Nurses' Perspectives on Clinical Oxygen Administration at Omdurman Teaching Hospital 2015

MOHAMMED ABDALLA ALI ABDUALBAGY[*]
EGBAL ABBASHAR ALGAMAR[**]

Abstract

Nurses play a pivotal role in the administration of oxygen therapy in patients at risk of respiratory dysfunction. The failure of nurses to recognize and respond to respiratory dysfunction may result in patients suffering respiratory related adverse events such as unexpected death. **The aim** of this study was to assess the competence of nurses regarding administration of oxygen therapy. **Methods:** The study is a descriptive cross-sectional hospital-based study conducted in emergency department at Omdurman Teaching Hospital. The study enrolled all nurses at the Emergency Department of the mentioned hospital (n=67). The data were collected by using a questionnaire and an observation checklist, and then they were processed by using the Statistical Package for Social Sciences (SPSS) − version (16), and presented in simple frequency tables, figures and cross tabulations. The collected data was managed using Likertscale to measure the association between demographic data of the nurses and their qualification, whichwas checked using P-value 0,05.**Theresults of** the study revealed that: nurses knowledge about the major indications of oxygen administration was fair, whereas their knowledge about devices that deliver low flow rate oxygen was poor. The results also showed that about half of the respondent nurses

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[*] M.Sc. in Medical Surgical Nursing.
[**] PhD in pediatrics nursing and child health– Al-Neelain University, Faculty of Nursing Science.
 Correspondence: email aaalaaa2009@gmail.com

did not know the normal oxygen saturation (SPO_2) and most of nurses did not monitor oxygen saturation after administered oxygen. Association between nurses' qualification and their level of knowledge about the major indications of oxygen administration was significant (P-value =0.04); conversely, the association between the nurses' experience and their knowledge of the methods used to assess patients' needs to oxygen administration was not significant (P-value =0.83).

 Conclusion:nurses attheemergency Department of Omdurman Teaching Hospitaldo not have sufficient knowledge and practiceon oxygen administration.

On the base of the conclusion the researcher recommended that the Nurses' should beprovided with regular workshops and training courses to gain highly competent nurses' knowledge , skills in health care services guided by respect for children and families and focus on offer patients' best chance for optimal quality of life .Further and international researches are needed.

Key terms: oxygen administration, emergency nurses, normal oxygen saturation.

ملخص البحث

الخلفية: ملخص البحث

الخلفية: يؤدي الممرضون دورا حيوياً في إعطاء الأوكسجين للمرضى المعرضين لخطر ضعف الجهاز التنفسي. قد يؤدي فشل الممرضين فيا لتعرف على ضعف الجهاز التنفسي والاستجابة له كما ينبغي إلى مضاعفات سلبية ذات صلة بالجهاز التنفسي مثل الموت الفجائي.**الأهداف:**يتمثل الهدف العام للدراسة في الكشف عن مدي كفاءة الصفحة الممرضين لإعطاء الأكسجين.**الطرق والوسائل:** هذه الدراسة هيعبارة عن دراسة وصفية مستعرضة، أجريت في قسم الطوارئ في مستشفى أم درمان التعليمي، وشملت العينة جميع الممرضين (ن =67) في قسم الطوارئ. واستخدم الباحث اداتي الإستبانة وقائمة اختيار

الملاحظة لجمع البيانات المطلوبة للدراسة. وتمتحليل البيانات باستخدام الحزمة الإحصائية للعلوم الاجتماعية SPSSبإستعمال النسخة رقم (16).وعرضت البيانات باستخدام جداول التكراروالنسب المئوية والرسومات البيانية.أيضا تمت ادارة البيانات باستخدام مقياس "ليكارت" لقياس الإرتباطات الإحصائية بين المتغيرات الديمغرافية لعينة الممرضين وخبرة الممرضين ومؤهلاتهم ومعرفتهم.**النتائج:**أوضحت الدراسة أن مستوى معرفة الممرضين للدواعي الرئيسية لإعطاء الأكسجين كانت متوسطة،بينما كانتمعرفتهمبالأجهزة التي تقدم معدل انسياب أوكسجين منخفض معرفة ضعيفة؛ أيضا أبانت النتائج أنأكثر من نصف الممرضين لايعرفون تشبع الأكسجين (SPO2) في الدم،ومعظمهملم يراقبوا تشبع الأكسجين بعد إعطاء الأكسجينللمريض.أشارت النتائج أيضا إلى أن الإرتباطات الإحصائية بين مؤهلات الممرضين ومعرفتهم للمؤشرات الرئيسية لإعطاء الأكسجين ذات دلالة احصائية ، بعكس العلاقة بين خبرةالممرضين ومعرفتهم للأساليب المستخدمة لتقييم احتياجات المريض إلى إعطاء الأكسجين التيتكن كبيرة وليست ذات دلالة احصائية.

