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KNOWLEDGE AND PRACTICE OF OXYGEN THERAPHY AND ITS ASSOCIATIED FACTORS AMONG NURSES WORKING IN PEDIATRIC UNITS IN SELECTED HOSPITALS IN HAWASSA CITY, ETHIOPIA,2023.

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By my signature below, I declare and affirm that this thesis is my own work. I have followed all ethical principles of scholarship in the preparation, data collection, data analysis and completion of this thesis. All scholarly matter that is included in the thesis has been given recognition through citation. I affirm that I have cited and referenced all sources used in this document. Every effort has been made to avoid plagiarism in the preparation of this thesis.

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BIOGRAPHICAL SKETCH

I was born in the south regional state of Dilla Gedeo zone, 02 kebele, in 1986 E.C. I attended primary, secondary, and preparatory school at Dilla Donbosco School; later, I finished and graduated from Gondar University with a BSc in nursing in 2008E.C. I had a total of 5 years' experience, 6 months in Gedeo Zone Tumticha Health Centre and the rest in Dilla University referral hospitals as a staff nurse.

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LIST OF ABBREVIATIONS AND ACRONYMS

AAU	Addis Ababa University
AAP	American Academy of Paediatrics
ABG	Arterial Blood Gas
BSc	Bachelor of Science
BMV	Bag Mask Ventilation
ETB	Ethiopian Birr
KP	Knowledge and Practice
HUCSH	Hawassa University Comprehensive Specialized Hospital
MSc	Masters of Science
NGO	Non-Governmental Organization
O_2	Oxygen
OT	Oxygen Therapy
$PaCO_2$	Partial pressure of Carbon dioxide
PaO_2	Partial Pressure of Oxygen
SaO_2	Arterial Oxygen Saturation
SD	Standard Deviation
SpO_2	Arterial Oxygen Saturation Measured by Pulse Oximetry
SPSS	Statistical Package for Social Sciences
WHO	World Health Organization

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ABSTRACT

Background: - Oxygen is one of the most essential medications. Oxygen therapy is a medical procedure used to treat tissue hypoxia. It has the potential to improve medical outcomes and save lives when used correctly, but it can also cause harm when wrongly used. However, there is limited evidence on nurses' knowledge of oxygen therapy in the study area. Therefore, this study fills the research gap.

Objective: The objective of this study is to assess the knowledge and practice of oxygen therapy and its associated factors among nurses working in a paediatric unit in selected hospitals in Hawassa.

Method: - An institutional-based cross-sectional study design was employed during February 27–March 27, 2023 in six selected hospitals among 174 nurses working in paediatric units. A simple random sampling technique and self-administered structured questionnaire was used for data collection. Data was entered and analysis was done with Epi-data 3.1 and SPSS v26, Frequency and percentages were expressed in texts, tables, and charts, whereas logistic regression was conducted to check the association of dependent variables with factors and variables. A p-value ≤ 0.05 in multivariate analysis was considered significant in the 95% CI.

Results: The ages of the study subjects were in the range of 23–49. The mean age was 30.6 (SD = 4.8 years). The knowledge and practice levels of the study participants in oxygen therapy were 55.7% and 51.1%, respectively. The factors associated with knowledge of oxygen therapy among nurses were educational level of degree [AOR: 0.108; 95% CI (0.012–0.98)] and training [AOR: 4.07; 95% CI (1.8–9.2)] and practice being diploma [AOR: 0.04; 95% CI (0.004–0.05)], training [AOR: 3.77; 95% CI (1.48–96)] were significantly associated factors in the p value of less than 0.05.

Conclusion: The knowledge and practice level of nurses towards oxygen therapy were poor. Therefore, this study recommended that nurses who are all working in paediatrics units must receive training to update the KP oxygen therapy.

Key words: Knowledge, Practice, Oxygen Therapy, Nurses, Paediatrics unit

1: INTRODUCTION

1.1. Background

Oxygen therapy is one of the most commonly utilised treatment techniques for treating hypoxemia in acute care settings across the world. Hypoxemia, or low blood oxygen levels, is a serious condition that occurs frequently in conditions such as severe pneumonia or bronchiolitis of the lower respiratory tract, upper airway obstruction, severe asthma, respiratory distress syndrome, severe sepsis, heart failure, cardiac arrest, trauma, and carbon monoxide poisoning (1).

The oxygen content in the surrounding atmosphere is 21.00%. It contributes around 65.0% of the total mass of the human body and is necessary for the synthesis of energy in all of the body's tissues. It is on the World Health Organisation's list of essential medications (WHO). Oxygen therapy (OT) is so successful in treating very ill patients for hypoxia that it is both an essential and emergency drug for good recovery (2). The achievement of normal or near-normal oxygen levels in intensive care unit (ICU) or emergency patients, according to British Thoracic Society criteria, is a sign of adequate oxygen therapy. Given the lack of a medication that may reverse toxic pulmonary alterations, the only rational course of action is to avoid oxygen-induced poisoning (3,4).

So it is suggested that the staff provide it appropriately, and the majority of these staff were nurses (4–9).

However, according to several studies, nurses' general understanding of oxygen delivery was below the intended level and required improvement to meet the expected level (2,9–11). According to research studies done in many countries, there is a knowledge gap about oxygen treatment among practising nurses in hospitals. According to studies, nurses lacked appropriate knowledge and comprehension of oxygen treatment, and there was a need to refresh staff nurses' knowledge and other practical abilities through training and workshops. According to several studies, personnel in developing nations are undertrained in treatment for critically ill individuals, resulting in a lack of understanding of critical care principles and a barrier to delivering high-quality treatment (12,13).

The death rate in individuals who got OT was greater than in those who did not, owing mostly to improper oxygen utilisation. Critical care nurses must be knowledgeable about the provision of oxygen to critically ill patients. The paediatric oxygen treatment and delivery device

guideline states that nurses should have a supportive practice towards the demands of oral and nasal hygiene in children, as well as the usage of humidification devices while giving oxygen therapy (3,6).

Unless patients are orally rehydrated and mouth care is provided, as well as humidification, which helps mobilise secretions and improve patient comfort, oxygen can readily dry exposed membranes in the upper respiratory tract. As a result, oxygen should be supplied by personnel who have received oxygen administration training. Nurses are the most responsible health staff in terms of monitoring oxygen treatment. Failure to give oxygen appropriately puts the patient in danger of hypoxia, respiratory abnormalities, and death (3,6).

Too much oxygen, on the other hand, is hazardous owing to mechanisms such as hypoxic pulmonary vasoconstriction, reduced tissue oxygen delivery, absorption atelectasis, and oxygen free radical production. Hypoventilation, atelectasis, pulmonary oxygen toxicity, inflammation, and infection are among the unfavourable outcomes (4,16–19). As a result, ensuring that supplemental oxygen is administered in a timely and appropriate manner is crucial to patient care and the critical care nurse's duty. Nurses regularly and autonomously oversee oxygen therapy in the care of critically ill patients in order to enhance oxygen delivery and prevent the negative effects of hypoxemia. Previous studies have discovered unpredictability in emergency and critical care nurses' oxygen delivery techniques. On the other hand, the unpredictability of critical care nurses' oxygen treatment practices is contentious, given that those nurses' decisions and oxygen therapy management are linked.

1.2. Statement of the problem

Oxygen treatment needs specialised nursing care in order to improve patient outcomes and minimise complications. Although professional practice standards recommend that oxygen be administered in the same manner as any other drug, oxygen is routinely administered excessively, unjustly, without a prescription, and to patients who are considered to be having breathing issues. According to the study in Ghana, many Ghanaian nurses administered oxygen treatment for non-hypoxic patients because they believed it offered patients and their families a psychological boost (20).

Studies on critical care nurses in the Netherlands, Denmark, Australia, Iran, and Saudi Arabia have revealed a lack of understanding and practice towards the use of oxygen therapy (9,21). Similarly, research conducted in Egypt, Rwanda, and Uganda discovered that nurses lacked experience in oxygen treatment (25–27).

According to an Ethiopian survey, 36.2% of nurses working in the emergency department and critical care unit at three public hospitals in A.A. had a high level of expertise, while 63.8% had a poor level of knowledge (7).

Oxygen is thought to have an effect on lung tissue. Oxygen poisoning can occur as a result of lung changes caused by excessive oxygen concentrations. The alveoli collapse as a result of the reduced surfactant synthesis caused by the high oxygen level. As the alveoli collapse, the amount of gas exchanged decreases. To limit the likelihood of this happening, the doctor should monitor oxygen treatment and rapidly reduce supplementary oxygen (28).

Health care workers who are sufficiently knowledgeable and use evidence-based practice are critical for the safe, efficient administration and monitoring of oxygen treatment. However, research shows that there are major gaps in understanding and practice when it comes to oxygen supply. The optimal quantity and supply mechanism, for example, differ depending on whether the patient has a chronic or acute underlying medical condition (29).

The idea to conduct research related to the interest in this topic, along with my experience in the critical care field and my own observation, arises from theoretical gaps and the fact that, to my knowledge, there is no research related to pediatrics oxygen therapy or related KP of nurses for oxygen administration in pediatrics patients in our country.

A study showed that about 81.9% of patients in the emergency unit receiving oxygen (O_2) therapy and 50–84% of patients in the ICU are exposed to excess oxygen and hyperoxemia

(4,30).The use of supplemental oxygen by nurses working in the paediatrics unit has important implications for child patient outcomes. However, the only way to save children from dying and needless hospital stays is to deliver oxygen correctly. It will be very helpful to detect the outcome and proceed with appropriate management if nurses working in the paediatrics unit are evaluated for their knowledge and practice about oxygen administration.

As a result, having trained staff administer oxygen and monitor the patient's arterial blood gases and pulse oximetry is necessary. In most medical centres, nurses are in charge of oxygen therapy and fast reactions to adverse therapeutic effects. According to research performed in many nations, there is a considerable knowledge gap in nurses' understanding about how to utilise oxygen effectively in the majority of situations (31)(6,7,15).

As a result, the goal of this study is to evaluate nurses' knowledge and practice concerning oxygen treatment for critically ill patients, as well as the factors influencing oxygen therapy. Therefore, the purpose of this research is to evaluate nurses' knowledge and practice of oxygen treatment in the paediatric unit and associated factors at selected hospitals in Hawassa, Ethiopia. Since there have been no previous studies conducted in the study area, this study contributes to identifying and filling the gaps.

1.3. Significant Of the Study

Oxygen therapy is an essential medical treatment that may be given to patients in a variety of urgent situations. Patients are at risk of major health complications such as hypoxemia, respiratory failure, and death if oxygen treatment is not administered appropriately. Assuring that oxygen treatment is provided correctly, safely, and at the appropriate time is therefore critical to patients' care (32). This study has implications for nursing education, practice, administration, and research. The findings of this study could be used for the development of training material for nurses and for continuing professional development in effective oxygen administration. The study's finding was to produce data about knowledge and practice gaps about oxygen therapy and its contributing elements.

Examine local oxygen policy in relation to national standards, plan for staff education, and ensure that oxygen prescription and monitoring can be done on drug and observation charts. Local oxygen advocates were also instrumental in re-auditing the policy after its first implementation (11).

Additionally, it was hoped that this study will encourage the development of well-standardised and updated oxygen therapy guidelines to guarantee high quality and safe management of children and will encourage future research into the standardisation of the best practise tool in the Hawassa city selected hospital, Sidama region.

2: LITERATURE REVIEW

This review of the literature combines known information about nurses' knowledge and practice regarding oxygen treatment and associated aspects worldwide, regionally, and locally. This review of the research also divides associated factors into socio-demographic variables, organisational aspects, healthcare-related factors, and personal factors.

