Assessment of pediatric residents' knowledge, Attitude and practice regarding oxygen therapy and its complications at, TASH and SPMMC, Addis Ababa

A CROSS-SECTIONAL DESCRIPTIVE STUDY

RESEARCH THESIS

Assessment of pediatric residents' knowledge, Attitude and practice regarding oxygen therapy and its complications at, TASH and SPMMC, Addis Ababa

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A research thesis submitted to the department of Pediatrics and Child Health | College of Health Sciences | Addis Ababa University, in partial fulfillment for the Specialty Certificate in Pediatrics and Child Health

Declaration

Title: Assessment of pediatric residents' knowledge, Attitude and practice regarding oxygen therapy and its complications at, TASH and SPMMC, Addis Ababa

Name of researcher: Kalkidan Beza, MD

A. Declaration by the Student

I do hereby declare that this research submitted in partial fulfillment of the requirements for the specialty certificate of Pediatrics and Child Health is my original work and has not previously been submitted elsewhere.

Also, I do declare that a complete list of references is provided indicating all the sources of information quoted or cited.

Date and Signature of the Student
November 17, 2021

B. *Authority to submit the dissertation*

ADVISOR: Hanna Gebre, MD; assistant professor of pediatrics and child health, Addis Ababa University college of health science, school of medicine, department of pediatric and child health.

In my capacity as a supervisor, I do hereby authorize the student to submit his/her dissertation.

Date and Signature of the Supervisor
November 17, 2021

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Finally, I would like to acknowledge my colleagues for sharing their constructive ideas during the periods of development of this research.

Abstract

Title: Assessment of pediatric residents' knowledge, Attitude and practice regarding oxygen therapy and its complications at, TASH and SPMMC, Addis Ababa

Background: Oxygen therapy is a medical treatment used for tissue hypoxia. It has the potential to improve medical outcomes and save lives when used appropriately and to cause harm if used inappropriately.

Objective: To assess knowledge, attitude and practice of residents and about oxygen therapy and its complications in pediatrics department of TASH and SPMMC.

Methodology: A cross-sectional descriptive design was employed. All Pediatrics residents working in will be used as a source population. The total sample was determined by using single population formula by considering the assumptions 95% confidence interval with margin of error 5% the calculated final sample size is 141 by adding 10% non respondent. Level of knowledge was grouped by Bloom's original cut-off points into good (80-100%), moderate (60-79%) and poor (< 60%).

Result and discussion: Out of the 141 pediatric residents who responded, 13.5 % had a level of knowledge classifiable as poor, 68.8% moderate and 17.7% good. There is significant relation between the experience as a GP and whether there is previous training on oxygen therapy during administration of oxygen (p value= 0.026 and 0.041).

Conclusion: The majority of participants had moderate to poor level of knowledge of oxygen administration and positive attitude. However their practice was generally poor. Their knowledge could be boosted with regular education and training on oxygen administration.

ABBRIVIATIONS AND ACRONYMS

1. O2 = Oxygen
2. OT = Oxygen Therapy
3. SPO2 = Oxygen Saturation
4. TASH = TikurAnbessa Specialized Hospital
5. COT= Conservative oxygen therapy
6. SPMMC=St. Paul Millennum medical collage
7. PaO2: The partial pressure of oxygen in the blood.
8. ABG = Arterial Blood Gas
9. Hct = Hematocrit
10. CXR = Chest X Ray
11. PR = Pulse Rate
12. BP = Blood Pressure
13. ICU: Intensive Care Unit
14. GI = Gastrointestinal
15. ED = Emergency Department
16. SaO2: Arterial oxygen saturation measured from blood specimen.
17. SpO2: Arterial oxygen saturation measured via pulse ox meter.
18. SOT: Supplemental oxygen therapy
19. WHO World Health Organization

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CHAPTER ONE: INTRODUCTION

1.1 Introduction

Oxygen is an essential for almost all of earth's organisms. In the clinical location, O2 is used as a treatment for various pathophysiological conditions such as pneumonia, heart failure and hemorrhagic shock. While O2 administration is helpful, too much can be harmful. Antioxidants appear naturally in the body and are used to prevent damage caused by free radicalsO2 toxicity[1.]Supplemental oxygen help to prevent hypoxemia problems; once improperly administered, the patient can come across the risk of hypoxemia, respiratory dysfunction even death.[2]

Oxygen administration of critically ill patients is one of the most important aspects of patient care and will be effective on basis to the core responsibility of the physician to take care of patient comfort. In such way, required knowledge, good practice and positive attitudes about oxygen administration are key elements towards that aspect of care. This enables them to assess patients' condition and deliver individualized care to each patient in order to improve quality of life of the patient, prevent hypoxemia and acute lung injury [3].

In emergency situation parents and caretakers must not refuse oxygen therapy and special care for the patients in critical situation such as cardiac and/or respiratory arrest guidelines for Basic & Advanced Life Support is to be applied. According to Annika, the supplemental oxygen is a key point in clinical conditions management [4]and for any suspected hypoxia patient, oxygen therapy should immediately be initiated without waiting for medical prescription due to the emergency faced to.[5] however, a medical prescription report, and adequate monitoring from the nurses are necessary, because oxygen is a drug.

1.2 Background

Oxygen therapy is a medical treatment used for tissue hypoxia. It is prescribed to improve oxygen supply and reduce the work of breathing. It has the potential to improve medical outcomes and save lives when used appropriately and to cause harm if used inappropriately.

Oxygen is listed as a core item on the World Health Organization's (WHO) model of essential medicines used in a healthcare system[6]. Administering SOT has an essential role in preventing and managing hypoxemia in both acute and chronic conditions.

Maintenance of adequate oxygen delivery to vital organs often requires the administration of supplemental oxygen, sometimes at high concentrations. Although oxygen therapy is lifesaving, it may be associated with deleterious effects when administered for prolonged periods at high concentrations [7]

The optimal amount and method of oxygen delivery varies depending on a patient's underlying medical condition and whether the condition is acute or chronic. The selection of the best oxygen delivery device and flow rate of oxygen depends on many factors, some of which are the patient's age, the therapeutic goals, and patient tolerance[8]

Maintenance of adequate oxygen delivery to vital organs often requires the administration of supplemental oxygen, sometimes at high concentrations. Although oxygen therapy is lifesaving, it may be associated with deleterious effects when administered for prolonged periods at high concentrations. Oxygen should be prescribed to achieve a target saturation of 94–98% for most acutely ill patients or 88–92% for those at risk of hypercapnic respiratory failure [9]

Oxygen therapy, like any drug, if there is increase in its dose, this can have toxic effects on the human body, exposure to higher concentrations of oxygen; can lead to life-threatening health problems. The most common serious health problem could result from high oxygen concentration is "oxygen toxicity", also it is called oxygen poisoning or oxygen intoxication, is defined as too much oxygen in body tissues. This results when a person inhales too much concentrated oxygen, when receiving oxygen therapy[10]

Oxygen therapy is an essential component of resuscitation, acute medical care, basic life support, anesthesia and postoperative care, any errors in oxygen therapy can worsen a patient's condition and can even be life threatening. The benefits and potential complications of oxygen therapy are well known; however, oxygen therapy is often done by health team members without special attention and sufficient knowledge or practice[1112]

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[11].The target saturation must be tagged in drug chart. Oxygen should be administered by a professionally trained nurse [13]

The complications associated with oxygen therapy also calls for effective team work, proper documentation, and handing over of oxygen therapy specific issues[14]. Regardless of the setting in which oxygen is delivered; it should be regarded as a drug. Its potency in treating hypoxemia is often under estimated and, if given in appropriately, it can be lethal[15]. Patients must receive this therapy in an appropriate, safe and comfortable way. This depends on a sound understanding of why oxygen is being delivered, the methods of oxygen delivery and the nursing needs to the patient receiving it.

