Factors Contributing to Post Suction Hypoxemia in Critical Ill Patients

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Abstract

Background Tracheal suctioning is a rather frequent and essential procedure in patients under mechanical ventilation. During this procedure the tracheal secretion is removed to assure adequate oxygen supply and to avoid obstruction of the tube lumen, resulting in increased respiratory work, atelectasis and pulmonary infections. This procedure is associated with consequences and risks as hemorrhage, lesions of the tracheal mucosa, infections, atelectasis, cardiovascular disorder, hypoxemia and increase intracranial pressure. **Aim:** this study aimed to assess factors contributing to post suction hypoxemia in critically ill patients. **Study design:** a descriptive exploratory design was utilized in this study. **Setting:** this study was carried out in the Intensive Care Units of Alexandria Main Abo Quir- Hospital. **Subject**: A purposive sample of 66 patients of both genders was involved in the study and convenient sample of all nurses working in intensive care unit at Alexandria Abo Quir hospital. **Data collection tools:** (I): Patient related factors: which includes 5 parts used to assess patients' related factors. (II): Nurses related factors: which includes 2 parts used to assess nurses' related factors. **Results**: the present study revealed that more than half of them were male and had high education, more than two thirds of them were married and more than three quarters of them were employed. Additionally, there was a statistically insignificance relation between nurses' total level of practice and total level of knowledge. **Conclusion**: the majority of the studied nurses had unsatisfactory level of knowledge regarding suctioning procedure, while less than one fourth of them had satisfactory level of knowledge regarding suctioning procedure. In addition to more than half of the studied nurses had satisfactory level of suctioning performance, while less than half of them had unsatisfactory level of suctioning performance. Additionally, more than half of the patients were smokers and had hypertension as contributing factors to post suction hypoxemia in critically ill patients. **Recommendations**: Educational program for intensive care unit nurses to improve knowledge and practices about endotracheal tube suctioning and avoid complications through performing suctioning procedure.

Key words: Tracheal suctioning, Mechanical ventilation, Hypoxemia.

INTRODUCTION

Health care is undergoing dramatic change at a speed that makes it almost impossible to remain current and be protective. The chaos and multiple challenges facing nurses are evident in critical care, where new technology and therapeutic modalities interface with a continued strive for quality and positive outcome **(Jansson et al, 2020).**

Many patients in the critical care environment have altered mucociliary clearance because of pre-existing lung disease, which may have increased mucous production as part of the disease, lung damage from handling or trauma, muscle weakness and lack of ability to generate an effective cough, pain which may inhibit an effective cough or prevent expansion of the lung tissue and therefore decrease mucociliary clearance. Some of those patients may need mechanical ventilation (MV) to decrease the work of the respiratory muscles, administer a guaranteed fraction of inspired oxygen and increase alveolar ventilation and oxygenation **(Majeed, 2019).**

Generally, patient are connected to MV by endotracheal tube may have some

complications appear as ineffective airway clearance, depressed cough reflex, impaired mucociliary clearance system, some tracheal mucosal damage and infection. Care of mechanically ventilated patients is fundamental to intensive care nursing and constitutes a large part of the workload. Patients are highly dependent on skilled nursing throughout all aspects of their care. One such aspect is the ability to maintain a clear airway which necessitates endotracheal suctioning (ES) **(American Association for Respiratory Care (AARC), 2020).**

Endotracheal suctioning is one of the first skills learned by nurses. It involves the mechanical aspiration of secretions from the nasopharynx, oropharynx and trachea. Suctioning is necessary in mechanically ventilated patients to prevent airway obstruction, and to a lesser extent to decrease the work of breathing resulting from retained secretions. Preforming ES on a critically ill patient is not always a pleasant procedure **(Ansari et al, 2018).**

There are two types of ES systems: open suction system (OSS), which need to be disconnected from the respiratory circuit and empty suctioning catheter; and closed suction system (CSS), which do not need to be disconnected from the respiratory circuit and employ multi-use suctioning catheter. OSS was the standard method of practice until CSS was **introduced (Bülbül Maraş et al, 2017).**

Although ES is used to prevent occurrence of certain complication s, also it is associated with a number of complication in critically ill patients including hypoxemia and tissue hypoxia, significant changes in heart rate and blood pressure, presence of cardiac dysrhythmias attributed to mechanical stimulation of vagus nerve, atelectasis, and infection. Many practitioners simply do not apply critical thinking and preform this procedure in a rote manner. This manner of thinking does injustice to our patients. Suction is serious business. Hypoxemia may result from the removal of alveolar gas or the interruption of mechanical ventilation and oxygen supply during tracheal suctioning,

especially in patients who already have respiratory compromises **(Haghighat, S., & Yazdannik, A. 2018).**