2.1. Nurses Knowledge Regarding Oxygen Therapy

A cross-sectional quantitative study conducted in Turkey to examine how need-based training affected nurses working in paediatric intensive care units' knowledge of oxygen treatment found that 40% of participants had poor knowledge and 57.5% scored on average, which led researchers to the conclusion that the nurses' comprehension and application of oxygen treatment were less than expected. The results also showed that participants had a moderate (80%) level of knowledge about several aspects of O_2 treatment, including indications, crucial precautions, monitoring throughout therapy, and delivery (33).

A cross-sectional study done in Iran found that nurses working in critical care had a medium to moderate degree of awareness of various elements of O_2 treatment, such as indications, essential measures, and monitoring during therapy, as well as the identification of delivery equipment. According to the research, 92.4% and 98.2% of nurses agreed that oxygen therapy was dangerous (24).

A cross-sectional study conducted in Uganda found that nurses have a knowledge gap when it comes to selecting the right oxygen treatment delivery method for children. The majority of nurses (76%) knew how to use a concentrator, but the majority did not know how to use a pulse oximeter or deliver cylinder oxygen (10).

A cross-sectional descriptive study done in three governmental hospitals in Addis Ababa indicated that nurses with good knowledge were 55 (36.2%), whereas nurses with weak knowledge were 97 (63.8%), which is lower than the mean score of 3.03 (SD = 1.6665) (31).

2.2. Nurses Practice Regarding Oxygen Therapy

According to Dutch research, nurses have been given the authority to urge physicians to prescribe oxygen treatment. This finding suggests that, in general, nurses are adept at administering the proper dosage of oxygen without the need for a prescription and have a

reasonably high rate of appropriate oxygen therapy delivery. According to the study, based on self-reported actual practise of oxygen therapy by ICU physicians and nurses, most care providers realise the risk of hyperoxia exposure and have a poor tolerance for high oxygen concentrations. However, a significant proportion of their ICU patients were subjected to greater amounts of arterial oxygen than the self-reported goal ranges in real clinical practice (34).

According to Iranian research, 74.5% of nurses practiced good oxygen treatment and 25.5% practiced poorly (24). Egyptian research found that 18% of the tested sample had sufficient skills for giving oxygen treatment. Meanwhile, 40% and 42% of them practiced at an average and inadequate level, respectively (31).

A study conducted by Elmak Nimir University Hospital found that in terms of oxygen distribution technique, 58% of nurses selected suitable oxygen delivery devices based on doctor orders, 20% based on PaO2, 10% based on guidelines, and 12% based on patient condition (35).

Many guidelines in university hospitals throughout the world say that nurses should be knowledgeable in the best practices for pulse oximetry, humidification attachment, and the use of various oxygen devices in order to save the lives of many emergency patients. In Rwanda, the total number of nurses working in critical care medicine was observed to be 46.2%. An excellent oxygen treatment practice was found to be 43.4% with a mean score of 3.09 (SD = 1.7618), and a poor practice was 56.6%, which was lower than the mean score in Ethiopia (7,31,36–38)

2.3 Factors Associated With Nurses Knowledge and Practice Regarding Oxygen Therapy

2.3.1 Sociodemographic Factors

Despite the fact that most socio-demographic variables such as gender, age group, working place, and working shift were not found to be statistically significant in the majority of reviewed literature, level of education and cumulative years of experience were found to have some influence on knowledge and practice (10,20,39,40).

A quasi-experimental study done in Egypt on nurses practicing critical care medicine found statistically significant relationships between the analysed sample's degree of knowledge and their age as well as their certification at P = 0.010 and 0.001, respectively (29).

Research in Rwanda found that education level, nursing practices during oxygen administration, and total years of experience (>5 years vs. 5 years) had a significant connection with low KP towards oxygen therapy, with P-values of 0.049 (41).

There was a scarcity of literature demonstrating the relationship between socio-demographic characteristics and study variables done in Ethiopia.

2.3.2 Regarding health care facility

Organisational aspects such as the provision of guidelines in oxygen treatment, as well as the availability of trainings for critical care nurses, are connected with effective overall practice. According to research done in Saudi Arabia, a cross-sectional qualitative study found that a lack of training programmes was the main likely cause of poor knowledge. The study also found that, while cumulative experience might be beneficial, it does not necessarily ensure that patients receive high-quality care (6).

In a quasi-experimental study conducted in Egypt, 86%, 74%, 94%, and 100% of the studied sample, respectively, found that a lack of training courses, equipment and supplies, periodic maintenance, and a lack of a standardised protocol for oxygen therapy affected the administration of oxygen therapy to their patients. The study also found a very significant change in nurses' knowledge mean score between pre- and post-implementation of an oxygen treatment training programme (p 0.001) (20).

Cross-sectional research done at public hospitals in Addis Ababa found that participants were asked about the availability of oxygen therapy guidelines in the emergency department. The research went on to say that the supply of oxygen and delivery systems was recorded as "sufficient" in 79.79% of cases (52%), "inadequate" in 57.5% of cases (37.5%), and "unknown" in 16.5% of cases (10.5%). Inadequate oxygen supply and delivery systems have a significant impact on the quality and result of oxygen therapy (31).

2.4.3 Personal related factor

The oxygen saturation and delivery system should be included on the patient's monitoring sheet along with the oximetry result. In order to maintain the O2 saturation within the appropriate range, the responsible nurse should adjust the oxygen delivery mechanisms and flow rates (38).

67 nurses participated in the descriptive cross-sectional hospital-based study. It was shown that while nurses had a sufficient understanding of the main indications for administering oxygen, they lacked knowledge about the equipment used to provide low flow rates of oxygen. The degree of knowledge that nurses had on the primary reasons for administering oxygen was significantly correlated with their education (P-value =0.04), however it was not significantly correlated with their experience (P-value =0.83) (42).

Cross-sectional descriptive research done at three public hospitals in Addis Ababa found that when participants were asked if job stress affected oxygen therapy, 99.1% replied yes, 37.3% said no, and 10.5% said unknown. Monitoring and follow-up of patients on oxygen treatment may be adversely affected when job load increases (31).

2.4 Conceptual framework

After researching several literatures, this conceptual framework was adopted and modified (7,23,30,33,41,43,44). This demonstrates the impact of independent factors on the dependent variable.

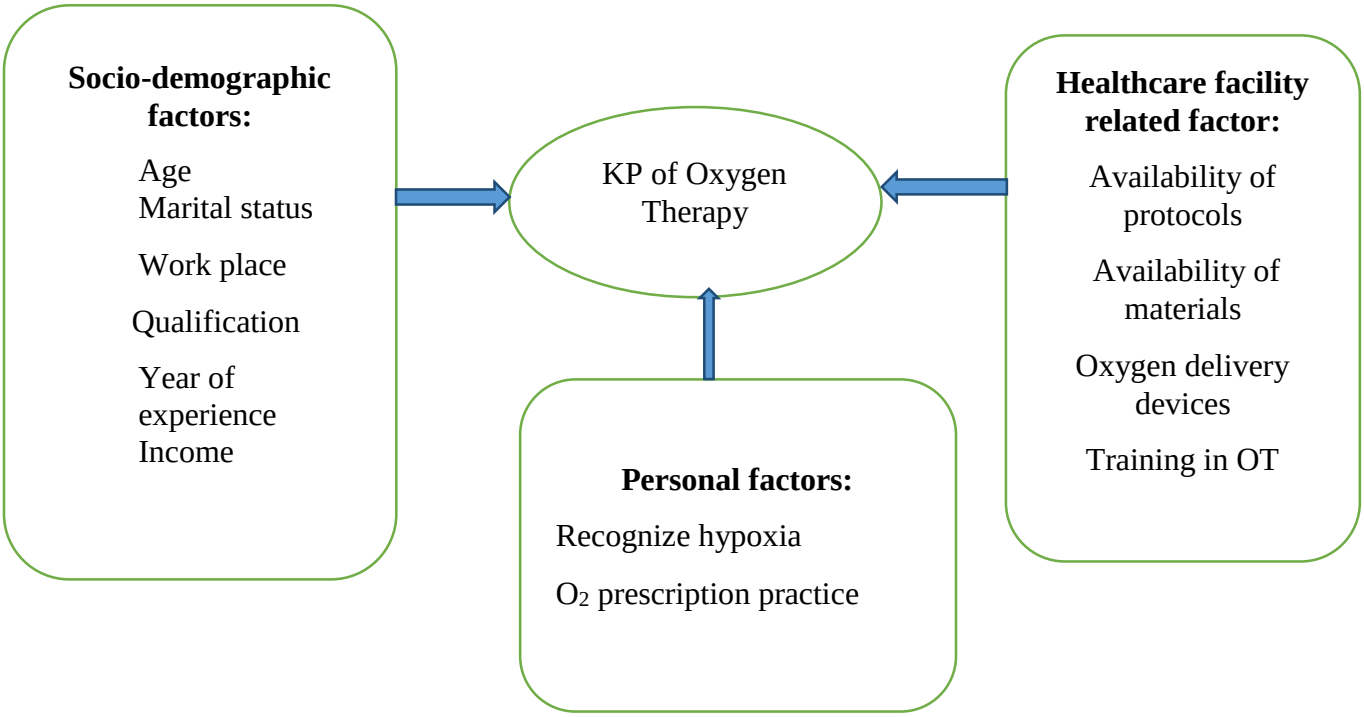

Figure 1: Conceptual framework; reflects relationship among Knowledge and practice of oxygen therapy and its associated factors among nurses working in paediatrics unit of selected hospitals in Hawassa, Ethiopia 2023

3: OBJECTIVES

3.1 General Objective was:

- To asses knowledge and practice of oxygen therapy and its associated factor among nurses working in paediatrics unit in selected hospitals Hawassa city, Ethiopia, 2023.

3.2 Specific objectives were:

- To determine the knowledge level of nurses regarding oxygen therapy in paediatrics units of selected hospitals in Hawassa city 2023
- To determine practical level of nurses regarding oxygen therapy in paediatrics unit
- To identify factor associated with Knowledge of nurses regarding oxygen therapy in paediatrics.
- To identify factor associated with Practice of nurses regarding oxygen therapy in paediatrics.

4: METHODS AND MATERIALS

4.1 Study Area and Period

The study was conducted in Hawassa city at a selected hospital in Hawassa, Ethiopia. Hawassa is the capital city of Sidama Regional State, Ethiopia. It is located 275 kilometres from Addis Ababa, the capital city of Ethiopia. The population is about 328,283, of which 159,397 (54.4%) are female and 168,886 (57.3%) are male. In Hawassa, there are 11 health centres (10 public), 17 health posts, 7 hospitals (1 specialised, 3 general, and 3 primary hospitals), namely HUCSH, Adare General Hospital, Leku Primary Hospital , Alatiyon General Hospitals, Yanet General Hospital , Bete Abrham Primary Hospital and Abem Primary Hospital. Thus, there were 1019 nurses working in various departments, including 269 nurses working in paediatrics from selected hospitals (45). The Study was conducted from February 27–March 27 at six selected hospitals in Hawassa.

4.2 Study Design

Institutional based cross-sectional study was conducted at Hawassa city from February to March 2023 G.C.

4.3 Population

4.3.1 Source population

All staff nurses working in Hawassa hospitals in pediatrics departments (units).

4.3.2 Study population

Nurses working in paediatrics units of selected hospitals in Hawassa town Sidama region Ethiopia, 2023

4.3.3 Sample population

The sample population was each randomly selected nurses working in the paediatrics unit of selected hospital in Hawassa who meets the inclusion criteria

4.4. Inclusion and Exclusion criteria

4.4.1. Inclusion criteria

Nurses currently working and who have at least six months of work experiences in the paediatrics unit.

4.4.2. Exclusion criteria

Nurses who were on annual, sick or maternity leave at the time of data collection.

