

## Assessment of Nurses' Performance Regarding Care of Children Undergoing Mechanical Ventilation

Osama Elshahat Mostafa\*, Amal Ahmad Khalil\*\*, Mohamed Mohamed Elmazahy\*\*\*, Nabila Hassan Abed Ella\*

Pediatric Nursing Department, Faculty of Nursing, Suez Canal University,\*\* Pediatric Nursing Department, Faculty of Nursing, Port Said University, \*\*\* Pediatric Medicine Department, Faculty of Medicine, Alazhar University.

### ABSTRACT

Mechanical ventilation is one of the most common therapies in the newborn intensive care units. Nursing care for ventilator pediatric patients which include: review communications, check ventilator settings and modes, suction appropriately, assess pain and sedation needs, prevent infection, prevent hemodynamic instability, manage airway, meet patient nutritional needs, and wean the pediatric patient from the ventilator appropriately, **Aim** of the present study was to assess nurses' performance regarding care of children undergoing mechanical ventilation. **Design:** descriptive research design was utilized in this study. **Setting:** the study was conducted at neonatal and pediatric intensive care units at two of the general hospitals in Port-Said City -these are El-Nasr General Hospital and Port-Foud General Hospital- and Suez Canal University Hospital. **Sample:** Convenience sample, including all nurses (90) who work in the previous mentioned hospitals and agreed to participate in the study. **Tools for data collection:** three tools: A structured Questionnaire Sheet, Nurses' Attitude Questionnaire Sheet and Nurses' Observational Checklist. **Results:** study revealed that less than half of studied nurses had unsatisfactory level of knowledge regarding care of children undergoing mechanical ventilation and more than half of nurses who had unsatisfactory level was found at university hospital, whereas all of nurses had adequate level of practice and had positive attitudes regarding care of children undergoing mechanical ventilation. **Conclusion:** The study concluded that there was a highly statistically significant difference between the total score of knowledge and educational level, place of work and work experience. Also the study reported that there was statistically significant difference between total knowledge score and practice score. **Recommendation:** it is recommended that nurses need for an educational programs about mechanical ventilation. The study also recommends that need for practical oriented program including oropharyngeal, nasopharyngeal suctioning, handwashing and documentation introduced for nurses.

**Key words:** Mechanical ventilation, Neonatal intensive care units, Pediatric intensive care unit.

**Corresponding author:** Osama Elshahat, Email. Os\_ed2010@yahoo.com Mobil / 01201606026.

### INTRODUCTION

Mechanical ventilation is one of the most common therapies in the neonatal intensive care units (NICU). It is associated with increased morbidity and mortality therefore it is considered a complex and

highly specialized area of intensive care units (Sant'Anna, 2012).

**Kumar (2011)** stated that mechanical ventilation is used when natural breathing is absent (apnea) or insufficient. This may be so in cases of intoxication, cardiac arrest,

neurological disease or head trauma, paralysis of breathing muscles due to the spinal cord injury or the effect of anaesthesia or muscle relaxant drugs. Various pulmonary diseases or chest trauma, cardiac disease such as congestive heart failure, sepsis and shock may also necessitate ventilation.

Neonatal and pediatric patient have smaller lungs, higher airway resistance, lower lung compliance, less surface area for gas exchange, and lower cardiovascular reserve than do adults, making them more vulnerable to rapid onset of respiratory distress (Cairo, 2012).

The neonatal mechanical ventilator has been considered an essential tool for managing premature neonates with respiratory distress syndrome (RDS) which is considered main indication of mechanical ventilation in pediatrics and is still regarded as an integral component in the neonatal respiratory care continuum. Infant mortality caused by RDS in the United States decreased from approximately 268 in 100,000 live births in 1971 to 98 in 100,000 live births in 1985 to 17 in 100,000 live births in 2007 (Brown and Diblasi, 2011). Also mechanical ventilation of newborn and pediatric involve the use of devices that recruit and maintain lung volume, improve gas exchange and lung mechanics, assist in overcoming the resistive properties of an artificial airway, reduce the work of breathing, limit lung injury to provide adequate ventilation and oxygenation. Neonatal and pediatric patient who requiring ventilatory support require diligent medical and nursing care with an aim towards optimizing mechanical ventilation as well as limiting ventilator induced lung injury, prevention of side effects and early diagnosis of potential

complications which could affect the clinical outcome (Gupta et.al., 2014).

Neonatal and pediatric patient who receiving assisted ventilation and neonatal intensive care require a multidisciplinary group of care providers consisting from professional nurses, physicians, respiratory therapists, social workers, developmental specialists, occupational and physical therapists, pharmacists, and clinical dieticians comprise the team who work in neonatal and pediatric intensive care units. (Karotkin, 2011).

The nursing process in the care of pediatrics on mechanical ventilation involves baseline and continuous assessment and provision of optimum ventilation through interventions such as preventing accidental or unplanned extubation; positioning for optimum ventilation and comfort and suctioning of the airway and one of the most important element of nursing process is nursing assessment which focused on physical examination, vital signs, response to treatment, pulmonary status, oxygenation, comfort, airway patency, laboratory analysis and pulse oximetry (Hockenberry & Wilson, 2013).

