

Oxygen therapy practice and associated factors among nurses working at an Ethiopian Referral Hospital

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ABSTRACT

Objective: Supplemental oxygen therapy is supplying oxygen at quantities higher than those found in the atmosphere (>21 %) and is mostly prescribed for hypoxic patients. To avoid hypoxemia, hypercapnia, and oxygen poisoning, nurses closely monitor patients receiving oxygen therapy. There are considerable gaps in nurses' practice of oxygen therapy. Patients who receive inappropriate oxygen therapy may have negative effects, and it has financial repercussions for both individuals and nations. The aim of this study was to assess oxygen therapy practices and associated factors influencing oxygen administration among nurses in an Ethiopian Regional Hospital.

Method: From March 1 to March 30, 2019, a cross-sectional institutional study using quantitative methods was performed amongst nurses working at a referral hospital in northwestern Ethiopia. Data was gathered using structured self-administered questionnaires.

Result: In this study, 147 participants (91.3 %) were found to have inadequate practice with oxygen therapy. Nurses' lack of knowledge about carbon monoxide, adult patients' typical breathing rates, cardiopulmonary function, and devices (face mask, nasal cannula, oxygen concentrators, pulse oximeter and others) that are difficult for patients to accept were found to be factors associated with oxygen administration practice.

Conclusion: The findings of this study showed that nurses' use of oxygen administration was subpar. The institutional factors, knowledge gaps, and attitudes of nurses were identified as the determinants affecting oxygen administration practice. Nurses would do better to read up on oxygen administration, interact with one another and undertake further training.

Relevance to Africa

- Oxygen is an important, and commonly used, yet resource constrained therapy with many positive applications, but needs to be used appropriately and judiciously especially in resource constrained settings.
- The findings of this study could be beneficial to healthcare staff members employed by various hospitals in Ethiopia and other African nations.
- This outcome may also be used for the benefit of policymakers in Ethiopia and Africa in general.

- The findings may serve as a foundation for future research on this topic in Africa.

Introduction

The majority of hypoxic patients are treated with oxygen therapy (OT), which delivers oxygen at concentrations higher than those found in the atmosphere (>21 %) [1]. World Health Organization (WHO) lists oxygen as a basic component of the safest and most effective drugs [2].

Patients may have uncontrolled (high/low dose) oxygen therapy, which can be administered in the ambulance and during the first several days of hospitalization. Administering uncontrolled (high/low dose)

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oxygen therapy is linked to a higher incidence of fatalities and severe respiratory acidosis [3]. To avoid hypoxemia, hypercapnia, and oxygen poisoning, nurses closely monitor patients receiving oxygen therapy [4].

According to a study in Greece, oxygen administration practices have substantial gaps, and some nurses believe that oxygen helps patients' breathing habits. However, in regards to oxygen therapy, nurses made a number of mistakes and omissions, including decisions regarding oxygen prescription, administration, adjustment, monitoring, discontinuation of therapy, and stoppage of oxygen therapy [5]. Absence of training and guidelines for oxygen therapy, nurse workload, inadequate oxygen supply and delivery devices (like face mask, nasal cannula, oxygen concentrators, pulse oximeter and others), lack of well-functioning equipment, and unsuitable written prescription for oxygen therapy were the variables that affected nurses' practice of administering oxygen [6,7].

A British study revealed that nurses can deliver oxygen with disregard to the doctor's order and prescription [8]. The trends of oxygen prescription by doctors are still poor today. Education on oxygen therapy can help nurses administer oxygen more effectively, which may be crucial for patients who are receiving it [8]. Improved nurse practice through training can minimize long-term negative consequences of oxygen administration [9]. Patients who receive inappropriate oxygen therapy may suffer oxygen toxicity, and it has financial repercussions for both individuals and nations [10].

