non-communicable diseases mainly cardiovascular disease. In sub-Saharan Africa countries including Tanzania, the mortality rate associated with cardiac arrest is expected to raise from 17.9 to 23 million deaths from2015 to 2030. Moreover, studies indicated that, most of recurrent deaths in cardiac arrest patients were associated with poor performance of CPR. Hence, this implies that there is a gap on the level of knowledge and skills among nurses in performing cardiopulmonary resuscitation.

The aim of the study: To assess the effect of cardiopulmonary resuscitation training on knowledge and perceived skills confidence among nurses at KCMC

Materials and Methods: Quantitative approach with pre- and post-research design was employed to nurses who met the inclusion criteria in the study. Data were collected by a structured questionnaire and a checklist before and after the CPR training. SPSS version 23 was used to analyze data in this study. Besides, a perceived skills confidence in CPR was measured by a Likert scale. **Furthermore, a paired t-test, nonparametric test were used to measure the level of knowledge and perceived skills confidence respectively.**

Results: The study enrolled 101 nurses, 80 (79.2%) females and 21 (20.8%) males with a mean age of 33.67 (SD ± 8.9).The average score in pre- test was 47.84, SD± 15.597 and in post-test was 83.08, SD± 11.4 P=0.000 and for perceived skills confidence among nurses was (M) =3.195 SD± 0.897, implying moderate level of CPR perceived confidence. (M)=4.166, SD± 00.582 suggesting high level of CPR perceived skills confidence among nurses at KCMC. Therefore, the mean difference between pre-test and post-test in nurse knowledge regarding CPR was -35.245, which was statistically significant at a P value of 0.001.

Conclusion and recommendation

The nurses had inadequate CPR knowledge and moderate perceived skills confidence at pre-test. Following training on CPR, there were significant improvements in both knowledge and perceived skills confidence of nurses**. Then, there is a need of conducting continue professional education regarding CPR to prevent the loss of knowledge and practices.**

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Fig 1: A modified conceptual framework, adopted from Wiedenbach's prescriptive theory (Cherian and Karkada, 2015). 6

ABBREVIATIONS

ABC	Airway Breathing Chest
ACLS	Advanced Cardiovascular Life Support
AED	Automated External Defibrillator
CAB	Chest Compression Airway Breathing
CPA	Cardiopulmonary Arrest
CPR	Cardiopulmonary Resuscitation
CVD	Cardiovascular Disease
ECC	Emergency Cardiovascular Care
ELCT	Evangelical Lutheran Church in Tanzania
GSF	Good Samaritan Foundation
HCP	Health Care Professional
ILCOR	International Liaison Committee on Resuscitation
KCMC	Kilimanjaro Christian Medical Centre
KCMCCO	Kilimanjaro Christian Medical Centre College
MNH	Muhimbili National Hospital.
MUHAS	Muhimbili University of Health and Allied Science
NCD	Non-Communicable Disease
SCD	Sudden Cardiac Death
WHO	World Health Organization

DEFINITIONS OF TERMINOLOGY

Cardiopulmonary resuscitation	Is an emergency procedure that combines chest compressions ofte with artificial ventilation to manually preserve intact brain functio until further measures are taken to restore spontaneous bloo circulation and breathing in a person who is in cardiac arrest (1).
Cardiac arrest	Is the abrupt loss of heart function in a person who may or may no have been diagnosed with heart disease (2).
Skills	An ability of nurses to do an activity such as cardiopulmonar resuscitation or job well, especially because it has been practiced (3).
Knowledge	Is an abstract concept without any reference to the tangible world (4)
Self-efficacy	Refers to an individual's belief in his or her capacity to execut behaviors necessary to produce specific performance attainments (5).
Sudden Cardiac Death	Refers to the sudden cessation of cardiac activity with hemodynami collapse, typically due to sustained ventricular tachycardia/ventricula fibrillation (6).
Basic Life Support	Is defined as a variety of non-invasive emergency procedure performed to assist in the immediate survival of a patient, includin cardiopulmonary resuscitation, hemorrhage control, stabilization o fractures, spinal immobilization, and basic first aid (2).
Self-perceived Confidence	Refers to nurse’s competence and skill in CPR and their perception t deal effectively with various situations and procedures (2).

1.0 CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Cardiac arrest is an abrupt loss of heart functioning to a person who may or may not be diagnosed with heart disease. It may come suddenly, or in the wake of other symptoms. Cardiac arrest is often fatal if appropriate steps aren't taken immediately, because the cessation of these functions leads to irreversible cell and brain damage, causing death rapidly (7).

Cardiac arrest is a major global public health problem among the population worldwide. The incidence of sudden cardiac death ranged from 31.3 to 99.4 death per 100,000 people globally (8). But surviving from cardiac arrest is possible if early and timely intervention shall be applied to the victim with cardiac arrest (9). Hence, early recognition and easy access to defibrillation are very important in delivering treatment to cardiac arrest and increases a chance of surviving by 7%-10% per minutes (10).

Cardiopulmonary resuscitation is a critical component of basic life support and should be established as the first line of response to a cardiac arrest in the interim before defibrillation and advanced life support are available (11). Its' measures vary according to the needs of the patient. According to the American Heart Association Guidelines (2020), illustrates six links of chain for surviving the in-hospital cardiac arrest among adults and pediatrics, these are; early recognitions, activation of emergency response, high-quality cardiopulmonary resuscitation (CPR), advanced resuscitation, post-cardiac arrest, and recovery (7).

The registered nurses from Botswana had improved knowledge and skill after attending training on cardiopulmonary resuscitation but it deteriorates in three months after the training (12). This implies there is a need for providing regular CPR refresher course among nurses. Besides another study shows, regular updates and simulation training based on hospital scenarios and evidence-based guidelines helps Healthcare professionals (HCP) to retain knowledge and skills for improving their competency on CPR (13). Moreover, studies demonstrated an increase of knowledge and self-efficacy in performing CPR from lower and middle income countries due to manikins training provided (14). This highlights the importance of periodical training requiring repeated practice to gain CPR competence.

Evidence from Kenya shows almost half 56% of the mortality cases were contributed by inadequate knowledge among health professionals on performing CPR (6). A recent study in

Tanzania recommended a periodical formal system of training to evaluate the knowledge and skills regarding CPR retained in every health professionals from different carder (9). Also, this is likely to highlight the need for regular in-service training programs to updated nurses' knowledge and skills as well as self-perceived competence in performing CPR. Therefore, this necessitates the design of the study to assess the effect of cardiopulmonary resuscitation training on nurse's knowledge and self-perceived confidence skills at Kilimanjaro Christian Medical Centre.

1.2 Problem statement

Cardiac arrest is the major healthcare problem with poor survival rate. Mortality in sub-Saharan Africa countries including Tanzania is expected to raise from 17.9 to 23 million death from 2015 to 2030, if there are no appropriate measures to alleviate the problem (15). In Tanzania, 33% of the population is affected by the non-communicable disease (NCD) mainly cardiovascular diseases (CVDs). Besides, cardiopulmonary resuscitation (CPR), was said to be significant lifesaving procedure performed to improve survival rates from patient suffering cardiac arrest (16). Therefore, surviving cardiac arrest is possible if the victim will be helped by a skilled healthcare provider as early as possible.

In Tanzania, shortage of skilled health care professionals, inability to respond quickly and providing an effective treatment to CVD situation was the major causes of premature death (15). This implies that, most of health care workers have inadequate knowledge and self-confidence in performing CPR. Recent studies shows that, the level of knowledge and skills regarding cardiopulmonary resuscitation was poor and only few 14.3%. of healthcare workers felt they are competent on performing CPR (9,17). This implies there is little training to improve the knowledge and skills on performing CPR among nurses in Tanzania. Therefore, this study intends to assess the effectiveness of cardiopulmonary resuscitation training on nurses' knowledge and self-perceived skills confidence at Kilimanjaro Christian Medical Centre, Kilimanjaro, Tanzania.

1.3 The rationale of the study

Nurses' knowledge and skills in performing CPR is a key for an effective management of patients with sudden cardiac arrest in their health settings. The finding of this study identified the current knowledge and skills on performing cardiopulmonary resuscitation among nurses. Also, knowledge and skills acquired through CPR training in providing evidence- based

knowledge on the effectiveness of training to improve nurse practice and quality of health care service to patient with cardiac arrest. Moreover, the study findings will be helpful in nursing education toward developing content for syllabus and continuing professional developments.