There are many associated risks and complications. The recommendations prior to suctioning include comprehensive patient assessment and patient preparation. The recommendations during suctioning include appropriate catheter selection, depth of insertion, suction pressure, duration of procedure and number of suction passes. Prevention of infection and maintenance of asepsis, i.e. hand – washing, wearing gloves, aprons and goggles are also essential **(Mwakanyanga, et al, 2018).**

Significance of the study:

Post suction hypoxemia affects about 150,000 people each year in Europe. In the United States between 200,000 and 350,000 cases occur each year, which results in between 30,000 and 50,000 deaths **(Moller, Pedersen et al, 2018).**

In Egypt the incidence of post suction hypoxemia in Abo Quir Hospital were approximately 90 cases through the year 2018 in cardiac care unit and intensive care unit. Rates are similar in males and females. They become more common as people get older. Most patients who succumb to post suction hypoxemia occur within the first few hours of the event **(El-Din, Mai Shams ,August 1, 2019).**

Aim of study:

Assess factors contributing to post suction hypoxemia in critically ill patients.

Research question:
- What are the factors contributing to post suction hypoxemia in critically ill patients?

Subjects and Methods:
I- Technical Design:
A-Research design:

A descriptive exploratory design will be utilized in this study.

B- Research Setting:

This study will be conducted in the Intensive Care Units of Alexandria Main Abo Quir- Hospital.

C- Subjects:

1- A purposive sample of 66 patients of both genders was involved in the study based on the power analysis (Epi-info program) with the following information (population size = 88 over 4 months. Expected frequency = 50%, acceptable error =5 % confidence coefficient = 95 %. Number of subjects was estimated by the power analysis (Epi-info program).

2- Convenient sample of all nurses working in intensive care unit at Alexandria Abo Quir hospital.

D-Tools for data collection:

The study data was collected through the following three tools:

I): Patient related factors:

Patient interview questionnaire: based on current literature review **(Guglielminotti, Desmonts, & Dureuil 2016).** It will be used to assess factors contributing to post suction hypoxemia in critical ill patients. It includes the following:

1-   Clinical assessment sheet:

It will be developed by researcher and divided into five parts:

A-   **Demographic data** such as: age, sex, marital status, occupation and education)

Patients history as: (present history, smoking and past history).

C-   **Patient assessment chart** as (diagnosis, last feeding, need for suction and lab investigation).

D-   **Intubation**: date of intubation, endotracheal tube, tracheostomy tube, duration of intubation and tube size.

E-   Physiological parameters:

These parameters will put in table and compare between before and after suction as: pulse, heart rate (HR), respiratory rate (RR), arterial gasometry and pH measurement, arterial blood partial pressure of oxygen (PaO_2), arterial blood partial pressure of carbon dioxide ($PaCO_2$), oxygen saturation (SaO_2), serum bicarbonate HCO_3 and cardiac dysrhythmia.

Tool (2): Nurses related factors:

1- Knowledge   assessment questionnaire: to assess nurses' level of knowledge about factors contributing to post suction hypoxemia. It will be developed according to recent literature review **(Lookinkland, 2017).**

❖ **Scoring system:** the total score of knowledge assessment questionnaire was 29 marks. Each correct answer was given one mark and the incorrect answer was given zero. It was categorized as follows: $\geq$ 85% (=25 marks) = satisfactory level of knowledge, and < 85% = unsatisfactory level of knowledge.

2- **Nurses observational checklist:** **(Lynn, 2018)**

Observational suction checklist that prepared by world health organization (WHO) to assess nurses performance regarding to factors contributing to post suction hypoxemia in critical ill patients it include the following parts:

A. Prepare patient as (explain procedure, position of patient)

B. Providing post care for patient as (readjust oxygen source, reassess breathing sound, etc………).

C. Providing post care for equipment as (turn of suction apparatus, discard suction catheter, etc...…………)

D. Documentation as (amount and color of secretion, abnormal finding in patient, etc...…………).

❖ **Scoring system:** the total score of nurses' observational checklist was 43 marks. Each correct answer was given one mark and the incorrect answer was given zero. It was categorized as follows: $\geq$ 85% (=37 marks) = satisfactory level of nursing practice, and < 85% = unsatisfactory level of nursing practice.

