Addis Ababa University

College of Health Sciences

School of Medicine

Department of Emergency and Critical Care medicine

A cross-sectional study on knowledge and associated factors towards oxygen therapy among residents and nurses working at the adult emergency department of Tikur Anbessa Specialized Hospital Ethiopia, 2025

Investigator: Dr. Hulugrigesh Derib (MD, ECCM PGY-3)

A research thesis to be submitted to the Department of Emergency and Critical Care Medicine, College of Health Sciences presented in partial fulfillment of the requirements for a specialty certificate on emergency and critical care medicine.

December, 2025

Addis Ababa Ethiopia

Addis Ababa University

College of Health Sciences

School of Medicine

Department of Emergency and Critical Care medicine

Knowledge and associated factors towards oxygen therapy among residents and nurses working at the adult emergency department of Tikur Anbessa Specialized Hospital Ethiopia, 2025

A cross-sectional study on knowledge and associated factors towards oxygen therapy among residents and nurses working at the adult emergency department of Tikur Anbessa Specialized Hospital Ethiopia, 2025

Investigator: Dr. Hulugrigesh Derib (MD, ECCM PGY-3)

Advisers: Dr. Bitania Debalkew (MD, Assistant professor of ECCM)

Dr. Ayenew Amare (MD, Assistant professor of ECCM)

Dec 2025

Addis Ababa Ethiopia

Full title of research	Knowledge and associated factors towards oxygen therapy among residents and nurses working at the adult emergency department of Tikur Anbessa Specialized Hospital Ethiopia, 2025
Study area	Tikur Anbessa Specialized hospital, Addis Ababa, Ethiopia
Total cost of the project	28,600
Source(s) of funding	AAU, CHS
Duration of project	6 months
Name of investigator	Dr. Hulugrigesh Derib (MD, ECCM PGY-3)
Address of investigator	Cell phone:0921399476 Email:huluderib@gmail.com
Name of advisors	Dr. Bitania Debalkew (MD, Assistant professor of ECCM) Dr. Ayenew Amare (MD, Assistant professor of ECCM)

Acknowledgements

First and foremost, I would like to thank to the management and staff of Tikur Anbessa Specialized Hospital, especially the Emergency and critical care medicine department, for their support and permission to carry out this study.

I would also like to thank my advisors Dr. Bitania Debalkew and Dr. Ayenew Amare for their continuous guidance, encouragement, and insightful feedback throughout the development of this thesis.

Abstract

Background: Oxygen therapy is a critical intervention in the management of hypoxemia. It is used to treat respiratory distress in emergency and critical care settings. Even-though its importance, inappropriate administration and a knowledge gap among healthcare providers may compromise patient outcomes.

Objective: To determine the level of knowledge and associated factors towards oxygen therapy among residents and nurses working in the adult emergency and critical care medicine department of Tikur Anbessa Specialized Hospital, Ethiopia, 2025.

Methodology: A cross-sectional study was conducted among 108 participants (57 nurses and 51 residents). Data were collected using a structured self-administered questionnaire assessing sociodemographic characteristics, knowledge of oxygen therapy and related factors. Data analysis was by using SPSS version 25. Descriptive statistics were computed, and logistic regression was used to identify factors associated with satisfactory knowledge.

Results*: Among 108 participants*, 55(50.9%) were male and 64(59.3%) were in the age range between 25-30 years. Among them, 57(52.8%) were nurses and 51(47.2%) were residents. Overall, 65(60.2 %) demonstrated satisfactory knowledge, while 43(39.8%) had unsatisfactory knowledge. Availability of oxygen therapy guidelines (AOR = 4.943, 95% CI: 1.567-15.591, p = 0.006), professional category (AOR = 3.646, 95% CI: 1.163-11.431, p = 0.027) and training on oxygen therapy (AOR=37.037, 95% CI: 10.163-134.976, p=0.001) were significantly associated with satisfactory knowledge.

Conclusion: The study demonstrated that most respondents had satisfactory knowledge of oxygen therapy. But significant gaps were found, especially regarding, need of humidification, FiO_2 levels and monitoring practices. Regular training, improved guideline accessibility and ensuring adequate oxygen supply are recommended to enhance safe and effective oxygen therapy.

Keywords: *Oxygen therapy, knowledge*

M

Table of Contents

Tables

Figures

Annex

Abbreviations

COPD --Chronic **O**bstructive **P**ulmonary **D**isease

ED-- Emergency **D**epartment

EMS-- Emergency **M**edical **S**ervices

EMTs --Emergency **M**edical **T**echnicians

ETB --EThiopian **B**irr

GP -- General **P**ractitioner

IRB -- Institutional **R**eview **B**oard

KAP -- Knowledge, **A**ttitude and **P**ractice

LMICs -- Low- and Middle-Income **C**ountries

SPSS --Statistical **P**ackage for the **S**ocial **S**ciences

SRN --Serial **N**umbers

TASH --Tikur **A**nbessa **S**pecialization **H**ospital

WHO --World **H**ealth **O**rganization

Y-12 HMC --Yikatit -12 **H**ospital **M**edical **C**ollege

1. Introduction

1.1 Background

Oxygen therapy is a fundamental intervention in emergency medicine. It is used to treat hypoxemia and prevent tissue hypoxia in critically ill patients. It plays a vital role in the management of various acute and chronic respiratory and cardiovascular conditions, such as chronic obstructive pulmonary disease (COPD), asthma exacerbation, pneumonia, shock, cardiac arrest, and trauma.(1) Timely and appropriate use of oxygen can significantly improve patient outcomes and reduce mortality in emergency departments(ED). However, despite its life-saving potential, the misuse or overuse of oxygen can result in harmful effects, including oxygen toxicity, hypercapnia and worsening of preexisting conditions. The proper administration of oxygen requires clinical reasoning, adequate knowledge and adherence to evidence-based protocols. (2)

In low- and middle-income countries (LMICs) such as Ethiopia, challenges in oxygen therapy are compounded by limited resources, equipment shortages, and inconsistent clinical practices. Emergency departments are often overwhelmed by high patient volumes and constrained by infrastructure and staffing limitations. Within such environments, the knowledge of front line healthcare workers particularly physicians (residents) and nurses are pivotal in ensuring the safe and effective use of oxygen therapy.(3)

International studies showed varying levels of understanding among healthcare providers regarding oxygen therapy. In some cases, healthcare workers lack clarity on indications, delivery methods, flow rates and monitoring parameters. In emergency settings where decisions must be made quickly, knowledge and clinical experience significantly influence outcomes. Therefore, assessing the Knowledge of residents who are the primary caregivers in the ED is essential for identifying educational needs and improving clinical practices.