1.4 General research question

What are the effects of cardiopulmonary resuscitation training on knowledge and perceived skills confidence among nurses at Kilimanjaro Christian Medical Centre?

1.5 Research questions

i. What are nurses' levels of knowledge on cardiopulmonary resuscitation before and after the training in the Kilimanjaro Christian Medical Centre?
ii. What are the level of self-perceived confidence skills by nurses on cardiopulmonary resuscitation before and after the training in the Kilimanjaro Christian Medical Centre?

1.6 Broad objective

To assess the effects of cardiopulmonary resuscitation training on knowledge and perceived skills confidence among nurses at Kilimanjaro Christian Medical Centre.

1.7 Specific objective

This study will be guided by the following specific objectives;.

i. To determine levels of knowledge on cardiopulmonary resuscitation before and after the training in the Kilimanjaro Christian Medical Centre
ii. To determine nurses' perceived skills confidence on cardiopulmonary resuscitation before and after the training in the Kilimanjaro Christian Medical Centre

1.8 Theoretical Model

This study used Kirkpatrick's Model to assess the effectiveness of cardiopulmonary resuscitation training on nurse's knowledge and skills among nurses at Kilimanjaro Christian Medical Centre. In 1954, Donald Kirkpatrick formulated the Kirkpatrick model. The model has four stages that can be used to assess the effectiveness of training in an organization or people before, during, and after training. These levels are; the ***Reaction***which refers to what

degree participants react favorably to the learning event. Also, ***Learning*** refers to what degree participants acquire the intended knowledge, skills, and attitude based on their participation in the learning event. Moreover, ***Behaviour*** refers to the extent to which participants apply what they learned during training when they are back to their job. Then lastly is the ***Results*** which refers to the degree at which the targeted outcomes occur as a result of the training and the support and accountability package (18).

1.8.1 How Kirkpatrick's Model was applied in the study

In this study, only the first two levels (Reaction and Learning) were applied to measure the effectiveness of the training, since both levels 3 and 4 are perceived to be limited in this study due to the nature of the study and cost-effectiveness.

Level one Reaction was assessed by using questionnaire consisting of various concepts on CPR knowledge, nurses perceived skills confidence in performing CPR through the available Likert scale checklist questionnaire before training. This model enables the researcher to evaluate the degree at which nurses responded favorably to the training during a study intervention.

The level of the learning outcome was conducted after training by assessing nurse's knowledge on CPR as well as their perceived skills confidence on performing CPR after training by using the questionnaire which consists of multiple-choice questions and a Likert scale checklist that covered different aspects of CPR. Therefore, this theory enables the researcher to develop tools for assessing the perceived skill and knowledge among nurses at KCMC to fulfil the objective of the study.

CHAPTER TWO
2.0 LITERATURE REVIEW

2.1 Introduction

This chapter will discuss literature pertinent to the study as documented from different sources. It will cover, a chain of survival, sequences of Cardiopulmonary Resuscitation (CPR), the collection and analysis of primary data based on direct observation or experiences in the field conducted in assessing nurses' knowledge and practice on CPR and end up with a conclusion. The main purpose of the literature review is to help the researcher to build a logical framework of the study and set it within traditional inquiry and context of related studies.

2.2 CPR measures carried out to attend a cardiac arrest

Cardiopulmonary resuscitation is a series of life-saving actions that improve the chances of survival following cardiac arrest (19).The successful resuscitation after cardiac arrest requires an integrated set of coordinated actions characterized by the links in the Chain of Survival. The links include immediate recognition of cardiac arrest and activation of the emergency response system, early CPR with an emphasis on chest compressions, rapid defibrillation, effective advanced life support, and integrated post-cardiac arrest care. The newest development in the CPR guideline is a change in the basic life support sequence of steps from "A-B-C" (Airway, Breathing, Chest compressions) to "C-A-B" (Chest compressions, Airway, Breathing) for adults. Also, "Hands-Only (compression-only) CPR" is emphasized for the untrained lay rescuer (20).

Adult In-Hospital Chain of Survival



(Adopted from American Heart Association, 2020)

According to the International Liaison Committee on Resuscitation (2015) guidelines for Cardiopulmonary Resuscitation (CPR) and Emergency Cardiovascular Care (ECC) in the

scientific journal Circulation shows that, high-quality CPR can increase survival rates for hospital discharge (21).

2.3 Assessment of nurses' knowledge and skills of CPR pre-training

Several studies in developing countries reported a low knowledge of cardiopulmonary resuscitation (CPR) among health providers including nurses. The study conducted by Elazazay, Abdelazez, and Omibrahem, (2012) from Tanta Cancer Institute Ministry of Health revealed there is a significant change of knowledge from 23.4% to 82% among nurses in pre and post training (22). A similar study conducted in Uganda at Mbarara Regional Hospital reported changes in CPR skill from 46% to 81.5% among nurses before and after instruction respectively (23).Therefore, findings shows training is more important on improving both nurses knowledge and skills regarding CPR.

Despite both CPR knowledge and skills had improved after application of training, A study by Rajeswaran and Ehlers, (2014) noticed a deterioration of CPR skills form 85% to 17% among nurses during the 12 week after conduction CPR training (12). Therefore, the study recommended a need of conducting a periodic in-service training among nurses to retain and update the current knowledge and skills concerning a CPR.

In Tanzania, a study on assessment of knowledge and skills of cardiopulmonary resuscitation among healthcare providers discovered that, there was an inadequate level of CPR knowledge and skills displayed by all **cadres** in all departments although most providers had performed CPR in the past at urban tertiary referral hospital (9). This connotes that there is a change in knowledge and skills over the period that affects the performance of the resuscitation status among healthcare professionals. Although this shows that there is an existing knowledge gap among health care providers in Tanzania, therefore this highlights the need to conduct a pre and post-test study to assess the impact of CPR training on the level of knowledge and skills among nurses in Tanzania.

2.4 Nurses' knowledge and skills of CPR post-training

Inadequate CPR knowledge and skills among health providers including doctors and nurses had been reported by several studies conducted in various hospitals. Evidence from a study conducted in Uganda by Munezero*et al.*, (2018) showed a significant improvement of both knowledge and skills from 16.8% to 73.2% and 19.18% to 85.6% respectively (23). Therefore, on evaluation of nurses' knowledge and skills following cardiopulmonary resuscitation;

training had a positive impact on the nurses' knowledge and skills**.** Furthermore, a similar study conducted in Nigeria revealed that there is a significant improvement in CPR skills and knowledge after the training and it recommends regular training for all health providers (24). However, a study conducted by Peter et al., (2012) shows that 28% of health care providers (HCP's) had an inadequate knowledge and skills prior formal CPR training. But also, good acquisition of knowledge and CPR skills by 100% was observed after initial training. Health care professionals must acquire appropriate resuscitative knowledge and skills (25). Even though such skills are poorly retained by HCPs and the knowledge is often outdated due to insufficient refresher programs to keep up with guideline updates. Therefore, findings point out a lack of adequate training programs in healthcare settings to advance CPR knowledge and skills among HCPs as such raising a concern to assess the level of knowledge and skills among nurses before and after exposure to training. It is in this regard, this study aims to fill this gap as of all healthcare professionals, and nurses are often the first to discover a patient of cardiopulmonary arrest (CPA) in any part of the hospital, be it the emergency or the in-patient wards.

2.5 Evaluation of change in knowledge and skills of CPR among nurses after training

Bullock (2000) emphasized how to acquire, retain, and/or develop skills in resuscitation. He agrees with what other researchers observed on retention of both the cognitive knowledge and the psychomotor skills that are necessary for resuscitation become significantly weaker after 4-6 months. He also insists that the development of CPR skills is essential for maintaining this vitally important skill in the professional life of nurses**.**

Besides, a study conducted in a pediatric CPR in India regarding skill retention of health care worker after training revealed cardiopulmonary resuscitation performance decrease with time among in-service (26). There is a need improve the level of knowledge and skills of by constantly providing a regular practice on CPR.

Moreover, a comparison study conducted in Nigeria revealed that, students who had some prior CPR training scored 50% higher on average than 16.8% of student who did not have prior knowledg**e** (27). This implies training is more effective on impacting CPR knowledge among University medical students. Furthermore, study conducted in Kwazulu Natal, South Africa, to explore retention of knowledge and skills on CPR among health care practitioners who

attended BLS course concluded that knowledge and practice improve as one gets formal training on CPR (28).