Although oxygen therapy is the most common therapy used for infants, inappropriate control of administered oxygen could lead to irrevocable damage to many of the newborns, particularly preterm infants[16]. The commonest and most extensively studied complication is retinopathy of prematurity which can lead to permanent damage to retina and blindness[17].

Other complicating factors in achieving the goals of neonatal oxygen therapy include patient size, tolerance of delivery device, and variability in the use of delivery devices, which suggest that clinicians lack adequate knowledge in the use of oxygen delivery equipment, and the lack of training in the practical aspects of neonatal oxygenation and equipment used to monitor the effects of oxygen therapy[10]

1.3 Statement of the problem

There are significant gaps regarding oxygen therapy despite their frequent use. Maximum percent oxygen delivery and flow rates are particularly poor, with potential negative impact on patient care including delivering too little oxygen in emergencies with BVM and facemasks and head boxes leading to CO2 retention[11]

Based on theoretical gaps and on the fact that there is, on my knowledge, no research related to oxygen therapy or related knowledge and practice of Pediatric residents for oxygen administration in pediatric patients in our country, the idea comes out to conduct the research related to the interest to this topic coupled with my own observation.

Oxygen is thought to affect lung tissue. High concentration of oxygen could bring changes to the lung that causes oxygen toxicity. This high concentration of oxygen reduces the production of surfactant which in turn results in the collapse of alveoli. The subsequent collapse of alveoli diminishes the exchange of gas[18]. The physician should monitor oxygen therapy and reduce supplementary oxygen as soon as possible to prevent the risk of such occurrence.

The last not least practical concern is the procedure were some humidification bottles for Oxygen the critical ill patients that receive oxygen using high flow system in TASH emergency unit are empty while insurance of humidification attached on device and add water vapor to inspired air is required because O2 is a dry gas that dehydrates respiratory mucous membrane. Apart from this practice, there were no protocols to guide oxygen therapy. Therefore, residents have used prior knowledge to administer oxygen.

Oxygen can easily dehydrate exposed membranes in the upper respiratory tract unless patients are orally rehydrated and/or mouth care is given and humidification which can mobilize secretions and enhance patient comfort [19]

1.4 Significance of the study

Oxygen therapy is a very vital medical treatment that could be prescribed to the patients in different critical conditions. Failure to administer oxygen therapy correctly places the patients at risk of many serious health problems as hypoxemia, respiratory dysfunction and death [2]Thus ensuring that oxygen therapy is administered in a correct and safe way as well in the correct time is fundamental to patients' care.

This study is intended to identify the depth of knowledge and practices gap among Residents on oxygen therapy and its complications at pediatrics department of Tikur Anbessa Specialized Hospital and St. Paul hospital millennium medical college

CHAPTER TWO: LITERATURE REVIEW

2.1 Oxygen dimension overview

Oxygen is not something new in our life, the presence of air is vital for human being survival. It has been documented in the ancient Greek as well as in Vedic Hindu literature more than 2000 years ago, known as an atmospheric gas necessary for survival of all living things; denoted by letter O2. [20]

It was only in the 18th century that gas was isolated by Joseph Priestley and its significance in respiratory physiology was described by Antoine Lavoisier [21,22]. The problems of oxygen deficiency as well as the need and indications for oxygen therapy were subsequently recognized. Soon, oxygen came to be known as a cure all' medicine used for conditions varying from cholera, arthritis, anemia and syphilis to glaucoma, epilepsy, diabetes and cancers. It was around second decade of the twentieth century and later that the oxygen therapy was adopted for indications based on firm scientific foundations[23]

Oxygen therapy is defined as oxygen given at concentrations greater than that found in the surrounding air. It is used as a treatment for respiratory failure (an inability of the lungs and respiratory apparatus to ensure adequate systemic oxygenation and/or carbon dioxide excretion).

This is further classified by whether there is a failure of oxygenation (a low partial pressure of oxygen [PaO2]) with a normal partial pressure of carbon dioxide (PaCO2, "type 1" respiratory failure), or whether the PaCO2 is high ("type 2," or hypercapnic, respiratory failure).

Any patient with suspected or known tissue hypoxia in emergency department should be given oxygen therapy. Patients in cardiac and /or respiratory arrest need to be managed according to Basic and Advanced Life Support guidelines by the attending doctor, nurse or midwife. Patients who are already started on acute oxygen therapy should be monitored carefully and regularly. Initial investigations like ABG, Hgb or Hct and CXR should be done. Monitoring of PR, BP, RR, level of consciousness and pulse oximetry are mandatory.[24 25]

After stabilizing the emergency situations oxygen therapy must be prescribed by a doctor or the appropriately authorized nurse. The prescription should include indications, target oxygen saturation, oxygen delivery device, range of oxygen flow or percentage of inspired oxygen and when oxygen is to be applied. The prescription should also be signed and dated.[26]

Earlier studies had evaluated the use of oxygen at hospitals in other countries. In the study conducted in 2006 by Ganeshan et al[27], knowledge of 53 nurses and 40 doctors that worked in intensive care unit of the General Hospital in UK and were active in oxygen prescription, was evaluated. 25% of the physicians and 50% of the nurses could not prescribe the right dose and method of oxygen therapy in cardio respiratory arrest cases.

They concluded that doctors and nurses did not have sufficient knowledge and understanding of oxygen therapy. In a similar study, Brokalaki et al. assessed the knowledge of oxygen therapy in seven hospitals in a major city of Greece, in 2004 [12] the findings showed that the familiarity level of participants with some aspects of O2 therapy such as its indications, necessary measurements and monitoring during therapy, and identifying delivery devices was on moderate level (<80%).

A previous study directly described intensive care clinician's attitudes to the introduction of COT for mechanically ventilated adult patients. In 2013, Eastwood et al., in their survey questionnaire of 90 intensive care clinicians in an Australian ICU, identified considerable consistency in the attitudes and stated practices in relation to COT[28]. The key findings of this Australian study were that clinicians were strongly concerned about oxygen related lung injury and reported that COT was easy to perform, and that further research should be conducted to show no harm was being caused as a result of COT.

