EVALUATION OF NEONATAL RESUSCITATION PRACTICE AND ASSOCIATED FACTORS AMONG NURSES IN DELIVERY SUITES AT REGIONAL REFERRAL HOSPITALS IN RUVUMA.

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EVALUATION OF NEONATAL RESUSCITATION PRACTICE AND ASSOCIATED FACTORS AMONG NURSES IN DELIVERY SUITES AT REGIONAL REFERRAL HOSPITALS IN RUVUMA.

By

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A Dissertation Submitted in (Partial) Fulfilment of the Requirement for the Degree of Master of Medicine (Anaesthesiology) of the Muhimbili University of Health and Allied Sciences.

October, 2024

CERTIFICATION

The undersigned verify to have read and thus approve the acceptance by Muhimbili University of Health and Allied Sciences, a dissertation titled **"EVALUATION OF NEONATAL RESUSCITATION PRACTICE AND ASSOCIATED FACTORS AMONG NURSES IN THE DELIVERY SUITES AT REGIONAL REFFERAL HOSPITALS IN RUVUMA"** in (partial) fulfillment of the requirements for the degree of master of medicine (Anaesthesiology) of the Muhimbili University of Health and Allied Sciences.

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Date

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I, Felix Paul Amani, testify that the dissertation is my original work and has not been or will not be presented to any other university for a comparable or different degree award.

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DEDICATION

The dissertation is devoted to all medical professionals who work in delivery rooms with tremendous enthusiasm in order to ensure the survival of the babies.

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LIST OF ABBREVIATIONS

AAP	American Academy of Pediatrics
AHA	American Heart Association
BA	Birth Asphyxia
BEmONC	Basic Emergency Obstetric and Newborn Care
BMV	Bag and Mask Ventilation
EmONC	Emergency Obstetric and Newborn Care
HBB	Helping Babies Breathe
HCPs	Health Care Providers
MDGs	Millennium Development Goals
MUHAS	Muhimbili University of Health and Allied Sciences
NICU	Neonatal Intensive Care Unit
NR	Neonatal Resuscitation
RRHs	Regional Referral Hospitals
SDG	Sustainable Development Goals
SPSS	Statistical Package for Social Sciences

DEFINITIONS OF TERMS

Neonatal Resuscitation (NR):

Consists of supportive services provided to a newborn after delivery to aid with the initiation of breathing and blood circulation. For neonates who are unable to establish and maintain spontaneous breathing at birth, certain supporting treatments are necessary. Initial stabilization involves keeping the baby warm, and dry, and cleaning the airway. Additional steps include administering ventilation and chest compression (1).

Birth Asphyxia (BA):

Is a phenomenon when the newborn baby fails to receive adequate oxygen before, during, or immediately after delivery, depriving the brain and other essential organs of oxygen. All of these result from the inability of newborns to begin and maintain spontaneous breathing (1).

ABSTRACT

Background: Birth asphyxia is a leading cause of early newborn mortality in resource-limited countries. Despite interventions, many sub-Saharan African countries still experience neonatal deaths due to inadequate resuscitation skills among health care providers. Timely and adequately performed resuscitation can prevent more neonatal deaths resulting from birth asphyxia.

Aim: The study evaluated neonatal resuscitation practices and associated factors among nurses working in delivery rooms with the aim of identifying gaps and develop interventions to reduce morbidity and mortality due to birth asphyxia, ultimately improving neonatal care.

Methodology: A cross-sectional study was performed in two regional referral hospitals in Ruvuma. A total of 60 nurses working in delivery suites were conveniently sampled. Neonatal resuscitation practice was first assessed on a newborn mannequin, followed by assessment of knowledge level using a standard observation checklist and self-administered questionnaires respectively.

Proportion was used to grade knowledge level and quality of resuscitation practice. Fisher's exact test and logistic regression analyses were used to measure the association between variables with level of significance considered at *p*-value < 0.05 and 95% confidence intervals.

Results: Out of 60 nurses evaluated for neonatal resuscitation practice, only 7(11.7%) had adequate resuscitation practice. Availability of essential equipment (AOR=18.26; CI: 1.92-174.01; P=0.012) and formal training (AOR = 7.35; CI: 1.00-53.82; p=0.05) were strong predictors of adequate newborn resuscitation practice.

Conclusion and recommendations: The study revealed that nurses' newborn resuscitation practice is inadequate, with the availability of appropriate equipment and formal training being key predictors of adequate practice. To improve skills, regular refresher trainings and supportive supervision are needed, along with adequate equipment accessibility.

CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND

There were approximately 2.4 million newborn deaths globally reported by WHO in 2019 (2), nearly three-quarters of which occurred in developing countries (3,4). According to further reports, neonatal mortality accounted for over 47% of all deaths in children under the age of five, with about a third dying on their first day of life and nearly three quarters dying during their first week (1). Birth asphyxia is reported to be the primary cause of early newborn mortality. According to studies, up to one million newborns every year die and four million suffer from birth asphyxia (5,6). Recent reports in Tanzania have shown that the newborn mortality rate is 21 deaths per 1,000 live births, with the majority of them being due to birth asphyxia (7,8). Many of these deaths could be avoided by the application of low-cost interventions and their effective delivery during neonatal resuscitation (8).

Significant physiological changes occur during delivery as the newborn transits from the intrauterine to the extrauterine environment. Most newborn babies successfully make a transition upon birth without needing special support (9). However, some newborns will require extra intervention, including immediate resuscitation in the delivery room. If appropriate resuscitation is not provided to neonates with birth asphyxia, they are likely to die of hypoxia (10). Neonatal resuscitation that is carried out correctly will aid the infants in starting and maintaining breathing, avoiding hypoxic organ damage and neonatal mortality (11). Neonatal resuscitation includes supportive services performed post-delivery to aid a baby initiate breathing and maintain circulation, which will ultimately prevent morbidity and mortality caused by hypoxia to vital organs (10).

Standard guidelines are available and widely utilized to steer the neonatal resuscitation practice of health care providers (HCP). Similar guidelines are employed in training programs for neonatal resuscitation. These guidelines include, 2020 American Heart Association which is comprehensive with a component of neonatal resuscitation that

needs advanced measures with expertise and the Helping Babies Breathe (HBB) guideline for basic neonatal resuscitation designed for use in resource limited countries. These guidelines provide a similar approach towards neonatal resuscitation, aiming to facilitate smooth transition of the newborn baby after delivery. They underline that the most crucial stage in ensuring that a baby survives after birth is to create enough lung inflation as demonstrated by chest rise, which calls for the presence of trained staff who have enough resources to perform positive pressure ventilation (PPV). Maintaining warmth and circulatory function are other factors. These guidelines serve as visual cognitive aids for NR since they provide stepwise interventions for resuscitating neonates (10)(11).

Several efforts to reduce under-five mortality across the globe have been put forth such as the Millennium Development Goal number 4 (MDG4) which targeted the decrease in mortality rate among under-fives by two-thirds between 1990 and 2015. These strategies are being hindered by a disproportionately high rate of neonatal deaths. Nearly a quarter of these neonatal deaths are due to birth asphyxia (12). Studies have shown that effective neonatal resuscitation delivered by skilled and knowledgeable HCPs can significantly reduce neonatal mortality rates (13–15). To accomplish the projected Sustainable Development Goals (SDG) of reducing newborn mortality to 12 per 1,000 live births by 2030, knowledge and expertise in NR are thus crucial (19).

Several quality improvement initiatives have been used by Tanzania's Ministry of Health (MoH) to help the country meet its SDG and MDG goals. Among the strategies was the Basic Emergency Obstetric and Newborn Care (BEmONC), whereby HCPs were trained on BEmONC, received supportive supervision, and were given access to necessary resuscitation equipment like bag-and-mask and suction devices (20). A simulation-based training for Helping Babies Breathe (HBB) created by the American Academy of Pediatrics (AAP) to equip HCPs in developing countries with skills in NR and newborn care is an initiative done for the same reasons (15).

The teaching of NR to trainees has also been guided by a number of NR trainings that have been conducted in various health facilities around the nation to date. For instance, HBB has expedited the delivery of necessary resuscitation equipment to healthcare

facilities, albeit the facilities themselves are still in charge of replenishing and maintaining the equipment. Additionally, in-house training is being conducted to increase skill retention and teach new personnel in addition to supporting supervisions from the MoH and refresher seminars on HBB for health care providers. However, the situation is still challenging in most facilities (22).

1.2 PROBLEM STATEMENT

Global initiatives like the Sustainable Development Goals (SDG), which aim to reduce neonatal mortality to 12 per 1,000 live births by 2030, and the Millennium Development Goal number four (MDG4), which focused on reducing the under-five mortality rate by nearly two-thirds between 1990 and 2015, are still not fully implemented, particularly in low- and middle-income countries (16). In Tanzania, population-based surveys have indicated that neonatal mortality ranged between 26 and 40 deaths per 1000 live births during the last three decades which is still above MDG4 and SDGs average target, with wide variations between regions (17). In the southern regions of Tanzania, neonatal mortality is the leading cause of death among under-fives. It is estimated to be 43 per 1000 live births and is higher than in other parts (18). Preterm delivery, infection, and birth asphyxia (BA) have been reported as three main causes of neonatal deaths, and approximately one-third of all newborn deaths are caused by birth asphyxia (6,7,17).

Neonatal resuscitation is an essential intervention that can avert most neonatal deaths and other morbidities such as long-term neurological deficits caused by birth asphyxia (9). However, the majority of studies done in the country have revealed that most neonatal deaths are due to poor practice of neonatal resuscitation among HCPs.

Staff working in delivery suites in Tanzania receive training on neonatal resuscitation through HBB and BEmONC programs as a component of their professional education and refresher on-job seminars to improve their skills retention on NR (19). However, knowledge level and retention of skills are still a challenge in most HCPs in Tanzania (7,20). The few studies done mostly in rural areas to assess the practice of NR have revealed diversity in knowledge and practice depending on working facility, professional/qualification, training, experience, and equipment availability (21).

This study therefore aimed to determine the current neonatal resuscitation practices of nurses working in the labour wards and obstetric theatres in two regional referral hospitals in Tanzania and to identify their associated factors.