It has been estimated that at least 1.4 million deaths annually worldwide occur as a result of improper oxygen administration and a lack of supplemental oxygen therapy [11]. In 2010, the UK National

patient safety agency stated that, during a five-year period, inadequate oxygen therapy performance directly contributed to nine deaths. Of those, four deaths were directly linked to using high flow oxygen improperly [12]. Similar to this, according to a 2010 report from Australia, of the total (62), 21 deaths related to oxygen therapy were caused by high flow oxygen therapy [13]. In order to enable the stakeholders, make the necessary solutions, this study aims to explore the extent and contributing aspects of oxygen therapy practice among a cohort of Ethiopian nurses.

Methods

Study design, area, period and populations

An institution based cross sectional study design was employed. The study was conducted at Debre Markos University Specialized Hospital (DMUSH) (medical ward, pediatric ward, adult ICU, NICU, surgical ward, emergency ward, TB clinic, pediatric emergency triage and treatment (ETAT), and recovery room) from March 1 to March 30, 2019. The hospital is found in the northwestern Amhara area, which is 300 kms from Addis Ababa and 265 kms from Bahirdar. Participants were nurses working at DMUSH referral hospital. Nurses with a minimum of six months of working experience and involved in direct patient care were included in the study. All nurses (161) who were employed by DMUSH in medical ward, pediatric ward, adult ICU, NICU, surgical ward, emergency ward, TB clinic, pediatric emergency triage and treatment (ETAT), and recovery room were taken using the census method.

Data collection tools and procedures

A semi-structured self-administered questionnaire was prepared and used to collect data. The questionnaire was divided into two sections: checklists used to measure practice aspect and questions about (socio-demographic, knowledge, attitude, and institutional factors) related questions [7,14,16]. Eight trained interns in oxygen administration from Debre Markos University were involved in collecting data from the questionnaire while being closely supervised by two doctors from the hospital. Throughout the method, the principal investigator followed the data gathering process.

Data quality assurance

Prior to data collection, a pretest was conducted in Finote Selam Primary Hospital on 5 % of the sample size of participants to ensure question clarity. Then, concepts and statements were corrected. The lead investigator conducted daily spot checks and reviews of all completed questionnaires, trained the data collectors, provided regular supervision and timely feedback, and coded and reviewed the obtained data for consistency and completeness.

Data processing and analysis

The collected data were cleaned manually, coded, and entered into Epi data version 4.2 and exported to SPSS version 23 statistical software for data transformation and further analysis. Descriptive statistics like frequencies, proportion, and summary statistics (mean, median, IQR, and standard deviation) were used to describe the study population with relevant variables and presented in tables and graphs. Multi-collinearity between the study variables was diagnosed using standard error and correlation matrix. The assumptions for the binary logistic regression model were first checked and then bivariable analysis was carried out to identify candidate variables ($p < 0.25$) for multivariable analysis. Using these candidate variables, multivariable analysis was performed to investigate statistically significant independent predictors of oxygen therapy by adjusting for possible confounders. Finally, variables whose

Table 1

Socio-demographic characteristics of participant nurses and their relation with practice of oxygen therapy and associated factors among nurses working at referral hospital in northwest, Ethiopia.

Variables	Category	Practice level			
		Poor		Good	
		Number	100 %	Number	100 %
Gender of participants	Male	91	92.9 %	7	7.1 %
	Female	56	88.9 %	7	11.1 %
Age of participants	21–39	133	90.5 %	14	9.5 %
	40 and above	14	100 %	0	00 %
Marital status of participants	never married	53	89.8 %	6	10.2 %
	ever married	94	92.2 %	8	7.8 %
Education level of participants	diploma nurse	8	100 %	0	00 %
	BSc nurses	139	90.8 %	14	9.2 %
Work experience of participants	2–11 years	129	90.2 %	14	9.8 %
	12–21 years	11	100 %	0	00 %
	22 and above	7	33 %	14	66.7 %
Current work department of participants	Emergency	20	100 %	0	00 %
	Surgical ward	22	100 %	0	00 %
	Recovery room	11	100 %	0	00 %
	Pediatric ward	22	100 %	0	00 %
	Medical ward	21	87.5 %	3	12.5 %
	NICU*	24	100 %	0	00 %
	Adult ICU**	11	61.1 %	7	38.9 %
	ETAT***	10	90.9 %	1	9.1 %
TB clinic	6	100 %	0	00 %	

*Neonatal intensive care unit, ** Adult intensive care unit, *** Emergency triage and treatment.