Regarding oxygen dispensing method, in the research done by Elmak Nimir university hospital, the result showed (58%) based on doctor order selection of appropriate oxygen delivery device(20%) of nurses know based on pao2, 10% based on guideline , and 12% patient condition[29]. At TASH, residents only use face mask as high flow systems and I am wondering whether pediatric residents know how important it is to choose different deliveries specific and constant percent of oxygen depending of patient's breathing. The reliable proof suggested that choice of the oxygen supply device, patient; physician and nurse and contextual characteristics impact individually and in combination on the actual nurses manage oxygen therapy [30]

A study done on nurses working in emergency department at Debre Tabor General hospital in South Gondar showed Only 63 (60%) were aware that SOT should be administered to treat and prevent hypoxia, while 27 (25.7%) nurses were aware that SOT is contraindicated for untreated pneumothorax. Regarding normal oxygen saturation, 54 (51.4%) of them answered correctly. Almost half of the respondents (55, 52.2%) were aware that a non-rebreathing oxygen face mask with a reservoir bag is used to deliver a higher oxygen concentration than nasal prong. In this study, about 52% of the nurses had good knowledge whereas 48% of nurses had poor knowledge of oxygen therapy[9]

Based on the observed practice of supplemental oxygen administration, only 33% of the nurses had good practice and the majority (67%) of nurses had poor practice of supplemental oxygen administration. Only 21.9% and 27.9% of the nurses assessed oxygen saturation and vital signs during supplemental oxygen administration, respectively[9]

Table 1: Administering the oxygen therapy [4]

ACTION	RATIONALE
1. Ensure patency of airway .	To promote effective oxygenation
2. The type of delivery system used will depend on the needs and comfort of the patient. It is the nurse's role to assess the patient and use the prescribed system.	To provide accurate oxygen delivery to the patient. Most stable patients prefer nasal cannulae to masks
3. Ensure oxygen is prescribed on prescription chart. In some situation protocol may be in place to allow designated nurses to administer oxygen. In these cases the doctor must review the patient's condition within the stated time and prescribe oxygen accordingly.	To ensure a complete record is maintained and expedite patient treatment. The exception to this action would be during an emergency situation where the resuscitation guideline should be followed.
4. Ensure that the oxygen dose is clearly indicated. If nasal cannula or reservoir masks are being used check that the flow rate is clearly indicated	In accordance with the administration of Medicines policy.
5. Inform parent and or relative/carer of the combustibility of oxygen	Oxygen supports combustion therefore there is always a danger of fire when oxygen is being used.
6. Show and explain the oxygen delivery system to the parent or care taker.	To obtain consent and cooperation
7. Assemble the oxygen delivery system carefully as shown in.	To ensure oxygen is given as prescribed
8. Attach oxygen delivery system to oxygen source.	To ensure oxygen supply is ready

9. Attach oxygen delivery system to patient according to manufacturer's instructions.	For oxygen to be administered to patient
10. Turn on oxygen flow in accordance with prescription and manufacturers instruction.	To administer correct % of oxygen.
11. Ensure patient has either a drink or a mouthwash within reach.	To prevent drying or the oral mucosa.
12. Clean oxygen mask as required with general purpose detergent and dry thoroughly needed.	To minimize risk of infection (Single patient device)

Oxygen should be considered as a drug that needs to be prescribed to prevent or treat hypoxemia. A high percentage oxygen should be started in an emergency situations like cardiorespiratory arrest, peri-arrest conditions and critical illnesses such as sepsis without waiting for prescription. ABG analysis must be made within at least an hour in hypercapnic risk patients and up to every 10 minutes for critically ill and patients undergoing lung and thoracic surgery[31]. A written documentation is vital after giving high percentage oxygen.

A pulse oximetry monitoring may have limitations that include Peripheral vasoconstriction (hypothermia, cardiac failure, and fluid loss), Bright ambient light, patient motion, fitting sickle cell disease when in vaso-active crisis, nail varnish, some dyes, such as methylene blue. Such monitoring also affected in carbon monoxide poisoning, have misleadingly normal SpO2 and not affected by jaundice, anemia: can be slightly altered with dark skin.[32]

Pulse oximetry will not identify patients with Type II (high CO2) respiratory failure. An acceptable SpO2 will only inform of hypoxaemia (low oxygen tension in blood), not hypoxia (delivery of oxygen to tissues).

Normal oxygen saturations at rest; pre-term (36 weeks or less)87 -92%, term neonates; 88-92%, Term (>36 weeks) neonates and children; greater than 92%[33].

Oxygen therapy is indicated in acute hypoxemia (Eg. pneumonia, shock, asthma, heart failure), pneumothorax, abnormal Hgb (Eg. Acute GI blood loss or carbon monoxide poisoning).Carbon monoxide poisoning is the only condition to aim for a SpO2 over 98%.

The risks associated with hypoxaemia are well recognized, but there is growing evidence that prolonged hyperoxia should also be avoided, as high fractions of inspired oxygen may cause damage to the lungs and have other detrimental systemic effects.

Once the target saturation has been identified and prescribed, guidance regarding the most appropriate delivery system to reach and maintain the prescribed saturation is provided for those administering oxygen. Low-flow oxygen therapy devices are commonly used to provide supplemental oxygen to patients. Those who receive oxygen via a low-flow device typically have minimal respiratory distress and can maintain adequate ventilatory patterns Although there is little recent published work, researchers have evaluated the effectiveness of low-flow oxygen therapy devices in terms of satisfactory blood oxygen concentrations, usually measured by pulse oximetry (SpO2), or arterial blood gas analysis (ABG).

Some earlier researchers have described patterns of supplemental oxygen use or the impact of device factors, such as size, shape and fit on oxygen delivery and patient oxygenation; for instance, poor face mask fit can decrease the fraction of inspired oxygen (FiO2).The studies that have been conducted on oxygen delivery device have generally assessed device comfort or device preference. Device comfort has a direct impact on patient acceptance of oxygen therapy. An uncomfortable device may lead to increased interruptions to the therapy and increased episodes of hypoxaemia and this places the patient at risk of dyspnoea, altered or deteriorating mental state and respiratory arrest[34]

The commonly used devices are nasal cannula, simple face mask, partial rebreathing, nonrebreathing mask and air entrainment mask.

The nasal cannula is a comfortable delivery system for patients. It doesn't interfere with talking or eating and comes in sizes appropriate for all age groups. It can deliver FiO2 levels of 0.24 to 0.40 with flow rates up to 6 L/minute in children. We have to remember that the amount of oxygen delivery may vary according to inspiratory time and rate and depth of respiration. The rule of thumb is that for each liter of oxygen provided, the FiO2 should increase by approximately 4%[24].

The simple face mask is more cumbersome. Some older children complain of feeling claustrophobic with masks, and they must be removed before meals. For these reasons, it is used for short term oxygen delivery. Simple face masks can provide FiO2 levels between 0.4 and 0.6.Low flow rates can cause rebreathing and increased levels of CO2[24].