### **Aim of the study**

---

**The aim of the present study was to:** - assess nurses' performance regarding care of children undergoing mechanical ventilation

### **Research questions:**

1. What is the nurses' performance regarding care of children undergoing mechanical ventilation

## Subjects and Methods

The subjects and methods for this study were portrayed under four main designs as follows:

- I- Technical design.
- II- Administrative design.
- III- Operational design.
- IV- Statistical design.

### **I- Technical design**

The technical design includes the research design, setting, sample size and tools for data collection.

### **Research design**

Descriptive design was used in this study.

### **Setting**

The present study was conducted at Neonatal Intensive Care units (NICU) and Pediatric Intensive Care Units (PICU) in two of the general hospitals in Port-Said City -these are El-Nasr General Hospital which includes NICU and PICU and Port-Foud General Hospital which includes NICU only-and Suez Canal University Hospital which includes NICU and PICU.

### **Sample size**

Convenience sample, include all available nurses (males & females) working in the above mentioned settings (NICU and PICU) comprised the subjects of the study with total number = 90 nurses.

## Tools of data collection

Data was collected through the use of the following tools:

### **1) A Structured Questionnaire Sheet.**

A structured Questionnaire Sheet was designed by the researcher in arabic language based on (**Hockenberry & Wilson, (2013)** and **Bowden and Greenberg, (2012)**) to assess nurses' knowledge regarding care of children under mechanical ventilation at Neonatal and Pediatric intensive care units. It was composed of two parts:

**Part 1: Socio-demographic Data:** Socio-demographic data of nurses such as; nurses' age, level of education, years of experience, and training courses.

**Part 2: Nurses' Knowledge regarding care of children undergoing mechanical ventilation:**

This part contains (64) closed and open ended questions divided as the following:

Knowledge about anatomy and physiology of respiratory system, mechanical ventilation, mechanical ventilator device ,care of Endotracheal Tube ,suctioning from airways, Capillary Blood Gases, Chest Physiotherapy, insertion and care of Nasogastric Tube, changing position of child, Cardiopulmonary Resuscitation, Knowledge about daily hygienic care, and weaning from mechanical ventilation.

**Scoring system:** Scoring system for knowledge of the studied nurses was calculated as the following:

- The total number of questions were **(64)** questions. A total score of **(128)** were given for all questions.
- The studied nurses' answers were compared with a model Key answer, where **(2)** score was given for completely correct answer, **(1)** for incompletely correct answer, and **(0)** for incorrect answer.
- These scores were converted into a percent score, and means and standard deviations were computed. The knowledge was considered "**Satisfactory**" if percent score was **60%** or more and "**Unsatisfactory**" if less than **60%**.

## **2) Nurses' Attitude Questionnaire Sheet.**

Modified Likert scale adopted from **Abdel Azyz (2001)**, to assess nurses' attitude regard care of child under ventilator and consists of (13) statements. The scale was measured on five point's Likert Scales ranging from strongly agree, agree neutral, disagree, and strongly disagree respectively.

**Scoring system:** The total number of items was (13) and they were measured on five points likert scale ranging from 5,4,3,2 and 1 for responses: strongly agree, agree, neutral, disagree, and strongly disagree respectively for the positive statements number (3,5,and 8) and this scoring was reversed from 1 to 5 for negative statements number (1,2,4,6,7,9,10,11,12, and 13). Score of items were summed up with total score (25) divided by number of items giving mean score for the attitude of nurses

regarding care of children under mechanical ventilator. Total score was converted into a percent score, and means and standard deviations were computed. The attitude was considered "**Positive**" if percent score **60%** or more and "**Negative**" if less than **60%**.

## **3) Nurses' Observational Checklist.**

This was used to assess nurses' practice regarding care of children undergoing mechanical ventilation. It was developed based on **Bowden and Greenberg (2012)**. This part covers nurses' practice regarding:

Item (1):- preparation of ventilator. It includes 14 steps.

Item (2):- Endotracheal tube care. It includes 14 steps.

Item (3):- Oropharyngeal suctioning. It includes 15 steps.

Item (4):- Nasopharyngeal suctioning. It includes 14 steps.

Item (5):- Endotracheal tube suctioning. It includes 17 steps.

Item (6):- Eye Care. It includes 14 steps.

Item (7):- Mouth Care. It includes 12 steps.

Item (8):- Capillary Blood Gases specimen. It includes 16 steps.

Item (9):- Chest Physiotherapy. It includes 12 steps.

Item (10):- Changing Child's Position. It includes 8 steps.

---

Item (11):- Cardiopulmonary Resuscitation. It includes 12 steps.

Item (12):-Nasogastric tube insertion and care. It includes 18 steps.

### Scoring of Nurses' Practice:-

- The total number of steps were (166) steps. A total score of practice (330) were given for all steps
- Score for each step performance were distributed as follows, "**Adequate done**" (score 2), "**Inadequate done**" (score 1), "**Not done** (0).
- For each category of the practice, the scores of the items were summed –up and the total was divided by the number of the items, giving a mean score for the part. These scores were converted into a percent score, and means and standard deviations were computed. The practice was considered "**Adequate**" if the percent score was **60% or more** and "**Inadequate**" if it was **less than 60%**.

