NURSES KNOWLEDGE, ATTITUDE, AND PRACTICE REGARDING OXYGEN THERAPY IN ICU AND EMERGENCY WARD AND ASSOCIATED FACTORS AT SELECTED PUBLIC HOSPITALS OF MEKELLE TOWN, TIGRAY ETHIOPIA 2021.

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A THESIS TO BE SUBMITTED TO ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES, SCHOOL OF NURSING AND MIDWIFERY, DEPARTMENT OF NURSING AND MIDWIFERY IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER IN CARDIOVASCULAR NURSING.

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APPROVAL SHEET

ADDS ABABA UNIVERSITY, COLLEGE HEALTH SCIENCES, SCHOOL OF NURSING AND MIDWIFERY, DEPARTMENT OF NURSING

As thesis research advisor and co-adviser, we hereby certify that we have read and evaluated this thesis prepared under our guidance by Tesfu Kahsay entitled nurses Knowledge, Attitude and Practice regarding oxygen therapy in ICU, Emergency wards and associated factors at selected Public hospitals of Mekele TownTigray, Ethiopia,2021. We recommend that it be submitted as fulfilling the thesis requirement.

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As members of the Board of Examiners of the MPH thesis open defense examination, we certify that we have read and evaluated the thesis prepared by Tesfu Kahsay and examined the candidate. We recommend that the thesis be accepted as fulfilling the thesis requirements for the degree of Master of Public Health.

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External Examiner	Signature	Date

STATEMENT OF THE AUTHOR

By my signature below, I declare and affirm that this thesis is my own work. I have followed all ethical principles of scholarship in the preparation, data collection, data analysis and completion of this thesis. All scholarly matter that is included in the thesis has been given recognition through citation. I affirm that I have cited and referenced all sources used in this document. Every serious effort has been made to avoid any plagiarism in the preparation of this thesis. This thesis is submitted in partial fulfillment of the requirement for the degree of master in cardiovascular nursing to AAU. I would like to declare that this thesis has not been submitted to any other institution anywhere for the award of any academic degree, diploma or certificate.

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ACRONYMS AND ABBREVIATIONS

ABG: Arterial Blood Gas

BP: Blood Pressure

COPD: Chronic Obstructive Pulmonary Disease

CXR: Chest X Ray PR = Pulse Rate

ED: Emergency Department

CMP: Continuous medical education

HTC: Hematocrit

ICU: Intensive care unit

KAP: Knowledge, Attitude, Practice

MI: Myocardial Infarction

O2: Oxygen

OT: Oxygen Therapy

$PaCO_{2:}$ partial pressure of carbon dioxide (in arterial blood)

PACU: Post anesthetic care unit

PaO_2: partial pressure of oxygen (in arterial blood)

SaO_2: arterial oxygen saturation

SpO_2: arterial oxygen saturation measured by pulse oximetry

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ABSTRACT

Providing oxygen therapy safely and effectively requires health-care professionals that have sufficient knowledge, the right attitude, and evidence-based practice. Clinical practice guidelines suggest that oxygen be prescribed the same as any other drug; however, oxygen is often administered excessively, discriminately without any prescription. This predisposes patients to hyperoxia and hypoxemia. So, oxygen therapy by emergency and ICU nurses has important implications for patient outcomes. The objective of the study is to assess Nurses Knowledge, Attitude, and Practice regarding oxygen therapy in ICU, Emergency wards, and associated factors at selected Public hospitals of Mekele Town Tigray, Ethiopia,2021. A facility-based descriptive cross-sectional study design was conducted. 199 Nurses selected by systematic random sampling technique from February 03, 2021 until April 28, 2021 and met the criteria were included. Data was entered and analyzed using statistical software SPSS for windows V 26.0. The ethical clearance was obtained from Addis Ababa University College of health Sciences School of Nursing and Midwifery. The result showed that most of the study subjects were in the age range of 21-50. The mean age was 30.7 ± 4.4 years. 118(62.1%) were males. 112(58.9%) of nurses' have sufficient knowledge toward oxygen therapy whereas 128(67.4%) nurses have positive attitude toward oxygen therapy. In addition 108 (56.8%) had satisfactory practice towards oxygen therapy. The presence of written prescription, OT guideline, and recent use of OT was significantly associated with nurses' knowledge. Meanwhile professional training, recent use of OT and nurses department was significantly associated with nurses attitude. Furthermore Age, sex, presence of adequate oxygen delivery system, periodic maintenance of oxygen system and on-job training were found to be significantly associated with oxygen therapy practices ($p<0.05$, 95% C. I) Significant.

The majority of nurses had sufficient knowledge and satisfactory practice and positive attitude towards oxygen therapy. While maintaining good practices, Education programs on the occupational use of OT through conferences, workshops, research and lectures are needed to raise the knowledge of health care workers about OT. In addition national OT guidelines should be available for nurses.

Key words: Knowledge, Attitude, Practice, Oxygen Therapy

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

Oxygen is a colorless and odorless gas, first recognized by Joseph Priestley in 1771 and introduced for medical purposes in 1887, mainly to support patients with pneumonia. It has been used in clinical practice for more than 100 years (1).Oxygen therapy is commonly prescribed for patients in hospitals and community settings. It is used to treat clinical conditions that result in hypoxemia, e.g., some respiratory and cardiovascular diseases, shock, sepsis, and trauma (2). It has the potential to improve medical outcomes and save lives when used appropriately and to cause harm if misused (3).

Supplemental oxygen therapy is widely used administered to acutely ill patients in hospitals. Approximately 34% of patients in ambulances, 25% of individuals in emergency rooms, and 15% of patients admitted to hospital in the UK. In these settings,50–84% of patients are exposed to excess oxygen and hyperoxemia due to efforts to prevent or reverse hypoxemia (4,5).Oxygen (O_2) as a drug has a maximum positive biological benefit and associated toxicity effects. When administering supplemental oxygen to treat acute and chronic hypoxemia, overexposure toxicity may occur (6).

Oversupplying oxygen or without hypoxemia leads to hyperoxemia, a condition potentially associated with severe adverse events (1). The most detrimental effect of breathing a high concentration of O2 is the development of oxygen toxicity. It can happen in any patient who breaths oxygen concentrations greater than 50% for longer than 24 hours (7).

Assessment of the patient's oxygen need is based on the disease process and the severity of the hypoxemia. The nursing assessment considers the patient's level of consciousness, vital signs (including the rate and depth of breathing), nail bed color, airway patency or presence of an artificial airway, SaO2, and ABGs. (7)while there are reasons to supply oxygen during acute hypoxemia, the prescription policy shifted to systematic oxygen administration to "prevent" hypoxemia despite normal oxygen saturation.

As a result, several patients experience hyperoxemia during their hospital stay, a condition recently associated with a small but significant increase in mortality. And Liberal oxygen therapy

increases mortality without improving other patient-significant outcomes. Supplemental oxygen may become unfavorable above 94–96% SpO2 (5). The desired goals for all patients on oxygen therapy are stable arterial oxygen saturation (SaO2) level, non-labored respirations, and a decrease in anxiety and shortness of breath. These goals should be accomplished through the delivery of the least amount of supplemental oxygen needed (7)

Besides study also indicated lack of knowledge of oxygen therapy and the equipment use, unmatched oxygen prescription and delivery, misunderstanding of fundamental physiological principles of oxygen, and perception of care provider oxygen as a remedy than a drug causes inappropriate use of oxygen therapy (2,3,6,8,9).

Studies also report positive attitude and good practice of nurses towards oxygen therapy have significantly better patient outcome, specifically in ischemic heart disease patients (6). The guideline for oxygen therapy and delivery devices for pediatrics describes nurses should have encouraging attitude to the needs of oral and nasal hygiene in children, use of humidification devices when administering oxygen therapy.

Provision of oxygen therapy safely and effectively requires appropriate oxygen technologies, supplies, and health-care professionals that obtain adequate knowledge to select the dose and delivery method that suits the patient's needs and therapeutic dose (10)

Regardless of where oxygen is delivered, it should be considered as a drug, its ability to treat hypoxemia is often underestimated and can be lethal if given inadequately. This therapy must be provided in a appropriate, safe and comfortable way to patients. This depends on an accurate understanding of how to provide oxygen, how to supply O2 and the patient's nursing needs. (4)

Therefore, this study aims to assess nurses ‘knowledge, attitude, practice and associated factors regarding oxygen therapy.

1.2 STATEMENT OF THE PROBLEM

Oxygen is one of the most common therapeutic interventions prescribed in acute health-care settings in the world to treat hypoxemia. Hypoxemia is a severe condition characterized as insufficient oxygen in the blood which frequently occurs in diseases like lower respiratory tract infection (severe pneumonia or bronchiolitis), upper airway obstruction, severe asthma, common neonatal conditions like birth asphyxia and respiratory distress syndrome, severe sepsis, heart failure, cardiac arrest, trauma, carbon monoxide poisoning, and obstetric and perioperative emergencies(11)

Hypoxemic patients present with strider, nasal flaring, subcutaneous emphysema, sub costal recession, grunting, tachypnea, hypotension, and tachycardia. Hypoxia is considered dangerous when PaO2 is less than 45mmHg, and SaO2 is less than 80%. Consciousness is lost when PaO2 is less than 30 mmHg, and SaO2 is less than 56%. Hypoxia is prevalent in ICU. For example, a point-prevalence study shows that 54% were hypoxemic. Among these, 51% were mild, 42% were moderate, and 13 % were severe. The severity of hypoxemia was an independent risk factor of mortality (12)
.

The studies conducted in Netherland, Denmark, Australia, Iran and Saudi Arabia on nurses practicing in critical care medicine demonstrated that Knowledge and attitude towards oxygen therapy practice was poor (8,13–15). Similarly the study conducted in Egypt, Rwanda, Uganda and Eretria showed nurses lack knowledge on oxygen therapy (4,9,16). In Ethiopian study knowledge of nurses practicing in ED and ICU of three public hospitals in A.A was found to be good in 36.2% while it was poor in 63.8%. In addition same study reported positive attitude of responders to be 53.3% while good practice was 43.4% (17).

Hypoxias linked to preventable deaths, avoidable cardiac arrest, failed cardiac arrest resuscitation, and unplanned admission to the intensive care unit (ICU)(18).For the treatment of documented hypoxemia, the administration of supplemental oxygen is considered a life-saving intervention and first-line therapy in critically ill patients. However, current practice tends to result in hyperoxemia, associated with poor hospital outcomes and increased mortality in inpatients setting(19).

Safe, effective administration and monitoring of oxygen therapy require health-care professionals who have adequate knowledge, the right attitude, and evidence-based practice regarding oxygen therapy (15–17). However, studies indicate significant knowledge, perception, and practice gaps in oxygen administration. For instance, the optimum quantity and supply method varies according to the patient's underlying medical condition is acute or chronic.

The selection of the best oxygen delivery device and the flow rate of oxygen depend on many factors, including the patient's age, therapeutic objectives, and patient tolerance (8).