The partial rebreathing mask can provide oxygen supplementation between 60% and 70%, with variable stability. This bag requires a minimum flow of 10 L/minute to prevent bag collapse on inspiration and make sure that the bag is inflated in order to prevent suffocation hazard.

The no rebreathing mask can be used over the full range of FiO2. As with the partial rebreather, it poses a suffocation risk if not used properly. It delivers FIO2 of 0.7-0.95 through 6-15L/min[24].

The venturi mask is used with high flow oxygen to provide fixed FiO2 levels between 0.24 and 0.50. It delivers the most precise oxygen concentration and humidification is not required. It's recommended for use in unstable patients who need stable, low levels ofoxygen[3536]

The patient's oxygen saturation and oxygen delivery system should be recorded on the bedside. Patients should thus be monitored as specified by the standardized guideline for that reason all patients on oxygen therapy should have regular pulse oximetry measurements. The frequency of oximetry measurements will depend on the condition being treated and the stability of the patient. Critically ill patients should have their oxygen saturations monitored continuously and recorded every few minutes whereas patients with mild breathlessness due to a stable condition will need less frequent monitoring[4]

CHAPTER THREE: OBJECTIVES

3.1 General Objective

To assess knowledge and practice of residents about oxygen therapy and its complications in pediatrics department of Tikur Anbessa Specialized Hospital and St. Paul hospital millennium medical college.

3.2 Specific Objectives

1) To determine residents knowledge on oxygen therapy and its complications
2) To evaluate residents practice on oxygen therapy
3) To identify factors associated with poor interventional practices on oxygen therapy complications

CHAPTER FOUR: MATERIALS AND METHODS

4.1 Study Area and Period

The study was conducted at TASH and SPMMC located in the capital city of Ethiopia, Addis Ababa from June to August 2021 G.C.

4.2 Study Design

A cross-sectional descriptive study design was employed.

4.3 Study Population

All Pediatrics residents working in were used as a source population.

4.4 Sample Size Determination and Sampling Procedure

The total sample was determined by using single population formula by considering the following assumptions
95% confidence interval, Margin of error= 5%
P=50% since previous studies done on this topic on nurses used no sample size determination and used all nurses working in emergency department.

The following formula was used to calculate sample size.
$N= (Za/2)^2*p(1-p)/d^2$; then after substituting $(1.96)^2(0.5*0.5)/(0.05)^2$ =384
Therefore for the total population in this study is less than 10000, so using reduction formula
nf= n/1+n/N

The minimum sample size required for the study will be estimated to be 128 then by adding 10% non-response rate a total sample size of 141 was obtained.

4.5 Data collection Procedure

A self-administered and structured questionnaire was prepared. There were 3 assigned data collectors and they were given 1 day training about the study. The questionnaires were developed to meet the specific objectives of the study. English language was used in a structured questionnaire.
To measure the standard of the structured questionnaire a pre-test was conducted before the actual data collection.

4.6 Data Management and Analysis

Data was entered to the SPSS soft ware to be analyzed depending on the objectives of the study.

4.7 Inclusion Criteria

All Pediatric and Child Health who were working in the two hospitals were included in the study.

4.8 Exclusion Criteria

Residents who were having incomplete response to the questionnaire and also residents on annual, maternity and sick leave during the study period were excluded.

4.9 Ethical Issues

After a legal supporting letter from AAU College of Health Sciences, Department of Pediatrics and Child Health and SPMMC were obtained and permission from TASH was assured.

4.10 Quality Control Measures

A brief explanation was given for each resident prior to filling the questioner and close check up on each filled questioner were done on data collection.

4.10.1 Dependent Variables

Knowledge, Practice and attitude

4.10.2 Independent Variables

Sex, age
Marital status
Name of hospital
Total Residency service
Experience as GP
Extra training and lectures

4.11 Definition of Concepts

Critically ill patient: Patients in acute and critical care include those who are acute and whose current condition could be classified as critical, but also those with complex, chronic diagnoses (and their families) across the continuum of care.

Knowledge: Is facts, information and skills acquired through experience or education; the theoretical or practical understanding of a subject.

Oxygen: Oxygen is an unscented, monochrome and tasteless gas that constitutes one fifth of the earth's atmosphere and is essential to living organisms. Oxygen is also a medical intervention in the prevention and treatment of hypoxia.

Practice: Is actual application or use of an idea, belief, or method, as opposed to theories relating to it.

4.12 Operational Definitions

Good knowledge - Residents who scored the correct response or answer to knowledge questions above 80%

Good practice - Residents who scored the correct response or answer to practice questions above 80%.

Good attitude – residents who scored the correct response or answer to attitude questions above 80%.

Moderate knowledge – Residents who scored the correct response to knowledge questions 60-80%.

Moderate attitude –residents who scored the correct response or answer to attitude questions between 60-80%

Moderate practice - Residents who scored the correct response or answer to practice questions between 60-80%.

Poor knowledge - Residents who scored the correct response or answer to knowledge questions below 60%.

Poor attitude –residents who scored the correct response or answer to attitude questions below 60%.

Poor practice - Residents who scored the correct response or answer to practice questions below 60%

4.13 Data Management and Analysis

Data entry, cleaning & analysis was by SPSS V. 25. Descriptive statistics to present data in tables & graphs were used. Association between variables done via chi score with Pearson formula and P value of 0.05 was taken as a cutoff value for significant association.

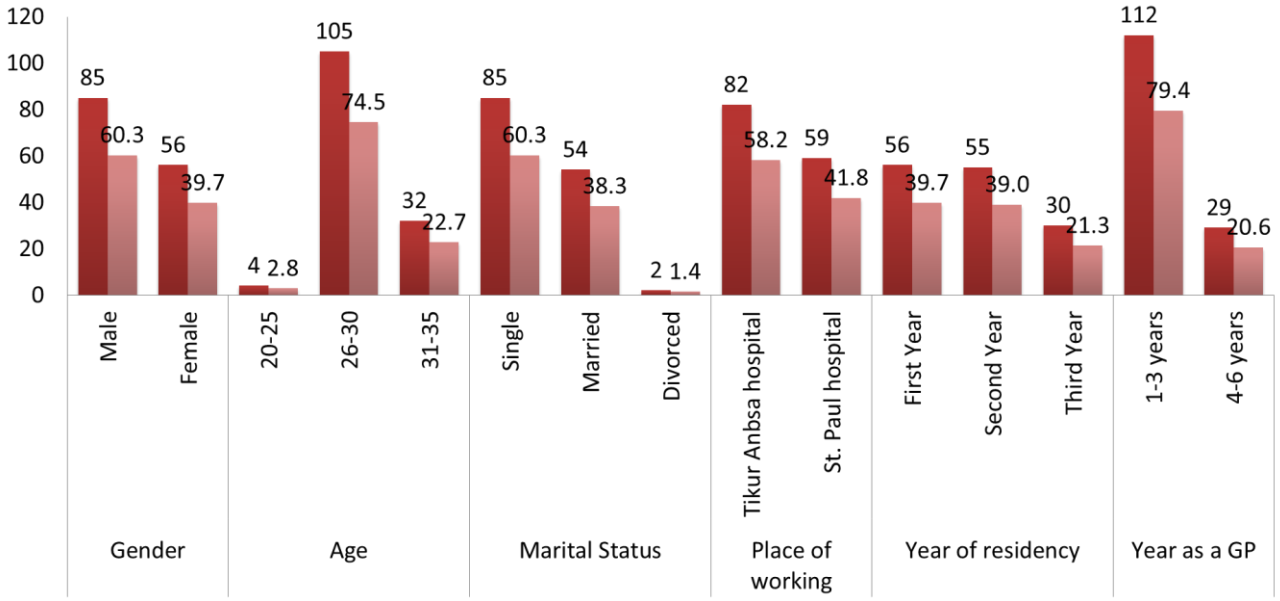
CHAPTER FIVE: RESULTS

In this chapter, we analyze the data with the purpose of answering the key questions defined in Chapter 1 section 1.6 Research objectives.

