Assessment of Nurses' Performance Regarding Care of Children Undergoing Oxygen Therapy

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Abstract

Background: One life-saving treatment that is recommended to prevent or cure tissue hypoxia is oxygen therapy. In medical environments, in order to treat patients who are at risk for low tissue oxygenation and low blood oxygen levels, which can be fatal, the World Health Organization (WHO) recommends oxygen as a necessary medication. **Aim of the study:** The purpose of this study was to assess nurses' performance regarding care of children undergoing oxygen therapy. **Design:** A descriptive design was utilized in this study. **Setting:** The study was carried out in Sohag University Hospital's Pediatric at Intensive Care Unit (PICU). **Sampling**: A convenient sample of all(100) available registered nurses on staff who provides oxygen therapy to children **Tool:** A structured Interviewing Questionnaire Sheet consisting of three tools. **Tool I:** Personal characteristics of the studied nurses, **tool II**: Personal characteristics and medical data of children, and **tool III:** Nurses' knowledge regarding the care of children under oxygen therapy. **Results:** It should be noted that 40.0% of the nurses in the study had average knowledge, 69.0% had inadequate total practices for caring for children receiving oxygen therapy, and 92.0% were women**. Conclusion**: It was based on the results of this study that there was a favorable relationship between the nurses' overall practice and understanding of caring for children receiving oxygen therapy. **Recommendations**: Promote nurses' ongoing exchange of improved information and techniques, and participate in oxygen training courses more mandatory and ongoing.

Keywords: Nurses' performance, Care of Children, Oxygen, Therapy.

Introduction

Oxygen therapy is a life-saving therapy used for the prevention or treatment of tissue hypoxia. In clinical settings, the World Health Organization (WHO) enlists oxygen as an essential drug used to treat children at risk for low tissue oxygenation and low oxygen levels in the blood called hypoxemia, which is life-threatening oxygen therapy improves the quality of life and survival rate in children with respiratory infections, shock, and respiratory distress. Also, oxygen is used too, of course, at normoxic concentration, especially for trauma or if a person has breathing difficulties. However, it has also been suggested that oxygen can be mixed with other gases, which may have a synergistic effect **(Adeniyi et al., 2021 &Biggs et al., 2022).**

One medication that is frequently used in clinical settings and is vital for saving lives is oxygen. It must be used with caution, though, as, like any drug, it can be harmful if used improperly, leading to longer hospital stays, higher rates of admission to high-dependency units, and a higher chance of death. indeed, **(Joosten et al., 2022).**

Included were indications for administering oxygen. It can be started for a variety of reasons, such as increased metabolic demand, maintaining oxygenation while administering anesthetic, supplementing during the treatment of lung diseases that impact oxygen exchange, treating headaches, exposure to carbon monoxide, and more. About 21% of the atmosphere at sea level is made up of oxygen **(Abuzaid et al., 2022).**

Pediatric nurses play an important role in oxygen administration ,where the administration of oxygen to pediatric patients must be of an oxygen delivery system that is appropriate for children`s age, size, needs, clinical condition, and treatment goals. there are two types of oxygen delivery systems as: low-flow (variable performance) systems and high-flow (fixed performance) systems. With low-flow systems, 100% oxygen mixes with room air during inspiration, and room air is entrained, making the percentage of delivered oxygen variable. High-flow devices provide such a high flow of premixed gas that the infant doesn't need to breathe room air. Supplemental oxygen therapy is frequently advised for pediatric children when peripheral oxygen saturation is consistently below 94**%(Walsh, 2023).**

Significance of the study

Oxygen therapy is very urgent in managing acutely ill children. Therefore, a lack of nursing care for

children undergoing oxygen therapy causes dryness in mucous membranes, skin pressure, and blindness, and the mask may cause some children fear with feelings of suffocation as with all devices the nurse should ensure the children's comfort. From the clinical experience and observation of the researcher on pediatric units. It was observed that there was insufficient knowledge and practice regarding care of children's oxygen therapy in the pediatric setting, which may lead to children's brain damage and blindness. Therefore, the researcher will conduct this study to assess nurses' performance regarding the care of children undergoing oxygen therapy **(Franklin et al., 2023).**

According to the statistical office of Sohag University Hospital , the incidence rate of oxygen therapy were more than 600 cases per month admitted to the Pediatric Intensive Care Unit(PICU),Neonatal Intensive Care Unit **(**NICU)**,** most cases were subjected to has been undergoing oxygen therapy which required knowledgeable and practiced nurses to provide nursing care for these pediatric group(**Sohag University Hospital in pediatric statistics department,2024).** So, it is important to conduct such a study to evaluate the effect of self-learning pachage about oxygen provide to children on nursing performance at Pediatric Intensive Care Unit(PICU),Neonatal Intensive Care Unit **(**NICU).

Aim of the study

This study aimed to:

Assess the nurses' performance regarding the care of children undergoing oxygen therapy:

1. Assess the nurses' knowledge regarding the care of children undergoing oxygen therapy.
2. Assess the nurses' practices regarding the care of children undergoing oxygen therapy.
3. Evaluate the relationship between nurses' knowledge and practice regarding the care of children undergoing oxygen therapy.

Research questions

1- What is the level of nurses 'knowledge regarding the care of children undergoing oxygen therapy?
2- What is the level of nurses' practices regarding the care of children undergoing oxygen therapy?
3- Is there a relation between nurses' knowledge and nurses' practice regarding the care of children undergoing oxygen therapy?

Subjects and method

Research design

A descriptive research design was utilized to conduct this study.

Setting

The current study was conducted at the Pediatric Intensive Care Unit (PICU) and Neonatal Intensive Care Unit (NICU) in Sohag University Hospital which is found on the second floor and consisted of 4 rooms (first, second, and third room contains 7incubators, fourth room consisted from 2 incubators for isolation) and Pediatric Intensive Care Unit (PICU) in sohag Specialized Pediatric Hospital which located in the second floor and consisted from 3 rooms (every room contains 6 beds) and Pediatric Units and Pediatric Emergency at the second floor consisted from 4 rooms (every room contains 8 beds).

Sampling

A convenient sample of (100) nurses caring for children undergoing oxygen therapy and working in the previously mentioned setting was included in the study.

Tools for data collection

Two tools were used for data collection as follows:

Tool (I) - *A structured interviewing questionnaire sheet* developed by the researcher **(Helmy et al., 2007)** and translated into Arabic.

Part (1): Personal characteristics of the studied nurses such as age, gender, years of experience, work unit, qualification, and knowledge about oxygen therapy.,

Part (2): Personal characteristics and medical data of children such as age, gender, type of delivery, previous hospitalization, cause, and condition of children.