## II -Administrative Design

An official requests were issued from the dean of faculty of nursing, Port Said University to the directors of the mentioned hospitals to take the permission to obtain approval to conduct the study

### Ethical considerations:

---

The aim of the study has been explained to directors and nurses at NICU and PICU at mentioned hospitals before participation in the study. Oral consent was obtained from nurses to participate in the study, ensuring complete privacy and

stressing the confidentiality of the collected data. The investigator assured that the information obtained was confidential and to be used only for the purpose of the study. The researcher emphasized that participation were absolutely voluntary and each nurse has the right to withdraw from the study at any time with no questions asked as well as confidentiality was assured.

## III- Operational Design

The operational design of the current study included the preparatory phase, pilot study and field work.

### The preparatory phase:

A review of the past and current related literature covering mechanical ventilation and care needed for children undergoing mechanical ventilation was done using available books, articles, periodicals, magazines and internet search to get acquainted with the research problem and to develop the study tools.

### Tool validity:

It was ascertained by a Jury consisting of five experts in medical and pediatric nursing .Necessary modifications were done according to the experts' opinions.

### Pilot study:

A pilot study was carried out on 10 nurses (10% of studied participants) to applicability, clarity, relevance, feasibility of study tool and to estimate the time will be needed to fill it. Pilot study excluded from the inter sample of research work. It took about one month from May 2014 to

June 2014. Necessary modifications were done according to the result of pilot study.

### **Field work:**

After obtaining the official permission to conduct the study and after finalization of tools, the researcher met with nurses individually and explained to them the purpose of the study and oral consent of each nurse was obtained before their participation. Personal communication with attending pediatricians and nurses was carried out to ensure cooperation in study settings. Nurses were interviewed separately and questionnaire sheet was filled by the researcher. The time that was spent in completing questionnaire sheet was 25-35 minutes. Available nurses (number 90) were observed for 3 hours every shift during morning, afternoon and night shifts. Every nurse was observed for three times during different shifts (one time in every shift) nurses were rotated among three shifts every week. Collection of data was carried out for 4 months from the beginning of July 2014 to the end of October 2014.

### **D- The Statistical Design**

The raw data were coded and entered into SPSS system files (SPSS package version 18). Analysis and interpretation of data were conducted.

The following statistical measures were used:

- Descriptive statistics including frequency, distribution, mean, and standard deviation were used to describe different characteristics.
- Kolmogorov – Smirnov test was used to examine the normality of data distribution.
- Univariate analyses including: t-test, ANOVA test and Mann Whitney test were used to test the significance of results of quantitative variables. Chi-Square test and Monte Carlo test were used to test the significance of results of qualitative variables.
- Linear correlation was conducted to show correlation between knowledge Score (%) and practice and attitude scores among the studied nurses responsible for care of mechanically ventilated children.

The significance of the results was at the 5% level of significance.

---

**Results**


---

**Table (1): Personal and occupational characteristics of the studied nurses responsible for care of mechanically ventilated children:**

Personal and occupational characteristics	Studied nurses (n=90)	
	No.	%
<b>Age (years)</b>		
20-	35	38.9
25-	26	28.9
35-<40	29	32.2
<b>Min-Max</b>	20.0-39.0	
<b>Mean±SD</b>	28.2±4.8	
<b>Educational level</b>		
Secondary school nursing	52	57.8
Technical Institute of Nursing	24	26.7
Bachelor's Degree of Nursing	14	15.6
<b>Years of experience in nursing</b>		
1-	31	34.4
5-	42	46.7
10-	17	18.9
<b>Min-Max</b>	1.0-16.0	
<b>Mean±SD</b>	7.0±3.6	
<b>Attending training courses in mechanical ventilation</b>		
No	52	57.8
Yes	38	42.2
<b>Place of work</b>		
General hospitals	50	55.6
University hospital	40	44.4

Table (1) revealed that the 38.9% of the studied nurses were at the age group 20 to less than 25 years old, with a mean of 28.2±4.8 years. More than half of studied nurses (57.8%) had diploma, while 15.6% of them had bachelor degree in nursing. Regarding nurses' working experience the table showed that slightly less than half of studied nurses (46.7%) had 5 to less than 10 years of working experience in nursing field, while 18.9% of them had more than 10 years of working experience, with a mean of 7.0±3.6 years. More than half of studied (57.8%) nurses hadn't attended training courses in mechanical ventilation. Table also showed that 55.6% of studied nurses were working in two of general hospitals in Port Said and the rest were working in university hospital.

**Figure (1): Total knowledge level among the studied nurses responsible for care of mechanically ventilated children.**

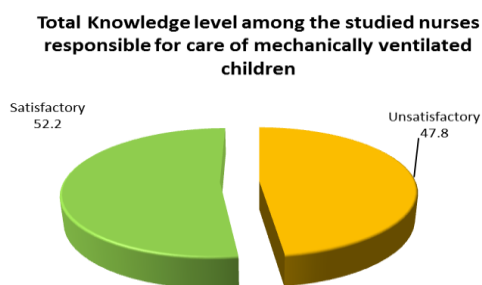


Figure showed that more than half of studied nurses (52.2%) had satisfactory level of knowledge, while 47.8% of them had unsatisfactory level of knowledge regarding care of children undergoing mechanical ventilation.