SOCIALDEMOGRAPHIC CHARACTERISTICS

One hundred forty one pediatric residents participated in the study with male participants constituting >60% and most residents were in the age category 26-30 years and >58% were from Tikur Anbessa hospital and 42% were from St. Paul hospital. Other demographic data is depicted in figure 1

Fig.1: Distribution of respondents by socio-demographic characteristics (N=141)



KNOWLWDGE OF PEDIATRIC RESIDENTS ON OXYGEN ADMINISTRATION AND COMPLICATIONS

As indicated in the table below only 35.4% give the right answer about oxygen indications, 49.6 % gave the correct answer about normal range of oxygen saturation in infants and young children and 93.6 % give the right answer about physiology of respiratory system

Table 5.1: Distribution of response on level of knowledge (N=141)

Knowledge questions	Responses	Frequency	Percent
Indication of Oxygen administration	Correct	91	64.6
	Incorrect	50	35.4
Proper use of oxygen	Correct	114	80.9
	Incorrect	27	19.1
The normal oxygen saturation at rest for infant and young children	correct	70	49.6
	Incorrect	71	50.4
Contraindication to oxygen administration	Correct	24	17
	Incorrect	117	83
Physiology of lung	Correct	132	93.6
	Incorrect	9	6.4
Respiratory system physiology	Correct	94	66.7
	Incorrect	47	33.3
Sign of oxygen toxicity	Correct	107	75.9
	Incorrect	34	24.1

ATTITUDE OF PEDIATRIC RESIDENTS ON OXYGEN ADMINISTRATION AND ITS COMPLICATIONS

As per the table below (3), the question requesting whether the oxygen is a kind of drug and should be prescribed by a medical officer 73.8 gave the correct answer, only 50.4% managed to provide the good answer about how persons with severe lung disease managed, only 12.8% managed to provide a good answer the in comparing continuous oxygen administration and intermittent oxygen therapy, 70.2% managed to provide a good answer on whether oral and nasal hygiene and normal saline drops as necessary should be done when giving oxygen therapy in adult critical care ill patient.

Table 5.2: Distribution of responses on attitude of pediatric residents on oxygen administration and its complication (N141)

Variable		Frequency	Percent
Oxygen is a drug that should be given only when ordered by a medical officer, or a registered nurse initiated order in an emergency situation	Strongly Agree	104	73.8
	Agree	27	19.1
	Neutral	2	1.4
	Disagree	4	2.8
	Strongly Disagree	3	2.1
Oral and nasal hygine and NS drops as necessary should be done when giving oxygen in children	Strongly Agree	99	70.2
	Agree	39	27.7
	Neutral	3	2.1
	Disagree	0	0
	Strongly Disagree	0	0
Continuous oxygen administration is more beneficial than intermittent oxygen therapy	Strongly Agree	18	12.8
	Agree	42	29.8
	Neutral	40	28.4
	Disagree	38	27
	Strongly Disagree	1	0.7
Humidification is the best practice to prevent dryness of mucus membrane of URT causing soreness	Strongly Agree	88	62.4
	Agree	49	34.8
	Neutral	4	2.8
	Disagree	0	0
	Strongly Disagree	0	0
Persons with severe lung disease need to be maintained at the prescribed oxygen saturation range	Strongly Agree	71	50.4
	Agree	57	40.4
	Neutral	6	4.3
	Disagree	3	2.1
	Strongly Disagree	4	2.8
Since oxygen is a drug, its adminstration to the patient is not safe and also its very dangerous	Strongly Agree	23	16.3
	Agree	40	28.4
	Neutral	28	19.9
	Disagree	32	22.7
	Strongly Disagree	18	12.8
A child on oxygen therapy indicates that the patient is critically ill	Strongly Agree	7	5
	Agree	55	39
	Neutral	31	22
	Disagree	39	27.7
	Strongly Disagree	8	5.7

PRACTICE OF PEDIATRIC RESIDENTS ON OXYGEN ADMINISTRATION AND ITS COMPLICATIONS

The table below (4) depicts findings towards the question related to the best practice on pulse oximetry and limitation for the questions stated in the table; figures show respectively that only 22.7% have best practice on pulse oximetry. Also 44% of respondents demonstrate a good practice on effects of collection of water in tube and about the best practice which helps oxygen to travel easily, 69.5% managed to prove their aptitude about good practice thereto. The respondents who are aware of providing appropriate oxygen concentration using nasal cannulae turn around 75.9%, and to the question related to provide appropriate oxygen concentration using facial mask, only 15.6 % have information on difficulty of tolerating and constantly struggling to remove the oxygen when use face mask for oxygen therapy

Table 5.3: Distribution of responses on practice of oxygen administration

Questions on oxygen practice	Responses	Frequency	Percent
Use of pulse oximetry for monitoring	Correct	32	22.7
	Incorrect	109	77.3
Factors causing obstruction of oxygen delivery tube	Correct	62	44
	Incorrect	79	56
Methods of optimizing fast delivery of oxygen	Correct	98	69.5
	Incorrect	43	30.5
Proper use of Nasal cannula	Correct	107	75.9
	Incorrect	34	24.1
Patient discomfort while using oxygen delivery devices	Correct	22	15.6
	Incorrect	119	84.4

ASSOCIATED FACTORS ON OXYGEN THERAPY

Regarding attendance of training courses, around 78% of the respondents have never attended any short or long-course training about oxygen administration, and only 14.9% of respondents are aware that there is a guideline in the facility they are working. Around 70% of residents reported that there is shortage of oxygen supply and 85% of participant agrees on effect of work load on oxygen therapy.

Table 5.4: Distribution of responses on factors on oxygen administration (N=141)

Variable		Frequency	Percent
Have you trained on oxygen therapy/administration?	Yes No	32 109	22 78
Is there a guideline of oxygen therapy in the currently working ER?	Yes No I don't know	21 63 57	14.9 44.7 40.4
Do you know that using too little oxygen in emergency room may contribute to carbon dioxide retention?	Yes No	62 79	44 56
Is there adequate supply of oxygen and delivery systems in ER?	Yes No	43 98	30.5 69.5
Do you think work load/ burden affects oxygen therapy in ER?	Yes No	120 21	85 15

Regarding attendance of training courses, around 78% of the respondents have never attended any short or long-course training about oxygen administration, and only 14.9% of respondents are aware that there is a guideline in the facility they are working.