II- Operational design:

It includes the preparatory phase, content validity, tools reliability, pilot study and field work.

A) The preparatory phase

It includes reviewing of related literature and theoretical knowledge of various aspects of the study using books, journals, articles, internet periodicals and nursing magazines to develop tools for data collection.

B) Content validity: validity was tested through a jury of 7 experts that consisted of: (3 professors, 3 assistant professors, one lecturer) from Medical Surgical Nursing at the Faculty of Nursing, Ain Shams University for the content validity. The jury reviewed the tools for clarity, relevance, comprehensiveness, and simplicity; then based on the opinion of the jury minor modifications were carried out, and then the final forms were developed.

B) Tools reliability: Alpha Chronbach test was used to measure the internal consistency of the two tools used in the current study.

D) A Pilot study: A pilot study was conducted on 10% of the study subjects. In order to test the applicability of the study tools, the clarity of the study tools, as well as estimating the average time needed to complete the tools. Accordingly, necessary modifications were made for the final development of the study tools. Some questions and items were omitted, added or rephrased and then the final forms were developed. Patients selected for the pilot study were excluded from the study subjects.

E) Ethical considerations:

The ethical research considerations in this study included the following:
- The research approval was obtained from the Ethical Committee in Faculty of Nursing, Ain Shams University before starting the study.
- The researcher clarified the objective and the aim of the study to the patients and nurses to obtain their cooperation.

- The researcher maintains anonymity of the subjects and confidentiality of the subjects' data.
- The patients were allowed to choose to participate or not and they were informed that they have the right to withdraw from the study at any time without giving any reason.
- Values, cultures and beliefs were respected.

E) Field work:

- Sampling and data collection was started and completed within 4 months; from May 2021 until the end of August 2021.
- The purpose of the study was simply explained to the nurses who agree to participate in the study prior to any data collection.
- The study tools were filled in and completed by the researcher.
- The researcher was available at the Intensive Care Unit, Surgical Intensive Care Unit, Neurology Intensive Care Unit and Cardiac Care Unit, Alexandria Main Abo Quir Hospital 3days/week at morning and afternoon shifts to collect data from the selected patients and nurses.
- The patients who fulfilled the inclusion criteria were selected. The researcher obtained the relatives patients' oral consent for participating in this study after explaining the aim of the study.
- Collection of data was begun with the health assessment tool, and it was completed by the researcher within (10-15 minutes). After that, Nurses observational checklist was also completed by the researcher within about (10 min.), then compare between physiological parameters before and after suction was also completed by researcher; in the end knowledge assessment questionnaire that will be complete be nurses' staff work at intensive care units to assess knowledge of nurses.
- All information gathered through data collection tools was interpreted to identify and assess factors contributing to post suction hypoxemia in critically ill patients**.**

III. Administrative Design:

An official letter was issued from the Faculty of Nursing, Ain Shams University to the directors of the Intensive care unit,

Surgical intensive care unit, Neurology intensive care unit and Cardiac care unit, Alexandria Main Abo Quir Hospital at which the study was conducted, explaining the purpose of the study and requesting the permission for data collection from the study group.

IV. Statistical Design:

- The collected data were organized, categorized, tabulated and statistically analyzed using the Statistical Package for Social Science (SPSS) version (20.0) and (Excel 2010) to evaluate the studied subjects' changes throughout the study phases and to assess factors contributing to post suction hypoxemia in critically ill patients. Data were presented in tables and charts. The statistical analysis includes: percentage (%), mean, standard deviation (SD), Paired T test, r-test, P-value and qi-square test. The observed differences and association were considered as follows: -Non-significant (NS) difference obtained at $p > 0.05$.

Significant (S) difference obtained at $p \leq 0.0\,5$. Highly significant (HS) difference obtained at $p < 0.001$.

Results:

Table (1): represents demographic characteristics of the studied patients, regarding their gender more than half of them (61.1%) were male, and more than one third of them (33.3%) were in the age group of $18 \geq 30$ years old. As regards marital status more than two third of them (71.2%) were married, more than half of them (54.5%) had high education, and more than three quarter of them (77.3%) were employed.

Table (2): shows the demographic characteristics of the studied nurses; regarding their age more than three quarters of them (80.3%) were in the age group of $18 \geq 30$ years old. As regards of their qualification more than half of them (53.0%) had nursing associate degree, and more than half of them (59.1%) had $1 \geq 5$ years of professional experience. Regarding total years of ICU experience more than two third of them (71.2%) had $1 \geq 5$ years.