الخاتمة:ممرضيالطوارئ في مستشفى أم درمان التعليميلم تكن لديهم معرفة كافية بإعطاء الأكسجينولا ممارسة عملية كافية له.

استادا علي خلاصة النتائج من البحث يوصي الباحث بضرورة اقامة ورش عمل ودورات تدريبية للمرضين حتي يؤدي الممرضن عملة بكفاءة في معرفة وعمل المهارة. الاتجاة الي اجراء بحوث تجريبية او عملية .

مصطلحات مفتاحية: إعطاء الأوكسجين، ممرضي الطوارئ، تشبع الأكسجين في الدم

Introduction:

Oxygen (O_2) is probably the most common drug to be used in the care of patients who present with medical emergencies; appropriately 34% of ambulance journeys involve oxygen use at some stage and national audit data suggest that 18% of hospitals in patients in the United Kingdom(UK) are being treated with oxygen at any given time[1].

A study conducted in UK which aimed to testdoctors' and nurses' knowledge of oxygen therapyrevealed that a quarter of the doctors and nearly half of thenurses were unable to select the correct dose and method of administration of oxygen in the event of cardio-respiratory arrest[2].

As most studies and medical reports indicate, oxygen therapy is one of the most indispensible considerations in the managementand treatment of disease across a myriad ofmedical and surgical specialties. An imperative part of nurses' role is to assess patientsfor early signs of hypoxia and decide whether there is a needfor supplemental oxygen. On the other hand, delaying oxygen administration because of theneed for a medical order may significantly affect the patient's outcome [4]. Nurses frequently and independently make decisions about the selection and management of low flow oxygen therapy devices. Indeed, administering supplemental oxygen in a timely and appropriate manner isa fundamental aspect of patients' care[5].

In an Australian study, an online questionnaire was designed and administered to intensive care nurses working in Australia and New Zealand.The study aimed to establish if there was variability in oxygen therapy practices of critical care nurses and examine the degree of variability; it found that there is limited evidence to inform or support critical care nurses'oxygen therapy practices[6].

Research Methodology:

This is a descriptive cross-sectional study conducted at Omdurman Teaching Hospital.Omdurman Teaching Hospital

was established in 1898. It is located between Al-Khalifa Mosque and the Doctors' Street in Al-Shuhadā neighborhood in Omdurman Locality, Sudan. It has varies specialties such as urology, medicine and cardiology. It has a number of units such as Coronary Care Unit, Intensive Care Unit and Traumaand EmergencyDepartment. Emergency Department, where the study was conducted, includes smaller units and wards forsorting and classifyingpatients, and then referring them to the appropriate room according to theirconditions. For example:Asthmatic Room is assigned for asthmatic patients;C_1 Room for male patients; C_2Room for female patients; AB Room for critically ill patients;TraumaRoom for traumatic patients. The population of this study consisted of permanent nursing staff who had been workingat theTraumaand EmergencyDepartment for more than one year. They had various academic qualifications: diploma, bachelor, and master degree in nursing science. They worked ineithermorning shifts or night shifts at Asthmatic Room, C_1Room, C_2Room, AB room and Trauma Room. National service nurses and students of nursing science under training were excluded from the sample.

The total size of the sample was (67) nurses. The total coverage technique was adopted, as the total census was less than (200) [7].

The relevant data of the study were collected using a structured questionnaire and an observational checklist. The information collected included, in addition to the personal and demographic data, the respondent nurses' knowledgeabout: indications of oxygen administration, low flow oxygen delivery devices, determination of oxygenation status, clinical evaluation of respiratory status, and pulse oximetry and arterial blood gases analysis. In addition to knowledge, information regarding the nurses' practice of oxygen administration was alsocollected by the same instruments.

Data analysis was carried out by the Statistical Package for Social Science (SPSS) version 16.0. Measuresincluded: percentage and mean, and the binary outcome variable was created. Methods of graphical presentation included: frequency and percentage tables,bar graphs and pie graphs. The level of significance selected for this study was p value equal to or less than (0.05). The study proposal was ethically cleared by the Ethical Committee of Al-Neelain University and a written agreement was obtained from the Ministry of Health of Khartoum State – Department of Research Management, and the concerned officials of the hospital in which the study was conducted. Then a verbal consent was obtained from each one of the participants (nurses) of the study.

Results:

Table (1): demographicvariables of the nurses (n=67).