Another study conducted in the same country on clinicians in the tertiary hospital did not differ from other studies whereby the exposure to prior training and difference in experience documented a significant CPR knowledge retention (29). Their findings suggest that the retention of skills and knowledge is largely depends upon regular and periodic practices in the techniques of CPR and the ability of resuscitators to recall. However, some researchers went on to establish studies irrespective of the status of baseline training of the participants, they show that there is a considerable decline of the knowledge recall and skill performance even after short periods following the post-training program in cardiopulmonary resuscitation. A similar study conducted in Botswana on retention of nurses' knowledge after basic life support and advanced cardiac life support training at immediate, after 6-months and 12-months of post-training intervals revealed that nurses retain theoretical knowledge but performance skills degrade quickly (30).

ACLS skills degrade faster than BLS skills with 63% passing BLS at 3months and 58% at 12 months. Only 30% of participants passed ACLS skills at 3 months and14% at 12 months (31). Previous studies have emphasized that CPR knowledge and skills deteriorate over time when they are not repeated and that the level of knowledge and skills of nurses who practice constantly is better than those who do not (32). Also, some studies have shown that knowledge and skills of CPR deteriorate with a time of weak retention, so researchers recommend the necessity of periodical training on CPR. These works of literature have revealed an inadequate knowledge and skillsets among HCPs in low-income countries and therefore suggest a demand to assess the impact of training before and after exposure.

2.6 Perceived skills confidence in performing cardiopulmonary resuscitation before and after training

An interventional study was done by Abelsson, Odestrand, and Nygårdh, (2020) to investigate the effect of a two-hour education to strengthen self-confidence as the step in improving pre-hospital youth laymen's basic life support. The study concluded that their self-confidence can be improved. This can lead to an increased will and ability to identify a cardiac arrest and to begin compressions and ventilations. The confidence to use a defibrillator to increase self-

confidence is a result of young people ability to perform first aid to a person suffering from a traumatic event (33).

Another prospective from a randomized single-blind controlled study regarding impact of cardiopulmonary resuscitation (CPR) manikin chest stiffness among children revealed that, Compression resistances of manikins though influencing CPR performance, did not discourage 8 to 13-year old children after CPR training. The findings show the significance of receiving CPR training to the community despite the ages (34). However, the previous study was limited by time in training duration and children capability to perform the CPR. Then, another study by Liaw*et al.*, (2020) on improving perception and confidence towards bystander cardiopulmonary resuscitation and public access automated external defibrillator (AED) program shows that; Training programs appear to improve the perception and the confidence of the participants towards performing CPR and using AED through the promotion of a positive attitude, positive societal expectation, and a positive sense of empowerment (35).

2.7 Research Gap

A rapid emergency care intervention can prevent cardiac arrest from resulting to death. For Cardiopulmonary Resuscitation (CPR) to have any real significance for the survival of the patient, it requires an educational effort through various methods such as regular in-service training to equip healthcare providers with the current knowledge to improve their clinical skills. Studies have indicated the impact of CPR training in increasing knowledge and skills of conducting CPR among health care providers (12,14,33) **.** However, little is known regarding knowledge and skills of conducting effective CPR among the HCPs in Tanzania**.** Therefore, this study assessed the difference in nurse's knowledge and skills before and after training, particularly to nurses who are likely close to first identify patients' cardiac arrest in health settings among all health care providers at KCMC, Kilimanjaro Tanzania.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study design

The study used a pre and post-test quasi-experimental study design whereby training intervention was conducted using a single group of participants. This design enabled the researcher to assess the effect of CPR training to nurses' level of knowledge and perceived skills confidence before and after training as an intervention on cardiopulmonary resuscitation at Kilimanjaro Christian Medical Centre.

3.2 Study area and setting

The study was conducted at Kilimanjaro Christian Medical Centre (KCMC) in the Kilimanjaro region. The region is located in the North part of Tanzania with coordinates of 4.1337º S and 37.8088º E that covers an area of 13250km^2. Kilimanjaro is one of Tanzania's 32 administrative regions consisted of seven districts. Kilimanjaro Christian Medical Centre (KCMC) is situated four kilometers north of Moshi Municipality on the slopes of the snow-capped Mount Kilimanjaro in Kilimanjaro region, Tanzania. It was established in early 1960 as a teaching and a referral hospital for the northern zone under the leadership of the Lutheran Church, Anglican, and Moravian Church in Tanganyika. After completion of the buildings, the KCMC was opened and immediately taken by the Tanzania government in 1971. But in 1992 when the government changed the policy to liberalize the economy, it was handed back to Good Samaritan Foundation (GSG) and Evangelical Lutheran Church in Tanzania (ELCT) for service, teaching, and research.

The researcher opted to conduct this study at Kilimanjaro Christian Medical Centre because it is the university teaching hospital and a referral hospital for the northern zone which provides services like Resuscitation, Gynecology and obstetrics, dermatology, Pediatric, Physiotherapy, orthopedic, Intensive Care Unit, Emergency, Ophthalmology, Surgery, and Internal Medicine and others for over 15 million people in Northern Tanzania. Moreover, the hospital is a huge complex with 500-800 inpatients with 630 official beds, 90 canvas, 40 baby Incubators, 1852 students, 1300 staff, and 1000 daily visitors and companions. (36).

3.4 Study population

The research population refers to the entire group of things or events in which are of interest to the study (37).The population of this study involve registered nurses and enrolled who are full-time working in the Kilimanjaro Christian Medical Centre (KCMC). Registered are those nurses with a diploma, nursing degree, and master's degrees while those with a nursing certificate are enrolled nurses. At KCMC there are about 246 enrolled and registered nurses, then the study targeted all registered and enrolled nurses.

3.5 Sample size estimation

According to Magnani (1997), the formula for calculating the required sample size for **a pre-post study** design is:

$$n=D\ [(Z_{\alpha/2}+Z_{\beta})^{2} * (p_1 (1-p_1) +p_2 (1-p_2))/ (p_1-p_2)^2]$$

Where, n = required minimum sample size

D = design effect

P1 = the estimated level of an indicator measured as a proportion at the time of the first survey.

P2 = the expected level of the indicator either at some future

Z_α = the level of statistical significance that the observed change of size would not have occurred by chance

Z_β = the statistical power for normal distribution

Therefore, based on the prevalence of the study done by Meaney *et al.*, (2012) in Botswana

65% had CPR knowledge and skills before training while another study conducted in Iran by Shahrakivahed *et al.*, (2015) *et al.*, (2015), the proportion of nurses who had good knowledge and skills on CPR was 85% after the training workshop (38,39).

$n=2\ [(1.96+0.84)^2 * (0.65\ (1-0.65) +0.85(1-0.85))/ (0.65-0.85)^2]$ The expected sample size for the study 96.

However, the total sample size that used for the study was obtained by adding the 10% (9.6) sample size for non-respondents (Magnani, 1997). Therefore, the total sample size that was included in the study for the pre and post-study survey was 106 individuals.

The sample size in each stratum at a particular department was determined by using Morgan and Krejcie's (1970) table for nurses (40).

Table 1: represent randomization of registered and enrolled nurses at the department.

Department	Number of		Sample size Proportion		Total Sample size.
	Registered Nurses	Enrolled Nurses	Registered Nurse	Enrolled Nurse	
Obstetrics and gynecology	20	10	9	5	14
Medical department	26	4	10	2	12
Surgical department	25	5	10	2	12
Ear Nose Throat department	5	5	2	2	4
Urology department	13	1	6	1	7
Pediatric department	23	6	10	3	13
Main operating theater	11	4	5	2	7
Dermatology department	11	2	5	1	6
Emergency department	25	3	9	1	10
Dialysis department	11	7	6	3	9
Eye department	14	9	6	4	10
Oncology department	6		2		2
Total	190	56	80	26	106

3.6 Sampling procedure

A multistage random sampling technique was used to obtain study participants for assessing effect of CPR training on level of knowledge and perceived skills confidence. The researcher uses this technique to put the population into groups with the same likelihood of being selected as a study sample by either individual elements or by each combination of elements in the population (41). Initially all departments at KCMC were selected by using the simple random sampling since nurses from every department play a key role in the management of

in hospital cardiac arrest patient. Then at the departmental level, nurses were stratified into registered and enrolled nurses and allocated in each stratum. Finally a list of all nurses from each stratum was developed by using a computer software like excel sheet prepared by researcher together with the head of department from where nurses worked. The list was used to select participant from each stratum by using simple random sampling based on sampling fraction when met inclusion criteria to participate in pre-test and post-test. Therefore, maximizes the attendance and responsive rate of the study participant to the training and avoid unnecessary inconvenience of halting hospital nursing services.

