Nursing Competency for Caring of High-Risk Neonates at Neonatal Intensive Care Unit

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Abstract

Background: The survivor rate of High-Risk Neonates (HRNs) is growing; however, the number of them who need to receive competent care at Neonatal Intensive Care Unit (NICU) is increasing. Competency in neonatal nursing has a direct effect on the health and safety of HRNs. **The aim** of the study was to assess nursing competency for caring of HRNs at NICU. **Research design**: a descriptive research design. **Settings:** The study was carried out at NICU of Pediatric and Maternity Hospital affiliated to Ain Shams University. **Subjects**: all available neonatal nurses at previous mentioned setting (n=60) and purposive sample included 30 HRNs who connected with mechanical ventilation. **Tools:** Pre-designed Questionnaire Sheet to assess nurses' knowledge about care of HRNs on mechanical ventilation (MV), Competency Checklist to assess their competency level and modified Likert type scale to assess their attitude. **Results:** the study revealed that the slightly less than half of studied nurses had good knowledge and more than three quarters of them were incompetent regarding to care of HRNs on MV. Meanwhile, slightly less than three quarters had positive attitude regarding care of HRNs on MV. There was a positive correlation between nurses' knowledge and their competency and attitude. **Conclusion:** About three quarters of studied nurses were incompetent and had positive attitude regarding care of HRNs on MV, Meanwhile Nearly half of them had good knowledge. **Recommendation:** Implement competency-based training programs, relying on job training to raise the efficiency of nurses and Continuous evaluation of nurses' competency level.

Keywords: Attitude, Competency, High risk neonates, Mechanica

Inttroduction:

High Risk Neonate (HRN) is defined as a neonate, regardless of Gestational Age (GA) or birth weight, who has a greater chance of morbidity or mortality, especially within the first 28 days of life (*Altimier & Philips, 2016*). Neonatal Intensive Care Units (NICUs) are a critical aspect in maintaining the health and wellbeing of neonates in a hospital (*Fox, Hoque & Watts, 2017*).

High-risk neonates are mostly classified according to GA, birth weight and main pathophysiologic difficulties. Most comm-on problems related to physiologic status involve the neonate's maturity, conseque-nces of immature organs and systems such as jaundice, respiratory distress and chemical disturbances as hypoglycemia and hypocalcemia (*Al-lawama et al, 2019*).

The neonatal mechanical ventilator has been considered an essential tool for managing HRNs with respiratory distress

syndrome (RDS) and is still regarded as an integral component in the neonatal respiratory care continuum. Many different ventilation modes and ventilation strategies are available to assist with the optimization of mechanical ventilation and prevention of ventilator-induced lung injury of neonates *(Jamil, Ahmed & Itoo, 2019).*

Competency is a topic of great interest to educators and administrators in practice disciplines, particularly health care disciplines as nursing. It is the combination of observable and measurable knowledge, skills, abilities and personal attributes that contribute to enhanced nurses' performance and ultimately result in organizational success *(Soroush, Zargham-Boroujeni & Namnabati, 2016).*

The competency of health care staff is essential to the delivery of high-quality neonate care. One of the greatest challenges within a changing health care environment is ensuring a competent nursing staff to care for neonates *(Touchie & ten Cate, 2016)*.

The planning and delivery of nursing care to HRNs is a complex process that necessitates thorough, ongoing evaluation to determine effectiveness of both nursing and medical therapies. The neonatal nurse is responsible for the safe and appropriate use of technical equipment in the care of these critically ill neonates *(Ghanbari et al., 2017)*.

The neonatal nurse uses many technologic support systems to monitor the body responses and maintain the body functions of the neonate. The registered neonatal nurse must have a comprehensive knowledge and skills about the possible complications of mechanical ventilation to minimize risk, prevent problems and provide immediate intervention when necessary *(DiBlasi & Gallagher, 2017).*

Significance of the study:

Considering the neonatal mortality rate detected by many reports and statistics. This mortality rate due to many reasons, including causes related to neonatal illness and other reasons due to the lack quality of care provided to them by the medical team including nurses. Nurses caring for newborns receiving mechanical ventilation face several challenges. Incidence of RDS which requiring assisted ventilation are 50% at GA < 30 weeks, 37% at GA 31-32 weeks, 12% at GA 33-34 weeks and 2% at GA 35-36 weeks *(Jamil, Ahmed & Itoo, 2019).*

So, at this study, the researcher assessed nursing competency for caring for high risk neonates to stand on the efficiency of nursing care provided to high risk neonates to improve the nursing care, which leads to an improvement in their health, reduce the number of deaths, reduce disabilities and reduce the cost, thus helping to improve the community.