Tikur Anbessa Speciality hospital (TASH) is the largest tertiary referral and teaching hospital in Addis Ababa, Ethiopia. It is also a busiest ED which handles a wide variety of critical cases daily and often requiring immediate oxygen therapy. However, there is little local research assessing adult emergency healthcare providers' knowledge regarding oxygen use. This study proposes to

evaluate the knowledge of residents and nurses in TASH's adult emergency department to identify competency gaps and guide tailored training, clinical guidelines and policy improvements ultimately enhancing patient safety, resource utilization and clinical outcomes.

1.2 Statement of the Problem

Oxygen therapy is a critical component of emergency care to treat life-threatening conditions such as respiratory distress, myocardial infarction, stroke and shock. Inappropriate use of oxygen can lead to serious complications, like oxygen toxicity, delayed diagnosis or worsening of underlying conditions. Despite its frequent use, studies conducted in various healthcare settings worldwide have shown considerable gaps in healthcare professionals' knowledge regarding its appropriate administration.

A 2024 systematic review and meta-analysis done at Ethiopia studies revealed that only about 52.13% of healthcare providers demonstrated good knowledge on oxygen therapy.

A cross-sectional study conducted in the emergency departments of four public hospitals in Addis -=Ababa, Ethiopia by Mohammed Kalifa et al. (2023), assessed the knowledge, attitude, and practice (KAP) of physicians and nurses regarding oxygen therapy. The study found that physicians had a satisfactory mean knowledge score of 72%, while nurses scored poorly with a mean of 35%..

A 2021 cross-sectional study assessed the knowledge, attitude, and practice of 141 paediatrics residents regarding oxygen therapy and its complications at Tikur Anbessa Specialized Hospital and St. Paul's Hospital Millennium Medical College in Addis Ababa showed low competency levels: only 17.7% had good knowledge.

However, there is limited evidence assessing the level of knowledge among the frontline providers' namely residents and nurses who are responsible for initiating and managing oxygen therapy at adult emergency department of TASH. The lack of such data presents a barrier to designing targeted intervention and training programs aimed at improving clinical outcomes and ensuring patient safety. Therefore, this study aims to assess the knowledge and associated factors towards oxygen therapy among residents and nurses in the ED of TASH.

1.3 Significance of the study

This thesis research studied current knowledge of residents and nurses towards oxygen therapy at TASH adult emergency and critical care department and pinpointing specific competency gaps. These observations guide the design of targeted training and continuing education. The results can initiate hospital leaders and policymakers in developing or updating protocols, guidelines and educational interventions to improve the delivery of oxygen therapy. This work aims to enhance patient safety, optimize clinical outcomes and ensure more efficient use of resources in emergency care.

2. Literature Review

Globally, studies showed significant gaps in healthcare professionals' knowledge and Practice regarding oxygen therapy. In Iraq, a study conducted at teaching hospitals in Al-Nasiriya City assessed both the knowledge and practices of nurses related to oxygen therapy, found poor understanding of hypoxemia recognition and oxygen device selection. The study concluded with a strong recommendation for regular training and the implementation of national protocols for oxygen use. (4)

A study conducted in Tehran assessed nurses' knowledge regarding oxygen therapy. The study found that while many nurses understood basic concepts such as the need for humidification, there were significant deficiencies in key areas including oxygen flow rate settings, appropriate mask selection and understanding patient-specific oxygen requirements. They emphasized the need for targeted educational interventions to bridge these knowledge gaps.(5)

A study conducted in Riyadh, Saudi Arabia, assessed the KAP of nurses, paramedics, emergency medical technicians (EMTs) and Emergency Medical Services (EMS) physicians working in emergency departments. It found that knowledge scores were moderate, indicating a need for improved training and adherence to guidelines. (6)

In Uganda, a qualitative study investigated healthcare providers' perceptions of barriers to oxygen therapy for pediatric patients, identified key obstacles, including equipment shortages, insufficient training and lack of standard treatment protocols. The study concluded that improving provider training and ensuring reliable oxygen supply infrastructure are essential for enhancing pediatric care outcomes. (7)

A study in Ondo State, Southwest Nigeria, assessed doctors' and nurses' knowledge and practice of oxygen therapy, found 49.50% of the respondents had a high level of knowledge of oxygen therapy. It recommended targeted education and national guideline implementation to address these gaps.(8)

In Sudan, a survey assessed both knowledge levels and perceived barriers to acute oxygen therapy among healthcare workers. The results were 9.4% of physicians and 8% of nurses demonstrating

good knowledge. Major barriers included inadequate training, absence of standardized protocols and misconceptions about oxygen toxicity.(9)

A study conducted in Kenya, examined nurses' knowledge of oxygen therapy and its implications for patient care, revealed widespread knowledge gaps, particularly in identifying hypoxia, adjusting oxygen flow rates and documenting therapy properly. The study concluded that improving education and protocol availability is critical to enhancing oxygen therapy practices.(10)

A 2024 systematic review and meta-analysis of 14 Ethiopian studies (2,960 participants) revealed that only about 52.13% of healthcare providers demonstrated good knowledge towards oxygen therapy. Oxygen therapy guidelines significantly boosted knowledge. These findings highlight the urgent need for structured training programs, policy implementation and consistent guideline availability across African health facilities. (11)

