Therapeutic Effect and Complaints for Patients Receiving Supplemental Oxygen Therapy at Zagazig University Hospitals

Tayser Esam Goda Morsi[1], Fathia Attia Mohamed [2] & Aida Ahmed Mohamed [3]

(1) Clinical Instructor of Medical Surgical Nursing, Faculty of Nursing at Zagazig University, (2) Assistant Professor of Medical Surgical Nursing, Faculty of Nursing at Zagazig University, & (3) lecturer of Medical Surgical Nursing, Faculty of Nursing, Zagazig University

Abstract

Background: Oxygen therapy is one of the most widely used medicines. It can also cause harmful effects when used incorrectly and can even be fatal. **The aim** of this study was to assess therapeutic effect and complaints among patients receiving supplemental oxygen therapy at Zagazig university hospitals. **Subject and methods: Research design:** A descriptive design was used. **Setting**: The study was conducted at all intensive care units and emergency departments at Zagazig University Hospitals, Sharqia government, Egypt. **Subjects:** A purposive sample of 30 patients was included in this study. **Tools of data collection:** Two tools were used: **Tool I:** A structure interview questionnaire to assess therapeutic effects and patient **Tool II:** Complaints and standardized dyspnea scale. **Results:** Study results revealed that oxygen therapy was effective in improving most patients' vital signs, arterial blood gases and dyspnea scale but they had some complaints such as dryness of mouth, nose and eye, ulcers behind the ear, bleeding from the nose and statistically significant relations were found between patients' smoking habit, duration of smoking, oxygen therapy duration and flow rate and therapeutic effect of oxygen therapy. **Conclusion:** patient's condition was improved with oxygen therapy with some complaints. **Recommendations:** A close observation for patients receiving oxygen therapy is needed as well as their complaints to save patients life.

Keywords: Therapeutic effect, complaints, patients, oxygen therapy

Introduction

Oxygen is an indispensable element of life; its deficiency has deleterious consequences to all organs of the human body leading eventually to cell dysfunction and death. Oxygen supplementation is used on a daily basis in clinical practice (1). Patients must receive this therapy in an appropriate, safe, effective and comfortable way. This depends on a sound understanding of why oxygen is being delivered, the methods of oxygen delivery and the nursing needs of the patient receiving it (2).

Oxygen therapy should be considered for patient with a significant reduction in arterial oxygen levels. Irrespective to diagnosis and especially if the patient is drowsy or unconscious. Indication for oxygen therapy include cardiac and respiratory arrest, respiratory failure, chest pain or acute respiratory syndrome with hypoxia or evidence of shock, low blood pressure, decrease cardiac output, increase metabolic demand and carbon monoxide poisoning (3). Oxygen therapy has been widely used and strongly recommended for COVID-19 patients in hospitals and cabin hospitals. Oxygen therapy can be administrated for patients diagnosed with COVID-19 regardless of hypoxia and may be helpful to prevent the disease progression by inhibiting the rapid replication of the virus and improving the body's antiviral ability. When oxygen is used appropriately, it can save lives (4).

The effectiveness of oxygen therapy depends on the ability to deliver the precise dose (FiO2) with devices that meets the flow and patients comfort. Oxygen therapy systems generally are categorized as low flow/ variable/ performance or high flow/ fixed performance devices. The low flow devices consist of the nasal cannula, simple face mask, partial rebreathing mask, and non-rebreathing mask. The high flow O2

delivery devices consist of venture mask, oxygen tent and oxygen hood [5].

Like most other drugs, oxygen therapy can cause adverse reactions and complications. After prolonged exposure to oxygen therapy oxidative damage can occur in any cell in the body, deleterious effects most often occur in lungs, eyes, red blood cells, kidney and endocrine glands. Also, the rate of absorption atelectasis and oxygen toxicity is accelerated [6]. Mask discomfort, nasal dryness, oral dryness, eye irritation, nasal and eye trauma, gastric distension, and aspiration are variety of untoward effects on patients with oxygen therapy [7].

The primary focus for patient care is determining the oxygen saturation of hemoglobin in arterial blood (SaO2). The SaO2 is commonly measured or estimated with pulse oximetry, blood gas analysis, and hemoximetry. These methods are used by nurses to determine the efficiency of the respiratory system, patients' state, and interventions that should be applied [8].

Significance of the study:

Oxygen is widely available and used in a range of settings and conditions. It has remained one of the most effective therapeutic agents available [9]. Inadequate oxygen administration may result in cardiac arrhythmias, tissue injury, renal injury and ultimately cerebral damage. Inadequate knowledge about supplemental oxygen and the equipment required and used to administer it to patients are among the barriers to optimal delivery of oxygen to the patients [10].

When care for the patient with oxygenation disorders, the goals should be individualized to reflect the client's capabilities and limitations. In many cases, identifying desired outcomes of care is best accomplished in small steps. Outcomes may be based on physiological parameters such as respiratory rate or arterial blood gases values and client comfort levels, the desired outcome of intervention might be a respiratory rate of 20 breaths per minute or less, improved ABG results and minimal or absent patient complaint. Achievement of the outcome indicates resolution of the problem [11]. Therefore this study was conducted to assess therapeutic effect and complains of patients receiving oxygen therapy.