Aim of the study:

This study aimed to assess the nursing competency for caring of high risk neonates at Neonatal Intensive Care Unit.

Research questions

What is the nursing competency level of care for high risk neonate at Neonatal Intensive Care Unit?

Subjects and Methods:

Technical design

Research Design:

A descriptive design was used to conduct this study.

Research Settings:

The study was carried out at NICUs of Ain Shams Pediatric Hospital, this consists of two parts; the first part is specialized in the surgical condition and consists of two rooms each room is containing seven incubators, the second part is specialized in medical condition and consists of three rooms each one has eight incubators while NICU in Maternity Hospital consists of four rooms, each one contains nine incubators.

Subjects:

The subjects composed of: **A-** all available neonatal nurses who worked at the previous mentioned settings, they composed of 60 nurses who provided care for neonates on mechanical ventilation regardless of their age, gender, qualification and experience. On the other side, there exists four nurses refused to take apart into the questionnaire. While, two nurses did not complete the questionnaire and two of them did not return it back. While, seven nurses were sharing in pilot study, and excluded from the study subjects, by this way this study subjects composed of 60 nurses.

B- Purposive sample: High risk neonates regardless of their gestational age, birth weight and gender, the neonates included at the study were 30 neonates and connected with mechanical ventilation.

Tools of the study:

I. Pre-designed Questionnaire Sheet:

It was designed by the researcher after reviewing the related literature and reviewed by supervisors. It was written in an Arabic language for gathering data in relation to the following parts:

Part 1:

- Neonatal nurses' characteristics included age, gender, level of education, experiences, marital status, training course and working hours.
- Neonates characteristics included chronological age, gestational age, birth weight, gender, diagnosis and types of ventilation.

Part 2:

- Neonatal nurses' knowledge related to care of HRNs on mechanical ventilation, the questionnaire consisted of 40 closed ended questions in form of Multiple Choice Questions (MCQs) and 5 questions in form of True/False questions, This part was consisted of eight items to assess nurses' knowledge about high risk neonate, care of mechanical ventilation, endotracheal suctioning, maintaining body temperature, blood gases interpretation, infection control, feeding and developmental care.

Scoring system:

A scoring system was followed to assess nurses' knowledge according to care of HRNs on MV. The Questionnaire was contained of 45 questions, the total scores of the questionnaire were 45 grades, the right answer was scored as a single point and the wrong answer was scored as a zero point. The nurses' knowledge was checked with a model key answer and accordingly the nurses' knowledge was categorized into either correct or incorrect. These scores were summed and were converted into a percent score. It was classified into 3 categories:
- **Good** knowledge if score $\geq 85\%$.
- **Average** knowledge if score from $75 - < 85\%$.
- **Poor** knowledge if score $<75\%$.

II. Neonatal Nurse Skills and Competency Checklist:

It was adapted by the researcher based on **Pulse Job Association, (2015); Perry& potter, (2015); Department of Pediatrics All India Institute of Medical Sciences, (2015); MacDonald et al., (2012)** and it revised by supervisors. This checklist was used to assess nurse's competency for care of HRNs on mechanical ventilation at NICU**,** mainly concerned with the most critical procedures for neonates on mechanical ventilation including endotracheal suctioning, bundle for prevention of infection when maintaining a central venous catheter, bundle of care for prevention ventilator associated pneumonia "VAP", oro-nasopharyngeal suctioning, care of ventilator machine, endotracheal tube care, ryle insertion, ryle feeding and I.V insertion.

Scoring system:

A scoring system was followed to assess nurses' practice; each competency skill was assigned a score according to sub-items. The total score of nurses' practices were 146 grades, each item was evaluated as "competent" was taken one score and "In competent" was taken zero score. These scores were summed up and were converted into a percentage score. It was classified into 2 categories:

- **Competent** if score ≥ 90%.
- **Incompetent** if score < 90%.

III – Attitude Rating Scale:

Likert like type rating scale was used to assess the attitude of the nurses toward caring of HRNs on mechanical ventilations. It was adapted by the researcher based on **Likert, 1932**.

This scale was consisted of 24 items, these:

- Are the growing concerns of parents about newborns at high risk is normal?