1.3 CONCEPTUAL FRAMEWORK.

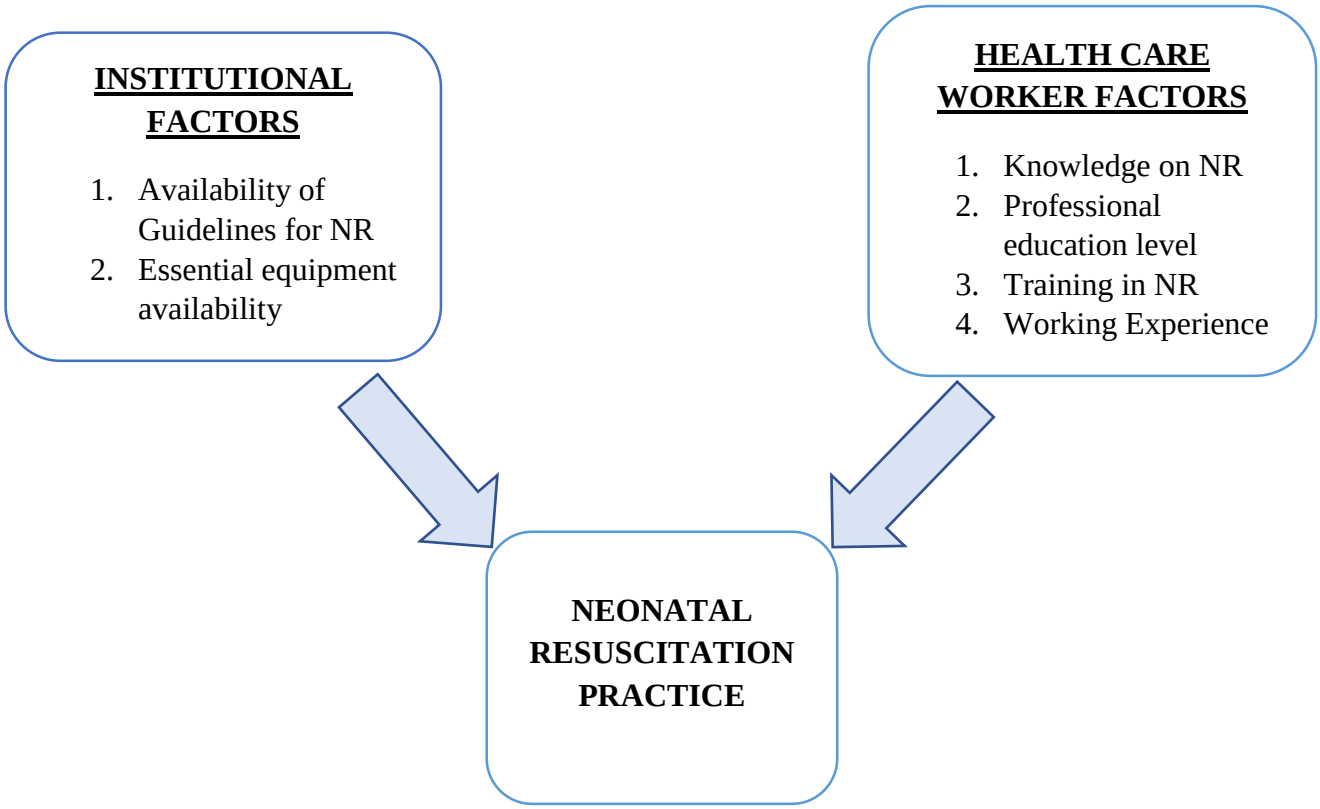


Figure 1**: Conceptual Framework**

SOURCE: Conceptualized by investigator.

EXPLANATION OF CONCEPTUAL FRAMEWORK

The study's goal was to assess how neonatal resuscitation is currently practiced and the related parameters among nurses who work in delivery areas. This conceptual framework highlights the items that may influence the conduct of resuscitating newborns which are: the provider's knowledge of neonatal resuscitation, neonatal resuscitation training, level of professional education, essential equipment availability, and the utilization of available guidelines for newborn resuscitation (7,22,23).

1.4 RATIONALE

When provided appropriately and adequately, neonatal resuscitation leads to desirable outcomes, but its failure results in increased complications of birth asphyxia, including permanent cognitive disabilities and neonatal mortality. There is a need to find effective measures on how to reduce the factors affecting knowledge and practice of helping babies breathe.

This study's findings would help to determine the current neonatal resuscitation practices among nurses working in the delivery areas in two regional referral hospitals in Ruvuma-Tanzania and identify the factors associated with the practice.

Furthermore, would provide information for implementation of appropriate focused interventions to enhance quality neonatal resuscitation practice and to give a room for conducting further studies in the same subject.

1.5 RESEARCH QUESTIONS

1. What is the current practice of neonatal resuscitation among nurses working in the delivery suites at Regional Referral Hospitals (RRH) in Ruvuma?
2. What are the factors influencing the practice of neonatal resuscitation among nurses working in the delivery suites at Regional Referral Hospitals (RRH) in Ruvuma?

1.6 OBJECTIVES

1.6.1 Broad objective

To evaluate the current practice of neonatal resuscitation and associated factors among nurses working in the delivery suites at RRHs in Ruvuma.

1.6.2 Specific objectives

1. To evaluate the practice of neonatal resuscitation among nurses working in the delivery suites at RRHs in Ruvuma from 1st September to 30th November 2023.
2. To determine the factors associated with the practice of neonatal resuscitation among nurses working in the delivery suits at RRHs in Ruvuma from 1st September to 30th November 2023.

CHAPTER TWO

2.0 REVIEW OF LITERATURE

2.1 Study Overview

Several studies have revealed that the greater number of neonatal morbidity and mortality is due to birth asphyxia, and neonatal resuscitation is still a big challenge among nurses (10,24). The majority of the preventable neonatal deaths in developing countries have been attributed to poor skills in neonatal resuscitation, and a significant difference in knowledge level on NR exists among nurses in the delivery suites in sub-Saharan Africa (24). The reported challenges during resuscitation include failure to quickly identify newborns requiring help, failure to use heart rate as a clinical sign to guide decision making, failure to initiate early rescue breaths within the first minute of life, the so-called “golden minute”, and failure of subsequent effective ventilation and chest compressions (21). Other studies have shown that equipment availability, knowledge and skills, appropriate training, and positive attitude contribute significantly to the reduction in neonatal morbidity and mortality (16,25).

2.2 Neonatal Resuscitation Practice

Anticipation and appropriate preparation are essential for successful neonatal resuscitation outcomes. As part of preparation, it is important to assess for perinatal risks that may help predict a newborn requiring resuscitation after birth. It is also crucial to have appropriate equipment sizes and proper teamwork with good communication (10,24).

Immediately after birth, an attending nurse should do a quick assessment of the baby to ascertain the need for special assistance. The newborn's color, breathing/crying, heart rate, movement, and grimace are all evaluated (10,24). The baby must be kept warm and dry, stimulated and repositioned, the airway must be opened, ventilation is necessary, and chest compression may be necessary during neonatal resuscitation. The first minute of life, or the so-called "golden minute," must be used to complete the early steps of assessment up to the giving of rescue breaths (ventilation) (24).

For many years, the American Academy of Pediatrics (AAP) has been running programs and updating guidelines on neonatal resuscitation that are used around the world and have led to significant improvements in the practice (26). Nevertheless, the NR practice is still a big challenge in most parts of the world. One cross-sectional study done in India among nurses from labour room and neonatal intensive care units (NICU) showed that the majority of nurses had poor NR practice regardless of the training given (27).

A multicenter cross-sectional electronic survey done in Europe to evaluate the policies and practices about neonatal resuscitation in a large sample of European hospitals using a 91-item questionnaire focusing on the current delivery room practices in neonatal resuscitation, identified a large variance in the practice of NR that needs resource allocation to be reconsidered in addressing the variation (28).

Another cross-sectional study conducted in Poland used an 11-question survey of current neonatal resuscitation practices in neonatal units to determine the factors, relevant to improving practices in this area. The survey showed variations in the practice being more inadequate for some centers that may impact the neonatal outcome and advised new educational programs to be implemented to address the issue (29).

An institutional-based cross-section study carried out in Northeast Ethiopia among nurses and midwives in public health facilities showed poor practice regarding immediate newborn care among participants, with nurses in hospitals being more skillful than those in health centers (31).

Another cross-sectional study done in Kenya to assess the HCPs practice and outcome of resuscitated newborn babies with birth asphyxia in general, showed an inadequacy in the practice of NR. Results showed that only 40% of the newborns had their airways suctioned correctly and in 17% the head was incorrectly positioned. All newborns who failed to respond to stimulation were provided with supportive ventilation breaths although, 54.6% of breaths were initiated within the first minute (32). Similarly, another cross-sectional study conducted in Kenya to assess neonatal resuscitation practice among nurses using an observational checklist found more than half (59%) of respondents did not comply with the standard practice. (25).

Cross-sectional health facility surveys done to assess improvement in newborn care and resuscitation after a quality improvement program in Tanzania reported poor practice of provider skills of neonatal resuscitation that was assessed using simulated clinical examinations using newborn mannequins (19). Yet another analytical cross-sectional study done in two regions in the Lake Zone on factors that influence knowledge and practice of newborn resuscitation among skilled birth attendants in rural areas revealed that the practice was high for birth attendants working in hospitals (59.4%) compared to those working in the health centers and only working facility, experience in the labor ward and availability of equipment significantly influenced the practice (21). The length of working experience of nurses has been shown to significantly influence the correct practice of NR. This was highlighted by a cross-sectional study conducted in seven districts of the Dodoma region. It concluded that nurses with working experience of five years and above-performed skills (53.2%) more correctly than those with less than five years of working experience (10.5%) (33).

2.3 Factors influencing neonatal resuscitation practice.

2.3.1 Provider's knowledge on neonatal resuscitation

Among the effective measures to prevent neonatal mortality due to birth asphyxia is to have nursing staff in delivery suites with appropriate NR skills (34). Good knowledge has been shown to positively influence NR skills among nurses. An observational cross-sectional study conducted in Eastern Ethiopia that assessed providers' skills retention of basic neonatal resuscitation showed a significant association between good knowledge level and skills retention (AOR, 3.31 [95% CI: 1.41, 7.73] p = 0.006). Providers possessing adequate knowledge levels were three times more likely to retain neonatal resuscitation skills (35).