Part (3): Nurses' knowledge regarding the care of children under oxygen therapy such as types, indications, contraindications, methods, hazards, side effects, complications, and efficiency of oxygen supply **(open questions, MCQ)**

Scoring system: The total knowledge scores were considered as: The scoring system for nurses' knowledge was evaluated for fulfillment of the interviewing questionnaire as the nurses' knowledge was checked with a model key answer. Therefore, the correct answer was scored (1) grade and the incorrect was scored (0).

The total mean score of the nurses' knowledge was classified into three categories.

- ❖ Poor knowledge (less than 65%).
- ❖ Average knowledge (from 65% to 74%).
- ❖ Good knowledge (from 75% to 100%).

Tool (II): An observational checklist: It was adopted by **(Helmy et al., 2007)** to assess nurses' practice regarding the care of children under oxygen therapy including masks, nasal cannulas, and head boxes or incubators. It consisted of (16 steps)

involved procedures of oxygen therapy (Head box or incubator), procedures of oxygen therapy (Nasal cannula) (16 steps), and procedures of oxygen therapy(Mask oxygen)(16 steps).

Scoring system: The total mean score of the nurses' practices was classified into two categories: The scoring system for nurses' practices was evaluated upon fulfillment of the interviewing questionnaire as the nurses' knowledge was checked with a model key answer. Therefore, the correct answer was scored (1) grade and the incorrect was scored (0).

The total level of nurses' practices was categorized as: A score (1) was given when the action was done completely and a score (0) was given when the action was not done.

- Satisfactory practice (85% and more).
- Unsatisfactory practice (less than 85%).

Content validity

The tools of the study were reviewed by a 5-panel experts: in the field of pediatric nursing to evaluate the content validity. Modifications of the tools will be done according to the panel's judgment on clarity of sentences, appropriateness of content, and sequence of items.

Reliability

The internal consistency will be measured to identify the extent to which the items of tools measure the same concept and correlate with each other.

Fieldwork

Data were collected over four months from the beginning of October 2023 to the end of January 2024. The researcher attended the previously mentioned settings 2 days per week (Saturday, and Sunday) ,The researcher data collection from 10 am to 1 pm data collected from nurses who accepted to participate in the study.

Nurses were asked to fill out the questionnaire sheet according to their free time throughout the day. Also, the researcher monitored the nurses during the care of children under oxygen therapy using an observational checklist. The time needed ranged from (10-15) minutes to answer the knowledge questionnaire sheet and (20-25) minutes for the observational checklist.

Pilot study

A pilot study was carried out on 10 % (5 nurses) to evaluate the clarity and applicability of the tools and also to determine the time needed for filling the structured questionnaire. According to the results taken from data analysis, the modifications, corrections, omissions, and additions were done as needed.

Ethical considerations

All of the nurses' ethical considerations were preserved. During the interview, participants received a thorough explanation of the purpose and advantages of the study. participants were also informed that participation in the study is entirely optional and that they can leave at any moment without providing a reason. Additionally, the individuals' privacy and confidentiality were protected during the data coding process. Each nurse gave their written agreement to participate in the study.

Administrative Design

Official permission was taken from the Dean of the Faculty of Nursing in Sohag University and the Manager of Sohag University Hospital to the administrator of the study settings to carry out the study. A clarity explanation will be given about the title, objectives, study technique, and tools that were illustrated to gain their coordination, as well as to allow the researcher to prepare regular arrangements for the attendance of the nurses according to appropriate time.

Statistical design

Computerized data entry and statistical analysis were fulfilled using the Statistical Package for Social Sciences (SPSS) version 25. The taken data were organized, analyzed, and represented in tables and graphs as required. Data were presented using descriptive statistics in the form of numbers, frequency distribution for a description of qualitative data was done, and a chi-square test was used to compare data between the different time points. Pearson's Correlation coefficient (r), was used to analysis the relationship between the variables. The relationship between characteristic data and study variables was tested using the chi-square test. Statistical significance was considered at P-value $\leq$ 0.05, highly significant at P-value $\leq$ 0.001, insignificant at P-value > 0.05.

Results

Regarding the distribution of the studied nurses according to their characteristics **table (1)** shows that the majority (92.0%) of studied nurses were female, more than half (58.0%) of them from rural areas. Also, it was found that (53.0%) of them were at the age of 25 years and more.

Table (2), revealed that (87.0%) of studied nurses reported that face masks are the most accessible technique of oxygen therapy followed by (84.0%) of them for nasal cannula& non rebreathing mask methods. More than two-thirds (70.0%) of the studied nurses un aware of the types of oxygen gases while the majority (99.0%) of them aware that

oxygen therapy is a treatment method. However the majority of them (94.9%) of them were showed that oxygen is an essential component for life. showed that the majority (95.0%) of studied nurses were aware of the indication of oxygen therapy and its hypoxia, and the most (87.0%) of the studied nurses' most popular way for them to provide oxygen was using a face mask, and more than three quarter (78.0%)%) of studied nurses' used nasal cannula and non-rebreathing mask, nevertheless, more than two thirds (62.0%) of studied nurses' used its various oxygen doses ranging from 0.5-15 litter. More than two-thirds (70.0%) of them use different methods of oxygen therapy depending on the children's condition.

Table (3) showed that the majority (98.0%) of studied nurses revealed that oxygen should be stopped gradually, with about more than a quarter (83.0%) of studied nurses doing that to avoid any consequences.

Table (4) revealed that (100.0%)of studied nurses' methods to assess the children for response to oxygen therapy correct answer is yes. More than three-quarters (76.0%) of studied nurses showed that from ways to evaluate children to respond to oxygen therapy to enhance their breathing and condition of children. The majority (90.0%) of them had correctly answered that oxygen has toxic effects, and also about less than half (49.0%) of them knew the causes of these toxic effects are increased oxygen concentration in children, and most (88.0%)of them correct answer about its complications from receiving oxygen, and more than half (53.0%) of them that these complications its brain damage and lung damage and more than one third (32.0%) of them it's caused blindness to children.

Table (5) showed that the majority (91.5%) of the studied nurses, prepared all needed equipment and made suction to ensure that air was clear. Additionally, more than three-quarters (83.0%) of them set up the humidifier system, more than three-quarters (80.9%) of them turn on the oxygen according to child's sheet litter/ min, and furthermore over two-thirds (68.1%) of them notify to medical personnel if the recommended concentration (dose)is needed.

