

**INTENSIVE CARE NURSES' INFECTION PREVENTION AND
CONTROL PRACTICES ON ENDOTRACHEAL SUCTIONING USING
A COMPREHENSIVE CHECKLIST AND INFLUENCING FACTORS IN
CONSULTANT HOSPITALS IN DAR ES SALAAM**

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Department of Clinical Nursing



**Intensive Care Nurses' Infection Prevention and Control Practices Using A
Comprehensive Checklist and Influencing Factors in Consultant Hospitals In Dar Es
Salaam.**

By

Helena Chinguile

**“A Dissertation Submitted in Partial Fulfillment of the Requirements for the
Degree of Master of Science in Nursing Critical Care and Trauma of the
Muhimbili University of Health and Allied Sciences”.**

October, 2021.

CERTIFICATION

The undersigned certify that she has read and hereby recommend for acceptance by the Muhimbili University of Health and Allied Sciences a dissertation titled “**Intensive care nurses’ infection prevention and control practices using a comprehensive checklist and influencing factors in consultant hospitals Dar es Salaam**” in partial fulfillment of the requirements for the degree of Masters of Science in Nursing Critical care and Trauma.

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(Co- Supervisor)

Date _____

DECLARATION

I, Helena Chinguile, declare that this dissertation report is my own original work. It is being submitted for the Degree of Master of Science in Nursing Critical Care and Trauma in the MUHAS. 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 work is dedicated to all nurses and other health care workers in Intensive Care Units at Muhimbili National Hospital, Muhimbili Orthopedic Institute and Jakaya Kikwete Cardiac Institute.

ABSTRACT

Background: Endotracheal suctioning (ETS) is an invasive procedure performed to patients with artificial airway aiming at clearing accumulated pulmonary secretions. It can cause infection of the lower airway if not aseptically done. In studies conducted Nurses expressed adequate knowledge of the procedure while inadequate infection prevention and control practices (IPC) were observed for the few items assessed.

Objective: The of the study was asses intensive care nurses' IPC practice on ETS by using a comprehensive checklist and influencing factors in consultant hospitals in Dar es Salaam.

Materials and Methods: This is a cross-sectional study design involving random sample of 129 ICU nurses from Muhimbili National Hospital, Muhimbili Orthopedic Institute and Jakaya Kikwete Cardiac Institute in Dar es Salaam. Among the 129 participants, 43% (n=55) were assessed for IPC practices on ETS using a comprehensive checklist prepared by the researcher through adapting the constructs from guidelines for ETS. All 129 participants were surveyed for hospital factors influencing a practice using a structured questionnaire. Data from both observation and survey were analyzed using SPSS version 23.0. Descriptive statistics where by frequency, percentage, mean and standard deviation used to analyze data, association of IPC practice and individual related factors was determined by using chi-square test, logistic regression tests was performed to determine significant association.

Results: Majority (60%) who were observed for IPC practice on ETS scored 10 points (66.7%) which was a cutoff point for a desired level. Level of education in nursing whereby, those with bachelor and masters level show significant association with IPC practice (AOR=5, 95% CI=1.14-22.44, p value=0.03). Participants reported various factors within the hospital that influence IPC practice positively and negatively.

Conclusion and recommendations: The observed IPC practice on ETS was desirable. There was a significant association between individual level of education in nursing and IPC practice. Hospital management should make sure that intensive care nurses are adequately supplied with equipment for ETS in order to maximize IPC practices. ICU nurses need to utilize effectively the available resources in order to maximize IPC practices for the better outcome of patients.

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LIST OF ABBREVIATIONS

CCU	Coronary Care Unit
EMD	Emergency Medicine Department
ETT	Endotracheal Tube
ETTS	Endotracheal Tube Suctioning
GCS	Glasgow Comma Scale
HCAI	Health Care Associated Infections
ICU	Intensive Care Unit
IPC	Infection Prevention and control
JKCI	Jakaya Kikwete Cardiac Institute
MNH	Muhimbili National Hospital
MOI	Muhimbili Orthopedic Institute
MUHAS	Muhimbili University of Health and Allied Sciences
PICU	Pediatric Intensive Care Unit
PPE	Personal Protective Equipment's
SOP	Standard Operating Procedure
VAP	Ventilator Associated Pneumonia

DEFINITION OF THE OPERATIONAL TERMS

Endotracheal tube	Is a flexible plastic tube that is inserted into the trachea (airway) through the mouth or nose to maintain airway patency to patients who can't protect the airway
Endotracheal tube suctioning	Is a procedure where by a negative pressure is applied to the distal ETT or trachea by introducing a suction catheter to clear excess or abnormal secretions(1)
Practices	Is defined as the act of carrying out or perform a procedure of endotracheal suctioning regularly or habitually
Invasive procedure	Is a medical procedure that involves penetration into a body e.g. cutting, puncturing or inserting an instrument into the body
A nurse	Is defined as any trained nurse with Diploma, Degree or Masters Level who is working at Muhimbili National Hospital, Muhimbili Orthopedic Institute and Jakaya Kikwete Cardiac Institute.
Endotracheal intubation	Is a medical procedure whereby, a flexible plastic tube is placed into the wind pipe (trachea) most commonly through the mouth, but in some situations can be placed through the nose for the aim of securing the airway and assist the work breathing for critically ill patients.
Critically ill patient	Is a patient with serious illness or has got severe injuries, with physiological and metabolic derangements as well as organ dysfunction and unstable condition.

CHAPTER ONE: INTRODUCTION

1.0 BACKGROUND

1.1 Airway management to critically ill patients

Maintaining airway patent and ensuring adequate ventilation is very crucial to critically ill patients, since most of these patients can't protect the airway. Endotracheal intubation with mechanical ventilation is among the commonly procedure used as a definitive method of airway management to critically ill patients in the Intensive Care Unit (ICU) for maintenance of airway patency to patients at risk of compromising the airway due to alteration of conscious state e.g. GCS <8 and in cases of respiratory failure or cardiovascular collapse(2). This tube is introduced to the trachea commonly via the oral or nasal route for special cases. Presence of this tube to the trachea inhibits effective coughing and loss of mucociliary function hence endotracheal suctioning is a very important component of care to these patients. This procedure is invasive because a device (suction catheter) is inserted into the body (the trachea). The procedure requires high technical skills because it involves various complications including infections. Infection prevention and control (IPC) practices during the procedure is highly demanded in order to ensure that patients do not acquire health care associated infections (HCAI) such as pneumonia (3).

1.2 Nurses role to patients with ETT and receiving mechanical ventilation

The basis of care for the intubated patients with mechanical ventilation mostly is in the hands of nurses in the ICU. One of the roles of the nurse to these patients is to ensure airway patency (4). Since the normal function of the respiratory system of the intubated patient and mechanically ventilated is compromised and cough reflex is impaired, the nurse has the role of ensuring patency of the airway by clearing lung secretions to prevent airway blockage. Therefore, endotracheal tube suctioning (ETS) is a procedure performed mostly by ICU nurses to remove lung secretions in order to ensure airway patency. However, this procedure has its

complications and should be performed carefully. Infection prevention and control (IPC) is a major role of the nurse (5).

1.3 Complications of ETS procedure

Among the complications of ETS procedure are: hemorrhage due to traumatization and lesions of tracheal mucosal, cardiovascular changes, hypoxemia, lung atelectasis and infection of the lower airway like pneumonia(6,7), which is attributed during a process of caring the patient (8) and unsafe ETS practices by ICU nurses, and it is among the cause of morbidity and mortality to these patients(9). Therefore, the nurse is responsible to ensure aseptic techniques practices during endotracheal tube suctioning (ETS) procedure so that patients with endotracheal intubation will not get another burden of HCAI and prolong their recovery, hospital stay and increase cost.

But in order for nurses to have best IPC practices during the ETS procedure and maximize the quality of care to patients with endotracheal intubation, it requires integration of various factors (10,11) of which some are within the individual nurse and others are within the institution. Nurses need to have good knowledge, skills, attitude and a sense of feeling obliged for the patient's health outcome during care provision; on the other hand, the institution has the responsibility of ensuring availability and easy accessibility of IPC materials, guidelines, continuous training and supervision.

Worldwide, several studies have been conducted on ETS procedure and in most studies; results show that IPC practices during the procedure is not good even though knowledge about the procedure seems to be adequate among study participants in most studies.

In Tanzania, currently two studies have been done on ETS procedure. Mwakanyanga et al did their study on Intensive care nurses knowledge and practice on endotracheal tube suctioning of the intubated patients in five hospitals in Dar es Salaam, whereby, few measures of IPC were assessed. The study identified that nurses have a knowledge of IPC , but practices on those components of IPC assessed during the performance of the ETS procedure was not satisfactory (12). This implies that nurses' knowledge of the procedure is adequate but practice to the few IPC items assessed was not adequate.