Background variables	Frequency	Percent
Age in years		
20-25	25	37.4%
26-30	29	43.3%
31-35	11	16.3%
36-40	2	3%
Total	67	100.0%
Qualification		
Diploma	50	74.6%
Bachelor	5	7.5%
Master	12	17.9%
Total	67	100.0%
Experience in years		
1-3years	40	59.7%
4-6years	25	37.3%
>6years	2	3.0
Total	67	100.0%
Training courses		
Yes	8	11.9%
No	59	88.1%

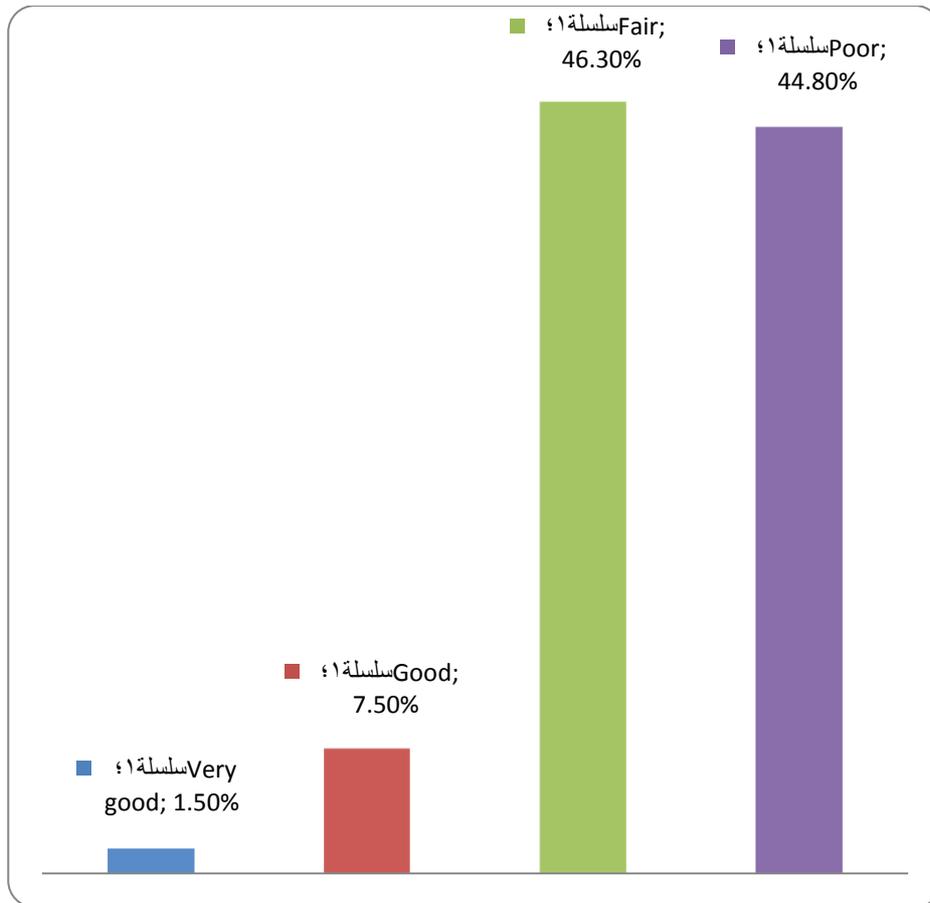| Total	67	100.0%

Fig. (I): level of nurses' knowledge about major indications of oxygen administration.(n=67)

Table (2): Responses of the nurses about normal range of oxygen saturation (SPO$_2$):(n=67)

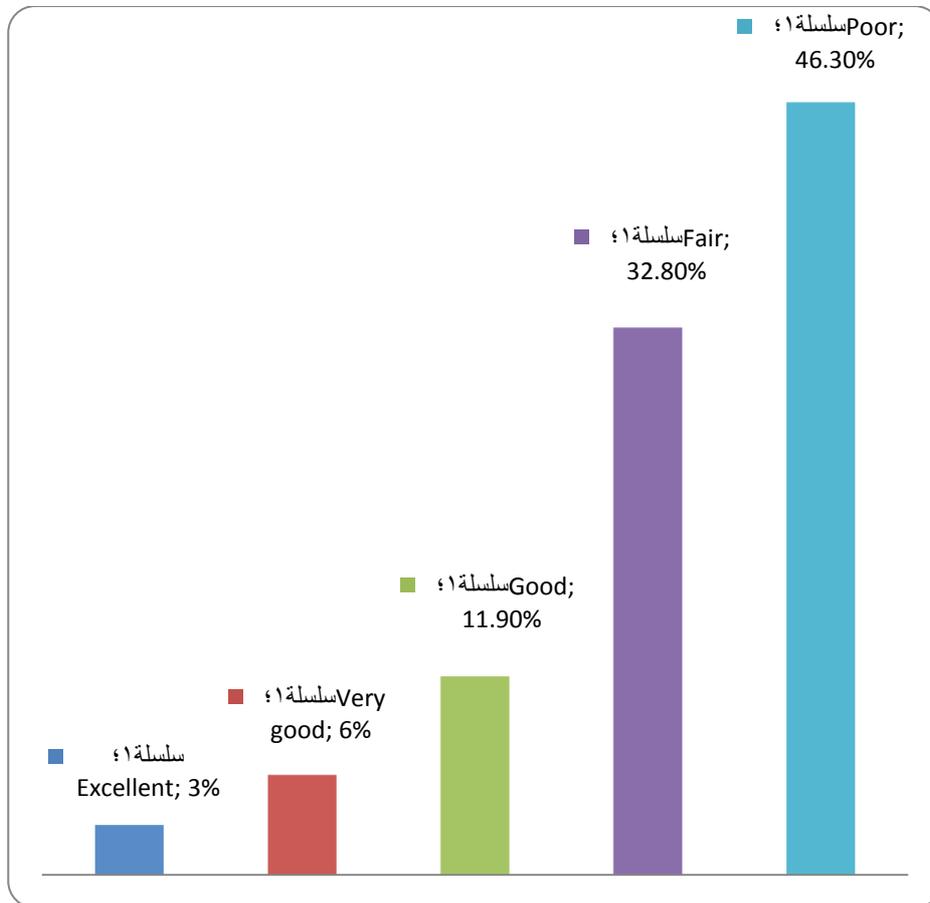| Item	Frequency	Percent
Know	33	49.3%
not know	34	50.7%
Total	67	100.0%