- It is necessary to train on the latest equipment used in the care of newborns at high risk.

- Newborns who are most at risk need extensive and intensive nursing care.

Scoring system:

The total score of attitudes rating scale was 72 grades. Each statement was assigned a score according to nurses' attitude, responses were "agree", "uncertain", "disagree" and were scored 3, 2 and 1 respectively. The scoring was reversed for negative statements; the scores of the items were summed up and were converted into a percentage score.

It was classified into 2 categories:
- **Positive** attitude if score ≥ 80%.
- **Negative** attitude if score < 80%.

Content, Face Validity and Reliability:

-Validity: It was ascertained by a group of experts in neonatal nursing (3). Their opinions elicited regarding the format, layout, consistency, accuracy and relevancy of the tools.

-Reliability analysis by measuring of internal consistency of the tool through Cronbach's Alpha test.

Tool	Cronbach's Alpha
Questionnaire Sheet	.893
Competency checklist	.862
Likert scale	.817

Operational Design:

Preparatory Phase:

This phase included reviewing of literature related to nurses' knowledge about care of HRNs on MV. This served to develop the study tools for data collection. During this phase, the researcher also visited the selected places to get acquainted with the personnel and the study settings. Development of the tools was under supervisors' guidance and experts' opinions were considered.

Ethical Considerations

The research approval was obtained from the Faculty Ethical Committee before starting the study.

The ethical research considerations include the following:

-The researcher was clarified the objectives and aim of the study to nurses included in the study before starting

-Verbal approval was obtained from the nurses before inclusion in the study; a clear and simple explanation was given according to their level of understanding. They secured that all the gathered data was confidential and used for research purpose only.

-The researcher was assuring maintaining anonymity and confidentiality of subjects' data included in the study

-The nurses were informed that they are allowed to choose to participate or not in the study and they have the right to withdrawal from the study at any time.

Pilot Study:

The pilot study was carried out on 7 nurses those represent 10% of neonatal nurses at the NICU of Maternity and Pediatric Hospital affiliated to Ain Shams University Hospitals in order to test the applicability of the constructed tools and the clarity of the included questions related to nurses' knowledge and practice regarding to care of HRNs on mechanical ventilation. The pilot has also served to estimate the time needed for each subject to fill in the questionnaire. According to the results of the pilot, some corrections and omissions of items were performed as: change the format of some questions from a list questions to MCQ questions as definition and causes of high risk neonates, so the nurses were included in the pilot study not sharing in the study sample.

Fieldwork:

An approval was obtained from the Medical Director of Maternity and Pediatric Hospital affiliated to Ain Shams University Hospitals. A letter was issued to them from the Faculty of Nursing, Ain-Shams University for explaining the aim of the study in order to obtain their permission and cooperation. Data were collected in four months, from the beginning of June 2018 to the end of September 2018.

The researcher firstly met with the neonatal nurses worked at the previously mentioned settings, explained the purpose of the study after introducing himself. The researcher was visiting the study setting 2days / week at morning shift (8a.m-2p.m) and at afternoon shift (2pm-8pm). The questionnaire for knowledge was filled by nursing staff which take 40-45 minutes, the attitude scale was filled by neonatal nurses in 15-20 minutes, while the checklist for assessing nurses' practice regarding care for HRNs on MV was filled by the researcher in

50-60 minutes while nurses given care for HRNs on MV.

Administrative Design:

An official permission to conduct the study obtained from the medical director of pediatric and obstetric hospitals affiliated to Ain Shams University. The researcher met the hospital director to explain the purpose and the methods of the data collection.

Statistical Design:

Data collected from the studied sample was revised, coded and entered using Personal Computer (PC). Computerized data entry and statistical analysis were fulfilled using the Statistical Package for Social Sciences (SPSS) version 22. Data were presented using descriptive statistics in the form of frequencies, percentages. Chi-square test (X2) was used for comparisons between qualitative variables. Spearman correlation measures the strength and direction of association between two ranked variables.

Significance of the results:

Highly significant at p-value < 0.01.
Statistically significant was considered at p-value < 0.05

Non-significant at p-value ≥ 0.05.

Results:

Table (1): This table showed that the mean age of nurses was 28±8 years, 68.3% of them were female and 61.7% were not married. Moreover, this table showed that 50% of nurses had Technical nursing degree, the mean of years' experience of them was 8.75±7.2 years. 68.3% and 51.7% of them attended a training course and worked as a part time respectively.