A study by Ally, T. S. titled “Knowledge and Practice of Intensive care nurses on prevention of ventilator associated pneumonia” which was conducted at Muhimbili National Hospital (MNH) also some measures of IPC during ETS procedure were assessed. Similar to Mwakanyanga’s study, nurses expressed adequate knowledge of the procedure while in the observation, nurses’ IPC practice was not adequate(13). Therefore, this study assessed IPC practices during ETS procedures by using a comprehensive checklist with 15 IPC components from recommended guidelines for ETS procedure, and the factors influencing practices among nurses in critical care settings at tertiary hospitals in Dar es Salaam.

1.4 Problem statement

Endotracheal intubation with mechanical ventilation is a method used for airway management to critically ill patients in the critical care settings. Its main purposes is to maintain a clear, patent airway and to facilitate the work of breathing to patients with breathing impairment(9). Endotracheal tube (ETT) inhibit effective coughing and loss of mucociliary function causing accumulation of secretions in the airway(3) therefore, ETS procedure becomes a very essential component of care for these patients. ETS is potentially harmful procedure associated with a variety of complications; among them is infection like pneumonia. Therefore, nurses are obliged to have good IPC practices during the ETS procedure. In studies conducted, it was observed that the most significant divergence in ETS procedures among nurses is on the IPC practices assessed which includes: hand disinfection prior to procedure, use of Personal Protective Equipment (PPE) such as gloves, apron, face mask, and maintenance of suction catheter sterility(14–17).

In Africa, currently there is scarcity of published data on IPC practices during ETS procedure among nurses. In Kenya, Malombe, P., M. study observed that majority (51.2%) of participants had poor practices on hand disinfection prior t to procedure(18), and only 50% of participants prepare sterile equipment for the procedure and use sterile gloves, also majority (53.3%) were observed not to maintain the suction catheter sterility. Furthermore, majority of study participants were observed to not discard the suction catheter after single use, which

imply that the same suction catheter is used multiple times, and also practices on PPE use was not adequate for majority of participants(19,20).

In two studies conducted in Dar es Salaam Tanzania, it was observed that majority of nurses have poor practices on hand disinfection technique prior and after the ETS procedure and only 50% of them prepare sterile equipment for the procedure. Also it was observed that, only 50% of participants discard the used suction catheter after single use. This implies that, the same suction catheter is being reused several times in a day to suck in the ETT(12,13) which means patients with endotracheal intubation are exposed to a risk of acquiring HCAI.

This study highlighted the importance of assessing IPC practices during ETS procedure by using a comprehensive checklist and finds the factors influencing compliance among nurses in critical care settings.

1.5 Study rationale

This study identified Intensive care nurses' IPC practice on endotracheal suctioning using comprehensive checklist and influencing factors in consultant hospitals Dar es Salaam. The hospital management, through the findings of this study will be able to ensure adequate and sustainable supply of resources for maximum IPC practices, encouraging and motivating nurses' practices on IPC in order to improve the quality of care to patients in ICU. The results of this study provide a way for further research in this area in order to improve nursing care.

1.6 General research question

What is the nurses' practice on IPC during ETS procedure and what factors influence practices among ICU nurses?

1.6.1 Specific research questions

1. What is the level of IPC practices during ETS procedure among ICU nurses?
2. What are the individual factors influencing IPC practice during ETS procedure among ICU nurses?
3. What are the hospitals factors influencing IPC practice during ETS procedure among ICU nurses?

1.7 Research objectives

1.7.1 Broad objective

To assess IPC practices during ETS procedure, and factors influencing practices among nurses in critical care settings, at tertiary hospital, Dar es Salaam.

1.7.2. Specific objectives

1. To assess ICU nurses' IPC practices during ETS procedure
2. To identify individual factors associated with IPC practices during ETS procedure.
3. To describe Hospital factors influencing nurses' IPC practices during ETS procedure.

1.8 Conceptual framework

Endotracheal tube suctioning (ETS) is an invasive procedure(4) which require good IPC practices during procedure performance. Among the IPC practices which should be maintained includes: hand disinfection prior and after the procedure(21), use of sterile kit for every procedure of ETS, new sterile suction catheter for each procedure, two nurses needed for the procedure, the performer and an assistant, use of sterile gloves for the performer, PPE use i.e. apron and face mask, use of non-touch techniques, use of sterile Normal Saline solution for rinsing the suction catheter in between the procedure, and proper disposal of used materials(1,6,22). IPC practices during the ETS procedure incorporate multiple factors. Maysa Nofal et al, and Olajide, A., identified significant correlation between good IPC practices among health care workers and variables like knowledge, attitude, age and length of working experience, accessibility of PPE's and other materials for IPC, receipt of IPC training, supervision by IPC committee of the hospital and presence of guidelines/standard operating procedures (10,11). In Tanzania, Powell-Jackson, T., et al, study on IPC found that female health care workers are most likely to have good practices on hand hygiene(23). Work load and shortage of staff also was reported to influence IPC practices among health care providers(24). The conceptual framework in Fig. 1 was prepared by the researcher based on the literature review. The factors influencing IPC practices during ETS procedure were grouped into; Socio-demographic characteristics and Hospital related factors.

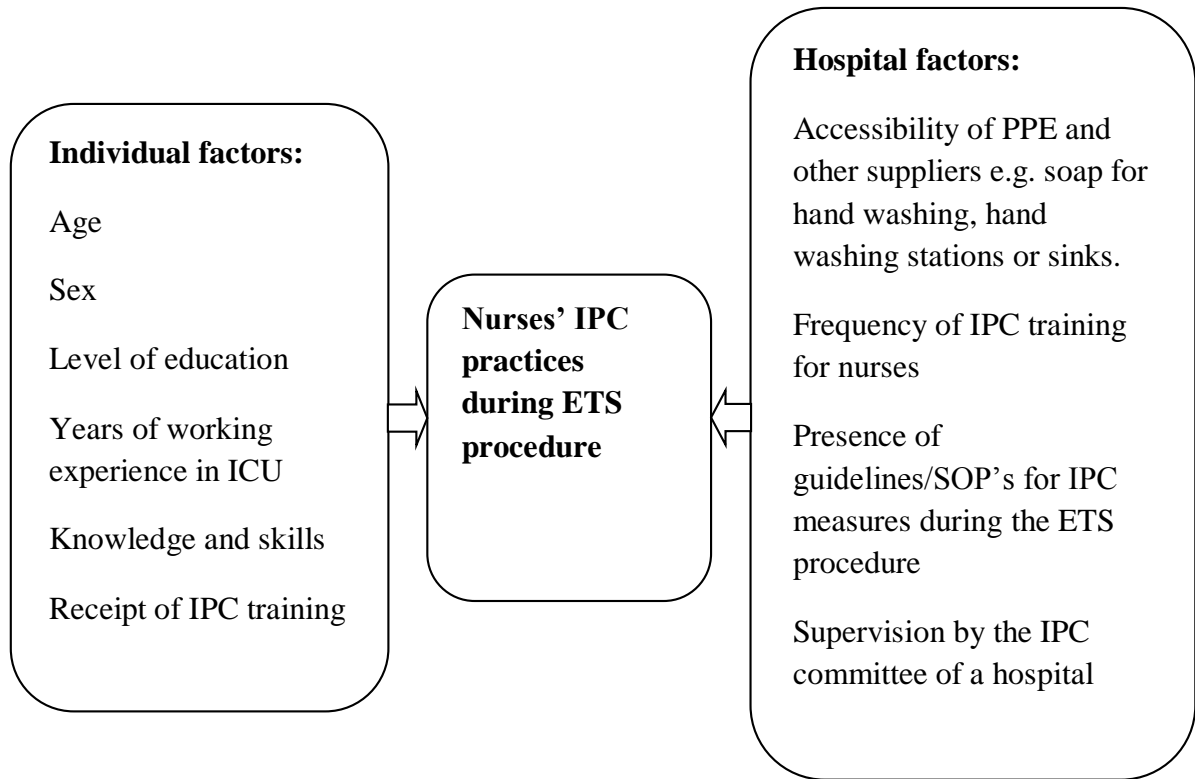


Figure 1: Conceptual framework for IPC practice on endotracheal suctioning and influencing factors

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

A review of the literature showed five main concepts which are presented in the following literature summaries: Incidence of infection to patients with ETT associated with ETS, measures to prevent infection, IPC standard practices during ETS procedure, individual characteristics and hospital related factors influencing IPC practices during the ETS procedure.