Aim of the study:

The current study aimed to assess therapeutic effect and complaints among patients receiving supplemental oxygen therapy at Zagazig university hospitals.

Research Questions:

1. What is the therapeutic effect of supplemental oxygen therapy?
2. What are the patients' complaints from supplemental oxygen therapy?

Subjects and methods:

Research design:

A descriptive design was used

Study setting:

The current study was carried out at the intensive care units and emergency departments at Zagazig University Hospitals, Sharqia government, Egypt.

Study subjects:

A purposive sample composed of 30 patients aged 20-65 years, from both sex, receiving supplemental oxygen therapy, free from any cognitive or hearing disorders, accept to participate in the study, un intubated and un arrested.

Tools of data collection:

Two tools were used to collect necessary data.

Tool I: an interview questionnaire for patients was developed by the researchers based on the literature review. It consisted of four parts; **Part one** used to assess the demographic data which included age, gender and social status and

medical history of patient which included smoking, smoking duration per year, department and medical diagnosis. **Part two** involved oxygen profile; some data were obtained from patients' medical records (source, type, device, period and flow rate of oxygen therapy). **Part three** used to assess therapeutic effect of oxygen therapy involved clinical measurement of vital signs and arterial blood gases results; these measurements were obtained before and after oxygen therapy. **Part four** involved the patients' Complaints from the use of supplemental oxygen therapy: including (Dryness of mouth, nose and eye, ulcers behind the ear, bleeding from the nose, itching and irritation of skin around the nose and mouth result from the nasal cannula) and open ended question if the patients have another complaint about oxygen therapy .

Tool II: standardized dyspnea scale Perry, et al [(12)] & Rache, et al [(13)]; was obtained from patients to assess the difficulty of breathing and scoring from zero where there is no difficulty in breathing at all and progresses to ten where the difficulty of breathing reached the maximum.

Content validity& Reliability:

The Tool "interview questionnaire" was revised by a panel of three experts from different specialties, which included one professor of medical surgical nursing, one professor of administrative nursing and one professor of obstetrics nursing at Zagazig University they reviewed the tool's content for clarity, relevance, comprehensiveness, applicability, understanding, and ease for implementation. The reliability of this tool was tested through measuring its internal consistency. In the current study, Cronbach α was 0.82.

Fieldwork

Once the approval was granted to progress in the study, the researcher started to organize a schedule for collecting the data. The researcher visited study setting to be familiar with work process, time of work and observe patients attending the study settings to a set schedule for data collection.

The researcher used to go to the study setting for interviewing the patients who fulfill the criteria. The purpose of the study was explained to each patient individually, and then the patient was asked to participate in the study. The study tools were obtained from patients. The time needed to answer the interview questionnaire ranged from 20-30 minutes for each patient according to patient state and 45-60 minutes for measurement of vital signs and arterial blood gases. The fieldwork was executed over the period from beginning of October 2019 to the end of March 2020; two days a week (Saturday and Sunday) in the morning and afternoon shifts

Pilot study:

A pilot study was conducted on 5 patients (10%) in the setting according to studied sample. The goal was to check the clarity, applicability, relevance and feasibility of the tools. And to identify the difficulties may be faced during the application. It also helped to estimate the time needed to fill in the questionnaire. Since no modifications were done, the subjects who shared in the pilot study were included in the main study sample.

Administrative and ethical considerations:

The study was approved by the Research Ethics Committee (REC) and the Postgraduate Committee of the Faculty of Nursing at Zagazig University. Verbal consent was obtained from the patients after a description of the purpose of the study.

Statistical analysis:

All data were collected, tabulated and statistically analyzed using SPSS 20.0 for windows (SPSS Inc., Chicago, IL, USA 2011). Quantitative data were expressed as the mean ± SD & (range), and qualitative data were expressed as absolute frequencies (number) & relative frequencies (percentage). Mann Whitney U test was used to compare between two

groups of non-normally distributed variables paired t test was used to compare between paired two variables of normally distributed.Percent of categorical variables were compared using Chi-square test or Fisher's exact test when appropriate. McNemar test was used to compare between before and after categorical variable. All tests were two sided. P-value < 0.05 was considered statistically significant (S), and p-value ≥ 0.05 was considered statistically insignificant (NS).

Results:

Among 30 patients, the mean age was 54.5±10.4 years, 46.7%% were males. More than three quarters were married (76.7%) and 30% were smokers with duration ranged from 5 to 35 years. In addition the highest percentage of patients' medical diagnosis 40% was related to respiratory system and all patients received moist oxygen therapy from central source (100%), less than two thirds of studied patients received oxygen therapy via face mask for less than 5 days with flow rate ≤5L/M (53,3%, 63,3 and 63,3%) respectively **(Table1)**.