Oxygen therapy needs special nursing care to improve patient outcomes and prevent complications. Although clinical practice guidelines recommend that oxygen be prescribed like any other drug, oxygen is often administered excessively, discriminately, without any prescription, and in patients with perceived breathlessness(20).A study by F.E. Adipa et al. found that several nurses believed that oxygen provided both patients and their families with psychological comfort and prescribed oxygen therapy for non-hypoxic patients in Ghana (15).

Nurses' knowledge of the correct delivery devices and case-specific optimum oxygen saturation targets is critical for caring for patients with severe COPD, severe cystic fibrosis, and bronchiectasis. Yet, a study by Cousins et al. (2016) displays 80% of the patients with COPD brought in to the emergency department received high concentrations of oxygen(21)

KAP assessment regarding oxygen therapy at emergency departments of one federal and three regional hospitals in Addis Ababa, Ethiopia, showed that there is knowledge, attitude, and practice gaps among nurses working in an ED of a public hospital(17).

The uses of supplemental O2 by emergency and ICU nurses have important implications for patient outcomes. In Ethiopia there is inadequate research conducted in the assessment of nurses knowledge, attitude, practice and associated factors regarding oxygen therapy. Therefore, this study will fill the gap of nurses' level of knowledge, attitudes, and practices and associated factors regarding oxygen therapy.

CHAPTER 2: LITERATURE REVIEW

This literature review summarizes on the existing information in nurses knowledge, attitude and practice regarding oxygen therapy and associated factors globally, regionally and locally. This literature review is organized by socio-demographic factors, organizational factors, healthcare related factors and individual factors.

2.1. Nurses Knowledge Regarding Oxygen Therapy

Provision of oxygen therapy requires knowledge and practical competencies concerning oxygen delivery devices, oxygen saturation target based on the risk of type of respiratory failure, patient preferences, and monitoring and interpretation of finding including blood gases in all critically ill patients and cases of suspected respiratory acidosis and hypercapnia. Different methods are used for oxygen therapy. These are nasal cannula, face mask, venturi mask, partial re-breather mask, non re-breather mask, oxygen tent, oxygen hood, face tent, tracheal catheter, and nasal catheter (20,22–24).

A cross sectional quantitative study conducted in Turkey assess the effectiveness of need-based training on knowledge regarding oxygen therapy among nurses in pediatric ICU reveals that 40% of participants had poor knowledge, and 57.5% scored average. None had an excellent knowledge pre-test. Post-test shows that 27.5% of participants had good knowledge, 66.25% scored average, and 5% of nurses had poor knowledge. The study generalized that the nurses' level of knowledge regarding oxygen therapy was lower than expected. Their knowledge is incredibly inadequate in terms of oxygen therapy application methods (10).

A cross sectional study conducted in Iran (2017) demonstrates the level of familiarity nurses working in critical care with certain aspects of O2 therapy such as indications, necessary measurements, and monitoring during therapy and the identification of delivery devices was fair to a moderate level. In the report, 92.4% and 98.2% of nurses believed that oxygen therapy can be associated with risk and should be recorded in the patient’s medical file respectively (14) .

An investigation of ICU nurses' knowledge, attitude, and practice in Saudi Arabia reveals a gap. Over 15% of participants reported oxygen could never be harmful and 32.8% of the participants thought that using oxygen therapy is very safe for any condition (25).

Another Quasi experimental study conducted in Egypt in 2018 reported 76%, of the studied sample had unsatisfactory level of knowledge in relation to administering oxygen therapy. While, only 6% and 18% of the studied sample have satisfactory and average levels of knowledge regarding administering oxygen therapy respectively (16).

However, crosses sectional survey from Uganda shows nurses have a knowledge gap in selecting the appropriate oxygen therapy delivery device for children. Most nurses (76%) had adequate knowledge on how to use a concentrator, but the majority did not know how to use a pulse oximeter or administer cylinder oxygen (26). In contrary a cross sectional quantitative Rwandese study conducted in 2017 reported that the mean score of level of knowledge, participants was 87.7% (4).

Furthermore a study conducted in Eriteria, Asmera in 2019 at Orrota national referral hospital revealed overall about 43.3% of the nurses working in the ED and ICU had good knowledge about OT (27).

Meanwhile a cross sectional descriptive study conducted in three public hospitals in Addis Ababa in 2015 reported, Good knowledge among nurses who were working in ED was found to be 55(36.2%) whereas nurses with poor knowledge were 97(63.8%) which is lower than the mean score of 3.03(SD= 1.6665) (17).

2.2. Nurses Attitude Regarding Oxygen Therapy

Attitude denotes the act or manner of doing something, performance or action that combines theory and practice, and attitudes are near related to knowledge, beliefs, emotions, and personal values. They influence a person's ability to make decisions (28).

A Cross sectional Quantitative study was conducted in the Netherlands in 2020 G.C to assess attitude of Dutch ICU clinicians towards oxygen therapy. Interestingly enough 71% of the responders were nurses practicing in critical care all over the country. From nurses working in critical care medicine all over the country, 64% considered oxygen-induced lung injury to be a ‘major concern’. The majority of respondents considered a partial pressure of oxygen (PaO_2) of 6-10 kPa (45-75 mmHg) and an arterial saturation (SaO_2) of 85-90% as acceptable for 15 minutes, and a PaO_2 7-10 kPa (53-75 mmHg) and SaO_2 90-95% as acceptable for 24-48 hours in an

acute respiratory distress syndrome (ARDS) patient. In most case scenarios, respondents reported not to change the fraction of inspired oxygen (FiO_2) if SaO_2 was 90-95% or PaO_2 was 12 kPa (90 mmHg). In Conclusion a representative sample of ICU Nurses from the Netherlands were ‘concerned’ about oxygen-induced lung injury, and reported that they preferred PaO_2 and SaO_2 targets in the lower physiological range and would adjust ventilation settings accordingly (13).

To the contrary an Australian study reported, 22.3% (120/540) of respondents reported a ‘major concern’; 32.3% (174/540) of respondents reported a ‘concern, but not major’; and, 44.2% (238/540) of respondents reported ‘no concern’. Further, for a mechanically ventilated patient, 33% (180/538) of respondents selected oxygen toxicity as a greater threat to lung injury than barotraumas (8).

In a cross sectional study conducted in Saudi Arabia in 2018, on nurse practitioners working in ED revealed, Good attitude regarding OT was low in more than half of participants in this study. The mean attitude score was reported to be 26.31±3.17. Overall, 32.8% of the participants who believed that using OT is very safe for any condition (29)

Meanwhile, A Cross sectional study from Asmera, Eriteria reported that 63.3% of the nurses working in the ICU and ED, on oxygen therapy had positive attitude (27). While, the attitudes of participant nurses working in critical care in Rwanda in the various subject areas raised were moderate (63.1%) with mean score of 42.25 and SD of 9 (4). While a study conducted in three public hospitals in Addis Ababa reported that Good attitude or positive attitude was found to be 81(53.3%) with mean score of 13.763(SD= 2.1024) where as poor attitude or negative attitude for oxygen therapy was 71(46.7%) (17).

2.3. Nurses Practice Regarding Oxygen Therapy

In Denmark, nurses' practice of handling oxygen therapy to an intensive care patient is not to be carried out in the format of a written guideline or a guide for nurses practicing how to supply

oxygen to different patients' categories (30). However, a study from the Netherlands suggests that Nurses have been empowered to remind physicians to prescribe oxygen treatment. This result indicates that, in general, nurses are skilled at delivering the appropriate dose of oxygen without the prompting of a prescription and maintain a relatively high rate of appropriate administration of oxygen therapy (13). The study went on to report, Self-reported attitudes versus actual practice oxygen therapy by ICU physicians and nurses most care providers' intensive care clinicians acknowledge the risk of hyperoxia exposure and report a low tolerance for high oxygen concentrations. However, a large percentage of their ICU patients were exposed to higher levels of arterial oxygen than the self-reported target ranges in actual clinical practice (13).

Overall oxygen therapy practice from Iranian study conducted in 2015 reported 74.5% of the nurses had good practice and 25.5% of them had poor practice (31). Meanwhile, In an Egyptian study reported 18% of the studied sample had adequate level of practices in relation to administering oxygen therapy. Meanwhile, 40%, and 42% of them had average and inadequate levels of practices respectively (16).

Many guidelines around university hospitals all around the globe explained that nurses should have to be skilled on the best practices on pulse oximetry, humidification attachment, use of different oxygen devices to save the life of many emergency patients (32,33). Assessment of good practice focused on best practices on pulse oximetry, humidification device attachment and usage of nasal cannula and facemasks was used for studies conducted in east African countries. The overall practice of nurses working in critical care medicine was reported to be 46.2% and 45% (moderate) in Rwanda and Eriteria respectively (4,27). Furthermore, assessment of good practice on oxygen therapy was found to be 43.4% with mean score of 3.09(SD= 1.7618) and poor practice was 56.6% which is lower than the mean score, in an Ethiopian study (17).

2.4 Factors Associated With Nurses Knowledge, Attitude, and Practice Regarding Oxygen Therapy

2.4.1 Socio-demographic related factors

Even though the variation in most of the socio-demographic variables such as sex, age group, working place and working shift was not found to be statistically significant in most reviewed literatures; Level of education, and cumulative years of experience was statistically found to have some influence in knowledge attitude and practice (4,16,26,27,29,34).

A cross sectional study conducted in the Netherlands on 2020 on ICU clinicians all over the country, out of which 71% were females reported that, Compared to university ICU Nurses, more nurses from non-university ICUs reported they would begin to 'raise concern' after a shorter duration of time with a stable SaO2 of 85% ($p < 0.01$). ICU clinicians of younger than 40 years of age more often reported they were majorly concerned with oxygen induced lung injury compared to older nurses ($p = 0.03$) (13).

A cross sectional quantitative study from Saudi Arabia reported that, the total attitude score based on demographics showed a significantly higher score among the age group of 46–50 years. In addition, females had significantly higher attitude score than males (P=0.04). Nurses working in critical care medicine, who had 1 year of experience showed a significantly lower attitude score than all others with P<0.000. The assessment of attitude towards oxygen therapy by hospital also showed that there is significant difference among hospitals. For instance, SRC had a lower mean attitude score than the other hospitals with a significant difference based on Bonferroni post hoc analysis with P<0.000. Also, King Khalid university hospital had a lower attitude score than King Saud medical complex (P=0.037) (29).

A Quasi experimental study from Egypt conducted on nurses practicing in critical care medicine shows that, there was statistically significant relations between level of knowledge of the studied sample and their age as well as their qualification at P= 0.010 and 0.001 respectively (16). While, the study proved that, there were no statistically significant relations between level of knowledge and gender, years of experience, working place, and working shift (P>0.05). Meanwhile, a study conducted in Rwanda and Eritrea, Asmera revealed that Education level and nursing practices

during administration of oxygen as well as total year of experience (>5 years Vs <5 Years) were shown to have significant association with poor KAP towards oxygen therapy with P- Values of 0.049 (4,27).

Literature showing the socio-demographic variables association with the study variables conducted in Ethiopia was lacking.

2.4.2 Healthcare facility related factors

Organizational factors such as presence of guideline in oxygen therapy; as well as availability of trainings for staff nurses working in critical care medicine are associated with good overall practice.