Fig (II): level of nurses' knowledge regardinglow flow rate of oxygen delivery devices. (n=67)
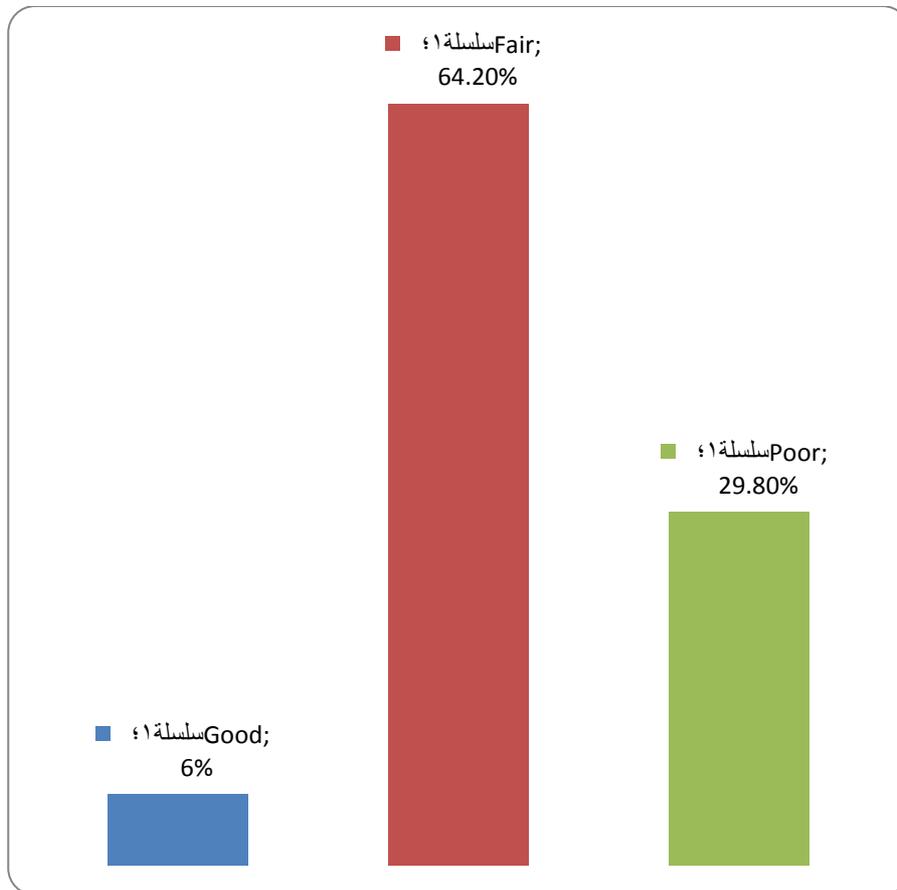
Fig (III) knowledge of nurses' about the method used to assess patient needs to oxygen. (n=67)

Table (3): the relationship between nurses' qualification and their knowledge about major indications of oxygen administration: (n=67)

