

Quality of Nursing Care Provided to Neonates Undergoing Mechanical Ventilation: An Assessment Study

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Abstract: **Background:** Neonates on mechanical ventilation are the most critical cases at neonatal intensive care units and need a high quality of nursing care to complete cure without complication from mechanical ventilation. **Aim of the study:** Assess the quality of nursing care provided to neonates undergoing mechanical ventilation. **Research design:** Descriptive design was utilized. **Subject and setting:** A purposive sample of nurses (60) working in neonatal Intensive Care Units in University Children's Hospital in El-Mounira (Abu El-Rish) & El-Kasr Al-Ainy University Hospital. **Tools:** Tools of the study were (1) questionnaire sheet to assess nurses' knowledge about quality of nursing care provided to neonates undergoing mechanical ventilation, (2) medical record of neonates undergoing mechanical ventilation and (3) observational checklists to assess nurses' practice provided to neonates undergoing mechanical ventilation at neonatal intensive care units. **Results:** The study results indicated that, about half of the studied nurses had low knowledge, more than two thirds of them know factors that affect the quality of nursing care provided to neonates undergoing mechanical ventilation and two-thirds of them had incompetent total practice regarding care of neonates undergoing mechanical ventilation. There was a highly positive relation between the studied nurses' total knowledge and their total practice with $p < 0.001$. **Conclusion:** In the light of the study findings, the studied nurses had low knowledge and incompetent quality of nursing care provided to neonates undergoing mechanical ventilation. Factors affecting quality of nursing care provided to neonates undergoing mechanical ventilation included nurses' knowledge, practice and neonates' age, gender, weight and duration of connection with mechanical ventilation. **Recommendations:** The study recommended to improve the nurses' knowledge and practice regarding the quality of nursing care and its application in care of neonates undergoing mechanical ventilation.

Keywords: Neonates, Nurses, Mechanical Ventilation, Quality of Nursing Care.

1. INTRODUCTION

The neonatal period is the first 28 days of life. The neonate is at the highest risk of dying. Approximately 75% of all neonates' deaths occur during the first week of life and up to 45% occur within the first 24 hours. The transitional change that takes place within the first 6 to 10 hours of life involve many adaptations that take weeks to attain full adaptation. (Bhalla, et al., 2015).

The most dramatic and rapid extrauterine transitions occur in the four interdependent areas: respiration, circulation, thermoregulation and the ability to stabilize blood glucose level. Both pre-term and full-term sick neonates find difficulties in coping with the new environment and face many health challenges for survival due to immature lungs. The mortality rates were high and impossible for the survival of sick neonates before NICUs be constructed (Shann & Duke, 2017).

The NICU is provided with all equipment necessary for the neonate to be have safe, clean, warm and infection free environment. The basic aim of the NICU is the maintenance of airway, breathing, circulation, prevention of hospital-acquired infection and high quality of care to obtain the best outcome (Marion, 2017).

Mechanical ventilation is an equipment that is use in the NICU to assist the neonates in breathing. Mechanical ventilation is not a curative and supporting the neonates until recover the ability to breathe independently. Indicated when alveolar ventilation is inadequate to maintain normal blood oxygen and carbon dioxide levels (Askin, 2015).

Complications of mechanical ventilation includes: Increased intra-thoracic pressure that cause decrease venous return, hypotension and increase intracranial pressure. Increased airway pressure that cause barotrauma to airway lead to subcutaneous emphysema and ventilator induced respiratory alkalosis. Potential complications such as pneumothorax, airway injury and ventilator-associated pneumonia (Wilson, et al., 2017).

Nurses should be vigilant to subtle variations such as early recognition of changes may prevent a significant deterioration. So, neonates on respiratory support should be have a constant nursing observation on heart rate, blood pressure, oxygen saturation, mode of mechanical ventilation, arterial blood gases results and auscultate chest sound (Kaditis, 2016).

Quality of nursing care is a dynamic concept that evolve as health care, science, technology and the parent's expectations evolves. Quality has been an essential aspect of the delivery of professional care which include neonates focus, teamwork and breaking down professional barriers and a better management of the resources. Nurses are involved in the ventilation and weaning process have to provide the care to the neonates in safe and effective manner (Dehlink & Tan, 2016).