The appropriate use of oxygen therapy by nursing staff associated with insufficient training and education for nursing staff; a lack of familiarity with oxygen delivery devices; a lack of understanding of the effects, role, and dangers of oxygen therapy, staff time constraints; difficulties with changing long-established behavior; patients transferred from other wards/departments with oxygen therapy already in situ; and communication difficulties between doctors and nurses were also reported to be associated with poor oxygen therapy practice in many studies (6,16,21,35–37).

A mixed study conducted in Denmark in 2018 pointed out, knowledge among ICU nurses, and training through formal ICU education is of significant importance to nurses when learning how to perform the balancing act of handling oxygen to ICU patients. Inter professional collaboration aswell as continuous training was also reported to enhance nurses knowledge and practice concerning OT (30).

A cross-sectional qualitative study conducted in Saudi Arabia show that shortage of training program was the leading possible associated factor for poor knowledge in a report from .The study also reported that, even though cumulative experience may help, it does not always ensure that patients' treatment is of good quality(34).

A Quasi experimental study conducted in Egypt in 2019 reported 86%, 74%, 94%, and 100% of the studied sample stated that; lack of training courses, lack of equipment/supplies, lack of

periodic maintenances and unavailability of standardized protocol for oxygen therapy affect on administration of oxygen therapy to their patients respectively (16). The study also shows that there is a highly significance differences in nurses knowledge mean score between pre and post implementation of training program regarding oxygen therapy ($p<0.001$) (16).

A cross sectional study conducted in Addis Ababa public hospitals show that participants were asked about the availability of oxygen therapy guideline in ED, Thirty six (23.7%) said 'Yes' there is guideline while Ninety one (59.9%) nurses replied 'No' and the rest Forty five (29.6%) nurses did not know whether it is available or not. As the majority of nurses evidenced no oxygen therapy guideline were available, This caused the gaps seen on poor knowledge, attitude and practice on oxygen therapy (17). The study went on to report that, the supply of oxygen and delivery systems were reported 'Adequate' in Seventy nine 79 (52%), It was reported 'Inadeqaute' in Fifty seven (37.5%) and Sixteen (10.5%) did not know whether the supply is adequate or not. Inadequate supply of oxygen and delivery system particularly affects the quality and outcome of oxygen therapy. In other words whenever there is shortage of oxygen supply and delivery devices nurses forced to share with inappropriate devices that should be discouraged and it needs to done as per the guideline or protocols stated (17).

2.4.3 Individual related factors

Oxygen saturation and delivery system should be recorded on the patient's monitoring chart alongside the oximetry result. Oxygen delivery devices and flow rates should be adjusted to keep the oxygen saturation in the target range by the responsible nurse (22).

A review conducted from studies done in Australia revealed oxygen prescription practice by senior nurse practitioners working in ICU was very low. The results from the review suggest that appropriate oxygen delivery improved as prescription rates improved. They demonstrated that the number of patients at risk of type II respiratory failure with saturation levels above 92% decreased from 47% at initial audit to 18% (P=0.04) following a multi component intervention and as prescribing rates increased (2.4% to 34%; P=,0.0001) (21). To the contrary, nurses practicing in ICU from Denmark expressed being used to working and adjusting oxygen supplement according to a standard prescription by senior practitioners (30).

A cross sectional study conducted in the Netherlands on 2020 on ICU clinicians all over the country, out of which 71% were females reported that, Significantly more ICU nurses than physicians perceive oxygen-induced lung injury a major concern during mechanical ventilation; 20% of the nurses reported that high FiO2 posed a greater threat of lung injury than high tidal volumes and high ventilator pressures, compared with 7% of physicians ($p < 0.01$) (13).

In yet another cross sectional study from the Netherlands, ARDS, cardiac ischemia, sepsis and untreatable anaemia were reported to be the major cause of admission to the ICU and major indications to oxygen therapy. The proportions of ICU clinicians adjusting FiO2 levels in specified clinical indication was found to be different for nurses and physicians, as well as senior nurses and nurses in training. Nurses in training more often favored tissue oxygenation level indicator with lactate assessment than senior ICU nurses ($P = 0.01$) (38). A descriptive Iranian study pointed out only 27.9% of respondent nurses was able to correctly state the indication for oxygen therapy namely decreased level of consciousness, chest pain, respiratory distress, seizure, severe respiratory infections and sepsis (14).

An Eriterian study reported 95% of the nurses replied that hypoxemia is an indication for oxygen therapy and 58.3% of the respondents knew that oxygen saturation is a criterion for assessment of patient response. Workload or burden was found to affect practice of nurses on oxygen therapy ($P=0.041$) in the Eriterian study (27). To the contrary a cross sectional Rwandese study results showed that 26.2% of respondent nurses know hypoxemia and acute myocardial infarction are indication of oxygen therapy (4).

A cross sectional descriptive study conducted in three public hospitals in Addis Ababa showed; Participants were asked whether work load affecting oxygen therapy said yes 99(65.1%), no 37(24.3%) and unknown 16(10.5%). Whenever there is more and more work load monitoring and follow up of patients on oxygen therapy could be affected at large (17).

2.5. Justification of the Study

The aim of this study is to assess nurses' knowledge, attitude, and practice regarding oxygen therapy in ICU, and emergency ward and associated factors at selected public hospitals of Mekelle Town Tigray Ethiopia. A study showed that about 81.9 % of patients in the emergency unit receiving O2 therapy and 50 –84% of patients in ICU are exposed to excess oxygen and hyperoxemia(20,39). The use of supplemental O2 by emergency and ICU nurses has important implications for patient outcomes. Since there is no previous studies conducted to the study area, this study will contribute to identify and fill the gaps in the assess nurses knowledge, attitude, practice regarding oxygen therapy in ICU, and emergency ward and associated factors at selected public hospitals of Mekelle Town Tigray Ethiopia

2.6. Significance of the Study

Oxygen therapy needs special nursing care to improve patient outcomes and prevent complications. Clinical practice guidelines recommend that oxygen should be prescribed like any other drug. Besides, Nurses' Knowledge, practice, and perception are mandatory for safe and effective oxygen therapy administration and better patient outcomes. To ensure this, KAP gaps and factors associated with it will be identified. This assessment will help determine the current picture of nurses' knowledge, attitudes, and practices in oxygen therapy and related factors. It improves nurses' knowledge, attitude, and practice on oxygen therapy and will be used as necessary information for health care capacity-building intervention in oxygen therapy and monitoring. This study will also be used as an input for health care providers, administrators, nurse educators and policymakers to use it as baseline information for further development and possible intervention to avert the gap

2.7. Conceptual Framework

This conceptual framework is adapted and modified after reviewing different literatures (10, 11, 14, 15, 16, 18 23 & 24). This shows the effect of independent variables on dependent variable.

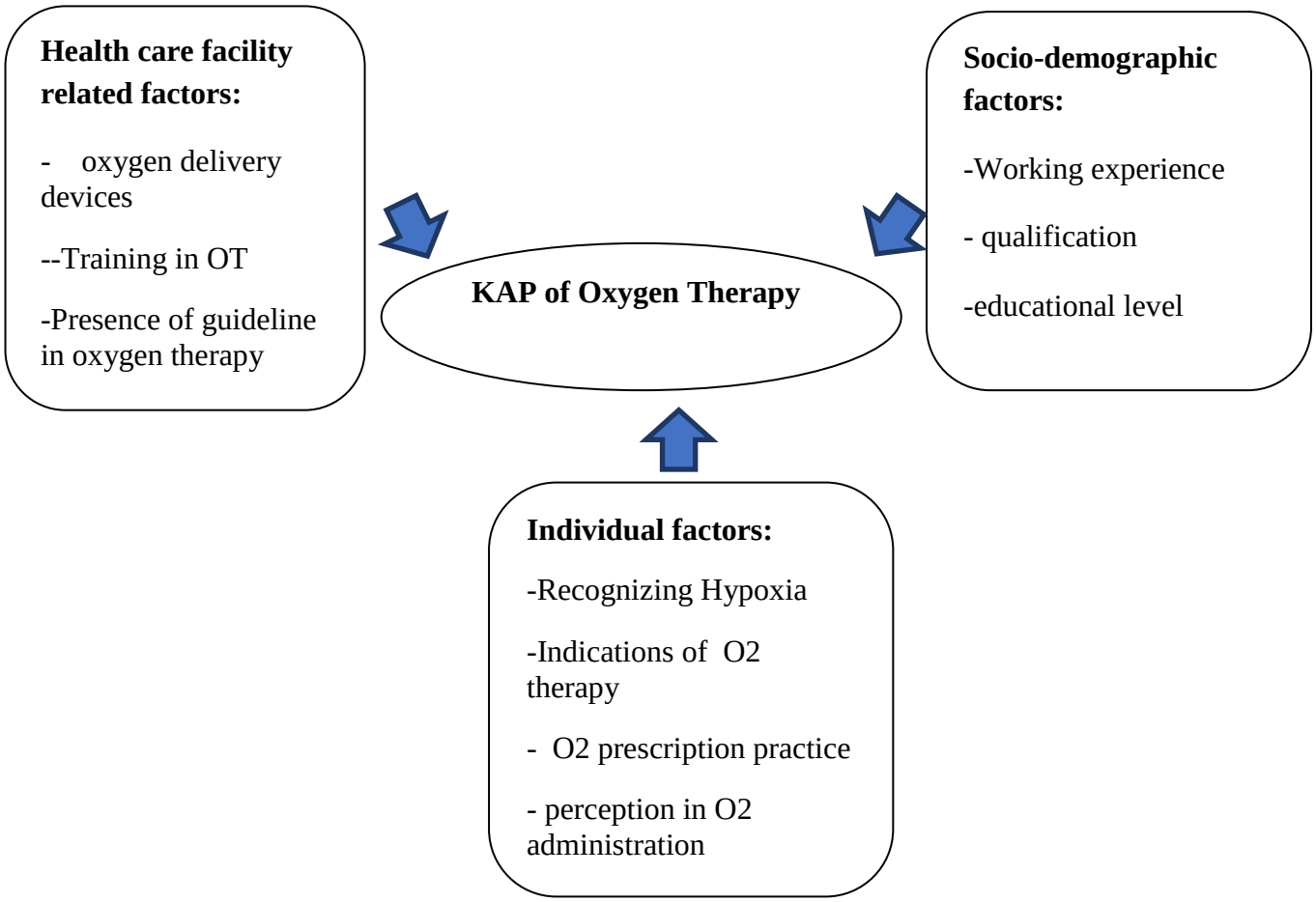

Fig 1. A conceptual framework for Nurses Knowledge, Attitude and Practice regarding oxygen therapy in ICU, Emergency wards and associated factors at selected Public hospitals of Mekele Town Tigray, Ethiopia,2021

CHAPTER 3: OBJECTIVE OF THE STUDY

3.1. General Objective

To assess Nurses Knowledge, Attitude and Practice regarding oxygen therapy in ICU, Emergency wards and associated factors at selected Public hospitals of Mekele Town Tigray, Ethiopia, 2021

3.2. Specific Objectives

The specific objectives of this study are to:

1. Assess the knowledge of nurses regarding oxygen therapy in ICU, Emergency wards
2. Assess attitude of nurses on the oxygen therapy ICU, Emergency wards
3. Assess practice of nurses on oxygen therapy in ICU, Emergency wards
4. Determine factors associated with KAP on nurses regarding oxygen therapy in ICU, Emergency wards

CHAPTER 4: METHODS AND MATERIALS

4.1 Study Area And Period

The study was conducted at three hospitals in Mekelle city. Mekelle City is the regional capital of Tigray. Mekelle is one of the fastest-growing and second-largest cities next to Addis Ababa. According to the projection done by the Ethiopian statistics agency (ESA) the population of the city was 524,000 in 2019 G.C. The city is situated between 13 ° 25'24 'and 13 ° 33' 44' N and 39 ° **25** '26 'and 39 ° 33 '14' E, approximately 780 km north of Addis Ababa. Its altitude varies between 1930 and 2353 m above average sea level. Administratively, Mekelle is regarded as a special zone consisting of seven sub-cities. There are four hospitals located in Mekelle city. The study was conducted in three public hospitals selected by lottery method namely Ayder Comprehensive Hospital, Mekelle General Hospital and Qiuha General Hospital. The Hospitals are staffed with a total of 1079 Nurses. A total of 315 nurses were selected from the hospitals by merit of the departments they are currently serving which are areas of critical care medicine. 25, 175 and 15 Nurses are currently serving in the intensive care units of Mekelle, Ayder and Quiha Hospitals respectively. While 30, 60 and 10 Nurses are currently serving under the Emergency units of Mekelle, Ayder and Quiha Hospitals respectively.