Table (6) showed that the majority (91.5%) of the studied nurses, prepared all needed equipment and made suction to ensure that air was clear. Additionally, more than three-quarters (83.0%) of them set up the humidifier system, more than three-quarters (80.9%) of them turn on the oxygen according to child's sheet litter/ min, and furthermore over two-thirds (68.1%) of them notify to medical personnel if the recommended concentration (dose)is needed.

Table (7) clarifies that, more than two thirds (69.0%) of the studied nurses had unsatisfactory level of total reported practices regarding care of children undergoing oxygen therapy , and one thirds (31.0%) of the studied nurses had satisfactory level of total reported practices regarding care of children undergoing oxygen therapy.

Figure (1) explains that while (20.0% and 24.0%) of the nurses in the study worked in the PICU and NICU, respectively, the majority (56.0%) of the nurses were employed in the pediatric department.

Figure (2) explains that over half of the nurses in the study (53.1%) have worked in a pediatric unit for less than five years.

Figure (3) explains that a fifth (40.0%) of the nurses in the study had average knowledge about how to care for children receiving oxygen therapy, a third (37.0%) had poor knowledge, and a fifth (20.0%) had good knowledge.

Figure (4) explains that one-third (31.0%) of the nurses in the study had a satisfactory level of total reported practices regarding the care of children receiving oxygen therapy, while more than two-thirds (69.0%) of the nurses in the study had an unsatisfactory level of total reported practices.

Figure (5) explains that there was a statistically significant positive association between the total level of practice among the studied nurses and their total levels of knowledge about oxygen administration at $P < 0.05$.

Results

Table (1): Distribution of the studied nurses according to their personal data characteristics (N=100)

Personal data	No. (100)	%
Sex:		
Male	8	8.0%
Female	92	92.0%
Residence:		
Urban	42	42.0%
Rural	58	58.0%
Marital status:		
Single	46	46.0%
Married	54	54.0%
Age: (years)		
20 - < 25	47	47.0%
≥ 25	53	53.0%
Qualification:		
Nursing diploma	41	41.0%
Nursing diploma + Specialization	40	40.0%
Bachelor's degree	19	19.0%
Training courses about oxygen administration:		
No	72	72.0%
One course	17	17.0%
More than one course	11	11.0%

Table (2): Distribution of the studied nurses according to their knowledge of oxygen therapy methods (N=100)

Items	No. (100)	%
Available methods of giving oxygen therapy in the current unit of the hospital:		
Don't know	12	12.0%
Face mask	87	87.0%
Nasal cannula and non-rebreathing mask	84	84.0%
CPAP and Ambo bag	74	74.0%
Venturi mask	50	50.0%
Headbox or incubator	15	15.0%
Type of oxygen gases:		
Don't know	70	70.0%
Critical for humans to breathe and live each day	30	30.0%
Medical air and surgical air	2	2.0%
Oxygen is an essential element for life:		
Yes	99	99.0%
No	1	1.0%
Oxygen is a treatment:		
Yes	99	99.0%
No	1	1.0%
Causes:		
Don't know	4	4.0%
Vital elements for life	94	94.9%
Important to improve breathing	37	37.4%
Treatment for hypoxia, and maintaining normal functions of body cells	5	5.1%
Indications for using oxygen:		
Don't know	2	2.0%
Hypoxia	95	95.0%
Hypoxemia, COPD	47	47.0%
Respiratory distress, respiratory failure	36	36.0%
Asthma, pneumonia	9	9.0%
Methods of giving oxygen therapy:		
Don't know	12	12.0%
Face mask	87	87.0%
Nasal cannula and non-rebreathing mask	78	78.0%
CPAP and Ambo bag	60	60.0%
Venturi mask	35	35.0%
Headbox or incubator	9	9.0%
Needed equipment to complete oxygen therapy:		
Don't know	5	5.0%
Source of oxygen	66	66.0%
Mask of oxygen, cup humidifier	83	83.0%
Flow meter, tube of oxygen	73	73.0%
Different oxygen concentration doses:		
Don't know	19	19.0%
According to the age and condition of the children	18	18.0%
According to the type of mask	0	.0%
0.5-15 litter	62	62.0%
20%-30%-40%-50%	27	27.0%
The use of different methods of oxygen therapy depends on:		
Don't know	29	29.0%
According to children's condition	70	70.0%
According to the children's age	12	12.0%

Table (3): Distribution of the studied nurses' knowledge regarding oxygen therapy(methods, dose variation, duration of oxygen administration, and stoppage of oxygen (No=100)

Items	No. (100)	%
Methods of giving oxygen:		
Intermittent	63	63.0%
Continuous	63	63.0%
Causes:		
Don't know	27	27.0%
Depending children's condition, and under the physician's order	71	71.0%
Intermittent and continuous	4	4.0%
Does the dose of oxygen vary from one case to another?		
Yes	100	100.0%
No	0	0.0%
Causes:		
Don't know	4	4.0%
Depending children's condition, under physician orders	95	95.0%
According to children's response to oxygen therapy	28	28.0%
Does the duration of oxygen administration differ from one case to another?		
Yes	100	100.0%
No	0	0.0%
Causes:		
Don't know	12	12.0%
Depending children's condition, under physician orders	86	86.0%
According to children's response to oxygen therapy	22	22.0%
Should be oxygen stopped gradually?		
Yes	98	98.0%
No	2	2.0%
Causes:		
Don't know	17	17.0%
Yes, from weaning oxygen gradually to prevent any complications	83	83.0%
Yes, from decreased flow meter gradually until flow meter convey to 0,5 litter	21	21.0%

Table (4): Distribution of the studied nurses' knowledge regarding oxygen therapy (evaluation for a response, toxic effect and complications) (N=100)

Items	No. (100)	%
Are there ways to evaluate a child's response to oxygen therapy?		
Yes	100	100.0%
No	0	0.0%
Ways:		
Don't know	7	7.0%
Yes, improves the breathing and condition of children	76	76.0%
Yes, breathing become normal	39	39.0%
Yes, the color of my lips and skin is pink	23	23.0%
Yes, normal vital signs	18	18.0%
ABG	8	8.0%
Evidence of good response to oxygen:		
Don't know	11	11.0%
Yes, improves the breathing and condition of children	82	82.0%
Yes, breathing become normal	43	43.0%
Yes, the color of my lips and skin is pink	14	14.0%
Yes, normal vital signs	11	11.0%
ABG	6	6.0%
Does oxygen have a toxic effect?		
Yes	90	90.0%
No	10	10.0%
Causes of this toxic effect:		
Don't know	39	43.3%
Increase oxygen concentration in children	49	54.4%
Wrong administration of oxygen	3	3.3%
Increase the duration of oxygen therapy	4	4.4%
Are there complications that occur when receiving oxygen therapy?		
Yes	88	88.0%
No	12	12.0%
Complications:		
Don't know	23	26.1%
Brain damage and lung damage	53	60.2%
Blindness	32	36.4%
Atrophy in brain	10	11.4%

