Knowledge and Practice of Nurses towards Oxygen Therapy in the Public Hospitals of Harari Region, Ethiopia

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Abstract

Background: Oxygen therapy refers to the administration of oxygen as a medical intervention. Inadequate oxygen administration may result in serious complications including cardiac arrhythmias, tissue injury and ultimately cerebral damage. The aim of this study was to determine knowledge and practice of nurses on supplemental oxygen therapy in Harari region, Ethiopia.

Methods: This cross-sectional descriptive study was performed on all nurses working in three public hospitals in the Harari region, Ethiopia in 2021. A self-administered questionnaire was used to assess nurses' knowledge and practice about oxygen therapy. Demographic information was also collected using the questionnaire. Data were analyzed in SPSS 20 using descriptive statistics.

Results: Of 422 participants, 212 (50.2%) were female. The majority of nurses were 20-29 years old (40.5%) and had a Bachelor's degree (69.9%) and 4-6 years of work experience (35.5%). We found that 61.4% and 47.5% of the nurses had good knowledge and practice level about oxygen therapy, respectively. Knowledge about oxygen therapy had no significant association with gender, age, education level, marital status and work experience.

Conclusion: Our findings indicate that there is a clear knowledge and practice gap among nurses working in the public hospitals of Harari region, Ethiopia. Therefore, extensive educational and training programs should be offered to nurses to raise their knowledge and practice about oxygen therapy.

Highlights:

What is current knowledge?
All nurses have good knowledge and attitude towards oxygen therapy

What is new here?
This research show that not all nurses have good knowledge and attitude towards oxygen therapy

Introduction

Oxygen is listed as a core item on the World Health Organization's (WHO) model of essential medicines (1). Oxygen therapy provides oxygen at concentrations higher than the level found in the atmosphere (>21%) (2). It is a key instrument for resuscitating pre-hospital trauma patients during evaluation and transportation (3,4), preventing and managing hypoxemia and saving the lives of patients with heart and lung diseases if used at an appropriate time and in an appropriate amount according to the WHO updated guidelines (2, 5).

The optimal amount and method of oxygen delivery varies depending on patient's underlying medical condition. The selection of appropriate oxygen delivery device and oxygen flow rate depends on many factors including patient's age, therapeutic goals and patient's tolerance (6). Oxygen should be prescribed to achieve a target saturation of 94-98% for most acutely ill patients or 88-92% for those at risk of hypercapnia respiratory failure (7, 8).

Oxygen can develop skin breakdown around the mask or the cannula and easily dehydrate exposed membranes in the upper respiratory tract unless patients are orally rehydrated and/or provided with mouth care, along with humidification, which can mobilize secretions and enhance patient comfort (9). Although oxygen therapy is one of the most widely used resuscitation methods, it may be harmful to patients if used inappropriately. Pulmonary oxygen toxicity and oxygen-induced hypercapnia are two major side effects of oxygen therapy (8). Therefore, oxygen should be administered by trained staff.

Nurses are the primary healthcare personnel who monitor oxygen therapy and can contribute to reducing adverse effects of supplemental oxygen therapy (10)Based on studies conducted in different countries, there is a knowledge and practice gap on oxygen therapy among practicing nurses in hospitals (11–13). The present study aimed to determine the knowledge and practice of nurses on oxygen therapy in the Harari region, Ethiopia.

Methods

This institutional-based, cross-sectional study was conducted from April 1 to April 30, 2021. The study included all nurses (n=446) working in three public hospitals in the Harari region, Ethiopia. Data were collected using a self-administered questionnaire designed by Lema et al. (13) with some modifications. After confirming content validity, the reliability of questionnaire were assessed via a pilot survey. The questionnaire consisted of three sections; demographic information (such as gender, age and marital status), oxygen therapy knowledge (9 items) and oxygen therapy practice (19 items). A checklist was used to assess the practice of nurses on oxygen administration. The checklist consisted of nineteen items regarding the processes before (5 items), during (11 items) and after (3 items) oxygen therapy.

The collected data were analyzed in SPSS (version 20) using descriptive statistics.

Results

Out of 446 subjects, 422 participated in the study (94.62% response rate). The mean age of nurses was 33±1.76 years. The majority of subjects were 20-29 years old (40.5%) and had a Bachelor's degree (69.9%),4-6 years of work experience (35.5%) and their mean work experience was 5 years (Table 1).