The study was conducted in selected hospitals from February 01, 2021, until April 28, 2021.

4.2 Study Design

The descriptive institution-based cross-sectional study design was conducted.

4.3 Population

4.3.1 Source Population

All staff nurses working in the selected hospitals and that fulfill the inclusion criteria.

4.3.2 Study Population

Nurses working in emergency departments, intensive care units including NICU, PICU, and Post anesthetics care units.

4.4. Eligibility Criteria

4.4.1 Inclusion Criteria

- Nurses currently working and having a year or more experience in the emergency departments and intensive care units, including NICU, PICU, and Post anesthetics care units, are willing to participate in the study.

-Nurses who are willing to participate

4.4.2. Exclusion Criteria

- Nurses who are on sick leave maternity leave and annual leave.

-Nurses who are working in the two units during data collection time were excluded from one unit in the study

4.5. Sample Size Determination and Procedure

4.5.1 Sample Size Determination

The sample size calculated using a single proportion formula..A study conducted by Lemma. G (2015), about oxygen therapy at emergency departments of one federal and three regional hospitals in Addis Ababa reported 36.2%,53.3%,and 43.4% for Good knowledge, attitude and practiced respectively (17). The average of the three variables i.e 44.4% will be taken for computation.

With a 95 % confidence level, a precision of 5%, p-value 44.1%, $Z\alpha/_2$ =1.96,d=0.05 and 10% non-response rate ,the sample size calculated using the formula;

Sample size (n)

$$n= \frac{(Z\alpha/2)2\times P(1-P)2}{(d)2}$$

n=sample size

Zα/2 = Standard proportion population at 95% confidence interval (1.96)

P= Estimated proportion of good Knowledge

d=margin of error

N= (1.96)2 × 0.44×0.56/ (0.05)2 = 377.

Using the population correction formula for the sample size of less than 10,000

$N_f=N_0/(1+(N_0-1)/N)$

Where N_0 is 377, N is 315

Final Sample size will be 171 after taking 10 % non-response rate, the final sample size will be **188.**

4.5.2. Sampling Procedure

Mekelle city has one comprehensive specialized and three General hospitals. For this study, Ayder Comprehensive Specialized Hospital, Mekele general hospital and Quiha general hospital are selected by simple lottery method. Ayder Comprehensive Specialized Hospital has 756 nurses and 500 beds while Mekelle General Hospital has 230 Nurses and 188 beds; and Quiha General Hospital has 111 nurses and 90 beds. The total sample size was proportionally allocated in to the selected hospitals and again proportionally allocated to each unit based on the number of nurses working in EM and ICU for each hospital

Table 2: Proportional Allocation of Nurses for the assessment of nurses Knowledge, Attitude and Practice regarding oxygen therapy in ICU, Emergency wards and associated factors at selected Public hospitals of Mekele TownTigray, Ethiopia,2021

NO.	Name of selected hospitals	Total number of Nurses in selected Hospitals	Total Number of participants present the study unit	Proportional allocation of each participants
1	Mekele Genearl Hospital	**230**	ICU=25	ICU=15
			EM=30	EM=18
2	Ayder Comprehensive specialized	**756**	ICU=175	ICU=104
			EM=60	EM=36
3	Qiuha General hospital	**111**	ICU=15	ICU=9
			EM=10	EM=6
	TOTAL	1097	315	188

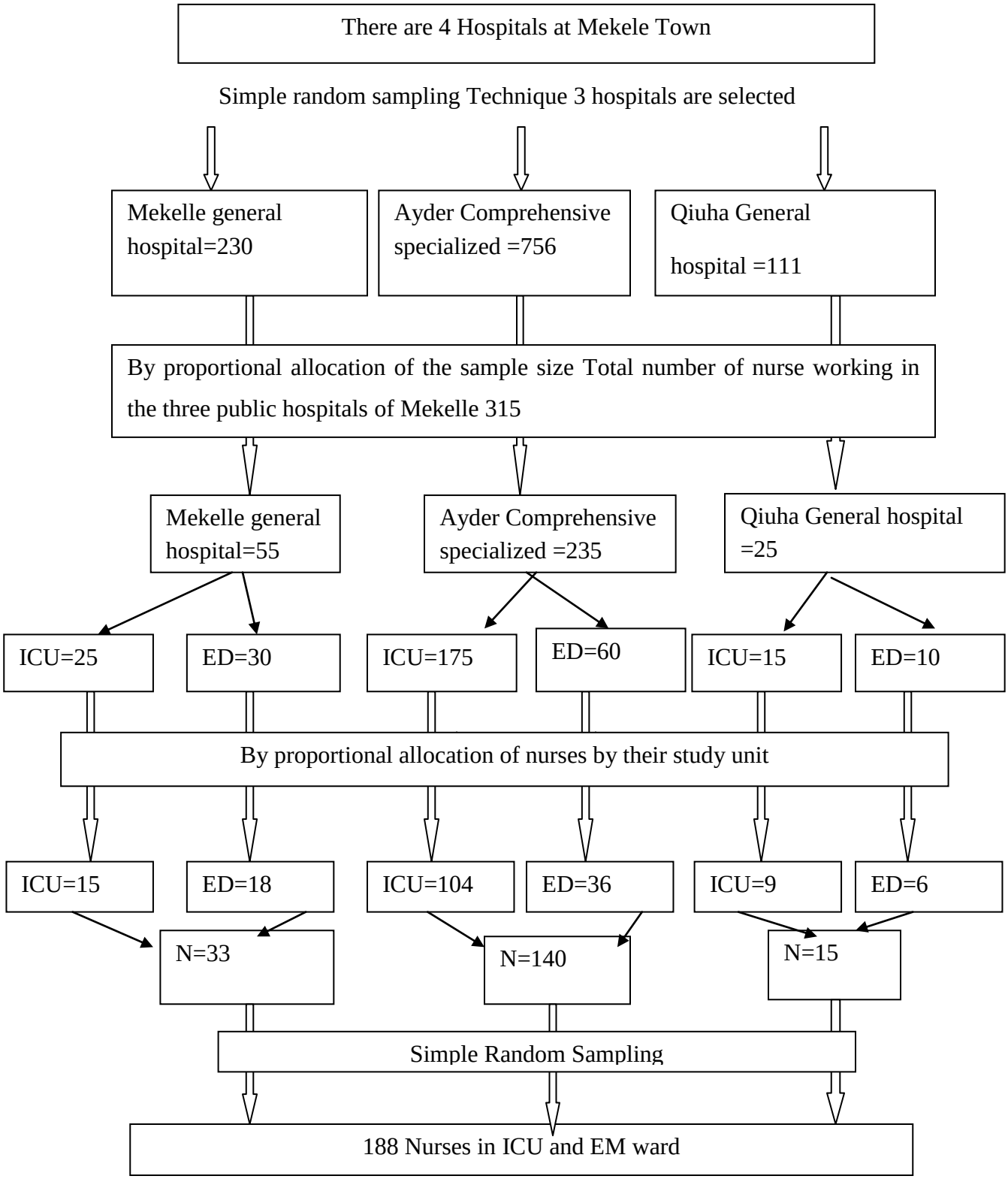

Figure 2: Schematic presentation of sampling procedure used to select study participants selected public hospitals in **Mekelle Town,Tigray Ethiopia**

4.6 Study Variables

4.6.1 Dependent Variables

- Knowledge, Attitude and Practice on oxygen therapy

4.6.2 Independent Variables

Socio-demographic characteristics:

- Age
- Educational status
- Years of Experience
- working area
- type of nursing profession,

Healthcare facility Factors

- Training on oxygen therapy
- Availability of oxygen therapy protocols & guidelines
- Availability of oxygen delivery and monitoring device

Individual factors:

- Recognizing Hypoxia
- Indications of O2 therapy
- O2 prescription practice
- perception in O2 administration

4.7. Operational Definitions

Knowledge: The capability of respondents to reply to knowledge questions is measured in terms of knowledge scores.

- **Sufficient knowledge**: is nurses' knowledge status when they score above or equal to the mean (17).

- **Insufficient knowledge**: is nurses' knowledge status when they score below the mean (17).

Attitude: The capability of respondents to reply to Attitude questions is measured in terms of Attitude scores.

- **Positive attitude:** those who are able to answer above or equal to the mean of the attitude questions correctly were regarded as having favorable attitude (17).

- **Negative attitude:** those who are able to answer < mean of attitude questions were regarded as having unfavorable attitude (17)

Practice: The capability of respondents to reply to Practice questions is measured in terms of Practice scores.

- **Satisfactory practice:** is the practice status of nurses when they score above or equal to the mean (17).
- **Unsatisfactory practice**: is the practice status of nurses when they score below the mean (17).

4.8. Data Collection Tool And Procedure

A pre-tested and validated structured questionnaire which is adopted from Desalu et al. (2019) (40) and Lemma G (2015) wae used to collect data (17). The tool has shown a good acceptability, reliability and content validity as indicated by good response rate (80–98.3%), high consistencies (Cronbach's Kappa coefficient) ranging from 0.546–0.897 (all $p<0.001$) (40). The tool consists of five parts of and 49 questions. The first part of the survey contains 6 questions on socio-demographic data and the second part of the survey contains 12 questions on knowledge. The third part contains 7 questions on Oxygen Therapy attitude. And the fourth part has 10 questions on Oxygen Therapy Practice Question for Nurses. The fifth part contains 14 questions on factors associated with KAP regarding oxygen therapy, (Health care related factors and individual factors). For knowledge questions Score 1 for correct answer & Score 0 for incorrect answers will be used. For attitude questions: five point likert responses will be used with choices of strongly agree, agree, neutral, disagree and strongly disagree. For practice questions: score 1 for correct answer and score 0 for incorrect answers will be used.