3.7Inclusion and exclusion criteria

3.7.1 Inclusion criteria

The study include registered and enrolled nurses working at Kilimanjaro Christian Medical Centre

3.7.2Exclusion criteria

The study excludes all nurses with acute ill conditions and or on a long leave such as maternity leave at the time of the study at KCMC.

3.8 Variables

3.8.1 Independent variable

The independent variables for the study were

- Cardiopulmonary resuscitation training
- Knowledge about cardiac resuscitation (definition, causes, signs and symptoms, complications, and actions to prevent cardiac arrest)
- Perceived skills confidence in CPR
- Nurses' social demographic characteristics

3.8.2 Dependent variable

The dependent variable for the study was

- Level of knowledge related to CPR
- Nurses’ perception related to CPR skills.

3.9 Data collection tools

A researcher used a structured questionnaire and self-perceived confidence skills checklist during data collection after a review of related literature on CPR knowledge and skills providers (12,14,33). A structured questionnaire was used as data collection tools before and after intervention programs. Tools were structured based on American Heart Association (AHA*)* guideline 2020 together with the skills confidence checklist on CPR for assessing the skills on performing CPR.

3.9.1 Structured Questionnaire of knowledge on CPR

The structured questionnaire was administered to the participants to collect data on the nurse's knowledge relating to cardiopulmonary resuscitation. The questionnaire was structured in English language which consist two parts. The first part cover all aspects of Nurses' socio-demographic factors including sex, age, level of education, years of experience, and working unit. The **second part** covers nurses' knowledge relating to cardiopulmonary resuscitation including nurses' knowledge about CPR (definition, causes, signs &symptoms, complications, and actions to prevent sudden death), patients' and rescue' position during CPR, and how to assess the cardiac and respiratory system of the victims. The **second part** cover how to open the airway, depth, and rate of chest compression per minute for an adult, the ratio of chest compression to breathing rate, when to stop CPR, and complications of CPR.

3.9.2Checklist on level of self-perceived confidence in CPR skills

This tool was used to collect data on Nurses' perceived skills confidence relating to cardiopulmonary resuscitation. The checklist consisted of 8 steps of conducting CPR. The possible responses to particular questions were answered in five-point according to the Likert scale ranging from low to high level of CPR skills (1=very low, 2= low, 3=moderate, 4=high and 5=very high). The average score will be obtained by dividing the sum of the scores by the number of items.

3.10: Recruitment of study participants.

The **researcher used** sampling frame which had a list of all registered and enrolled nurses from each stratum at the department. This list of nurses from the stratum in each department was used to proportionate study participants into the groups for conducting effective training on CPR. To invite participants in this research, a random sample was used by drawing a

YES/NO ticket from the box in which those who draw YES tickets was invited to the study in order to attain the sample size as indicated in the table 1 above in each department.

3.11 Data

On fulfilling the study objectives, data were collected into three phases as describe below.

(a) Preparation for the training.

Before the data collection, convenient time for training was arranged in consultation with the hospital management that facilitated preparation of training logistics. Before the training, the researcher explained to participants the objectives, benefits of the training and inclusion and exclusion criteria of the study to the participants available for the study. Then the invitee was requested to sign a written consent form upon voluntary decision to participate in the study. For those who agreed to take part in the study were asked to complete the questionnaire

(b) The pre-test.

At this stage, questionnaire was administered to the study participants by a researcher to collect data about participant socio-demographic factors, knowledge, and skills. Both a structured questionnaire and checklist for self-perceived skills confidence regarding CPR were used at the beginning before the implementation of the training program**.**

(c) Intervention phase.

At this phase, the participants undergo the CPR training program, aimed at impacting knowledge and skills to the participants through the teaching and learning process. CPR training consists of two sessions which are educational and practical. In this stage, data were collected by both questionnaire and a self-perceived confidence checklist to assess the level of CPR knowledge and perceived skills confidence among nurses soon after the exposure to the training. CPR training was conducted in two days. First day **50** participants participate in the study and second day **51** participant to allow other nurses to proceed with the other hospital activities to avoid hampering the hospital's services. Besides, CPR Training was facilitated by the researcher and Anesthetists from KCMC who is an experts in resuscitation.

i. **Educational sessions**

This session was conducted for one hour and thirty minutes by using lecture, discussion, and handouts. The handouts related to CPR were written in English language, in order to be easily understood by all nurses and it comprises of all knowledge domains regarding causes and signs

of cardiac arrest, steps before and during CPR for adult, CPR complication, when to stop CPR, and when not to start CPR.

ii. **Practical sessions followed by immediate evaluation.**

The training session was given once to all groups immediately after the educational session for one hour and thirty minutes, where the facilitator demonstrate CPR steps by using full-body manikin for an adult victim. Each nurse follow the demonstration and re-demonstrate the steps individually until him/her correctly and completely perform the steps as required in performing CPR. Then a checklist on the level of self-perceived confidence in CPR skills was administered for collecting data on the level of CPR skills perceived by the study participant immediately after the practical sessions.

(d) Data collection during the post-test.

Data were collected two weeks after the training intervention at KCMC due to limited time. In this stage the assessment on retention of knowledge was done by administering questionnaire to the study participants. However, both the questionnaire and skills confidence checklist were used to assess the retention level for CPR knowledge and perceived skill confidence among nurses exposed to the training collection procedure

3.12Validity and reliability

The validity refers to how accurate a method or the instruments measure what is intended to measure (42). To ensure the validity of this research, a questionnaire was tested for criterion-related and content validity. On one hand of the content, validity was consider if the instruments (questionnaire, Likert scale questions, notes,) shall cover all aspects of the concepts measured by the study. Two day before the training questionnaires and teaching materials (handout, data show, and videotape) were presented to the Resuscitation experts available at KCMC.

Regarding, reliability the sample of eleven (11) registered nurses which are ten (10%) from Mawenzi regional referral hospital were recruited to pre-test the tool before the actual study but they were not included in a sample. The reliability of the tools (questionnaire and checklist) were administered to 11 registered nurses to assess the knowledge and self-perceived confidence in CPR skills at

Mawenzi hospital, before and after training. The data analyzed into the SPSS to calculate Cronbach alpha reliability test to establish the reliability of the tools whereby, the reliability coefficients of 0.7 or higher than 1 was accepted to measure the internal consistency of the tools. To pre-test the tools to ensure the instrument can bring accurate and reliable results to the study. However, the findings from the pre-test were used to make necessary adjustments for the improvement of the tool. Hence the same tool after adjustment for the pre-test conducted was administered to all participants and only the researcher participated in the data collection to ensure reliability.

3.13Data management and analysis plan

Data were sorted, coded, and entered into the IBM SPSS version 23. Descriptive statistics was used to describe means, standard deviations, and percentages from the demographic characteristics of the participants. A paired t-test was used to compare the difference between participants level of knowledge before training and immediately after two weeks on completion of training. Also, a one-way analysis of variance was used to compare the equality of score within the participants at various points of the study that is before CPR training, immediately after CPR training, and two-weeks following completion of CPR training to eliminate type I errors.

Perceived skills confidence in CPR is measured by Likert scales which are ordinal variable s with the non-normal distribution of data. Then, a nonparametric test (Wilcoxon sign rank test) was used to compare any change in score from the study participants before CPR training, immediately after CPR training, and two weeks after completion of CPR training. A Spearman rank correlation was used to measure the strength and direction of association between independent and dependent variables where the statistical significance for a p-value of < 0.05 was used as a cut-off point for the significant variable.

3.14Ethical consideration

Ethical clearance was obtained from the Institution Review Board at Directorate of Research and Publication of Muhimbili University of Health and Allied Science with a **Ref No DA.282298/O1.C/.** Also, permission latter from Kilimanjaro Christian Medical Centre referral hospital in the Kilimanjaro region to conduct the study was obtained. Participants were voluntarily provided with a written consent form upon receiving a clear explanation of the

objectives of the study from the principal investigator. The researcher explained the purpose, procedures, benefits, risks, as well as the right to decline or withdraw from the study to the clients at any stage without incurring any penalty. All data were coded and only a researcher access the data files locked in a safe cupboard and a key handled by the researcher. Data collection sessions was conducted in a Nursing laboratory where there was no disturbance to maintain privacy. Participants was reassured that all information will be treated with high secrecy by using anonymity numbers instead of names and remain within the purpose/objective of the study to maintain confidentiality.