Table (3): shows that there were highly statistically significance differences between mean scores of the patients' physiological parameters before and after suctioning procedure in which $p \leq 0.001$ except for Hco3, there was insignificant difference before and after suctioning procedure in which $p > 0.05$.

Table (4): shows that there was a statistically insignificance relation between nurses' total level of practice and total level of knowledge in which $p > 0.05$.

Table (5): shows that there were a statistically insignificance relation between nurses' demographic characteristics and total nurses' level of practice regarding suctioning procedure in which $p > 0.05$.

Table (6): shows that there were highly statistically significance relation between nurses' age, qualification, and total years of ICU experience and total nurses' level of knowledge regarding suctioning procedure in which $p \leq 0.001$, while there was a statistically significance relation between nurses' total years of professional experience and total nurses' level of knowledge regarding suctioning procedure in which $p \leq 0.005$.

Table (1): Frequency distribution of the demographic characteristics of the studied patients (n=66).

Items	Number (No.)	Percentage (%)
Gender		
Male	41	62.1
Female	25	37.9
Age		
18 ≥ 30 years	22	33.3
31 ≥ 40 years	20	30.3
41 ≥ 50 years	7	10.6
≥ 51 years	17	25.8
Marital status		
Single	15	22.7
Married	47	71.2
Widow(er)	3	4.5
Divorced	1	1.5
Education		
Illiterate	2	3.0
Read and write	13	19.7
Secondary education	15	22.7
High education	36	54.5
Occupation		
Employee	51	77.3
Unemployed	15	22.7

Table (2): Frequency distribution of the demographic characteristics of the studied nurses (n=66).

Items	Number (No.)	Percentage (%)
Age		
18- ≥ 30 years	53	80.3
31- ≥ 40 years	5	7.6
41- ≥ 50 years	6	9.1
≥ 51 years	2	3.0
Qualification		
Diploma in practical	10	15.2
Nursing associate degree	35	53.0
Bachelor's degree	16	24.2
Master's degree	5	7.6
Total years of professional experience		
1 ≥ 5 years	39	59.1
6 ≥10 years	13	19.7
11 ≥ 15 years	8	12.1
16 ≥ 20 years	5	7.6
≥ 21 years	1	1.5
Total years of ICU experience		
1 ≥ 5 years	47	71.2
6 ≥10 years	11	16.7
11 ≥ 15 years	4	6.1
16 ≥ 20 years	3	4.5
≥ 21 years	1	1.5

Table (3): Comparison between mean scores of the patients` Physiological parameters before and after suctioning procedure (n=66).

Items	BEFORE		AFTER		t-test	P value
	Mean	SD	Mean	SD		
Respiratory rate	20.26	2.803	24.77	4.003	7.738	0.000 (HS)
Heart rate	86.71	12.039	118.23	35.896	6.820	0.000 (HS)
PH	7.40	.031	7.38	.059	2.832	0.006 (HS)
Pao2	94.20	6.234	87.99	9.995	6.229	0.000 (HS)
Paco2	38.02	4.160	40.82	8.339	3.482	0.001 (HS)
Hco3	21.53	4.466	21.32	5.229	.612	0.543 (NS)
Sao2	96.70	1.358	92.08	4.824	7.224	0.000 (HS)
Cardiac dysrhythmia	.02	.123	.61	.492	9.134	.000 (HS)

Table (4): Relation between total nurses' level of knowledge and total level of practice regarding suctioning procedure (n=66).

Variables		Total level of practice				X^2	P value
		Not done		Done			
		NO.	%	NO.	%		
Total level of knowledge	Incorrect	32	48.5	26	39.4	324	.981 (NS)
	Correct	0	0.0	8	12.1		

Table (5): Relation between the nurses' demographic characteristics and total nurses' level of practice regarding suctioning procedure (n=66).