The World Health Organization (WHO) defines the quality of nursing care provided to neonates undergoing mechanical ventilation as a process that must guarantee each neonate with the both of diagnostic and therapeutic acts. To ensure the best result in health and at the lowest cost. Achieve the greatest satisfaction in procedures, results and human contact in the health care team (WHO, 2017).

Significance of the Study

In Egypt neonatal mortality rate was estimated as 12.8% from the total births. Where 80% from neonatal deaths are due to complications related to respiratory distress, preterm birth, asphyxia, infection and pneumonia. Need to respiratory support with mechanical ventilation. The success of treatment relies on optimal positioning and maintaining patency of upper airway of neonates. The application of infection control principles in providing nursing care for neonates may prevent 80% of neonatal deaths (WHO, 2015). Globally, 2.5 million children died in the first month of life, in 2017 primary cause of prematurity (UNICEF, 2018). Nurses play an important role in caring of neonates undergoing mechanical ventilation until extubated. So, it was important to conduct this study to shed light on the quality of nursing care provided to neonates undergoing mechanical ventilation.

Aim of the Study

This study aimed to assess the quality of nursing care provided to neonates undergoing mechanical ventilation.

Research questions:

1. What is the quality of nursing care provided to neonates undergoing mechanical ventilation?
2. What are the factors affecting the quality of nursing care provided to neonates undergoing mechanical ventilation?

2. THE SUBJECT AND METHODS

A) Research design:

A descriptive design was utilized to achieve the aim of this study.

B) Setting:

This study was conducted at Neonatal Intensive Care Units affiliated to Cairo University namely Abu El- Rish Children's Hospital & El-Kaser El Ainy Hospital.

C) Subject:

A purposive sample that composed of 60 nurses & 60 neonates connected with MV were included in the study from the previously mentioned settings where; 32 nurses from Abu El- Rish Childern's Hospital and 28 nurses from El-Kaser El Ainy Hospital (Cairo University). Regardless their characteristics (gender, age, educational levels and years of experience).

D) Tools of data collection (Appendix IV):

Three tools were used for data collection:

Tool I: A questionnaire sheet

This tool was developed by the researcher based on review of literature in an arabic language to suit the nurses' level of understanding and composed of open and closed ended questions to assess the following:

- 1- Characteristics of the nurses (age, gender, educational level, job, years of experience and attending previous training program).
- 2- This part was concerned with an assessment of:
 - a. The nurse's knowledge about normal neonate (definition, characteristics, normal respiratory, pulse rate, body temperature and the most common health problems).
 - b. Mechanical ventilation (definition, indications, types, modes and complications).
 - c. Nursing care provided to neonates connected with mechanical ventilation (care of endotracheal tube, follow weaning process from mechanical ventilation according to neonatologist prescription, infection control measures during endotracheal tube insertion, during oral and nasal suctioning and monitoring & reporting complications related to MV).
 - d. Quality of nursing care provided to neonates undergoing mechanical ventilation (definition of quality, its related concepts, indicators and standards).
 - e. Factors affecting the quality of nursing care provided to neonates undergoing mechanical ventilation (related to the neonates, ventilation process and nurses).

The scoring system of nurses' knowledge:

The studied nurses' answers were compared with a model key answer, where one score was given for correct answer, and zero for incorrect answer. The score of items was summed up and the total divided by the number of items, giving a mean score for the pair. These scores were converted into a percent score. Means and standard deviations were computed. According to the nurses' answers, their knowledge was categorized as a good ($75 \leq 100\%$), the average ($60 \leq 75\%$) and poor ($< 60\%$).

Tool II: Medical record of neonates undergoing mechanical ventilation:

To assess neonates' data such as; gender, gestational age, type of delivery, age by days, cause of admission to NICU, weight in grams, the ventilator mood, duration of connection with MV by days, complications resulting from mechanical ventilator and progress of neonate ventilation status.

Tool (III) Nurses' observational checklists:

The observational checklists were adopted from the **Bowden & Smith, (2015) and Correia, (2017)**, it used to assess the quality of nursing care before, during and after nursing care provided for neonates undergoing mechanical ventilation (assist with endotracheal intubation and fixation, endotracheal suctioning and appendix IV, P. 141).

The scoring system of nurses' observational checklists:

A score of one degree was given for competent practice and zero for the incompetent one. The scores were summed up and the total was divided by a number of the steps, giving a mean score for the procedure. These scores were converted into a percent score. The nurses' practices considered competent if the percent score was $\geq 85\%$ and incompetent if the percent score was $< 85\%$.