Table 2
Distribution of oxygen administration practice among nurses working at referral hospital in northwest Ethiopia.

Variables	Category	yes		no		
		No.	100 %	No.	100 %	
Before oxygen administration	Assess patient oxygen saturation	108	67.1	53	32.9	
	Verify physician prescription before administration	68	42.2	93	57.8	
	Wash hands	53	32.9	108	67.1	
	Prepare needed equipment	121	75.2	40	24.8	
	Check the functionality of the oxygen administering devices	75	46.6	86	53.4	
	Check the functioning of the mechanical ventilator	12	7.5	149	92.5	
	Identify the right patient	141	87.6	20	12.4	
	Introduce yourself to the patient	21	13	140	87	
	Explain procedure to the patient	24	14.9	137	85.1	
	written informed consent for mechanical ventilator	10	100	00	00	
	Disinfect hands	23	14.3	138	85.7	
	Wear disposable gloves	104	64.7	57	35.4	
	Total	760	47.2	884	52.8	
	During oxygen administration	Assess patient oxygen saturation	68	42.2	93	57.8
		Assess patient's respiratory status for normal and abnormal findings	31	19.3	130	80.7
Connect flow meter to the oxygen supply		125	77.3	36	22.4	
Fill humidifier with suitable amount of distilled water		46	28.6	115	71.4	
Set the mechanical ventilator according to physician order		11	6.8	150	93.3	
Open oxygen supply before connecting oxygen device to the patient		41	25.5	120	74.5	
Connect oxygen device to the oxygen setup with humidification		51	31.7	110	68.3	
Adjust flow rate of oxygen according to prescribed rate		46	28.6	115	71.4	
Connect oxygen therapy device to the patient appropriately		56	34.8	105	65.2	
Connect tubing over and behind each ear with adjuster comfortable to patient		50	31.1	111	68.9	
Place gauze pads at ear beneath the tubing, if necessary		23	14.3	138	85.7	
Adjust the fit of the device; tubing to make patient feel comfort		43	26.7	118	73.3	
Sucking the patient's secretion who was on mechanical ventilator		10	6.2	151	93.8	
Reassess the patient's respiratory status		34	21.1	127	78.9	
Total		635	28.2	1619	71.8	
After administering oxygen therapy	Assess patient's oxygen saturation	82	50.9	79	49.1	

Table 2 (continued)

Variables	Category	yes		no	
		No.	100 %	No.	100 %
	Discard used equipment which are not reusable	96	59.6	65	40.4
	Remove gloves	104	64.7	00	00
	Wash hand	46	28.6	115	71.4
	Total	328	51.0	259	40.2

p-value less than 0.05 ($p < 0.05$) from the multivariable analysis were declared as statistically significant. An adjusted odds ratio with 95 % CI was considered to identify the strength of association between oxygen therapy and its predictors.

In this study, we defined nurses as operationally having adequate practice, adequate knowledge or favorable attitude by their achieving at least 60% correct responses in respectively: oxygen therapy practice by observation, knowledge questions, or attitude questions [14]. High work load was defined by high patient-nurse ratio more than 1 to 5 ratio for medical, surgical, and pediatric wards, more than 1 to 2 ratio for adult ICU and NICU, and more than 1 to 4 ratio for emergency ward [15].