Prior training on resuscitation was greatly associated with the knowledge and skills performance of NR (AOR = 3.79, 95% CI: 1.73, 8.32). However, there is less evidence in sub-Saharan countries about nurses' and midwives' knowledge. A study to assess knowledge on basic neonatal resuscitation and associated factors done in Ethiopia showed that a majority (90.2%) of nurses and midwives had poor knowledge of NR (36).

Another study on knowledge and experience of NR among midwives in Tamale, Ghana showed that most (98.1%) of the participants had insufficient knowledge of NR (12). Having providers skilled and knowledgeable on NR can significantly reduce neonatal mortality rates. Thus there must be opportunities for midwives to be trained in this important lifesaving skill (13,31,37).

In resource limited areas, nurses are the first responders in providing NR. Majority of them have theoretical knowledge but significantly lack skills essential for correct practice of NR (4).

A cross-sectional observational study to determine the knowledge and practice about neonatal resuscitation among nursing staff working in up to secondary level care done in India also revealed that nurses knew the necessary equipment and steps involved in NR, but lacked practical skills on the correct use of BMV and doing chest compressions (34).

Another study conducted in Kenya to assess neonatal resuscitation practices among nurses working at Level 5 hospitals showed that the practice of neonatal resuscitation was significantly associated with knowledge level on neonatal resuscitation (p=0.001). Nearly 74.4% of study participants were highly knowledgeable and adequately practiced neonatal resuscitation as per standard guidelines (25).

In Tanzania for example, a HBB program has been undertaken to address the issue of NR in several areas. Among the addressed challenges are availability of essential supplies (19). In spite of these efforts, a variation in knowledge level among nurses in hospitals and those in health centers still exists. A cross sectional study to evaluate factors that influence knowledge and practice of neonatal resuscitation of birth attendants in rural areas of the Lake Zone further showed that the significant predictors of knowledge on NR are facility level (AOR=3.227; CI: 1.99-5.22; p=0.001), professional or attained qualification (AOR=3.118; CI: 1.62-5.99; p=0.001) and trainings attended (AOR=3.102; CI: 1.55-6.20; p=0.001) (21). Another study to determine predictors of knowledge and skills of nurses on neonatal resuscitation showed that working in labor ward was the major influencing factor for adequate knowledge and skills on NR (AOR = 3.28; CI:1.52–7.08: $P < 0.05$) (33).

2.3.2 Training on neonatal resuscitation

Well-trained staff working in delivery suites greatly contribute to reductions in preventable neonatal morbidity and mortality. A retrospective study done in Turkey to assess the outcome of neonatal resuscitation program courses on mortality and morbidity of newborn infants with birth asphyxia showed a great decline in number of babies with birth asphyxia, number of babies not resuscitated and number of days for hospital stay. Furthermore, there was a significant increase in the Apgar score in the first minute among babies (38).

Similarly, a cross-sectional study undertaken in Afghanistan at centers providing EmONC services showed that training in NR is significantly ($p < 0.001$) correlated to providers' knowledge and skills, and this training was of great help to HCP in the community, at private clinics and at primary care facilities to save the life of newborns (4).

A study done in Australia to examine the neonatal resuscitation training requirements for midwives and raise awareness for the lack of consistency in training found that teaching methods and frequency of training on NR varied between centers. It also recommended that training should be multi-modal with evidence based training programs and NR training occurring at least annually to improve the current practice of midwives as first responders during NR (39).

In Eastern Ethiopia, a facility-based cross-sectional study was done to assess basic newborn resuscitation knowledge and influencing factors among midwives and nurses in Public Health Institutions using a pre-tested face-to-face interviewer-administered questionnaire, found that those who were trained in NR were 3.79 times more likely to be knowledgeable compared to those without trainings (36).

Another study conducted in Ethiopia extracting data analyzed from the 2016 National EmONC surveys done in centers offering maternal and neonatal care services which explored factors influencing neonatal resuscitation practice with bag and mask revealed that health care providers who are not trained on neonatal resuscitation were 36% less likely to adequately perform neonatal resuscitation than those with training (40). Thus

incorporating competency based training, refresher training and clinical mentorship will improve the NR practice (40,41)

A study done in Kenya to assess the practice of neonatal resuscitation among nurses in Machakos tertiary hospitals using a self-administered questionnaire and an observational checklist revealed that practice of neonatal resuscitation is significantly associated with NR training (p=0.004). Approximately 59.8% of the trained participant practiced NR as per guideline (25).

Many low resource countries, including Tanzania, adopted a more feasible training program called Helping Babies Breathe (HBB) as an effort to reduce newborn asphyxia and mortality (42). As a result of this, NR providers were equipped with neonatal resuscitation knowledge, skills and supplies. Impact assessment of this program is still lacking though a substantial improvement in newborn resuscitation was noticed in some regions of the Tanzania mainland (43). Structured on-job training, supportive supervision and equipment availability help to improve newborn resuscitation skills retention among health care providers. Therefore on−site training should be part of efforts to improve provider's performance and strengthen quality of care (7).

2.3.3 Profession education level

According to a survey conducted in Kenya about nurses' evaluations of newborn resuscitation techniques, there is a substantial correlation between education level and neonatal resuscitation technique. Whereby, licensed nurses practiced NR in accordance with the standards (28).

Another cross-sectional study done to assess the characteristics influencing knowledge and newborn resuscitation practice among skilled birth attendants in rural Lake Zone, Tanzania, using standard semi-structured questionnaire discovered that knowledge of HBB was related (p=0.001) to participants' educational attainment (21).

2.3.4 Availability of NR Guidelines

Presence of protocols and guidelines are low cost interventions to equip nurses in the delivery suites with evidence based practice to improve their performance in NR (8).

Correct practice requires knowledge of the available guidelines and presence of supporting equipment. A survey of neonatal resuscitation in Spain to identify gaps between guidelines and practice showed no difference in knowledge of guidelines and equipment in delivering neonatal resuscitation. However, the tertiary hospitals had much better performance in accordance with international guidelines due to the presence of supportive equipment (30)

A cross-sectional study on nurses' assessments of newborn resuscitation practices in Machakos level 5 hospitals found that even though the guidelines were prominently displayed on the walls, the majority of respondents did not refer to them. The biggest barrier to their use, according to reports, was a lack of guidance, direction, understanding, and commitment (28).

2.3.5 Essential equipment

The practical application of NR by HCPs is significantly influenced by the equipment that is available in delivery suites. One Ethiopian study on the factors influencing neonatal resuscitation practice in centers offering maternity and newborn health services showed that hospitals with necessary equipment are more likely to undertake neonatal resuscitation than their counterparts (43).

Appropriate use of the available equipment positively influences the NR outcomes. A study done among nurses in Western Nigeria to assess knowledge and practice on neonatal resuscitation showed that the majority of the nurses had access to essential equipment such as radiant warmers, Ambu-bags, suction machines and oxygen delivery units. Still they had an overall poor practice due to lack of knowledge on the use of such equipment (16). Similarly, another study done in Kenya to assess newborn resuscitation practice among nurses revealed that the majority had access to essential equipment and its presence positively influenced the NR practice however, still a few participants did not use the equipment (25).

Among trained birth attendants in Tanzania's rural Lake Zone, a survey of factors that influence knowledge and practice of helping baby to breathe (HHB) revealed that

facilities with necessary equipment had a higher percentage of sufficient NR practice than those without (27).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study design

A hospital-based, analytical cross-sectional study design was used.

3.2 Study duration

The study was done for three months from 1st September to 30th November 2023.

3.3 Study Area

The study was done at Songea and St. Joseph's RRHs in the Ruvuma region located in southern part of Tanzania's mainland. Ruvuma region is among the regions reported with a high incidence of neonatal mortality in Tanzania. These are regional referral hospitals in the Ruvuma region but also serve people from some parts of the neighboring regions of Njombe and Mtwara. They offer both normal and complicated delivery services that require surgical interventions. At St. Joseph's Hospital there are five delivery rooms with a total of ten beds and one obstetric theatre, with 35 nurse staff. Songea Hospital has two delivery rooms with four delivery beds and one obstetric theatre with a total of 25 nurses.

3.4 Study population

This study involved all the nurses working in the obstetric theaters and labor wards.

3.5 Sampling technique

The necessary number of 60 nurses for the study was obtained using a consecutive sampling technique.

3.6 Sample Size Determination

Study sample size was calculated from the Kish and Leslie formula (1965)

$$n = \frac{Z^2P(100-P)}{\varepsilon^2}$$

Whereas;

n = Minimum estimated sample size

Z = Percentage point of the normal distribution that corresponds to the degree of confidence.

ε = Margin of error assumed to be 5%

P = Proportion obtained from previous similar study. For this study a 52% of participants with adequate skills on neonatal resuscitation obtained from a similar study done in Tanzania will be used.

$$\mathbf{n} = \frac{1.96 \times 1.96 \times 52(100-52)}{5^2}$$

n = 383.5, approximately 384

Therefore, 384 minimum nursing staff were to be studied.

Applying the formula for finite population to obtain sample size;

$$\mathbf{n_c} = \frac{n}{1+(\frac{n}{N})}$$

Whereas;

n = calculated sample size

N = Finite number of study population during time of study (60)

$$\mathbf{n_c} = \frac{384}{1+(\frac{384}{60})}$$

$\mathbf{n_c}$ = 51.89 (approximately 52).

Adjusted sample size = $\mathbf{n \times \frac{1}{R}}$

Whereby;

n = calculated size of sample

R = Response rate,

Approximating Non-response = 10%, then response rate is 90%

Adjusted sample size = 52 x $\frac{1}{0.90}$ = 58

Thus, the final sample size to be studied is 58 nurse staffs**.**

3.7 Inclusion and Exclusion criteria

3.7.1 Inclusion criteria

All nurses working in the labor wards and obstetric theatres who consented to participate in the study.