3.15 Research dissemination plan

After this study, result will be submitted to Muhimbili University of Health and Allied Science, Muhimbili School of Nursing, Publication in peer review journal and MUHAS library. Finding will be disseminated to the executive director of Kilimanjaro Christian Medical Centre.

CHAPTER FOUR: RESULTS

4.1 Socio-demographic characteristics

Out of 101 of the study participants who participated in the study, the majority 80 (79.2%) were females. The mean age of study participants was 33.67 (SD ± 8.9) and 42.6% of participants aged from 20 to 29 years.

The majority of participants had diploma education (59.4%), also 23 (22.8%) study participants had certificate, 15 (14.9%) had bachelor degree and 1(1.0%) had master degree. Of 101, 37 (36.6%) had working experiences of more than 5 years.

Table 1: Socio-demographic characteristics of participants

Variable	Category	Frequency	Percent
Gender	Female	80	79.2
	Male	21	20.8
Age	20 to 29	43	42.6
	30 to 39	32	31.7
	40 to 49	19	18.8
	50 to 59	7	6.9
Education level	Certificate	23	22.8
	Diploma	60	59.4
	Advanced Diploma	2	2.0
	Bachelor's Degree	15	14.9
	Master’s Degree	1	1.0
Working Experience	Less than “1” year	15	14.9
	1 to 2 years	25	24.8
	3- 4 years	24	23.8
	More than “5” years	37	36.6
Current working ward	Medical ward	12	11.9
	Surgical ward	12	11.9
	Oncology	2	2.0
	ENT wards	4	4.0
	Obs. and Gyn.	14	13.9
	EMD	10	9.9
	Paediatric	13	12.9
	Dialysis	9	8.9
	Urology	7	6.9
	MOT	7	6.9
	Dermatology	4	4.0
	Eye department	7	6.9

4.2 Nurses knowledge of cardiopulmonary resuscitation before training

Out of 101 study participants, (45, 44.6%) knew the meaning of cardiopulmonary resuscitation and only a few (12, 11.9%) were knowledgeable about the correct sequence for Life Basic Support.

Of the 101 nurses, the majority (71, 70.3%) had adequate knowledge on the position of the victim during CPR and only a few (12.9%) nurses were aware of the first step in the sequence of CPR when performing Basic Life Support on the adult, child, or infant. Out of 101, 35 (34.7%) knew about two methods of opening the airway during CPR as they mentioned head-tilt-chin lift and jaw thrust, and further 33.7% of nurses recognized jaw thrust as the method of opening the airway if a cervical spine is suspected.

Moreover, about a half of (57, 56.4%) nurses knew about carotid artery which is usually used to feel for a pulse in the adult victim while a majority (69, 68.3%) of participants were familiar with three steps to check for a victim's breathing. Similarly, nearly a half (54, 53.5%) knew about the component of high-quality CPR. Likewise, half (50, 49.5%) of participants were aware of the rate of compressions per minute as specified in the 2015 American Heart Association guidelines. Also, 43.6% of nurses mentioned appropriate depth (at least 2 inches) of chest compressions when performing CPR on an adult. Of 101, 35 (34.7%) knew about how the chest compressions should be while performing CPR as they said hard and fast with as few interruptions as possible.

In addition, minority (27.7%) of nurses reported an early recognition as the first link in the adult chain of survival as well more than a half (63.4%) had an understanding on the precise ratio (30:2) of compression and breathing during 2 rescues CPR on an adult victim. Furthermore, the majority (73.3%) of nurses in this study had an understanding on the next step after performing 30 high-quality chest compressions on an adult victim that is to give two rescue breaths.

Of 101, a minority of (26.7%) nurses knew the conditions for when to stop CPR, and more than a half (65, 64.4%) were aware of all CPR main complications.

4.3 Nurses knowledge of CPR after training

Out of 101 nurses, a majority (77, 76.2%) knew the exact meaning of what cardiopulmonary resuscitation is, and 73.3% of them realized the correct sequence for the life basic support as stated compression, opening airway, and breathing.

Also, the majority (87, 87%) of study participants knew the appropriate position for a victim during CPR and most (72.3%) of participants had an understanding on the first step in the sequence of CPR i.e., checking the scene for safety when performing Basic Life Support on a victim.

Of 101 nurses, the majority (76,75.2%) knew about the methods to open airways during performing CPR, likewise most (87.1%) of them knew the jaw thrust method of opening the airway if a cervical spine is suspected. Out of 101 participants, many (96,95%) had well-known the carotid artery used to feel a pulse in the adult victim and most (90.1%) of them were familiar with the three steps for checking a victim's breathing as mentioned look, listen and feel. More than a half (68, 68%) of nurses were aware of the component of the high-quality CPR also 90% of nurses knew the accurate rate (100 to 120) of compressions per minute as specified in the 2015 American Heart Association guidelines. Similarly, many (93, 92.1%) recognized the correct depth (at least 2 inches) of chest compressions when perfuming CPR on an adult.

In addition, of 101 participants, the majority of 82 (81.2%) knew how to perform chest compressions in CPR as they stated it should be hard and fast with as few interruptions as possible. As well, (50.5%) of nurses recognized early recognition as the first link in the adult chain of survival. Furthermore, the majority (93.1%) were conversant about the ratio (30:2) of compression and breathing during 2 rescues CPR on an adult victim. Also, 93 (92.1%) nurses knew about giving two rescue breaths as the next step after performing 30 high-quality compressions on an adult victim. Less than a half (47.5%) of nurses had known the conditions on when to stop CPR and 88 (87.1%) knew the main complication of CPR.

4.4 Nurses knowledge of CPR two weeks after training

4.4.1 Nurses knowledge regarding meaning and positioning of patient before, after and two weeks after training

Out of 101 nurses who participated in this study, more than half (63, 62.4%) knew what cardiopulmonary resuscitation means, also about 44 (43.6%) knew the correct sequence for the life basic support. In addition, 71 (70.3%) nurses were aware of the appropriate position of a victim during CPR, and a few were able to know the first step in the sequence of CPR when performing Basic Life Support on a victim as only 30 (29.7%) nurses reported checking the scene for safety.

Of 101, more than half of participants knew the methods in opening the airway during CPR whereby 62 (61.4%) said head-tilt-chin lift and jaw thrust. Also, 64 (63.4%) knew the method of opening the airway in a victim if a cervical spine injury is suspected. Moreover, a majority (75, 74.3%) of nurses were able to mention the carotid type of artery used to feel a pulse in the adult victim

Table 2: Nurses knowledge before, after and two weeks after training

Category	**Responses**	**Before Training**		**After training**		**Two weeks After**	
		F	%	F	%	F	%
Meaning of CPR	Chest compression and head tilt-chin lift	22	21.8	8	7.9	9	9.8
	Combination of rescue breathing and open -air way	34	33.7	16	15.8	20	21.7
	Combination of chest compression and rescue breathing	45	44.6	77	76.2	63	68.5
The correct sequence for life basic support	Airway, Breathing, Compression	80	79.2	20	19.8	30	32.6
	Breathing, Airway, Compression	8	7.9	1	1.0	9	9.8
	Compression, Airway, Breathing	12	11.9	74	73.3	44	47.8
	Compression, Breathing, Airway	1	1.0	5	5.0	9	9.8
Position of victim during CPR	Supine position on relatively hard surfaces	71	70.3	87	86.1	71	77.2
	Sitting up a position with head aside	3	3.0	2	2.0	3	3.3
	Prone position	4	4.0	11	10.9	18	19.6
	Lateral position to prevent the patient from aspiration	22	21.8	87	86.1	71	77.2

4.4.2 Nurses knowledge regarding step for performing CPR before, after and two weeks after training

Moreover, majority 70 (69.3%) of nurses knew the three steps for checking a victim breathing i.e, look, listen, and feel. Less than a half (43.6%) knew the component of high-

quality CPR as they reported a chest compression rate of 100 to 120 per minute and allowing full chest re-call after each compression.