Fig 2. Respondents answer to questions on prior oxygen therapy training

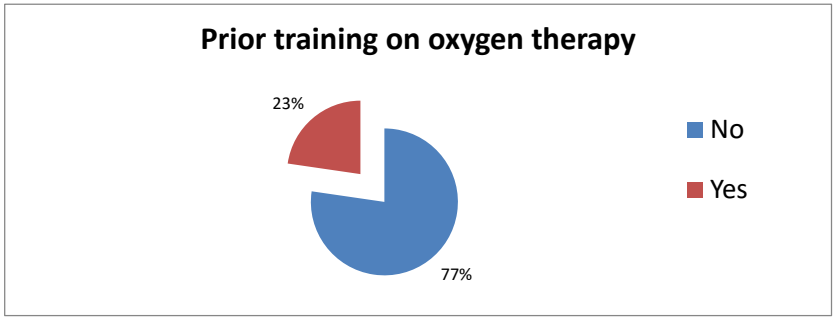
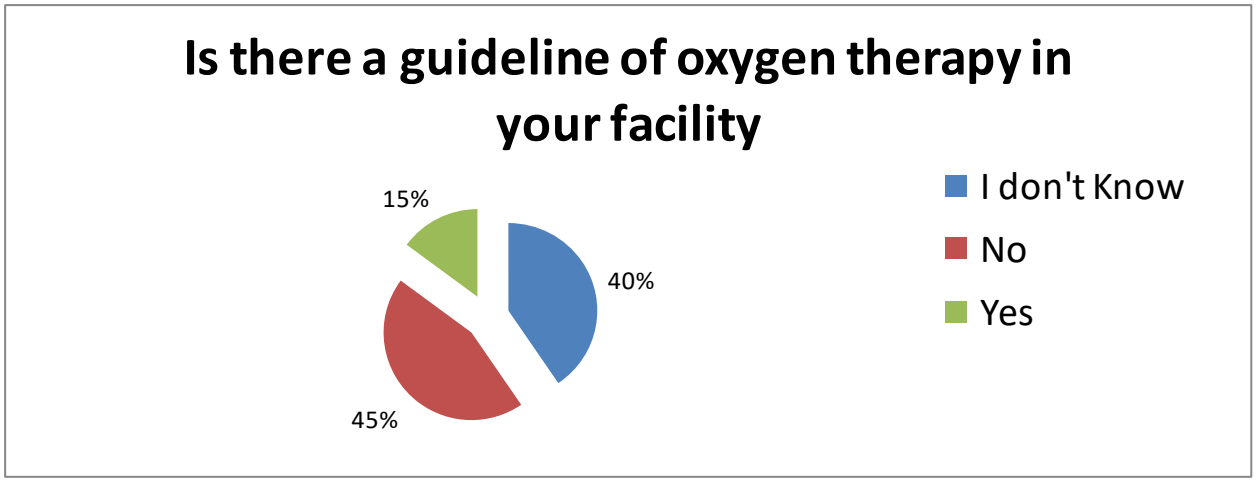


Fig 3. Respondents answer to questions on availability of oxygen guideline



BLOOMS CUT OFF POINTS

The result on table below of this study shows that the majority of residents had poor or moderate knowledge about oxygen administration and the level of knowledge of the participants scored low levels of knowledge turns around 13.5%, 25 respondents, representing 17.7% of the population documented the high level of knowledge while standard deviation (SD) stands for 2.36.

Fig. 4 Categorization of participants' knowledge, attitude and practice, toward oxygen administration at TASH and SPMMC according to bloom's cut off points (N=141)

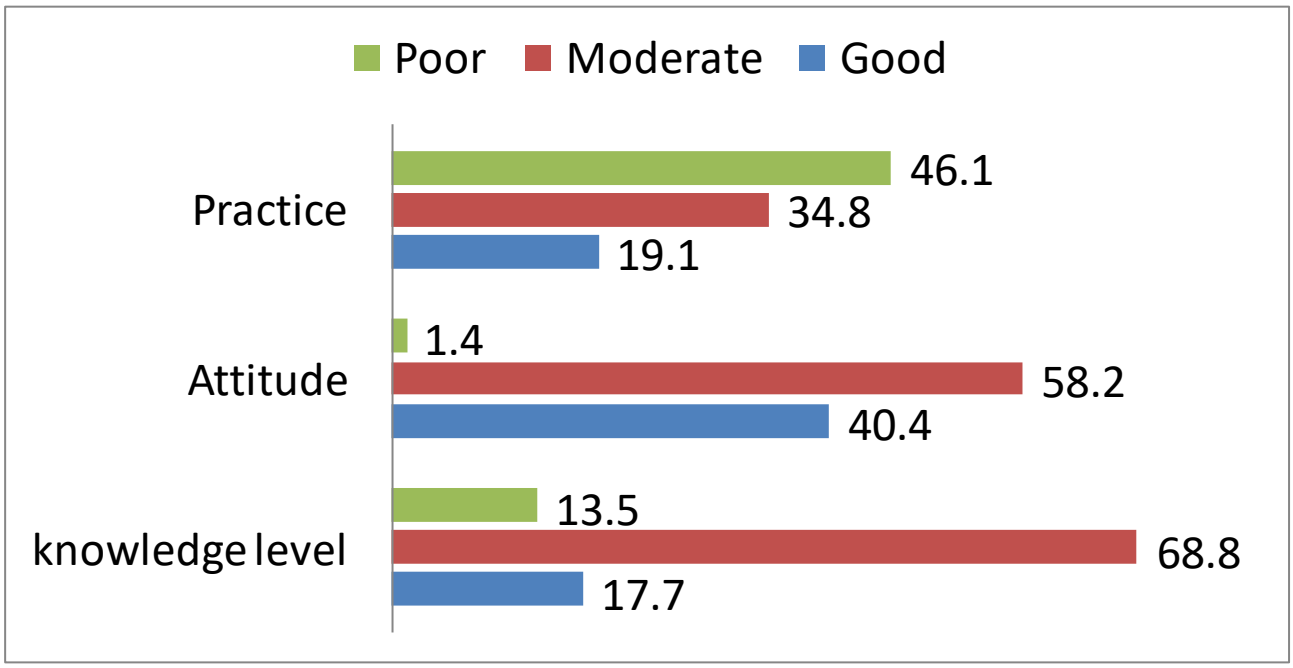


Table 5.5: Association between socio demographic characteristics and levels of knowledge

The table below (8) shows that there is significant relationship between experience as a GP and whether training on oxygen therapy is there or not with P values of 0.02 and 0.041 respectively.