3.7.2 Exclusion criteria

Nurses who were not available during the study period

3.8 Study Variables

Dependent variable:	Independent variables:
1. Practice of neonatal resuscitation (Adequate/Inadequate)	1. Knowledge of health care provider
	2. Professional education level of HCP
	3. Training on neonatal resuscitation
	4. Working experience
	5. Number of neonatal resuscitations performed
	6. Essential equipment availability
	7. Availability of standard Guidelines

3.9 Data collection tools

Data from consented participants was obtained using two tools: a standard questionnaire that obtained demographic data, professional knowledge level, qualification, years of working experience, previous training, number of resuscitations performed before, and knowledge of neonatal resuscitation. Knowledge of NR was evaluated using 20

structured questions adopted with some modifications from the HBB guide book 2nd edition for neonatal resuscitation. Each question had 4 options whereby a participant was required to select and circle the correct response. Nurses' skills in neonatal resuscitation were evaluated by a standardized scenario using a mannequin and an observation checklist with eight basic neonatal resuscitation steps that were taken from the HBB-WHO guideline for neonatal resuscitation skills with some modification. The steps included preparation of the necessary equipment, calling for help and starting of timer, keeping the baby warm, initial new born assessment, managing the airway, providing rescue ventilation, chest compressions and post resuscitation care. A pilot study was performed to check for workability of data collection tools and procedure.

3.10 Data collection methods and procedure

Each participant who had agreed to participate was required to execute newborn resuscitation in an Objective Structured Clinical Examination (OSCE) setting that simulated a real neonatal resuscitation utilizing a mannequin. This method minimized harm to real neonates whenever the participants inadequately perform neonatal resuscitation which would necessitate the principal investigator to intervene leading to bias in the information collected. The same scenario was provided to each participant and a WHO standard observational checklist containing eight steps for assessing clinical knowledge and skills for basic newborn resuscitation was used. It consisted of four (4) basic sections: setting up the necessary equipment, keeping the baby warm, managing the airway, and providing rescue ventilation and chest compressions. An observational checklist was used to assess if steps were correctly done, partially/incorrectly done, or not done at all. These skills were assessed for 15 minutes during which each participant must have completed the basic steps. If a participant ran out of time, the skills were deemed inadequate. Whenever the participant called for help while performing NR, the principal investigator acted as a helper. Two auxiliary data collectors were recruited: the first dealt with provision of a self-administered questionnaire to participants after completion of skills assessment and the second helped with time keeping and coordinating the flow of participants to a practice station for skills assessment in which there was a principal investigator.

After being assessed for skills, each participant was provided with self-administered standard and coded questionnaires. The number of previous newborn resuscitations, professional level of expertise, qualification, years of working experience, prior training, and demographic data (age and sex) were all noted in this section. The knowledge portion was assessed using structured questions that were taken from the HBB guide book for neonatal resuscitation, 2nd Edition. A total of 20 structured questions were used to assess the knowledge level of NR among participants and a participant was required to answer correctly at least 15 questions to be regarded as having adequate knowledge. The focus of the questions was on recognizing a newborn who needs assistance, setting up the necessary equipment, making decisions about who needs assistance, and taking the appropriate actions, including initiating neonatal resuscitation, performing bag-mask ventilation, and applying chest compression.

3.11 Data management

Data were entered and cleaned using the IBM-SPSS version 26 software. To prevent data loss, there was a software backup and e-mail sharing with supervisors. Only the primary investigator, study supervisors, and the IRB had access to the acquired data in its raw form for review and approval. The institutional policies outlined in the rules for data sharing and re-use shall be followed when granting authorization to use this data.

3.12 Data Processing and Analysis

The questionnaires were coded and entered into IBM-SPSS version 26. Demographic information, knowledge, and practice were descriptively analyzed and summarized in frequency tables and figures. The standard knowledge assessment questions were coded with correct answers receiving a score of one (1) and erroneous answers receiving a score of zero (0). Correct responses were added and a total score of 75% was regarded as adequate knowledge. The proportion of participants who scored at least 75% was calculated to obtain the level of knowledge in NR among participants.

A step on the practice observational checklist received two (2) points if it was successfully completed, one (1) point if it was incorrectly or partially completed, and zero (0) points if not done at all. After analysis participants were regarded having adequate

skills as per guidelines if they had a total score of at least 75% of the correctly performed steps on neonatal resuscitation. The participant who did not correctly perform essential initial steps during resuscitation was regarded as having inadequate skills regardless of the total score.

To evaluate the correlation between independent and dependent variables, Fisher's exact test was applied. Whenever a p-value was less than 0.05, significance was taken into account. Logistic regression analysis was employed to look for correlation strength between adequate practice and independent variables. A p-value less than 0.05 was regarded as statistically significant, and 95% confidence intervals were stated where appropriate.

3.13 Ethical consideration

The MUHAS Research Ethics Committee granted an ethical approval to conduct the study. Participants were voluntarily recruited after signing informed consent and were free to stop participating in the study anytime they wanted. Confidentiality was highly observed for the information collected.

3.14 Data dissemination

The Muhimbili University of Health and Allied Science (MUHAS) depository will have a copy of the completed work available for use as a reference. The study's results will be shared to MUHAS scientific meetings as well. A manuscript will be created and presented to refereeing journal for publication. Songea and St. Joseph's Regional Referral Hospitals will also receive a copy in appreciation for their involvement in this study.

CHAPTER FOUR

4.0 RESULTS

4.1 Demographic Characteristics:

The study enrolled 60 nurses, more than half 33(55%) were aged between 20-30 years, and most were females, 43(71.7%). Based on their qualification most were assistant nurse officers (ANO) 38(63.3%). More than half of the respondents worked in labor ward 37(61.7%). Most of the participants, 31(51.7%) had 1-5 years of work experience within their delivery suite (Table 1).

Table 1: **Socio-demographic characteristics of the study participants (N = 60)**

Variable	Frequency (n)	Percent (%)
Age group (years)		
20 – 30	33	55.0
31 – 40	17	28.3
>40	10	16.7
Median age in years (IQR)	30 (27, 38)	
Sex		
Male	17	28.3
Female	43	71.7
Designation		
ANO	38	63.3
EN	7	11.7
Midwife	2	3.3
NO	13	21.7
Qualification		
Bachelor degree	13	21.7
Diploma	39	65.0
Certificate	8	13.3
Working station		
Labor ward	37	61.7
Obstetrics theatre	23	38.3
Number of years at work		
< 1 year	18	30.0
1 – 5 years	31	51.7
>5 years	11	18.3

Only a few participants had ever attended formal training on neonatal resuscitation 11(18.3%), out of which five were trained on HBB (45.5%). Majority of respondents with formal training had trained once 9(81.8%), and most respondents had trained more than six months before the time of data collection 6(54.5%). Few study participants, 7(11.7%) had ever attended on-job training on neonatal resuscitation, out of which 3 (42.9%) had attended once and 3(42.9%) had attended more than 3 times. Twenty-four (40%) study participants had performed less than 5 neonatal resuscitations in past six months prior to data collection time. More than half participants were informed on the guidelines that are now available for newborn resuscitation 46(76.7%) (Table 2).

Table 2: **Formal training in neonatal resuscitation, Number of resuscitations performed and Awareness of available resuscitation guidelines on NR (N = 60)**

Variable	Frequency (n)	Percent (%)
Attended any formal training		
Yes	11	18.3
No	49	81.7
Training attended (n = 11)		
BEmONC	3	27.3
HBB	5	45.5
HBB & BEmONC	1	9.1
NNICU	1	9.1
NR	1	9.1
Frequency of attendance (n = 11)		
Once	9	81.8
Twice	1	9.1
Thrice	1	9.1
Last training (n = 11)		
< 6 months	5	45.5
≥ 6 months	6	54.5
Received on-job training		
Yes	7	11.7
No	53	88.3
Number of on-job training done (n = 7)		
1	3	42.9
2 – 3	1	14.3
>3	3	42.9
Number of resuscitations done past 6 months		
≤ 15	51	85.0
>15	9	15.0
Confident in resuscitation		
Yes	47	78.3
No	10	16.7
I don’t know	3	5.0
Aware of resuscitation guideline to be used		
Yes	46	76.7
No	11	18.3
I don’t know	3	5.0

4.2 Preparation before resuscitation:

The study participants were assessed for equipment preparation before commencing demonstration of the NR practice using a manikin. Appropriate size BVM and face mask were prepared by majority of participants, 58(96.7%) and 54(90%) respectively. A clock/timer and scissors were the least prepared equipment 8(13.3%) and 7(11.7%) respectively (Fig. 2).

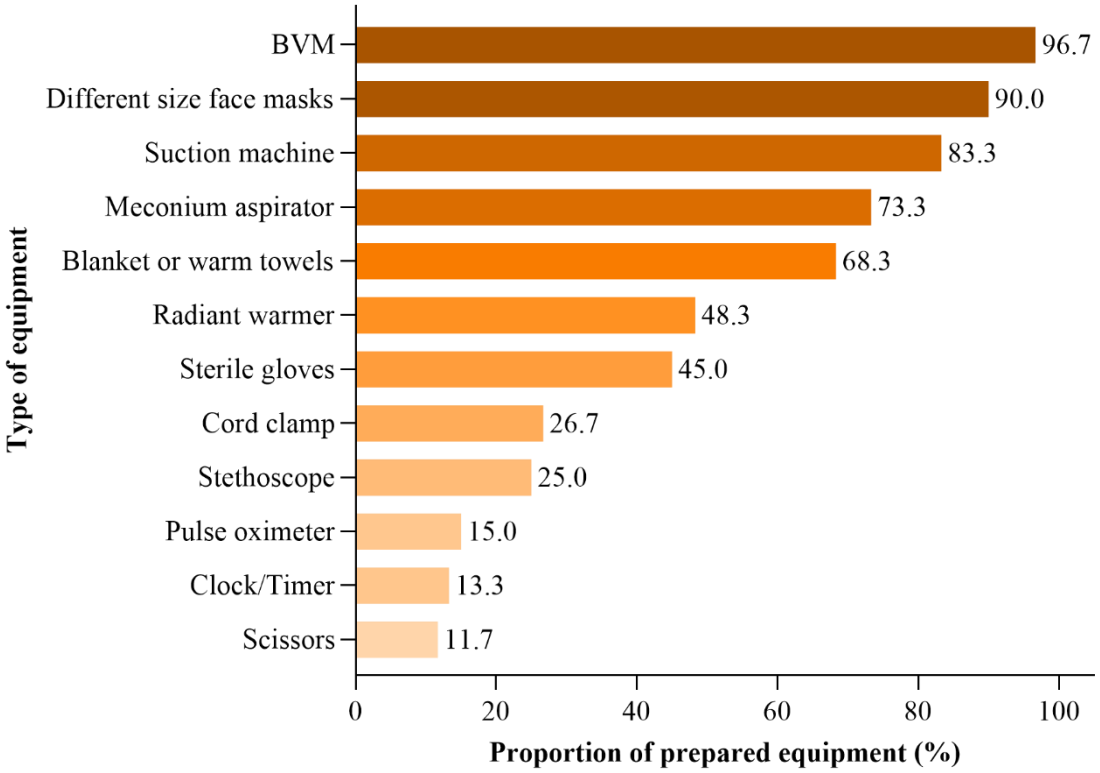


Figure 2: **Proportion of equipment preparation among study participants**.