Table (5): Distribution of the studied nurses' total level of knowledge score regarding care of children undergoing oxygen therapy

Knowledge level	No. (100)	%
Poor	37	37.0%
Average	40	40.0%
Good	23	23.0%
Mean ± SD (Range)	31.24 ± 6.12 (17.0-49.0)	

Table (6): Distribution of the studied nurses' practice regarding care of children undergoing oxygen therapy (N=100) (Nasal cannula)

Items	Done		Not done	
	No.	%	No.	%
Explain the procedure to the parents to reduce fear of the unknown.	9	19.1%	38	80.9%
Prepare all needed equipment.	43	91.5%	4	8.5%
Using a portable oxygen supply ensures that the cylinder fills adequately.	38	80.9%	9	19.1%
Make suction to ensure that the airway is clear.	43	91.5%	4	8.5%
Set up the humidifier system.	39	83.0%	8	17.0%
Ensure the child's nose is cleared of any mucous.	33	70.2%	14	29.8%
Position the prong slant of the nasal cannula in the baby's nostrils.	35	74.5%	12	25.5%
Tighten the cannula to fit closely by sliding up the movable sheath at the back of the tubing.	34	72.3%	13	27.7%
If necessary, fix it by tapping the tubes on the child's cheeks.	31	66.0%	16	34.0%
If the skin is affected, use protective barries.	31	66.0%	16	34.0%
Position the baby in a semi-setting position and turn on the oxygen saturation, alarm, and pulse rate.	39	83.0%	8	17.0%
Turn on the oxygen according to the child's sheet litter/ min.	38	80.9%	9	19.1%
Attach the tube to the mask and then to the oxygen source, and ensure that it hasn't defected (examine it)	29	61.7%	18	38.3%
Observe the baby's condition during oxygen therapy (pulse, respiration, respiratory effort) and record it frequently.	33	70.2%	14	29.8%
After oxygen inhalators				
Record to medical staff the prescribed concentration (dose).	32	68.1%	15	31.9%
Monitor the amount of water in the humidifier bottle.	23	48.9%	24	51.1%
Clean all equipment every day with warm water and an antiseptic solution.	23	48.9%	24	51.1%
Make face care and apply eye drops times/ day.	9	19.1%	38	80.9%

Table (7): Distribution of the studied nurses' total level of practice regarding the care of children undergoing oxygen therapy(N=100)

Practice level	No. (100)	%
Unsatisfactory	69	69.0%
Satisfactory	31	31.0%
Mean ± SD (Range)	12.68 ± 2.51 (7.0-17.0)	

Figure (1): Distribution of the study subjects according to working unit (N=100).

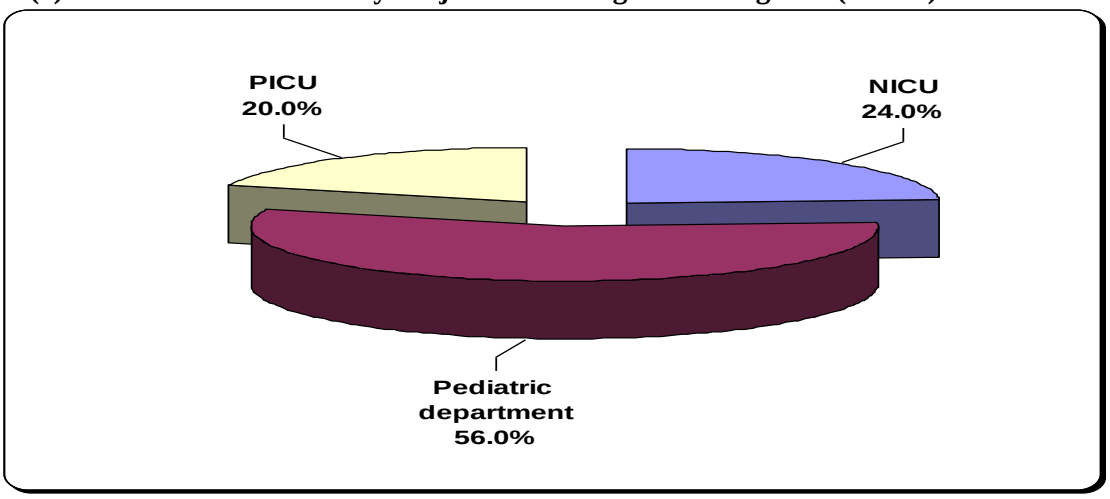


Figure (2): Distribution of the study subjects according to years of experience (N=100)

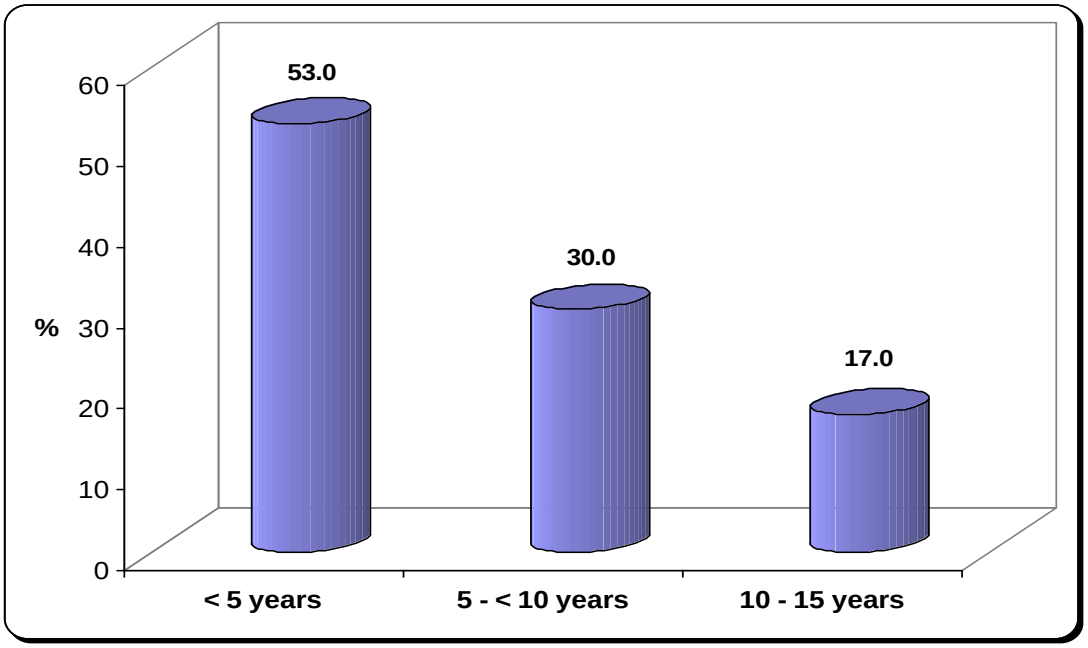


Figure (3): Distribution of the studied nurses' total level of knowledge score regarding the care of children undergoing oxygen therapy