II. Operational design:

Operational design includes preparatory phase, content validity, a pilot study and fieldwork.

A) Preparatory phase:

It included review of related literature and theoretical knowledge of various aspects of the study using books, articles, magazines, periodicals and internet to develop tools for data collection and get acquainted with the research problem.

B) Pilot study: -

A pilot study was carried out, including 10% from the studied nurses to test the clarity, applicability, feasibility & relevance of the tools used and to determine the needed time for the application of the study tools. The nurses who were included in the pilot study were included in the sample because no radical modification was done after conducting the pilot study.

C) Tools validity and reliability:

Content validity was tested through a panel of three experts (professors) from the Faculty of Nursing, Ain Shams University to ensure its validity, comprehensiveness, accuracy, clarity and relevance.

Reliability was tested by using a Cronbach's Alpha test for a questionnaire sheet and it was (84.2%).

D) Field work:

The actual field work of data collection was carried out through six months, from the 1st of February 2018 to the end of July 2018 during morning and afternoon shifts. The researcher was available two days / week in the previously mentioned setting by rotation. The researcher introduced herself to the studied nurses and explain the purpose of the study to gain their cooperation prior to data collection. Each study nurse was individually interviewed using the previously mentioned tools where the questionnaire was filled in by nurses (10-20) minutes. The researcher checked the neonate’s medical record sheet to assess the neonates’ data. The observational checklists were used to assess the nurses' actual practice in care of neonates undergoing mechanical ventilation. The nurses were not aware that the researcher is observing their practice. Nurses were encouraged by the researcher to participate in the study.

III) Administrative design:

The necessary approval was obtained from the Dean of the Faculty of Nursing, Helwan University to director of the study setting to obtain the permission for conducting this study.

Ethical consideration:

Research approval was obtained from the Faculty of Nursing Helwan University Scientific Research Ethical Committee before starting the study. The purpose of the study was simply explained to the nurses who agreed to participate in the study prior to data collection. The researcher assured that the data collected for the scientific research purpose only and strictly confidential. The nurses informed that they have the right to withdraw from the study at any time without giving any reason. Consent was obtained orally from parents of the neonates included in the study, ensuring complete privacy and total confidentiality.

IV) Statistical design:

The collected data were organized, categorized, tabulated and statistically analyzed using the Statistical Package for Social Science (SPSS) version 20. Data were presented in tables and figures. The statistical analysis included percentage (%) and chi-square (χ^2)

The observed differences and associations were considered as:

- P-value ≤ 0.05 was considered significant.
- P-value ≤ 0.001 was considered as highly significant.
- P-value > 0.05 was considered insignificant.

3. RESULTS

Table (1): Number and percentage distribution of the studied nurses according to their characteristics (n=60).

Characteristics of Nurses	No.	%
Job		
Staff Nurse	31	51.7
Internship	25	41.6
Supervisor	4	6.7
Attending training courses		
No	44	73.3
Yes	16	26.7
The training course were useful (n=16)		
Yes	4	25
No	12	75

This table revealed that more than two thirds of the studied nurses (70%) were in the age group between 20:<30 years old ($\bar{X} \pm SD$ 32.22 \pm 4.83), half of them (50%) were males gender, more than one third of them (38.3%) had diploma of technical institute of nursing and specialty, more than half of them (61.7%) have less than 5 years’ experience ($\bar{X} \pm SD$ 7.57 \pm 1.83).

Table (2): Number and percentage distribution of the studied nurses related to their job and attending training courses (n=60).

Characteristics of Nurses	No.	%
Age by years		
20 :< 30	42	70.0
30 :< 40	16	26.6
40 : ≤ 50	2	3.4
$\bar{X} \pm SD$	32.22 ± 4.83	
Gender		
Female	30	50.0
Male	30	50.0
Level of qualification		
Diploma of technical nursing school	22	36.7
Diploma of technical institute of nursing and specialty	23	38.3
Bachelor of nursing science	15	25.0
Years of experience		
1:< 5	37	61.7
5:< 10	8	13.3
10:< 15	9	15.0
15:≤ 20	6	10.0
$\bar{X} \pm SD$	7.57±1.83	

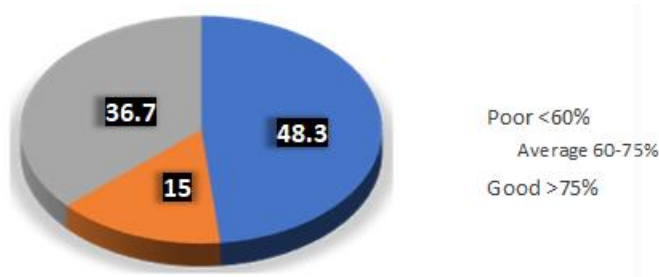
This table revealed that more than half of the studied nurses (51.7%) were staff nurses, more than two thirds of them (73.3%) never been attending any training courses and three quadrants of them (75%) thought that the training courses were unuseful.