4.2.1 Practice of neonatal resuscitation

Sixty study participants were observed to evaluate their practice of neonatal resuscitation in comparison with the available standard practice. Only 7(11.7%) participants met the standard of adequate neonatal resuscitation practice, (Fig. 3).

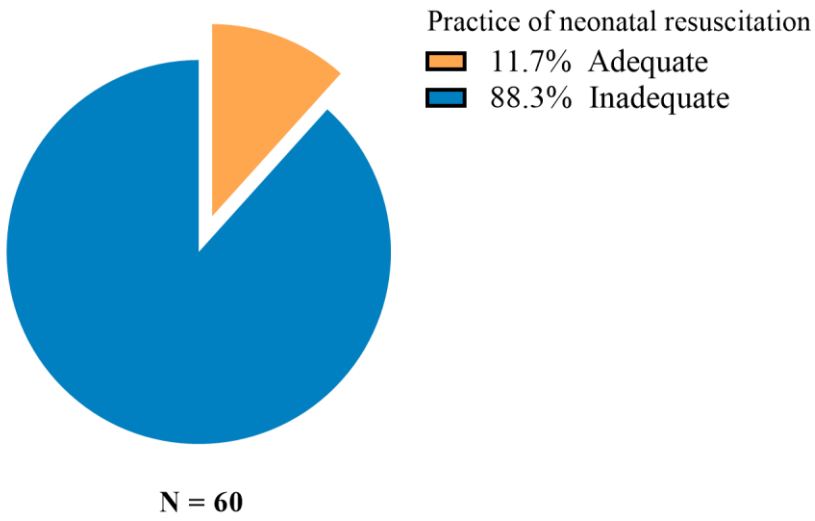


Figure 3: **Neonatal resuscitation practice among nurses.**

4.2.2 Observation of practice for individual steps of neonatal resuscitation

Upon observing participants for the individual steps during NR it was found that, 'calling out for help' and 'starting the clock' were not done by majority of participants 53(88.3%) and 53(88.3%) respectively. Initiation of ventilation within the 'Golden minute' was correctly done by almost all participants 59(98.3%).

Provision of initial 5 rescue breaths for neonates unresponsive to initial stimulatory maneuvers was the most incorrectly done procedure by majority of participants 47(78.3%). Post resuscitation care was the only step where by all respondents had an idea and more than half of the participants did it correctly 36(65.0%), (Fig. 4).

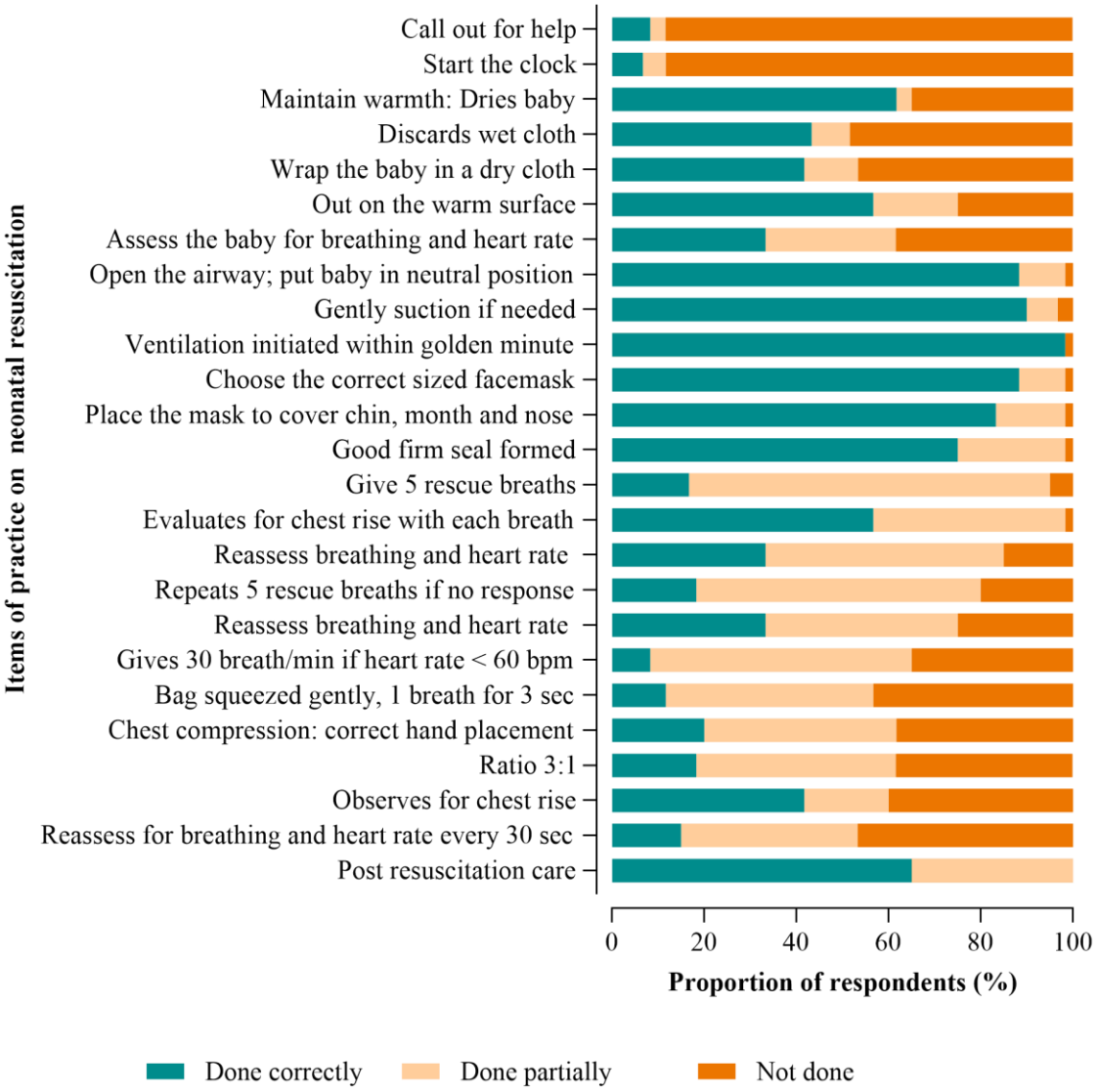


Figure 4**: Neonatal resuscitation practice for observed individual steps.**

4.3 Factors influencing neonatal resuscitation practice.

The factors influencing the observed practice of neonatal resuscitation among participants were also looked at in this study. More than half 35(58.3%) of participants had adequate knowledge, however, of those only 4(11.4%) had adequate neonatal resuscitation practice. Three (12.0%) participants had adequate practice, despite being scored as having inadequate knowledge. Our findings revealed no statistical association between healthcare provider's knowledge and adequate practice of neonatal resuscitation (**p=1.00**).

Nearly all of the participants with adequate skills on neonatal resuscitation were diploma holders 5(12.8%). However, professional level of education was not statistically associated with adequate newborn resuscitation practice (**p=0.712**).

More than half of participants who had adequate practical skills had received formal training on neonatal resuscitation 4(36.4%). There was a significant statistical association between formal training and adequate skills on neonatal resuscitation (**p=0.017**).

Adequate skills on neonatal resuscitation was shown by participants who had worked for more than 5 years 3(27.3%). However, working experience was not significantly associated with adequate skills on neonatal resuscitation (**p=0.160**).

Participants who had performed more than 15 resuscitation cases within past 6 months had adequate skills on neonatal resuscitation 4(44.4%). The number of resuscitations performed within the last 6 months was significantly associated with adequate skills on neonatal resuscitation practice. Majority of the participants with adequate skills on resuscitation had adequate essential equipment available 5(55.6%). There is a significant association between availability of equipment for resuscitation and adequate skills on resuscitation practice (**p<0.001**).

Nearly all of the participants with adequate skills on neonatal resuscitation were aware of the standard neonatal resuscitation guideline 6(13.0%). Being aware of the standard neonatal resuscitation guideline was not statistically associated with adequate skills in newborn resuscitation practice (**p=1.000**) (Table 3).