4.5 Sampling Method

4.5.1 Sample size determination

Single population proportion formula, the sample size was determined. P value of 50% is used because there haven't been any studies conducted in paediatric units before, and a margin of error of 0.05 is assumed with a 95% confidence level. The sample size of this study was determined by using the formula for calculating a single population mean.

Where n_i = initial estimated sample size Z = standard score corresponding to 95% confidence interval 1.96 P = proportion/prevalence of KP of oxygen therapy in paediatrics unit d =the margin of error (precision) 5%

The following formula was used to calculate sample size. $n_i = \frac{(Z(_a/_2)^2 \times P\ (1-P))}{d^2}$; then

$$n_i = = \frac{(Z(_a/_2)^2 \times P\ (1-P))}{d^2} = \frac{(1.96)^2 \times 0.5\ (1-0.5))}{0.05^2} = 384$$

$$n_f = \frac{ni}{1+ni/N} = \frac{384}{1+\frac{384}{269}} \approx 158$$

Since the total study population working in the paediatrics unit of the selected hospital was 269, which was less than 10,000, an adjustment formula was used

Considering 10% of non-response rate, a total sample size (nf) is = 174

4.5.2 Sampling procedure

The number of study unit to be samples from each selected hospitals was determined by using proportional allocation formula from selected hospitals describe by formula = $n = \frac{nf \text{ x ni}}{N}$ and sample will take six hospitals by simple random sampling method.

nf=final sample population=174

ni=nurses from each hospital

N=total nurses in selected hospitals in paediatrics unit=120+30+25+34+32+28=269

considering 10% of non-response rate, a total sample size (nf) is 174

Sampling procedure for finite population formulan $= \frac{nf \text{ x ni}}{N}$ where,

n_f=final sample population=174 ni=nurses from each hospital

N=total nurses in paediatrics=269

HUCSH=120 n= (120x 174)/269 =78

Adare General Hospitals =30 n= (30x 174)/269=19

Leku primary Hospitals =25 n= (25x 174)/269=16

Alatiyon General Hospitals =34 n= (34x 174)/269=22

Yanet General Hospitals =32 n= (32x 174)/269=21

Bete Abrham primary Hospitals =28 n= (28x 174)/269=18

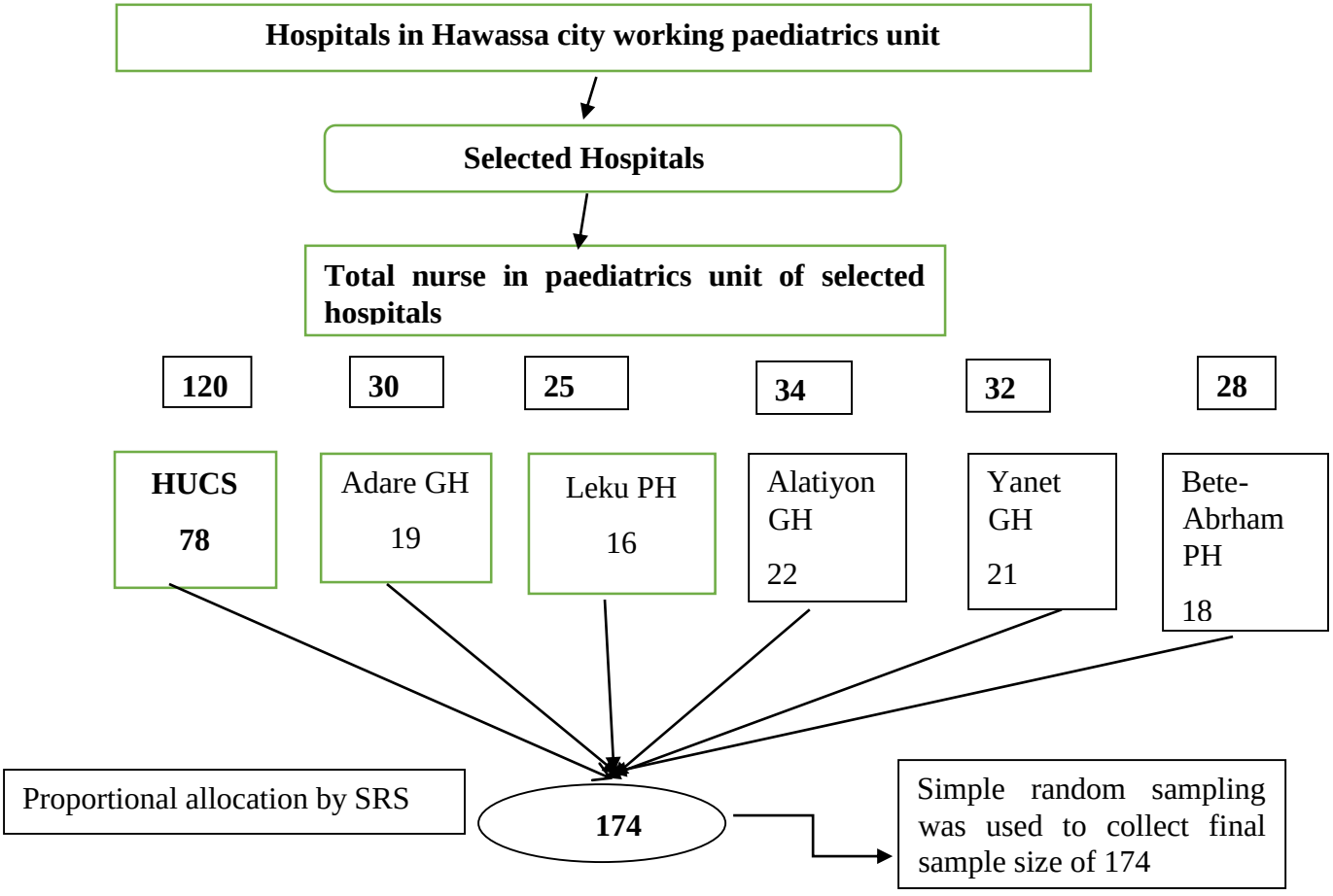

Figure 2: Diagrammatic presentation of sample size allocation among nurses working in paediatrics unit of selected hospitals in Hawassa city toward oxygen therapy in children in 2023

4.6. Variables

4.6.1. Dependent (Outcome) variable

- Knowledge toward oxygen therapy
- Practice toward oxygen therapy

4.6.2. The independent variables

- Socio demographic factors (age, sex, marital status, level of education, departments of working, work experience and monthly income)
- Health care facility factor (presence of guideline and protocol OT and provision of training on OT and availability of oxygen delivery and monitoring device).
- Personal factor; recognizing hypoxia, indication of O_2 therapy, and O_2 prescription practice.

4.7. Operational definition

Good knowledge -Those nurses who scored mean and above the mean of the knowledge questions (31).

Good practice - Those nurses who scored mean and above the mean of the practice questions (31).

Poor knowledge –Those nurses who scored below the mean of the knowledge questions (31).

Poor practice – Those nurses who scored below the mean of the knowledge questions (31).

4.8. Data Collection tools and procedures

4.8.1. Data Collection tools

A standardized and self-administered questionnaire was used. Data was collected by six trained BSc nurses assigned at each hospital and used a self-administered questionnaire to gather the data. A standardized and self-administered English version questionnaire was developed from different literature's to meet the specific objectives of the study, and adopted from the previous research questionnaire. The questionnaire was composed of socio-demographic variables, knowledge questions, practical questions, and factors affecting Nurses KP in oxygen therapy (43,46).

Section one: Socio-demographic variables which include (age, sex, marital status, ward, level of education, work experience and monthly income).

Section two: included knowledge questions which came from different literatures related to oxygen therapy with yes, no answer.

Section three: Practical questions with Yes or No answer which include guidelines and various literatures. *The last section* has to assess factors affecting Nurses KP in oxygen therapy which include health facility factor and personal factors with Yes or No questions.

4.8.2. Data collection procedure

Data collection began on February 27, 2023, and continued through March 27, 2023, with the selected hospitals' consent. Data were gathered using a questionnaire that was self-administered. Six trained Bsc nurses who were allocated to each hospital and trained for one day under the direction of the primary investigator served as the data collectors. The lead researchers were constantly supervising. The goal and data collecting methods of the research are the basis for and a component of the training of the data collectors. Additionally, every data collector daily reviews each participant's questionnaire for completeness. During data collection, participants and the questionnaire both received codes that could be used to track down any problems.

4.8.3. Data quality control

Five expert medical professionals, researchers, and academics reviewed the instrument to ensure its quality and determined its content validity. The content validity index of the instrument was determined at 0.81 (CVI = 0.819) based on the experts' assessment. Important advice and comments from professionals were also given. Important advice and comments from professionals were also given. Throughout the data collecting period, the lead investigators, the supervisor, and the data collector they confirmed the data's completeness every day. To assure data quality, a pre-test was conducted at Abem main hospitals on 5% (9 nurses) of the actual sample size from the nurses who met the requirements before the real data collecting period, and it was then conducted at a different, comparable public hospital. Some unclear surveys were changed for consistency and clarity based on the pre-test findings. Based on the analytical result from the pre-test, which was 0.819 (Cronbach's alpha = 0.819), the tool's dependability was also assessed. To check multicolinearity, the variance inflation factor (VIF) and tolerance test were done after regression, and the values near 1 in the VIF and

more than 0.1 in the tolerance test showed there were no confounders between the variables. The model goodness of fit test was done by Hosmer and Lemeshow goodness of fit test at the p values greater than 0.05 and showed that good model fitness was present in the variables.

4.9. Data analysis

Each questionnaire was reviewed for accuracy after data collection, and a code was provided before data input. Data was sorted, edited, cleaned for missed values, and entered into EpiData version 3.1 and exported to SPSS version 26 (47) for further analysis. For categorical variables, frequencies and percentages were shown, whereas means and standard deviations were utilised for continuous variables. When Shapro Wilk tested the normality of continuous data, all of the P values were larger than 0.05, proving that the null hypothesis test was invalid. In order to evaluate elements connected to outcome variables, a logistic regression model was applied. Bivariate analysis was performed largely to examine each variable's relationship to the dependent variable separately. In order to control the potential impact of confounders, variables associated with the dependent variable at p-values 0.25 were transferred to multivariable logistic regression. Finally, variables associated with the KP of oxygen therapy nurses working in paediatric units were identified on the basis of the adjusted odds ratio (AOR), with a 95% CI and p-value 0.05.

4.10. Ethical consideration

The Institutional Review Board (IRB) of Addis Ababa University, the Department of Nursing and Midwifery, and the Hawassa City Health Bureau all provided their ethical approval before each facility was notified of the study's objective in order to get their consent and collaboration. Participants were advised that there was no benefit or risk to their participation in this trial, and signed agreement was acquired after obtaining the hospitals' approval to conduct the study. Finally, participants' confidentiality is maintained by using a locked file and keeping their anonymity throughout the research project during data collection and analysis.

4.11. Dissemination and Utilization of Findings plan

In order to improve hospital services, particularly to comprehend their level, identify gaps, and take measurements to improve service, the results of this study were presented and submitted to the nursing department, school of nursing and midwifery, College of Health Sciences, Addis Ababa University. They were also shared with the staff, authorities, and officials in the paediatric and child health departments at Hawassa Health Bureau. It was also presented at several seminars, and efforts were made to publish it, such as at the Federal Ministry of Health.

5. RESULT

5.1 Sociodemographic and institutional characteristics of participants

5.1.1 Sociodemographic characteristics of participants

In this study, 174 nurses from six different Hawassa selected hospitals were examined. 106 respondents (60.9% of them) identified as female. The age distribution of responders, which included more than half of the nurses, ranged from 23 to 31 years old, with a mean (SD) of 30.6 (4.857). The age ranges of the responders were, respectively, 23 and 49. 153 participants, or more than two thirds, had a first-degree earning. There were 64 (36.2%) nurses employed in pediatrics wards. 23 (13.2%) of the respondents had nursing experience of more than five years, whereas 66 (37.9%) had experience between two and five years.