A multi-center cross-sectional study conducted in South Gondar zone hospitals, 2021: on Knowledge, attitude, and practice of health professionals for oxygen therapy, found that 54.6% of participants have a good level of knowledge towards oxygen therapy. Factors such as age, years of experience, training and access to guidelines were significantly associated with better knowledge. (12)

Another study at Wolaita Sodo University Comprehensive Teaching and Referral Hospital reported that 44.4% of nurses had good knowledge regarding oxygen therapy. The study emphasized the need for continuous education and the development of national oxygen therapy guidelines .(13)

A study in selected public hospitals in Mekelle, Tigray, examined nurses' KAP of oxygen therapy. About 58.9% had adequate knowledge. Key factors influencing Knowledge included access to guidelines, recent clinical use, department type and professional training. The study emphasized the need for on-going training, proper resources, and institutional support to enhance safe and effective oxygen therapy.(14)

A study conducted in 2022 at Y12 HMC assessed the KAP of nurses and midwives regarding oxygen therapy. The findings revealed that a slight majority of participants had good knowledge of oxygen therapy toward its use. (15)

A cross-sectional study conducted in the emergency departments of four public hospitals in Addis Ababa, Ethiopia by Mohammed Kalifa et al. (2023), assessed the knowledge, attitude, and practice (KAP) of physicians and nurses regarding oxygen therapy. The study found that physicians had a satisfactory mean knowledge score of 72%, while nurses scored poorly with a mean of 35%. Despite adequate knowledge and practice among physicians, their attitude remained sub-optimal, and nurses scored unsatisfactorily across all domains. Contributing factors included lack of training, absence of guidelines, inadequate oxygen supply, and high workload.(17)

A 2021 cross-sectional study assessed KAP of 141 pediatric residents regarding oxygen therapy and its complications at Tikur Anbessa Specialized Hospital and St. Paul Hospital Millennium Medical College in Addis Ababa. The results showed 17.7% had good knowledge. Years of residency and prior service as a general practitioner are associated with good knowledge. The study called for urgent,regular training and recommending the integration of oxygen therapy education into pediatric residency programs to improve clinical skills and patient care outcomes.(16)

3. Conceptual frame work

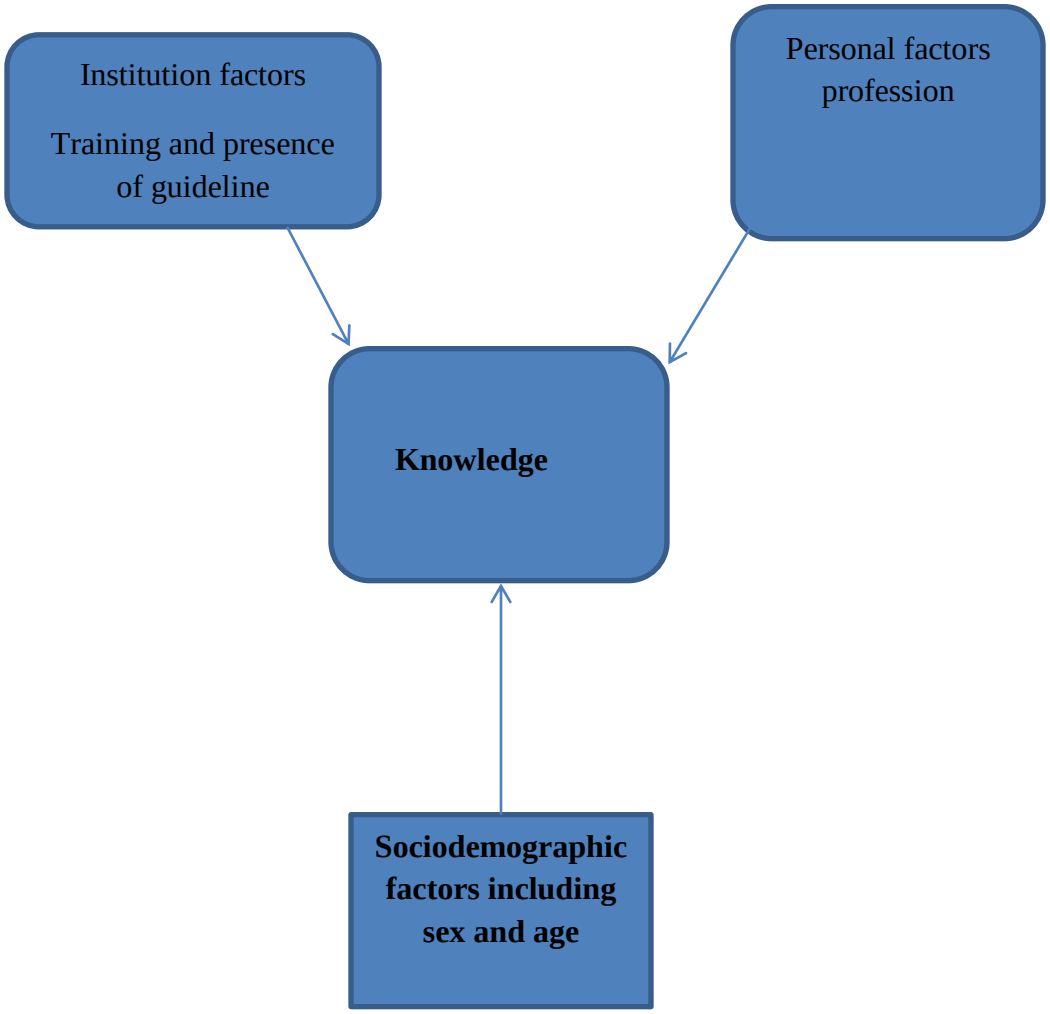

Figure 1: conceptual framework of factors affecting knowledge of residents towards oxygen therapy(11,12)

4. Objectives of the study

4.1 General Objective:

- ✓ To assess the level of knowledge and associated factors towards oxygen therapy among residents and nurses working at adult emergency department of TASH.

4.2 Specific objectives:

- ✓ To determine the level of knowledge towards oxygen therapy among residents and nurses working at the adult of ED TASH.
- ✓ To identify factors associated with knowledge towards oxygen therapy in these emergency departments.