**Table (2): Practice score (%) among the studied nurses responsible for care of mechanically ventilated children**

Practice score (%)	Min-Max	Mean±SD	Inadequate (60>)		Adequate (60%≤)	
			No.	%	No.	%
Preparation of ventilator	100.0-100.0	100.0±0	0	0.0	90	100.0
Endotracheal tube care	53.6-78.6	65.5±5.9	8	8.9	82	91.1
chest physiotherapy	41.7-87.5	74.2±10.4	8	8.9	82	91.1
Suctioning						
• Oropharyngeal suctioning	40.0-66.7	55.2±7.6	47	52.2	43	47.8
• Nasopharyngeal suctioning	42.9-71.4	58.4±7.3	41	45.6	49	54.4
• Endotracheal tube suctioning	64.7-82.4	74.7±6.2	0	0.0	90	100.0
Daily Hygienic Care						
• Eye Care	57.1-71.4	66.1±4.5	9	10.0	81	90.0
• Oral Care	62.5-91.7	77.2±6.7	0	0.0	90	100.0
Capillary Blood Gases (CBGs)	46.9-100.0	68.8±8.5	14	15.6	76	84.4
Changing child's position	56.3-87.5	78.1±8.7	1	1.1	89	98.9
Cardiopulmonary resuscitation	66.7-83.3	72.6±5.0	0	0.0	10	100.0
Nasogastric tube insertion and care						
• Insertion of Nasogastric tube	58.3-79.2	72.0±5.9	4	4.4	86	95.6
• Care of Nasogastric tube	53.8-73.1	66.5±5.5	7	7.8	83	92.2
<b>Total practice score</b>	<b>62.9-77.7</b>	<b>70.9±3.5</b>	<b>0</b>	<b>0.0</b>	<b>90</b>	<b>100.0</b>



Table (2) lightened that all of nurses (100.0%) had adequate level of practice for children undergoing mechanical ventilation. The same table also showed that more than half of studied nurses (52.2%) had inadequate level of practice regarding Oropharyngeal suction and about half of them (45.6%) had inadequate practice regarding nasopharyngeal suctioning.

**Table (3): Total score of Attitude (%) among the studied nurses responsible for care of mechanically ventilated children**

Attitude score (%)	Min-Max	Mean±SD	Negative (60>)		Positive (60%≤)	
			No.	%	No	%
	61.5-95.4	77.2±6.9	0	0.0	90	100.0

Table (28) illustrated that all nurses (100.0%) has a positive attitude toward care of children undergoing mechanical ventilation.

**Table (4): Relation between knowledge score and personal and occupational characteristics of the studied nurses responsible for care of mechanically ventilated children**

Personal and occupational characteristics	Studied nurses (n=90)				Significance
	unsatisfactory (60>) [n=43]		satisfactory (60%≤) [n=47]		
	No.	%	No.	%	
<b>Age (years)</b>					$X^2=3.039$ $P=0.219$
20-	20	46.5	15	31.9	
25-	9	20.9	17	36.2	
35-<40	14	32.6	15	31.9	
<b>Educational level</b>					$X^2=47.891$ $P<0.0001^*$
Nursing Diploma	41	95.3	11	23.4	
Nursing institute graduate	2	4.7	22	46.8	
Faculty of nursing graduate	0	0.0	14	29.8	
<b>Duration of working experience (years)</b>					$X^2=11.964$ $P=0.003^*$
1-	8	18.6	23	48.9	
5-	22	51.2	20	42.6	
10-	13	30.2	4	8.5	
<b>Attending training courses</b>					$X^2=1.818$ $P=0.178$
No	28	65.1	24	51.1	
Yes	15	34.9	23	48.9	
<b>Number of courses attended (n=38)</b>					$X^2=4.27$ $^{MC}P=0.118$
Once	11	25.6	9	19.2	
Twice	3	7.1	10	21.3	
Three or more	1	2.3	4	8.5	
<b>Duration of courses attended (days)[n=38]</b>		[n=15]		[n=23]	$Z=2.26$ $P=0.033^*$
Min-Max		1-7		1-14	
Median (Q1-Q3)		1 (1-2)		2 (1-3)	
<b>Place of work</b>					$X^2=11.224$ $P=0.001^*$
General hospital	16	37.2	34	72.3	
University hospital	27	62.8	13	27.7	

$X^2$ : Chi-Square test  
at  $P<0.05$

$^{MC}P$ : Monte Carlo corrected P-value

$Z$ : Mann Whitney test \*significant

Regarding the table (4) that describes relations between total nurses' total knowledge mean scores and personal and professional characteristics data, it was found that satisfactory knowledge score was significantly higher among nurses who had technical and bachelor degree in nursing. Table also showed that there is statistically significant relationship between the total knowledge and work experience (P=0.033). This table also revealed that there is statistically significant relationship between the total knowledge and place of work (P=0.001), where high unsatisfactory knowledge scores were in university hospitals.