The mean knowledge score of nurses about oxygen therapy was 7.51±1.45. All nurses were aware of indications for supplemental oxygen therapy. In addition, 385 nurses (91.23%) knew about the range of oxygen saturation at rest for adults <70 years (95-98%). Moreover, 375 nurses (88.86%) answered untreated pneumothorax as the contraindication for oxygen therapy. Based on the results, nurses had 38.51% of nurses had poor knowledge of oxygen therapy (Table 2).

The mean practice score of nurses about oxygen therapy was 4.37±1.76. Based on the results, only 47.5% of the nurses had good practice and the majority (52.5%) of nurses had poor practice level about supplemental oxygen administration (Table 3).

We also found that gender, age, education level, marital status and work experiences had no significant association with knowledge of nurses on oxygen therapy (Table 4).

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Table 1. Distribution of sociodemographic characteristics of the subjects

Variable	Category	N (%)
Sex	Female	212(50.24)
	Male	210(49.76)
Age range (Year)	20-29	171(40.52)
	30-39	159(37.68)
	40-49	92(21.80)
Marital status	Married	263(62.32)
	Single	159(37.68)
Education level	Diploma	127(30.09)
	Bachelors' degree	295(69.91)
Work experience (Year)	0-3	98(23.22)
	4-6	150(35.55)
	7-9	105(24.88)
	>10	69(16.35)

Table 2. Knowledge of nurses about oxygen therapy

Variable		N (%)
Cause of oxygen therapy	Acute myocardial infarction	422(100.00)
	To prevent and treat hypoxia	422(100.00)
	Shock	422(100.00)
	During surgery	422(100.00)
The normal oxygen saturation at rest in adult <70 years is …	95-98%	385(91.23)
	90-95%	26(6.16)
	85-89%	11(2.61)
Oxygen therapy is contraindicated in …	Acute hypoxemia in pneumonia, shock, asthma heart failure and pulmonary embolism	0(0.00)
	Untreated pneumothorax	375(88.86)
	Carbon monoxide poisoning	3(0.71)
	Post thoracic and abdominal surgery	44(10.43)
Which of the following is sign and symptom of oxygen toxicity?	Non-productive cough	365(86.49)
	Substernal chest pain	389(92.18)
	Nausea and vomiting	377(89.34)
	Fatigue	361(85.55)
Which of the following is a potential adverse effect of oxygen therapy?	Oxygen toxicity	422(100.00)
	Retinopathy of prematurity	11.6(2.75)
	Depression of ventilation on selected population	313(74.17)
	Absorption atelectasis	393(93.13)
The disposable plastic device with two protruding prongs for insertion into nostrils connected to oxygen source used for low medium concentration of oxygen (23%-44%) is …	Nasal cannula	245(58.06)
	Trans-tracheal catheter	281(66.59)
	Nasal catheter	367(86.97)
	Face mask	203(48.10)
Pulse oximetry is affected by nails varnish/paint, hypothermia and/or patient's position	True	422(100.00)
	False	0(0.00)
During oxygen therapy, apply water-based gauze if lips or nose become dry	True	323(76.54)
	False	99(23.46)
Humidifier reduces the risk of dry oxygen and its side effects	True	422(100.00)
	False	0(0.00)

Table 3. Nurses' practice level regarding oxygen administration

Before Administration		N (%)
Verify physician prescription before administration	Done	318(75.36)
	Not Done	104(24.64)
Check the device before administration	Done	411(97.39)
	Not Done	11(2.61)
Wash hands	Done	118(27.96)
	Not Done	304(72.04)
Prepare needed equipment	Done	353(83.65)
	Not Done	69(16.35)
Wear disposable glove	Done	388(91.94)
	Not Done	34(8.06)
During administration		
Assess patient's oxygen saturation	Done	308(72.99)
	Not Done	114(27.01)
Use appropriate device size and way	Done	388(91.94)
	Not Done	34(8.06)
Adjust flow meter of oxygen supply	Done	393(93.13)
	Not Done	29(6.87)
Fill humidifier with sufficient amount of distilled water	Done	355(84.12)
	Not Done	67(15.88)
Open oxygen supply before connecting oxygen device	Done	269(63.74)
	Not Done	153(36.26)
Connect oxygen device to oxygen set up	Done	402(95.26)
	Not Done	20(4.74)
Adjust flow rate of oxygen as prescribed	Done	294(69.67)
	Not Done	128(30.33)
Connect oxygen therapy device to patients appropriately	Done	292(69.19)
	Not Done	130(30.81)
Place gauze pad on ear beneath the tubing if necessary	Done	236(55.92)
	Not Done	186(44.08)
Adjust the device tubing to make patients comfort	Done	207(49.05)
	Not Done	215(50.95)
Follow patient's vital signs during administration	Done	201(47.63)
	Not Done	221(52.37)
After administration		
Wash hands	Done	85(20.14)
	Not Done	337(79.86)
Document date and time of initiating oxygen therapy	Done	179(42.42)
	Not Done	243(57.58)
Check vital sign	Done	228(54.03)
	Not Done	194(45.97)