5. Methodology

5.1 Study area and period

The study was conducted at the adult Emergency Department of TASH, which is located in Addis Ababa, the capital city of Ethiopia. TASH is the largest referral and teaching hospital in the country it serves as a national referral centre and provides specialized medical services, including emergency and critical care, to a large and diverse patient population. The emergency department operates 24 hours a day and is staffed by multidisciplinary teams including nurses, residents, specialists, and consultants from various departments. At TASH, there are around 40 cylinders deliver for both adult and paediatric emergency department per day. There are around 8 gauge and 8 concentrators. Oxygen is delivered at all zone of adult emergency, especially at red zone. Due to its high patient load and central role in training health professionals, TASH provides a suitable and representative setting for assessing the knowledge of healthcare workers especially residents and nurses regarding oxygen therapy.

The study was conducted over a **six -month period,** from **June to November, 2025**. This period includes time allocated for data collection, data entry, and preliminary analysis

5.2 Study design

Institutional based cross-sectional study design was used. It was implemented to explore the level of detailed information on the residents' and nurses' Knowledge and associated factors influencing their performance towards oxygen therapy in adult emergency department.

Additionally, the study was using a combination of descriptive statistics, to analyse the prevalence of satisfactory knowledge based on mean score and inferential statistics to identify any associations between demographic and professional characteristics, with Knowledge levels.

5.3 Population

5.3.1 Source population

The source of the study population was all residents and nurses working in the adult emergency department of TASH, Addis Ababa, Ethiopia. This includes residents and nurses who are directly involved in patient care and oxygen therapy administration in the adult emergency department.

5.3.2 Study population

The study was included residents and nurses working in the Tikur Anbessa Specialized Hospital during the study period who are involved in oxygen.

5.3.3 Study unit

The study unit was the individual residents and nurses working in the emergency department at TASH who meets the inclusion criteria. Each individual was assessed for their knowledge regarding oxygen therapy through structured questionnaires.

5.3.4 Sampling frame

The sampling frame was a list of all residents (including emergency and detaching residents) and staff records of nurses working in the emergency department of Tikur Anbessa Specialized Hospital. This list was obtained from hospital records, which provide a complete list of individuals working in the department during the study period. Each eligible resident and nurses were served as a sampling unit and was invited to participate in the study.

5.4 Eligibility criteria

5.4.1 Inclusion criteria

The study was included nurses and residents from various specialties (e.g., emergency, Internal Medicine, Surgery, Anaesthesia, and Family Medicine) residents who are working in TASH's adult emergency department during study period, directly involved in oxygen therapy.

5.4.2 Exclusion criteria

Individuals who are on annual leave and administrating nurses who are not involve in oxygen therapy.

5.5 Sample size determination and sampling technique

5.5.1 Sample size determination

The sample size for this study was calculated using the single population proportion formula, suitable for estimating proportions in cross-sectional studies. A 52% as a proportion of good knowledge about oxygen therapy, which was taken from previous study conducted at Ethiopia.

Formula:

$$n = \frac{Z^2 P(1-P)}{d^2}$$

Where: n =sample size

Z= the standard normal deviate (set at 1.96 for a 95% level of precision)

P= the expected prevalence (set at 52%)

d = the acceptable margin of error (set at 5%)

Substituting values: n= (1.96)2 *0.52*(1−0.52)/(0.05)2 =383.5, Rounded to sample size of **384**.

Finite Population Correction: Since the total number of residents in the emergency department is less than 10,000, (120), the sample size will be adjusted using the finite population correction formula:

nadj= n0/1+(n0/N **)** Where: n0 = initial sample size (384) & N= total population (120) , nadj=91

Non-Response Rate**:** Assuming a 10% non-response rate: nfinal=nadj/1-non response rate (0.1) which results 91/0.9= 101

Table 1 Sample size calculation based on associated factors

Factors	Proportion 1	Proportion 2	Unadjusted Sample size (no)	n adjusted for finite population (N=120)	Final sample size after 10% non-respondent
Years of work experience	0.627	0.504	502	97	108
Training on oxygen therapy	0.423	0.416	78,000 not feasible	Not applicable	
Availability of guideline	0.632	0.502	486	97	108

Final Sample Size: sample size calculated for specific objectives are higher than the first objective Therefore, the final sample size was 108.

5.5.2 Sampling technique and procedures

A **s**tratified random sampling technique was employed for this study to ensure proportional representation of both residents and nurses working in the ED of TASH. This approach was appropriate because the two groups (residents and nurses) may have different roles and levels of exposure to oxygen therapy, and stratification allowed for more accurate comparison and generalization within each professional category.

Step 1: Stratification The study population was divided into two distinct strata:

Strata 1: Nurses**. Strata 2**: Residents

Step 2: Proportional Allocation

The total final sample size (108) was allocated proportionally to each stratum based on their actual number in the department. Nurses (63/120) *108=57 & residents (57/120) *108=51

Step 3: Simple Random Sampling within Each Stratum

Within each stratum, simple random sampling was used to select individual participants.

5.6 Study variables

The dependent variables in this study include the participants' knowledge level regarding oxygen therapy.

The independent variables in this study encompass a range of socio-demographic characteristics (age, sex) profession, service of years, specialty, training and years of residency.

5.7 Operational definitions

Satisfactory knowledge: Participants who were scored above the mean score (71.9%) of the knowledge questions to towards oxygen therapy.

Unsatisfactory knowledge: participants who were score below the mean

5.8 Data collection tool, methods and procedures

Data was collected using a structured, self-administered questionnaire developed based on a comprehensive review of relevant literature and previously validated tools from similar studies and was tested for validity on 10% of the participant prior to the distribution by the principal investigator. Reliability of the tool was checked using reliability coefficient (Cronbach's alpha) and was 0.7 for all knowledge questions. The questionnaire comprises two sections. The first section gathers socio-demographic information such as age, sex, study area, years of experience, profession, specialty program and training status. The second section assesses knowledge through multiple-choice and true/false questions focusing on oxygen therapy indications, contraindications, delivery methods, safety protocols, and possible complications.