**Table (5): Relation between total practice score and personal and occupational characteristics of the studied nurses responsible for care of mechanically ventilated children**

Personal and occupational characteristics	(n=90)	Practice score (%) Mean±SD	Significance
<b>Age (years)</b>			F=1.193
20-	35	71.6±3.3	P=0.308
25-	26	70.9±3.9	
35-<40	29	70.3±3.4	
<b>Educational level</b>			F=12.679
Nursing Diploma	52	69.9±3.2	<b>P&lt;0.0001*</b>
Nursing institute graduate	24	71.2±3.4	
Faculty of nursing graduate	14	74.6±2.2	
<b>Duration of working experience (years)</b>			F=7.905
1-	31	72.8±3.7	<b>P=0.001*</b>
5-	42	70.3±2.9	
10-	17	69.4±3.3	
<b>Attending training courses</b>			t=0.289
No	52	71.1±3.5	P=0.773
Yes	38	70.8±3.6	
<b>Number of courses attended (n=38)</b>			F=0.534
Once	20	70.7±3.9	P=0.591
Twice	13	71.1±2.8	
Three or more	5	72.4±1.6	
<b>Place of work</b>			t=2.261
General hospital	50	69.7±3.3	<b>P=0.026*</b>
University hospital	40	72.6±3.2	

t: t-test

F: ANOVA test

\*significant at P≤0.05

Table (5) detected the relationship between practice score and personal and occupational characteristics of the studied nurses and it was found that there is that there is a high statistically significant relationship between the total practice and educational level (P<0.0001), where the practice score was statistically higher among nurses who had bachelor degree in nursing. This table also showed that there is statistically significant relationship between the practice and place of work (P=0.026).

**Table (6): Correlation between Knowledge Score (%) and practice and attitude scores among the studied nurses responsible for care of mechanically ventilated children**

	Knowledge score (%)
	P
Practice score	0.026*
Attitude score	0.436

\*significant at  $P \leq 0.05$

Table (6) reveals correlation between Knowledge Score and practice and attitude scores among the studied nurses, it shows that there is statistically significant relationship between the knowledge score and practice score ( $p=0.026$ ).

**Table (7): Relation between attitude score with personal and occupational characteristics of the studied nurses responsible for care of mechanically ventilated children**

Personal and occupational characteristics	(n=90)	Attitude score (%) Mean±SD	Significance
<b>Age (years)</b>			F=0.359 P=0.699
20-	35	77.1±6.8	
25-	26	78.2±5.9	
35-<40	29	76.6±8.1	
<b>Educational level</b>			F=0.412 P=0.664
Nursing Diploma	52	77.3±7.5	
Nursing institute graduate	24	76.3±6.2	
Faculty of nursing graduate	14	78.5±6.4	
<b>Duration of working experience (years)</b>			F=0.821 P=0.443
1-	31	75.9±6.1	
5-	42	77.7±7.4	
10-	17	78.4±7.1	
<b>Attending training courses</b>			t=2.355 <b>P=0.021*</b>
No	52	75.7±6.9	
Yes	38	78.3±6.5	
<b>Number of courses attended (n=38)</b>			F=0.467 P=0.631
Once	20	75.9±7.0	
Twice	13	73.8±6.2	
Three or more	5	76.3±5.5	
<b>Place of work</b>			t=1.612 P=0.111
General hospital	50	76.2±6.9	
University hospital	40	78.5±6.9	

t: t-test

F: ANOVA test

\*significant at  $P \leq 0.05$

Table (7) shows the relationship between attitude score and personnel and occupational characteristics of studied nurses .it was found that there is statistically significant relationship between the attitude score and attendance of training courses (p=0.021).

## **DISCUSSION**

---

Regarding to the studied nurses' knowledge about definition of mechanical ventilation, the present study showed that majority of the studied nurses had unsatisfactory answers. These findings may be due to the complexity of mechanical ventilation definition. This finding is supported by **Abdel Azyz, (2001)** who found that, majority of studied nurses had poor level of knowledge about definition of mechanical ventilation. This finding was not in accordance with **Mohamed, (2012)** who found that majority of studied nurses had good level of knowledge about definition of mechanical ventilation.

Regarding nurses' knowledge about signs of child need for mechanical ventilation and indications of mechanical ventilation, this study found that more than three quarters of studied nurses had satisfactory level of knowledge. That may be due to both of signs of child need for mechanical ventilation and indications are main items of knowledge that nurses who introduce care for children under mechanical ventilation must have it. This finding is inconsistent with finding of **Napolis et al., (2006)** who found that only one third of studied nurses had complete correct knowledge about indications and signs of child need for mechanical ventilation.

**Khan, (2014)**, focused on importance of suction to maintain clearance of airway and prevent stasis of pulmonary secretions,

the nurse should assess children condition to determine the need for suctioning and keeping airway free from secretions. As regards to nurses' knowledge about suctioning from airways, the current study revealed that more than half of studied nurses had unsatisfactory level. This may be due to lack of periodic educational programs about suctioning and its importance. These findings are consistent with **Mohamed, (2012)**, who found that majority of nurses had poor level of knowledge about suctioning.

Weaning from mechanical ventilation is a time-sensitive and complex intervention influenced by patient, clinician, and organizational factors. Weaning from mechanical ventilation is challenging and requires expert knowledge and skill **Croker, 2002 & Fischer, (2014)**. As regard to nurses' knowledge about weaning from mechanical ventilator, current study revealed that majority of nurses had unsatisfactory level. This may be due to nurses considered weaning procedure is doctor not nursing responsibility. This result is supported by study of **Fischer, (2014)** about intensive care nurses' knowledge of evidence based guidelines regarding weaning the mechanically ventilated patient who revealed that intensive care nurses lack adequate knowledge on weaning the critically ill patient from the mechanical ventilator.