Items	Total nurses' level of practice				X^2	P value
	Not done		Done			
	(No.)	(%)	(No.)	(%)		
Age						
18- ≥ 30 years	28	42.4	25	37.9	56.021	.399 (NS)
31- ≥ 40 years	4	6.06	1	1.52		
41- ≥ 50 years	0	0	6	9.09		
≥ 51 years	0	0	2	3.03		
Qualification						
Diploma in practical	3	4.55	7	10.6	54.664	.449 (NS)
nursing Associate degree	24	36.4	11	16.7		
Bachelor's degree	5	7.58	11	16.7		
Master's degree	0	0	5	7.58		
Total years of professional experience						
1 ≥ 5 years	20	30.3	19	28.8	59.651	.850 (NS)
6 ≥10 years	8	12.1	5	7.58		
11 ≥ 15 years	4	6.06	4	6.06		
16 ≥ 20 years	0	0	5	7.58		
≥ 21 years	0	0	1	1.52		
Total years of ICU experience						
1 ≥ 5 years	24	36.4	23	34.8	43.045	.997 (NS)
6 ≥10 years	8	12.1	3	4.55		
11 ≥ 15 years	0	0	4	6.06		
16 ≥ 20 years	0	0	3	4.55		
≥ 21 years	0	0	1	1.52		

Table (6): Relation between the nurses' demographic characteristics and total nurses' level of knowledge regarding suctioning procedure (n=66).

Items	Total nurses' level of knowledge				X^2	P value
	Incorrect		Correct			
	(No.)	(%)	(No.)	(%)		
Age						
18- ≥ 30 years	51	77.3	2	3.03	**111.980**	**.000** (HS)
31- ≥ 40 years	5	7.58	0	0		
41- ≥ 50 years	2	3.03	4	6.06		
≥ 51 years	0	0	2	3.03		
Qualification						
Diploma in practical	10	15.2	0	0	**89.924**	**.002** (HS)
nursing Associate degree	35	53	0	0		
Bachelor's degree	13	19.7	3	4.55		
Master's degree	0	0	5	7.58		
Total years of professional experience						
1 ≥ 5 years	38	57.6	1	1.52	**101.771**	**.012** (S)
6 ≥10 years	13	19.7	0	0		
11 ≥ 15 years	6	9.09	2	3.03		
16 ≥ 20 years	1	1.52	4	6.06		
≥ 21 years	0	0	1	1.52		
Total years of ICU experience						
1 ≥ 5 years	46	69.7	1	1.52	**117.021**	**.001** (HS)
6 ≥10 years	10	15.2	1	1.52		
11 ≥ 15 years	1	1.52	3	4.55		
16 ≥ 20 years	1	1.52	2	3.03		
≥ 21 years	0	0	1	1.52		

Discussion:

Regarding the **demographic characteristics of the patients** under the study, the findings of this study revealed that more than half of them were male. This result agreed with a study carried out by **(Al-Shareef, A., & Alyoubi, R., Prevalence and Outcome of Neurological Referral to the General Intensive Care Unit International, 2014)** who found that the incidence of admission was higher among males in ICU.

But that was not in agreement regarding the age group in which more than one third of them were in the age group of 18 ≥ 30 years old, while they showed that the age of the studied patients was common between 36 and 65 years.

As regards the marital status, more than two thirds of them were married, more than half of them had high education, and more than three quarters of them were employed. That was in the same line with **(Bhardwaj, K., & George, M., A Simple**

Aid to Reduce Communication Difficulties of Mechanically Ventilated Patients in The ICUS, 2019) who showed that more than two thirds of the studied patients were married and were employed, while about half of them had high education.

Concerning the **demographic characteristics of the studied nurses**, the findings of this study revealed that more than three quarters of them were in the age group of 18 ≥ 30 years old. This finding can be supported by the study findings done by **(Oleci PF, Marisa DRL, Driano M.F., Knowledge about endotracheal suctioning on the part of intensive care nursing professionals, 2013)** who reported that around two thirds of the study subjects were males and their ages ranged between (15 and 34) years old.

As regards of their qualification, more than half of them had nursing associate degree. These results were not in accordance with those results obtained by **(Akram A, Akram MA, Mohsen AH, Mohammadreza A. The**

gap between knowledge and practice in standard endo-tracheal suctioning of ICU nurses, 2012), who stated that all of them held the BS degree as level of education.

Moreover, more than half of them had 1≥5 years of professional experience. This is in the same line with (Savita S., Jyoti S., Gurneet KB., Effectiveness of endotracheal suctioning Protocol in terms of knowledge and practices of nursing personnel" 2014) who reported that more than half of them were employed in nursing with experience of (1-5) years.

Regarding the total years of ICU experience, more than two thirds of them had 1 ≥ 5 years. These findings were not correspondent with those obtained by (Savita S, Jyoti S, Gurneet KB. Effectiveness of endotracheal suctioning Protocol in terms of knowledge and practices of nursing personnel, 2014) who stated that two-thirds of the nursing personnel had less than one year of experience in ICU and the rest had 1-5 years of experience in ICU.