According to therapeutic effect of oxygen therapy, concerning relation between patients vital signs before and after oxygen therapy, (90%) of patients was suffering from abnormal respiratory rate before oxygen therapy, this was upturned after oxygen therapy, where 76.7% of patients had normal respiratory rate with statistically significant difference with p.value 0.0001. Also pulse rate was (50%) abnormal before oxygen therapy and decreased to (26.70%) after oxygen therapy, while blood pressure not improved and temperature was the same before and after the oxygen therapy. As regard to relation between patients arterial blood gases before and after oxygen therapy (17%) of patients had normal PaO2 before oxygen therapy, this was improved after oxygen therapy, where 60% of patients had normal PaO2 with statistically significant difference p=0.0001. Moreover non one had normal level of SaO2 before oxygen therapy which upraised to be 30% of patients had normal level of SaO2 p=0.004. In addition PaCO2 improved from 30% before oxygen therapy to be 73% after treatment with oxygen, with statistically significant difference p=0.001 **(Table 2)**.

Table (3) reveals that the common patients' complains during oxygen therapy were fatigue followed by eye dryness, mouth dryness, post ear ulcer and eye burning (73.3%, 66. 7%, 63.3 %) respectively.

Table (4) shows that 30% of patients were suffered from severe dyspnea before oxygen therapy and only 10% complaint from very very severe with mean ± SD (6±2) and range from 2 to 9. While after oxygen therapy 26.7% had light difficulty of breathing and 10% very severe difficulty of breathing, with no one had very very severe difficulty of breathing, it is obvious that scale decline after oxygen therapy with mean± SD (3.2±1.6) and range from 1 to 7, the difference is statistically significant P=0.0001.

The study findings detects statistically significant difference between smoking habit of patients and their respiratory rate and arterial blood gases(SaO2 and PaCO2) and dyspnea scale after oxygen therapy (p<0.05). The study also demonstrates statistically significant difference between duration of smoking habit of patients and their respiratory rate and arterial blood gases (SaO2, PaCO2& HCO3) and dyspnea scale after oxygen therapy p<0.05 **(Table 5)**.

Table 6 detects statistically significant difference between patients' oxygen therapy duration per day and their post respiration, PaO2 and SaO2 after oxygen therapy p<0.05. The study also demonstrates statistically significant difference between patients pulse rate, respiratory rate and post SaO2 after oxygen therapy and oxygen flow rate (liter/minute) (p<0.05).

Discussion:

Based on the current study findings, nearly to half of studied patients was male, more than three quarter aged more than 40 years. In the same consequence with Al-Otaibi [14] who reported in his master thesis entitled " Current practice of prescription and administration of oxygen therapy: An observational study at a single teaching hospital" that there were 14 male and 7 female and their age was on average 42 years. Finding of this study clarified that nearly third of studied patients were smokers within duration ranged from 5 to 35 years. This disagree with Andrade, et al. [15] who reported in his master thesis entitled " Hyperbaric oxygen therapy for wound care" that majority of studied patients were smokers and possible explanation was that majority of patient was youth male.

Based on the current study the findings showed that the highest percentage of patient's medical diagnosis was related to respiratory system, followed by general condition, while nearly one quarter of patients medical diagnosis was related to cardiac vascular condition and less diagnosis was related to post-operative condition. This result in the same consequence with Sankar [16] who reported in his master thesis entitled "An audit of oxygen prescribing practices in a tertiary care hospital" that respiratory diagnosis was the commonest followed by cardiovascular and neurological illness then others as sepsis and cyanosis.

The results of the current study revealed that all patients received moist oxygen therapy from central source, more than half of them received oxygen therapy via face mask for less than 5 days with flow rate ≤5L/M**.** these results was in accordance with Jacobs, et al. [17] who reported in his thesis entitled "Patient Perceptions of the Adequacy of Supplemental Oxygen Therapy" that Respondents varied in time on oxygen, with most reporting usage from 1 year to more than 5 years and using oxygen 24 h/d. One-third of respondents used continuous flow rates equal to or exceeding 5 L/M. This may be due to difference of patient condition as majority of them had COPD and pulmonary hypertension.

The results of the current study clarified that majority of patients was suffering from abnormal respiratory rate before oxygen therapy, this was upturned after oxygen therapy, where more than three quarter of patients had normal respiratory rate with statistically significant difference (p=0.0001). This agree with Geng, et al. [18] who reported in his thesis entitled " High-Flow Nasal Cannula: A Promising Oxygen Therapy for Patients with Severe Bronchial Asthma Complicated with Respiratory Failure" that heart rate (HR) and respiratory rate (RR) in both groups (high flow nasal cannula and conventional oxygen therapy) were assessed. The results suggested that these indicators in both groups significantly decreased with time, as OT improves oxygenation by increasing arterial oxygen tension and arterial oxygen content.

These results was in accordance with Yuste, et al. [19] who reported in his thesis entitled " Efficacy and safety of high-flow nasal cannula oxygen therapy in moderate acute hypercapnic respiratory failure" that A nonsignificant improvement was observed in respiratory rate (28.0 ±0,9 versus 24.3±1.5, p = 0.22), this result was due to most of patient aged more than 66 years, there was marked increase in PCO2 and patient tolerance so O2 therapy improve patient but not significantly.