Regarding monthly income, respondents were found to have a minimum of 6193 and a maximum of 9019 ETB. Based on marital status, 100 (57.5%) were married, and the remaining was single. All of the participants had work experience lasting more than 6 months. From the total nurses, 88 (50.6%) took oxygen therapy training, and the remaining did not. The other sociodemoghraphic variables and their categories were described **(Table 1)**.

Table 1:Socio-Demographic characteristics of Nurses in paediatrics unit of selected Hospitals in Hawassa City 2023

Variables	Categories	Frequency(n=174)	Percentage
Sex	Male	68	39.1
	Female	106	60.9
Age	23-31	109	62.6
	32-40	59	33.9
	41-49	6	3.5
Marital status	Married	100	57.5
	Single	74	42.5
Department currently working	Paediatrics OPD	31	17.8
	Paediatrics Emergency	54	31.0
	Paediatrics ward	64	36.8
	Paediatrics ICU	25	14.4
Working experience	6month to 1 year	26	14.9
	1year to 2 year	59	33.9
	2year up to 5 year	66	37.9
	>5 year	23	13.3

From a total of 174 nurses participants, more than two third, or 153 (87.9%), were BSc level; from these, 10 (5.7%) were MSc level; and the remaining 11 (6.3%) were diploma level.

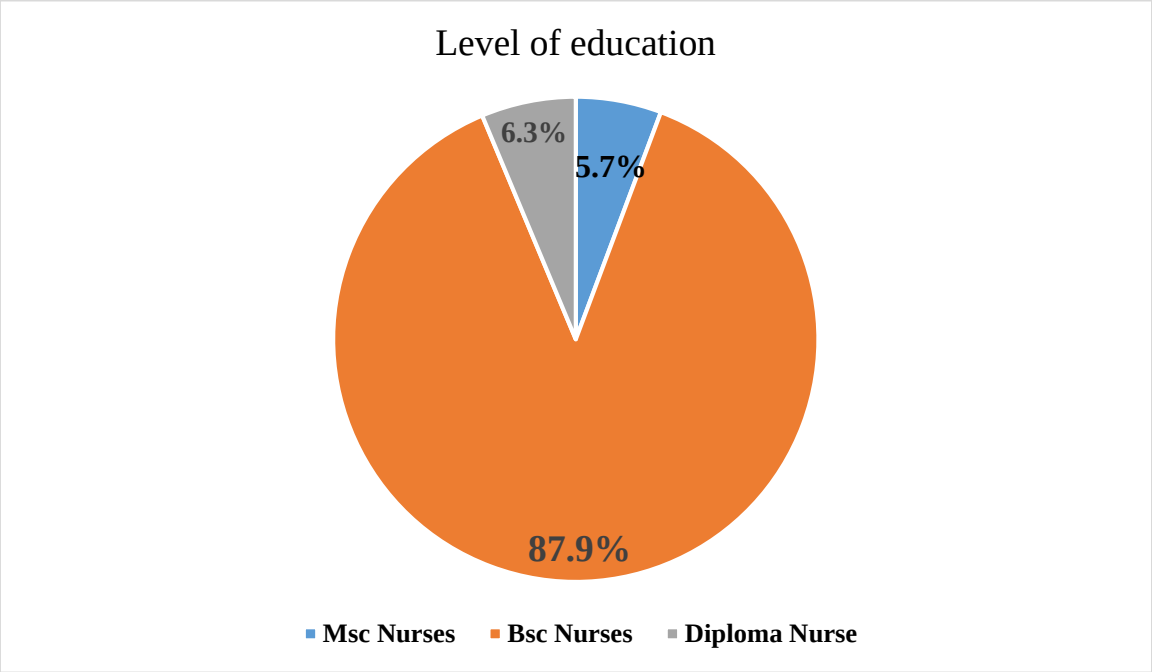

Figure 3: Education level of nurses working in paediatric unit of selected hospital in Hawassa city, Sidama region Ethiopia 2023.

5.1.2 Institutional characteristics of nurses

In institutional characteristics of nurses participants that describe the level of hospitals currently working in pediatrics units that participate, from a total of 174 participants, the highest number of participants were comprehensive specialized hospitals, which is 78 (44.9%), and the remaining were at referral and primary hospital levels, at 62 (35.6%) and 34 (19.5%), respectively.

From total participants 45 (25.9%) of the participants reported that there is no guideline about oxygen therapy in the unit where they are currently working. 89 (51.1%) of nurses reported there is an adequate supply of oxygen and delivery systems in their working units, rest reported inadequacy. 114 (65.5%) nurses reported that patients were administered oxygen without extra payment. 113 (64.9%) of respondents responded that they get oxygen cylinders equivalent to the label written. 106 (60.9%) of nurses reported periodic maintenance of oxygen delivery equipment. 112 (64.6%) nurses reported that work load affects oxygen therapy.

Regarding personal factors, of the total participants, 105 (60.3%) got information about oxygen therapy through medical or nursing training; 28 (16.1%) got it through in-service training; 33 (19%) got it through formal education in colleges or universities; and the remaining 8 (4.6%) got it through reading books and journals. On the other hand, about the format in which physicians order oxygen therapy, 93 (53.4%) said that it was in written form, and the remaining others said through oral order 42 (24.1%) and telephone order 39 (22.4%).

Table 2: Institutional character of Nurses towards Oxygen Therapy among nurses working in paediatrics unit of the selected Hospitals in Hawassa, Ethiopia, 2023

Variables	Categories	Frequency(n=174)	Percentage (%)
Level of hospitals	Primary hospitals	34	19.5
	Referral hospitals	62	35.6
	Comprehensive	78	44.9
Guidelines to use O_2 therapy in your ward	Yes	129	74.1
	No	45	25.9
Adequate supply of O_2 and delivery systems	Yes	89	51.1
	No	85	48.9
Presence of periodic maintenance of O_2 delivery in your unit	Yes	106	60.6
	No	68	39.1
Presence of workload of burden that affect oxygen therapy	Yes	112	64.4
	No	62	35.6
Last time you administer oxygen	<6 month	117	67.2
	6-12month	41	23.6
	> 12 month	16	9.2

5.2 Knowledge of Nurses on Oxygen Therapy in Paediatric Units

5.2.1 Knowledge level of the participant towards OT

This study revealed that 77 (44.3%) of the participants had low understanding about oxygen treatment, whereas 97 (55.7%) of the participants had strong knowledge. The participants' knowledge ratings on oxygen treatment ranged from 8 (0.6%) to 25 (11.5%), with a standard deviation of 4.156.

Respondents were divided into two groups based on their scores (excellent knowledge and bad knowledge) after answering 25 knowledge-based questions on oxygen treatment. As a result, the mean and above (i.e., 16.5) are regarded as "good knowledge" and the remainder as "poor knowledge." The pediatrics unit nurses' mean knowledge score at Hawassa chosen hospitals

was 16.48 (65.9%; SD = 16.63%).Depending on their mean score, their knowledge level was described as 55.7% good knowledge and 44.3% poor knowledge.

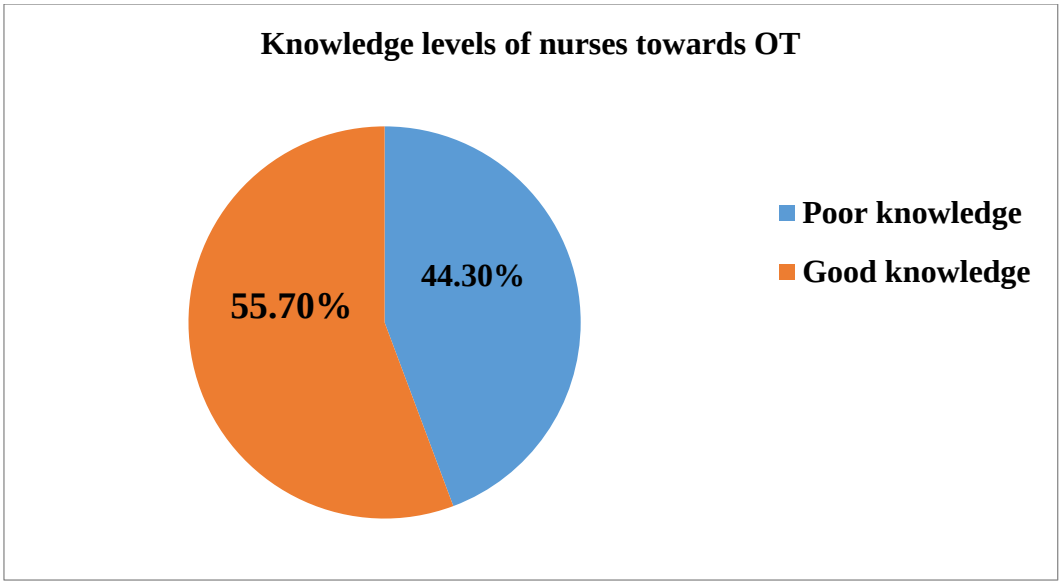

Figure 4: Knowledge level among nurses working in paediatrics units of selected hospitals in Hawassa city about oxygen therapy 2023:

5.2.2 Nurses' Knowledge toward oxygen therapy based on educational level

The knowledge levels of nurses in their respective classification as MSc, BSc and diploma nurses. From total of 10 MSc nurses their knowledge level was 1(10.0%) and 9 (90.0%) as poor and good knowledge respectively. From total of 153 BSc nurses their knowledge level was 70 (45.8%) and 83 (54.2%) respectively as poor and good knowledge respectively. The remaining part was from diploma nurses and they were 11 in total and from them poor knowledge level account for about 6 (54.5%) and the remaining had good knowledge level of about 5 (45.5%) from the participants and it is also described in bar chart below.

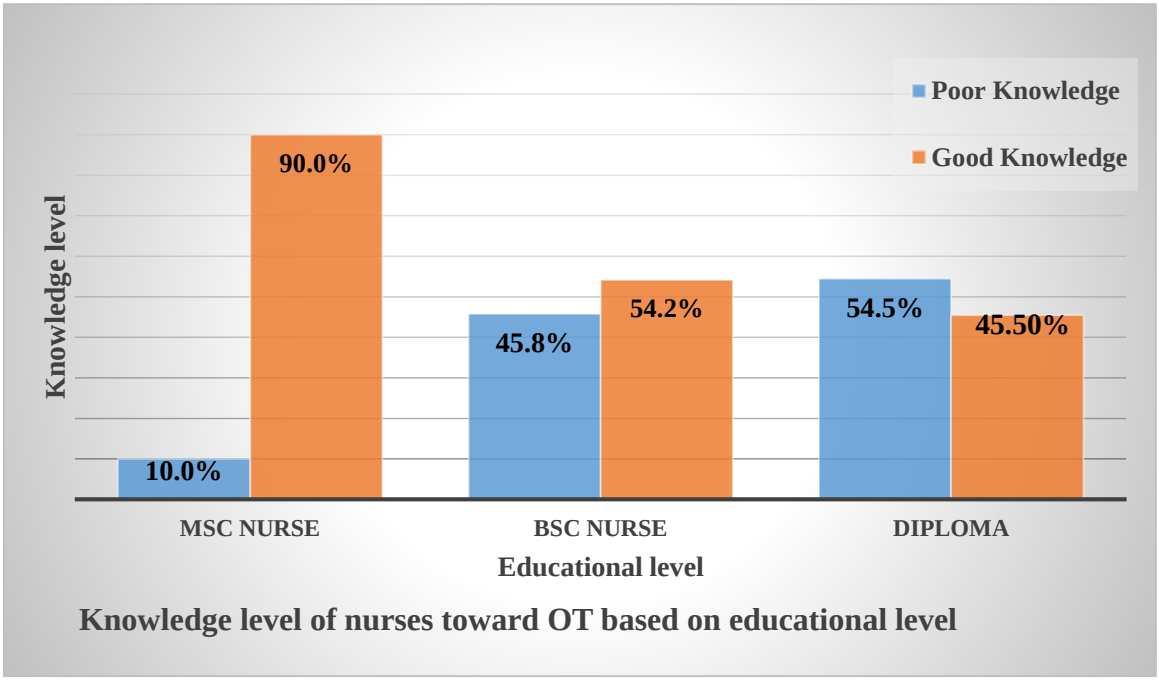

Figure 5: Knowledge level towards oxygen therapy among nurses working in paediatrics unit of selected hospitals in Hawassa city based on their educational level, 2023

5.2.3 Nurses' Knowledge toward oxygen therapy based on hospitals level

From this finding from total of 174 (100%) participants were involved and from the total of 34(44.1%) who were working in primary hospital had good knowledge and from them 19(55.9%) had poor knowledge level. From total of who were working in general hospital of 24(38.7%) had poor knowledge and from them 38(61.3%). From total of 78 of nurses who are working in comprehensive specialized university hospital 34 (43.6%) had poor knowledge and from them 44(56.4%) had good knowledge level. The others were described in the following bar graph **6 below** which depicts the knowledge level toward oxygen therapy among nurses working in pediatrics unit of selected hospitals in Hawassa.