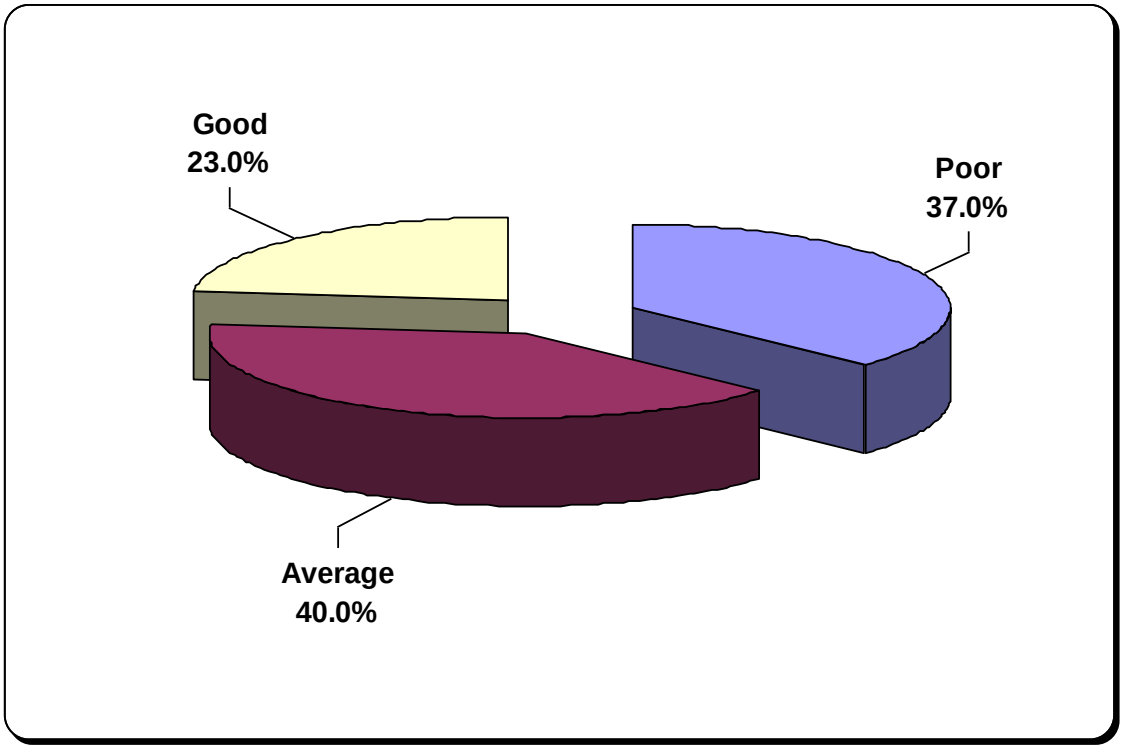


Figure (4): Distribution of the studied nurses' total level of practice regarding the care of children undergoing oxygen therapy