Based on the current study the findings showed that less than fifth of patients had normal PaO2 before oxygen therapy, this was improved after oxygen therapy, where more than half of patients had normal PaO2 with statistically significant difference (p=0.0001). Moreover non one had normal level of SaO2 before oxygen therapy which upraised to be more than quarter of patients had normal

level of SAO2 (p=0.004). In addition PACO2 improved from 30% before oxygen therapy to be nearly three quarter after treatment with oxygen, with statistically significant difference (p=0.001). These findings in the same line with Rizk, et al. [20] who reported in his thesis entitled " Effect [of] Oxygen Therapy by Venturi Mask versus Non Invasive Ventilation on the Outcome of Patients Who Develop Hypoxia after Open Heart Surgery" that there were a significant increase in mean PaO2 and SpO2 after using oxygen therapy by venture mask but disagree with this thesis according to PaCO2 and HCO3 that showed a significant increase after using oxygen therapy via venture mask, this study author explain that increased carbon dioxide emission by rapid breathing, result in decrease PaCO2 level which increased PH resulting in respiratory alkalosis.

The current study clarified that the common patient complain during oxygen therapy were fatigue followed by eye dryness, mouth dryness, post eye ulcer and burning, while the less complains were burning around nasal cannula and epistaxis, this may related to unsatisfactory nurses practice regarding oxygen therapy especially preparatory phase and related to methods of O2 administrating, flow rate, duration and care provided during therapy. This in same line with Wen, et al. [21] who reported in his thesis entitled "Is humidified better than non-humidified low-flow oxygen therapy? A systematic review and meta-analysis" the incidence of dry nose and throat, nose bleed and chest discomfort with both humidified and non humidified O2 therapy.

This result was in the same consequence with Yue, et al. [22] who reported in his thesis entitled "Clinical effect of conventional wet low -flow oxygen and dried low flow oxygen" that patient complained from dry nose and throat, nosebleed and chest discomfort. This result was supported by Jamieson, et al. [23] who reported in his book entitled " Clinical Nursing Practices E-Book: Guidelines for Evidence-Based Practice" that oxygen , even when adequately humidified , cause the mouth and nasal passage to become dry and other complain as skin ulcer, irritation and nose bleeding according to duration of O2 therapy and nurses practice.

Based on the current study the findings showed that incidence of dyspnea was declined after oxygen therapy with mean± SD (3.2±1.6) and range from 1 to 7 the difference statistically significant (P=0.0001).This agree with Bell, et al. [24] who reported in his thesis entitled " Randomized control trial of humidified high flow nasal cannulae versus standard oxygen in the emergency department" that in regard to the patients' self-reported dyspnea scale,75% from the intervention group (high flow oxygen therapy) reported a reduction in Borg score compared with 55.8% from the control group (standard oxygen therapy group) (P = 0.044).This result was disagree with Vargas, et al. [25] who reported in his thesis entitled " Physiologic Effects of High-Flow Nasal Cannula Oxygen in Critical Care Subjects" that Dyspnea improved with oxygen therapy, but this improvement was not significant.

The result of the present study showed that there was statistically significant difference between smoking habit of patients and their respiratory rate and arterial blood gases(SaO2 and PaCO2) and dyspnea scale after oxygen therapy (p<0.05). This result was agree with Arabaci, et al. [26] who reported in his thesis entitled " Effects of Smoking on Pulmonary Functions and Arterial Blood Gases Following Coronary Artery Surgery in Turkish Patients" that smoking affects pulmonary functions by causing obstructive type respiratory problems and by worsening existing restrictive type respiratory problems. The postoperative deterioration in blood gas and vital signs measurements of smokers was also statistically significant compared with nonsmokers .

This result was supported by Lump, et al. [27] who reported in his

book entitled "Nunn's Applied Respiratory Physiology E-Book" that airway diameter is reduced acutely with smoking as result of bronchoconstriction due to inhaled particles and increases mucus production that have severe effect in lung function and cause premature airway closure. Increase closing volume, decreased forced expiratory volume and disturbed ventilation perfusion gas exchange thus respiratory rate and ABG result deterioration.

The result of the present study revealed that there was statistically significant difference between duration of smoking habit of patients and their respiratory rate and arterial blood gases(SaO2, PaCO2 &HCO3) and dyspnea scale after oxygen therapy ($p<0.05$). This agree with Preston, et al. [28] who reported in his book entitled "Respiratory Nursing at a glance" that continuing to smoke is associated with an increased risk of accelerated decline in lung function and increased mortality and it is possible that the negative effect of smoking offset any benefit from oxygen therapy. Patient who continue to smoke should be counseled that the potential for clinical benefit of oxygen therapy might be limited. This result is supported by Mason, et al. [29] who reported in his book entitled "Murray and Nadel's Textbook of Respiratory Medicine E-Book" that intensity, quantity and duration of smoking correlate with development of clinically significant pulmonary abnormalities. For example, longitudinal studies have shown accelerated decline in forced expiratory volume, altered cough reflexes and impaired gas exchange in response to cigarette smoking duration.