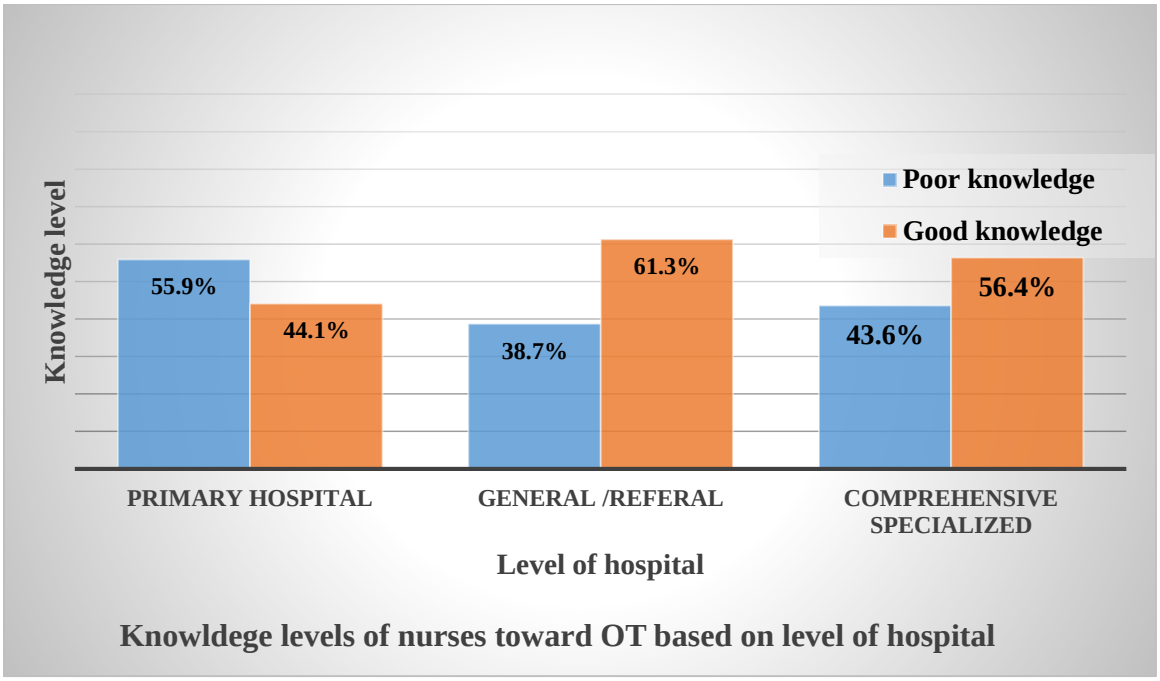

Figure 6: knowledge levels of nurses towards oxygen therapy based on level of hospitals nurses working paediatrics units in Hawassa city 2023

5.2.4 Knowledge score of nurses based on some knowledge questions

From total 174 nurses 120(69%) knows about the use of oxygen therapy while the remaining 54(31%) didn't know about the use of oxygen therapy in children. On the other hand 104(59.8%) amount of oxygen to be delivered by non-rebreathe facemask in children and others didn't appropriately know about amount of oxygen to be delivered by non-rebreathe facemask. From total 111(63.8%) know about use of blood gas analysis and 63 (36.2%) didn't know about the use of blood gas analysis and the remaining knowledge questions were described in **table 3** below.

Table 3: Score of nurses for basic knowledge question towards oxygen therapy by nurses working in paediatrics units of the selected Hospitals in Hawassa, Ethiopia, 2023		
Variables	Responses	
	Answered	Not answered
Normal requirement of oxygen for neonates	121(69.5%)	53(30.5%
Normal requirement of oxygen for under five children	120(69%)	54(31%)
Conditions needed for oxygen therapy	111(63.8%)	63(36.2%)
Devices required for administering OT for children	119(68.4%)	55(31.6%)
Oxygen toxicity occur to the children	105(60.3%)	69(39.7%)
Sign of oxygen toxicity	116(66.7%)	58(33.3%)
Normal breathing rate for toddler (1-3years) in BPM	110(63.2%)	64(36.8%)
Conditions that affect pulse oximetry reading	126(72.4%)	48(27.6%)
Supplemental O_2 is contraindicated for untreated pneumothorax	108(62.1%)	66(37.9%)
Amount of oxygen to be delivered by nasal canulla	105(60.3%)	69(39.7%)
Amount of oxygen delivered by simple face mask in paediatrics	100(57.5%)	74(42.5%)
Oxygen is like any other medications	117(67.2%)	57(32.8%)
Documents after administration oxygen therapy	122(70.1%)	52(29.9%)
Oxygen should only give after doctors prescription	118(67.8%)	56(32.2%)
Oxygen is not medication but supportive	105(60.3%)	69(39.7%)
Hypoxia in children can be recognize	125(71.8%)	49(28.2%)
High percentage of o_2 via non rebreathe mask indicated for	124(71.3%)	50(28.7%)
Conditions oxygen therapy indicated in children	123(70.7%)	51(29.3%)
Symptoms of central cyanosis	117(67.2%)	57(32.6%)
Oxygen therapy indicated patient with hypoxia	119(68.4%)	55(31.6%)
Child with anaemia may have oxygen related symptoms	121(69.5%)	53(30.5%)
Oxygen level during convulsion and restless child	101(58%)	73(42%)

5.3 Practice of nurses towards oxygen therapy

Regarding nurses practice their mean practice score from 16 practice questions is 10.82(67.67%) with SD = 3.1 (19.37%). The lowest score was 4(1.1%) whilst the highest score was 16 (13.3%). The level of practice of nurses toward oxygen therapy was dichotomized as Good with their practice score of ≥ mean and poor with their practice score of < their scored mean. From all of the participants 85 (48.9%) had poor practice towards oxygen therapy, while 89 (51.1%) had good practice towards oxygen therapy.

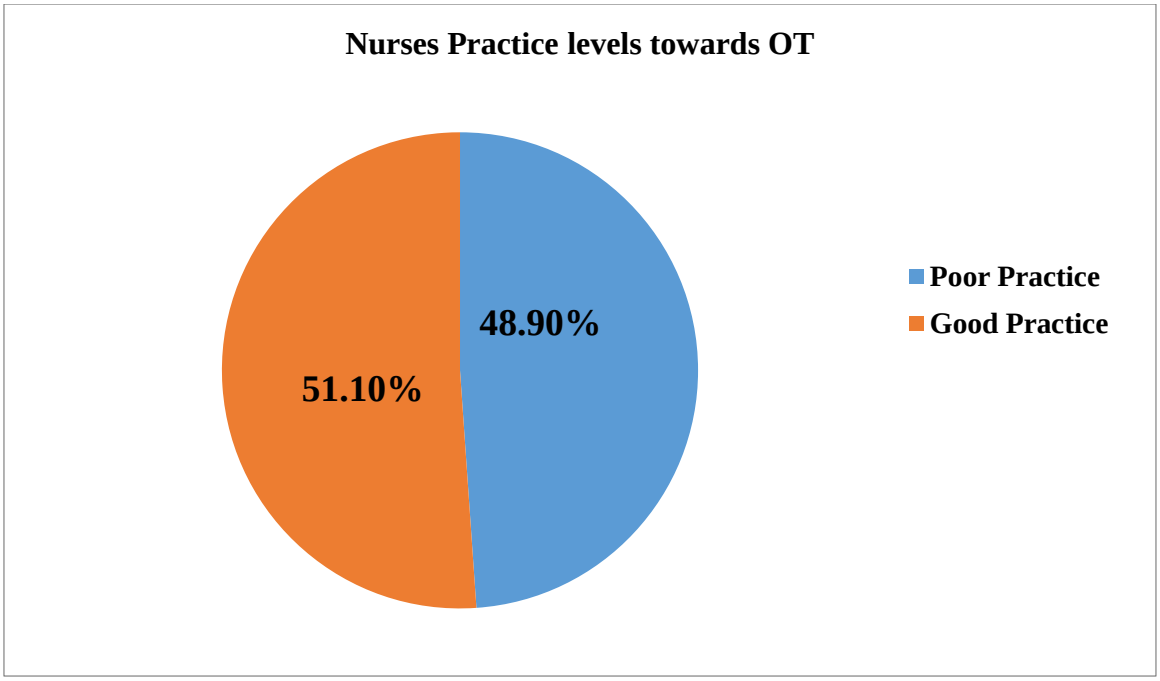

Figure 7: Practice level of participants about oxygen therapy among nurses working in paediatrics units of selected hospitals in Hawassa city 2023

5.3.1 Nurses' Practice toward oxygen therapy based on educational level

The practice score of nurses in their respective classifications as MSc, BSc, and diploma nurses A total of 10 MSc nurses scored practical levels of 2 (20.0%) and 8 (80.0%) as poor and good practice, respectively. From the total of 153 BSc nurses, their Practice scores were 75 (49.0%) and 78 (51.0%), respectively, as poor and good Practice. The remaining parts were from diploma nurses, and they are 11 (6.3%) in total, and from them, 8 (72.7%) had a poor practice level, and the remaining 3 (23.3%) had a good practice. The practice levels of the remaining two educational level participants were also described in bar chart 8 below.