Endotracheal suctioning is a very important component of care to patients with endotracheal intubation and mechanically ventilated due to the fact that the presence of this tube in the trachea hinders effective coughing and cause a loss of mucociliary function, which results in accumulation of secretions in the airway(14). Is a procedure where by pulmonary secretions are mechanically removed from the patient's airway passage via the mouth or nose where the ETT is inserted. It is an invasive and it is associated with complications, where infection is among the complication, therefore, it is highly recommended to have good IPC practices during the procedure(25).

2.1 Incidence of infections to patients with ETT associated with ETS procedure

Invasive devices have been identified to be among the risk factors for HCAI(26). The prevalence of HCAI among patients is identified to be high in ICU's (34.5%) compared to other settings, whereby, among the risk factors identified is exposure to invasive devices like ETT with mechanical ventilation(27) and unsafe suctioning procedures(28). Also ventilator associated pneumonia (VAP) is found to account for 20% of all HCAI in PICU at Egypt, in this study 72.2% of infants receiving mechanical ventilation developed VAP while some factors, including inadequate general IPC practices on ETS among nurses were found to be statistically significant risk factors associated with VAP(29). In Uganda, a study found 32.5% of patients with infections related to ventilator(30). Currently in Tanzania, there is scarcity of published data on the incidence of infections to patients receiving mechanical ventilation with endotracheal intubation.

2.2 Measures to prevent infections

It requires an integration of various factors in order to prevent infections associated with mechanical ventilation with ETT to critically ill patients. Nurses are responsible to have a good hand disinfection practice (21) before providing care to these patients, use of PPE, aseptic techniques during invasive procedures like ETS and proper mouth care to patients with oral ETT (31) together with application of measures to prevent VAP e.g. VAP bundle (32)

2.3 IPC standards practices during ETS procedure

Management of endotracheal intubated patients requires high technical skills. One of the important skill is IPC practices during ETS procedure, since the patient can acquire health care associated infection when IPC practices during the procedure is inadequate(33). IPC practice starts from preparation of the procedure whereby a nurse needs to prepare a sterile suction kit containing sterile swabs/ gallipot for sterile solution (Normal Saline) and forceps, a bottle of sterile solution (normal saline), a sterile suction catheter and sterile gloves for the one performing the procedure. The nurse performing the procedure need to put on PPE's such as face mask, apron, and goggles, hand washing /disinfection prior to procedure and wear sterile gloves, also an assistant should disconnect ventilator circuit from the patient's ETT. During the procedure, the nurse has to hold the suction catheter close to the tip with sterile dominant hand, sucking first inside the ETT, wipe the catheter with sterile swab and rinsing the suction catheter with normal saline (sterile) in between the procedure and suck in the mouth lastly without going back to the ETT with the same suction catheter. After the procedure the nurse should discard the used suction catheter and the remaining solution appropriately, remove gloves and wash hands(6,15,34).

2.4 Individual factors associated with nurses' practices of IPC during ETS procedure.

IPC practices during endotracheal suctioning depends on the knowledge and skills of the individual nurse performing the procedure(35,36) and individual attitude. These factors vary among individuals (21). Maysa Nofal and colleagues identified socio-demographic characteristics that influence nurses' practice of IPC which are; knowledge and skills,

attitude, perceived risk of infection, and length of working experience (11) and in Tanzania, Powell-Jackson et al, identified that female health care workers are most likely to practice hand hygiene(23) In India, it was observed that nurses' practice of hand washing before ETS procedure was not adequate, wearing of gloves have replaced the hand washing procedure. In Tanzania, having received special training in critical care was identified to be associate with good IPC practices during ETS procedure (12).

2.5 Hospital factors influencing IPC practices during ETS procedure.

Health care organization is involved in prevention of health care associated infections by providing good infrastructure to guide, support and monitor good IPC practices and transmission based precautions in order to promote patient safety and to decrease health care associated infections(37). Olajide et al, identified hospital related factors like accessibility of PPE and other materials for IPC, frequency of IPC training to health care workers, supervision by IPC committee of a hospital and presence of guidelines or SOP's(10). Similar to Luo et al, where they identified that availability and easy accessibility of material resources play an important role for nurses best practices of IPC (38), and that, nurses are likely to adhere to IPC guidelines in their practices if supplies for IPC are adequate and sustainable (39). Since ETS should be performed aseptically, one nurse cannot perform it alone. Understaffing, too busy working environment with insufficient time is linked to inadequate IPC practices (40).

In Tanzania, despite good knowledge expressed by nurses on IPC practices during ETS procedure, the observed practices is not satisfactory(12,13).

Summary of the literature

Endotracheal suctioning is a procedure which require adherence to IPC practice in order to prevent infection to the lower airway such as pneumonia. Studies have reported incidence of infection to critically ill patients receiving mechanical ventilation resulted from inadequate IPC practice during ETS. In Tanzania there is scarcity of published data on incidence of infections due to ETS. Evidence from Tanzania and elsewhere show inadequate IPC practice during ETS procedure among ICU nurses. However, most of these studies have assessed few

items of IPC to be adhered during the procedure. This study assessed IPC practice during ETS procedure using a comprehensive checklist with 15 IPC items focusing on the preparation, procedure and post procedure. The study further assessed factors influencing IPC adherence among ICU nurses at consultant hospitals in Dar es Salaam.

CHAPTER THREE: MATERIALS AND METHODS

3.1 Study design

It was across-sectional and observational method using quantitative approach. Quantitative approach was used to collect quantifiable information to be used for statistical analysis of the population sample(41). Cross-sectional design involves the collection of data at one point in time, it enables to catch the phenomena under study at one point of data collection (42). This design was used because a researcher wanted to study the level of IPC on endotracheal suctioning among ICU nurses at a particular time. Each participant was assessed at a single time during the study. The researcher used quantitative approach with a purpose of obtaining quantifiable data which were converted into useable statistics that will aid in making generalizations from a large population.

3.2 Study setting

The study was conducted in the ICU's at Jakaya Kikwete Cardiac Institute (JKCI), Muhimbili National Hospital (MNH) and Muhimbili Orthopedic Institute (MOI), all are located in Upanga, Dar es Salaam, Tanzania. JKCI is a National Specialized and University Teaching Hospital offering cardiovascular care, training and research services. It has 103 beds capacity, and 2 ICU's; Coronary Care Unit (CCU) and Surgical ICU. CCU is a unit which cares patients with unstable heart diseases like acute Myocardial Infarctions, cardiac arrhythmias, cardiomyopathies and others. It has 6 beds capacity, with 2 mechanical ventilator machines. Surgical ICU is a unit which cares patients with post cardiac surgeries like Coronary Artery Bypass Grafting (CABG), heart valve repair or replacement, post pacemaker insertion or an Implantable Cardioverter Defibrillator (ICD), aneurysm repair and congenital heart diseases surgeries e.g. Tetralogy of Fallot. It has 9 beds capacity, each with a mechanical ventilator machine.

MNH is a National Referral Hospital, Research Centre and University Teaching Hospital where it receives and manages patients with medical and surgical conditions from every

region of the country. It has 1500 beds capacity, and 5 ICU's. Medical ICU, which cares critically ill patients with medical conditions, it has 13 beds capacity each with a mechanical ventilator machine. Surgical ICU, which cares critically ill patients with surgical conditions, it has 19 beds capacity each with a mechanical ventilator machine. Pediatric ICU (PICU), cares pediatric patients with both medical and surgical conditions, it has 10 beds capacity with 5 mechanical ventilator machines. Maternity ICU, which cares pregnant women and post-delivery women with critical conditions such as eclampsia, it has 6 beds capacity with 5 mechanical ventilator machines. Neonatal ICU (NICU), cares for new born babies with critical conditions, it has 5 beds capacity with 5 mechanical ventilator machines.

MOI is a National Referral Hospital, University Teaching Hospital and Research Centre. It is a specialized hospital which provides management of orthopedic, neurosurgery and trauma condition and it has 340 beds capacity. There is only one ICU which admits critically ill patients mostly those with neurological conditions such as severe traumatic brain injuries, cervical-spine injuries and brain tumors. It has 19 beds capacity, each with a mechanical ventilator machine.

Selection of the study site was based on the fact that, they are the government hospitals whereby, most critically ill patients from all regions in the country are referred to, and the ICU's are well equipped.

3.3 Study population

The population in this study was all nurses licensed by Tanzania Nurses and Midwives Council to practice nursing, who are working in ICU's at the selected hospitals.

MNH medical ICU has a total number of nurses 30, surgical ICU 34 nurses, PICU 24 nurses, maternity ICU 13 nurses and NICU 17 nurses, a grand total of 118 nurses. MOI ICU has a total number of nurses 15. JKCI, CCU has a total number of nurses 14, and surgical ICU 23 nurses, a total of 37 nurses from JKCI. A total population of 170 nurses was involved in a study.