Ethical consideration

The DMU College of Health Sciences' research committee provided ethical approval and clearance. The college of health science provided a letter of support for the Debre Markos referral hospital. Additionally, DMRH was asked for permission to perform the study; this permission was granted with reference number DMU/845/06/19. After outlining the purpose of the study, informed consent was requested from each study participant to affirm their readiness to participate. The responders also had the freedom to decline or end the agreement at any time. The anonymous recording and coding of the questionnaire ensured the confidentiality of the data provided by each respondent.

Results

Socio-demographic characteristics

The response rate of this study was 94 %. Of the 161 participants, 98 (60.9 %) were men, 147 (91.3 %) were in the 20–39 age range, with a median age of 29 years (interquartile range of 27–31). The median amount of work experience was 5 years (interquartile range of 4–8). Of the participants, 102 (63.4 %) were married, and 153 (95 %) were BSc nurses (Table 1).

Practices of nurses on oxygen therapy

Among the participants 52.8 %, 71.8 %, and 40.2 % respectively did not assess the need for oxygen administration before, during and after oxygen administration (Table 2).

Knowledge of nurses towards oxygen therapy

The treatment and prevention of hypoxia were the responses given by 134 (83.2 %) and 82 (50.9 %) participants, respectively, regarding the nurses' understanding of the practical uses of oxygen therapy. Moreover, 68 (42.2 %) and 115 (71.4 %) of the participants were aware that oxygen therapy is used to treat carbon monoxide poisoning and cardiac arrest, respectively (Table 3).

Attitude of nurses on oxygen therapy

Just 37.3 % of participants agreed that patients who are nearing the end of life should receive oxygen therapy, while 62.7 % of participants disagreed that continuous oxygen administration is more advantageous

Table 3
Distribution of nurses according to their knowledge regarding to oxygen therapy aim and indication among nurses working at referral hospital in northwest Ethiopia.

Variables	Categories	Frequency	Percent (100 %)
Aim of oxygen therapy	Treat hypoxia	No	27 16.8 %
		Yes	134 83.2 %
	Prevent hypoxia	No	79 49.1 %
		Yes	82 50.9 %
	To treat acute myocardial infraction	No	80 49.7 %
		Yes	81 50.3 %
Indication of oxygen therapy	For carbon monoxide poisoning with oxygen saturation 99 %	No	46 28.6 %
		Yes	115 71.4 %
	For critical illness such as sepsis	No	93 57.8 %
		Yes	68 42.2 %
	For cardio pulmonary arrest	No	93 57.8 %
		Yes	68 42.2 %
	Blood pressure cuff on the arm of probe will lead to increased oxygen saturation reading	No	98 60.9 %
		Yes	63 39.1 %
	Blood pressure cuff on arm of probe will lead to the correct oxygen saturation reading	Yes	119 73.9 %
		No	42 26.1 %
	The wave formed must be optimal before a reading can be accepted	No	52 32.3 %
		Yes	109 67.7 %
Appropriate nursing care during oxygen therapy	Mouth care	No	52 32.3 %
		Yes	109 67.7 %
	Encourage adequate fluid intake	No	89 55.3 %
		Yes	72 44.7 %
	Apply water-based cream if lips or nose become dry	No	77 47.8 %
		Yes	84 52.2 %
	Apply petroleum jelly to minimize inflammation of lips and nose	No	111 68.9 %
		Yes	50 31.1 %
	Nurses who know normal oxygen saturation at rest for adult < 70 years	No	73 45.3 %
		Yes	88 54.7 %
	Nurses who know normal breathing rate of neonate	No	116 72.0 %
		Yes	45 28.0 %
Nurses who know normal breathing rate of neonate	No	105 65.2 %	
	Yes	56 34.8 %	
Nurses who know normal breathing rate of child	No	93 57.8 %	
	Yes	68 42.2 %	
Nurses who know normal breathing rate of adult	No	53 32.9 %	
	Yes	108 67.1 %	
Nurses who know about pulse oximetry reading factors	No	118 73.3 %	
	Yes	43 26.7 %	
Nurses who know the solution to reduce risk of the side effect of dry gas	No	65 40.4 %	
	Yes	96 59.6 %	
Nurses who know about collection of water in tube affect the flow of oxygen	No	110 68.3 %	
	Yes	51 31.7 %	