Table (3): Number and percentage distribution of the studied nurses' knowledge regarding factors affecting quality of nursing care (n=60).

Factors affecting quality of nursing care	Correct		Incorrect	
	No.	%	No.	%
Factors related to the neonates				
Age	35	58.3	25	41.7
Diagnosis	35	58.3	25	41.7
Weight	35	58.3	25	41.7
Factors related to ventilation process				
Length of stay on mechanical ventilation	48	80.0	12	20
Complications related to mechanical ventilation	52	86.7	8	13.3
Weaning process	52	86.7	8	13.3
Factors related to nurses				
Practical skills	33	55	27	45
Ratio between number of neonates to nurses	33	55	27	45
Attending to training courses	31	51.7	29	48.3
Salary	31	51.7	29	48.3

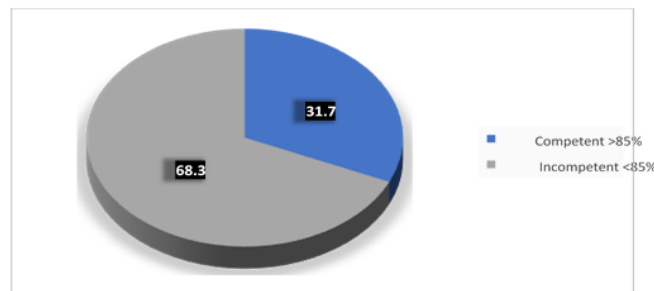
This table clarified that, factors affecting quality of nursing care related to neonates such as age, diagnosis and weight were known to more than half (58.3%) of the studied nurses, factors related to ventilation process such as complications related to mechanical ventilation and weaning process were known to 86.7% of them and factors related to nurses were known to 55% of them namely nurses' practical skills and ratio between number of neonates to nurses.

Figure (1): Percentage distribution of the studied nurses' total knowledge regarding quality of nursing care provided to neonates undergoing mechanical ventilation (n=60).



It was obvious from this figure that, nearly half of the studied nurses (48.3%) had poor level of total knowledge, while less than one quadrant of them (15%) had an average level of total knowledge and more than one third of them (36.7%) had a good level of total knowledge regarding the quality of nursing care provided to neonates undergoing mechanical ventilator.

Figure (2): Percentage distribution of the studied nurses' total practice as regards nursing care provided to neonates undergoing mechanical ventilation (n=60).



It was obvious from this figure that, nearly two thirds (68.3%) of the studied nurses had an incompetent total practice regarding nursing care provided to neonates undergoing mechanical ventilation. While less than one third of them (31.7%) had a competent total practice regarding nursing care provided to neonates undergoing mechanical ventilation.

Table (4): Relation between nurses' total knowledge regarding care of neonates undergoing mechanical ventilation and their characteristics (n=60).

Characteristics	Total knowledge						X ²	p-value
	Good (n=22)		Average (n=9)		Poor (n=29)			
	No.	%	No.	%	No.	%		
Age by years								
20 <: 30	14	63.6	7	77.8	21	72.4	3.381	0.759
30 <: 40	7	31.8	2	22.2	7	24.1		
40 <: 50	1	4.5	0	0.0	1	3.4		
Gender								
Female	11	50.0	3	33.3	16	55.2	1.341	0.514
Male	11	50.0	6	66.7	13	44.8		
Level of qualification								
Diploma of technical nursing school	5	22.7	1	11.1	16	55.2	22.155	<0.001**
Diploma of technical institute of nursing and specialty	8	36.4	2	22.2	13	44.8		
Bachelor of nursing science	9	40.9	6	66.7	0	0.0		
Years of experience								
1 <: 5	13	59.1	1	11.1	23	79.3	24.178	<0.001**
5 <: 10	2	9.1	2	22.2	4	13.8		
10 <: 15	2	9.1	5	55.6	2	6.9		
15 <: 20	5	22.7	1	11.1	0	0.0		
Job								
Staff Nurse	14	63.6	3	33.3	14	48.3	5.939	0.431
Internship	7	31.8	5	60.6	13	39.5		
Supervisor	1	4.5	1	11.1	2	6.9		

This table indicated that, there were positive relations between the studied nurses' total knowledge and their qualification and years of experience (P < 0.001). While there were no relations between the studied nurses' total knowledge and their age, gender and job.