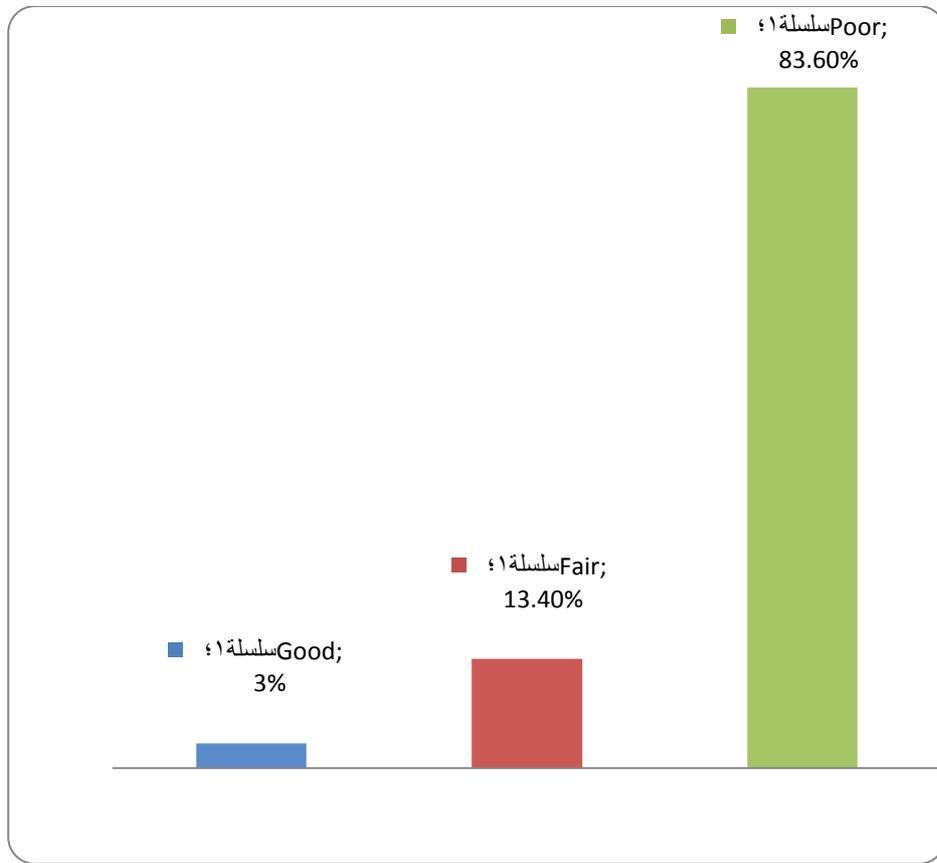| Qualification	Knowledge level:				total
	Very good	Good	Fair	Poor	
Diploma	0 0%	2 4%	21 42%	27 54%	50 100%
Bachelor	1 6.7%	3 20%	8 53%	3 20%	15 100%
Master	0 0%	0 0%	2 100%	0 0%	2 100%
Total	1 1.5%	5 7.5%	31 46.3%	30 44.3%	67 100%

P value=0.04

Fig. (VI):level of nurses' knowledge regarding factors that cause inaccurate pulse oximetry reading. (n=67)

Table (4) Relationship between nurses' qualification and their knowledge regarding low flow rate oxygen delivery devices: (n=67)

| Qualification | Knowledge level: | | | | | total |
	Excellent	Very good	Good	Fair	Poor	
Diploma	0 0%	2 4%	7 14%	16 32%	25 50%	50 100%
Bachelor	2 13.3%	1 6.7%	1 6.7%	6 40%	5 33.3%	15 100%
Master	0	1	0	0	1	2

	0%	50%	0%	0%	50%	100%
Total	2	4	8	22	31	67
	3%	6%	11.9%	32.8%	46.3%	100%

P value= 0.04

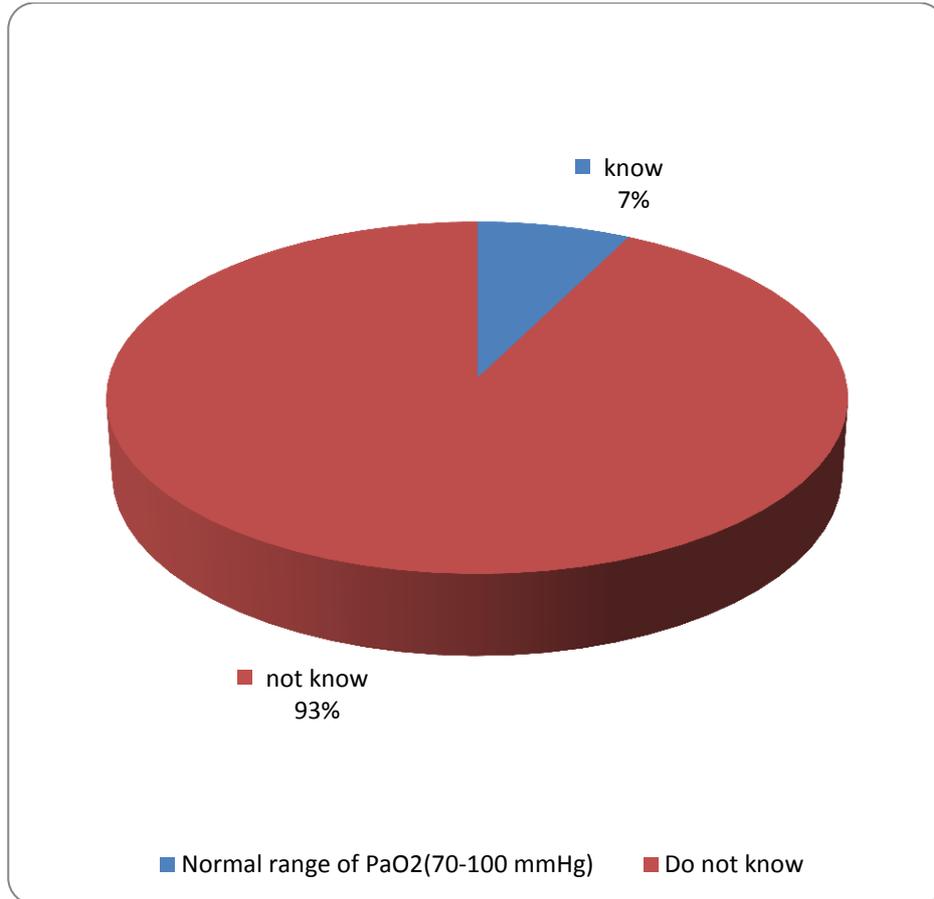**Fig (V): nurses knowledge about normal partial pressure of oxygen in arterial blood. (n=67)**