Data was collected from respondents after taken informed written consent with Google form.

5.9 Data Quality Control

The data collector was largely responsible for controlling data quality, and before entering the information into the SPSS program, the responses were reviewed for completeness of the data.

5.10 Data Processing and Analysis

The data was collected and checked for completeness and accuracy, and it was sorted and summarized. After that, the data was entered into a computer using a developed data entry format, which was coded for each category of variables. After coding, data was entered using SPSS version 25, then analysis was done by the principal investigator using the same computer package. Descriptive statistics and chi-squared test were carried out to compute different rates, proportions, and relevant associations. Independent variables were analyzed using bivariate logistic regression with dependent variable. After binary logistic regression analysis those who will have p value of less than 0.2 undergo multivariate logistic regression with the dependent variable with adjusted Odds ratio with 95% confidence interval and the p-value of ≤ 0.05 will be considered to have a significant association with the outcome variables.

5.11 Ethical Considerations

Approval for this study was obtained from the emergency and critical care department research Committee. Subject identifiers omitted from data analysis to keep the secret of the participants. The purpose and of this study were explained to the participants written informed consent was provided to each participant. Confidentiality was maintained at all levels of the study by not mentioning the names of the respondents.

6. Results

Sociodemographic and Work-Related Characteristics

A total of 108 healthcare professionals participated in the study, giving a response rate of 100%. Of these 55(50.9%) were male and females 53(49.1%). The majority 64(59.3%) were in the 24-30 years.

Professionally, 57(52.8%) were nurses and 47.2% were residents from different speciality. Most respondents (78.7%) had ≤5 years of work experience. From resident's majority of participants (72.6%) were *ECCM,* while the remainder were from other specialties including surgery, anaesthesia, ENT, internal medicine and family medicine. Among residents 39.2% were in their second year, 31.4% in their first year and 29.4 % in their third year of residency. majority of participants 91% had education level of degree. Only 45.4**%** reported the existence of an oxygen therapy guideline in their department, 50% had received training on oxygen therapy. Regarding resource adequacy, 42.6% reported sufficient oxygen supply and majority (89.8%) indicated that workload negatively affected oxygen therapy provision. Please referee Table 2 below for details.

Table 2 Sociodemographic and work area related characteristics

Variables	Category	Response	
		N	%
Sex	Male	55	50.9
	Female	53	49.1
Age	24-30 years	64	59.3
	31-35 years	33	30.6
	>=36 years	11	10.2
Profession	Nurse	57	52.8
	Residents	51	47.2
Level of education	Diploma &master	10	9.3
	Degree	98	90.7
Speciality	ECCM	37	72.6
	Others 1(surgery &aesthesia)	7	13.7
	Others 2(IM &FM)	7	13.7
Work experience	<=5 years	85	78.7
	>=6 years	23	21.3
Availability of guideline on oxygen therapy at ED	No	59	54.6
	Yes	49	45.4
Training on oxygen therapy	No	54	50.0
	Yes	54	50.0
Years of residency	1st year	16	31.4
	2nd year	20	39.2
	3rd year	15	29.4
Adequacy of oxygen supply and delivery systems at ED	No	62	57.4
	Yes	46	42.6
Workload effect on oxygen therapy	No	11	10.2
	yes	97	89.8

Health professional level of knowledge on oxygen therapy

Knowledge levels were high for questions regarding: Low-flow device identification (100%), oxygen cylinder positioning (99.1%), normal oxygen saturation range (95.4%), complications of prolonged oxygen therapy (95.4%), indications for oxygen therapy (86.1%) and recognition of hypoxemia (86.1%). However, gaps were seen in: Humidification requirements (17.6%), monitoring during oxygen therapy (27.8%) and FiO_2 delivery device knowledge (38.9%). Referee table 3.

Table 3 Knowledge question and correct answer with frequency and percentage

Question		N	%
What is the normal oxygen saturation range in a healthy adult <70years old?		103	95.4
What is /are indication of Oxygen therapy?		93	86.1
Hypoxemia can be detected by?		93	86.1
Which device is appropriate for delivering low-flow oxygen therapy?		108	100.0
Choice the correct answer about oxygen therapy device and its FiO2		42	38.9
At what saturation level is oxygen typically indicated in an acutely ill patient?		64	59.3
What is the maximum recommended oxygen flow rate for a nasal cannula?		92	85.2
Which of the following is a complication of prolonged oxygen therapy?		103	95.4
What is the clinical sign of oxygen toxicity?		85	78.7
Which of the following is not monitor during oxygen therapy?		52	48.1
Humidification is always necessary when using oxygen therapy.		19	17.6
Oxygen cylinders should be stored upright and secured.		107	99.1
Oxygen therapy requires a physician's prescription.		89	82.4
Oxygen can be safely administered to the patient for long time use low dose without any complication.		47	43.5
Oxygen can be safely administered to any patient without monitoring		91	84.3

Knowledge score comparison with profession

Professionally, residents showed higher knowledge scores than nurses in several domains. For instance, 56,2 % of residents versus 43.8% of nurses correctly identified the SpO_2 threshold

for initiating oxygen therapy, 54.8 % of residents versus 45.2% of nurses correctly identified FiO_2 levels of devices. However, nurse had higher score in humidification and cylinder position. *Referee table 4*