Table (5): Relation between the studied nurses' total practice regarding care of neonates undergoing mechanical ventilation and their characteristics (n=60).

Characteristics Data	Total practice				X ²	p-value
	Competent (n=19)		Incompetent (n=41)			
	No.	%	No.	%		
Age by years:						
20 <: 30	14	73.6	28	68.2	0.982	0.806
30 <: 40	5	26.3	11	26.8		
40 <: 50	0	0.00	2	4.8		
Gender						
Female	9	47.3	21	51.2	0.029	0.866
Male	10	52.6	20	48.7		
Degree of qualification						
Diploma of technical nursing school	2	10.5	20	48.7	9.028	0.011*
Diploma of technical institute of nursing and specialty	9	47.3	14	34.1		
Bachelor of Nursing	8	42.1	7	17.0		
Years of experience						
1 <: 5	2	10.5	35	85.3	21.231	<0.001**
5 <: 10	6	31.5	2	4.8		
10 <: 15 year	6	31.5	3	7.3		
15 <: 20 years	5	26.3	1	2.4		
Job						
Staff Nurse	13	68.4	18	43.9	9.012	0.029*
Internship	4	21.1	21	51.3		
Supervisor	2	10.5	2	4.8		

This table indicated that, there were positive relations between the studied nurses' total practice and their qualification and job ($P < 0.011$ & $P < 0.029$). There were highly positive relations between the studied nurses' total practice and their years of experience ($P < 0.001$). While there was no relation between the studied nurses' total practice score and their age and gender.

Table (6): Relation between the studied nurses' total knowledge and total practice regarding nursing care provided to neonates undergoing mechanical ventilation (n=60).

Total practice	Total knowledge						χ^2	p-value
	Good (n=22)		Average (n=9)		Poor (n=29)			
	No.	%	No.	%	No.	%		
Competent $\geq 85\%$ (n=19)	14	63.6	2	22.2	3	10.3	16.855	<0.001**
Incompetent $< 85\%$ (n=41)	8	36.4	7	77.8	26	89.7		

This table indicated that, there are highly statistical significant differences between the studied nurses' total knowledge and their total practice level (p-value <0.001).

4. DISCUSSION

The quality of nursing care provided to neonates undergoing mechanical ventilation is essential to deliver safe and effective nursing care. That identified as offering the best possible care and ensure the best possible results for neonates every time during deal the healthcare system with the neonates. The ventilation strategy aims to support the neonate's respiratory system during disease to minimize any damage to the lungs (Garder, et al., 2016).

Regarding characteristics of the studied nurses in table (1), the present study result illustrates that, age of more than two-thirds of the studied nurses was ranged between 20:<30 years. This result is in an agreement with Mohamed, (2015), a study which entitled "Nurses' Knowledge and Practices about Oxygen Artificial Therapy to High-Risk Neonates" in Egypt, who found that, more than half of them were between 20 :<30 years old.

The result of the current study reveals that, more than one third of the studied nurses having a diploma of the technical institute of nursing and speciality. This finding is in an agreement with Fashafsheh, (2015), in a study about "Knowledge and Practice of Nursing Staff toward Infection Control Measures at NICU" in Palestinian, who found that, more than half of the studied nurses having a diploma of the technical institute of nursing and speciality. The researcher believed that the technical nursing institute provides the hospitals with a large number of diploma nurses graduates than faculties of nursing.

Regarding years of experience, the study finding reveals that, more than half of the studied nurses' experience ranged between 1:< 5 years. This finding is in an agreement with Obaid, (2016) in a study about "Nurses' Knowledge Concerning Neonatal Respiratory Care in Neonatal Intensive Care Units at Pediatric Teaching Hospitals in Baghdad City" who found that more than two-thirds of the studied nurses' years of experience ranged between 1:< 5. The researcher believed that, this could be due to that most of nurses working at NICU were newly recruited.