Table 4. Logistic regression analysis for knowledge of nurses on oxygen therapy

Variable		Knowledge level		Crude Odds Ratio	Adjusted Odds Ratio
		Good N (%)	Poor N (%)		
Sex	Male	130(61.90)	80(38.10)	1	1
	Female	131(61.79)	81(38.21)	0.99(0.02-1.42)	1.34(0.496-5.08)
Age (Years)	20-29	106(61.99)	65(38.01)	1	1
	30-39	99(62.26)	60(37.74)	1.01(0.80-8.02)	0.94 (0.38–2.31)
	40-49	57(61.96)	35(38.04)	0.99 (0.04-6.42)	0.452 (0.01–5.43)
Education level	Diploma	79(62.20)	48(37.80)	1	1
	Bachelors	183(62.03)	112(37.97)	0.99(0.02-2.24)	1.57(0.36-5.06)
Marital status	Married	163(61.98)	100(38.02)	1	1
	Single	99(62.26)	60(37.74)	1.01 (0.02-7.24)	0.63(0.11-3.59)
Work experience (Year)	≤6	154(62.10)	94(37.90)	1	1
	≥7	108(62.07)	66(37.83)	0.99(0.02-1.20)	0.452 (0.01–5.43)

Discussion

In this study, 61.49% of nurses had good knowledge about oxygen therapy, which is higher than the levels reported from Debre Tabor General Hospital, Ethiopia (48%) [14], CMC hospital in Punjab, India (52%) [15], Beirut, Lebanon (55.1%) [16] and Orotta National Referral Hospital in Asmara, Eretria (56.7%) [17]. However, previous studies in Rwanda (73.8%) [18], Egypt (76%) [19] and Addis Ababa, Ethiopia (63.8%) [20] reported higher levels of knowledge about oxygen therapy among nurses. This discrepancy might be due to the difference in sample size, study setting and study period.

According to the results, 47.5% of the nurses had good practice level about oxygen therapy. This finding is greater than the rates reported by studies

conducted in Addis Ababa, Ethiopia (43.4%) (20), Debra Tabor General Hospital, Ethiopia (33%) (14), the University Teaching Hospital of Kigali, Rwanda (32.3%) (18), Eritrean hospitals (45%) (17) and Addis Ababa, Ethiopia (43.4%) (20). However, in a study in Egypt (19) and Iran (21), 58% and 74.5% of nurses had good practice level on oxygen therapy, respectively. This might be due to unavailability of oxygen administration guidelines and insufficient training on oxygen therapy.

In our study, the nurses had poor knowledge about normal oxygen saturation, contraindications of oxygen therapy and sign and symptoms of oxygen toxicity. About half of the nurses did not follow patients' vital signs during and after oxygen administration. In addition, more than 75% of the participants did not wash hands before and after the procedure. Furthermore, one third of the subjects did not adjust oxygen flow rate according to the prescription.

There was some limitation in our study, the present study was a cross sectional design so it did not show temporal relationships. In addition, our study did not include nurses working in private hospitals, which questions the generalizability of our results.

Conclusion

More than half of nurses working in public hospitals of the Harari region do not have good practice about oxygen therapy. Moreover, 38.51% of the nurses do not have good knowledge about oxygen therapy. These findings indicate a clear knowledge and practice gap among nurses in the study area, which can negatively affect patients' safety. Therefore, it is recommended to promote knowledge and practice of nurses about oxygen therapy through in-service training and workshops.

Conflict of interest

The authors declare that there is no conflict of interest regarding publication of this article.

Author contributions
Starting from title to data analysis and writing the manuscript was by AH

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