Table 3: **Factors influencing the practice of neonatal resuscitation among nurses**

Variable	Skills on neonatal resuscitation practices		P - value
	Adequate (%)	Inadequate (%)	
Health care provider's knowledge			
Adequate	4 (11.4)	31 (88.6)	1.000
Inadequate	3 (12.0)	22 (88.0)	
Qualification			
Bachelor degree	2 (15.4)	11 (84.6)	0.712
Diploma	5 (12.8)	34 (87.2)	
Certificate	0 (0.0)	8 (100.0)	
Working station			
Labor ward	6 (16.2)	31 (83.8)	0.233
Obstetrics theatre	1 (4.3)	22 (95.7)	
Formal training on NR			
Yes	4 (36.4)	7 (63.6)	**0.017**
No	3 (6.1)	46 (93.9)	
Working experience (years)			
< 1	2 (11.1)	16 (88.9)	0.160
1 – 5	2 (6.5)	29 (93.5)	
>5	3 (27.3)	8 (72.7)	
Resuscitation done past 6 months			
< 15	3 (5.9)	48 (94.1)	**0.007**
> 15	4 (44.4)	5 (55.6)	
Availability of equipment for NR			
Adequate	5 (55.6)	4 (44.4)	**< 0.001**
Inadequate	2 (3.9)	49 (96.1)	
Aware of standard NR guideline			
Yes	6 (13.0)	40 (87.0)	1.000
No	1 (9.1)	10 (90.9)	
I don't know	0 (0.0)	3 (100.0)	

Key: NR: Neonatal resuscitation

Note: All p-values were derived from Fisher's Exact Test

4.4 Multivariate Logistic Regression analysis of factors influencing neonatal resuscitation practice among nurses.

Binary logistic regression was used to identify significant predictors of adequate neonatal resuscitation practice among nurses working in delivery suites. The results show that having a formal training on neonatal resuscitation, having performed more than 15 resuscitations in the past 6 months before data collection time and availability of essential equipment for resuscitation are predictors for adequate practice.

Participants with formal training were 8.76 times more likely to perform neonatal resuscitation adequately than those with no training. Nurses who had performed more than 15 resuscitations for the past 6 months before data collection were 12.8 times more likely to have adequate resuscitation skills than those with less number of resuscitations. Furthermore, nurses with essential equipment available were 30.63 times more likely to adequately perform neonatal resuscitation than those without equipment.

After adjusting for other factors, results showed that availability of essential equipment (p-value=0.012) and attending formal training (p-value=0.050) were significant predictors of adequate neonatal resuscitation practice. (Table 4).

Table 4**: Univariable and multivariable analysis on factors associated with the adequate resuscitation practice.**

Variables	Category	Univariable analysis			Multivariable analysis		
		cOR	95% CI	P - value	aOR	95% CI	P - value
Knowledge	Adequate Inadequate	0.95 1[a]	0.19 – 4.66	0.946			
Qualification	Bachelor Certificate/Diploma	1.53 1[a]	0.26 – 8.96	0.639			
Station	Labor ward Obstetrics theatre	4.26 1[a]	0.48 – 37.90	0.194	2.09	0.19 – 22.67	0.544
Work experience	>5 year 1 – 5 years < 1 year	3.00 0.55 1[a]	0.41 – 21.73 0.07 – 4.30	0.277 0.570			
Attended formal training	Yes No	8.76 1[a]	1.61 – 47.72	0.012	7.35	1.00 – 53.82	0.050
Resuscitation done past 6 months	>15 ≤ 15	12.80 1[a]	2.21 – 74.22	0.004			
Equipment available	Adequate Inadequate	30.63 1[a]	4.44 – 211.15	< 0.001	18.26	1.92 – 174.01	**0.012**
Awareness of NR guideline	Yes No	1.95 1[a]	0.21 – 17.73	0.553			

Key: cOR: Crude Odds Ratio, aOR: Adjusted Odds Ratio, 1[a]: Reference Category

CHAPTER FIVE

5.0 DISCUSION

5.1 Neonatal resuscitation practice.

In most delivery suites, nurses are the immediate frontline staffs in performing resuscitation to newborns whenever a need arises. Having majority of them lacking adequate practical skills to perform newborn resuscitation continues to put newborns needing this essential intervention at great risk of receiving substandard care. This study found an overall inadequate neonatal resuscitation practice, 53(88.3%) out of 60 study participants. The researcher attributes this practical discrepancy to lack of regular on job refresher trainings to translate theoretical understanding to practical skills, as reflected by majority who possessed adequate knowledge but inadequately performed resuscitation. This is in line with three other studies from Tanzania showing poor resuscitation skills (19,22,33). Similar findings were revealed from studies conducted in Kenya by Muli et al and in Ethiopia by Sintayehu et al (24,34). Conducting regular refresher on job trainings at least six months interval with emphasis on basic airway management skills and cardiopulmonary resuscitation as per current guidelines, will impart nurses with essential practical skills that will in turn improve the provision of adequate newborn care with better outcomes.

Contrary to our study, which showed inadequate skills on neonatal resuscitation for most participants, a study done in Ethiopia by Abdu et al showed that more than half (62.7%) of the study participants had good neonatal resuscitation skills (31). This may be attributed to differences in sample size used, data collection tools and parameters used to measure respondents' practice. Unlike the Ethiopian study, our study used an observational checklist with a standard clinical scenario adopted from HBB guideline using a newborn mannequin to simulate working environment and hence captured real practice.

Essential steps during resuscitation when appropriately performed results in better newborn outcomes. Our study revealed that more than half 37(61.7%) nurses dried the newborns with warm dry towels after delivery. This showed there was an understanding that prevention of hypothermia is important during resuscitation. However, only

26(43.3%) participants discarded the wet towels and wrapped the newborns with new dry and warm towels, although spare towels were available. We did not have a clear reason as to why participants did not discard the wet towel used and to wrap the newborn with another warmed towel. It might be their usual practice during resuscitation or just being in a hurry to provide the newborn with rescue breaths. Further studies can be done to ascertain the reasons for them not discarding the wet towels during resuscitation. The results correlate with those of a study done in Kenya by Shikuku et al (32). Maintenance of a warm environment during newborn resuscitation should be emphasized especially discarding the wet towel and keeping the baby warm with a new warm towel.

Opening the newborn's airway in neutral position and gently suctioning of any meconium or secretions are crucial initial steps during resuscitation that help the newborn initiate spontaneous breathing or assist during delivery of adequate supportive breaths necessary for survival. Nearly all participants in our study did it correctly, which concur with the findings of a study done in Kenya by Shikuku et al (32). These essential interventions should be adequately performed as part of resuscitation, and every healthcare provider in the delivery suites should be well equipped with these skills and apply them in a timely manner to prevent newborn morbidity and mortality secondary to birth asphyxia.

Guidelines recommend an immediate initiation of five rescue breaths to every newborn who fails to initiate spontaneous breathing with the initial stimulatory interventions such as drying by rubbing a newborn with the warm towel, opening the airway in neutral position and aspiration of meconium obscuring the airway. Nearly all of our study participants understood the importance of early initiation of the rescue breaths to newborns who did not respond to initial stimulatory interventions. However, most of them provided either less or more than the recommended five rescue breaths. This was thought to be due to either failure to use the available recent guidelines that were well displayed at resuscitation areas or incorrect adapted practice from co-workers. Not only that but also it might be due to lack of refresher on job-trainings on the importance and correct administration of initial supportive ventilation during resuscitation. This is an easy opportunity for improving skills as many providers already knew the importance of providing breaths so teaching them to provide five breaths should not be difficult. Our findings are in line with those of a study done in Kenya by Shikuku et al (32).

Chest compressions and appropriate positive pressure ventilation at a ratio of 3:1 needs to be performed to newborns with heart rates lower than 60 beats/min to provide effective oxygenation and blood circulation. Findings from our study revealed that only a few 11(18.3%) participants were able to correctly perform this essential step to newborns. The results are similar to a study done by Basu et al in India that also revealed poor performance of this step as only 20.7% of participants did it correctly. This may be attributed to lack of translation of knowledge to practice but also lack of refresher courses on neonatal resuscitation among study participants (34).

More than half 39(65%) of participants understood the importance of adequate post resuscitation care for the continuum of successful outcomes, including documentation of the resuscitation event, prevention of hypothermia and early initiation of breast/expressed feeding. Having postnatal wards with trained nurses helps achieve this goal.

5.2 Factors associated with neonatal resuscitation practice.

5.2.1 Essential equipment availability

Availability of essential resuscitation equipment is well known to influence how an individual practices in an effort to achieve positive results. Our study findings revealed a statistically significant association (p=0.012) between essential equipment availability during resuscitation and adequate neonatal resuscitation practice. Moreover, participants with adequate resuscitation equipment were 18.26 times more likely to adequately practice neonatal resuscitation than those with inadequate equipment. Our findings also concur with other several studies carried out in Tanzania, Kenya and Ethiopia by Mzurikwao et al (21), Muli et al (25) and Abrha et al (40) respectively.

Appropriate resuscitation equipment should be easily accessible by every healthcare provider performing newborn resuscitation. Hospitals should strive to procure and sustain their availability at all times.

5.2.2 Training in NR.

Participants who had ever trained on NR were far better in resuscitation performance than their counterparts. Having trained on NR significantly associated with adequate resuscitation practice (p=0.05).

Our study found that after controlling for other factors by Multivariable analysis, previous training on NR was the best predictor of adequate resuscitation practice (p=0.050). These finding were in line with that of a study carried out in Kenya by Muli et al (p=0.004) (25). Regular refresher on job trainings positively influence skills retention and better practice of the intended recipients. We therefore recommend that refresher on job trainings should be scheduled at least after every six months, as they help remind and cement hands on skills to participants on top of their already acquired background knowledge.

5.2.3 Profession education level

As one advances in professional education level, reasoning and quality of duty performance is expected to increase. However, it may not being always in line as thought. Our study revealed no statistical association between professional education level and adequate neonatal resuscitation practice (p=0.712). Contrary to our findings, a study in Ethiopia by Sintayehu et al, showed that having higher educational status was associated with better skill retention and practice (35). In our settings majority of nurses are Certificate and Diploma holders, quite well experienced and had trained more in hands on skills. Nurses with bachelor degrees are currently on the rise to be enrolled in delivery suites, they are more knowledgeable with quite good reasoning however they lack practical skills. These nurses should be identified and special attention paid to training them.

5.2.4 Availability of guidelines

In our study, nearly all 6(85.7%) out of 7 participants who adequately performed resuscitation were aware and adhered to the available resuscitation guidelines. However, being aware of the standard neonatal resuscitation guideline was not statistically associated with adequate practice of neonatal resuscitation (p=1.000). Contrary to our findings, a study carried out in Kenya by Muli et al, found a significant association (p=0.001) between reference to guidelines during neonatal resuscitation and practice of neonatal resuscitation (25).