Table (2): This tables showed that the mean chronological age of neonates was 12.2±7.4 days. This table also showed that 60% & 43.3 % of neonates were girls and full-term, respectively. This table reveals that the mean of birth weight of neonates was 2.090 ±0.710 kg.

Figure (1): This figure showed that 50% of neonates diagnosed with respiratory distress syndrome. Meanwhile, 16.7%, 13.3%, 13.3% and 6.7% of neonates diagnosed with pneumonia, congenital heart, surgical condition and hypoxic ischemic encephalopathy respectively.

Figure (2): This figure showed that 41.6% of nurses had good knowledge about care of high-risk neonates on mechanical ventilation. While, 31.7% and 26.7% of nurses had average knowledge and poor knowledge respectively.

Figure (3): This figure showed that 77 % of nurses were incompetent in care for high risk neonates on mechanical ventilation and only 23% of them were competent.

Figure (4): This figure showed that 72% of nurses had positive attitude for care for high risk neonates on mechanical ventilation and only 28% had negative attitude.

Table (3): This table illustrated positive correlation between total knowledge of the neonatal nurses and their total competency regarding care of high-risk neonate.

Table (4): This table illustrated positive correlation between total attitude of the neonatal nurses and their total knowledge regarding care of high-risk neonate.

Table (5): This table illustrated no correlation between total attitude of the neonatal nurses and their total competency regarding care of high-risk neonate.

Table (1): Number and Percentage Distribution of the Neonatal Nurses According to their Characteristics (n=60).

Characteristics	No	%
Age		
20 - <25	3	5
25 - <30	0	0
30 - <35	1	1
35 or more	1	8.3
	7	1
	1	1.7
	2	2
		0
$\overline{x}$ S.D **28 ± 8**		
Gender		
Male	1	3
Female	9	1.7
	4	6
	1	8.3
Marital Status		
Married	2	3
Not Married	3	8.3
	3	6
	7	1.7
Qualification		
Secondary nursing degree	2	3
Technical nursing degree	1	5
Bachelor nursing degree	3	5
	0	0
	9	1
		5
Years of Experience		
< 5 years	2	4
5 - <10 years	6	3.3
10 - 15 years	1	2
>15 years	3	1.7
	2	3.
	1	3
	9	3
		1.7
$\overline{x}$ S.D **8.75 ± 7.2**		
Training Course		
Yes	4	6
No	1	8.3
	1	3
	9	1.7
Working Hours		
Full Time	2	4
Part Time	9	8.3
	3	5
	1	1.7

Table (2): Number and Percentage Distribution of the Neonates According to their Characteristics (n=30).

Characteristics of High-Risk Neonates	No	%
Chronological age		
< 24 hours.	6	20
1 to < 10 days	5	16.7
10 to 28 days	10	33.3
>28 days	9	30
$\overline{x}$ S.D 12.2±7.4		
Gender		
Boys	12	40
Girls	18	60
Gestational age		
< 37 weeks	17	56.7
37 to 42 weeks	13	43.3
Birth weight		
< 1.500 Kg.	12	40
1.500 < 2.000 Kg.	10	33.3
2.000 < 3.500 Kg.	8	26.7
$\overline{x}$ S.D 2.090 ±0.710		