Table 3 (continued)

Variables	Categories	Frequency	Percent (100 %)
Nurses who know about nasal cannula	No	88	54.7 %
	Yes	73	45.3 %
Nurses who know about oxygen therapy device that difficult to tolerate	No	99	61.5 %
	Yes	62	38.5 %
Nurses who know the device used for high percentage (60–90 %) oxygen for short term treatment in trauma patient	No	134	83.2 %
	Yes	27	16.8 %

Table 4
Attitude of participants towards oxygen administration therapy among nurses working at referral hospital in northwest Ethiopia.

Variables	Categories	Frequency	Percent (100)
Oral, nasal hygiene and normal saline drops shod not be done necessarily when giving oxygen therapy	Agree	105	65.2 %
	Disagree	56	34.8 %
Humidification is not always used to prevent dryness of mucous membrane of upper respiratory tract	Agree	103	64.0 %
	Disagree	58	36.0 %
A patient on oxygen therapy indicates that he/she is at the end of life	Agree	110	68.3 %
	Disagree	51	31.7 %
Continuous oxygen administration is more beneficial than intermittent	Agree	60	37.3 %
	Disagree	101	62.7 %
Person on sever lung disease need to be maintained at the prescribed oxygen saturation range	Agree	131	81.4 %
	Disagree	30	18.6 %
Since oxygen is a drug, its administration may be unsafe and dangerous for the patient	Agree	91	56.5 %
	Disagree	70	43.5 %
Oxygen is given only when ordered by physician, even an emergency situation	Agree	75	46.6 %
	Disagree	86	27.3 %

than intermittent administration (Table 4).

Knowledge, attitude and practice of nurses on oxygen therapy

According to the distribution of nurses' knowledge, attitude, and practice related to oxygen administration, 141 (87.6 %), 117 (72.7 %), and 147 (91.3 %) of the participants, respectively, had poor knowledge, poor attitude, and poor practice. Practice, knowledge, and attitude had medians of 10 (IQR = 7–13), 11 (IQR= 9–13), and 3 (IQR = 2–5), respectively (Fig. 1).

Institutional factors for oxygen therapy

There was no training in oxygen therapy, according to 133 (82.6 %) of the participants, and there were not enough oxygen cylinders with the labeled capacity, according to 90 (54.9 %) participants. Additionally, 98 (60.9 %) and 110 (68.3 %) of participants noted that the supply of oxygen and the delivery system were insufficient, and patients had to pay for the supply of oxygen and delivery system. Additionally, a heavy workload was reported by 128 participants (87 %) as contributing institutional factors to oxygen therapy practices (Table 5).