Data was collected by pre-coded self administered structured questionnaire. To collect the data three Bsc nurses and one supervisor was trained for 3 days by the principal investigator about

how to administer the questionnaire, ethical issues and rights of participants. Those three BSc Nurses was assigned to the selected three hospitals independently to collect the data. The entire data collection period was supervised by one trained health professional and the principal investigator.

4.9. Data Quality Management

Before the actual data collection, a pre-test was done on 5% of the sample size by the principal investigator, which was not to be included in the actual study. Pre-test was conducted in Yekatit Mebeata Hospital, which is the fourth hospital in Mekelle city not selected for this study. No relevant problem was identified during pretesting in addition internal consistency was maintained. The data collectors and the supervisor was provided with a three-day training/orientation session for the importance of the study and how to ensure confidentiality of the study participants. The collected data was reviewed daily for its completeness, accuracy, clarity, and consistency by the supervisor and the principal investigator.

4.10. Data Analysis and Presentation

The data was coded, entered and cleaned using EPI Data version 3.1 and then exported into SPSS statistical software version 26 for analysis. Descriptive statistical analysis such as simple frequencies, measures of central tendency, and variability measures will be used to describe the characteristics of participants. Then the information was presented using frequencies, summary measures, tables and figures. Bi-variable and multivariable analysis will be used to see the association between each independent variable and the outcome variable, using binary logistic regression Analysis. Chi-square test was done and variables that show P -value of ≤ 0.05 with 95% CI was considered statistically significant.

4.11. Ethical Consideration

Ethical clearance was obtained from Addis Ababa University's research committee, College of health sciences, school of nursing, and midwifery. A formal letter from the University was submitted to the Mekelle city health bureau to obtain their cooperation. The goal of the study was explained to the study subjects. At the time of data collection, verbal and written consent

was taken to confirm whether they are willing to participate. Those not willing to participate were given the right to do so. Confidentiality of responses was also be ensured throughout the research process.

4.12. DISSEMINATION PLAN

This study's findings will be presented to Addis Ababa University, College health sciences school of Nursing and Midwifery, and the hard copy will be available at the AAU library. It will also disseminate to Mekelle city health bureau, studied hospitals and finally, it will be published in peer-review journals.

CHAPTER 5: RESULTS

5.1 Socio-Demographic Characteristics of Nurses

A total of 188 nurses working in three selected governmental hospitals in Mekelle city were included for this study, 180 of them responded for the questionnaire, making the response rate of 95.7%. Regarding sex of respondents, 114 (63.3%) were males. More than half, 100 (55.6%) of the respondents were in the age group 30-39, and the mean (+SD) age of respondents was 30.7 (+4.4). The minimum and maximum age of respondents was 21 and 50 years respectively. Most participants 163 (90.6%) had first degree. 86 (47.8%) of the nurses are working in adult ICU. 148 (82.2%) of respondents were found to have 6-15 years of total experience as a nurse, while 111 (61.7%) have experience of <=5 years in the current department (Critical care department which is focus of study).

Table 2: Socio-Demographic Characteristics of Nurses In Mekelle City Public Hospitals, 2021 (n = 180).

Characteristics		**Frequency**	**Percentage (%)**
Age	21-29	74	41.1
	30-39	100	55.6
	40-49	5	2.8
	>49	1	0.6
Sex	Male	114	63.3
	Female	66	37.7
Departments nurses	NICU	17	9.4
are currently	PICU	16	8.9
working	ICU	86	47.8
	ED	61	33.9
Educational Status	MSc Nurse	6	3.3
	BSc Nurse	163	90.6
	Diploma Nurse	5	2.8
	Others	6	3.3
Total Experience as	<=5	28	15.6
a health care worker	6-15	148	82.2

(In years)	16-25	3	1.7
	>25	1	0.6
Total Experience of nurses in respective clinical care medicine unit	<=5	111	61.7
	6-15	68	37.8
	16-25	1	0.6

5.2 Nurses' Knowledge toward oxygen therapy

Respondents were asked 13 knowledge based questions to assess their knowledge toward oxygen therapy and they categorized in to two groups based on their score (Good knowledge and Poor Knowledge). Total cumulative knowledge level was determined out of 13 and mean level of knowledge was determined to be 8.59. Hence mean and above (i.e, >=9) is considered "Sufficient knowledge" while the rest was considered "Insufficient knowledge". Findings of this study revealed that the majority of nurses who participated in this study had sufficient knowledge score, 104 (57.8%).

Table 3: Frequency Distribution of Nurses' Knowledge Score Towards Oxygen Therapy Working in Emergency and ICU's s of the Selected Public Hospitals in Mekelle, Ethiopia, 2021 (N=180)

Characteristics		**Frequency**	**Percentage (%)**
Oxygen is like any other medication	True	75	41.7
	False	105	58.3
Oxygen is not medication but a supportive therapy	True	146	81.1
	False	34	18.9
Oxygen should only be given after doctors' prescription	True	82	45.6
	False	98	54.4
Oxygen promotes combustion	True	132	73.3
	False	48	26.7
Hypoxemia can be recognized by clinical signs	True	169	93.9
	False	11	6.1

Blood Gas Analysis is useful for confirming hypoxemia	True	113	62.8
	False	67	37.2
Breathlessness is not always a sign of hypoxemias	True	134	74.4
	False	46	25.6
Pulse Oximetry is useful in detecting and monitoring hypoxemia	True	168	93.3
	False	12	6.7
SpO2 level < 90 % in adults define hypoxemias	True	100	55.6
	False	80	44.4
Can be administered for Central cyanosis	True	110	61.1
	False	70	38.9
Can be administered for asymptomatic anemias	True	126	70
	False	54	30
Can be administered for eclampsia	True	148	82.2
	False	32	17.8
Can be administered for restlessness and convulsion in children	True	150	83.3
	False	30	16.7

5.3. Nurse's attitude toward oxygen therapy

Regarding nurses attitude (Mean = 5.69, SD = 1.33, range = 1–5). The lowest possible score (positive attitude) was 7 whilst the highest possible score (negative attitude) was 35. The level of attitude of nurses toward oxygen therapy was dichotomized as positive with attitude score of more than mean and negative with attitude score of less than or equal to mean. Most of the nurses, 122 (67.8%) have positive attitude towards oxygen therapy of critically ill patient.

Table 4: Frequency Distribution of Nurses' Attitude Score Towards Oxygen Therapy Working in Emergency and ICU's s of the Selected Public Hospitals in Mekelle, Ethiopia, 2021 (N=180)

Items	Positive	Negative
Oxygen should only be given by order or prescription	145(76.3%)	45(23.7)
Oral and nasal hygiene and normal saline drops as necessary should be done when giving oxygen therapy in children	176(92.6%)	14(7.4)
Continuous oxygen administration is more beneficial than intermittent oxygen therapy	104(54.7%)	86(45.3)
Humidification is the best practice to prevent dryness of mucus membrane of upper respiratory tract causing soreness	180(94.7%)	10(5.3)
Persons with severe lung disease need to be maintained at the prescribed oxygen saturation range	168(88.4%)	22(11.6)
Since oxygen is a drug its administration to the patient is not safe and also it is very dangerous	137(72.1%)	53(27.9)
A patient on oxygen therapy indicates that the patient is at the end stage of life	171(90.0%)	19(10.0)

5.4 Practice of nurses towards oxygen therapy

Regarding nurses practice (Mean = 5.69, SD = 1.56, range = 1–9). The lowest possible score (poor practice) was 1 whilst the highest possible score (Good practice) was 9. The level of practice of nurses toward oxygen therapy was dichotomized as Good with practice score of less than mean and poor with practice score of greater than or equal to mean. From all of the participants 79 (43.9%) had unsatisfactory practice towards oxygen therapy, while 101 (56.1%) had satisfactory practice towards oxygen therapy.

Table 5: Frequency Distribution of Nurses' Practice Score Towards Oxygen Therapy Working in Emergency and ICU's s of the Selected Public Hospitals in Mekelle, Ethiopia, 2021 (N=180)

Characteristics		**Frequency**	**Percentage** (%)
type II respiratory failure Practice	Nasal catheter at 1-2 L/min/ in the absence of Venturi masks	106	58.9
	Nasal catheter at 16 L/min	35	19.4
	Oxygen mask with reservoir 6-9L/min	39	21.7
type I respiratory failure Practice	FiO2 of 60%	108	60
	FiO2 of 20%	40	22.2
	FiO2 of 150%	32	17.8
Humidification is essential for patients receiving oxygen through one the following device	Endotracheal tube or a tracheostomy	18	10
	Nasal Prong	149	82.8
	Oxygen mask	13	7.2
Regarding weaning and discontinuation of oxygen which of the following statement is true?	started if clinically stable on low-dose oxygen	131	72.8
	commenced after a new chest radiograph is normal	36	20
	clinically stable on high-dose oxygen	13	7.2
Which of the following condition can not affect Pulse oximetry monitoring/reading	Patient motion or fitting	9	5
	Carbon-monoxide poisoning	16	8.9
	Jaundice and anemia	15	8.3
	False nails, nail varnish	140	77.8
Which of the following is the best in pulse oximetry practice	The wave form and/or signal strength must be optimal	139	77.2
	A blood pressure cuff on the arm of probe will lead to a false SPO2 reading	26	14.4
	A blood pressure cuff on the arm of	15	8.3

	probe will lead to a correct reading		
Which of the following method help to reduce the risk of side effects associated with dry gas administration and to promote patient comfort?	Use face mask	10	5.6
	Use nasal cannula	3	1.7
	Attach humidification device	127	70.6
	Attach Pulseoxy	26	14.4
	All	14	7.8
What will be the effect of collection of water in the tubing during oxygen administration?	Can partially or completely occlude the flow of oxygen	21	11.7
	Empty the collected water in the tubing as needed	29	16.1
	Facilitates flow of oxygen and promote patient comfort	130	72.2
Which of the following oxygen delivery device can provide 60 – 90% of oxygen used for short term treatment during trauma ?	Nasal catheter	26	14.4
	Venturi masks and adapters	13	7.2
	Non- rebreathing oxygen mask	71	39.4
	Tracheostomy mask	3	1.7
	All	67	37.2
Which nursing intervention is not appropriate during oxygen therapy?	Mouth care	6	3.3
	Encourage adequate fluid intake	19	10.6
	Apply water based cream if lips or nose become dry	15	8.3
	Apply petroleum jelly to minimize inflammation of lips and nose	140	77.8