Table 4 knowledge question and correct answer based on profession

Question	Profession	Response	
		N	%
What is the normal oxygen saturation range in a healthy adult <70years old?	Nurse	53	51.5
	Resident	50	48.5
What is /are indication of Oxygen therapy?	Nurse	46	49.5
	Resident	47	51.5
Hypoxemia can be detected by?	Nurse	50	48.5
	Resident	43	46.2
Which device is appropriate for delivering low-flow oxygen therapy?	Nurse	57	52.8
	Resident	51	47.2
Choice the correct answer about oxygen therapy device and its FiO2	Nurse	19	45.2
	Resident	23	54.8
At what saturation level is oxygen typically indicated in an acutely ill patient?	Nurse	28	43.8
	Resident	36	56.2
What is the maximum recommended oxygen flow rate for a nasal cannula?	Nurse	50	54.3
	Resident	42	45.7
Which of the following is a complication of prolonged oxygen therapy?	Nurse	54	52.4
	Resident	49	47.6
What is the clinical sign of oxygen toxicity?	Nurse	43	50.6
	Resident	42	49.4
Which of the following is not monitor during oxygen therapy?	Nurse	25	48.1
	Resident	27	51.9
Humidification is always necessary when using oxygen therapy.	Nurse	8	42.1
	Resident	11	57.9
Oxygen cylinders should be stored upright and secured.	Nurse	57	53.3
	Resident	50	46.7
Oxygen therapy requires a physician's prescription.	Nurse	44	49.4
	Resident	45	50.6
Oxygen can be safely administered to the patient for long time use low dose without any complication.	Nurse	22	46.8
	Resident	25	53.2
Oxygen can be safely administered to any patient without monitoring	Nurse	43	47.8
	Resident	47	52.2

Overall, 60.2% of respondents demonstrated satisfactory knowledge, while 39.8% had unsatisfactory knowledge. See fig 2.

Residents had more satisfactory results 36(70.6%) than nurses (50.9%). 3rd years had greater knowledge (80%) followed by 2nd years (70%) and last 1st years (62.5%). Those who had training on oxygen therapy had better knowledge (90.7%) than who did not have training. Referee table 3 to below for more detail.

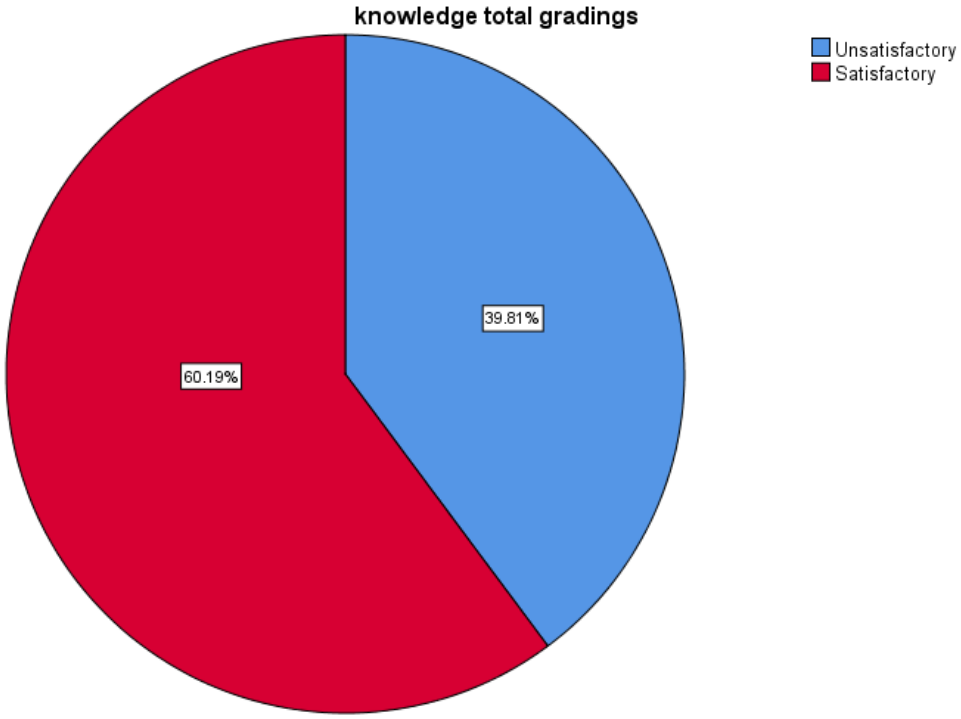

Figure 2 overall knowledge score

Table 5 Factors affecting the knowledge level of health professionals who are working in adult ED of TASH with chi square analysis

Variable	Category	Knowledge score		Total	Chi square P value
		Unsatisfactory N(%)	Satisfactory N(%)		
Profession	Nurses Residents	28(49.1) 15(29.4)	29(50.9) 36(70.6)	57 51	.029
Years of residency for residents only	1st year 2nd year 3rd year	6(37.5) 6(30) 3(20)	10(62.5) 14(70) 12(80)	16 20 15	.147
Work experience	<=5 >5	33(38.8) 10(43.5)	52(61.2) 13(56.5)	85 23	0.431
Guideline availability on oxygen therapy in the current working emergency room	no yes	31(52.5) 12(24.5)	28(47.5) 37(75.5)	59 49	.003
Have you trained in oxygen therapy/ administration?	no yes	38(70.4) 5(9.3)	16(29.6) 49(90.7)	54 54	.001
Is there an adequate supply of oxygen and delivery systems in emergency room	no yes	22(35.5) 21(45.7)	40(64.5) 25(54,3)	62 46	.192

Factors associated with Knowledge of Oxygen Therapy

From all factors which were undergone bivariable logistic regression, only those factors with p value <=0.2 included with multivariable logistic regression. Profession, the availability of oxygen therapy guidelines in the working area and had training were significantly associated with the satisfactory knowledge on the multivariable logistic regression ($p < 0.05$). Respondents who had training on oxygen therapy 37 times more likely to have satisfactory knowledge than those who had not (AOR = 37.037; 95 % CI:10.163-134.976; $p = 0.001$). Referee table 6

Table 6 Factors affecting the knowledge level of health professionals who are working in adult ED of TASH with bivariable and multivariable analysis

Factor Variables	Category	Knowledge		COR, 95%CI	AOR, 95%CI	P value
		Unsatisfactory N	Satisfactory N			
Profession	Nurse	28	29	1		0.027
	Resident	15	36	2.317	3.646(1.163-11.431)	
Guideline's availability	No	31	28	1		0.006
	Yes	12	37	3.413	4.943(1.567-15.591)	
Training on oxygen therapy	No	38	16	1		0.001
	Yes	5	49	23.275	37.037(10.163-134.976)	

7. Discussion

This study assessed the level of knowledge and its associated factors regarding oxygen therapy among residents and nurses working at adult emergency department of Tikur Anbessa Specialized Hospital. The findings provide important insights key gaps that must be addressed to ensure safe and effective oxygen administration in emergency settings.