Regarding the comparison between the mean scores of the **patients' physiological parameters** before and after suctioning procedure, the current study showed that there were highly statistically significant differences between mean scores of the patients' physiological parameters before and after suctioning procedure in which $p \leq 0.001$ except for Hco3, there was an insignificant difference before and after suctioning procedure in which $p > 0.05$. This was in agreement with (TaheriP., AsgariN., MohammadizadehM. and GolchinM., The Effect of Open and Closed Endotracheal Tube Suctioning System on Respiratory Parameters of Patients Undergoing Mechanical Ventilation, 2012) who showed that there was a significant difference between mean respiratory rate and arterial blood oxygen saturation before, during and after the closed and open suctioning.

Furthermore, these were not in agreement with (Jongerden, I.P. Rover, M.M. Grypdonck, M.H. and Bonten, M.J. Open and Closed Endotracheal Suction Systems in Mechanically Ventilated

Intensive Care Patients: a meta-analysis, 2017) who stated that there were not statistically significant differences between mean scores of the patients' physiological parameters before and after suctioning procedure. This is may be due to body begin to do compensatory mechanism. Also there are increase heart rate and decrease in level of PaO_2 and SaO_2 because of about half of the nurses had lack of performance regarding suctioning procedure.

Concerning the relation between the **total nurses' knowledge and the total practice** regarding suctioning procedure, the present study revealed that there was a statistically insignificant relation between nurses' total level of practice and total level of knowledge in which $p > 0.05$. This was in the same line with (Maras. G., Guler. E., Eser. I., Kose. S., Knowledge and practice of intensive care nurses for endotracheal suctioning in a teaching hospital in western Turkey, 2017) who showed that there was not a statistically significant relation between the nurses' scores of knowledge and practice in which ($p = 0.063$).

Concerning the relation between the nurses' **demographic characteristics and the total nurses' level of knowledge** regarding the suctioning procedure, the present study clarified that there were a highly statistically significant relation between nurses' age, qualifications, and total years of ICU experience and total nurses' level of knowledge regarding the suctioning procedure in which $p \leq 0.001$, while there was a statistically significant relation between nurses' total years of professional experience and total nurses' level of knowledge regarding suctioning procedure in which $p \leq 0.005$. This was not in conformity with (Majeed HM.., Assessment of knowledge and practices of intensive care unit nurses about endotracheal suctioning for adult patients in Baghdad, 2019) who stated that there was no significant association regarding nurses knowledge, practices with nurses' certain demographic characteristics in which P-value is (0.905, 0.962) for knowledge and practice level respectively.

As regards the relation between the **nurses' demographic characteristics and total nurses' level of practice** regarding suctioning procedure, this study showed that there were a statistically insignificant relation between nurses' demographic characteristics and the total nurses' level of practice regarding suctioning procedure in which p> 0.05. These results are concurrent with **(Mary P. Effectiveness of endotracheal suctioning technique, 2015)** who found in her research that there was not a statistically significant difference in the mean practice score of both groups (P value=0.27).

Finally, patients connected to MV by endotracheal tube had some complications appear as ineffective airway clearance, depressed cough reflex, impaired mucociliary clearance system, some tracheal mucosal damage, hypoxemia and infection. Care of mechanically ventilated patients is fundamental to intensive care nursing and constitutes a large part of the workload. Patients are highly dependent on skilled nursing throughout all aspects of their care. One such aspect is the ability to maintain a clear airway which necessitates endotracheal suctioning (ES). So, it is important to assess the factors contributing to post suction hypoxemia in critically ill patients.

Conclusion:

The results of this study concluded that:

The current study showed that the majority of the studied nurses had unsatisfactory level of knowledge regarding suctioning procedure, while less than one fourth of them had satisfactory level of knowledge regarding suctioning procedure. In addition to more than half of the studied nurses had satisfactory level of suctioning performance, while less than half of them had unsatisfactory level of suctioning performance. Moreover, there was a statistically insignificance relation between the nurses' total level of practice and total level of knowledge in which p> 0.05. Additionally, more than half of the patients were smokers and had hypertension as contributing factors

to post suction hypoxemia in critically ill patients.

Recommendations:

The results of this study projected the following recommendations:
- Educational program for intensive care unit nurses to improve knowledge and practices about endotracheal tube suctioning and avoid complications through performing suctioning procedure.
- The need to place practice guidelines and teaching programs to be perform and up dated in hospitals for teaching nurses especially the newly employed.
- Replication of the current study on a larger probability sample is recommended to achieve generalization of the results.

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