Out of 101 participants, 74 (73.3%) were aware of the rate of compressions per minute as specified in the 2015 American Heart Association guidelines. The majority (74.3%) also knew the correct depth (at least 2 inches) of chest compressions when performing CPR on an adult victim. About 56 (55.4%) nurses mentioned precisely how the chest compressions should be performed in CPR as they said hard and fast with as few interruptions as possible. Though, less than a half (43.6%) of participants recognized first link in the adult chain of survival. Most (73, 72.3%) of nurses knew accurately the compression and breathing ratio during 2 rescue CPR on an adult victim.

Similarly, more than a half (63, 62.4%) knew about giving two rescue breaths as the next step after performing 30 high-quality chest compressions on an adult victim, and only 42 (41.6%) nurses were familiar with conditions about when CPR should stop to a victim. Likewise, 58.4% of nurses had well-known the main complication of CPR.

Table 3: Nurses knowledge regarding step for performing CPR before, after and two weeks after training

First step on performing CPR Basic Life Support	Determine responsiveness	31	30.7	19	18.8	39	42.4
	Open the airway	44	43.6	5	5.0	14	15.2
	Check for breathing	13	12.9	4	4.0	9	9.8
	Checking the scene for safety	13	12.9	73	72.3	30	32.6
The airway is open by two methods	Head - tilt – chin lift	24	23.8	9	8.9	12	13.0
	Jaw thrust	26	25.7	9	8.9	14	15.2
	By oropharyngeal and nasopharyngeal method	16	15.8	7	6.9	4	4.3
	1 and 2 are correct	35	34.7	76	75.2	62	67.4
The artery is used to feel a pulse in the adult victim	Brachial artery	14	13.9	5	5.0	5	5.4
	Carotid artery	57	56.4	96	95.0	75	81.5
	Radial artery	26	25.7			10	10.9
	Popliteal artery	3	3.0			2	2.2
The three steps to check for a victim's breathing	Look, listen, and feel	69	68.3	91	90.1	70	76.1
	Feel, push and ventilate	8	7.9	4	4.0	3	3.3
	Listen, breathe, and exhale	9	8.9	6	5.9	14	15.2
	Look, listen and ventilate	14	13.9	91	90.1	5	5.4
Rate of compression per minute is as in	80 to 100	24	23.8	3	3.0	7	7.6
	100 to 120	50	49.5	90	89.1	74	80.4
	At least 100	18	17.8	7	6.9	9	9.8
	At least 120	6	5.9	3	3.0	2	2.2

the 2015 AHA guidelines							
Depth of chest compression in performing CPR in adult	½ inches	6	5.9	3	3.0	7	7.6
	Inch	29	28.7	93	92.1	9	9.8
	At least 2 inches	44	43.6	5	5.0	75	81.5
	At least 3 inches	20	19.8	3	3.0	1	1.1
Compression and breathing ratio in rescue 2 in adult	15:1	10	9.9	2	2.0	11	12.0
	15:2	17	16.8	94	93.1	56	60.9
	30:2	64	63.4	5	5.0	19	20.7
	30:1	9	8.9	2	2.0	5	5.4
The next step after performing 30 high-quality chest compressions in adult victim	Give two rescue breaths	74	73.3	93	92.1	63	68.5
	Continue with compression	3	3.0	2	2.0	5	5.4
	Activate the emergency response system	10	9.9	2	2.0	24	26.1
	Check for a pulse	14	13.9	4	4.0	63	68.5

4.5 Comparison of nurses' knowledge before and after training

Nurses' knowledge of CPR was tested before and after training to determine the effect of Cardiopulmonary Resuscitation Training on nurses' knowledge, also to evaluate if it has a significant association on improving nurses' knowledge of Cardiopulmonary Resuscitation. The paired samples t-test was conducted to test this hypothesis.

Table 3: T-Test of nurses' knowledge before and after training

			T-Test Differences					T	df.	Sig.
			Mean	Std. Dev.	Std. Error Mean	95% Confidence Interval of the Difference				
	Mean	Std. Dev.				Lower	Upper			
Knowledge score pre training	47.84	15.597								
Knowledge score post-training	83.08	11.453	-35.245	18.364	1.855	-38.927	-31.563	-18.999	97	.000

A t-test analysis was conducted to evaluate the effect of CPR training on nurses' knowledge scores. The results showed a significant increase in the nurses' knowledge score of CPR Before training (M = 47.84, SD = 15.5) to after the training (M = 83.08, SD = 11.4), t (97) =-18.999, p = 0.000. The mean increase in the knowledge scores was 35.245 with a 95% confidence interval ranging from -38.92 to -31.563, the eta squared statistic (.72) indicated

a large effect size. These findings reveal that CPR training had a positive effect on improving nurses' knowledge of performing CPR in their health care settings.

4.6 Comparison of nurses' knowledge post-training and Two weeks after training

The comparison of nurses' knowledge on CPR was tested immediately after training and two weeks after training to determine the retention of nurses' knowledge after they had attended Cardiopulmonary Resuscitation training. The paired samples t-test was conducted to analyse nurses' knowledge retention.

Table 4: T-Test of nurses' knowledge post-training and two weeks after training

			T-test Differences					T	df	Sig.
	Mean	Std. Dev.	Mean	Std. Dev.	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Knowledge score post training	83.19	11.532	18.697	21.798	2.311	14.105	23.289	8.092	88	.000
Knowledge score two weeks after training	64.49	17.556								

A t-test analysis was conducted to evaluate the nurses' retention of knowledge after two weeks of CPR training. The analysis results indicated a significant decrease in the nurses' knowledge score of CPR Post-training (M=83.19, SD=11.5) to Two weeks after Training (M =64.49, SD=17.5), t (88) = 8.092, p = 0.000. The mean decrease in the knowledge scores was 18.679 with a 95% confidence interval ranging from 14.105 to 23.289. The t-test findings revealed that nurses were less likely to retain the knowledge of CPR after sometimes since when CPR training was conducted.

4.7 Perceived skills confidence among nurses at KCMC

The analysis indicates that before training, the mean of the perceived skills confidence among nurses was (M) =3.195 SD± 0.897, implying moderate level of CPR skills confidence among nurses. After CPR training, the analysis shows that the mean of nurses' perceived skills confidence was (M) =4.166 SD±0.582, suggesting high level of CPR skills confidence among nurses at KCMC. The results of this study indicate positive effect of Cardiopulmonary Resuscitation training on improving nurses' perceived skills confidence from moderate before training to high after the training.

Two weeks post training, the mean of the perceived skills confidence was found to be (M) =4.042 SD±0.668 indicating high skills confidence among nurses.

Although, the analysis indicates a slight decrease in the perceived skills confidence when compared to post training. But it is sought to be higher as compared to pre training skills confidence score.

CHAPTER FIVE
DISCUSSION

5.1 Discussion

The study was carried out to assess the effect of cardiopulmonary resuscitation training on knowledge and perceived skills confidence among nurses at Kilimanjaro Christian Medical Centre (KCMC). Before CPR training, the knowledge score of nurses was low, and perceived skills confidence score was moderate however they increased significantly immediately after training and decreased two weeks after the intervention. Therefore, the null hypothesis of no change in the nurses' knowledge and perceived skills confidence of CPR after training was rejected at 0.05.

Nurse's level of knowledge on cardiopulmonary resuscitation before and after the training

The results of this study show a high effect of CPR training on improving nurses' knowledge for instance, it was found before training only 11.9% of nurses were familiar with the correct sequence for Life Basic Support but immediate after training 73.3% of nurses realized the correct sequence for the life basic support as they specified compression, airway, and breathing. This is in agreement with a study in Mozambique which showed that self-efficacy on CPR increased significantly immediately after the intervention (14), also similar to studies conducted among nursing students in Thailand and Jordan (43,44).The studies are similar in terms of study setting and methodological approach; however, the study population is different as this study involved participant with had no previous working experience.

In this study, the mean knowledge score among nurses before training was 47.84 (SD=15.5). Then with similar methodological approaches, average score in our study was lower than in Uganda where the average score before instruction was 53.8 and after training, it increased significantly to 83.08 (SD=11.4) a little high than in Uganda that was 82.5 (23). This finding validates a positive and great effect of CPR training in increasing nurses' knowledge. Though two weeks after training knowledge deteriorated to 64.49 (SD=17.5). In similarity with a study in Botswana that registered nurses' CPR knowledge and skills improved after training, but deteriorated over the three months until the post-test was conducted (12). Two studies

conducted in Botswana revealed that health provider retain knowledge and skills for 3 months after training, in contrast with the present study deterioration of knowledge occur within 2 weeks.