As regards to nurses' knowledge about daily hygienic care which includes (oral care, eye care and skin care), current study demonstrated that half of studied nurses had unsatisfactory level. This may be due to nurses don't rank daily hygienic care as a high priority nursing procedures in comparison with another critical procedures which introduced for child on mechanical ventilator. This is supported by findings of **Strickland, (2003)** who stated

---

that the provision of daily hygienic care may be altered by the perception that it has lower priority in patients' health and well-being as other nursing intervention for critically ill patients.

**Balaguer et al, (2013)** stated that prone position was found to slightly improve the oxygenation in neonates undergoing mechanical ventilation. This study showed that more than three quarters of nurses had unsatisfactory level of knowledge about best suitable position for infants undergoing mechanical ventilation, This may be due to nurses aren't in up to date knowledge and that evident in more than half of studied nurses didn't attend training courses about mechanical ventilation.

This study revealed that about half of nurses had unsatisfactory level in total score of knowledge about nursing care of children undergoing mechanical ventilation. This might be explained by the fact that more than half of studied nurses had diploma degree in nursing and had not attended any training program about mechanical ventilation. This result is consistent with results of **Pandit, (2013)**, **Abbas, (2013)** and **Suhara et al., (2013)** which their studies demonstrated that majority of the studied nurses had unsatisfactory level of knowledge regarding nursing care of children undergoing mechanical ventilation.

Also, this study revealed that there is a statistical significant relationship between total score of knowledge and place of work, which apparent that more than half of nurses who had unsatisfactory level of knowledge were found in university hospital. This may be due to no one of studied nurses in university hospital had Bachelor degree and all of them had

diploma and technical institute degree in nursing , and also may be due to lack of training courses.

This study also demonstrated that total unsatisfactory score of knowledge was significantly higher among diploma nurses; This could explain the fact that bachelor nurses are more educated than diploma and high technical instituted nurses and they receive update knowledge in critical care nursing during their undergraduate studies. These finding also inconsistent with the study findings of **Kim , (2007)**, **Darshan et al., (2009)**, **Botha, (2012)** and **Abbas, (2013)** which their studies about assessing knowledge of staff nurses about mechanical ventilation and their studies revealed that there is no statistical significant association between nurses' knowledge and educational level.

This study also revealed that about half of studied nurses had inadequate level in total practice of oropharyngeal and nasopharyngeal suctioning, while all of them had adequate level in total practices of endotracheal tube suctioning. This is may be due to critical nature of endotracheal tube suctioning therefore all medical staff emphasize on importance of it, while frequency of oropharyngeal and nasopharyngeal suctioning converting them into daily routine care that leads to negligence in providing them.

Chest physiotherapy, an airway clearance technique, is combined of chest wall percussion, vibrations and positioning of the patient for drainage of mucus. CPT is believed to reduce respiratory complications through promoting clearance of secretions and consequently improving ventilation of the lungs (**Pountney, 2007**). This study revealed that majority of nurses had good knowledge about CPT, this is due

to, CPT had become is very important practice in intensive care units and considered main procedure for child under mechanical ventilation and should precede suctioning procedure to maintain airway clearance. This result is congruent with result of **Karagozolu et al, (2013)** who displayed that nurses had a good knowledge about CPT.

In the same line, the majority of the studied nurses had satisfactory level of total practice in CPT; this may be due to the fact that about half of studied nurses had training courses in mechanical ventilation. These findings are congruent with **Elsayed et al, (2013)** who found that majority of the studied nurses had a competent level of performance about CPT. These findings aren't supported by **Abed Elatif, (2014)** who found that all of nurses had poor level of practice regarding CPT.

Patients in intensive care units are at high risk for eye problems due to the loss of normal physiologic defense mechanisms of the eyes in addition to the drawback effect of the mechanical ventilation & the use of sedations which leads to decrease tear production and increase evaporation due to eye lid opening (**Kam et al. 2013**). The majority of studied nurses had adequate level of practice regarding eye care. This is due to simplicity of procedure and emphasizing of staff nurses on importance of eye care. This result is incongruent with findings of **Koutzavekiaris et al. (2011)** whose study revealed that practices scores about eye care were inadequate.

Regarding endotracheal tube care, current study revealed that great majority of nurses had adequate level of total practice but all nurses hadn't done step: five; Stabilize tube with one hand, with

another hand cut soiled tape and remove it. This may be due to fear of nurses from dislodging or displacing the tube. This study also demonstrated that there are some steps that repeated in some procedure and all nurses don't make them. These steps including; auscultate anterior lung bilaterally in E.T.T suctioning, assess chest sounds in both oropharyngeal and nasopharyngeal suctioning. From the researcher point of view, nurses didn't make these steps because of lack of professional practice of nurses which enable them to perform these steps.

Regarding to universal precautions during mechanical ventilation including hand washing, wearing protective clothes such as gloves, gown and face mask this study revealed that majority of studied nurses done hand washing and wearing gloves adequately. This may be due to emphasizing on universal precautions and infection control policy in intensive care units. This finding is consistent with **Adinma, et al., (2009)** who stated that practice of nurses about universal precautions was better.

Documentation is a communication tool for exchange of information stored in records between nurses and other caregivers and facilitates continuity, individuality of care and safety of patients (**Voutilainen et al. 2004 and Urquhart et al. 2009**). This study found that majority of nurses was inadequate in documentation in all procedure. This may be due to several factors including lack of time for documentation every action, also nurse document for purpose of documentation only and for eligibility about her intervention not to describe child status accurately in addition to lack of adequate documentation system or hospital administration follow up.