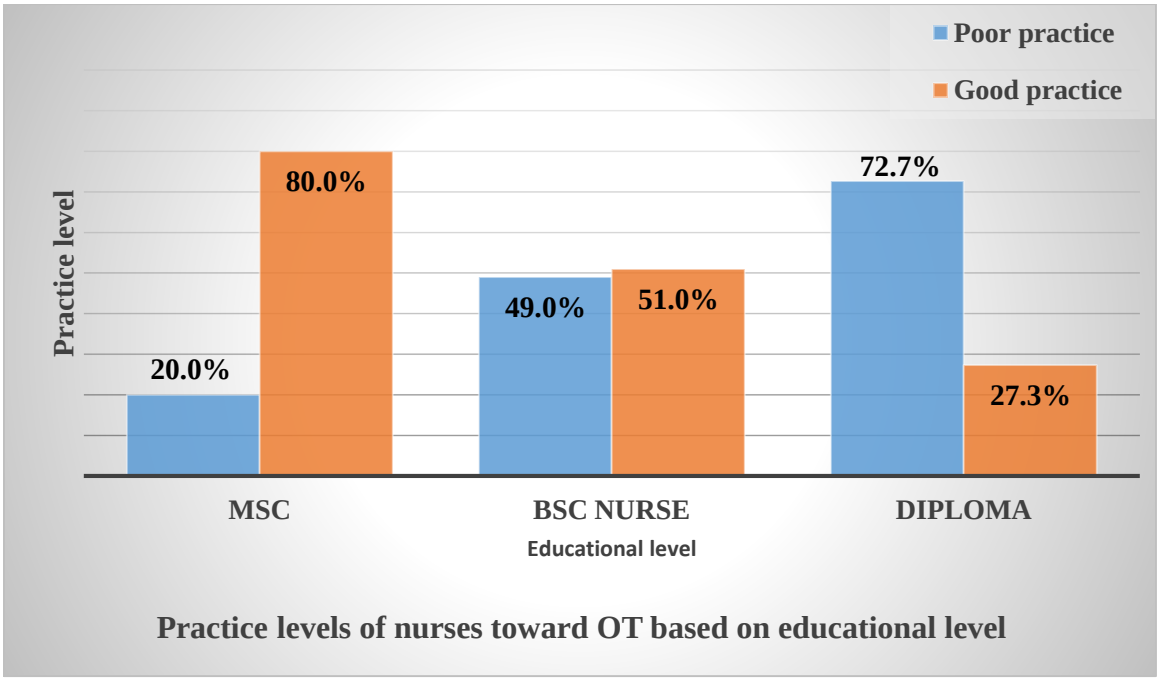

Figure 8: Practice level of participants towards oxygen therapy among nurses working in paediatrics unit of selected hospitals in Hawassa city with their level of education, 2023

5.3.2 Nurses' Practice toward oxygen therapy based on level of hospitals

From this finding, a total of 174 (100%) participants were involved, and of the total of 34 who were working in primary hospitals, had a poor practice level of 27 (79.4%), and the remaining had a good practice level of about 7 (20.6%). From nurses who are working in comprehensive specialised university hospitals, their practice levels were 27 (34.8%) for poor practice and 51 (65.4%) for good practice towards oxygen therapy. From the total nurses who are working in referral hospitals 31 (50.0%) had good practice and 31 (34.8%) had poor practice levels towards oxygen therapy respectively. Total practice level was 51.1% for good practice and 48.9% for poor practise, and also described in **bar chart 9** below.

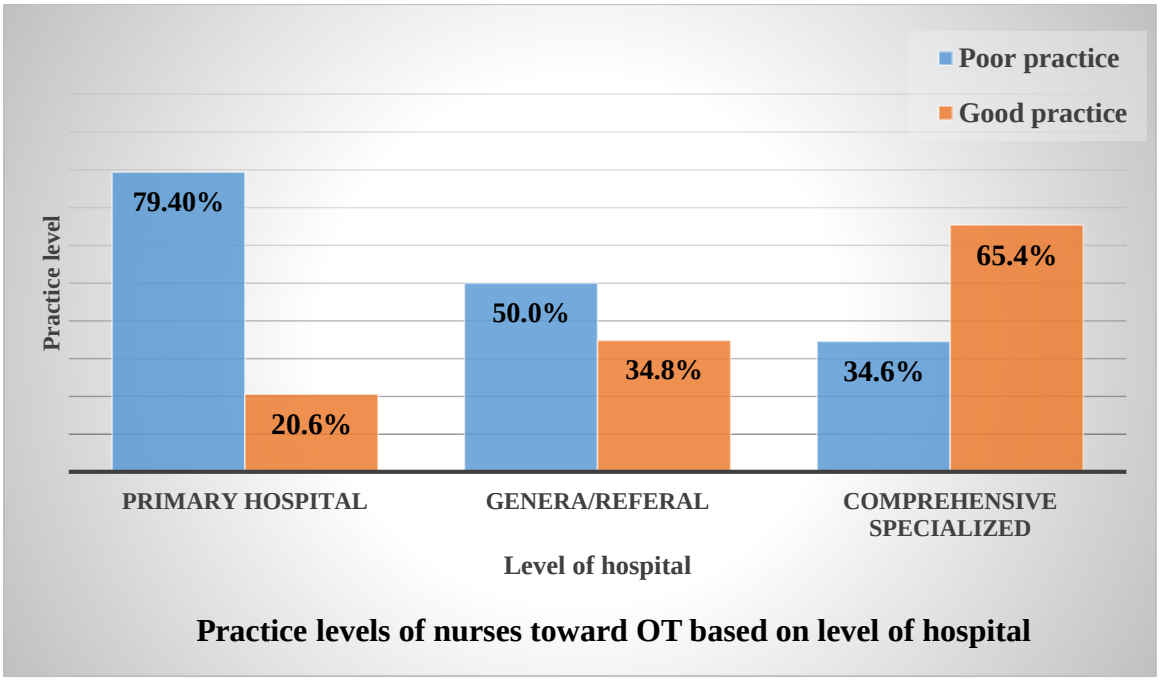

Figure 9: Practice level of participants towards oxygen therapy among nurses working in paediatrics unit of selected hospitals in Hawassa city based on level of hospitals, 2023

5.3.3. Practice of nurses toward OT on basic practice question

All participants in this study appropriately answered all the questions. From the total participants, around 98 (56.3%) appropriately gave oxygen initially for respiratory failure, and others 76 (43.7%) didn't practice appropriately giving oxygen initially for respiratory failure. In terms of using pulse oximetry at the appropriate time, 111 (63.8%) used it at the appropriate time, while 63 (36.2%) did not. From the participants, 130 (74.7%) checked the vital signs of patients before administration of oxygen, and 44 (25.5%) didn't follow the vital signs before administration of oxygen. From those 174 nurses, 124 (95.38%) appropriately measured vital signs for a patient when the patient arrived at the hospital to seek treatment, and 6 (4.6%) did not appropriately measure since they only measured in an emergency situation only. The remaining was described in (table 4):

Table 4: Frequency Distribution of Nurses‟ Practice Score towards Oxygen Therapy Working in Paediatrics units of the Selected Hospitals in Hawassa, Ethiopia, 2023		
Variables	Responses	
	Answered	Not answered
Best in pulse oximetry practice	116(66.7%)	58(33.3%
Measuring oxygen saturation in the same hand and with BP cuff	114(65.5%)	60(34.5%)
Attaching humidification device during oxygen administration	121(69.5%)	53(30.5%)
Types of patients who needs humidification's from listed equipment's user	108(62.1%)	66(37.9%)
Methods needed to reduce side effect associated with dry gas administration	108(62.1%)	66(37.9%)
Effects of collections of water in oxygen administration tube	125 (71.8%)	49(28.2%)
Ways of applying mouth care for preventing dryness and inflammation	122(70.1%)	52(29.9%)
Number of children sharing one oxygen cylinder in your unit	114(65.5%)	60(34.5%)
Needed time you changed humidifier water	114(65.5%)	60(34.5%)
Types of liquid needed to humidification's	133(76.4%)	41(28.6%)
Mechanisms to use pulse oximetry	118(67.8%)	56(32.2%)
Ways of using pulse oximetry during daily monitoring patients	128(73.6%)	48(26.4%)

5.4 Factors Associated with Nurses' Knowledge and Practice Regarding Oxygen Therapy

5.4.1 Association among nurses' Knowledge about oxygen therapy

This study found that there was no significant association in bivariate and multivariate logistic regression analysis with the knowledge levels of the participants in terms of sex, marital status, department in which they are currently working, monthly income, source of information, and format used to prescribe oxygen.

But there was a significant association with the knowledge levels of the participants in terms of their level of education, age, work experience, level of hospital in which they were working, whether they had ever received any oxygen therapy training and the presence of updated guidelines about oxygen therapy in the hospitals where associated with their knowledge about oxygen therapy in a bivariate logistic regression analysis. After bivariate analysis, only those variables that were significantly associated (p-value<0.25) with knowledge were entered for further multivariate analysis. By adjusting potential confounders in multivariate logistic

regression analysis.In multivariable logistic regression analysis, level of education in a p value of 0.048 for BSc nurses was significantly associated with knowledge of nurses. Nurses with a BSc (89.2%) are less likely to have good knowledge than MSc holders in the COR and AOR of 0.132 (0.01-1.06) and 0.108 (0.012-0.98), respectively. On the other hand, nurses who received updated training were significantly associated with the knowledge in a p value of 0.001 with the [COR: 4.77; 95% CI (2.5-9.1)] and [AOR: 4.07; 95% CI (1.8-9.2)]. Nurses who received update training four times more likely knowledgeable than not take training.

Table 5:Bivariate and multivariate analysis showing association of independent variables with the knowledge level of participants toward towards oxygen Therapy in selected hospitals of Hawassa, Ethiopia, 2023

Variables with categories		Knowledge level		COR(95%CI)	P-Value	AOR(95%CI)
		Poor N (%)	Good N (%)			
Age	21-31	44(25.3%)	65(37.4%)	1		1
	32-40	32(18.4%)	27(15.4%)	0.57(0.3-1.08)*	0.086,0.52	0.81(0.38-1.74)
	42-49	1(0.6%)	5(2.9%)	3.38(0.38-29.9)	0.273,0.90	0.98(0.07-13.9)
Education level	MSc	1(0.6%)	9(5.2%)	1		1
	BSc	70(40.2%)	83(47.7%)	0.13(0.01-1.06)*	0.057,0.03	0.108(0.012-0.98)*
	Diploma	6(3.4%)	5(2.9%)	0.093(0.009-1.0)*	0.050,0.086	0.1(0.009-1.6)
Experience	6m – 1 year	10(5.7%)	16(9.2%)	1		1
	1year-2year	27(15.5%)	32(18.4%)	0.74(0.28-1.89)	0.532,0.873	0.89(0.32-2.53)
	2year-5year	35(20.1%)	31(17.9%)	0.55(0.21-1.39)*	0.211,0.398	0.62(0.23-1.31)
	>5year	5(2.9%)	18(10.3%)	2.25(0.63-8.0)*	0.210,0.337	2.22(0.46-10.66)
Level of hospitals	Primary	19(10.9%)	15(8.6%)	1		1
	General	24(13.8%)	38(21.9%)	2.006(0.8-4.6)*	0.108,0.312	1.55(0.609-4.18)
	CSH	34(19.5%)	44(25.3%)	1.64(0.7-3.6)*	0.233,0.530	1.35(0.55-5.34)
Training	No	54(31%)	32(18.4%)	1		1
	Yes	23(13.2%)	65(37.4%)	4.77(2.5-9.1)**	0.000,0.001	4.07 (1.8-9.2)**
Guideline	Yes	50(28.7%)	79(45.4%)	1		1
	No	27(15.5%)	18 (10.4%)	0.42(0.21-0.84)*	0.015,0.873	1.09(0.47-2.54)

*Key: *P value<0.05 = Significant, ** = Highly significant, 1= reference, COR=Crude odds ratio, AOR=Adjusted odds ratio, N (%) = number (knowledge level in percentage, CSH=comprehensive specialised hospital*

5.4.2 Association among on nurses' Practice towards oxygen therapy

The study found no correlation between nurses' practice and their sex, income, work experience, information source, or oxygen content in the cylinder. While in bivariable and multivariate logistic regression analysis, participants' age, marital status, level of education, departments they work in, receiving updated training, hospital level, presence of guidelines in the hospital, last time to administer oxygen, maintenance of equipment's, and way of ordering

by physician significantly associate nurses' practice towards oxygen therapy. From the finding that working in ICU had six times more likely good practice than working in OPD in the p value of 0.015 and with COR: 3.36; 95% CI (1.1-10.1)] and [AOR: 6.13; 95% CI (1.42-26.5)], and the others were described in table 6 below:

Table 6: Bivariate and multivariate analysis showing association of independent variables with the Practical level of participants toward towards Oxygen therapy in selected Hospitals of Hawassa, Ethiopia, 2023