3.4 Sample size calculation

The formula for sample size estimation for finite population from Taro Yamane, 1967 as cited by (43) was employed as follows:

$$n = \frac{N}{1 + N(e)^2}$$

Where;

n = Minimum sample size required

N = the population size

e = Margin error estimated at 5 % (0.05)

Thus;

$$n = \frac{170}{1 + 170 (0.05)^2}$$

n = 119

Therefore, the minimum number of nurses required to participate in a study was 119.

This sample size was adjusted for 10% non-response rate:

$$n = \frac{119 \times 100\%}{100\% - 10\%}$$

n = 132

Therefore, the adjusted number of nurses required to participate in a study was 132 nurses.

The allocation of the sample to MOI, MNH, and JKCI was made proportionally basing on the number of nurses working in the setting by using the following formula:

$$n = \frac{\text{Number of nurses in a selected setting} \times 132}{\text{Number of nurses in all settings}}$$

Where; n = Number of nurses to be taken as a sample in each selected setting.

$$\text{So, at MOI, the sample size was: } n = \frac{15}{170} \times 132 = 12 \text{ nurses}$$

$$\text{At MNH, the sample size was: } n = \frac{118}{170} \times 132 = 91 \text{ nurses}$$

$$\text{At JKCI, the sample size was: } n = \frac{37}{170} \times 132 = 29 \text{ nurses}$$

Therefore, the required sample size was 132 nurses.

For those settings which had more than 1 unit, sample size allocation per each unit was done as follows:

$$n = \frac{\text{Number of nurses in a unit}}{\text{Number of population in a setting}} \times \text{Number of sample in a setting}$$

Where n = sample size required in each unit

Therefore; For MNH:

$$\text{Medical ICU: } \frac{30}{118} \times 91 = 23 \text{ nurses}$$

$$\text{Surgical ICU: } \frac{34}{118} \times 91 = 26 \text{ nurses}$$

$$\text{Pediatric ICU: } \frac{24}{118} \times 91 = 19 \text{ nurses}$$

$$\text{Maternity ICU: } \frac{13}{118} \times 91 = 10 \text{ nurses}$$

$$\text{Neonatal ICU: } \frac{17}{118} \times 91 = 13 \text{ nurses}$$

For JKCI:

$$\text{CCU: } \frac{14}{37} \times 29 = 11 \text{ nurses}$$

$$\text{Surgical ICU: } \frac{23}{37} \times 29 = 18 \text{ nurses}$$

For MOI, sample size was 12 nurses since there is only one unit.

3.5 Sampling procedure

Simple random sampling using a lottery method was used(44) . The researcher obtained small pieces of papers of equal size, shape and color according to the number of nurses in each unit. The papers were written ‘YES’ corresponding to a number of sample size required in a unit and others were written ‘NO’. The papers were folded and mixed up in a box. Nurses were asked to pick only one piece of paper blindly; therefore the selection depended on chance. Those who picked ‘YES’ were recruited to participate in a study and those who picked ‘NO’, they were not recruited. The papers were not replaced. Among the selected participants who consented to participate (n=129), 43% (n=55) were observed for their IPC practices during ETS procedure.

3.6 Inclusion and exclusion criteria

Inclusion criteria

All nurses registered by Tanzania Nurses and Midwives Council with Diploma level and above, both males and females, who are working in ICU’s of the selected hospitals, with working experience in ICU of 3 months or more and who consented to participate in a study.

Exclusion criteria

Nurses who are at the managerial position because they do not work at the patient’s bedside.

3.7 Dependent variable

The main outcome for this study was nurses’ IPC practices on ETS. This was determined by using a comprehensive checklist.

3.8 Independent variables

Individual factors

These included factors like age, sex, level of education in nursing profession, working experience in ICU, knowledge and receipt of IPC training. These variables were measured by using a structured questionnaire.

Hospital factors

These are the factors within a hospital which can influence nurses' IPC practices. Those factors are like: availability of equipment, accessibility of PPE and other suppliers e.g. hand washing soap or disinfectant, number of staff in a unit, frequency of IPC training programs for nurses, availability and location of sinks and water taps for hand washing, and presence of guidelines/SOP for IPC measures during the ETS procedure. These were also assessed by using a structured questionnaire.

3.9 Data collection tools

Observation checklist: A comprehensive checklist was used (Refer appendix B). The checklist was developed by the researcher through adapting the constructs from recommended guidelines for ETS(6,15,34) where some of the items were slightly modified to suit the local context of Tanzanian practice.

Structured questionnaire: A facilitated structured questionnaire (Refer appendix A) which was developed by the researcher and some of the questions were adapted from previous study(13). The questionnaire was reviewed by 3 ICU experts. This questionnaire consisted of two parts; part one comprised of individual characteristics which in turn were used as independent variables for their relationship with a practice and part two hospital related factors influencing nurse's IPC practices on ETS procedure. It has a total of 21 questions. All questions were revised and as a result some of the questions were omitted, some added and others rephrased according to panel agreement.

The questionnaire used was in English language since all study participant use this language in their work. Every study participant who consented to participate in a study was given a questionnaire to fill after the observation completed.

3.10 Data collection methods

Two methods of data collection were used, observation and survey(45) . Using observation method allowed the researcher to collect data concerning nurses' IPC practices on ETS. The components of IPC practices were adapted from the recommended guidelines for ETS. One checklist was used for each participant and was identified by the same identification number used on a questionnaire responded by the participant. The researcher observed the participant when performing ETS uninterrupted and then mark on the checklist 1 for a practiced item and 0 if not practiced. Further, self-administered questionnaire was used to obtain data pertaining to individual characteristics of the participant and hospital related factors that can influence nurses' IPC practices on ETS procedure. The questionnaire was developed by the researcher after review of the literatures and some questions were adapted from previous studies. The researcher together with two research assistants who were trained for data collection distributed questionnaires to participants after observations on same day of data collection.

3.11 Validity and Reliability

The modified questionnaire were handed to 4 ICU nurse experts to assess content validity of the questionnaire, those nurses were excluded in a study. Closed and open ended questions were used to determine the hospital factors and they were objective and focused to strengthen reliability. Either, the researcher conducted pre-testing of the tools to establish validity and reliability. The questionnaire were pre-tested with 2 nurse critical care specialists, 2 degree holder nurses, 2 diploma nurses, a total of 6 nurses whom they were chosen randomly from the selected hospitals to evaluate if the questions were understood by the nurses. These nurses were not part of the study. Cronbach's alpha scale was used to calculate the internal consistency of the measuring scale where by a reliable score of 0.781 was obtained. Observations were done only by the researcher in order to ensure consistency in scoring IPC practice during the procedure and avoid bias.

3.12 Data collection

Data collection was carried out from 11th May to 30th May, 2021. Data were collected to 129 participants who consented to participate in a study out of the calculated sample size which was 132. English version questionnaire was used because all nurses in Tanzania are trained using English language. Questionnaire was filled in the presence of two trained research assistants and participants were requested to be free to ask any questions or clarification. Nurses from 9 ICU's were interviewed for hospital factors. Identification numbers were used for each form instead of names. Participants were requested to read and sign the consent form upon agreement. Research assistants were 2 Registered nurses. Questionnaires were filled in working hours per each shift. Consent forms and filled questionnaires were collected and placed into sealed envelopes by the research assistant and taken from each unit daily.

Observations were carried out in 6 units. Among 129 participants who were randomly selected and consented to participate in a study, 43% (n=55) were selected conveniently to participate in observation. Convenient method was used to obtain participants for observation because ETS is not a routine procedure rather it is performed when a need arise. This number reached after saturation. The researcher selects one unit conveniently each day and arrived there at 7:00 am every day when a new shift begin. Observations were carried out from 7am to 6pm every day. Since ETS procedure is not a routine procedure rather it is performed to a patient after assessment and finds that there is a need of performing it. Therefore the researcher would stay in a selected unit, cooperate with nurses in building rapport and when it is needed to perform ETS procedure, and then the participant was observed for IPC practices uninterrupted. Participants were aware that they were being observed. Few of them who refused to be observed were not included in observation part.

3.13 Data analysis

Data from both questionnaires and observation were analyzed using SPSS version 23. Descriptive statistics, whereby frequency, percentage, mean and standard deviation were calculated. Scores in observation were converted into percentages. Because IPC is very important for patient's safety, a score of 10(66.5%) was a cutoff point for a desired level.

Those who scored below 10 were undesirable. Chi-square test and Fisher exact test were used to identify the association in the observed difference in practice scores by the independent variables: sex, age, level of education in nursing, working experience in ICU, receipt of IPC training where a p value ≤ 0.2 was considered further analysis step. Logistic regression tests were carried out to express the magnitude and direction of the association between levels of education in nursing profession, years working in ICU, IPC training and ICU nurses IPC practice on ETS procedure where by, bivariate analysis was conducted to find out if there is a relationship between dependent and independent variables and a p value of ≤ 0.05 was considered in multivariate analysis.