While place of hospital currently working and year of residency shows no significant relationship.

variable	Knowledge level			Total	P value
	Good Knowledge	Moderate knowledge	Poor Knowledge		
Age					
20-25	0	3	1	4	0.28
26-30	16	77	12	105	
31-35	6	17	6	32	
Place of Working					
TASH	10	62	10	82	0.2
SPMMC	15	35	9	59	
Year of residency					
1st year	8	39	9	56	0.841
2nd year	11	38	6	55	
3rd year	6	20	4	30	
Experience as a GP					
1-3 Years	16	83	13	112	0.026
4-6 Years	9	14	6	29	
Training on Oxygen therapy					
Yes	5	24	3	32	0.041
No	20	73	16	109	

Table 5.6: Association between socio demographic characteristics and levels of practices

The table below (8) shows that there is significant relationship between the year of residency , year of experience as a GP and previous training on oxygen therapy and residents practices during administration of oxygen with p value= 0.03, 0.026 and 0.0331. Age and place of hospital don't show significant relationship.

Variable	Practice level			Total	P value
	Good Practice	Moderate Practice	Poor Practice		
Age					
20-25	0	2	1	4	0.62
26-30	20	33	52	105	
31-35	6	14	12	32	
Place of Working					
TASH	12	30	40	82	0.08
SPMMC	15	19	25	59	
Year of residency					
1st year	11	17	28	56	0.03
2nd year	6	26	23	55	
3rd year	10	6	14	30	
Experience as a GP					
1-3 Years	16	83	13	112	0.026
4-6 Years	9	14	6	29	
Training on Oxygen therapy					
Yes					
No	5	12	15	32	0.0331
	22	37	50	109	

CHAPTER SIX: DISCUSSION

INTRODUCTION

The aim of this study was to assess knowledge, attitude and practice of residents regarding oxygen therapy and its complications and the perspectives of participants on clinical oxygen therapy, the indication and contraindication of oxygen therapy, physiology of respiratory system related to clinical oxygen therapy and patient monitoring.

It aims also to look for perspectives on challenges of oxygen therapy such as knowledge and related gaps, availability of protocols, availability of delivery device, work- load, and other oxygen supply challenges. The perspectives of pediatric residents on clinical oxygen therapy towards initiation of therapy, patient assessment and oxygen monitoring were the key factors surrounding this study.

The participants were made up of 141 pediatrics residents whose 82 are allocated at TASH and 52 at St. Paul hospital. The socio demographic trends show that the majority of the respondents about 85% are males and the majority of the participants are in the age category 26-30 years which constitutes 75%. First and second year residents are the majority of participants with comparable percent i.e. 39% each as they constitutes the largest number of pediatric residents, senior residents are around 21% of the participants. Around 80% of respondents have a working experience of 1-3 years as a general practitioner.

KNOWLWDGE OF PEDIATRIC RESIDENTS ON OXYGEN ADMINISTRATION

Assessment of pediatric residents' knowledge regarding oxygen therapy was mainly focused on indications and contraindication of oxygen therapy, normal oxygen saturation of infants and young children and basic physiology of respiratory system. The guidelines from WHO, Western Australian Hospitals35 British Thoracic Society16 and Allied Health provincial multi-disciplinary group stated that physicians and nurses should have the knowledge of oxygen therapy indications, normal oxygen saturation at different ages including normal respiration rates.

To the knowledge of researcher, this kind of study was the first to be conducted on pediatric residents in the country. As documented through the different analysis performed, the majority of pediatric residents had poor to moderate knowledge about oxygen administration. These facts that can contribute more to the observed weakness it is probably the level of education and lack of basic practical knowledge; that could be gained from different trainings, workshops, and exposures to scientific journals, etc.. The percentage of participants scoring on the low level of knowledge turns around 13.5% and only 25 participants, standing for 17.7% with standard deviation of 2.3 score the high level of knowledge.

In this study 17.7% of residents have good knowledge of oxygen therapy and its complication. This result is inconsistent to studies done on doctors and nurses in south west Nigeria in 2020 which shows 49.5 % had good knowledge, This study goes hand in hand to a study done in Rwanda in 2017 showed only 3.1 % of ICU health care workers have good knowledge.

According to the table the table 3 the study reported lack of knowledge on oxygen therapy such as the indication of oxygen therapy and normal oxygen saturation of infants and young children. The results showed that 64.6% of respondents are aware of indication of oxygen therapy, and about the knowledge of normal oxygen saturation at rest approximately only a half of respondents 49.6% provided the correct answer. The reported low levels may be linked with the lack of training; as showed in table 5 that majority standing for 78 % of the respondents had not training course. This implies the responsibility of hospital management for not providing the staff skills development program while updating the knowledge of the pediatric residents is a paramount factor in professional performing.

ATTITUDE OF PEDIATRIC RESIDENTS ON OXYGEN ADMINISTRATION

According to the table 6, poor attitude or negative attitude score for oxygen therapy was found to be 1.4 %. Even if majority of residents have positive attitude for oxygen therapy much more awareness and related updates constitute a paramount factor to professional performance success. This finding contributes to the guideline for oxygen therapy where pediatric residents should have encouraging attitude to the needs of mouth hygiene in children and use of humidification devices when administering oxygen therapy 15

Oxygen as a drug is agreed by 73% residents and this implies proper indication and dose with order is need for its administration which later results in improvement of patient care minimization of complication and unnecessary usage. Its comparable a study in Rwanda which shows 54% agree on using oxygen as a drug

PRACTICE OF PEDIATRIC RESIDENTS ON OXYGEN ADMINISTRATION

Assessment of good practice on oxygen therapy, the results show that 27 out of 141 respondents, standing for 19.1 % have good practice of oxygen usage, while 46.1 % present poor practice. This is comparable to the Nigerian study done by Adeniyi et al which shows 48.2% of doctors has poor practice.37 The standard guidelines for oxygen administration and monitoring, Blake 15 explained that physicians and 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.37

Significant relation between residents' knowledge about the indication at oxygen and the problem associated with face mask was reported at 15.6% of the respondents had information on difficulty of tolerating and constantly struggling to remove the oxygen when they use face mask for oxygen therapy; about providing appropriate oxygen concentration, 75.9% of the respondents had knowledge about using nasal cannulae, this might due to hospital management policy for not accommodating staff capacity building program.

ASSOCIATED FACTORS ON OXYGEN ADMINISTRATION

Associated factors on oxygen therapy were evaluated whether these points was affecting pediatric residents knowledge, attitude and practice on oxygen therapy. In this study among respondents 109 out of 141 representing 78% had never attends any continuing education courses about oxygen administration and only 32 out of 141 representing 22% of

respondents managed to get related training and it is commonly known that a lack of training on oxygen therapy affected residents' knowledge, attitude and practice.