The results of this study confirm the deterioration of nurses' knowledge sometimes after training thereof proposing effective improvement of educational or training programs for imparting knowledge on CPR. Since nurses should have adequate CPR knowledge and skills to be able to implement effective interventions in cardiac arrest situations.

Self-perceived confidence skills on cardiopulmonary resuscitation before and after training

The study also shows an increase in perceived skills confidence from moderate before training to higher after training. Though, two weeks after training, it remained high but slightly lower when compared to immediately post-training. Similar to a study in Uganda where the gain in skills ranged from 14.0 points to 74.1 points before and after training (23). The results of this study suggest a great gain in knowledge of CPR (t =-18.99) from 47% to 83% when compared to skills confidence gain from moderate to high before and after training. The studies are similar in terms of study setting and methodological approach; however, the sample size of the study is different as **this** study involved larger sample size compared to **this** study.

Study limitation and mitigation

The targeted population obtained pre and post-test training done, a few limitations of this study should be acknowledged. First, the study conducted in one consultant hospital out of four consultant hospitals in Tanzania among because this study was conducted at a single hospital, therefore, the result cannot be generalized to other nurses working in other consultant hospitals. Thus, other multicenter studies with larger sample sizes are required to ascertain the validity. Second, the study results might be biased because participants' self-rating may sometimes not give the actual skills. The retention of knowledge and perceived skills confidence was supposed to be assessed one month after training because of limited time; assessment was done two weeks after training.

CHAPTER SIX

6.1 Conclusion

Nurses in KCMC had an inadequate CPR knowledge and moderate perceived skills confidence at pre-assessment, which could have negatively impacted CPR performance. This was mainly contributed with the only few participants knew about the first step in the sequence of CPR when performing Basic Life Support on the adult, child, or infant; methods of opening the airway during CPR as they mentioned head-tilt-chin lift; chest compressions should be done while performing CPR and jaw thrust as the method of opening the airway.

Moreover, the study revealed statistically a significant improvement in both knowledge and perceived skills confidence of CPR for nurses post training. This is mainly contributed to changes in familiarity of the participant on the rate of compressions per minute, compressions should be performed in CPR, participants recognized first link in the adult chain of survival, rescue breaths as the next step after performing 30 high-quality chest compressions on an adult victim, familiar with conditions about when CPR should stop on a victim and the main complication of CPR. Therefore, effective CPR regular training needs to be instituted in KCMC to ensure continuous training and practice for the nurses to acquire competency and maintain the knowledge and skills

6.2. Recommendation

The finding of the present study has some implications on nursing practice, nursing education, and research

Nursing practice

The main implications of the present study are that nurse's knowledge about CPR is inadequate, without specific training or on-the-job training, lack of facilities and resources to maintain knowledge and skills would affect the chance of patient survival in cardiac arrest situations.

Nursing education

i. Cardiopulmonary resuscitation to be included in the curriculum of the nursing program.

Nursing Practice

i. Sensitization on review of AHA guideline on CPR in a hospital setting
ii. From this finding, nurses who are working in KCMC consultant hospital need to be provided with on-job training to update knowledge and skills about CPR for the benefit of cardiac arrest patients.
iii. All nurses are likely to experience cardiac arrest patients regardless of their level of education, experience, and area of work, should periodically update their knowledge and skills about CPR.

Nursing research

i. Need for further research based on experimental study with a larger sample size to determine the effectiveness of CPR training on Nurses CPR knowledge and skills.
ii. Study to assess at which point knowledge is retained after training.

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APPENDICES

Appendix I: Questionnaire (English version)

NAME OF THE STUDY: **Effect of Cardiopulmonary Resuscitation Training on Knowledge and Perceived Skills Confidence among Nurses at Kilimanjaro Christian Medical Centre, Kilimanjaro, Tanzania**

This survey questionnaire is a part of the research study on the Effect of cardiopulmonary resuscitation training on nurse's knowledge and self-perceived confidence skills at Kilimanjaro Christian Medical Centre, Kilimanjaro, Tanzania. The survey is completely anonymous, protected by data privacy and confidentiality.

SECTION I

Respondent ID No: _____

Social demographic data

1. Age ……..
2. Sex …….
3. Which ward are you currently working in?
    i. Medical wards
    ii. Surgical wards
    iii. Obstetric and Gynecology
    iv. Others (Specify)……
5. Level of nursing education
    i. Certificate
    ii. Diploma
    iii. Advanced Diploma
    iv. Bachelor's degree
    v. Master's degree.

6. What is your working experience?

i. Less than “1” year

ii. 1 to 2 years

iii. 3- 4 years

iv. 5 years and above

Section II

Knowledge of cardiopulmonary resuscitation (*Please Circle the most correct answer*)

7. What is cardiopulmonary resuscitation mean

i. Chest compression and **heard** tilt—chin lift

ii. Combination of rescue breathing and open airway

iii. Combination of chest compression and rescue breathing

iv. Cardiac arrest

8. The correct sequence for the life basic support is

v. Airway, Breathing, Compression

ii. Breathing, Airway, Compression

vi. Compression, Airway, Breathing

7 What is the position of the victim during CPR

i. **Supine** position on relatively hard surfaces

ii. Sitting up a position with head aside

iii. Prone position

iv. Lateral position as the lateral position will prevent the patient from aspiration

8 When performing Basic Life Support on the adult, child, or infant, the first step in the sequence of CPR is to:

i. Determine responsiveness

ii. Open the airway

iii. Check for breathing

Checking the scene for safety

10 The airway is open by two methods.

i. Head - tilt – chin lift

ii. Jaw thrust

iii. By oropharyngeal and nasopharyngeal method

iv. A and B are correct

11If a cervical spine injury is suspected, which method of opening the airway should be used?

i. Head - tilt – chin lift

ii. Jaw thrust

iii. Heimlich method

iv. Abdominal thrust

12Which artery is usually used to feel for a pulse in the adult victim?

i. Brachial artery

ii. Carotid artery

iii. Radial artery

iv. Popliteal artery

13 What are the three steps to check for a victim's breathing?

i. Look, listen, and feel

ii. Feel, push and ventilate

iii. Listen, breathe, and exhale

iv. Look, listen and ventilate

14 Which of the following are the component of the high quality CPR

i. Chest compression rate of 100 to 120 per minutes

ii. Allow full chest recall after each compression

iii. Early recognition of cardiac arrest

iv. (i) and (ii) are correct.

15 What the rate of compressions per minute is as specified in the 2015 American Heart Association guidelines?

i. 80 to 100

ii. 100 to 120

iii. At least 100

iv. At least 120

16 How deep is should chest compressions be when perfuming CPR on an adult

i. ½ inches

ii. Inch

iii. At least 2 inches

iv. At least 3 inches

17 While performing CPR your chest compressions should be

i. A gentle and slow

ii. Hard and fast with as few interruptions as possible

iii. Gently but fast

iv. Slow with frequent interruptions to check for a pulse

18What is the first link in the adult chain of survival?

i. Prevent heart disease

ii. Early CPR

iii. Avoiding tobacco use

iv. Early recognition

19 During 2 rescue CPR on an adult victim, what is the compression and breathing ratio

i.15:1

ii.15:2

iii.30:2

iv.30:1

20 After performing 30 high-quality chest compressions on an adult victim, the next step is to?

i. Give two rescue breaths

ii. Continue with compression

iii. Activate the emergency response system

iv. Check for a pulse

21 When to stop CPR

i. When the person is revived and starts breathing on their own

ii. When the rescuer becomes exhausted

iii. A and B are correct

iv. iv.None of the above

22 What is the main complication of CPR?

i. Ribs fracture

ii. Lung injuries such as pneumothorax

iii. Lung contusion

iv. iv.All of the above

Appendix 11.Self-perceived skills confidence Evaluation checklist.

Read each statement and then select the response that best indicates your level of confidence in particular CPR skills.