The result of the present study showed that there was statistically significant difference between patients' oxygen therapy duration per day and their respiratory rate, PaO2 and SaO2 after oxygen therapy $p<0.05$. This result is supported by Mason, et al. [29] who reported in his book entitled "Murray and Nadel's Textbook of Respiratory Medicine" that benefits of increased duration of OT are a reduction of hematocrit, modest neuropsychological improvement and improvement of pulmonary hemodynamics and dramatic reduction of cor pulmonale as in COPD patients, it also improve dysnea and work of breathing by reducing airway resistance.

The results of the current study revealed that there was statistically significant difference between patients pulse rate, respiratory rate and post SaO2 after oxygen therapy and oxygen flow rate (liter/minute) ($p<0.05$).This agree with Makdee, et al. [30] who reported in his thesis entitled " High-Flow Nasal Cannula Versus Conventional Oxygen Therapy in Emergency Department Patients With Cardiogenic Pulmonary Edema: A Randomized Controlled Trial" that respiratory and pulse rate were significantly different between HFNC group with 35L/m and conventional oxygen therapy group with 3 L/m, and the Dyspnea Scale score, were not significantly different between the two groups. This also agree with Kim, et al. [31] who reported in his thesis entitled " Effectiveness of high-flow nasal cannula oxygen therapy for acute respiratory failure with hypercapnia" that PaO2 was significantly improved and PaCO2 was significantly decreased with HFNC due to increased flow rate compared with conventional oxygen therapy with less flow rate. This also agree with Roca, et al. [32] who reported in his thesis entitled " High-flow Oxygen Therapy in Acute Respiratory Failure" The total gas flow administered was higher with the HFNC than with the face mask (30 [21.3–38.7] L/min vs 15 [12–20] L/min, $P < .001$). The HFNC was associated with less dyspnea, higher PaO2 and lower respiratory rate

Conclusion:

Oxygen therapy was effective in most patients as patients' vital signs, arterial blood gases results and dyspnea scale were improved with oxygen therapy administration. There was statistically significant difference between patients' smoking habit, duration of smoking habit and their respiratory rate, arterial blood gases and dyspnea scale after oxygen therapy. Also, there was statistically significant difference between patients' oxygen therapy duration per day and their post respiration, PaO2 and SaO2 after oxygen therapy $p<0.05$, furthermore, there was statistically significant difference between patients pulse rate, respiratory rate and post SaO2 after oxygen therapy and oxygen flow rate (liter/minute) ($p<0.05$). There were some patient complains including (fatigue , eye dryness, mouth dryness, post ear ulcer and burning , burning around nasal cannula and epistaxis) that may be related to unsatisfactory nurses knowledge and practice regarding safe and effective use of supplemental oxygen therapy.

Recommendations:

Based upon the findings of the present study, a close observation for patients receiving oxygen therapy in needed as well as their complaints to save patients life. Also careful monitoring and assessment of patient's clinical signs especially the result of arterial blood gases analysis as it is the gold standard for documenting physiologic indices of oxygenation are recommended.

Table (1): Demographic Characteristics and Oxygen Profile of Studied Patients Treated with Oxygen Therapy (n=30):

Variables	No.	%
Demographic data		
Age per years	7	23.3
≤40	23	76.7
>40		
Mean± SD	54.5±10.4	
Median (range)	53.5(20-65)	
Sex:		
Male	14	46.7
Female	16	53.3
Social status: Single	7	23.3
Married	23	76.7
Medical history		
Smoking: Non smokers	21	70.0
Smokers	9	30.0
Duration of smoking per year(n=9): ≤5	2	22.2
>5	7	77.8
Mean ±SD	23.3±11	
Median (range)	25(5-35)	
Department		
Critical ICU	8	26.7
Post anesthesia ICU	4	13.3
Cardio thoracic ICU	18	60.0
Medical diagnosis related		
Respiratory system	12	40
Cardiac vascular system	7	23.30
Post-operative	2	6.70
General condition	9	30
Oxygen profile		
Source of oxygen: (central source)	30	100.0
Type of oxygen : (Moist)	30	100.0
Device of oxygen inhalation		
face mask	16	53.3
Venture	11	36.7
Nasal cannula	3	10
Period of oxygen therapy per day		
≤5 days	17	63.3
>5 days	13	36.7
Mean ± SD	6.2±3.7	
Median (range)	5(2-18)	
Oxygen flow rate per liter /minute	19	63.3
≤5 liter	11	36.7
>5 liter		
Mean ± SD / Median (range)	5±2.2 / 5(2-10)	

Table (2): Relation between the Vital Signs and Arterial Blood Gases before and after Oxygen Therapy among Studied Patients (n=30):