Figure (1): Number and Percentage Distribution of the Neonates According to Medical Diagnosis (n=30).
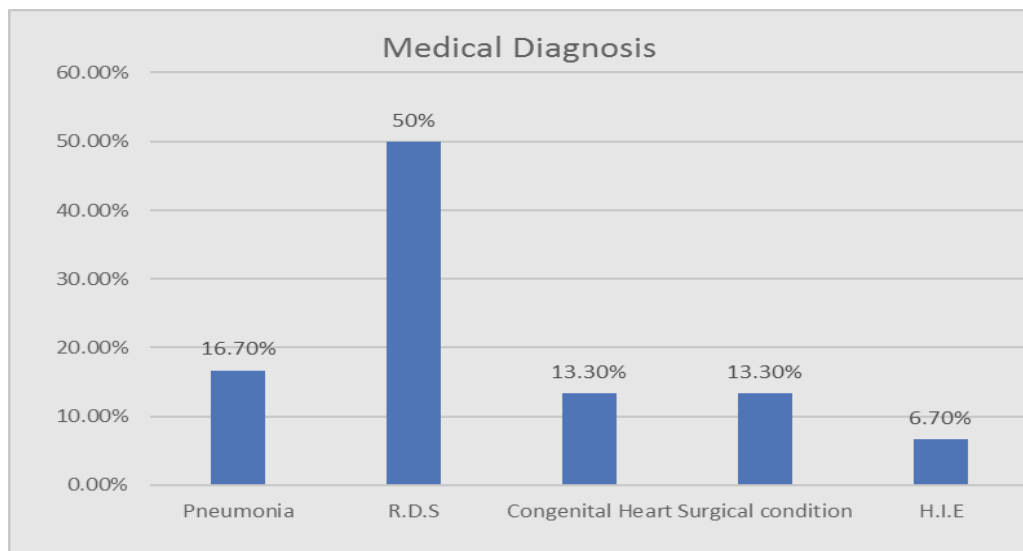
Figure (2): Percentage Distribution of The Nurses' Total Knowledge Level regarding to Care for High Risk Neonates on Mechanical Ventilation
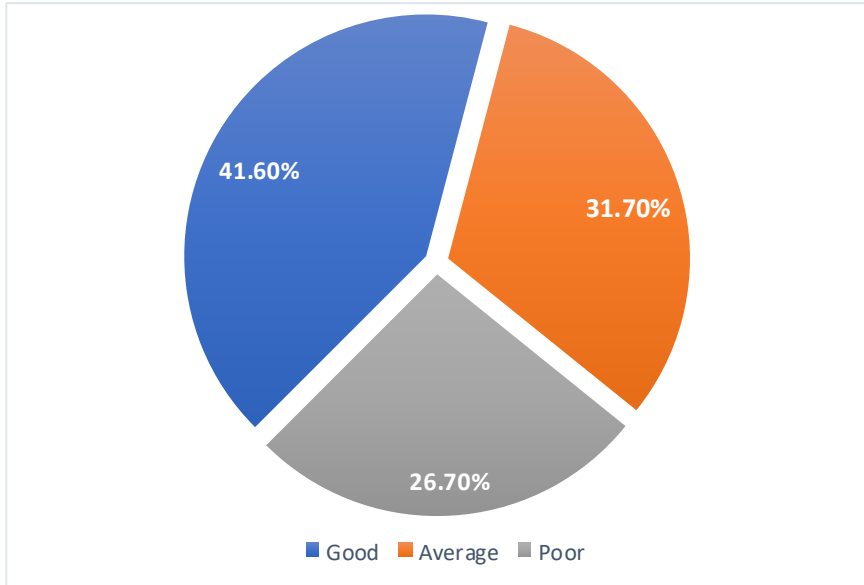