3.14 Ethical considerations

The ethical clearance was sought and granted from the MUHAS Institutional Review Board (Appendix G). Introduction letter to the management of study settings were provided by MUHAS IRB (Appendix D-F). Permission to conduct the study was sought from the MNH management (Appendix H), MOI management (Appendix I) and JKCI management (Appendix J). Participants were well informed and signed a consent form (Appendix C). Participation in the study was voluntary and no harm was expected during participation. Either, participants were asked not to write their names or registration numbers, code numbers were used in both questionnaire and checklist. The names of the hospitals and units where data for hospital factors influencing IPC practice were also not mentioned for ethical purposes.

3.15 Dissemination of results

Result of this study will be disseminated in each unit which participated in this study; School of Nursing MUHAS, MUHAS library, MNH administration, MOI and JKCI administrations. Moreover, the results will be published in Nursing Journals and presented in scientific conference. Also Ministry of health and social welfare (MOHSW) will access a copy of dissertation report.

3.16 Strength and Limitations of the study

The current study assessed intensive care nurses' IPC practice on ETS by using a comprehensive checklist. The study was conducted in ICU's of Government hospitals only which are located in Dar es Salaam: MNH, MOI and JKCI and it involved a few number of participants therefore findings may not be representative of the general population of ICU nurses in Tanzania. This may threatens the external validity of the findings hence another research on this area with large sample size and incorporation of other hospitals out of Dar es Salaam and private hospitals is required. Observation, like other methods has its own limitations and ethical implications. One of the main problems is Hawthorne effect(14), whereby participants can behave differently when they know that they are being observed and is an important threat to the validity of observational research. However, literature suggests that participant's change of behavior is usually temporary, whereby through establishment of good rapport, there is a tendency for the observed to become familiar with the presence of the observer and continue to perform their practice as they are used to do. Therefore the Hawthorne effect may not have affected the study findings in this study because the researcher established a good rapport with participants by being among the team.

CHAPTER FOUR: RESULTS

4.0 GENERAL CHARACTERISTICS OF PARTICIPANTS

One hundred and twenty nine nurses (129) consented to participate and completed a study, response rate was 97.7%. Table 1 below summarizes general characteristics of participants.

Table 1: General characteristics of participants

Variable	Categories	Frequency	Percentage (%)
Sex	Male	44	34
	Female	85	66
Age group	25-30	49	38
	31-40	58	45
	41-50	22	17
Level of education in nursing	Diploma	83	64
	Bachelor	46	36
Working experience in ICU	Less than 1 year	18	14
	1 year to 5 years	67	52
	5 years to 10 years	28	22
	More than 10 years	16	12
Receipt of training on IPC	Yes	68	53
	No	60	46
	Don't remember	1	1

Majority of participants 85 (66%) had female gender, 58 (45%) were in age group of 31-40 years, 83 (64%) had a diploma level of education, majority 67 (52%) had a working experience of 1 year to 5 years and more than a half of participants 68 (53%) had received a training on IPC.

Among the study participants (n=129), 43% (n=55) were observed for IPC practice during the procedure. Since IPC is very important for patient's safety, a cutoff point of 10 (66.5%) was considered for desirable practice. The IPC practice scores were as follows: Majority 33 (60%) scored 10 (66.5%) and above. The scores are summarized in frequency and percentages in Table 2 below.

Table 2 : Scores of IPC practice

Score in %	Frequency (n=55)	Percent
80%	11	20
86.7%	10	18
53.3%	6	11
66.7%	6	11
40%	5	9.1
46.7%	5	9.1
73.3%	4	7.3
60%	3	5.5
33.3%	2	3.6
26.7%	1	1.8
93.3%	1	1.8
100%	1	1.8

The mean score of practice was 66.5% (sd=18.5%). The minimum score was 22.6% and maximum was 100%

4.1 IPC practices on ETS procedure

This section describes the observed IPC practices on ETS. Among the observed participants, 28 (50.9%) did not prepare a sterile suction catheter for the procedure, majority 47 (85.5%) did not wash/disinfect their hands prior to procedure and after procedure 38 (69.1%), also majority 37 (63.7%) did not discard the suction catheter after completing the procedure. Table 3 below summarizes the practice scores with their corresponding frequency and percentage.

Table 3 : IPC practice observed and the scores in percentages and number values (n=55)

SN	SKILLS TO BE OBSERVED	PRACTICE	
		Yes	No
	BEFORE PROCEDURE		
1.	Preparation of sterile suction kit	29 (52.7%)	26 (47.3%)
2.	Preparation of sterile solution (Normal Saline)	45 (81.8%)	10 (18.2%)
3.	Preparation of sterile suction catheter	27 (49.1%)	28 (50.9%)
4.	Preparation of sterile gloves for the performer	48 (87.3%)	7 (12.7%)
5.	Wearing PPE	55 (100%)	0
6.	Hand washing / disinfection prior to procedure.	8 (14.5%)	47 (85.5%)
7.	Wearing sterile gloves	48 (87.3%)	7 (12.7%)
	DURING THE PROCEDURE		
8.	Ask an assistant to disconnect ventilator circuit from ETT	32 (58.2%)	23 (41.8%)
9.	Hold catheter close to the tip with sterile dominant hand and insert in the ETT	37 (67.3%)	18 (32.7%)
10.	Sucking first inside the ETT.	55 (100%)	0
11.	Wipe the catheter with sterile gauze	35 (63.6%)	20 (36.4%)
12.	Rinsing the suction catheter with sterile solution (Normal Saline) in between the procedure.	45 (81.8%)	10 (18.2%)
13.	Suck in the mouth lastly and never return to the ETT with the same suction catheter.	50 (90.9%)	5 (9.1%)
	AFTER PROCEDURE		
14.	Discard the used suction catheter in the bucket for infectious materials	18 (32.7%)	37 (63.7%)
15.	Remove gloves and wash hands.	17 (30.9%)	38 (69.1%)

Initially, Chi-square test was conducted to show the direction and strength between categorical variables of Age, Sex, Level of education in nursing profession, Years of working experience in ICU and Receipt of IPC training and IPC practice where by a p value ≤ 0.2 was considered in bivariate analysis. Table below summarizes the results.

Table 4 : Chi-square test Fisher-exact test

Variable	Categories	Undesirable practice	Desirable practice	Total	P Value
		N=22(%)	N=33(%)		
Sex	Male	7(37)	12(63)	19	0.728
	Female	15 (42)	21 (58)	36	
Age group (in years)	25-30	10(50)	10(50)	20	0.407*
	31-40	8 (31)	18 (69)	26	
	41-50	4 (44)	5 (56)	9	
Level of education	Diploma	17(47)	19(53)	36	0.132
	Bachelor	5 (26)	14 (74)	19	
Working experience (in years)	1 - 5	13(41)	19(59)	32	0.911
	5-10	9 (39)	14 (61)	23	
Receipt of IPC training	Yes	11(34)	21(66)	32	0.315
	No	11 (48)	12 (52)	23	

***P value from Fisher exact test**

4.2 Individual characteristics associated with desirable IPC practice

In unadjusted odds ratio, there was no significant association between variables of gender, age group, education level in nursing, working experience in ICU, receipt of IPC training and IPC practices during the ETS procedure (p values > 0.05) but in level of education those with Bachelor and Masters are 2.5 times more likely to have adequate IPC.

Table 5 : Individual characteristics associated with desirable IPC practice on ETS

Factor	Bivariate		Multivariate	
	COR (95%CI)	P Value	AOR (95%CI)	P Value
Sex				
Female	1	1	1	1
Male	1.22(0.39-3.84)	0.729	1.17(0.32-4.26)	0.807
Age group				
31-40	1	1	1	1
25-30	0.44(0.13-1.49)	0.189	0.42(0.09-2.04)	0.286
41-50	0.56(0.12-2.63)	0.459	0.44(0.07-2.88)	0.394
Education level				
Diploma	1	1	1	1
Bachelor	2.51(0.74-8.42)	0.138	5.04(1.14-22.44)	0.033
Working experience				
1 year to 5 years	1	1	1	1
5 years to 10 years	1.06(0.36-3.18)	0.911	0.55(0.10-3.00)	0.491
Receipt of IPC training				
Yes	1	1	1	1
No	0.57(0.19-1.71)	0.317	0.25(0.05-1.33)	0.103

Adjusting for Sex, Age group, Level of education in nursing, Years of working experience in ICU and Receipt of IPC training in Multivariate Logistic Regression Model, the results are as follows: There is no significant difference in IPC practices between sex, age group, years of working experience in ICU and receipt of IPC training (p values > 0.05). Significant difference in IPC practices was found between ICU nurses with different education level ($p = 0.033$).