Items	Time				#p-value
	Before therapy		After therapy		
	No	%	No	%	
Vital signs					
Pulse rate					
Abnormal	15	50.0	8	26.7	0.17
Normal	15	50.0	22	73.3	
Respiratory rate					
Abnormal	27	90.0	7	23.3	**0.0001(S)**
Normal	3	10.0	23	76.7	
Blood pressure					
Abnormal	1	3.3	3	10.0	0.5
Normal	29	96.7	27	90.0	
Body temperature					
Normal	30	100.0	30	100.0	-
Arterial blood gases					
PaO2					
Abnormal	25	83	12	40.0	**0.0001(S)**
Normal	5	17	18	60.0	
SaO2					
Abnormal	30	100	21	70.0	**0.004(S)**
Normal	0	0.0	9	30.0	
PH					
Abnormal	1	3.3	0.0	0.0	0.99
Normal	29	96.7	30	100	
PaCO2					
Abnormal	21	70.0	8	27	**0.001(S)**
Normal	9	30.0	22	73	
HCO3					
Abnormal	26	86.7	18	60.0	0.08
Normal	4	13.3	12	40.0	

#Mc Nemar significant test (S) statistically significant =p<0.05

Table (3): Frequency Distribution of Patient's Complaint from the Oxygen Therapy (n=30):

Items	No.	%
Mouth dryness		
Present	19	63.3
Post ear ulcer		
Present	19	63.3
Eye dryness		
Present	20	66.7
Eye burning		
Present	19	63.3
Nose dryness		
Present	16	53.3
Epistaxis		
Present	2	6.7
Itching and Burning in nares and mouth around nasal cannula		
Present	3	10.0
Fatigue		
Absent	8	26.7
Present	22	73.3
Headache		
Absent	15	50.0
Present	15	50.0
Other complaint		
Absent	15	50.0
Present	15	50.0

Table (4): Relation between Dyspnea Scale Pre-Post Oxygen Therapy among studied Patients (n=30):

Dyspnea scale	difficulty of breathing before O2 therapy (n=30)		difficulty of breathing after O2 therapy (n=30)		Paired t	p-value
	No	%	No	%		
Difficulty of Breathing						
Very light	0	0	3	10		
Light	0	0	8	26.7		
Average	3	10.0	9	30		
Fairly severe	8	26.7	7	23.3		
Severe	9	30.0	0	0		
very severe	7	23.3	3	10.0		
Very very severe	3	10.0	0	0		
Mean ±SD Median (range)	6±2 6(2—9)		3.2±1.6 3(1—7)		18.5	**0.0001 (S)**

Paired t test of significant (S) statistically significant =p<0.05

Table (5): Relation between of Patients' Vital Signs , Arterial Blood Gases and Dyspnea scale after Oxygen Therapy and their Smoking Habit and duration of smoking (n=30):

Items	Smoking				^p	duration of smoking				^p Value
	Smokers n=9		Nonsmokers n=21			≤ 5 years n=2		>5 years n=7		
	No	%	No	%		No	%	No	%	
Post pulse										
Abnormal	4	44.4	4	19.0	0.19	1	50.0	3	42.9	0.99
Normal	5	55.6	17	81.0		1	50.0	4	57.1	
Post .respiration										
Abnormal	8	88.9	11	52.4	**0.001**	0	0	3	42.9	**0.0001**
Normal	1	11,1	10	47.6	**(S)**	2	100.0	4	57.1	**(S)**
Post blood pressure			2	9.5						
Abnormal	1	11.1			0.99	0	0	1	14.3	0.99
Normal	8	88.9	19	90.5		2	100	6	85.7	
Post temperature										
Abnormal	0	0	0	0	-	0	0	0	0	-
Normal	9	100	21	100		2	100	7	100	
post.PaO2										
Abnormal	4	44.4	8	38.1		2	100.0	3	42.9	0.444
Normal	5	55.6	13	61.9	0.99	0	0	4	57.1	
post.SaO2										
Abnormal	6	66.6	7	33.3	**0.004**	1	50.0	6	85.7	**0.014 (S)**
Normal	3	33.3	14	66.6	**(S)**	1	50.0	1	14.3	
post.PH										
Abnormal	0	0	0	0	-	0	0	0	0	-
Normal	9	100.0	21	100		2	100	7	100	
post.PaCO2										
Abnormal	7	77.8	5	23.8	**0.0001 (s)**	0	0	3	42.9	**0.001 (s)**
Normal	2	22.2	16	76.2		2	100	4	57.1	
post.HCO3										
Abnormal	5	55.6	13	61.9	0.99	0	0	5	71.4	**0.0001 (s)**
Normal	4	44.4	8	38.1		2	100	2	28.6	
Difficult of breathing Mean ±SD	6.2±2.2		3±1.3		**0.0001 (s)**	3.8±2.4		6.5±0.7		**0.0001 (s)**

^Fisher exact test MW= Mann whitnney test of significant
Statistically significant =p<0.05

Table (6): Relation between Patients' Vital Signs , Arterial Blood Gases and Dyspnea scale after O2 Therapy and Duration and flow rate of O2 therapy (n=30):