Table (5) Responses of the nurses on normal range of $PaCO_2$: (n=67)

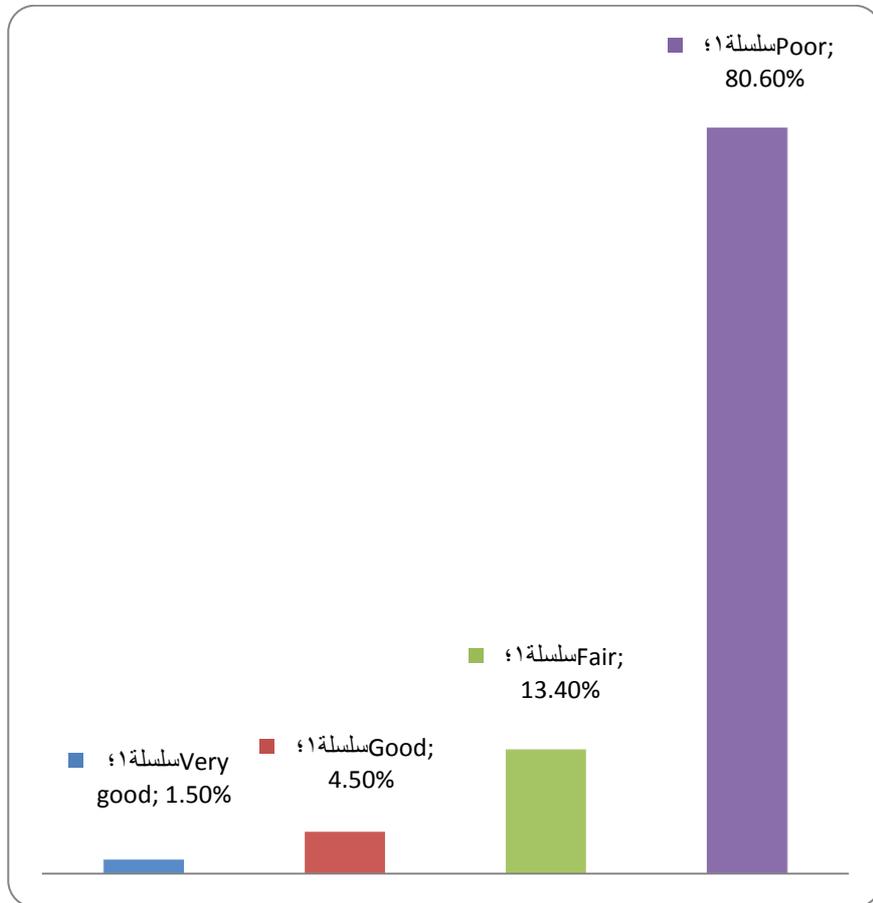| Item	Frequency	Percent
Normal range of $PaCO_2$ 35-45mmHg	5	7.5%
Do not know	62	92.5%
Total	67	100.0%

Fig. (VI): nurses' awareness of clinical manifestations of hypoxemia. (n=67)

Table (6):association between nurses' experience and knowledge of the methods used to assess patients' needs to oxygen therapy: (n=67)

Experience in years	Knowledge level:			Total
	Good	Fair	Poor	
1-3years	3 7.5%	24 60%	13 32.5%	40 100%
3-6years	1 6.7%	10 66.7%	4 26.7%	15 100%
>6years	0 0%	9 75%	3 25%	12 100%