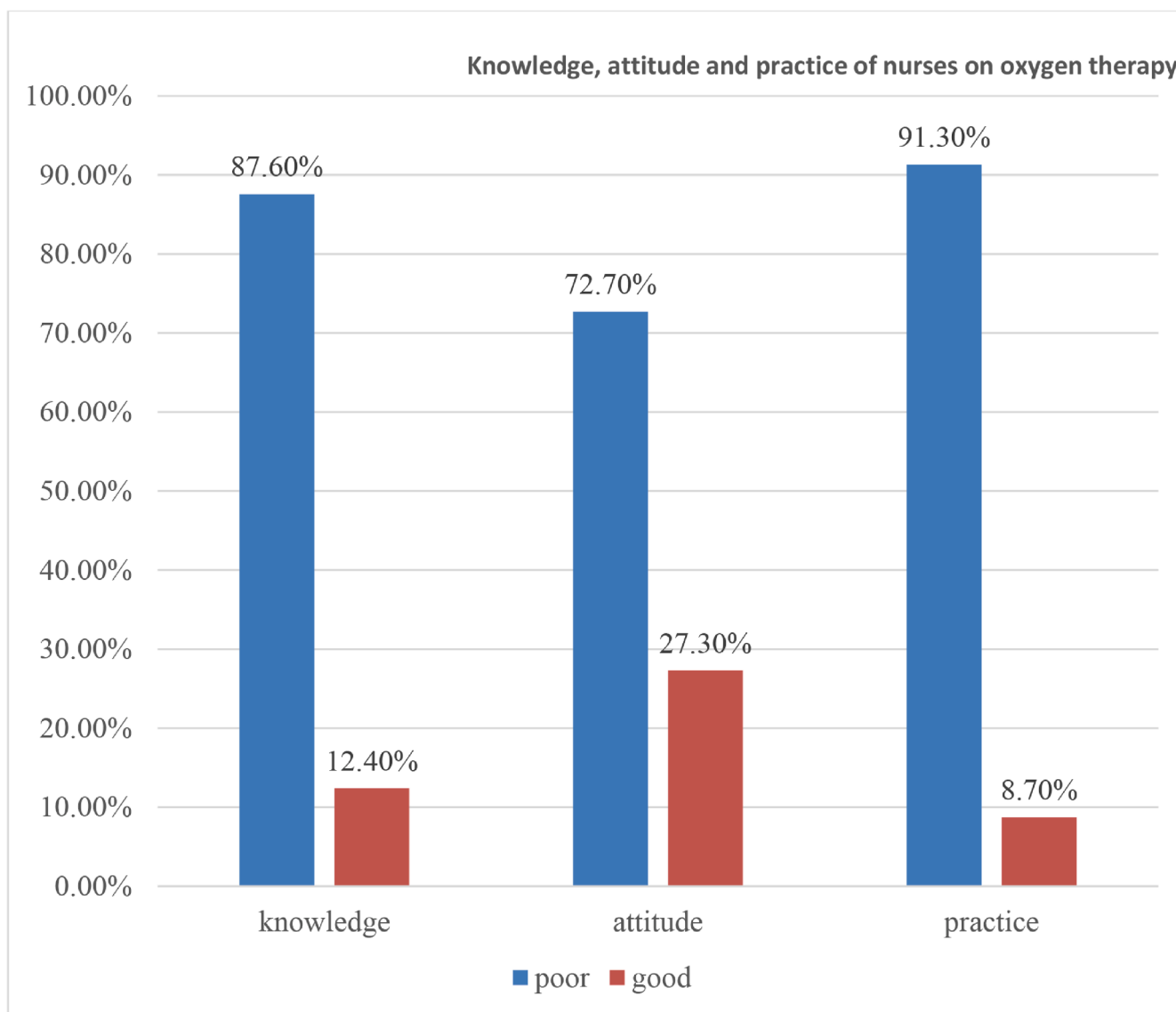


Fig. 1. Distribution of practice, knowledge and attitude regarding to oxygen administration therapy among nurses working at referral hospital in northwest Ethiopia.

Table 5

Institutional factors affecting nurses' practice of oxygen administration at referral hospital in northwest Ethiopia.

Variables	Categories	Frequency	Percent (100)
Training on oxygen therapy	Yes	28	17.4
	No	133	82.6
Adequate supply of oxygen and delivery system	Yes	98	60.9
	No	63	39.1
Work load/burden	Yes	128	79.5
	No	33	20.5
Patient pay for oxygen administration procedures	Yes	110	68.3
	No	51	31.7
Adequate amount of oxygen cylinders equivalent to the label written	Yes	71	44.1
	No	90	55.9

Associated factors of oxygen therapy practice

Multivariable analysis showed that there was a statistical significance between the nurse's level of practice and the knowledge of nurses. Nurse's knowledge of the normal breathing rate of adults, the indication of oxygen administration in carbon monoxide poisoning with oxygen saturation of 99 % and the need for oxygen administration in cardio-pulmonary arrest influenced nurses' practice.