Items	Oxygen duration per days				^p	Oxygen flow (liter/minute)				^p
	≤5 day n=17		>5 days n=13			≤5 liter n=19		>5 liter n=11		
	No	%	No	%		No	%	No	%	
Post pulse		.					.		.	**0.014 (S)**
Abnormal	5	29.41	3	23.08	0.99	8	42.11	0	.00	
Normal	12	70.59	10	76.92		11	57.89	11	100.0	
Post respiration										
Abnormal	15	88.23	3	23.08	**0.0001**	13	68.42	5	45.45	-
Normal	2	11.76	10	76.92	**(s)**	6	31.58	6	54.55	
Post blood pressure										
Abnormal	0	.00	3	23.08	0.07	2	10.53	1	9.09	-
Normal	17	100.0	10	76.92		17	89.47	10	90.91	
Post temperature		.		.			.		.	
Abnormal	0	.00	0	.00	-	0	.00	0	.00	
Normal	17	100.0	13	100.0		19	100.0	11	100.0	-
Post PaO2		.		.			.		.	
Abnormal	13	76.47	5	38.46	**0.035 (S)**	9	47.4	5	45.45	0.99
Normal	4	23.53	8	61.54		10	52.6	6	54.55	
Post SaO2		.		.			.		.	
Abnormal	10	58.82	3	23.08	**0.04(s)**	10	52.6	2	18.18	**0.004(s)**
Normal	7	41.18	10	76.92		9	47.4	9	81.82	
post.PH		.		.			.		.	
Abnormal	0	.00	0	.00	-	0	.00	0	.00	-
Normal	17	100.0	13	100.0		19	100.0	11	100.0	
post.PaCO2		.		.			.		.	
Abnormal	13	76.47	8	61.54	0.24	6	31.58	2	18.18	0.67
Normal	4	23.53	5	38.46		13	68.42	9	81.82	
Post HCO3		.		.			.		.	
Abnormal	12	70.59	10	76.92	0.71	11	57.89	7	63.64	0.99
Normal	5	29.41	3	23.08		8	42.11	4	36.36	
Difficult of breathing Mean ±SD	3.12±1.7		3.2±1.6		MW=0.28 P=0.78	3.12±1.9		3.2±0.87		MW=1.04 P=0.3

^Fisher exact test (MW) =Mann Whitney test of significant χ^2 = Chi square test

statistically insignificant =p>0.05 (S)= statistically significant =p<0.05

References:

1. Kavitha, K. & Patil, N. G. Effectiveness of need based training on knowledge regarding oxygen therapy for pediatric clients, International Journal of Pharmaceutical Science Invention, (2015). 4(9), 20.
2. Mahmoud, A. H. O., Alseed, H. A. H. F., Awad, H. M. A. A., Ahmed, A. H. & Elhussein, G. E. M. O. Assessment of Knowledge and practice of nurses regarding oxygen therapy in elmak nimir university hospital, European journal of pharmaceutical and medical research, (2016). 3(4), 30.
3. Aitken, L. Marshall, A. & Chaboyer, W. (2015). Critical care nursing, Rose, l., &Butcher, R., oxygen therapy, (4th ed), (2015). (p: 464), Elsevier.
4. Shen, C. Yue, X. Wang, J. Shi, C. & Li, W. Nocturnal oxygen therapy as an option for early COVID-19, International Journal of Infectious Diseases, (2020). doi:10.1016/j.ijid.2020.06.080.
5. Batools, &Garg, R., Appropriate use of oxygen delivery devices, openAnaesthesiology Journal,(2017).,volume11,Doi:102174/1874321801711010035, 35.
6. Adipa, F. E., Aziato, L. & Zakariah, A. N., Qualitative exploration of nurses' perspectives on clinical oxygen administration in Ghana, International Journal of Africa Nursing Sciences, (2015). volume 2, 42-43, available at http://creativecommons.org/licenses/by-nc-nd/4.0/, accecced at 16/2/2020, at 12am.
7. Nishimura, M., High-flow nasal cannula oxygen therapy in adults, Journal of Intensive Care, (2015). DOI 10.1186/s40560-015-0084-5, Available at https://www.ncbi.nlm.nih.gov/, accecced at 4-11-2020 at 11pm.
8. Nathan, D. & Legband, Development of Peritoneal Microbubble Oxygenation as an Extrapulmonary treatment for hypoxia, ProQuest Dissertations, (2017), Degree of Doctor, The University of Nebraska ,13.
9. Sankar, An audit of oxygen prescribing practices in a tertiary care hospital, Curr Pediatr Res journal, 20 (1&2), (2016). 250-252.
10. Mal, P. R., Suneel, P., Prabin, K., Raj, D. P., Alam, K. M., Aakash, S., Kumar, J. N. & Shatdal, C., Survey to Assess the Knowledge of Postgraduate Residents about Acute Oxygen Therapy, emergency medicine and critical care, (2019). 3(12), 94.
11. Delaune, S. C. & Ladner, P. K., Fundamental of Nursing : Standers and Practice, Oxygenation, (4th ed), (2011). (p: 876), Delmar Cengage Learning Co.
12. Perry, A. G., Potter, P. A. & Ostendorf, W., Skills Performance Checklists for Clinical Nursing Skills & Techniques - E-Book, oxygen therapy, 8th edition, Elsevier, united states of America, (2014). 522.
13. Rache, Thomas, Richards, E. & Taylor, C., Practical medical procedures at glance, common procedures_respiratory,1st edition, Wiley, UK, (2015). P: 52.
14. Al-Otaibi, H. M., Current practice of prescription and administration of oxygen therapy: An observational study at a single teaching hospital, Journal of Taibah University Medical Sciences, (2019). 14(4), 359 .
15. Andrade, S. M. & Santos, I. C. R. V., Hyperbaric oxygen therapy for wound care, Rev Gaúcha Enferm, (2016). 37(2), 2.
16. Sankar, An audit of oxygen prescribing practices in a tertiary care hospital, Curr Pediatr Res journal, (2016). 20 (1&2), 250-252.
17. Jacobs, S. S., Lindell, K. O., Collins, E. G., Garvey, C. M., Hernandez, C., McLaughlin, S., Schneidman, A. M. & Meek, P. M., Patient Perceptions of the Adequacy of Supplemental Oxygen Therapy, AnnalsATS, (2018). (15)1, 24.
18. Geng, W., Batu, W., You, S., Tong, Z. & He, H., High-Flow Nasal Cannula: A Promising Oxygen Therapy for Patients with Severe Bronchial Asthma Complicated with Respiratory Failure, Hindawi, (2020). https://doi.org/10. 1155/2020/2301712, 1-7.
19. Yuste, M. E., Moreno, O., Narbona, S., Acosta, F., Penas, L. & Colmenero, M., Efficacy and safety of high-flow nasal cannula oxygen therapy in moderate acute hypercapnic respiratory failure, Rev Bras Ter Intensiva, (2019). 31(2), 156.