Guidelines serve as visual cognitive aids for reference to direct a correct and timely performance of necessary actions for a better outcome. During neonatal resuscitation, none of the participants in our study used the displayed resuscitation guideline. This may be attributed to either lack of trainings and supportive supervision on how to use them or failure to understand and comprehend the information due to being written in English

which is the second language in our setting. Available guidelines need to be translated into the local language and people should have proper training and guidance in how to use them during neonatal resuscitation.

5.2.5 Provider's knowledge on NR

Having knowledge on NR is one of the key predictors for the adequate performance of resuscitation and better newborn outcome. However, our study found that provider's knowledge level was not associated with the adequacy of resuscitation practice (p=0.946). This is in contrast to studies done in Kenya by Muli et al, (25) and in Ethiopia by Sintayehu et al, (35) which did show an association between having adequate knowledge and better performance skills on NR. This difference may be attributed to lack of translation of theoretical knowledge into practical skills in most of our study participants due to a greater emphasis in theoretical knowledge during their pre-service trainings with minimal competence-based hands on skills practice. The importance of having a background knowledge cannot be overemphasized as it is well known to positively impact the practice. Regardless of its lack of association with adequate practice in our findings, we still advocate inculcating the right neonatal resuscitation knowledge to all healthcare providers working in delivery suites.

5.3 STUDY STRENGTHS AND LIMITATION

5.3.1 Strengths

i. We adopted a standardized checklist to assess neonatal resuscitation practice among study participants.
ii. Employing the use of direct observation technique to participants performing neonatal resuscitation at usual working environment reflecting their daily practice.
iii. Study involved more than one referral hospitals making results potentially similar to reality.

5.3.2 Limitation

i. Being a cross-sectional study, it lacks a true confirmation of cause and effect relationship between predictors and outcome variables.

ii. We did not look at other human factors such as attitude and burnout that would have affected performance of individual participants.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

Our study found inadequate skills in neonatal resuscitation among nurses working in delivery suites at two regional referral hospitals in Ruvuma in relation to available standard guidelines for neonatal resuscitation. This reflects a great number of newborns missing an opportunity for adequate care necessary for their survival, that would probably explain the high neonatal morbidity and mortality we see in the region.

Presence of adequate essential resuscitation equipment during resuscitation and having attended a formal neonatal resuscitation training prior, were the independent variables associated with adequate newborn resuscitation skills.

Having adequate knowledge and presence of displayed guidelines for resuscitation does not necessarily reflect the better skills of neonatal resuscitation. Majority had inadequate equipment preparation such as clock/timer, also did not know when to seek for help, did not maintain warmth by discarding the wet towels, conduct initial assessment for breathing and heart rate, or understand the need for provision of five initial rescue breaths and initiation and performance of chest compressions with ventilation (CPR).

6.2 RECOMMENDATIONS

Our study has highlighted a need to have adequate essential equipment for resuscitation within delivery suites. Thus, healthcare facilities should strive to ensure the availability and accessibility of appropriate resuscitation equipment to be well utilized for the better outcome of resuscitated newborns.

The hospital managements should organize at least every 6 months on-job trainings to inculcate hands on skills to nurses through the use of more realistic mannequins to simulate resuscitation practice. This will help to translate their theoretical knowledge into practical skills and their retention. Perhaps also, nurses who have good skills could be identified and trained as trainers to help others learn the necessary skills.

Hospitals should have guidelines displayed on resuscitation areas and having regular supportive supervision and training for their appropriate use during resuscitation. However, further studies could also be done to assess why the guidelines were not used despite being present on resuscitation areas.

Furthermore, we recommend more studies be done in this subject to lower level healthcare facilities to assess their performance status and explore more factors influencing neonatal resuscitation practice. This may help to come up with a holistic approach in addressing the existing gaps in the practice thus improve newborn care in the country.

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APPENDICES

APPENDIX I: STANDARDIZED CHECKLIST.

EQUIPMENT	PREPARED	NOT PREPARED
Radiant warmer		
Blanket or warm towels		
Suction		
Clock		
Meconium aspiration		
Stethoscope		
BMV		
Different size face mask		
Pulse Oximetry		
Scissors		
Cord clamp		
Sterile Gloves		

RESUSCITATION	DONE CORRECTLY	DONE PARTIALY	NOT DONE
1. Call out for help 2. Start the clock			
3. Maintain warmth			
• Dries Baby			
• Discard wet cloth			
• Wrap the baby in a dry cloth			
• Put on the warm surface			
4. Assess the Baby for Breathing and Heart Rate*			
5. Open the Airway			

• Put the baby in neutral position			
• Gently suction if needed			
6. Ventilation			
• Initiated within Golden Minute			
• Choose the correct sized facemask			
• Place mask to cover chin, mouth and nose			
• Good firm seal formed*			
• Give 5 rescue breaths			
• Evaluates for chest rise with each breath*			
• Reassess breathing o Breathing o Heart Rate			
• Repeats 5 rescue breaths if no response (Reapplies mask and Repositions head) *			
• Reassess o Breathing o Heart Rate			
• Give 30 breaths/min (If HR>60BPM)			
• Bag squeezed gently. 1 breath for 3 seconds			
7. Chest compression (If HR<60bpm)			
• Correct hand placement			

• Ratio 3:1			
• Observe for chest rise			
• Reassess for breathing and heart rate every 30 sec.			
8. Post resuscitation care			

NB: Starred steps must be correctly done for the practice to be adequate.

APPENDIX II: STANDARD QUESTIONNAIRE

QUESTIONNAIRE TO ASSESS KNOWLEDGE AMONG NURSES WORKING IN THE DELIVERY SUITES AT SONGEA AND ST. JOSEPH'S REGIONAL REFERRAL HOSPITALS IN RUVUMA.

ID NO: ……

Demographic characteristics.

1. Age …….

2. Gender…….

3. Designation…… (eg: Midwife, NO, ANO, Intern Nurse,)

4. Highest qualification achieved by the Health Provider (Tick where Applicable)

(i) Master Degree
(ii) Bachelor Degree
(iii) Diploma
(iv) Certificate
(v) Others (Specify)

5. Working Station (circle which applies)
(i) Labor ward (ii) Obstetrics theater

6. Years of work at Labor ward or obstetric theater
(i) < 1 year (ii) 1-5 years (iii) > 5 years

7. Did you attend a formal training in neonatal resuscitation? (If NO Go to QN 11)
(i) Yes (ii) No

8. Which training did you attend? ..... (eg: HBB, BEmONC, etc)

9. How many times have you attended neonatal resuscitation training?
.....

10. When was the last training you attended? .....

11. Is there any on-job Neonatal resuscitation training done for the past 6 months? (if NO skip QN 14)

(i) Yes (ii) No

12. How many on-job training have been done for the past 6 months?

……..

13. How many have you ever attended?

……

14. How many neonatal resuscitations have you performed for the past six months?

(i) Less than 5 (ii) 5 - 10 (iii) 10 - 15 (iv) More than 15

15. Are you confident to perform neonatal resuscitation?

(i) Yes (ii) No (iii) I don't know

16. Are you aware of neonatal resuscitation guidelines that can be used in your working area?

(i) Yes (ii) No (iii) I don't Know

Knowledge Assessment Questions:

Select and circle the correct response against the provided options

1. To prepare for birth
    a. You identify the helper and review the emergency plan
    b. You ask everyone but mother to leave the area
    c. You prepare equipment only when you need it
    d. You do not need a helper
2. To prepare the area for delivery
    a. Open all the door and windows to get fresh air
    b. Darken the room
    c. Make sure the area is clean, warm, and well lighted
    d. Keep the room temperature cold
3. What should you do to keep the baby warm?
    a. Open all the windows
    b. Give a baby a bath after delivery

c. Place hot water bottles next to the baby's skin
d. Place the baby skin to skin with mother

4. What should you do to keep the baby clean?
    a. Wash your hands before touching the baby and help mother wash her hands before breast feeding
    b. Reuse the suction devise before cleaning
    c. Keep the umbilical cord tightly covered
    d. Do not touch the baby
5. What should you do in the Golden Minute?
    a. Bathe the baby
    b. Deliver the placenta
    c. Evaluate the heart rate
    d. Help the baby breathe if necessary
6. Which baby can receive routine care after birth?
    a. A baby who is not breathing
    b. A baby who is gasping
    c. A baby who is crying and/or breathing well
    d. A baby who is floppy
7. Routine care for a healthy baby at birth includes
    a. Drying, removing the wet cloth, and bathing the baby
    b. Drying, removing the wet cloth, and positioning the baby skin to skin
    c. Bathing and putting clean clothes on the baby
    d. Drying and wrapping the baby in the wet cloth
8. When should the umbilical cord be clamped or tied and cut during routine care?
    a. After the placenta is delivered
    b. Around 1-3 minutes after birth
    c. Immediately after the baby is born
    d. Before the baby has cried
9. A baby is quiet, floppy and not breathing at birth. What should you do?
    a. Dry the baby thoroughly
    b. Shake the baby
    c. Throw cold water on the baby's face

d. Hold the baby upside down

10. A newborn baby is quiet, floppy and not crying. The baby does not respond to steps to stimulate breathing. What should you do next?
    a. Slap the baby's back
    b. Hold the baby upside down
    c. Squeeze the baby's ribs
    d. Begin ventilation
11. In which situation should a baby be suctioned?
    a. When a baby is crying at birth
    b. When a baby is crying but there is meconium in the amniotic fluid
    c. When you see secretions blocking the mouth and nose
    d. Before drying the baby
12. Suctioning the baby unnecessarily or frequently can
    a. Cause a baby to stop breathing
    b. Make a baby to start coughing and breathing
    c. Stimulate a baby to cry
    d. Increase the baby's heart rate
13. Which of the following statements about ventilation with bag and mask is TRUE?
    a. The mask should cover the eyes
    b. Air should escape between the mask and face
    c. Squeeze the bag to produce gentle movement of the chest
    d. Squeeze the bag to give 80 to 100 breaths per minute
14. A baby's chest is not moving with bag and mask ventilation. What should you do?
    a. Stop ventilation
    b. Reapply the mask to get a better seal
    c. Slap the baby's back
    d. Give medicine to the baby
15. You can stop ventilation if,
    a. A baby is blue and floppy
    b. A baby's heart rate is slow
    c. A baby's heart rate is normal and the chest is not moving
    d. A baby's heart rate is normal and the baby is breathing and crying