---

These results pointed out to the importance of training programs, which emphasizes the importance of proper documentation which describes child status for achievement of better health of children. Many authors found the same results as findings of **Ahmed, (1998)** whose study carried out in Shebin-El-kom teaching hospital and revealed that no proper keeping or accurate documentation system was locally available. Also **Wang et al, (2011)** whose study revealed that there is inadequate documentation of nursing intervention.

Concerning to total score of practice of studied nurses about care of children undergoing mechanical ventilation, the study showed that all of nurses had adequate level of practice. This could be explained by the fact that about half of nurses had five to ten years of experience and about twenty percentages of studied nurses had more than 10 years of working experience and no one of studied nurses had less than one year as years of work experience.

This study also revealed that there is statistically significant positive relationship between the knowledge score and practice score. These findings are consistent with **Pandit, (2013)** who mentioned that that there is positive relationship between knowledge and practices of nurses .This can be explained in light of **Carol, (2005)**, who mentioned that the formal training courses plays an important role in enhancing and updating nurses' knowledge and performance beside improving care given to high risk child.

The result of this study showed that a high statistically significant relationship between the total practice and educational level, whereas it is statistically significant

relationship between the practice and place of work. This relation agrees with **Abed Elsatar, (2012)** who stated that there is significant relationship between total practice and educational level and years of experience.

Regarding to nurses' attitude regarding care of children under mechanical ventilation, this study revealed that all studied nurses had positive attitude. This may be due to all nurses had adequate level of practice that lead to high level of satisfaction for nurses about care that they introduce it for children under mechanical ventilator. This study is consistent with **Presneill J. (2007)** which the study conducted that critical care nurses had positive attitude toward management of mechanical ventilator and weaning.

Generally, the current study focused on assessment of nurses' performance regarding care of children undergoing mechanical ventilation, based on assessment of knowledge, practice and attitude of nurses worked at NICU and PICU. About half of nurses had unsatisfactory level of knowledge; this may be due to lack of periodic training courses and lack of updating knowledge while all studied nurses had adequate level of practice due to experience of nurses and nature of critical procedures that introduced to high risk children.

### **Conclusion & Recommendations**

---

In the light of the current study, it can be concluded that, less than half of nurses (47.8%) had unsatisfactory level of knowledge regarding knowledge about care of children undergoing mechanical ventilation, and 62.8% of them were found at university hospital. All nurses had adequate level of total practice and also

had a positive in total score of attitude about care of children undergoing mechanical ventilation. There was high statistically significant relationship between the total knowledge and educational level and place of work. There was statistically positive significant relationship between total knowledge score and total practice score. In the light of the findings of the current study recommended that nurses need for an educational programs about mechanical ventilation. The study also recommends that need for practical oriented program including oropharyngeal, nasopharyngeal suctioning, handwashing and documentation introduced for nurses.

### References

---

- Abbas, F.H., and Mua'ala, E.G. (2013): Impact of Education Program upon Nurses' Knowledge towards Children under Mechanical Ventilation at Pediatric Teaching Hospitals in Baghdad City, Iraqi National Journal of Nursing Specialties, 26 (1), p: 44-50.
- Abdel Azyz, A.Z. (2001): Assessment of nursing care given to children under mechanical ventilation, Un Published Master thesis, Ain Shams University., Faculty of Nursing; P. 115.
- Abedlatif, A.L. (2014): Quality of nursing care provided for preterm infants with respiratory syndrome, unpublished thesis, Faculty of nursing, Port Said University.P:86.
- Abedelstar, S.(2012) : Quality of nursing intervention provided to infants receiving mechanical ventilation, Unpublished Thesis, Faculty of Nursing, Tanta university,P.102-103.
- Adinma, E.D., Ezeama, C., Adinma J.I., and Asuzu, M.C. (2009): Knowledge and practice of universal precautions against blood borne pathogens amongst house officers and nurses in tertiary health institutions in Southeast Nigeria. Niger J Clin Pract, 12(4):398-402.
- Ahmed, M. (1998): Evaluation of quality of nursing care utilizing retrospective auditing technique at Shebin el kom teaching hospitals, Unpublished thesis, Faculty of nursing , Menophya University,P:95-98.
- [Balaguer, A.,](#) [Escribano, J.,](#) [Figuls, R.M.,](#) and [Fernandez, R. M.](#) (2013): Infant position in neonates receiving mechanical ventilation. [Cochrane Data base Syst Rev](#);28;3:CD003668.doi:10.1002/14651858.CD003668.pub3.
- Bowden, V., and Greenberg, S. (2010): Children and their families: the continuum of care, 2nd Ed., Philadelphia, PA: Lippincott Williams & Wilkins. P: 519-581.
- Brown, M., and Diblasi, R. (2011): Mechanical ventilation of premature neonate, Respiratory care, 56 (9): 1298-1311.
- Botha, L. (2012): Level of nurses' competence in mechanical ventilation in intensive care units of two tertiary health care institutions in Gauteng, Published Master thesis, Faculty of Community and Health Sciences, University of the Witwatersrand. P: 23, 25.26.27.37.
- Cairo, J.M. (2012): Mechanical ventilation, physiological and clinical applications, 5th E.D. Elsevier, U.S.A, P: 48, 63, 124, 460, 462.