As regards attending the training courses, the current study reveals that, nearly three-quadrants of the studied nurses never been attending any training course about nursing care provided to neonates undergoing mechanical ventilation. This result was congruent with Aziz, (2017) in a study entitled "Assessment of Nurses' Knowledge toward the Continuous Positive Airway Pressure (CPAP) Machine in Neonatal Intensive Care Unit" , in Egypt who found that, more than half of them never been attending any training course. From the researcher point of view, this result might be due to that, the hospitals are not offering continuous training and education for their nursing staff in addition to increasing workload.

The present study finding in table (5) shows that, the definition and characteristics of the normal neonate were known to more than half of the studied nurses. These findings were in an agreement with Farag, (2018) in a study entitled "Competency of Nursing Care Activities at Neonatal Intensive Care Units: An Assessment Study" who found that the definition and characteristics of the normal neonate were known to more than half of the studied nurses.

Regarding nurses' knowledge about definition and indications of the mechanical ventilation use were noticed in table (6) that were unknown to more than half of the studied nurses. These results were congruent with **Ibrahim, (2016)** in a study about "Neonatal Nurses' Knowledge and Practices regarding Nursing Management of Premature Babies in Neonatal Intensive Care Units" who found that, definition and indications of the mechanical ventilation use were unknown to more than half of the studied nurses. While, these findings were inconsistent with **Ahmed, (2014)** in a study about "Quality of Nursing Care for Neonates with Oxygen Therapy" who stated that, definition and indications of mechanical ventilation use were known to more than half of the studied nurses. The researcher believed that, this is might be due to that, nursing staff never been attending any training course to upgrade their knowledge about mechanical ventilation.

Regarding nurses' knowledge about the nursing care provided to neonates undergoing mechanical ventilation. The present study finding in table (7) reveals that, infection control measures during endotracheal tube insertion and care of endotracheal tube were unknown to more than three quarters of the studied nurses. These findings were in similarity with **El-tahan, (2016)** in a study about "Assessment of Nursing Care for Neonates Undergoing Open Heart Surgery", who found that, infection control measures during endotracheal tube insertion and care of endotracheal tube were unknown to one third of the studied nurses. While these findings were in dissimilarity with **Aziz, (2017)** who found that, infection control measures during endotracheal tube insertion and care of endotracheal tube were known to more than one third of the studied nurses. From the researcher point of view, this might be related to limited resources and severity of the neonatal condition.

The present study result in table (8) illustrates that, the indicators and standards of the quality were unknown to more than half of the studied nurses. These findings were in an agreement with **Fashafsheh, (2015)** who found that, the indicators and standards of the quality were unknown to 67% & 70% of the studied nurses respectively. While, these findings in disagreement with **Ekici, (2018)** study which entitled "Mechanical Ventilation Support in Neonates: Care Monitoring, Weaning, Maltepe University" in Turkey, who found that, the indicators and standards of the quality were known to 52% & 72% of the studied nurses respectively. The researcher believed that, this might be related to under estimation of the importance of quality indicators and standards when providing nursing care to neonates undergoing mechanical ventilation.

The current study in table (9) demonstrates that factors affecting the quality of nursing care provided to neonates undergoing mechanical ventilation related to, neonates (ventilation process), and nurses were known to more than half of the studied nurses. These findings were in an agreement with **Loutfy, (2014)** in a study about "Quality of Nursing Care Provided for Preterm Infants Suffering from Respiratory Distress Syndrome" who found that, factors affecting the quality of nursing care provided to neonates undergoing mechanical ventilation were known to more than half of the studied nurses. While, these findings were inconsistent with **Elsayed, et al., (2013)** in a study which entitled "Nursing Care Provided for Neonates with Respiratory Distress Syndrome in the Neonatal Intensive Care Units at Makkah Al-Mukarramah in Saudi Arabia" who found that these items were unknown to 62%, 53.2% & 51.2% of the studied nurses respectively. The researcher believed that, this difference might be due to that the nurse can provide more effective care when the number of nurses is adequate during all shifts, proper ratio between number of neonates and nurses, supplies available and the neonates condition.

The study result in table (10) reveals that, nearly half of the studied nurses having a poor total knowledge regarding quality of nursing care provided to neonates undergoing mechanical ventilation. This finding is in an agreement with **Loutfy, (2014)** who found that more than half of the studied nurses having a poor total knowledge regarding quality of nursing care to neonates undergoing mechanical ventilation. The researcher believed that, this might be due to lack of nurses motivation for learning and limited number of nursing staff.