Overall, 60.2% 0f participants demonstrated satisfactory knowledge who was scores above mean score of 71.9% on oxygen therapy. This level of knowledge is higher than Riyadh (6), the national pooled estimate of 52.1% reported in the 2024 Ethiopian systemic review and meta-analysis, which found generally low knowledge levels among healthcare workers across multiple regions.(18).

It is also slightly higher than reports from South Gondar Zone Hospital (54.6%)(12), Wolaita Sodo University Comprehensive Teaching and referral Hospital (44.4%)(20) and study on paediatric residents of TASH(16). The relatively higher score observed in our study may reflect the academic environment of a tertiary teaching Hospital and greater clinical exposure to critically ill patients.

Residents showed significantly higher knowledge 36(70.6%) than nurses 29(50.9). This aligns with findings from Riyadh (6) and Addis Ababa (17),where physicians consistently outperformed nurses in knowledge of oxygen therapy. The increased knowledge among residents may stem from their broader clinical training rotations in critical care, and greater familiarity with evidence-based protocols. Nevertheless, the lower knowledge levels among nurses –who often initiate oxygen therapy-represent, an important gap that requires targeted intervention.

Although the difference was not statistically significant, senior residents demonstrated higher knowledge score and showing a progressive increased across residency years. This trend is likely justified by the greater clinical exposure, increased responsibility in managing critically ill patients and repeated encounters with oxygen delivery devices and protocols that naturally accumulate as residents advance in their training.

Training was found to be the strongest predictor of knowledge. Participants who received oxygen therapy training were 37 times more likely to have satisfactory knowledge (AOR = 37.037; 95 % CI: 10.163-134.976; p = 0.001). This effect size is higher but consistent with findings from Nigeria(8) , Mekelle(24) and South Gonder(2), all of which reported training as a significant determinant of knowledge. Given that only 50% of participants reported received training, this highlights a major institutional gap. Structured and periodic training programs are therefore crucial for improving competency.

Participants who knew the availability of oxygen therapy guidelines in their emergency departments were 4.9 times more likely to have satisfactory knowledge than those who did not knew (AOR = 4.943; 95 % CI; 1.567-15.591; p = 0.006). This findings is consistent with the studies Tehran(5), Riyadh (6) and the 2024 Ethiopian meta-analysis (11) ,all of which emphasized that the presence of clear , accessible guidelines improve adherence, confidence and knowledge among healthcare workers. However, only 45.4% of participants in this study reported the existence of guidelines in their working area, suggesting an important institutional deficiency.

Despite generally satisfactory overall knowledge, important gaps were observed only 17.6% knew when humidification is required, and 38.9% correctly identify FiO2 delivery for different devices. These are critical components of safe oxygen administration. Similar deficiencies were reported in studies in Tehran(5), Kenya(10) and Sudan(9), indicating that inadequate understanding of delivery system and humidification is widespread problem across low and middle income countries.

Variables such as oxygen supply adequacy, years of experience and workload were not significantly associated with knowledge. This suggests that knowledge depends more on structured training and guidelines accessibility rather than on experience or resource availability alone.

The findings highlight the need for regular, structured training programs for nurses and residents, updating and dissemination of oxygen therapy, including simulation-based oxygen therapy and regular audits to assess adherence to protocols and reinforce knowledge.

8. Conclusion and Recommendations

This study determines that 60.2% of healthcare professionals working in the adult emergency department of TASH had satisfactory knowledge on oxygen therapy. Profession, availability of oxygen therapy guidelines and prior training were the strongest predictors of satisfactory knowledge. Residents demonstrated higher knowledge levels than nurses, reflecting differences in training exposure and clinical responsibility.

Despite the overall satisfactory knowledge level, important gaps were identified in key areas such as FiO2 delivery system and humidification requirement. These gaps pose risks for inappropriate oxygen administration and potential patient harm.

The recommendation of this study is to have regular training programs for both nurses and residents, ensure oxygen therapy guidelines are available, visible and update in all emergency and critical care units and conduct periodic clinical audits and supportive supervision to assess adherence to oxygen therapy protocols. Finally for future researcher should include multi-centre study to enhance representativeness and assess the impact of interventions over time.

Limitation

Since this study conducted at single tertiary Hospital (TASH), which may limit the generalization of the results to other hospitals in Ethiopia, particularly those with different staffing patterns, resource level or training structures.

9. Reference

1. McDonald V, Cousins J, Wark P. Acute oxygen therapy: a review of prescribing and delivery practices. Int J Chron Obstruct Pulmon Dis. 2016 May;1067.

2. O'Driscoll BR, Howard LS, Earis J, Mak V. BTS guideline for oxygen use in adults in healthcare and emergency settings. Thorax. 2017 Jun;72(Suppl 1):ii1–90.

3. Rational Use of Oxygen Participant Manual.

4. Alqaseer DK. KUFA JOURNAL FOR NURSING SCIENCES.VOL.11 No. 2 / 2021. 2021;(2).

5. Hassanzad M, Ghaffaripour H, Rekabi M, Mirzendehdel M, Sadati E, Derakhshanfar H. Nurses' Knowledge Regarding Oxygen Therapy; a Cross- Sectional Study.

6. Aloushan AF, Almoaiqel FA, Alghamdi RN, Alnahari FI, Aldosari AF, Masud N, et al. Assessment of knowledge, attitude and practice regarding oxygen therapy at emergency departments in Riyadh in 2017: A cross-sectional study. World J Emerg Med. 2019;10(2):88.

7. Dauncey JW, Olupot-Olupot P, Maitland K. Healthcare-provider perceptions of barriers to oxygen therapy for paediatric patients in three government-funded eastern Ugandan hospitals; a qualitative study. BMC Health Serv Res. 2019 Dec;19(1):335.