Variables with categories		Practice level		COR(95%CI)	P-Value	AOR(95%CI)
		Poor N (%)	Good N (%)			
Age	21-31	51(29.3%)	58(33.3%)	1		1
	32-40	29(16.7%)	30(17.2%)	0.910(0.48-1.7)	0.910,0.169	1.87(0.76-4.5)
	42-49	5(2.9%)	1(0.6%)	0.176(0.02-1.5)*	0.176,0.032	0.04(0.002-0.75)*
Education level	MSc	2(1.1%)	8(4.6%)	1		1
	BSc	75(43.1%)	78(44.8%)	0.26(0.05-1.2)*	0.095,0.068	0.16(0.02-1.14)
	Diploma	8(4.6%)	3(1.7%)	0.09(0.01-0.7)*	0.023,0.014	0.044(0.004-0.5)*
Marital status	Married	57(32.8%)	43(24.7%)	1		1
	Single	28(16.1%)	46(26.4%)	2.17(1.18-4.0)*	0.013,0.013	2.98(1.26-7.05)*
Dep.t of working	OPD	19(10.9%)	12(6.9%)	1		1
	ER	30(17.2%)	24(13.8%)	1.267(0.5-3.11)	0.607,0.502	1.47(0.47-4.57)
	Ward	28(16.1%)	36(20.7%)	2.04(0.84-4.8)*	0.111,0.129	2.35(0.78-7.08)
	ICU	8(4.6%)	17(9.8%)	3.36(1.1-10.1)*	3.365,0.015	6.13(1.42-26.5)*
Level of hospitals	Primary	27(15.5%)	7(4.0%)	1		1
	General	31(17.8%)	31(17.8%)	3.86(1.4-10.1)*	0.006,0.044	3.2(1.03-10.1)*
	CSH	27(15.5%)	51(29.3%)	7.29(2.8-18.9)*	0.000,0.000	9.9(3.08-31.9)*
Took Training	No	55(31.6%)	31(17.8%)	1		1
	Yes	30(17.2%)	58(33.3%)	3.43(1.84-6.4)*	0.000,0.005	3.77(1.48-9.6)*
Guideline	Yes	55(31.6%)	74(42.5%)	1		1
	No	30(17.2%)	15(8.6%)	0.37(0.18-0.76)*	0.006,0.482	0.68(0.23-1.98)
Maintenance	Yes	45(25.9%)	61(35.1%)	1		1
	No	40(23.0%)	28(16.1%)	0.5(0.27-0.96)*	0.036,0.437	0.72(0.3-1.65)
Order Format	Written	41(23.6%)	52(29.9%)	1		
	Oral order	19(10.9%)	23(13.2%)	0.95(0.46-1.99)	0.901,0.297	1.7(0.62-4.7)
	Telephone	25(14.4%)	14(8%)	0.44(0.2-0.95)*	0.038,0.134	0.46(0.16-1.27)
Last time	<6month	49(28.2%)	68(39.1%)	1		1
	6-12month	24(13.8%)	17(9.8%)	0.5(0.25-1.05)*	0.068,0.041	0.34(0.12-0.96)*
	>12month	12(6.9%)	4(2.3%)	0.24(0.07-0.79)*	0.019,0.019	0.15(0.03-0.74)*

*Key: P value<0.05 *= Significant, 1= reference, COR=Crude odds ratio, AOR=Adjusted odds ratio, CSH=comprehensive specialised hospital ER= Emergency room*

6: DISCUSSION

This study was aimed at assessing knowledge and practice of oxygen therapy and its associated factors among nurses working in the paediatric unit of selected hospitals in Hawassa, Ethiopia.

In this study population, around 106 (60.9%) were females and 68 (39.1%) were males. This finding was similar to that of a study done in Addis Ababa with participants of sex: 94 (61.8%) were female (31). In the study population around two-thirds, or 174 (64.8%), of participants were included in the study, and from them, 62.6% were in the age group of 23–31 years old, and their mean age was 30.6 with a SD of 4.857, this finding was in line with the study conducted in Mekele with the participants mean age of 30.7 (SD = 4.4) years (43). Based on their educational background, more than two-thirds, or 153 (87.9%), were BSc degree holders, and the finding was more than the study conducted in Addis Ababa (31), the discrepancy in the finding might be due to the study year and population. Based on their department currently working ,from total participants nurses working in PICU were 25(14.4%), and this finding was in line with the study conducted in Mekele which is 16(8.9%).

The finding of this study indicated that the good knowledge level of nurses toward oxygen therapy was 58.2%. This finding was congruent with the study done in Mekele, which found that 57.8% of nurses have good knowledge toward oxygen therapy (43). Although studies done in Uganda and Rwanda's public hospitals found that the total knowledge score of nurses was 76% and 87.7%, respectively (27,39) , this finding were higher than this study. This disparity might be attributed to a lack of oxygen therapy training, socio-demographic variables, variances in job experience, a study time gap, or a study setting difference and study populations.

Another similar study conducted in Egypt with knowledge score of about 18% and Addis Ababa was 36.2% for good knowledge (29,31) and it was lower than this study finding. The discrepancy might be due to study period and setting. The study conducted in Turkey about knowledge of nurses toward oxygen therapy found that 63.5% of nurses have good knowledge toward OT (33), which is comparable this study finding that discrepancy might be due to study setting, period and population. This study finding was higher than the finding from Addis Ababa and Egypt as its difference might be mainly due to study period and setting.

From this study finding from total participants about knowledge tool around two third of participants or 108 (62.1%) were aware that administering oxygen therapy is contraindicated for untreated pneumothorax and this finding was higher than the study conducted in South Gondar in Debre tabor hospital with the finding of 27 (25.7%), this discrepancy was mainly might be due to study period and setting (25).

This finding was similar with a study in Debre Tabor General Hospital in South Gondar among nurses showing that 63 (60%) of nurses working in the emergency department were aware of the use of oxygen therapy for hypoxia treatment. About the use of a non-rebreathing face mask with a reservoir bag to supply a higher oxygen concentration than a nasal prong, 124 participants (71.3%) were aware of its use and 50 (28.7%) were not aware, and this finding was higher than the study conducted in South Gondar, where 52.2% of participants were not aware of the use of a non rebreathe face mask for a higher oxygen supply when needed (25).

Receiving any updated training on oxygen therapy as continuous professional development training or any in-service training was highly significantly associated with the knowledge of nurses with a p value of 0.0001 and [AOR: 4.07; 95% CI (1.8–9.2)]. From this finding, nurses who received any updated training on oxygen therapy are four times more likely to have good knowledge than those who haven't taken any training on oxygen therapy. This finding was in line with the study done in Addis Ababa that training has association on the knowledge of nurses toward oxygen therapy with in the p value of <0.05 (31).

This study also described that educational level has a significant effect on the nurses' knowledge towards oxygen therapy with [AOR: 0.108; 95% CI (0.012–0.98)] and p value <0.05, as diploma-level nurses are 89.2% less likely to have good knowledge than masters-level nurses. This finding was in line with the quasi experimental study done in Egypt about effect of educational programme on the nurses knowledge and practice toward oxygen therapy with in the p value of highly significant as <0.001 (48).

On the practice assessment of oxygen therapy, the results show that out of 174 respondents, 89 (51.1%) have good practice of oxygen therapy, while 48.9% have poor practice. This study is in line with the study done in Gondar among nurses and Nigeria on medical professionals, which shows 53% and 51.8%% of the participants had good practice respectively (2,25).

In this study age, educational level, marital status, level of hospitals, department in which they are working, whether they ever took updated training, and the last time they administered oxygen had association on the nurse's practice towards oxygen therapy with in the p value of less than 0.05 and the finding was also in consistent with that of stud done in Mekele with the p value of less than 0.05 (43). This study finding describes that last known duration where nurses administer oxygen was also significant; in the p value of less than 0.05 and nurses who administer oxygen therapy with 6–12 months ago were found to be 66% less likely practice than those < 6 months ago [AOR 0.34;95% CI (0.12-0.96)] and those who administer >12 months ago where 85% less likely to have good practice than those who administered < 6months ago, this finding was inline with study done in Mekele as nurses who administered oxygen within 6 months were 9 times more likely to have good practice than nurses who administered >12 month ago (43) . In this study about format that physician order for nurses to administer oxygen nurses who administer through telephone order were found to be 56% less likely to practice than nurses who administer through written prescription in bivariate analysis, it was in line with study conducted in Mekele that nurses who practice through written order were 2.1 times higher than oral and telephone order (43). This implies that nurse's practice toward oxygen therapy could be improved by employing standard guidelines in the work unit, routinely administering oxygen therapy and administering oxygen therapy with written order from physicians.

The result of this study suggests that using guideline in the practice time had association in the bivariate analysis with a P value of 0.006 [COR: 0.372; 95% CI: (0.182–0.757)]. In this study, the participants who practiced without guideline were 32% less likely to have good practice than with guideline, it was congruent with a study done in Egypt that described that guideline has association on the practice of OT with p value of <0.001 (48).

Therefore, based on this finding, the study supports the need for adequate updated training for nurses, fulfilling hospitals with materials and guidelines, and encouraging nurses to upgrade their educational level to increase their knowledge and practice of oxygen therapy.

7: STRENGTH, LIMITATIONS, CONCLUSION AND RECOMMENDATION

7.1: Strength and Limitations

The research objectives are thoroughly addressed by the study, which is the main purpose of the investigation. Despite its strengths, this study had some limitations, and thus practice should be assessed by an observational checklist. As main issue design of the study is somewhat difficult to measure the association of outcome variable with independent variables. That should be considered in future research. Also, the self-reporting nature of the data collection is a limitation in that some participants might have information bias. Another limitation is the mode of data collection in the work setting itself. Some of the participants are busy during their usual work hours and may have read the questionnaire with incomplete concentration; this could have led to some information bias.

7.2. Conclusion

According to the findings of this study, there is a knowledge and practice gap in oxygen therapy among nurses working in Hawassa hospitals.

This study also shows that there is association of taking updated training, presence of updated guideline, upgrading educational level, making level of hospitals and department working in higher level or well equipping on knowledge and practice of participants toward oxygen therapy.

7.3. Recommendation

- **For Nurses:**
    - Update their knowledge and practice towards OT.
    - To upgrade their educational level in joint work with the hospital managers and directories.
- **For head nurses and hospital directors:**
    - To post wallpapers and posters should be posted at pediatric departments and wards with doses, duration, and proper technique of OT.
    - To facilitate updated training on time for nurses about oxygen therapy.
    - To upgrade the nurses' educational level to a higher level.
    - Facilitate training for nurses from each unit the hospitals.
- **For the Ministry of Health:**
    - To explore extending patient care medicine guideline with appropriate oxygen therapy delivery systems throughout the country.
    - To engage in nurses training and guideline development for OT.
    - To deliver materials needed as wall paper, posters and updated training materials for nurses and hospitals.
    - To examine local oxygen policy in accordance with national requirements, arrange for staff education, and ensure that oxygen prescription and monitoring could be accomplished on drug and observation charts.
- **For future researchers:**
    - To consider the observational and experimental study to assess the knowledge and practice toward oxygen therapy among study participants.

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9: APPENDIX

Appendix: I. Participant Information Sheet for the Study

Dear Madam, Miss, Sir,

My name is Bezawit Berhanu. Currently, I am a candidate in pediatrics and child health graduate nursing at AAU, College of Health Science, and Department of Pediatrics and Child Health Nursing. And kindly, I request your participation in this study titled "Knowledge and Practice of Oxygen Therapy and Associating Factors for Nurses Working in Pediatrics Units at Hawassa City Selected Hospitals, Sidama Region, Ethiopia," with the aim of assessing knowledge and practice of oxygen therapy and determinant factors regarding nurses working in pediatrics units.

Objective: This study is aimed at identifying nurses' knowledge and practice and determinants factors towards nurses working in paediatric units in selected hospitals in Hawassa city.

Participants: Randomly selected nurses having equal or greater than six months (6 months) of work experience in the pediatrics unit in selected hospitals in Hawassa city.