Also, the current study in table (12) shows that, two-thirds of the studied nurses were having incompetent practice when assisting in endotracheal intubation. This finding is in an agreement with **Aziz, (2017)** who found that more than half of the studied nurses were having incompetent practice when assisting in endotracheal intubation. While, this finding was inconsistent with **Ibrahim, (2016)** who found that more than two-thirds of them were having competent practice when assisting in endotracheal intubation. From the researcher point of view, this result might be due to new recruitments of staff nurses with insufficient years of experience.

The present study in table (15) shows that, more than two-thirds of the studied nurses were having incompetent practice when adjusting humidification of the mechanical ventilation. This finding is in an agreement with **Abd al-Aziz, (2017)** who found that, more than half of the studied nurses were having incompetent practice when adjusting humidification of

the mechanical ventilation. While, this finding is inconsistent with **Mohammed, (2018)** who found that, more than half of the studied nurses were competent practice. From the researcher point of view, this may be due to a lack of practice. Training about the importance of humidification of inspired oxygen and limited resources.

The present study in table (19) reveals that, more than half of the studied nurses were having incompetent practice regarding oxygen therapy administration by nasal cannula. This finding is in an agreement with **Mohammed, (2012)** in a study entitled "Quality of Nursing Care for Neonates Undergoing Mechanical Ventilation At Banha City" in Egypt, who found that, more than half of the studied nurses were incompetent practice. While, this finding is inconsistent with **El-tahan, (2016)** who found that, more than half of the studied nurses having a competent practice regarding oxygen therapy administration by nasal cannula. The researcher thought that, this result due to disproportion of ratio between nurses and neonates.

The present study in table (30) clarify that, more than half of the studied nurses were having an incompetent total practice of nursing care provided to neonates undergoing mechanical ventilation, this finding is in an agreement with **Elsayed, (2013)** who found that, more than half of them were having an incompetent total practice. While, this finding is inconsistent with **Ahmed, (2014)** who found that, more than half of the studied nurses were having competent total practice.

The researcher believes that, incompetent nursing practices might be attributed to insufficient training period and absence of training program to improve the practical nursing skills provided to neonates undergoing mechanical ventilation.

The current study in table (31 & 32) shows that, no relation between total nurses' knowledge and practice toward the care of neonates undergoing mechanical ventilation and their age. This result is in an agreement with **Aziz, (2017)** who reported that no significant statistical difference between the total nurses' knowledge scores the care of neonates undergoing mechanical ventilation and their age.

The current study shows that, there were positive relations between the total nurses' knowledge and practice with years of experience. It is in an agreement with **Fashafsheh, (2015)** who found that, there were statistically significant differences between the total nurses' knowledge and practice with their years of experience.

Regarding the relation between the total nurses' knowledge and practice. The current study reveals that, there were a positive relation between the total nurses' knowledge and practice. This study is in an agreement with **Obaid, (2016)** who found that, there are statistically significant differences between the total nurses' knowledge and practice.

This finding might be due to that, the nurses with requisite knowledge do better professional practice to improve the quality of nursing care provided to neonates undergoing mechanical ventilation.

5. CONCLUSION

In the light of the study findings, the studied nurses had a poor knowledge and incompetent quality of nursing care provided to neonates undergoing mechanical ventilation. Regarding factors affecting quality of nursing care provided to neonates undergoing mechanical ventilation included nurses' knowledge, practices and neonates' age, gender, weight and duration of connection with mechanical ventilation.

6. RECOMMENDATIONS

1. Improving the nurses' knowledge and practice regarding the quality of nursing care and its application in care of neonates undergoing mechanical ventilation.
2. The neonatal intensive care unit should be equipped with human resources to enable neonatal nurses providing high quality of care for neonates undergoing mechanical ventilation.
3. Develop a protocol of care for neonates undergoing mechanical ventilation to be used by nurses.
4. Emphasize the importance of continuous training based on actual needs assessment of nurses at NICUs who provided care for neonates undergoing mechanical ventilation.
5. Conducting an orientation program for the newly appointed nurses, to provide them with information relate to mechanical ventilation, and quality of nursing care for neonates undergoing mechanical ventilation.
6. Assessment of factors affecting nurses' performance at NICU for neonates undergoing mechanical ventilation.

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