Figure (3): Percentage Distribution of The Nurses' Total Practice regarding Care for High Risk Neonates on Mechanical Ventilation
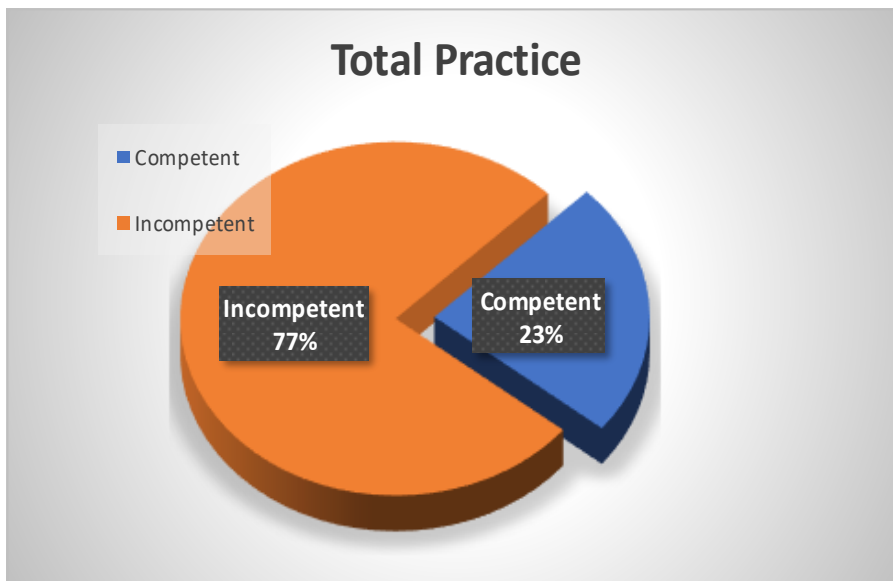
Figure (4): Percentage Distribution of the Nurses' Total Attitude regarding to Care of High-Risk Neonates (No= 60)
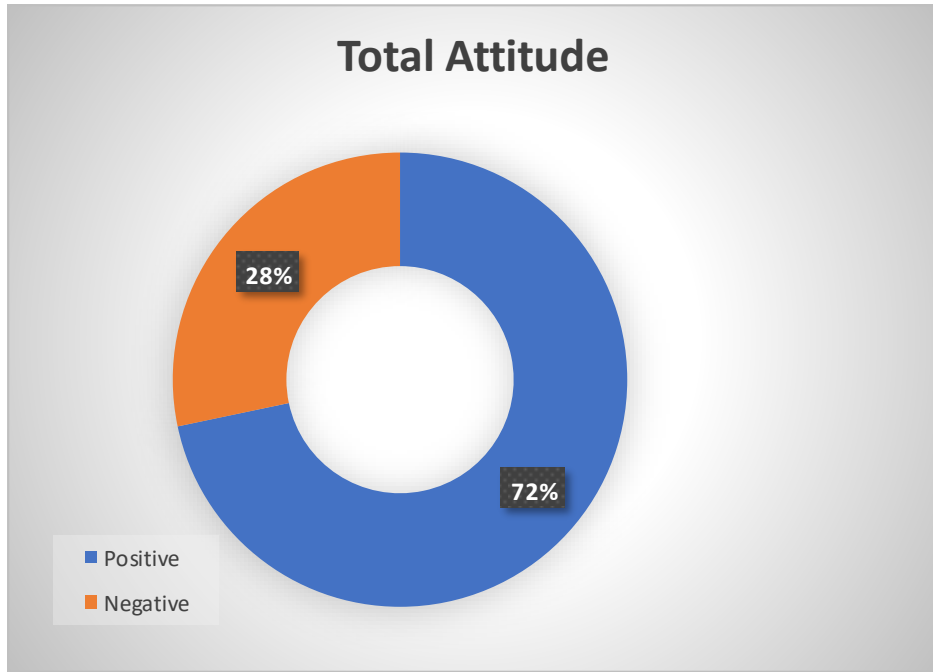

Table (3): Correlation between Total Knowledge of The Neonatal Nurses and Their Total Competency regarding Care of High-Risk Neonates.

Item	Total competency	
	r.	P. value
Total Knowledge	**0.431**	**0.001****

Table (4): Correlation between Total Attitude of the Neonatal Nurses and Their Total Knowledge regarding Care of High-Risk Neonates.

Item	Total Knowledge	
	r.	P. value
Total Attitude	**0.259**	**0.045***

Table (5): Correlation between Total Attitude of the Neonatal Nurses and Their Total Competency regarding Care of High-Risk Neonates.

Item	Total Competency	
	r.	P value
Total Attitude	0.162	0.218

Discussion:

Regarding the characteristics of studied nurses, the finding of the current study revealed that the mean age of nurses was 28 ± 8 years and the mean of years' experience of them was 8.75 ± 7.2 years. These results may due to increase the number of newly graduated nursing appointments by contract system to fill the deficit in the number of formal nursing. These results similar with the result of study performed by **Mohamed, (2017)** about nurses' compliance with neonatal care protocol regarding to mechanical ventilation, who found that the mean age of studied nurses was 28.8±9.6 years and the mean years' experience was 9.07±3.02 years.

Concerning the characteristics of studied neonates, the current study revealed that the mean age of them was 12.2±7.4 days. According to gestational age, the finding of the current study illustrated that slightly more than half of neonates was premature baby and the mean birth weight was 2.090 ±0.710 kg. These results agreement with the study achieved by **Fierson & AAP, (2018**) about screening examination of premature infants for retinopathy of prematurity, who reported that the mean age of neonates was 14 ±6.2 days, more than half of them was premature baby and the mean birth weight was 1.880 ±0.564 kg.

Concerning the types of ventilation connected to studied neonates, the finding of present study revealed that nearly two thirds of them were connected on mechanical ventilation. These results supported with the study done by **Ahmed, Mohamed, Mahmoud & Zaki, (2014)** about quality of nursing care provided for neonates with tracheoesophageal fistula who stated that more than half of studied neonates connected on mechanical ventilation.