Potential Risks: There is no foreseen risk from participating in this study.

Benefits: No financial benefit will be related to this study.

If you can take a few minutes from your busy schedule to complete the accompanying questionnaire, it would be greatly appreciated. There are no correct or incorrect responses; simply select the one that best reflects your observations.

Your voluntary participation in this study will be kept completely secret, and any information you submit will remain anonymous. Your participation in this study is much welcomed and will make a vital contribution to the enhancement of care quality in paediatric oxygen management. These surveys will be used just for my proposal and will be deleted after being tabulated. There will be no attempt to connect you to the answers. You may also choose not to participate in this study, or if you get uncomfortable throughout the study, you may leave at any moment.

Will you be willing to participate in the study? Yes or no (circle their response).

Yes, continue, and thank you very much for taking part in this study. If not, stop and say thanks.

Appendix II. Consent form

In signing this document, I am giving my consent to participate in the study entitled Knowledge and Practice of Oxygen Therapy and Determinant Factors in Nurses Working Pediatrics in Selected Hospitals and Health Institutions in Hawassa City, Ethiopia," with the aim of assessing nurses' knowledge and practice of oxygen therapy and determinant factors regarding oxygen management. I have been informed of the purpose of this research project, and I understand that I am selected to participate in this study randomly. I have been informed that my participation in this study is voluntary and voluntary. I have the right to refuse or interrupt the filling of the questionnaire, and my name will not be mentioned on the questionnaire. I, the undersigned, have understood the purpose of the study and fully agree to participate in it.

I have been assured that I have the right to ask for information that is not clear about the research before or during the research work and to contact:

Principal Investigator's Name: Bezawit Berhanu Tel: +251925633511

Supervisor's Name and Address: _____

Signature of the participant_____

Date _____ Thank you and has a nice day!

Appendix III. English version Questionnaire

Date_____ Hospital code_____

Instruction: Read each question carefully, tick [√] or encircle against the option that the best suits your response.

Part I: Questions related to nurses socio-demographic characteristic

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

Nº.	Socio-demographic Variables	Answer
101	Age in years?	_____Years
102	What is your gender?	1. Male 2. Female
103	Marital status?	1. Married 2. Single 3. Divorced 4. Widowed
104	In which department are you working currently?	1. Paediatrics OPD 2. Paediatrics emergence 3. Paediatrics Ward 4. Paediatrics ICU
105	What is your level of education?	1. MSc nurse 2. B.Sc. Nurse 3. Diploma nurse
106	Work experience in paediatric unit	1. 6 months-to 1 year 2. 1-2 year 3. 2-5years 4. >5years
107	How much is your Monthly Income?	_____ ETB

PART II: Questions to assess nurse's knowledge in oxygen therapy

Instruction: Please encircle your choice for the following questions.

Nº	Questions	Possible response
201	What is the advantage of oxygen therapy?	1.To treat hypoxia 2.Prevent hypoxia 3. All
202	What is a normal requirement of oxygen for neonates?	1.1Lt/min 2.2Lt / min 3.3Lt/ min 4.4lLt/ min
203	What is a normal requirement of oxygen for under five children?	1.1Lt/min 2.2Lt / min 3.3Lt/ min 4.4lLt/ min
204	Which of the following condition needed for oxygen therapy?	1. Acute hypoxemia 2.Pneumonia, 3.Shock 4.Asthma, 5.Heart failure 6.pulmonary embolism

		7.Pneumothorax 8.Carbon monoxide poisoning 9. Tension pneumothorax
205	Which devices are required to administer the oxygen therapy for children?	1.Face mask 2.Nasal prongs 3.Re-breather 4.Mask ventilator
206	Oxygen toxicity can occur in how much amount of oxygen to the child?	1.FIO2 >50% longer than 48hrs 2.FIO2 >20% longer than 48hrs 3.FIO2 >50% longer than 24hrs 4.FIO2 >20% longer than 48hrs
207	Which one of the following sign is for oxygen toxicity?	1. Blurred vision 2. Muscle twitching 3.Chest pain 4.Dehydrtion
208	What is the normal breathing rate for toddler (1-3 years) in breath per minute?	1.30-60 breath/minute 2.24-40 breath/minute 3.25-35 breath/minute 4.18-30 breath/minute
209	Which of the following conditions affect pulse oximetry readings?	1.Patient motion 2.Fitting 3.Carbon-monoxide poisoning 4.Anaemia 5.Nail polish 6.hypertermia
210	Supplemental oxygen is contraindicated for untreated pneumothorax?	1Yes 2No
211	The amount of oxygen to be delivered by non rebreathe face mask in paediatrics?	1.10-15 L/min 2. 0.25-4L/M 3.4-8L/M 4.9-12 L/M
212	What is the amount of oxygen delivered by nasal cannula in paediatrics?	1.0.25-4L/min 2.4-8L/M 3.13-15 L/min 4.9-12L/min
213	The amount of oxygen delivered by simple face a mask in paediatrics	1.0.25-4L/min 2 6-10L/M 3.9-12L /min 4.13-15 L/min
214	Oxygen therapy should be given same like other medication for the patients	1.Yes 2. No
215	What do you document after administration of oxygen therapy for your patient?	1.Date and time oxygen started 2. Method of delivery. 3. Oxygen concentration and flow rate. 4. Patient observation. 5. Add oronasal care to the nursing care plan
216	O_2 administration needs doctors" prescription	1. Yes 2. No
217	What is the importance of ABG? Give more than one answer?	1.Confirminghypoxemia 2.To confirm hypercarbia 3.For measuring blood PH 4. To measure base excess

218	O_2 is not medication but a supportive therapy?	1.Yes 2.No
219	When do you say hypoxemia in children's	1.If the child has SpO2 level < 90 % 2.Clinical symptoms like tachycardia 3.If the child has Normal blood PH(7.35-7.45)
220	High percentage oxygen via non-rebreathing mask is indicated for?	1.In child with emergency condition 2.In normal children 3.In traumatic injuries 4.Carbon monoxide poisoning
221	In which of the following condition oxygen therapy indicated in children?	1.Central cyanosis 2,Nasal flaring 3.Inability to drink or feed 4.Depressed mental state 5.Difficulty in breathing 6.All
222	What is the symptom of central cyanosis?	1.Generalized bluish discoloration of body 2. Visible mucous membranes 3.Presence of abnormal haemoglobin
223	Oxygen therapy indicated for patient with?	1.SPO_2< 90% when patient is thermodynamically stable 2.SPO_2< 94% if in emergency situation 3.Sepsis with hypo perfusion or shock 4. Alteration of mental status
224	A child with anaemia may have oxygen related symptoms as:	1.mild anaemia 2.Fast heart beat 3.shortness of breath
225	What happens to oxygen levels during convulsion and restless child?	1.The level of oxygen increase 2.The level of oxygen decrease

Part III. Self-reported practice related question regarding OT

Read each question carefully and circle the option in the column that the best suits your response**.**

No	Practical question	Possible response
301	A child had initial respiratory failure, select one correct initial concentration of oxygen to achieve a target saturation of 94-98%.	1.FiO2 of 60% 2.FiO2 of 20% 3.FiO2 of 150%
302	Which of the following is the best in pulse oximetry practice?	1. The wave form and/or signal strength must be optimal before a reading can be accepted 2. A blood pressure cuff on the arm of probe will lead to a false SPO2 reading 3. A blood pressure cuff on the arm of probe will lead to a correct oxygen saturation reading

303	Can you check the oxygen saturation in the same hand for a child have BP cuff in that hand?	1.Yes 2.No
304	Did you attach a humidification device during oxygen administration?	1.Yes 2.No
305	When you use a pulse oximeter?	1.Every child at admission (not just those with pneumonia) 2.All children at the time of admission to the ward 3.The progress of children 4.Any child who deteriorates
306	Humidification is essential for patients receiving oxygen through one the following device:	1.Endotracheal tube or a tracheostomy 2.Nasal Prong 3.Oxygen mask
307	Which of the following method help to reduce the risk of side effects associated with dry gas administration and to promote patient comfort?	1.Use face mask 2.Attach pulse oximeter probe 3.Use nasal cannula 4.Attach humidification device
308	What will be the effect of collection of water in the oxygen administration tube?	1.Can partially or completely occlude the flow of oxygen 2.Empty the collected water in the tubing as needed 3.Facilitates flow of oxygen and promote patient comfort
309	How do you apply mouth care and /or water based cream and /or petroleum jelly to prevent dryness and inflammation of lips and nose during oxygen therapy?	1.Help them to take frequent small drinks 2.Keep mouth and lips clean and moist 3.Apply gel to dry lips after brushing
310	Did you follow the patients' vital signs during oxygen administration?	1.Yes 2.No
311	If yes to question 310, when do you will check the vitals?	1.patients arrive at hospitals 2.if patients in emergence condition
312	How many children are sharing one oxygen cylinder for oxygen delivery in your unit/department?	1.2 children 2.3 children 3.4 children 4.sharing is not recommended
313	How often do you change the humidifier water?	1.Daily 2.Every other day 3.Within 2hour 4.As needed
314	What type of liquids do you used for humidification?	1. Water 2. Sterile water 3. Distil water 4. Normal saline
315	Arrange in chronological order about how to use a pulse oximeter? A. Have the child sitting comfortably in the parent's lap. B. Turn the pulse oximeter on. C. Attach the oximeter probe to the finger or toe of the child. D. Wait until there is a consistent pulse signal (this may take 20–30 seconds).	1. A B C D E F G H 2. C A D F H G B E 3 B A C D E F G H 4 D A C B H G E F

	E. Record the SpO2 on a monitoring chart 15 min after giving oxygen. chart. F. If the SpO2 is <90% the child should receive oxygen. – through nasal prongs or a nasal catheter – at a flow rate of 0.5–2 liters/minute continuously. G. Recheck the SpO2. H. Record the SpO2 on a monitoring	
316	For daily monitoring using pulse oximetry how do you use pulse oximetry put in chronological order? A. Oximetry should be used regularly to monitor any child clinical sign B. If the SpO2 >90% 10–15 minutes after coming off oxygen, leave off oxygen. C. Monitor the SpO2. D. Check the SpO2 again in one hour. E. Each day, record the SpO2 on the patient's monitoring chart, F. If the SpO2 is < 90%, resume oxygen. G. Take the child off oxygen	1. A B C D E F G 2. C A D F G B E 3 B A C D E F G 4 D A C B G E F

Part IV. Questions to assess factors affecting Nurses KP in oxygen therapy

Instruction: Please choose the appropriate answer for the following questions

4.1. Healthcare facility related factors		
Nº	Health care facility related variable	Possible Response
401	Level of hospitals you are currently working?	_____
402	Do you have the guideline for oxygen therapy in your unit Currently working place?	1.Yes 2.No 3.I don't know
403	Have you received any update/ special training on oxygen therapy?	1 Yes 2 No
404	Is there adequate supply of oxygen and delivery systems in your paediatrics working unit?	1.Yes 2.No
405	Do you get the amount of oxygen cylinder equivalent to the prescribed in the order sheet?	1.Yes 2.No
406	Is there periodic maintenance of oxygen delivery equipment's or devices?	1.Yes 2.No
407	Work load/ burden affects oxygen therapy in your paediatrics department?	1.Yes 2.No
408	What is your source of information concerning oxygen therapy?	1.Medical/Nursing training 2.In service training 3.Colleges 4.Journals 5. Print and electronic media
409	In what format does the physician prescribe oxygen	1. Written order

	therapy?	2. Oral order 3. Telephone order
410	How long has it been since you last administer oxygen to a patient?	1.<6month 2. 6-12 months 3. >12 months

Appendix IV Plagiarism Report

knowledge and practice of oxygen therapy and its associated factor among nurses working in paediatrics unit in selected hospitals Hawassa city, Ethiopia, 2023.

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