20. Rizk, Y. E., Essawy, T. S., Ali, A. H. A. & El-Gazzar, M. A., Effect of Oxygen Therapy by Venturi Mask versus Non Invasive Ventillation on the Outcome of Patients Who Devolope Hypoxia after Open Heart Surgery, Open Journal of Anesthesiology, (2018). 8(9), 241.
21. Wen, Z., Wang, W., Zhang, H., Wu, C., Ding, J. & Shen, M., Is humidified better than non-humidified low-flow oxygen therapy? A systematic review and meta-analysis, the journal of advanced nursing (JAN), (2017). DOI: 10.1111 /jan. 13323, 2537.
22. Yue, X., He, J. & Chang, Y., Clinical effect of conventional wet low -flow oxygen and dried low flow oxygen, Nursing Journal of Chinese People's Liberation Army, (2015). 32(5), 31.
23. Jamieson, E. M., Whyte, L. A. & Mccal, J. M., Clinical Nursing Practices E-Book: Guidelines for Evidence-Based Practice, oxygen therapy, (5th edition), (2007). (p: 251), elsevier.
24. Bell, N., Hutchinson, C. l., Green, T. c., Rogan, E., Bein, K. j. & Dinh, M. m., Randomised control trial of humidified high flow nasal cannulae versus standard oxygen in the emergency department, Emergency Medicine Australasia, (2015). 27(6), 540.
25. Vargas, F., Saint-Leger, M., Boyer, A., Bui, N. H. & Hilbert, G., Physiologic Effects of High-Flow Nasal Cannula Oxygen in Critical Care Subjects, Respiratory Care, (2015). 60(10), 1369–1376 .
26. Arabaci, U., Akdur, H. & Yigit, Z, Effects of Smoking on Pulmonary Functions and Arterial Blood Gases Following Coronary Artery Surgery in Turkish Patients, Japanese Heart Journal, ., (2003). 44(1), 61–62 .
27. Lumb, A. B. & Pearl, R. G., Nunn's Applied Respiratory physiology Book, basic principles, 8th edition, Elsevier, china, (2020). 6.
28. Preston, W. & Kelly, respiratory nursing at glance, emergency oxygen therapy, 1st edition, Willey Blackwell, UK, (2017). 98.
29. Mason, R. J., Broaddus, V. C., Martin, T. R., King, T. E., Schraufnagel, D., Murray, D. F. & Nadel, J. A., Murray and Nadel's Textbook of Respiratory Medicine, obstructive diseases, 5th edition, Elsevier, china, (2010). 950.
30. Makdee, O., Monsomboon, A., Surabenjawong, U., Praphruetkit, N., Chaisirin, W., Chakorn, T., Nakornchai, T., High-Flow Nasal Cannula Versus Conventional Oxygen Therapy in Emergency Department Patients With Cardiogenic Pulmonary Edema: A Randomized Controlled Trial, Annals of Emergency Medicine, (2017). 70(4), 468 .
31. Kim, E. S., Lee, H., Kim, S. J., Park, J., Lee, Y. J., Park, J. S., Yoon, H. I., Lee, J. H., Lee, C. T.& Cho, Y. J., Effectiveness of high-flow nasal cannula oxygen therapy for acute respiratory failure with hypercapnia, Journal of Thoracic Disease , (2018). 10(2), 885.
32. Roca, O., Riera, J., Torres, F. & Masclans, J. R., High -Flow Oxygen Therapy in Acute Respiratory Failure, respiratory care, (2010).55(4), 408.