According to medical diagnosis of studied neonates, the finding of the present study revealed that half of them diagnosed as respiratory distress syndrome. This result may be due to slightly more than half of studied neonates were premature. This result supported with the study performed by **Othman, (2017)** about monitoring quality of nursing care for neonates in the first 24 hours, who found that slightly more than half of neonates diagnosed as respiratory distress syndrome.

Concerning the total knowledge of the studied nurses about care of HRNs connected with mechanical ventilation, the present finding revealed that about half of them had good knowledge and only one quarter of studied nurses had poor knowledge. These results may be due to continuous training of neonatal nurses through training unit and infection control unit. These results agreement with the study performed by **Prasanna, Sheelu & Indira, (2016**) about assessing the knowledge regarding assessment of high-risk neonates among staff nurses and nursing students in selected hospitals at Nellore, who found that slightly more than half had good knowledge about care of HRNs.

Regarding to the total practice of studied nurses about care for HRNs connected with mechanical ventilation, the present finding of the current study revealed that slightly more than three quarters of them were incompetent. These results may be due to not available procedure book for the nurses at the unit, the training unit was based on theoretical training and lack of supplies & equipment that used during procedures. These results supported with the study done by **Babeker, (2015)** about assessment of nurse's knowledge and practice regarding to care of premature baby in neonatal intensive care unit at Omdurman maternity hospital and al rib at university hospital, who found that two thirds of studied nurses were

incompetent practice according care of premature baby.

According to the total attitudes of the studied neonatal nurses regarding to care of HRNs connected with mechanical ventilation, the finding of the present study revealed that about three quarters of them had positive attitudes. This high result may be due to increase the awareness of nurses about care of HRNs due to continuous training and instruction from supervisors. This result inconsistent with the study performed by **Gibbins et al., (2015)** about perceptions of health professionals on pain in extremely low gestational age infants, they reported that more than half of studied nurses had negative attitude toward care provided for low birth weight.

Concerning the correlation between total knowledge of the studied nurses and their total competency regarding care of HRNs connected with mechanical ventilation. The finding of the current study illustrated highly positive correlation between total knowledge of the studied nurses and their total competency. This result may due to whenever, the nurses had high knowledge level, increased competency level and vice versa This result supported by the study performed by **Ibrahim, (2017**) about performance of health care providers regarding helping babies breath during neonatal resuscitation, who found that there was positive correlation between total knowledge of the neonatal nurses and their total performance.

Regarding the correlation between total knowledge of the studied nurses and their total attitude regarding care of HRNs connected with mechanical ventilation. The finding of the current study illustrated positive correlation between total knowledge of the studied nurses and their total attitude. This result may due to increased knowledge level of nurses lead to increased attitude level and vice versa. This result supported with the

study performed by **Hassan, (2017)** about assessment of health care workers' perception toward infection control in neonatal intensive care unit, who found that there was positive correlation between total knowledge of studied nurses and total attitude.

Concerning the correlation between total competency of the neonatal nurses and their total attitude regarding care of HRNs connected with mechanical ventilation. The finding of the current study illustrated that no correlation between total attitude of the studied nurses and their total competency. This result disagreement with the study performed by **Dowling, Barsman, Dowling, Damato & Czeck, (2015)** titled in Neonatal nurses' beliefs, knowledge, and practices in relation to sudden infant death syndrome risk-reduction recommendations, who reported that there was positive correlation between beliefs and practice of studied nurses.

Conclusion:

Based on the study findings of the present study, the researcher concluded that: about three quarters of studied nurses were incompetent and had positive attitude regarding to care of high-risk neonates on mechanical ventilation. Meanwhile nearly half of them had good knowledge regarding to care of high-risk neonates on mechanical ventilation.

Recommendations:

In the light of the findings of the current study the following recommendations are suggested:

-Preparation of educational program for nurses about care of high-risk neonates on mechanical ventilation.

-Implement competency-based training programs for neonatal nurses about

care of high-risk neonates on mechanical ventilation.

-Relying on job training to raise the efficiency of neonatal nurses

-Preparing guidelines and competency checklist for the neonatal nurses who providing care for high risk neonates on mechanical ventilation.

-Continuous evaluation of nurses' competency level to identify weaknesses and strength points to be relied upon during training.

-Creating national care standards for care of high risk neonates on mechanical ventilation.

- Further researchers, about nurses' competency with increasing sample size and different settings.

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