Total	4 6.7%	43 64.2%	20 29.9%	67 100%

P value = 0.83

Table (7):nurses'practice of oxygen administration: (n=67)

Items	Done		Not appropriate		Not done		Not applicable		Total	
	F	P	F	P	F	P	F	P	F	P
1-Verify the doctor's orders for oxygen therapy	14	20.9%	17	25.4%	33	49.2%	3	4.5%	67	100%
2-hand washing before administration of oxygen	10	14.9%	6	9%	49	73.1%	2	3%	67	100%
3-Wearing gloves	58	86.6%	4	6%	4	6%	1	1.5%	67	100%
4-Confirming the patient's identity	8	11.9%	3	4.5%	52	77.6%	0	0%	63	94%
5-Respiratory rate	11	16.4%	5	7.5%	50	74.6%	1	1.5%	67	100%
6- Breathing pattern	8	11.9%	4	6%	54	80.6%	1	1.5%	63	100%
7-Pulse rate	5	7.5%	5	7.5%	56	83.6%	1	1.5%	67	100.1%
8-blood pressure	3	4.5%	2	3%	59	88.1%	3	4.5%	67	100.1%
9-Oxygen saturation	14	20.9%	5	7.5%	47	70.1%	1	1.5%	67	100%
10-Lung sounds	2	3%	3	4.5%	59	88.1%	3	4.5%	67	100%
11-Explain procedure to the patient if possible	16	23.9%	4	6%	44	65.7%	3	4.5%	67	100%
12-Put the patient in	28	41.8%	15	22.4%	24	35.8%	0	0%	67	100%

semi or high fowler position									
13-Adjust oxygen flow rate	18	26.9%	30	44.8%	13	19.4%	6	9%	67	100%
14-Apply oxygen device to the patient	51	76.1%	16	23.9%	0	0%	0	0%	67	100%
15-Check ABG values	4	6%	2	3%	13	19.4%	48	71.6%	67	100%
16-Monitor pulse oximetry reading	12	17.9%	3	4.5%	52	77.6%	0	0%	67	100%
17-Observe the patient's skin integrity	11	16.4%	4	6%	52	77.6%	0	0%	67	100%
18-Remove the gloves	23	34.3%	28	41.8%	16	23.9%	0	0%	67	100%
19-Hand washing after oxygen administration	13	19.4%	5	7.5%	47	70.1%	2	3%	67	100%
20-Date of oxygen administration	4	6%	0	0%	19	28.4%	44	65.6%	67	100%
21-Time of oxygen administration	4	6%	0	0%	18	26.8%	45	67.2%	67	100%
22-Oxygen delivery device used	1	1.5%	3	4.5%	19	28.3%	44	65.7%	67	100%
23-Oxygen flow rate	4	6%	0	0%	19	28.3%	44	65.7%	67	100%
24-respiratory rate	3	4.5%	0	0%	21	31.3%	43	64.2%	67	100%
25-pulse oximetry	3	4.5%	0	0%	19	28.3%	45	67.2%	67	100%

reading									
26-Nurses's name	4	6%	2	3%	17	25.3%	44	65.7%	67	100%
27-Nurses's signature	4	6%	0	0%	17	25.3%	46	68.7%	67	100%

P: percent: frequency

Discussion

The most frequent age group amongthe nurses was the group of (26-30) years old (29 nurses: representing 43.3%).Regarding their qualification, about (74%)of the respondent nurses had a diploma degree. Regarding experience, (59.7%) of thenurses have had experience in ERwhich range between (1-2) years,whereas a tiny minority of nurses (11.9%) have received training courses in oxygen administration. The first finding agrees with afinding obtained by asimilar study conducted in Ethiopia(2015)   which revealedthat the age of most of the nurses under study ranged between (26-30) years old (73%)[8].

In the present study, nurses' knowledgeof themajor indications of oxygen administration was fair (46.3 %). Major indications of reducedoxygen administration include: partial pressure of oxygen in arterial blood,decrease ofmyocardial work load, tachypnea, chest pain, dyspnea, low oxygen saturation in blood, cardiac arrest, and hypoxia.[9, 10, 11].Oneresult of this studyalso revealed that nurses'knowledgeof the device that can deliver low flow rate of oxygen was poor. Furthermore,concerning their responses tothe suggested flow rate delivered by each device, most ofthe respondent nurses did not know the appropriate low rate (nasal prong(70.1%), simple face mask(88.1%), partial re-breathing mask (88.1%) and non-rebreathing mask (95.5%)). Comparing this finding of the study with a previous study conducted in the UK in(2006) to test doctors' and nurses' knowledge against oxygen therapy, the study found that the findings are similar. That UK study in which about 30 doctors and 53 nurses participated revealed

that a quarter of the doctors and nearly half of nurses were unable to select the correct dose and method of administration of oxygen in the event of cardio-respiratoryarrest[2].Also the same finding of our study is similar to a finding obtained by study done in Ghana(2015)which aimed to gain full understanding of nurses' perspectives on clinical administration of oxygen in emergency and immediate post-operative environment at KBTH. That studyfound that nurses who are working in surgical and medicine emergency did not have adequate information aboutthe appropriate dose of oxygencorrespondent to the condition of the patient[8].