- 
- Carol, C., (2005): Application and Development of Pediatric Nursing Guidelines, *Journal of Pediatric Nursing*, 88 (26) P: 81-88.
- Crocker, C. (2002): Nurse led weaning from ventilatory and respiratory support, *Intensive Crit Care Nurs.* Oct; 18 (5):272-9.
- Darshan, K., Krishnan, P., and Krishnan, R.N. (2009): Knowledge of staff nurses on nursing activities to be carried out in an emergency department, *Inter National Journal of General Medicine*, Published online; vol 2.1-2.
- El sayed, S.M., Sabry, Y.Y., Sharkawy, M., Elsayed, E.M., and Ali, T. (2013): Establishing Basic Standards of Nursing care protocol at Neonatal Intensive care unit. *Nature and Science* 2013; 11(4) p: 86-92.
- Fischer, J.L (2014): Intensive care nurses' knowledge of evidence based guidelines regarding weaning the mechanically ventilated patient, published thesis, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg. P: 62-66.
- Hockenberry, M., and Wilson, D., (2013): *Wong's Nursing Care of Infants and Children*, 9th E.D., Elsevier, U.S.A, Ch; 32, Child with respiratory dysfunction, P: 1201-1219-1260.
- Gupta, P., Green, J.W., Tang, X., Gall, C.M., Gossett, J.M., Rice, T.B., Kacmarek, R.M., and Wetzell, R.C. (2014): Comparison of high-frequency oscillatory ventilation and conventional mechanical ventilation in pediatric respiratory failure. *JAMA Pediatr* 168(3): 243–249.
- Kam, R., Hayes, M., and Joshi, N. (2011): Ocular care and complications in the critically ill. *Trends in Anesthesia and Critical Care*, Volume1, Issues 5–6, Page 257–262.
- Karagozoglu, S., Donmez, A.A., Ozden, D., and Tel, .H. (2013): Nurses' Knowledge and Practices Regarding Chest Physiotherapy. 27 (2) P: 95-104.
- Karotkin G. (2011): *Assisted Ventilation of Neonates*, 5th ed., U.S.A: Elsevier; P.p. 126.
- Khan, Z.H. (2014): *Airway management*, 1<sup>st</sup> E.D. Springer, New York, P: 11.
- Kim, L.S. (2007): Critical care nurses' knowledge in preventing Nosocomial pneumonia, *Australian Journal of Advanced Nursing*, Vol.24, 27.
- Koutzavekiaris, L., Vouloumanou, E., Gourni, M., Petros, R., Michalopoulos, A., and Falagas, M. (2011): Knowledge and practices regarding prevention of infections associated with central venous catheters: A survey of intensive care unit medical and nursing staff. *American Journal of Infection Control*, Volume 39, Issue 7, Pages 542–547.
- Kumar B. (2011): *Handbook of mechanical ventilation*, 1<sup>st</sup> ed., New Delhi (India): Jaypee; P.p. 1.
- Mohamed, R.A. (2012): Quality of nursing care for neonates undergoing mechanical ventilation at Benha city, unpublished thesis, Faculty of nursing, Benha University, P: 99.
- Napolis, L., Jeronime, L., Baldini, D., and Caruso, P. (2006) : Availability and use of noninvasive ventilation in intensive
-

- care units of public, private and teaching hospitals in the greater metropolitan area of Sao Paulo, Brazil, *J Bras Pneumol* ;32(1) 29-34.
- Pandit, R.B. (2013): Effectiveness of self-instructional module on knowledge and practices of nurses regarding care of the patient undergoing mechanical ventilator. *Sinhgad e Journal of Nursing*, Vol. III, Issue II, P: 42-44.
- Pountney, T. (2007): *Physiotherapy for children*, 1<sup>st</sup> E.D., Elsevier, China. P: 82.
- Presneill, J.J. (2007): Decisions made by critical care nurses during mechanical ventilation and weaning in an Australian intensive care unit, "American Journal of critical care", Vol. 16(5), P: 433 – 434.
- Sant'Anna, G.M., and Keszler, M. (2012): Developing a neonatal unit ventilation protocol for preterm baby, early human development, 89, p: 925-628.
- Strickland, O.L., and Dilorio, C. (2003): Measurement of Nurse's outcomes, 2<sup>nd</sup> E.D., Springer, U.S.A. P:10.
- Suhara, F., K., George, J., Thomas, J. K., Chacko, J., Varghese, G.J., and Dharmarajan, B.(2013): Assessment of knowledge regarding mechanical ventilation among staff nurses working in selected hospital, mangalore with a view to develop an information pamphlet, *International Journal of Recent Scientific Research*, Vol. 4, Issue, 9, pp.1410-1413.
- Urquhart C., Currell R., Grant M.J. and Hardiker, N.R. (2009): Nursing record systems: effects on nursing practice and health care outcomes. *Cochrane Database of Systematic Reviews* (1), 1–66.
- Wang, N., Hailey, D., and Ping, Y.u. (2011): Quality of nursing documentation and approaches to its evaluation: a mixed-method systematic review, *journal of advanced nursing*, 1st ED., p: 1-18.
- Voutilainen, P., Isola, A., and Muurinen, S. (2004): Nursing documentation in nursing homes – state-of-the-art and implications for quality improvement. *Scandinavian Journal of Caring Sciences*, Volume 18, Issue 2, Pages 72–81.