16. A newborn baby's heart rate should be,
    a. Faster than your heart rate
    b. Slower than your heart rate
    c. Checked before drying the baby
    d. Checked only when the baby is crying
17. The indication for chest compressions is,
    a. Heart rate less than 60 beats per minute after effective ventilation
    b. Failure to inflate lungs with jaw thrust
    c. Poor response to drugs
    d. Absence of breathing at birth
18. Chest compression technique include
    a. Two thumbs technique
    b. One hand technique
    c. Two hands technique
    d. One finger technique
19. Chest compressions to ventilation ratio during neonatal resuscitation is
    a. 3:1
    b. 15:2
    c. 30:2
    d. 15:1
20. A baby who received ventilation
    a. Needs continued observation with mother
    b. Cannot be fed
    c. Always needs advanced care
    d. Should immediately receive antibiotics

APPENDIX III: CONSENT FORM. (ENGLISH VERSION)

I, Dr. Felix Paul Amani, a second-year resident pursuing Master of Medicine in Anesthesiology at Muhimbili University of Health and Allied Sciences. I carry on a study; **Titled**: **Evaluation of neonatal resuscitation practices and associated factors among nurses in delivery suites at regional referral hospitals in Ruvuma - 2023.**

This study seeks to assess the newborn resuscitation practices and related factors among nurses working in delivery rooms at Songea and St. Joseph's Regional Referral Hospitals. Please consider taking part in this research, as I sincerely ask. We will only utilize the information we collect for research. You will be asked to participate in this study by completing a standard questionnaire that will test your understanding of neonatal resuscitation. You will also be required to participate in an observational component where you will be observed performing actual resuscitation on a mannequin in order to gauge your proficiency.

Confidentiality:
Your information will remain confidential. Both the questionnaire and the observation checklist will be anonymous. With identifying codes known only to the interviewer, all data gathered from the study will be recorded into computers.

Right to take part in the research:
There are no penalties or benefits that you lose if you decline or leave the study; participation in it is entirely optional. Any inquiries are welcome, and you are always free to withdraw from the research.

Risk or Harm:
Participation in this study is not expected to pose any risks or harm.

Benefits:

Participating in evaluation of the current practice of neonatal resuscitation and its factors associated with will help in identifying gaps that may be used to suggest strategies for improvement with aim of reducing neonatal morbidity and mortality.

Please feel free to contact the following with any queries or issues you may have about this study:

Principal Researcher.

Dr. Felix P. Amani

Phone: no +255 766 354 948

+255 625 052 755

E-mail: amanifelix8@gmail.com

P.O BOX 19-Peramiho.

Supervisor

Dr. Edwin Lugazia

Phone: +255 754 283 900

+255 713 283 900

E-mail: elugazia@gmail.com

P.O Box 65001, Dar es Salaam,

OR

Director of Research, Innovations and Publications

Dr. Nahya Salim.

P. O. Box 65001, Dar es Salaam,

Tel. no 2150302-6.

SIGNING CONSENT.

If you agree being part of the research, please sign below.

I (initials)…… have read and comprehended all information on this form. I have received a sufficient clarification. I hereby, consent to take part in the research.

Sign ……. Date…….

APPENDIX IV: FOMU YA KIBALI. (SWAHILI VERSION)

Mimi Dk. Felix Paul Amani, Mwanachuo wa mwaka wa pili katika idara ya Ganzi na dawa za usingizi (Anesthesiology) toka Chuo Kikuu cha Afya na Sayansi Shirikishi-Muhimbili.

Ninafanya utafiti;

Unaoitwa: Tathmini ya namna ya kuwasaidia watoto wachanga (Neonatal Resuscitation) na sababu zinazohusiana kati ya wauguzi katika vyumba vya kujifungulia kwa hospitali za rufaa za mkoa wa Ruvuma - 2023.

Utafiti huu unalenga kutathmini namna ya kuwasaidia watoto wachanga na sababu zinazohusiana kati ya wauguzi wanaofanya kazi katika vyumba vya kujifungua katika hospitali za Songea na Mt. Joseph ambazo ni za rufaa kwa mkoa wa Ruvuma. Tafadhali ninaomba ridhaa yako kushiriki kwenye utafiti huu. Ukiridhia kushiriki, utapatiwa dodoso la kawaida ambalo litajaribu kutazama uelewa wako juu ya namna ya kuwasaidia watoto wachanga. Pia utahitajika kushiriki kwa vitendo kwa kutumia mdori wa mtoto mchanga kuonesha namna ya kumsaidia mtoto mchanga baada ya kuzaliwa.

Usiri:

Habari yako itachukuliwa kuwa ya siri na itatumika tu kwa utafiti. Dodoso na orodha ya uchunguzi haitajulikana. Kwa kutambua nambari zinazojulikana tu kwa mhojiwa, data zote zilizokusanywa kutoka kwa utafiti zitarekodiwa kwenye kompyuta.

Haki ya kushiriki katika utafiti:

Hakuna adhabu utakayopewa au faida ambazo utapoteza ikiwa utaaamua au kuacha kushiriki. Jiskie huru kuuliza swali lolote.

Hatari au Madhara:

Ushiriki katika utafiti huu hautarajiwi kuleta hatari yoyote au madhara.

Faida:

Kushiriki kwako katika tathmini hii kutasaidia kutambua mapungufu yaliyopo na sababu zake ambayo yanaweza kutumika kupendekeza mikakati ya uboreshaji kwa lengo la

kupunguza vifo na madhara mengine kwa watoto wachanga yatokanayo na kukosa huduma stahiki wakati wa kuzaliwa.

Tafadhali jisikie huru kuwasiliana na yafuatayo na maswali yoyote au maswala ambayo unaweza kuwa nayo juu ya utafiti huu:

Mtafiti Mkuu.
Dk. Felix P. Amani.
Simu: +255 766 354 948
+255 625 052 755
Barua pepe: amanifelix8@gmail.com
S.L.P. 19. Peramiho.

Msimamizi.

Dk. Edwin Lugazia.

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Barua pepe: elugazia@gmail.com
S.L.P. 65001. Dar es Salaam.

AU

Mkurugenzi wa Utafiti, Ubunifu na Machapisho.
Dr. Nahya Salim (MUHAS)
S.L.P. Dar es Salaam,
Tel. No 2150302-6.

SAINI YA UTAYARI WA KUSHIRIKI.

Ikiwa unakubali kushiriki katika utafiti huu, tafadhali saini hapa chini. Mimi (kwa ufupisho)……. nimesoma na kuelewa juu ya utafiti huu, na nimepokea ufafanuzi wa kutosha.

Hivyo, naridhia kuwa mshiriki.

Saini ya Mshiriki ……. Tarehe……

APPENDIX V: ETHICAL CLEARENCE.

UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

OFFICE OF THE DIRECTOR – RESEARCH, PUBLICATIONS AND INNOVATION

In reply quote
Ref. No.DA.282/298/01.C/1601

Date: 30/03/2023

MUHAS-REC-03-2023-1601

Felix Paul Amani,
Mmed Anasthesiology,
School of Medicine,
MUHAS

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: EVALUATION OF NEONATAL RESUSCITATION PRACTICE AND ASSOCIATED FACTORS AMONG NURSES IN DELIVERY SUITES AT REGIONAL REFERRAL HOSPITALS IN RUVUMA.

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: 30/03/2023
EXPIRATION DATE OF APPROVAL: 29/03/2024

STUDY DESCRIPTION:
Purpose:
The purpose of this observational cross sectional study is o evaluate the current practice of neonatal resuscitation and associated factors among nurses working in the delivery suites at RRHs in Ruvuma.

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-%2014524.pdf and in the MUHAS archives.

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

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 Kasusu Nyamuryekung'e
Chairman, MUHAS Research and Ethics Committee

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

cc; **Director of Postgraduate Studies**
MUHAS

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 VI: PERMISSION LETTERS

ST. JOSEPH'S MISSION HOSPITAL PERAMIHO
P.O. Box 19, Peramiho, Songea
Ruvuma, Tanzania East Africa
Mobile No: +255 753 565 153
info@hospera.or.tz

20/08/2023.

Ref: No. SJMHP/GVT/97/2023

Felix Paul Aman,
P.O.Box. 65001,
DAR ES SALAAM.

RE: REQUEST FOR CONDUCTING RESEARCH

The application letter received on 20/08/2023, with reference number **HD/MUH/T.02/2021,** has been accepted and request approved.

We therefore look forward to you for data collection of your research titled **Evaluation of Neonatal Resuscitation Practice and Associated Factors among Nurses in Delivery sites** at St. Joseph's Mission hospital Peramiho.

Therefore, when you come please report to the Medical Officer In charge for further internal arrangement of your research.

You are most welcome,

Yours faithfully,

.....
Dr. Adeodatus Haule
For Medical officer in charge
St. Joseph's Mission Hospital

K.N.Y
MEDICAL OFFICER INCHARGE
ST. JOSEPH'S MISSION HOSPITAL
P. O. Box 19, PERAMIHO

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF HEALTH

RUVUMA REGION

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57181 SONGEA

Ref. No. AFYA. /R.11/VOL.IX/73 20/08/2023

Felix Paul Amani,
P.O Box. 65001,
DAR ES SALAAM.

RE: REQUEST FOR CONDUCTING RESEARCH

The above heading is concerned.

2. Refer your application letter with **reference** with **reference Na: HD/MUH/T.02/2021.**

3. I would like to inform you, your request for your student to come to hospital for data collection of your research titled **Evaluation of Neonatal Resuscitation Practice and Associated Factors Among Nurses in Delivery Sites** at Songea Referral Hospital is accepted.

4. Therefore, when come please report to the Medical Officer In charge for further internal arrangement of your research.

Yours Sincerely,

Dr. Edson Francis (MD, MMED)
For: MEDICAL OFFICER INCHARGE
SONGEA REGIONAL REFERRAL HOSPITAL