The odds of nurses practicing poorly were 5.28 times higher for those who did not recognize that cardiac arrest is a sign for oxygen therapy is needed [AOR=5.28; 95 % CI: (1.15, 24.18)] than for those who did. Similar to this, nurses were 8.16 times more likely to have bad practice [AOR=8.16, (95 % CI: (1.09, 26.87))] than those who knew that carbon monoxide poisoning with oxygen saturation of 99 % is an indication of oxygen therapy. Additionally, nurses who did not know about the oxygen administration device that has difficulty of tolerating for patient were six times more likely to have poor practice [AOR=6.84; (95 % CI: (1.49, 31.43))] than those who did not know. Nurses who were unaware of the child's normal breathing rate were 87 % less likely to administer oxygen therapy incorrectly than those who were aware of it (AOR= 0.13; 95 % CI: (0.03, 0.56)). Finally, nurses who agreed that administering oxygen may be risky and harmful were 7.08 times more likely to practice oxygen

Table 6

Associated factors of nurses' oxygen therapy practice in bivariable and multi-variable analyses at referral hospital in Northwest Ethiopia, 2019.

Variables		Level of practice				P-value
		Poor	Good	COR (95% CI)	AOR (95% CI)	
Nurses who know carbon monoxide poisoning with oxygen saturation 99% was indication for oxygen therapy	No	44	2	2.56 (0.55-11.93)	8.18 (1.09-26.87)	0.04**
	Yes	103	12	1.00	1.00	
Nurses who know cardio pulmonary arrest was indication for oxygen therapy	No	88	5	2.68 (0.86-0.24)	5.28 (1.15-24.18)	0.03**
	Yes	59	9	1.00	1.00	
Nurses who know normal breathing rate of adult	No	44	9	0.23 (0.07-0.74)	0.13 (0.03-0.56)	0.01**
	Yes	103	5	1.00	1.00	
Nurses who know the device that is difficult to tolerate by the patient	No	94	5	3.19 (1.01-10.02)	6.84 (1.49-31.43)	0.01**
	Yes	53	9	1.00	1.00	
oxygen as a drug may be dangerous and unsafe during administration	Agree	86	5	2.53 (0.81-7.94)	7.08 (1.45-34.49)	0.02**
	Disagree	61	9	1.00	1.00	

*p < 0.25, ** p < 0.05

administration therapy poorly than nurses who disagreed [AOR=7.08, 95 % CI: 7.08 (1.45, 34.49)] (Table 6).

Discussion

This study investigated the levels of oxygen administration practice among nurses and evaluated the institution, knowledge, attitude, and sociodemographic characteristics of nurses that have an impact on this practices. In this study, most of the participants (91.3 %) had poor practice towards oxygen therapy (CI=87–95.7 %). It was poorer than that of studies conducted in Addis Ababa, Ethiopia [7], Egypt [14], Sudan [6], and Iran (25.5 %) [9]. A possible difference might be that participants in the Addis Ababa, Iran, Egypt and Sudan studies were well-experienced, which might have increased their practice level. Furthermore, the establishment of the institution, the sample size difference, the sociodemographic characteristic difference, and the use of just NICU nurses in Iran and Addis Abeba, Ethiopia, could be possible reasons for the difference.

According to our finding, nurses who did know that carbon monoxide poisoning with oxygen saturation of 99 % is an indication for oxygen therapy were 8.18 times more likely to practice oxygen administration therapy poorly than those who did not know (71.4 % of participants) [AOR=8.18; 95 % CI: (1.09, 26.87)]. This finding is supported by a study done in Gondar, Ethiopia [17]. Although the order of oxygen administration knowledge and practice is debated, it is empirically shown that knowledge serves as the foundation for practice. This indicates that nurses who have knowledge in oxygen therapy also practice oxygen therapy well.

Similarly, nurses who did not know that cardiac arrest is a sign of supplemental oxygen administration (42.2 %) were 5.28 times more likely to administer oxygen therapy incorrectly than those who did [AOR=5.28; 95 % CI: (1.15, 24.18)].