4.3 Hospital factors reported to influence IPC practices during the ETS procedure

All ($n=129$) participants were interviewed for the hospital factors influencing IPC practices on ETS. When participant were asked why they reuse a disposable suction catheter for sucking in the patient's ETT, majority 119 (92.2%) agreed that inadequate supply of disposable suction catheter is a reason keeping and reusing it and to the question about displaying of policy and guidelines for IPC practices during the ETS, majority 121 (93.8%) chose yes, it enhance IPC practices. Majority of participant 128 (99.2%) agreed that adequate supply of sterile suction kits for ETS influence desirable IPC practices and when they were asked does heavy work load have an influence to IPC practices during the procedure, majority 100 (77.5%) chose yes.

On adequate and sustainable supply of PPE materials, majority 117 (90.7%) agreed that it influence its uses while on the hand washing practices, majority 78 (60.5%) agreed that presence of hand washing sinks and water taps in a unit influence hand washing practices.

Majority of participants 108 (83.7%) disagree to the statement that presence of continuous education on IPC for ICU nurses promotes good practices of it, on the other hand, majority 91 (70.5%) selected no to a question which asked whether supervision by the IPC committee of the hospital enhance good IPC practices during the procedure. A large proportion of participants 105 (81.4%) selected yes when they were asked whether nurse to patient ratio has an effect to IPC practiced when performing the procedure of ETS and majority accepted that during emergency situations in a unit, IPC practices are affected while a large group of participants 119 (92.2%) pointed it is true that motivation from unit leaders can influence good IPC practices when performing a procedure. Table below summarizes a report of hospital related factors influencing IPC practices during the ETS among ICU nurses.

Table 6 : Response on Hospital factors influencing IPC practices during ETS

Question	Categories	Frequency and % (N=129)
The reason why nurses reuse a disposable suction catheter is	Negligence	10 (7.8)
	Inadequate supply of disposable suction catheters	119 (92.2)
Displaying policy and guidelines for IPC during ETS supports good IPC practices	Yes	121 (93.8)
	No	8 (6.2)
When sterile suction kits for ETS are adequate influence good IPC practices	I agree	128 (99.2)
	Neutral	1 (0.8)
Does heavy work load affects good IPC practices?	Yes	100 (77.5)
	No	29 (22.5)
Adequate and sustainable supply of PPE influences its use	I agree	117 (90.7)
	I disagree	12 (9.3)
Presence of hand washing sinks and water taps influence good hand washing practices	I agree	78 (60.5)
	I disagree	51 (39.5)
Presence of continuous education programs on IPC for nurses promotes good IPC practices	I agree	21 (16.3)
	I disagree	108 (83.7)
Does supervision by IPC committee of the hospital enhance good IPC practices among nurses?	Yes	38 (29.5)
	No	91 (70.5)
Does nurse to patient ratio affects IPC practices among nurses?	Yes	105 (81.4)
	No	24 (18.6)
Do emergency situations in a unit affect good IPC practices?	Yes	77 (59.7)
	No	52 (40.3)
Motivation from unit leaders can influence good IPC practices during a procedure	True	119 (92.2)
	False	10 (7.8)

CHAPTER FIVE: DISCUSSION

This study aimed to assess IPC practices on ETS and influencing factors among nurses in consultant hospitals ICU's in Dar es Salaam. One hundred and thirty two sample sizes were calculated whereas, One hundred and twenty nine nurses consented to participate in a study and all of them completed the study response rate was 97.7%. Among them, majority were females, more than a half of participant had age group between 31-40 years, majority had Diploma level in nursing, and more than a half had a working experience in ICU of 1 year to 5 years.

Observed level of IPC practices on ETS among ICU nurses for this study where a comprehensive checklist was used, is adequate whereby, majority. The finding contradict with a study conducted in Baghdad(36) and in Tanzania(12,13) where both studies reported inadequate IPC practice on the few IPC items assessed.

In the present study, despite adequate IPC practice observed on ETS still there is a discrepancy in hand washing/disinfection practices prior and after the procedure. The Tanzania Ministry of Health insisted on hand disinfection as the primary factor of IPC during any procedure(35). The finding is similar to a study done in Ireland on the observation study of the open system endotracheal suction practices of critical care nurses (14) and in Tanzania also a study got similar findings(12).

A study also found reuse of a suction catheter is another discrepancy. This contradicts to recommended guidelines and standards of endotracheal tube suctioning of the intubated patients(1,46) which recommends the use of a new, sterile suction catheter for each procedure when sucking the patient's ETT. Majority in the present study were found to keep the suction catheter after use. This finding contradicts to a study done by Mwakanyanga et in Tanzania whereby majority of participants discarded the used suction catheter after the procedure(12).

The present study found that, there is association between individual level of education in nursing and IPC practice on endotracheal suctioning. Participants with Bachelor level and

Masters in nursing had good IPC practice compare to others suggesting that with increase in level of education in nursing there is high chance of having desirable IPC practices. The finding contradicts to a study done in Nigeria where it was found that there was no relationship between level of education and utilization of IPC measures(10).

Scarcity of resources can have an influence on nurses' IPC practices as identified by majority in the current study that reuse of disposable suction catheter is attributed to its inadequate supply. Policy for suctioning recommended that suction catheters should be used only once and a new catheter for each time of suctioning should be used(1). The finding is supported by Luo et al, 2010 where it was identified that availability and accessibility of resources plays an important role for best IPC practices among nurses(38).

Policy/ guidelines for IPC during invasive procedures like ETS influence positively on IPC practices as agreed by majority of participants in this study. The finding is supported by a study done in Ethiopia on adherence to infection prevention and influencing factors among nurses whereby more than a half of participants said they have no IPC guidelines and policy displayed which would enhance IPC adherence(47) and in Pakistan majority of participants mentioned that unavailability and dissemination of IPC policies is a main factor affecting adherence to standard practices(48). The finding is contrary to a study done in Nigeria whereby majority disagreed to the fact that if a policy is available and displayed it influence positively to IPC practices(10).

Heavy workload such as inappropriate number of nurse: patient ratio can affect negatively IPC practices as acknowledged by majority of participants. The finding is supported by a study in Pakistan on factors affecting adherence with standard precautions where more than a half of participants identified work load due to shortage of staff affect negatively IPC practices among nurses(48).

Adequate and sustainable supply of PPE materials influence its uses in IPC practices as agreed by majority in this study. The finding contradicts with other studies conducted where it was found that PPE use practices are not attributed by the supply(15,36,39,49,50). Luo, Y. support

the finding where provision of adequate PPE was found to strengthen nurses adherence to standard precautions(38)

Hand washing practices is a first line for IPC(21). It was agreed by majority in the current study that presence of hand washing sinks and water taps in a unit may influence positively hand washing practices contrary to a study done by Ally, T. S where participants did not practice hand washing despite the presence of hand washing stations and it was suggested that nurses replaced hand washing practices with wearing of gloves(13).

Majority in the present study did not acknowledge that presence of continuous education on IPC or training may influence a practice. The finding contradicts to that of Zambia by Njovu, E., whereby majority recommended training to be among the factor that can improve IPC guideline adherence(24).

Majority in the current study disagreed that supervision by the IPC committee of the hospital can have an impact to practices among nurses. The finding contradicts to that of a study in Nigeria where majority agreed that prompt supervision by IPC committee of the hospital has an influence to practices hence the committee has a role of supervising and encouraging nurses to practice IPC when performing invasive procedures like ETS(10).

It was agreed by majority that in emergency situations e.g. cardiac arrest in a unit IPC practices are impaired. This finding is contradicted by Olajide et al study where it was found that in emergency situations, or when the unit is too busy does not jeopardize IPC practices(10). Nurses are obliged to have adequate IPC practices every time when providing care to patients in order to make sure they don't cause harm to the critically ill patient.

When nurses are motivated by unit leaders, they may have adequate IPC practices as agreed by majority of participants. The finding is supported by that of Pakistan where also majority highlighted that motivation from leaders may influence best IPC practices among nurses therefore unit leaders are required to find ways of promoting good IPC practices among nurses for the benefit of the patient(48).

CHAPTER SIX: CONCLUSION AND RECOMENDATIONS

6.1 CONCLUSION

The current study revealed adequate IPC practices on ETS where a comprehensive checklist was used.

There was no significant difference found in IPC practices between participants with different sex, age group, years of working experience in ICU and receipt of IPC training except in levels of nursing education where it was found that there is statistical significance difference between nurses with Bachelor or Masters Level in nursing and IPC practices on ETS.