8. Adeniyi BO, Akinwalere OO, Ekwughe FC, Ogunmodede AF, Kareem AO, Olakanye OD, et al. Assessment of knowledge and practice of oxygen therapy among doctors and nurses: A survey from Ondo State, Southwest Nigeria. J Pan Afr Thorac Soc. 2021 Aug 11;2:161–6.

9. Awad MSA, Mohamednour MFA, Rafat FA, Hamdnaalla MAA, Elfatih A, Hamed FJM, et al. An exploration of healthcare professionals' knowledge and perceived barriers about acute oxygen therapy: a survey in a tertiary care hospital, Sudan. BMC Med Educ. 2024 Dec 30;24(1):1551.

10. L. W. KB, J. O, S. O, C. M, M. Z, I. N. Knowledge of Oxygen Therapy among Nurses in a Tertiary Hospital in Kenya: Implications for Patient Care and Training Needs. Afr J Health Nurs Midwifery. 2024 Mar 1;7(1):108–24.

11. Aynalem ZB, Abera MN, Yazew BG, Abate MD, Kassie A, Meseret F, et al. Knowledge, attitude, practice and associated factors of oxygen therapy among health professionals in Ethiopia: A systematic review and meta-analysis. Ahmed SK, editor. PLOS ONE. 2024 Sep 6;19(9):e0309823.

12. Demilew BC. Knowledge, attitude, and practice of health professionals for oxygen therapy working in South Gondar zone hospitals, 2021: multicenter cross sectional study. 2022;

13. Argeta H. Assessment of Knowledge, Attitude and Practice of Nurses towards Oxygen Therapy at Wolaita Sodo University Comprehensive Teaching and Referral Hospital, Ethiopia, 2021. Int J Clin Ski. 2022;

14. Kahsay T. 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.

15. BioRes Scientia LLC, Kassaw AB, Berhe HA, Tarekegn TK, Bitew SE, Hailu KT, et al. Knowledge, Attitude and Practice and Associated Factors on Oxygen Therapy Among Nurses and Midwives in Y12 HMC-2022 Gc. J BioMed Res Rep. 2024 Jan 22;4(2):1–11.

16. Beza K, Etissa EK, Gebre H, Kebede RA. Assessment of pediatric residents' knowledge, attitude, and practice regarding oxygen therapy and its complications at Tikur Anbessa Specialized Hospital and St. Paul Hospital Millennium Medical College, Ethiopia. Ethiop J Pediatr Child Health. 2023 Aug 7;18(1):33–47.

17. Kalifa M, Sultan M, G/Medhin Y. Knowledge, Attitude and Practice of Physicians and Nurses Working in Addis Ababa on Oxygen therapy. Pan Afr J Emerg Med Crit Care [Internet]. 2023 Aug 11 [cited 2025 Jul 19];1(2). Available from: https://journal.esep.org.et/index.php/esep/article/view/41

Consent Statement:

I have read the information provided above. I have had the opportunity to ask questions about the study and my questions have been answered to my satisfaction. I voluntarily agree to participate in this study.

Code: _____
Signature: _____
Date: _____

Investigator's Name: _____
Signature: _____
Date: _____

Annex 1: Data Collection tool English form

Questioners

Section one: Sociodemographic Questions

1. Sex: ☐ Male ☐ Female
2. Age:_____
3. Profession ☐ nurses ☐ residents
4. Level of education for nurses only _____
5. Years of experience for nurses only_____
6. If you are a resident, what is your specialty_____
7. Service years as GP for residents only_____
8. Years of residency

   ☐ 1st year ☐ 2nd year ☐ 3rd year
9. Is there a guideline for oxygen therapy in the current working emergency room?_____
10. Have you trained in oxygen therapy/ administration? Yes/no
11. Is there an adequate supply of oxygen and delivery systems in emergency room? Yes/no
12. Do you think workload/ burden affects oxygen therapy in emergency room? Yes/no

Section two: Knowledge Questions on Oxygen Therapy

1. What is the normal oxygen saturation range in a healthy adult <70years old?
   a) 70–80% c) 95–100%
   b) 85–89% d) 100–105

2. What is /are indication of Oxygen therapy?
   a) Respiratory distress (RR>24 in adult) c) hypotension/shock
   b) Treat hypoxemia d) All

3. Hypoxemia can be detected by?

   a) Clinical sign b) pulse oximetry c) blood gases analysis d) all

4. Which device is appropriate for delivering low-flow oxygen therapy?
   a) Ventilator c) Nasal cannula
   b) Non-rebreather mask d) CPAP machine

5. Choice the correct answer about oxygen therapy device and its FiO2, it may be more than one

   a) Nasal cannula 1-5L/m gives Fio2 of 25-40% c) Simple face mask6-16L/M = 60-70%
   b) Non-rebreather with reservoir above 80%

6. At what saturation level is oxygen typically indicated in an acutely ill patient?
   a) <80% c) <90%
   b) <85% d) <95%

7. What is the maximum recommended oxygen flow rate for a nasal cannula?
   a) 2 L/min c) 6 L/min
   b) 5 L/min d) 10 L/min

8. Which of the following is a complication of prolonged oxygen therapy?
   a) Hypoglycemia c) Dehydration
   b) Oxygen toxicity d) Bradycardia

9. What is the clinical sign of oxygen toxicity?

   a) New onset convulsion b) low spo2 reading c) hypotension

10. Which of the following is not monitor during oxygen therapy

a) Respiratory quality c) Mental status

b) Vital sign d) Pain e) none

11. Humidification is always necessary when using oxygen therapy. True/ False
12. Oxygen cylinders should be stored upright and secured. True or False
13. Oxygen therapy requires a physician's prescription. True/ False
14. Oxygen can be safely administered to the patient for long time use low dose without any complication. True/False
15. Oxygen can be safely administered to any patient without monitoring. True or False

Name of the student: Dr**.** Hulugrigesh Derib

Signature

Date

Approval of the primary advisor

Name of the primary advisor: Dr. Bitania Debalkew

Signature

Date

Approval of the co-advisor

Name of co-advisor Dr. Ayenew Amare

Signature

Date