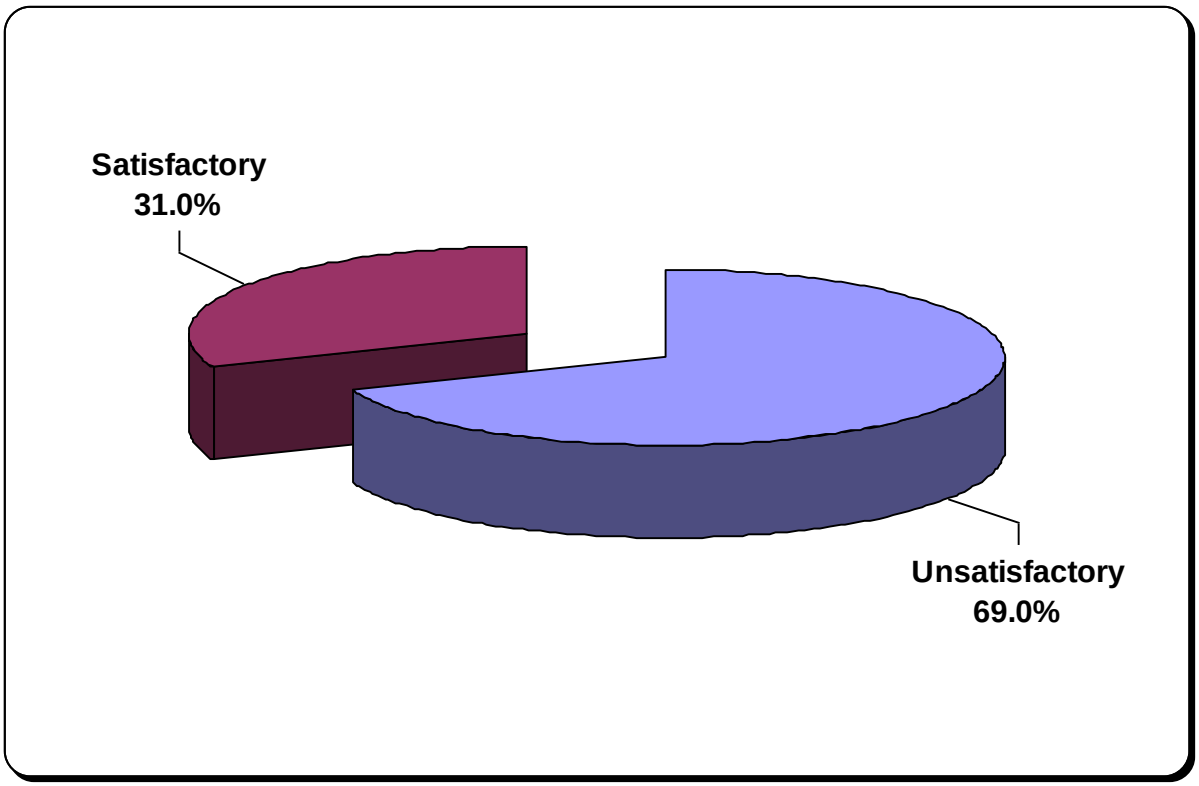
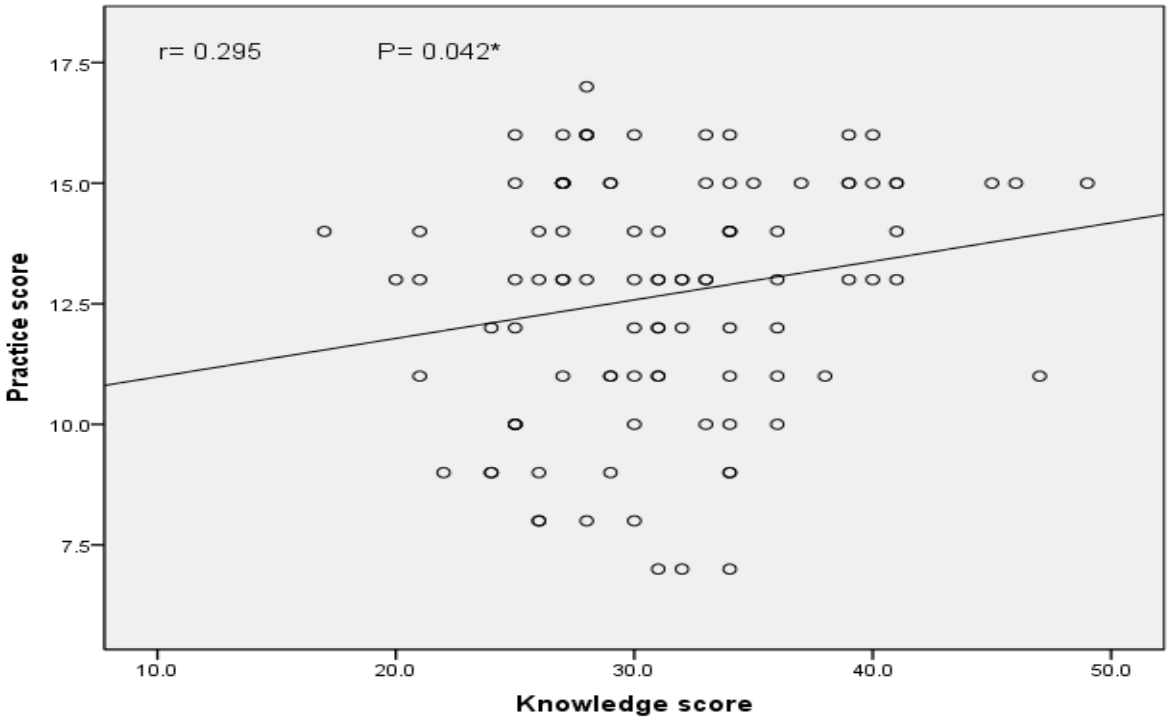


Figure (5): Correlation between nurses' total knowledge score and total practice score



Discussion

Oxygen should be treated like a drug it can have negative or harmful consequences when given in large doses over an extended length of time or when delivered in high concentrations. For example, according to 2019, the WHO estimated that 1.4 million people died as a result of improper oxygen administration and lack of supplementary oxygen therapy that have been associated with poor oxygen administration practices include the diagnosis of the children, the age of the children, the attitude of health professionals, and a lack of resources **(Adeniyi et al., 2021).**

Purpose of the current study was a descriptive study, evaluated to assess the nurses' level of knowledge about oxygen therapy & the level of reported practices related to the care of children undergoing oxygen therapy.

Regarding the characteristics of the studied nurses, the findings of the current study showed that the majority of studied nurses were females, and more than two-fifths of them had nursing diplomas at the educational level. This finding was supported by the finding of **Mustafa et al., *2019***, who conducted a study to evaluate the effect of educational programs on nurses' knowledge and practice about oxygen therapy; it discovered that the majority of the studied nurses were females, and their educational background nursing diplomas of studied nurses. The researcher explained this difference as the greater fraction of the nurses in Egypt were female and may also be related to the facts that study of nursing in Egyptian universities was exclusive to females only till a few years ago, and the researcher explains that most of the nursing students at the technical institute of nursing obligated to work in university hospitals. As well as they play a vital role in direct child care. In contrast to a Bachelor of Nursing, they have the right to choose the suitable hospital and the majority of them participate in the supervision and management.

According to the studied nurses, the current study showed that more than half of the studied nurses were aged 25 ≥ years, and less than three-quarters of them did not attend any training courses. This finding was supported by the finding of **Mohammed et al., 2022** who conducted a study **"**Nursing guidelines regarding safe and effective practices of supplemental oxygen therapy among criticall ill care patients" more than half of the studied nurses' were nurses' age between 25> and 35 years old and more than two-thirds of them did not attend any training courses about oxygen therapy. Also, this finding is in the same line with the study performed by **Mohammed, 2020** who conducted a study "Nurses' knowledge and skills regarding oxygen administration methods at pediatric teaching hospitals in Mosul city"**; which** found that more than two-thirds of nurses had no training courses about oxygen therapy. The researcher explains that nurses are getting older since they are newly graduated from nursing, and most of them have not taken any training courses because they have not been able to find any that would help them advance their training courses to improve knowledge and skills in nursing.

Regarding methods of studying nurses' knowledge of oxygen therapy, the current study revealed that most of them used the oxygen mask, nasal cannula, and most available methods for administrating oxygen therapy in the hospital. This finding was supported by **Ibrahim et al., 2024,** who conducted a study "Effect of implementing self-learning package about oxygen provide to children on nurses' performance at pediatric intensive care unit" They reported that most of them used face masks (87%), and more than three quarters (78%) used nasal cannula as a method for O2 delivery. The researcher explained that the most often utilized and most common methods used in the Hospital are its face and nasal masks.

Regarding methods of studying nurses' knowledge of oxygen therapy, the current study revealed that the majority of them correctly answered that oxygen therapy was a treatment. This finding was supported by **Bitok et al., 2024**, who conducted a study "Knowledge of oxygen therapy among nurses in a tertiary hospital in Kenya: implications for patient care and training needs" and reported that more than two-fifths answered oxygen therapy as a treatment. Also, this finding is in the same line with the study performed by **Bitok et al., 2024,** who found that most of them needed equipment masks, a source of oxygen, and a flow rate to complete oxygen Therapy This supported a current study that revealed more than three of them needed this equipment to complete giving oxygen therapy. The researcher explains that oxygen is a treatment result already its efficient treatment in the hospital and is an important, vital element for life. And must be used with the mask, sources of oxygen and a flow meter for giving and complete administration of oxygen therapy to children.