Despite adequate IPC practice observed, still a challenge was found in preparation of sterile suction catheter for the procedure where majority of participants were reusing a suction catheter, hand washing/disinfection prior and after the procedure, and dispose of the used materials especially suction catheter, majority kept the used disposable suction catheter for next use.

Also in the current study it was reported that inadequate supply of disposable suction catheters, display of policy/guidelines, heavy work load, adequate and sustainable supply of PPE materials, presence of hand washing sinks and water taps, continuous education programs on IPC, nurses to patient ratio, emergency situations and motivation from unit leaders may influence IPC practices during the procedure.

6.2 RECOMMENDATIONS

IPC practices on ETS procedure

ICU nurses need to play their role effectively in adhering to IPC practices when caring critically ill patients who receives mechanical ventilation with ETT in order to ensure that patients in ICU remains free from acquiring health care associated infections which might prolong their recovery and increase hospital stay and costs.

Unit leaders should find ways of encouraging nurses in ICU so that they utilize the available resources effectively to maximize patient's safety during invasive procedures like ETS.

Hospital factors influencing IPC practices on ETS

The hospital management should play their role to ensure adequate and sustainable supply of resources like disposable suction catheters and sterile suction kits for nurses' best IPC practices during ETS procedure.

Similar studies are recommended to include large sample size and other hospitals in Tanzania and non-government hospitals which provide care to critically ill patients and factors influencing IPC practices during ETS can be assessed through other methodology, such as qualitative methods.

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APPENDICES

APPENDIX A: Structured questionnaire (English Version)

Hospital factors influencing Infection Prevention and Control (IPC) practices during endotracheal tube suctioning (ETS) procedure, among intensive care nurses in consultant hospitals in Dar es Salaam: Muhimbili Orthopedic Institute, Muhimbili National Hospital and Jakaya Kikwete Cardiac Institute.

Date.....

Participant code number.....

INSTRUCTION

All information provided will be confidential; do not write your name in this form. This questionnaire has two parts. Answer all the questions in each part objectively and sincerely.

Part 1

Social demographic characteristics of participants

This part is pertaining to your personal particulars. You are required to fill or circle the answer that best describe your choice.

1. What is your age group (Years)
 - (a) 18-24
 - (b) 25-30
 - (c) 31-40
 - (d) 41-50
 - (e) 51-60
 - (f) >60

2. What is your gender?
 - (a) Male
 - (b) Female

3. What is your highest level of education attained in nursing profession?
 - (a) Diploma
 - (b) Bachelor
 - (c) Masters
 - (d) PhD

4. Mention any other qualification(s) you have

.....
.....

5. What is your working experience in ICU?

- (a) Less than 1 year
- (b) 1 year to 5 years
- (c) 6 years to 10 years
- (d) More than 10 years

6. Did you receive any training or orientation about IPC measures during care of the patient with endotracheal intubation?

- (a) Yes
- (b) No
- (c) I don't remember

Part 2: The following questions pertain to Hospital factors influencing IPC practices during ETS procedure

7. One the following is a reason why nurses reuse and keep a disposable suction catheter during ETS procedure

- (a) Negligence
- (b) No reason
- (c) Inadequate supply of disposable suction catheter

8. Policy and guidelines for ETT suctioning procedure in a unit support good IPC practices when performing the procedure.

- (a) Yes
- (b) No

9. Adequate supply of equipment such as sterile suction kits influence good IPC practices during the procedure.

- (a) I agree
- (b) I disagree
- (c) Neutral

10. Heavy work load such as caring more than one patient who is on mechanical ventilator with ETT it affects good IPC practices when performing ETS procedure.

- (a) I agree
- (b) I disagree
- (c) Neutral

11. When supply of PPE's in a unit is adequate and sustainable, nurses' practice of PPE use for infection prevention will be good.

- (a) I agree
- (b) I disagree
- (c) Neutral

12. Presence of hand washing sinks and water taps in a ward is associated with good hand washing practice before and after performing the procedure

- (a) Yes, I agree
- (b) No, I disagree

13. Continuous education programs to ICU nurses helps in promoting good IPC practices.

- (a) I agree
- (b) I disagree
- (c) Neutral

14. When there is good supervision by IPC committee of the hospital, IPC practices among nurses is good.

- (a) I agree
- (b) I disagree
- (c) Neutral

15. Does nurse to patient ratio affects good IPC practices during a procedure?

- (a) I agree
- (b) I disagree
- (c) Neutral

16. When the unit is too busy e.g. in emergency situations good IPC practices are compromised.

- (a) I agree
- (b) I disagree
- (c) Neutral

17. Motivation from unit leaders encourages nurses to have good IPC practices when performing procedures.

(a) True

(b) False

18. List other factor(s) that you think is/are affecting IPC practices when performing the ETS procedure

.....
.....
.....
.....
.....

APPENDIX B: Observation checklist (English version)

Observation checklist for nurse's infection prevention and control practices during endotracheal suctioning procedure in intensive care units at MOI, MNH and JKC.

Code number..... (To be filled by the investigator)

SN	IPC COMPONENT	PRACTICE	
		YES	NO
	BEFORE PROCEDURE		
1.	Preparation of Sterile suction kit		
2.	Preparation of sterile solution (Normal Saline)		
3.	Preparation of sterile suction catheter		
4.	Preparation of sterile gloves for the performer		
5.	Wearing personal protective equipment: Apron, face mask		
6.	Hand washing / disinfection prior to procedure.		
7.	Wearing sterile gloves		
	DURING PROCEDURE		
8.	Ask an assistant to disconnect ventilator circuit from ETT		
9.	Hold catheter close to the tip with sterile dominant hand and insert in the ETT		
10.	Sucking first inside the ETT.		
11.	Wipe the catheter with sterile gauze		
12.	Rinsing the suction catheter with sterile solution (Normal Saline) in between the procedure.		
13.	Suck in the mouth lastly and never return to the ETT with the same suction catheter.		
	AFTER PROCEDURE		
14.	Discard the used suction catheter in the bucket for infectious materials.		
15.	Remove gloves and wash hands.		

APPENDIX C: INFORMED CONSENT (English version)

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES**DIRECTORATE OF RESEARCH AND PUBLICATION****MUHAS INFORMED CONSENT**

Participant code number.....

Consent to participate in a research study.

Greetings,

My name is Helena Chinguile, a 2nd year student in Master of Science in Nursing Critical Care and Trauma from Muhimbili University of Health and Allied Sciences (MUHAS). I am conducting a study titled '**Intensive care nurses' infection prevention and control practices on endotracheal suctioning using a comprehensive checklist and influencing factors in consultant hospitals Dar es Salaam**'.

Purpose of the study: This study is conducted as a partial fulfillment of the requirement for the degree of Masters of Science in Nursing Critical Care and Trauma.

Study goal: To assess Infection Prevention and Control practices on endotracheal suctioning and influencing factors among intensive care nurses in tertiary hospitals Dar es Salaam.

What participation involves: If you agree to join the study, you will be observed for infection prevention and control practice on performing the procedure of endotracheal suctioning and interviewed in order to answer a series of questions in the questionnaire prepared for the study.

Potential risks. We do not expect any risks while participating in this study. However, if any physical injury will occur from participation in this study, I will guide you to obtain medical treatment according to the current standard of care in Tanzania. There will be no additional compensation for you.

Potential benefit: If you agree to participate in this study, you will help us to explore nurse’s performance on infection prevention during endotracheal tube suctioning and the results of this study will help to improve nursing practices of infection prevention during endotracheal suctioning.

Confidentiality: The information that you will provide will be confidential, will not be disclosed to anyone and will be used for research purpose only. Your personal information will be confidential; you will be contacted by the research team again only if it will be necessary to complete the information in a study. Refusal or withdraw from participating in a study will not involve penalty or loss of benefit which you are entitled.

Voluntary participation: Your participation in a study is voluntary, you can withdraw from the study after giving consent to participate.

Contact information: If you have any question about this study, you may contact the principal investigator Helena Chinguile, Muhimbili University of Health and Allied Sciences, School of Nursing, P.O. BOX 65004, Dar es Salaam. Mobile number 0755 666 928 or 0655 666 928. Or you may call Director of Research and Publication, Muhimbili University of Health and Allied Sciences, P.O. BOX 65001, Dar es Salaam. Telephone number +255222152467.

Do you agree?

Participant agree..... Participant disagree.....

I have read and understand the content in this form and I agree to participate in a study.

Signature of participant.....

Signature of principal investigator.....

Date.....

APPENDIX D: INTRODUCTION LETTER TO MNH

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



In reply quote;
 Ref. No. HD/MUH/1.515/2019

30th April, 2021

The Executive Director,
 Muhimbili National Hospital,
 P.O. Box 65000,
DAR ES SALAAM.