Participants were also asked about the availability of oxygen therapy guideline and 14% of the agreed and 44.7% disagree about availability of guidelines and 40.4% have no information. In this study as the majority of residents evidenced the lack of oxygen therapy guideline this can be the startup of is gaps noted on knowledge and practice on oxygen therapy. The guidelines cover the use of oxygen in critically ill and hypoxaemic children and adults and those who are at risk of hypoxemia. 11

Regarding information on availability of adequate supply oxygen: 43 of 141 representing 30.5 % thinks there is inadequate supply of oxygen at pediatric wards and emergency.

CHAPITER SEVEN: CONCLUSIONS

We concluded that there is gap in knowledge and practice of oxygen therapy among pediatric residents in the two top hospitals in the capital. Hence, extensive educational and training programs about oxygen therapy are needed to raise awareness among health-care professionals. Furthermore, regular practical training sessions should be organized for health workers to update their knowledge on the latest guidelines on oxygen therapy.

Recommendation

The available oxygen therapy guideline should be made available for residents. Workshops and training on SOT for pediatric residents and nurses should be conducted regularly. Professional person like pediatric critical care specialists and fellows could promote development and transfer of knowledge, improve physician's practices and enhance professional capacities through reviewing some of their objectives. Wallpapers, Posters should be posted at emergency departments and ward with doses, duration, proper technique and signs of complication of SOT. Seminar and team discussion sessions should be strengthened and should be regularly updated.

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APPENDX

Consent form

This study is proposed to assess Pediatric and Child Health Residents' Knowledge, attitude and practice towards oxygen therapy and its complications.

In order to attain the goal effectively, we are asking for your generous help. Here is a format for you to complete. There is no need to put your name on the format. No individual response will be reported. It is your full right to participate or refuse in the study. However, your honest participation will have a great contribution.
So please take a few minutes to answer these questions. If there is anything that requires clarification please do not hesitate to ask the facilitator.

Do you wish to participate in the study?

Yes, I want to participate in the study (please go to the next page)
No, I do not want to participate.

Questionnaire

ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH SCIENCES

DEPARTMENT OF PEDIATRICS & CHILD HEALTH

Self Administered Questionnaire for Pediatric residents

This is a self administered research questionnaire designed for pediatric residents who are currently working in Tikur Anbessa Specialized Hospital and Saint Paul's Hospital to assess residents knowledge, attitude and practice on oxygen therapy and its complications.

Your active participation in this study has its own significant importance to identify residents' knowledge, attitude and practice gaps on oxygen therapy and to develop possible solutions and recommendations.

Each question has one answer and choose your own response. To complete this questionnaire on average it takes about 20 minutes.

DO NOT WRITE YOUR NAME.

You have a right to discontinue responding at any point. Therefore I request your participation very kindly and thank you in advance

Call to **+2519-17 - 20- 53 - 93** or use email **kalkidanbeza1@gmail.com** for any doubts.

Identification

1. Sex

A. Female B. Male

2. Age

A. 20 – 25years

B. 26 – 30 years

C. 31 – 35 years

D. 36 – 40years

E. 41 – 45 years

F. 46 – 50 years

G. >= 51 year

3. Marital Status

A. Single

B. Married

C. Divorced

D. Widowed

4. Name of the hospital currently working

A. Tikur Anbessa Specialized Hospital

B. St. Paul's Specialized Hospital

5. Year of residency

A. 1st year B. 2nd year C. 3rd year

6. Total duration of service a general practitioner

A. 1 - 3 years

B. 4 - 6 years

C. 7 -10 years

D. > 10 years

QUESTIONNAIRES

Knowledge questionnaires on oxygen therapy

1. Oxygen is administered to

A. Treat hypoxia
B. Prevent hypoxia
C. A and B
D. All

2. Oxygen is not administered to

A. Carbon monoxide poisoning with oxygen saturation 99%
B. Critical illness such as sepsis
C. Cardiopulmonary arrest
D. All
E. None

3. The normal oxygen saturation at rest for infant and young children is

B. 96 – 98%
D. 90%
C. 86 – 88%
E. None

4. Oxygen therapy is not indicated

A. Acute hypoxemia in pneumonia, shock, asthma, heart failure and pulmonary embolus
B. Pneumothorax
C. Carbon monoxide poisoning
D. Post thoracic and abdominal surgery
E. None

5. Movement of air into and out of the lungs is

A. Inhalation
B. Ventilation
C. Exhalation
D. Inspiration
E. Expiration

6. The passive process in respiratory physiology is

A. Inhalation
B. Inspiration
C. Expiration
D. Ventilation
E. All

7. Which one of the following is a sign of oxygen toxicity?

A. Blurred vision
B. Dehydration
C. Chest pain
D. Muscle twitching
E. All

Attitudinal questionnaires on oxygen therapy

Answer questions from 8 to 14 by writing "X" according to your response

No	Description	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
8	Oxygen is a drug that should be given only when ordered by a physician, or a registered nurse initiated order in an emergency situation.					
9	Oral and nasal hygiene and normal saline drops as necessary should be done when giving oxygen therapy in children.					
10	Continuous oxygen administration is more beneficial than intermittent oxygen therapy.					
11	Humidification is the best practice to prevent dryness of mucus membrane of upper respiratory tract causing soreness.					
12	Persons with severe lung disease need to be maintained at the prescribed oxygen saturation range.					
13	Since oxygen is a drug its administration to the patient is not safe and also it is very dangerous.					
14	A child on oxygen therapy indicates that the patient is critically ill.					

Practical questionnaires oxygen therapy

15. Pulse oximetry monitoring is not affected by

A. Patient motion or fitting

B. Carbon-monoxide poisoning

C. Jaundice and anemia

D. Nail polish

E. All

16.Collection of water in the tubing during oxygen administration

A. Can partially or completely occlude the flow of oxygen

B. Empty the collected water in the tubing as needed

C. Facilitates flow of oxygen and promote patient comfort

D. A and B

E. B and C

17.Oxygen cannot travel easily through wet secretions, so optimize their removal by

A. Sitting the patient up, or out in a chair
B. Ensuring mouth is kept moist
C. Providing tissues and/or a sputum cup
D. Regularly assessing if a patient can take a deep breath and cough

E. All

18.. Nasal cannulae

A. Are suitable for patients with nasal polyps and nasal edema

B. May cause headaches or dry mucous membranes if flow exceeds 4L/min

C. Should not be used for those needing over 40% (> 4L/min)

D. A and B

E. B and C

19.Your patient may have difficulty of tolerating and constantly struggling to remove the oxygen delivery device. Most probably this device is

A. Nasal cannulae

B. Oxygen mask

C. Nasal catheter

D. Nasal prongs

E. All

Associated factors questionnaires on oxygen therapy

20. Have you trained on oxygen therapy/administration?

A. Yes B. No

21.Is there a guideline of oxygen therapy in the currently working emergency department?

A. Yes B. No C. I do not know

22. Do you know that using too little oxygen in emergency room may contribute to carbon dioxide retention?

A. Yes B. No

23. Is there adequate supply of oxygen and delivery systems in emergency department?

A. Yes B. No

24. Do you think work load/ burden affects oxygen therapy in emergency department?

A. Yes B. No