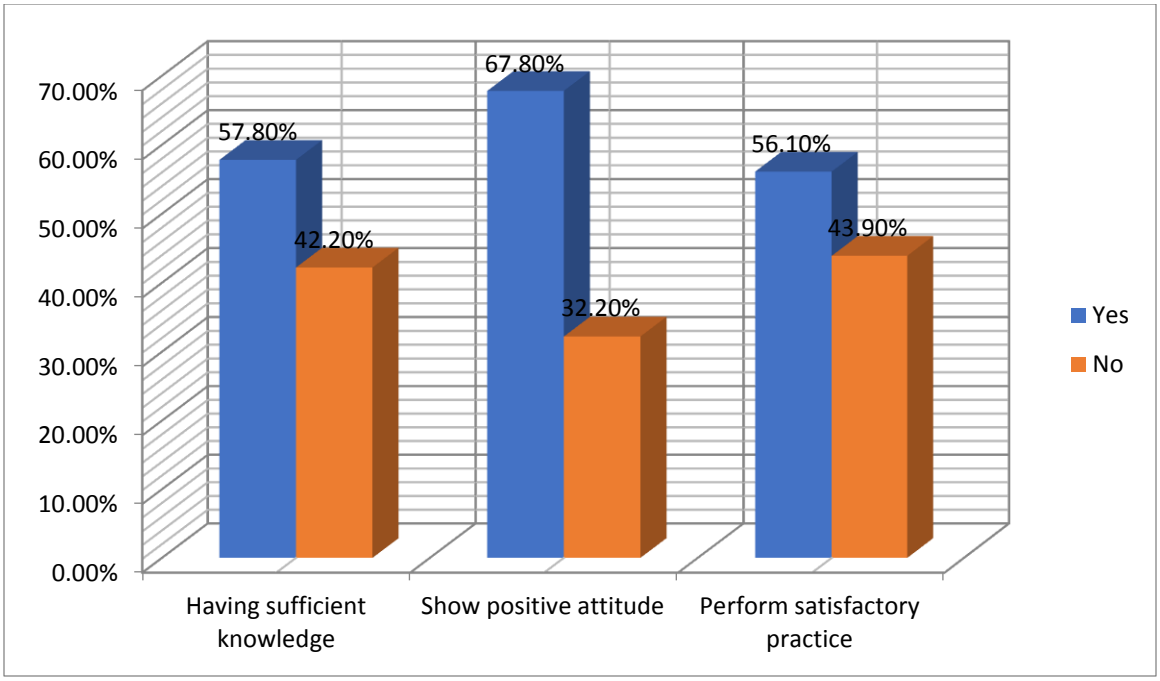

Figure 3: Level of Nurses Knowledge, Attitude, and Practice regarding oxygen therapy in ICU, Emergency wards, and associated factors Mekelle, Ethiopia, 2021.

5.5. Factors Associated with Nurses' KAP Regarding Oxygen Therapy

Health care associated factors and individual factors were assessed with a total of 14 coded questions. 144 (75.8%) of the responders reported there is no guideline of oxygen therapy in the unit they are currently working. 160 (84.2%) of professionals reported they have never received any continuing professional education (Update) special training on oxygen therapy. 118 (62.1%) of nurses reported there is adequate supply of oxygen and delivery systems in their working units, while a close minority of patients reported there is inadequacy. 174 (91.6%) of nurses reported that, patients administered oxygen without extra payment. 91(47.9%) of responders responded they get oxygen cylinders equivalent to the label written. 105 (55.3%) of nurses reported there is periodic maintenance of oxygen delivery equipments.

Regarding individual factors, 166 (87.4%) of nurses reported the source of information concerning oxygen therapy remained medical/nursing training. In addition, 164 (86.3%) of responders acknowledged that using too little oxygen in emergency room may contribute to carbon dioxide retention. 175 (92.1%) of nurses reported workload/ burden in the work place

affects oxygen therapy delivery. Significant majority of nurses i.e 131 (68.9%) reported to have received oral oxygen therapy prescription from physician. 162 (85.3%) of nurses reported to have faced unclear or incomplete written prescription. 164 (86.3%) reported to have administered oxygen therapy with in the past 6 months.

Table 6: Frequency Distribution of Associated Factors with Nurses' Practice Towards Oxygen Therapy Working in Emergency and ICU's s of the Selected Public Hospitals in Mekelle, Ethiopia, 2021 (N=180)

Characteristics		**Frequency**	**Percentage (%)**
Is there guideline of oxygen therapy in the unit you are currently working	Yes	44	24.4
	No	136	75.6
	I don't Know	0	0
Have you received any CPE/ update/ special training on oxygen therapy?	Yes	29	16.1
	No	151	83.9
	I don't Know		
Is there adequate supply of oxygen and delivery systems in your working unit?	Yes	113	62.8
	No	67	37.2
	I don't Know	0	0
Are your patients administered oxygen paid/ charged for the service?	Yes	13	7.2
	No	165	91.7
	I don't Know	2	1.1
Do you get the amount of oxygen cylinders equivalent to the label written?	Yes	87	48.3
	No	44	24.4
	I don't Know	49	27.2
Is there periodic maintenance of oxygen delivery equipments or devices?	Yes	100	55.6
	No	80	44.4
	I don't Know	0	0
What is your source of	Medical/Nursing training	157	87.2

information concerning oxygen therapy	In service training	7	3.9
	Colleagues	8	4.4
	Print and electronic media	1	0.6
	Others	7	3.9
Do you know that using too little oxygen in emergency room may contribute to carbon dioxide retention?	Yes	156	86.7
	No	16	8.9
	I don't Know	8	4.4
Do you think work load/ burden in the work place affects oxygen therapy delivery?	Yes	166	92.2
	No	10	5.6
	I don't Know	4	2.2
In what format does the physician prescribe oxygen therapy	Written	52	28.9
	Oral	128	71.1
Do you often face unclear or incomplete written prescription for oxygen delivery?	Yes	155	86.1
	No	20	11.1
	I don't Know	5	2.8
How long ago did you administer oxygen to a patient?	<6 months	155	86.1
	6-12 months	5	2.8
	>12 months	20	11.1
Indication for Acute Oxygen Therapy include Respiratory distress (respiratory rate >24/min in adult or 60 in neonate)	Yes	149	82.8
	No	28	15.6
	I don't Know	3	1.7

5.5.1 Association between nurses' Knowledge, attitude and practice towards oxygen therapy and independent variables

I. Regression analysis of Nurses' Knowledge toward oxygen therapy with related variables

Bivariate and multivariate logistic regression analysis used to identify the factors that are associated with nurse's knowledge toward oxygen therapy. On binary logistic regression analysis all socio-demographic variables (sex, age, level of education, Current working area) year of experience in nursing profession) were not significantly associated with knowledge toward oxygen therapy at p-value <0.05 with 95% C.I. The variable that was found to be statistically significantly related with Sufficient Knowledge was nurses that receive written physician prescription, Presence of guideline and Last known duration when nurses administer OT. Nurse that often receive written prescription for oxygen therapy were found to have significant correlation [COR=4.16; 95%CI (1.18-14.6)]. Presence of guideline for oxygen therapy in the work unit also significantly affects knowledge of with [COR=2.79; 95%CI (1.03-7.57)]. Last known duration where by nurses administer oxygen was also significant, about 10% more of those nurses that administer oxygen therapy <6 months were found to be knowledgeable than those >12 months ago with [COR=0.085; 95%CI (0.007-0.98)].

After bivariate analysis, only those variables, which were significantly, associated (p- value < 0.05) with knowledge entered for further multivariate analysis. By adjusting potential confounders in multivariate logistic regression analysis, Nurse participants who happen to administered oxygen to a patient were found to be 3 times more likely knowledgeable than those who did not administer oxygen therapy with in the past 6 months [AOR:3.21; 95% C. I (1.16-8.87)].

Table 7: Association Between Socio-Demographic Factors With Knowledge Of Nurses Working In Critical Care Medicine Units Towards Oxygen Therapy At Public Hospitals Of Mekelle, Ethiopia, 2021 (n=180)

Variable	**Mean knowledge Oxygen Therapy**		**COR (95%CI)**	**AOR (95%CI)**
	Insufficient Knowledge	**Sufficient Knowledge**		
Age in years				
21-29	30	44	0.904(0.491-1.66)	
30-39	43	57	1.02(0.16-6.49)	
40-49	2	3	0.00(0.00-0.001)	
>=50	1	0	1	
Sex				
Male	47	67	1.12(0.61-2.06)	
Female	29	37	1	
Department				
NICU	8	9	0.68(0.23-2.01)	
PICU	5	11	1.33(0.41-4.32)	
ICU	40	46	0.69(0.36-1.36)	
ED	23	38	1	
Format by which physicians prescribe oxygen therapy				
Written	19	33	0.408(0.157-1.07)*	0.51(0.25-1.035)
Oral	57	71	1	1
Presence of guideline with in the respective ward				
Yes	23	21	2.79 (1.03-7.57)*	1.53 (0.76-3.09)
No	53	83	1	1
Last duration of oxygen administration				
<6 months	60	95	0.085(0.007-0.98)*	3.21(1.16-8.87)*
6-12 months	4	1	0.26(0.042-1.58)	2.98(0.28-31.56)
>12 months	12	8	1	

II. Regression analysis of nurses' attitude towards oxygen therapy and independent variables.

On Bivariate analysis Presence of guidelines, Format by which physicians prescribe OT and Duration since the nurse administered oxygen therapy was found to have significant association with nurses' attitude towards oxygen therapy (P<0.05, 95% CI). Nurses that work in units with OT guidelines were found to be twice more positive about OT than their counterparts working in units without OT guidelines [COR=2.44; 95% CI (1.21-4.93)]. Meanwhile, Nurses that receive Written OT prescription from physicians were found to be three times more positive than those nurses that receive prescription orally [COR=2.67; 95%CI (1.36-5.22)]. Nurses that administer OT less than six months ago were found to be eleven times more positive than those that administer OT greater than twelve months ago [COR=11.5; 95%CI (3.6-36.4)]. After Bivariate analysis, only those variables, which were significantly, associated (p- value < 0.05) with attitude entered for further multivariate analysis.

On multinomial logistic regression, Nurses working in units with OT guidelines were found to be twice positive than nurses working in centers without guidelines [AOR= 2.25; 95% CI (1.05-4.8)]. Nurses who administered oxygen within the past 6 months have been nine times positive than those nurses that administered much longer with [AOR= 9.1; 95% CI (2.7-30)].

Table 8: Association Between Socio-Demographic And Other Factors With Attitude Of Nurses Working In Critical Care Medicine Units Towards Oxygen Therapy At Public Hospitals Of Mekelle, Ethiopia, 2021 (n=180)

Variable	**Attitude towards OT**		**COR (95%CI)**	**AOR (95%CI)**
	Negative Attitude	**Positive Attitude**		
Age in years				
21-29	24	50	1.67(0.484-5.75)	
30-39	31	69	0.42(0.018-9.684)	
40-49	3	2	0 (0.00-0.001)	
>=50	0	1	1	1

Sex				
Male	40	74	1.155(0.502-2.65)	
Female	18	48	1	1
Department				
NICU	3	14	0.45(0.059-3.03)	
PICU	9	7	0.43(0.094-1.99)	
ICU	30	56	0.57(0.12-2.71)	
ED	16	45	1	1
Is there OT guideline in your unit?				
Yes	21	23	2.44(1.21-4.93)*	2.25(1.05-4.8)*
No	37	99	1	1
In what format does the physician prescribe OT?				
Written	25	27	2.67(1.36-5.22)*	
Oral	33	95	1	1
Duration since the nurse administered oxygen therapy				
<6 months	40	115	11.5(3.6-36.4)*	9.1(2.7-30)*
6-12 months	2	3		
>12 months	16	4	1	1

III. Regression analysis of nurses' Practice towards oxygen therapy and independent variables.

Bivariate and multivariate logistic regression analysis is used to identify the factors that are associated with nurse's practice toward oxygen therapy. On binary logistic regression analysis none among the socio-demographic variables were found to be significantly associated with practice toward oxygen therapy at p-value <0.05 with 95% CI. In addition other variables like Presence of OT guideline in working units, adequate supply oxygen and delivery systems in the working unit, Format by which physicians prescribe OT and The last time by which nurses administer oxygen therapy were all found to have statistically significant correlation with oxygen therapy practices at p-value<0.05 with 95% CI.