Regarding the studied nurses' knowledge about the indication of oxygen therapy, the current study revealed that the majority of them answered hypoxia was considered from indication. This finding was supported by **Res Dev, 2021** who conducted a study " Knowledge and practice of nurses towards oxygen therapy in the public hospitals of Harari region, Ethiopia" and reported that all had correct knowledge of hypoxia from indication oxygen therapy. And this finding was supported by **Argeta, et al 2022**who conducted a study "Assessment of knowledge, attitude, and practice of nurses towards oxygen therapy at Wolaita Sodo University Comprehensive

Teaching and Referral Hospital, Ethiopia, 2021" who reported that the majority were aware that supplemental oxygen therapy should be administered to treat and prevent hypoxia. The researcher explains that the most common cases of oxygen therapy treatment prevent hypoxia.

The current study pointed out that more than half of nurses were aware of the various oxygen concentration levels between 0,5- 15 liters per minute. This finding was supported by **Helmy, 2007** who conducted a study "Assessment of Actual Nursing Care for Children Under Oxygen Therapy in Pediatric Units at Banha Hospitals " and reported that over two-thirds of them changed from children to another according to children's condition and doses of concentration of oxygen between 0,5-15 liters per minute.

Regarding the studied nurses' knowledge about the use of different methods of oxygen therapy, the current study revealed that, more than two- thirds of them answered that it depended on the children's condition. This finding was supported by **Anwr et al., 2024** who conducted a study " Effectiveness of competency-based training on Nurses' performance regarding oxygen administration safety for children with respiratory disorders" and reported that more than two quarters depended on different conditions of children. The researcher explained that result to different conditions of children according to need for oxygen therapy, so depending on most cases, according to the children's condition.

Regarding the studied nurses' knowledge about the use of different methods of oxygen therapy, the current study revealed that more than two- thirds of them answered depending on children's conditions. This finding was supported by **Saadoon et al., 2024**who conducted a study " Effectiveness of competency-based training on Nurses' performance regarding oxygen administration safety for children with respiratory disorders" and reported that more than two quarters depended on different conditions of children. The researcher explained that result to different conditions of children according to need for oxygen therapy, so it depended on most cases according to the children condition.

According to nurses' knowledge of the factors influencing the child during oxygen therapy administration, the study showed that the majority of nurses had scored poorly and were unable to describe that the factors affecting oxygen therapy administration are the child's age, comfort, unknown, and size of equipment used. **James and Ashwill, 2007**, who mentioned that oxygen administration differs for adults and children, noted that the primary differences in oxygen delivery between children and adults are the size of the equipment and the teaching and emotional support needed for children giving oxygen and their families.

According to the nurses' knowledge regarding continuity for providing oxygen, the result of the current study showed that more than half of nurses scored good as they know that oxygen should be given continuously. But no one of them could explain the causes for administering oxygen continuously. The result of the current study was similar to the result found by **Brokalaki et al.,(2004)** where one out of five of nurses chose how oxygen was administered and modified the dosage or stopped oxygen administration.

The present study showed that all of nurses answered correctly that the duration of oxygen administration varies from one case to case and most of them described the reason for that depending on the children's condition under physician orders. This finding was supported by **Helmy,2007** who reported that most nurses describe that oxygen duration changed from one case to another.

According to the nurses' knowledge of the stoppage of oxygen, the study found that the majority of nurses performed well as they were able to illustrate that oxygen should be stopped gradually even though they were not able to identify the reason for being stopped gradually; from high concentration, 100% decreased by 10% each time until stopped, or in a low concentration, less than 50%, should decrease 5%... each time until reaching 24% then stopped. In case of a gradual decrease of oxygen, helping to observe the patient and ensure that he can take normal respiration, **Nachhattar, et al,. 2001** pointed out that oxygen therapy should be administered continuously and should not be stopped abruptly until the child has recovered. Weaning should be considered when the child becomes comfortable. Weaning should be gradually attempted by discontinuing oxygen or lowering its concentration, for instance, 30 min and reevaluation of the clinical parameters and SpO2, to prevent any complication.

Regarding methods for evaluating the effectiveness and the positive response to oxygen therapy the majority of nurses scored well, as they were able to mention that oxygen therapy had many methods for assessment. At the same time, more than three-quarters of them go it from ways to assess the response of oxygen therapy for children, but only very few of them mentioned that oxygen therapy can be evaluated clinically by assessing vital signs and through laboratory results such as arterial oxygen tension and percentage oxygen saturation. **Attin, et al.(2020)** identified in their study that more than one mechanism may contribute supplemental tissue hypoxia, and predicting the response to oxygen needed to careful evaluation of these functions.

Also, the present study showed that more than three-quarters of nurses were able to identify in their children the well signs that demonstrated the effectiveness of oxygen therapy and children's response. Only a few of them could indicate the signs of a positive reaction, such as the improvement of the clinical manifestation, normal vital signs, disappearance of cyanosis, and improvement of laboratory results, arterial oxygen tension, and oxygen saturation of 190%. The result of the current study ,similar to other studies that had been done by **Helmy, 2007,** found more than half of them had good evidence of response to oxygen.

Regarding nurses' knowledge about the toxicity of oxygen as a result of high concentration and long duration, the study revealed that the majority of nurses were able to list that oxygen has a toxic effect in oxygen therapy, with complications including eye toxicity, lung toxicity, and oxygen dependency, and un able to identify the presence of these complication on the children **Bateman and Leach, 2006,** who reported that oxygen therapy cases pulmonary oxygen toxicity, high concentrations of oxygen (>60%) can harm the alveolar membrane when inhaled for extended period of time, There for the current study revealed that the actual nurses' knowledge toward oxygen therapy was insufficient , over than half of them scored poorly. This result agreed with **Ganeshan, 2006** who mentioned that there was lacked adequate of knowledge of oxygen therapy in both the medical and nursing staff.