The researchersalsofound that the nurses'knowledge regarding the methods used to assess patients' needs to oxygen administration was fair. Methods used to assess patients'needs to oxygen administrationinclude: clinical evaluation, pulse oximetry and arterial blood gases analysis[10].

The results of the study alsoindicatednurses' knowledge about the clinical manifestations of hypoxemia was poor. Clinical manifestations of hypoxemia are: changes in mental status, tachycardia, increased blood pressure, dyspnea, diaphoresis, cold extremities and cyanosis[12]. The researcher found that there was significant relationship(p value 0.04) betweenthenurses' qualification and themajor indications of oxygen therapy. Besides, thepresent study revealed that there was statistically significantrelationship between thenurses' qualification andtheir knowledge of low flow rate oxygen delivery devices(p value 0.04).The study verified that there was no statically significantassociation between the nurses'experience and their knowledge ofassessingpatients' needs to oxygen administration (p value 0.83).

A minority of the nurses (only one-fifth) in this study verified the doctor's order (20%) concerning oxygen administration to patients. Oxygen is considered to be a drug requiring a medical prescription and is subject to any law that covers its

use and prescription. Administration is typically authorized by a physician following legal written instructions to a qualified nurse[5]. A minority of therespondentnurses applied hand-washing before administering oxygen (14.9%). It is worth mentioning here that the use of gloves does not replace the need for cleaning hands[13] and hygiene must be strictly observed when appropriate regardless of the indications for glove use[13]. The majority of the nurses (86.6%) said they would wear gloves before administering oxygen. Gloves should, therefore, be used during all patient-care activities that may involve exposure to blood and all other body fluids (including contact with mucous membrane and non-intact skin), during contact precautions and outbreak situations[13].

As for the physical assessment of the patient, only20.9% thenurses would check oxygen saturation before applying oxygen to the patient, and only a small minority of them would check respiratory rate (16.4%).

The study further showed that only about quarter of the respondent nurses would explain therequired procedures to the patient (23.9%). This result disagrees witha correspondentresultobtainedby a study done in Australia2012 to determine patients' and nurses' perspectives on oxygen therapy.That resultshowed that all nurses describe various factors they perceived as having an impact on the patient's compliance with oxygen therapy, educate the patient about the need for oxygen therapy and reassure them about maintaining compliance with it[5]. Another finding of the reviewed study revealed that about quarter of the nurses (26.9%) adjust oxygen flow rate (l/m) appropriately. Regarding monitoring of patients after administering oxygen, the researcher found that (77.6%) ofthe nurses did not monitor oxygen saturation by pulse oximetry. It is similar to the finding of a study done in Ghana to gain full understanding of nurses' perspectives on clinical administration of oxygen with in the emergency and

immediate post-operative environment whichrevealed that nurses did not monitor and assess the patient after administering oxygen apart from the routine monitoring of vital signs (4 hourly)[8]. Regarding nurses'documentation, most of the items that should be documented after applying oxygen to patientswere not actually applied by the nurses (date of administration65.7%, time of administration (67.2%), O_2 flow rate (65.7%), respiratory rate(64.2%), SPO_2(67.2%), nurse's name(65.7%) and nurse's signature(68.7%)). Nurses should document the date of oxygen administration, time of oxygen administration, the type of delivery device, oxygen flow rate, SPO_2, respiratory rate [14], tailed with their name andsignature. Finally, the current study revealed that there was knowledge gap and poor practice among nurses who are working at the Emergency department of Omdurman Teaching Hospital at the time of the study, a result which is similar correspondent results obtained by all of the three studies conducted in the UK, Ghana and Australian college for critical care nurses.

Conclusion

On the basis of the obtained results described above, the researchersconclude that: the majority of respondent nurses working in ED at the time of the study had a diploma degree with a minimal chance of training.Nurses' knowledgeregardingthemajor indications of oxygen administration was fair. Nonetheless, their knowledge regarding the appropriatemethods used to assess patients' needs to oxygen administrationwas poor.That is in addition to the following basic points indicated by the findings:

- Nurses' implementation of oxygen therapyis insufficient.
- Documentation was observed byonly a small minority of nurses.

- Association between the nurses'qualificationand the following variables was statistically significant:
  - Nurses' knowledge about the major indications of oxygen administration.
  - Nurses' knowledge about low flow rate oxygen delivery devices.
- Association between the nurses 'experience and their knowledge regarding the methods used to assess patients' needs to oxygen administration was notstatistically significant.

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