VARRIABLE	1 = very low	2 low	3 = moderate	4 = high	5 = very high
Recognition					
Verify if a victim is either responsive or unresponsive?					
Identify the presence and absence of carotid pulse to patients					
Chest compression					
Interlock the fingers of both hands together.					
Perform 100 to 120 compressions per minute					
Open the airway					
O`1pen the person's airway using the head-tilt, chin-lift maneuver					
Open the person's airway by jaw thrust maneuver					
Insert an oral pharyngeal to prevent airway occlusion whe the patient is in the spine					
Breathing					
Give 2 rescue breathing after 30 chest compression					

Appendix II: Informed consent form for KCMC nurses (English Version)

ID. NO

CONSENT FORM FOR PARTICIPATING IN A RESEARCH STUDY

Hello, Greetings! My name is **Salome Joseph** I am studying for a Master of Science in Critical care and Trauma at the Muhimbili University of Health and Allied Sciences (MUHAS). I am researching the **"effect of cardiopulmonary resuscitation training on nurse's knowledge and self-perceived skills confidence during cardiac arrest at Kilimanjaro Christian Medical Centre, Kilimanjaro, Tanzania"**.

The aim of the Study

This study aims to assess the effect of cardiopulmonary resuscitation training on nurse's knowledge and self-perceived skills confidence during cardiac arrest at Kilimanjaro Christian Medical Centre.

Procedure

I would like you to participate in this study. You are selected because you are directly responsible for the subject matter of this study.The questionnaire will be given to you and self perceived skills confidence checklist to evaluate your CPR performance, privacy will be maintained as much as possible. If you have questions about this research, including questions about your participation, please do not hesitate to ask or contact the research team at any time.

Confidentiality

All information and issues relating to your participation in the study will be treated confidential, to protect confidentiality, your names will not be used in the written questionnaire instead number will be used.

Right to refuse or withdraw

It is your choice to participate in this study and it is your right to withdraw at any time you feel you're not ready to continue. I encourage you to participate because your views are very important in this study.

Benefits

There are no direct benefits to you from being in the study, however, your participation in this study will provide useful knowledge and skill in CPR which will hence improve cardiac arrest

patients' outcomes. Having knowledge and skills in CPR it will prevent and reduce the number of unexpected death.

Risks

There will be no harm to you as a result of participation in this study.

Whom to Contact

In case of any inquiry please contact the principal investigator, **Miss Salome Joseph** from MUHAS, P. O. BOX 65001, Dar es Salaam, mobile number **0652949330** if you ever have questions about this study you may call, the Chairperson of the (Research and Publications Committee, MUHAS. P.O. Box 65001, Dar es Salaam-Tanzania **255 0222151596**.

I …….... have read the contents of this form and understand. My questions have been answered. I agree to participate in this study.

Signature of participant…… Date…….

Signature of researcher/research assistant …….

Appendix iii: Ethical clearance

UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

OFFICE OF THE DIRECTOR - RESEARCH AND PUBLICATIONS

Ref. No.DA.282/298/01.C/ Date: 21/05/2021

MUHAS-REC-05-2021-620

Salome Joseph,
MSc. in Critical Care and Trauma,
School of Nursing
MUHAS

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: Effect of Cardiopulmonary Resuscitation Training on Knowledge and Perceived Skills Confidence among Nurses at Kilimanjaro Christian Medical Centre, Kilimanjaro, Tanzania

Reference is made to the above heading.

I am pleased to inform you that the Chairman has on behalf of the University Senate, approved ethical clearance of the above-mentioned study, on recommendations of the Senate Research and Publications Committee meeting accordance with MUHAS research policy and Tanzania regulations governing human and animal subjects research.

APPROVAL DATE: 21/05/2021
EXPIRATION DATE OF APPROVAL: 20/05/2022

STUDY DESCRIPTION:
Purpose:
The purpose of this quasi experimental study is to assess the effect of cardiopulmonary resuscitation training on knowledge and perceived skills confidence among nurses at Kilimanjaro Christian Medical Centre.

The approved protocol and procedures for this study is attached and stamped with this letter, and can be found in the link provided: https://irb.muhas.ac.tz/storage/Certificates/Certificate%20-%20601.pdf and in the MUHAS archives.

The PI is required to:

1. Submit bi-annual progress reports and final report upon completion of the study.
2. Report to the IRB any unanticipated problem involving risks to subjects or others including adverse events where applicable.
3. Apply for renewal of approval of ethical clearance one (1) month prior its expiration if the study is not completed at the end of this ethical approval. You may not continue with any research activity beyond the expiration date without the approval of the IRB. Failure to receive approval for continuation before the expiration date will result in automatic termination of the approval for this study on the expiration date.
4. Obtain IRB amendment (s) approval for any changes to any aspect of this study before they can be implemented.
5. Data security is ultimately the responsibility of the investigator.
6. Apply for and obtain data transfer agreement (DTA) from NIMR if data will be transferred to a foreign country.
7. Apply for and obtain material transfer agreement (MTA) from NIMR, if research materials (samples) will be shipped to a foreign country,
8. Any researcher, who contravenes or fail to comply with these conditions, shall be guilty of an offence and shall be liable on conviction to a fine as per NIMR Act No. 23 of 1979, PART III section 10 (2)
9. The PI is required to ensure that the findings of the study are disseminated to relevant stake holders.
10. PI is required to be versed with necessary laws and regulatory policies that govern research in Tanzania. Some guidance is available on our website https://drp.muhas.ac.tz/.

Dr. Bruno Sunguya
Chairman, MUHAS Research and Ethics Committee

Muhimbili University of Health and Allied Sciences
DIRECTOR
Research & Publications
Box 65001

9 United Nations Road; Upanga West; P.O. Box 65001, Dar Es Salaam: Tel. G/Line: +255-22-2150302/6; Ext. 1038; Direct Line:+255-22-2152489;Telefax:+255-22-2152489;E-mail:drp@muhas.ac.tz;Web:https://www.muhas.ac.tz

Appendix iv: Permission letter

K.C.M.C

KILIMANJARO CHRISTIAN MEDICAL CENTRE

An institution of the Good Samaritan Foundation

P. O. Box 3010, Moshi, Tanzania
Tel: 255-027-2754377/ 80Fax: 255-027-2754381

Email: kcmcadmin@kcmc.ac.tz Website: http://www.kcmc.ac.tz

Our Ref NO: KCMC/ P.I/VOL.XII/ 251 26.05.2021

Miss. Salome Joseph,
P.O.BOX 3010,
MOSHI.

RE: PERMISSION TO CONDUCT RESEARCH AT OUR ISTITUTION.

In reference to the above.

I would like to inform you that, permission is hereby granted for you to conduct research titled "**Effect of cardiopulmonary resuscitation training on knowledge and perceived skills confidence among nurses at Kilimanjaro Christian Centre, Tanzania** as from May 26th, 2021.

However, you may note in advance that during your study at KCMC you should observe medical ethics, procedures, rules and regulations that stipulated at our facility andthen you should to bring a copy of your study report after completion study to the particular department / unit.

You are warmly welcome!

KILIMANJARO CHRISTIAN MEDICAL CENTRE
An Institution of Good Samaritan Foundation
K.C.M.C.
P. O. Box 3010
MOSHI TANZANIA

Hilda siwale
FOR: EXECUTIVE DIRECTOR

Copy: Director of Nursing Services

Appendix v: Introduction letter

UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR – POSTGRADUATE STUDIES

Ref. No. HD/MUH/T.505/2019

25th May, 2021

EXECUTIVE DIRECTOR,
KCMC,
P.O BOX 3010,
MOSHI-TANZANIA.

Re: INTRODUCTION LETTER

The bearer of this letter is Salome Joseph (HD/MUH/T.505/2019), a student at Muhimbili University of Health and Allied Sciences (MUHAS) pursuing MSc. In Critical Care and Trauma.

As part of her studies she intends to do a study titled: **"EFFECT OF CARDIOPULMONARY RESUSCITATION TRAINING ON KNOWLEDGE AND PERCEIVED SKILLS CONFIDENCE AMONG NURSES AT KILIMANJARO CHRISTIAN MEDICAL CENTRE, KILIMANJARO, TANZANIA".**

The research has been approved by the Chairman of University Senate.

Kindly provide her with the necessary assistance to facilitate the conduct of her research.

We thank you for your cooperation.

Ms. Victoria Mwanilwa
For: DIRECTOR, POSTGRADUATE STUDIES

cc: Dean, School of Nursing, **MUHAS**
cc: Salome Joseph

9 United Nations Road; Upanga West; P.O. Box 65001, Dar Es Salaam: Tel. G/Line: +255-22-2150302/6; Ext. 1015; Direct Line:+255-22-2151378;Telefax:+255-22-2150465;E-mail:dpgs@muhas.ac.tz;Web:https://www.muhas.ac.tz

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