Additionally, compared to nurses who were familiar with the equipment, nurses who were unfamiliar with it (38.5 %) were 6.84 times more likely to practice oxygen administration incorrectly [AOR=6.84;

95 % CI: (1.49, 31.43)]. This demonstrated a strong association between oxygen therapy knowledge and practice. In contrast to this study, a study done in Sudan [6], revealed that there was no association between oxygen therapy practice and knowledge.

Nurses who agreed that administering oxygen as a medicine would be risky and unhealthy were 7.08 times more likely to practice oxygen therapy than nurses who disagreed [AOR=7.08; 95 % CI: (1.45, 34.49)]. The finding is supported by studies in Tasmania, Australia [13]. This indicates how proficiently oxygen therapy is practiced by nurses who are aware of its indications and contraindications.

Finally, nurses who did not know the average adult patient breathing rate (67.1 % of participants) were 87 % less likely to practice oxygen therapy than those who did know [AOR=0.13; (95 % CI: (0.03, 0.56))]. This is supported by a study done in University Teaching Hospital of Kigali [18].

Limitations of the study

According to our study, there were limitations. One is that nurses who worked in outpatient clinics were not included in the study since there was no oxygen administration there. In addition to this, the study period was time-consuming for data collectors due to nurses' eight-hour shifts, making it difficult to find nurses during collection. Furthermore, the study period and publication date are too far apart due to delayed analysis and write-up.

Conclusion

This study found that the use of oxygen treatment was subpar. There was a statistically significant correlation between the nurses' practice of oxygen therapy and their knowledge of the adult patient's normal breathing rate, the indications for oxygen therapy, the oxygen administration device (face mask, nasal cannula, oxygen concentrators, pulse oximeter and others) that patients find difficult to tolerate, and their attitude toward oxygen administration as a potentially harmful and unsafe drug. The most difficult aspects of giving oxygen treatment were a lack of oxygen supply, a lack of training, and a lack of ability and expertise in this area.

Recommendation

Hospital administration should put an emphasis on educational interventions pertaining to oxygen therapy administration to improve nurses' knowledge on the subject. Additionally, it is preferable to design an oxygen therapy protocol in order to enhance nurses' delivery of oxygen therapy and better ensure that oxygen supplies and oxygen therapy equipment are accessible. Nurses should liaise with other staff to advance their techniques for administering oxygen. Research should focus on the barriers to oxygen therapy administration and the practice level of nurses at other hospitals.

Author's contribution

Authors contributed as follows to the conception or design of the work; the acquisition, analysis, or interpretation of the data for the work; and drafting the work or the revising it critically for important intellectual content: MMT 30%, NAM, MSB and DT 15% each; and SAB, MG, BN, ATT, and TA contributed 5% each to complete. All authors approved the version to be published and agreed to be accountable for all aspects of the work

Dissemination and utilization of result

The findings of this study was presented to community of Debre-markos University during open defense. It was also disseminated to Debremarkos University College of health science library and managing

bodies of Debre Markos comprehensive specialized hospitals. Lastly, it will be published for further use.

CRedit authorship contribution statement

Mikiyas Muche Teshale: Conceptualization, Data curation, Methodology, Supervision, Writing – original draft, Writing – review & editing. **Nurilign Abebe Moges:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Writing – review & editing. **Meznew Sintayehu Bitew:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Writing – review & editing. **Setarg Ayenew Birhanie:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Writing – review & editing. **Mihretie Gedfew:** Data curation, Formal analysis, Investigation, Methodology, Software, Validation. **Belete Negese:** Data curation, Formal analysis, Investigation, Methodology, Validation. **Animut Takele Telayneh:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology. **Temesgen Ayenew:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Writing – review & editing. **Dejen Tsegaye:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Writing – review & editing, Supervision, Validation.

Declaration of competing interest

The authors declared no conflicts of interest.

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