Nurses working in units where OT guidelines are present were found to have twice satisfactory practice than nurses working in units without OT guidelines [COR=1.99; 95% CI (1.0 -3.97)]. nurses working in units with adequate supply of oxygen and oxygen delivery system reported to have twice more satisfactory practice towards oxygen therapy than their counterparts working in units without adequate supply [COR=2.09; 95% CI (1.13-3.85)]. Nurses who practice OT with written prescription from physician were found to have twice more satisfactory practice than nurses receiving oral prescription [COR=2.1; 95% CI (1.14-4.24)]. Finally, nurses that reported to deliver OT in the past 6 months were found to have eight times more satisfactory practice than nurses that deliver OT more than a year ago, [COR=8.7; 95% CI (2.46-31.1)].

On multinomial logistic regression, nurses who reported Presence of OT guide lines, Presence of adequacy in supply of oxygen and delivery system in nurses working units and who administered OT within the past 6 months were found to have statistically significant association With [AOR=2.19; 95% CI (1.03-4.67)], [AOR=2.02; 95% CI (1.04-3.93)] and [AOR=6.0; 95% CI (1.6-22.39)] respectively.

Table 9: Association Between Socio-Demographic And Other Factors With Practice Of Nurses Working In Critical Care Medicine Units Towards Oxygen Therapy At Public Hospitals Of Mekelle, Ethiopia, 2021 (n=180)

Variable	**Mean Practice Oxygen delivery**		**COR (95%CI)**	**AOR (95%CI)**
	Unsatisfactory Practice	**Satisfactory Practice**		
Age in years				
21-29	37	37	2.522(0.326-19.5)	
30-39	39	61	0.00(0.00-2.83)	
40-49	2	3	1.206(1.00-1.41)	
>=50	1	0	1	1
Sex				
Male	54	60	9.63(1.76-55.5)	
Female	25	41	1	1
Department				
NICU	8	9	7.62(0.3-16.4)	

PICU	11	5	6.21(0.8-4.7)	
ICU	41	45	9.3(2-18.1)	
ED	19	42	1	1
Is there OT guideline in your unit?				
Yes	25	19	1.99(1.0-3.97)*	2.19(1.03-4.67)*
No	54	82	1	1
Presence of adequate supply of oxygen delivery equipments				
Yes	42	71	2.09(1.13-3.85)*	2.02(1.04-3.93)*
No	37	30	1	1
In what format does the physician prescribe OT?				
Written	30	22	2.1(1.14-4.24)*	
Oral	49	79	1	
Duration since the nurse administered oxygen therapy				
<6 months	61	94	8.7(2.46-31.1)*	6.01(1.6-22.39)*
6-12 months	1	4	0.10(0.022-0.423)	9.1(1.06-77.2)
>12 months	17	3	1	1

5.5.2 Association between the dependant variables

Binomial logistic regression and Multinomial logistic regression analysis was conducted on the three dependent variables (Knowledge, Attitude and Practice). For this purpose practice of nurses towards oxygen therapy was analyzed against the other two variables. The odds of those nurses with positive attitude to practice oxygen therapy was found to be roughly three times more than those nurses with negative attitude with [COR=2.7; 95%CI (1.4-5.1)]. In contrast there was no statistically significant correlation among practice and knowledge of nurses.

On multinomial logistic regression, nurses who have positive attitude towards oxygen therapy were likely to practice satisfactory oxygen delivery practices three times better than their counterparts [AOR= 2.68; 95% CI (1.45-5.12)].

Table 10: Association Among Dependant variables of Nurses working in critical care medicine units towards oxygen therapy at public hospitals of Mekelle, Ethiopia, 2021 G.C. (n=180)

Variable	Mean Practice Oxygen delivery		COR (95%CI)	AOR (95%CI)
	Unsatisfactory Practice	Satisfactory Practice		
Knowledge of nurses				
Insufficient	38	38	0.726(0.24-2.21)	
Sufficient	41	63	1	
Attitude of nurses				
Positive	35	23	2.68(1.4-5.1)**	2.68(1.4-5.12)**
Negative	44	78		

CHAPTER 6: DISCUSSION

This study aimed to assess nurses' knowledge, attitude, practice and associated factors among nurses working in critical care medicine (ED and ICU) of selected governmental hospitals in Mekelle, Tigray, Ethiopia.

Findings of this study revealed that 104 (57.8%) of nurses' have Sufficient Knowledge toward oxygen therapy. Whereas the studies conducted in Uganda and Rwanda public hospitals showed that overall knowledge of nurses was 76% and 87.7% respectively (4,26). This discrepancy might be due to lack of trainings on area of oxygen therapy, socio-demographic differences, differences in work experience, study time gap and study setting difference. In contrast Studies conducted in Tureky, Egypt, Eriteria and Addis Ababa reported overall knowledge to be 27.5%, 18%, 43.3% and 36.2% respectively (12,16,17,27). Apart from study design difference and difference in socio economic status, these can be due to better training among our study participants and better experience. This implies the responsibility of hospital management for providing the staff skills development program while updating the knowledge of the staff nurses is a paramount factor in professional performing. There is a need to update the knowledge of staff nurses, training is essential and should be integrated into their work schedule regularly.

Physicians written prescription practice towards OT often enhance nurses' practice, of which in this study four times better practice was noted. A review conducted in Australia reinforced findings from this study and showed that appropriate oxygen therapy delivery is enhanced as prescription rates improve (18). This could be as a result of similarity in work unit protocloes to treat oxygen as a prescription drug, on top having forward and iterative sort of written communication among clinical practitioners which might be a norm in western medical practice including Australia as well as Hospitals located in Mekelle.

Presence of guideline for oxygen therapy in the work unit significantly affects knowledge of nurses, where nurses were found to be roughly three times more knowledgeable with [COR=2.79; 95%CI (1.03-7.57)]. Last known duration where by nurses administer oxygen was also significant, about 10% more of those nurses that administer oxygen therapy <6 months were found to be knowledgeable than those >12 months ago with [AOR=3.21; 95%CI (1.16-8.8)]. Nurses practicing written prescription for oxygen therapy were found to be 4 times more knowledgeable than counterparts. The results in this study are consistent with the study

conducted in A.A and Eretria which investigated that presence of guideline in the ward and routinely administering oxygen therapy are associated with knowledge toward oxygen therapy (17,27). This implies that nurse's knowledge toward oxygen therapy could be improved by employing standard guidelines in the work unit, routinely administering oxygen therapy and administering oxygen therapy with written prescription from physicians

The finding of this study also revealed that 122(67.8%) of nurses have positive attitude toward oxygen therapy. This result is comparable with those reported from Netherlands, Eretria and Rwanda (4,13,27). Meanwhile, This is greater than study conducted in Saudi Arabia and three public hospitals in Addis Ababa hospital that reported cumulative attitude to be positive in 32.8% and 53.3% of nurses respectively (17,28). This difference in nurses' attitude toward oxygen therapy of patients might be due to geographical, cultural and social variable which govern the research environments or be due to difference in question measuring nurse's attitude toward oxygen therapy of patient.

In this study nurses that work in units with OT guidelines were found to be twice more positive about OT than their counterparts working in units without OT guidelines [COR=2.44; 95% CI (1.21-4.93)]. Meanwhile, Nurses that receive Written OT prescription from physicians were found to be three times more positive than those nurses that receive prescription orally [COR=2.67; 95%CI (1.36-5.22)]. Nurses that administer OT less than six months ago were found to be eleven times more positive than those that administer OT greater that twelve months ago [COR=11.5; 95%CI (3.6-36.4)]. This is consistent with studies (Egypt, Eretria, Saudi Arabia and public hospitals in Addis Ababa) (16,27,17,28). This could be due to practice of more oxygen therapy with similar global guideline or presence of national guideline as well as national child critical care in service trainings for nurses.

The findings in this study also suggest that 101(56.1%) of nurses have Satisfactory practice regarding oxygen therapy. Studies from Egypt, Rwanda, Eretria and A.A reported satisfactory practice among nurses to be 18%, 46.2%, 45% and 43.4% respectively, all of these findings are lower than this study finding. These differences can be due to different measurement tool, lack of training of nurses on oxygen therapy, difference in socioeconomic background, lack of formal oxygen therapy education and absence of independent critical care medicine units equipped to deal with sustainable oxygen therapy in the former studies. Meanwhile a study from Iranian

hospital reported good practice among nurses to be 74.5% which is significantly higher than these report. These could be as a result of sustainable oxygen therapy, better nursing care, continuous in service nurse training, well equipped critical care centers and better staff communication in the Iranian setup.

This study revealed that adequate supply of oxygen and oxygen delivery system reported to have Good practice towards oxygen therapy [COR=2.09; 95% CI (1.13-3.85)]. An Egyptian study on 2019 reported lack of training courses, lack of equipment/supplies, lack of periodic maintenances and unavailability of standardized protocol for oxygen therapy affect administration of oxygen therapy to their patients, $p<0.01$ (16). The study also revealed that, Nurses who reported to have routine administration of OT were found to have 6 times satisfactory practice of oxygen therapy [AOR=6.01; 95% CI (1.6-22.39)]. This finding is consistent with findings from Saudi Arabia, Egypt, Eretria and AA (16,17,27,28).. This might be attributed to the similarity in the frequency of applying OT. Another possible explanation could be increased exposure and experience.

CHAPTER 7: STRENGTH AND LIMITATIONS

The research objectives are thoroughly addressed by the study, which is the main purpose of the investigation. Despite the strength, this study had certain limitations, and thus the results might not represent KAP of the whole population. The study carried out in a poor resource country, especially at a time of inconveniences at the study location, hence the major thrust of its limitations. Also, the self-reporting nature of the data collection is a limitation in that some participants might have under-reported or over-reported their views. Another limitation is the mode of data collection at the work setting itself. Many people are busy during their usual work hours and may have read the questionnaire with incomplete concentration; this could have led to some under-reporting or over-reporting of the results.

CHAPTER 8: CONCLUSION

Based on the results of this study, it could be concluded that: Majority of nurses had sufficient knowledge and satisfactory practice toward oxygen therapy. It was found that Knowledge and practice had statistically significant association with routine practice of oxygen therapy, presence of guidelines in the working units and presence of written prescriptions from physicians. Nurse's attitude was found to have statistically significant relation with their practice towards oxygen therapy. In spite of sufficient knowledge and satisfactory practice in majority of the nurses, this study also demonstrates that there is a clear gap of KAP among all groups of participants related to oxygen therapy use. The possible associated factors for this gap included shortage of training programs, unavailability of national OT guideline and Lack of oxygen prescription practices.

CHAPTER 9: RECOMMENDATION

Based on the findings of this study the following recommendations are made to enhance the Nurses KAP regarding OT.