On assessing the actual nurses' practice for oxygen administration as a motioned step- by- step procedure by the researcher, the study showed that regarding the step of ready for administration, which composed of eight elements. Only a few of them followed all items completely. They were able to clarify the procedure to the child's parents to reduce fear of the unknown, prepare all needed equipment, check the portable oxygen source (cylinder) before starting, make suction, and ensure that the child's airway was clear, set up the humidifier system, and be able to choose the suitable size and place of the device used in oxygen administration. Then test the alarms and oxygen, through vital signs and record it frequently. Less than half of them achieved this step at an acceptable level as they neglected some items, couldn't observe the child's condition during oxygen therapy, and may not record it frequently. So this step didn't show many nurses' mistakes or pitfalls, **Bateman and Leach, 2006** was pointed out that the nurse should check the physician's orders for the percentage of oxygen to be delivered to the child and the method of delivery to ensure safe and effective oxygen therapy. The prescriptions should cover the flow rate, delivery system, and duration.

However regarding the step after oxygen inhalation, which is composed of four steps, the study showed that only very few of the nurses reached the compliance level; while more than half of the nurses had an acceptable level of performance, as they neglect some elements of this step. They were unable to report to the medical staff if the prescribed dose was not effective, did not monitor the amount of water in the humidifier bottle, did not flow the aseptic technique, clean equipment used every day with warm water and antiseptic solution. They may make face care, but neglect the eye care and not apply eye drops many times a day. fewer than half of them neglected these elements completely and considered them as not done. This means that nurses make many mistakes or dangers in this step after oxygen inhalation, so many complications will happen to the child **James and Ashwill, 2007** explain that nurse's notes should include the date and time; and the type of mask.

On assessing nurses' knowledge regarding equipment needed for oxygen administration and how it is maintained and managed, the current study showed that less than half of nurses had scored poorly, while few of them scored well that oxygen delivery equipment is a source of oxygen, oxygen flow meter, oxygen humidifier, oxygen analyzer, and should be cleaned and inspected. This may be because the majority of nurses were of young age, had diploma qualifications, and less than five years of experience. low of guidelines that explain the practice of oxygen administration provide step by step, plus the absence of an orientation program for nurses as well as a continuous educational program for enhanced nurses' practice may contribute to this poor score. **James and Ashwill, 2007,** reported that the respiratory therapist responsible for the setup, maintenance, and management of the oxygen administration system used the dosage of oxygen delivered and the rate; the child's vital signs, skin color, respiratory effort, and Jung sounds; the child's response to the steps; and any teaching done with the child or family.

On assessing nurses' practice, the current study revealed that only a few of the nurses could reach the compliance level as they are able to perform the task according to the standard procedure. On the other hand, the majority of nurses had achieved an acceptable level of practice toward oxygen therapy as they were unable to perform the step according to the standard procedure.

This poor level of performance may be due to the fact that the actual practice is done by not highly qualified nurses who do not have experience and previous training courses in oxygen therapy, the lack of supervision, and the lack of hospital policy and procedure guidelines for oxygen therapy. So the researcher designed a simple oxygen guideline.

About studied nurses' practices regarding the care of children undergoing oxygen therapy the result of the present study showed that the majority of nurses prepare needed equipment, and most of them set up humidifiers for giving oxygen treatment, place the baby in a sitting position, and turn on the oxygen saturation, alarm, and pulse rate. This finding supported by **Res Dev, 2021** revealed that most nurses prepare needed equipment and set up humidifiers for giving oxygen therapy. Less than three-quarters of them position the baby in a semi-sitting position and turn on the oxygen saturation, alarm, and pulse rate. The researcher clarifies that these steps must be made before the procedure and are essential for the accurate completion of oxygen administration.

According to the total level of knowledge, the present study revealed that two-fifths of the studied nurses had an average level of knowledge score regarding the care of children undergoing oxygen therapy. This finding was supported by the finding of **Bamidele et al., 2021** "Assessment of knowledge and practice of oxygen therapy among doctors and nurses: A survey from Ondo state, southwest Nigeria" who reported that more than two-fifths of nurses in the total level of knowledge about oxygen administration. The researcher clarifies that most had average knowledge due to no updates or improvements in learning update information about oxygen therapy.

Regarding the total score of the nurses' practice about caring for oxygen provided to children, the current study revealed that more than two-thirds of them had an unsatisfactory level of total practice. This finding was supported by the finding of **Ibrahim et al., 2024** who reported that three-quarters of nurses had an unsatisfactory level of total practice regarding the care of children under oxygen administration. The researcher clarifies that most of them had unsatisfactory practice result due to not having any training courses to learn new skills and improve of practices about oxygen therapy.

Regarding the connection between nurses' characteristics and total level of knowledge about the care of children undergoing oxygen treatment. showed a study that there was a significant difference between the studied nurses' total level of knowledge regarding oxygen therapy and both the marital status, qualifications, and training courses regarding oxygen administration at $p< 0.05$. This finding was agreed upon by the finding of **Mostafa et al., 2019**, who reported that there was a significant relation between total nurses' knowledge mean score and level of education after implementation of the teaching program ($p<0.05$), and there is no significant relation between nurses' knowledge; there was a high statistical significant relationship between studied nurses' total level knowledge and their units at $P > 0.01$.

Regarding the relationship between nurses' characteristics and the total level of practice in the care of children undergoing oxygen treatment. showed a study that there was a significant difference between the studied nurses' total level of practice regarding oxygen administration and both the qualification and years of experience at $P< 0.05$. This finding was agreed upon by the finding of **Mayhob, 2017,** Nurses' Knowledge, practices and Barriers Affecting a Safe Administration of Oxygen Therapy," who reported that there was a statistically significant relationship between the level of practice of the studied sample and their qualifications among the studied sample.

It was observed from the present study that there was a statistically significant positive correlation between the studied nurses' knowledge and their practices, regarding oxygen therapy. This finding of **Ibrahim et al. (2024)**showed that there was a high statistically significant positive correlation coefficient between the total score of nurses' knowledge and their total score of practice pre - and post-implementation of the self-learning package.

Conclusion

According to the results of present study, it can be concluded that, two fifths of the studied nurses had average of the total level of knowledge Additionally over than two thirds of studied nurses had unsatisfactory of the total level of practices regarding care for children undergoing oxygen treatment. Furthermore, there was statistically significant positive correlation between total level of reported practices among the studied nurses and their total levels of knowledge regarding care of children undergoing oxygen therapy

Recommendations

The following suggestions are made in light of the current study's findings:

1- Orientation program of new nurses who are giving care for children undergoing oxygen therapy.
2- Regular training educational programs for nurses to develop and enhance their knowledge and performance.
3- Daily nurses' rounded under supervision by a technical supervisor and improved of nurses' communication, cooperation and giving rewarding motivation.
4- Utilize the straightforward design recommendations for nurses to enhance their understanding and proficiency in oxygen.
5- To enhance nurses' performance and understanding in caring for children receiving oxygen therapy, further research should be done.

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