Re: INTRODUCTION LETTER

The bearer of this letter is Helena Chinguile, a student at Muhimbili University of Health and Allied Sciences (MUHAS) pursuing MSc. in Nursing Critical Care and Trauma, School of Nursing.

As part of her studies she intends to do a study titled, *“Assessment of the Infection Prevention and Control Measures (IPC) Compliance During Endotracheal Tube Sectioning Procedure, and Factors Influencing Compliance Among Nurses in Critical Care Settings, at Tertiary Hospitals in Dar es Salaam.”*

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

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

We thank you for your cooperation.

Ms. P. J. Mwanthwa
For: DIRECTOR, POSTGRADUATE STUDIES

cc: Dean, School of Nursing, MUHAS
 cc: Helena Chinguile

APPENDIX E: INTRODUCTION LETTER TO MOI

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



In reply quote;
 Ref. No. HD/MUH/T.515/2019

30th April, 2021

The Executive Director,
 Muhimbili Orthopaedics Institute,
 P.O. Box 65474,
 DAR ES SALAAM.

Re: INTRODUCTION LETTER

The bearer of this letter is Helena Chinguile, a student at Muhimbili University of Health and Allied Sciences (MUHAS) pursuing MSc. in Nursing Critical Care and Trauma, School of Nursing.

As part of her studies she intends to do a study titled: *Assessment of the Infection Prevention and Control Measures (IPC) Compliance During Endotracheal Tube Suctioning Procedure, and Factors Influencing Compliance Among Nurses in Critical Care Settings, at Tertiary Hospitals in Dar es Salaam.*

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

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

We thank you for your cooperation.

Victoria Mwachima
 For: **DIRECTOR, POSTGRADUATE STUDIES**

cc: *Dean, School of Nursing, MUHAS*
 ✓cc: *Helena Chinguile*

APPENDIX F: INTRODUCTION LETTER TO JKCI



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



In reply quote;
 Ref. No. HD/MUH/T.515/2019

30th April, 2021

The Executive Director,
 Jakaya Kikwete Cardiac Institute (JKCI)
 P. O. Box 65141,
DARES SALAAM

Re: INTRODUCTION LETTER

The bearer of this letter is Helena Chinguile, a student at Muhimbili University of Health and Allied Sciences (MUHAS) pursuing MSc. in Nursing Critical Care and Trauma, School of Nursing.

As part of her studies she intends to do a study titled: *“Assessment of the Infection Prevention and Control Measures (UPC) Compliance During Endotracheal Tube Sectioning Procedure, and Factors Influencing Compliance Among Nurses in Critical Care Settings, at Tertiary Hospitals in Dar es Salaam.”*

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

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

We thank you for your cooperation.

My Victoria Mwaninga

For: DIRECTOR, POSTGRADUATE STUDIES

cc: Dean, School of Nursing, MUHAS
 cc: Helena Chinguile

APPENDIX G: Ethical clearance letter

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: 29/04/2021

MUHAS-REC-04-2021-581

Helena Chinguile
 MSc. in Nursing Critical Care and Trauma, School of Nursing
 MUHAS

**RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED:
 ASSESSMENT OF THE INFECTION PREVENTION AND CONTROL
 MEASURES (IPC) COMPLIANCE DURING ENDOTRACHEAL TUBE
 SUCTIONING PROCEDURE, AND FACTORS INFLUENCING
 COMPLIANCE AMONG NURSES IN CRITICAL CARE SETTINGS, AT
 TERTIARY HOSPITALS IN DAR ES SALAAM.**

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: 29/04/2021
 EXPIRATION DATE OF APPROVAL: 29/04/2022

STUDY DESCRIPTION:

Purpose:

The purpose of this descriptive cross-sectional study is to assess IPC measures compliance during ETS procedure, and factors influencing compliance among nurses in critical care settings, at tertiary hospital, Dar es Salaam.

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-%20607.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



cc: Director of Postgraduate Studies

APPENDIX H: Muhimbili National Hospital permission letter

THE UNITED REPUBLIC OF TANZANI

MINISTRY OF HEALTH, COMMUNITY
DEVELOPMENT, GENDER, ELDERLY
AND CHILDREN

MUHIMBILI NATIONAL HOSPITAL



In reply please quote;

Ref. No.: MNH/TRCU/Perm/2021/106

Date: 03rd May, 2021

Block Manager

- Mwisela
- General ICU
- NPC I
- Maternity I

Muhimbili National Hospital

RE: PERMISSION TO COLLECT DATA AT MNH.

Name of Student	Helena Chinguile
Title	“Assessment of the Infection Prevention and Control Measures (UPC) Compliance During Endotracheal Tube Sectioning procedure, and Factors influencing Compliance Among Nurses in Critical Care Settings, at Tertiary Hospitals in Dar es Salaam.”
Institution	Muhimbili University of Health and Allied Sciences
Supervisor	Dr. Lilian Mselle
Co - Supervisor	Dr. Menti Ndile
Period	03 rd May 2021, to 30 th June, 2021

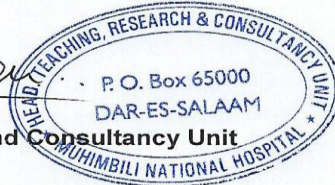
Approval has been granted to the above mentioned student to collect data at MNH.

Kindly ensure that the student abide to the ethical principles and other conditions of the research approval.

Sincerely,

[Signature]
Reid B. Mchome

Coordinator –Teaching, Research and Consultancy Unit



c.c DNS

c.c Helena Chinguile

APPENDIX I: Muhimbili Orthopedic Institute permission letter



P.O. Box 65474; DAR ES SALAAM, TANZANIA, MUHIMBILI COMPLEX
 Executive Director: +255-022-2153359
 General lines: +255-022-2151298/2152937/2152938
 FAX: +255-022-2151744
 E-Mail: info@moi.ac.tz
 Website: www.moi.ac.tz

OFFERING SERVICES IN ORTHOPAEDICS, NEUROSURGERY AND TRAUMATOLOGY

AB.145/292/OIB/176

30th April, 2021

✓
 Director, Postgraduate studies
 MUHAS
 P.O.BOX 650001
 DAR ES SALAAM.

RE: APPROVAL FOR PERMISSION FOR DATA COLLECTION

Reference is made to your letter dated 20th April, 2021 with reference NO: HD/MUH/T.515/2019 regarding the subject above.

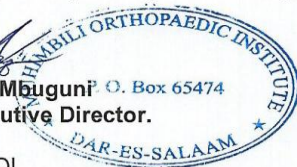
On behalf of the management of the Institute (MOI), I would like to officially inform you request for Helena Chinguile to collect titled '*Assessment of infection Prevention and Control Measures (UPC) Compliance during Endotracheal Tube Sectioning Procedure, and Factors Influencing Compliance Among Nurses in Critical Care Settings*' at Muhimbili Orthopaedic Institute has been approved.

Therefore you are requested to inform Ms.Hellena Chinguile start to collect data as requested.

It's my hope that you will provide enough cooperation regarding this matter.


 Abdallah Mbuguni P. Box 65474
 For: Executive Director.

Cc:MD-MOI



.....
 All correspondences to be addressed to the Executive Director

APPENDIX J: Jakaya Kikwete Cardiac Institute permission letter

UNITED REPUBLIC OF TANZANIA
 MINISTRY OF HEALTH, COMMUNITY DEVELOPMENT,
 GENDER, ELDERLY AND CHILDREN
 JAKAYA KIKWETE CARDIAC INSTITUTE (JKCI)



In reply, please quote; Ref: AB.123/307/01D/53

Date: 07/05/2021

Hellen Chinguile
 Msc. Nursing Critical Care
 MUHAS

RE: PERMISSION TO CONDUCT RESEARCH

Reference is made to your letter. Your request to conduct a study titled, '*Assessment of the Infection Prevention and Control Measures (UPC) Compliance during Endotracheal Tube Sectioning Procedure, and Factors Influencing Compliance among Nurses in Critical Care Settings, at Tertiary Hospitals in Dar es Salaam*'. Has been granted institutional permission.

This letter serves as an official document that permits you to collect your data at JKCI for the prescribed duration as per your ethical clearance. It is our sincere hope that you will abide to the rules and regulations of good clinical practice and the declaration of Helsinki. We wish you the very best and hope that your stay at JKCI will be fruitful.

You are required to provide a copy of your final project upon completion and submit it to Department of Research and Training JKCI.

In addition, your local contact person at JKCI will be Sr. Salma Wibonela, (lease with her before you start your data collection).

Best Regards,

Dr. Naizijwa, MAJANI
Head of Research Training & Consultancy
 CC: DIRECTOR NURSING SERVICES