The Federal Ministry of Health must consider expanding Critical care medicine with optimal oxygen therapy delivery systems in the country to address critically ill patients. In addition it should engage in training practitioners and guideline preparation towards oxygen therapy.

Insufficient knowledge and unsatisfactory practice calls for public health interventions. Awareness programs about the consequences of malpractice towards OT should be made available in the workplace to act as reference points. Even as the government of Ethiopia, non-governmental organizations and other stakeholders grapple with the problem of health service coverage some effort should be directed towards quality of care. Education programs on the occupational use of OT through conferences, workshops, research and lectures are needed to raise the awareness of health care workers about OT.

The study could be replicated in other urban areas in Ethiopia, and a comparison made with the current study to establish if the problem is widespread and not a unique problem to Mekelle. Other researchers are also encouraged to further study identified gaps by mitigating to the limitations of this report.

Public hospitals in Mekelle should work more on Emergency and ICU's s' oxygen therapy practices providing a high quality critical medicine care through optimal oxygen therapy services by ongoing training and support focusing on nurse practitioners working in the area.

The ICU and ED directorate should work to provide quality care to critically ill patient concerning OT and work on the contributing associated factor for better outcome.

Nurses should engage themselves in continuous medical education (CMEs) towards OT so as to update themselves of optimal oxygen therapy practices.

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ANNEXES

ANNEX A: INFORMATION SHEET

PURPOSE OF THE STUDY

The purpose of the study is primarily to assess nurses Knowledge, Attitude and practice regarding oxygen therapy in ICU, Emergency wards and associated factors in selected public hospitals Mekele city Tigray,Ethiopia.

WHAT IS EXPECTED OF YOU IF YOU AGREE TO PARTICIPATE?

It is expected that those who agree to participate will fill a questionnaire on Knowledge of oxygen therapy for 10-15 minutes. The cost of investigations would be borne solely by the researchers and at NO TIME would the patients be required to pay for any tests involved in this study.

YOUR PARTICIPATION IS VOLUNTARY- Your participation is voluntary, and you may withdraw at any phase of the study.

CONFIDENTIALITY -We will treat information collected from you in absolute confidence. No part or whole of such information shall be divulged to anybody except the investigators. We owe it a duty to keep your records secret.

BENEFIT OF PARTICIPATION

Your participation from this study will contribute to clinical practice improvement and patient care. I at this moment consent to participate in the above-stated study as explained to me and I am also aware that I have the right to withdraw my participation at any point during the study if I so wish. Signature Date .

Please select one answer the by ticking the box and filling the line.

ANNEX B: CONSENT FORM

Hello. How are you, my name is Tesfu Kahsay. I am a final year Post Graduate Cardiovascular Nursing Student at Addis Ababa University. The assessment of Nurses Knowledge, Attitude and Practice regarding oxygen therapy in ICU, Emergency wards and associated factors at selected Public hospitals of Mekele Town Tigray, Ethiopia,2021made for the partial fulfillment of my Master's degree in Cardiovascular Nursing. The aim of this study is to assessKnowledge, Attitude, Practice and associated factors regarding oxygen therapyThe results of the study will be used as baseline information to design appropriate interventional strategies to provide comprehensive care for cardiovascular patients.

The information you provide is confidential and is used only for the purpose of this study. Your cooperation and participation until the completion of the questionnaire is very necessary for the successful completion of the assessment. You will neither get harmed nor will you get benefit as a result of participating in this study. I therefore ask your genuine willingness. However, you have the right to decline if you don't volunteer to participate at any time.

If you have any question and confusion regarding the questions, you have the right to ask me at any point or you can contact me on the following address.

Email address: tesfuje2003@gmail.comand phone number.+251914022040

Are you willing to participate? Yes ☐ No ☐

Data collector: Name_____

Signature_____Date_____

ANNEX C: ENGLISH VERSION QUESTIONNAIRE
ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

SCHOOL OF NURSING DEPARTMENT OF NURSING AND MIDWIFERY

This is the questionnaire designed to assess Nurses Knowledge, Attitude and Practice regarding oxygen therapy in ICU, Emergency wards and associated factors at selected Public hospitals of Mekele Town Tigray, Ethiopia,2021.

Please read the questionnaire and provide your honest response to each item. Thank you for your cooperation!!

SECTION 1: Questions related to nurses socio-demographic characteristics

INSTRUCTION: Please encircle your choice or provide the appropriate answer for the following questions.

No.	Socio-demographic Variables	Answer
101	How old are you (at last birthday in years)?	_____Years
102	What is your gender	1.Male 2.Female
103	In which department are you working currently?	_____
104	What is your level of education?	1.Msc nurse 2.B.Sc.Nurse 3.diploma nurse 4.Other specify_____
105	For how many years you have experience as a health care worker?	_____
106	How long have you been working in this hospital or health facility?	_____ years

SECTION 2: Questions to assess nurses knowledge in oxygen therapy

INSTRUCTION: Please encircle your choice for the following questions.

No.	Knowledge Variables	Answer
201	Oxygen is like any other medication	1.True 2. False
202	Oxygen is not medication but a supportive therapy	1.True 2. False
220 2 03	Oxygen should only be given after doctors' prescription	1.True 2. False
204	Oxygen promotes combustion	1.True 2. False
205	Hypoxemia can be recognized by clinical signs	1.True 2. False
206	Blood Gas Analysis is useful for confirming hypoxemia	1.True 2. False
207	Breathlessness is not always a sign of hypoxemias	1.True 2. False
208	Pulse Oximetry is useful in detecting and monitoring hypoxemia	1.True 2. False
209	SpO2 level < 90 % in adults define hypoxemias	1.True 2. False
No.	**Questions (210-213) assess knowledge about indications for O_2 therapy**	**Answer**
210	Can be administered for Central cyanosis	1.True 2. False

211	Can be administered for asymptomatic anemias	1.True 2. False
212	Can be administered for eclampsia	1.True 2. False
213	Can be administered for restlessness and convulsion in children	1.True 2. False

SECTION 3: Question to assess nurses attitude on oxygen therapy

Instruction: Please answer questions from 301 to 307 by putting "X" on your response

No	Description	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
301	Oxygen should only be given by order or prescriptions					
302	Oral and nasal hygiene and normal saline drops as necessary should be done when giving oxygen therapy in children					
303	Continuous oxygen administration is more beneficial than intermittent oxygen therapy.					
304	Humidification is the best practice to prevent dryness of mucus membrane of upper respiratory tract causing soreness					
305	Persons with severe lung disease need to be maintained at the prescribed oxygen saturation range					
306	Since oxygen is a drug its administration to the patient is not safe and also it is very dangerous.					
307	A patient on oxygen therapy indicates that the patient is at the end stage of life					

SECTION 4: Questions to assess nurses oxygen delivery practices

INSTRUCTION: Please encircle your choice for the following questions

401. A 72-year-old farmer with COPD has carbon dioxide retention (type II respiratory failure), which of this device is appropriate for oxygen delivery to achieve a target saturation of 88-92%?

1. Nasal catheter at 1-2 L/min/ in the absence of Venturi masks
2. Nasal catheter at 16 L/min
3. Oxygen mask with reservoir 6-9L/min

402. A 12-year-old boy had type 1 respiratory failure, select one correct initial concentration of oxygen to achieve a target saturation of 94-98%.

1. FiO2 of 60%
2. FiO2 of 20%
3. FiO2 of 150%

403. Humidification is essential for patients receiving oxygen through one the following device:

1. Endotracheal tube or a tracheostomy
2. Nasal Prong
3. Oxygen mask

404. Regarding weaning and discontinuation of oxygen which of the following statement is true?

1. Weaning and discontinuation of oxygen therapy should be started if clinically stable on low-dose oxygen
2. Weaning and discontinuation of oxygen therapy should be commenced after a new chest radiograph is normal
3. Weaning of oxygen therapy should be initiated if clinically stable on high-dose oxygen

405. Which of the following condition can not affect Pulse oximetry monitoring/reading ?

1. Patient motion or fitting
2. Carbon-monoxide poisoning
3. Jaundice and anemia
4. False nails, nail varnish

406. Which of the following is the best in pulse oximetry practice?

1. The wave form and/or signal strength must be optimal before a reading can be accepted

2. A blood pressure cuff on the arm of probe will lead to a false SPO2 reading

3. A blood pressure cuff on the arm of probe will lead to a correct oxygen saturation reading

407. Which of the following method help to reduce the risk of side effects associated with dry gas administration and to promote patient comfort?

1. Use face mask D. Attach pulse oximeter probe

2. Use nasal cannula E. All

3. Attach humidification device

408. What will be the effect of collection of water in the tubing during oxygen administration?

1. Can partially or completely occlude the flow of oxygen

2. Empty the collected water in the tubing as needed

3. Facilitates flow of oxygen and promote patient comfort

409. Which of the following oxygen delivery device can provide 60 – 90% of oxygen used for short term treatment during trauma ?

1. Nasal catheter D. Tracheostomy masks

2. Venturi masks and adapters E. All

3. Non- rebreathing oxygen mask

410. Which nursing intervention is not appropriate during oxygen therapy?

1. Mouth care

2. Encourage adequate fluid intake

3. Apply water based cream if lips or nose become dry

4. Apply petroleum jelly to minimize inflammation of lips and nose

SECTION V. Questions to assess factors affecting Nurses KAP in oxygen therapy

Instruction: Please choose the appropriate answer for the following questions

5.1. Healthcare facility related factors		
No	Health care facility related variable	Answer
501	Is there guideline of oxygen therapy in the unit you are currently working?	1) Yes 2) No 3) I don't know
502	Have you received any CPE/ update/ special training on oxygen therapy?	1) Yes 2) No (Skip to Q-504 if you say 'No')
503	If yes to question 502, when did you receive the update/training?	_____ E.C (D/M/Y)
504	Is there adequate supply of oxygen and delivery systems in your working unit?	1) Yes 2) No 3) I don't know
505	Are your patients administered oxygen paid/ charged for the service?	1) Yes 2) No 3) I don't know
506	Do you get the amount of oxygen cylinders equivalent to the label written?	1) Yes 2) No 3) I don't know
507	Is there periodic maintenance of oxygen delivery equipments or devices?	1) Yes 2) No 3) I don't know
5.2. Individual factors		
508	What is your source of information concerning oxygen therapy	1) Medical/Nursing training 2)In service training 3) Collegues 4) Journals 5) Print and electronic media 6) Others, Please specify _____
509	Do you know that using too little oxygen in emergency room may contribute to carbon dioxide retention?	1) Yes 2) No 3) I don't know
510	Do you think work load/ burden in the work place affects oxygen therapy delivery?	1) Yes 2) No 3) I don't know
511	In what format does the physician prescribe oxygen therapy	1) Written 2) Oral
512	Do you often face unclear or incomplete written prescription for oxygen delivery?	1) Yes 2) No

		3) I don’t know
513	How long has it been since you last administer oxygen to a patient?	<6month 6-12 months 3) >12 months
514	Indication for Acute Oxygen Therapy include Respiratory distress (respiratory rate >24/min in adult or 60 in neonate)	1) Yes 2) No 3) I don’t know