

Assessment of the Nurses' Role toward Nutritional Therapy for High-Risk Neonates

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Abstract

Background: Nutritional therapy is important to support the high-risk neonates to promote growth and neurodevelopmental outcome. **Aim:** assess the nurses' role toward nutritional therapy for high-risk neonates. **Design:** A descriptive design. **Subjects:** A purposive sample was composed of 50 nurses who worked at the Neonatal Intensive Care Unit in Children Hospital and Gynecological Hospital affiliated with Ain Shams University. **Tools:** Assessment tool of high-risk neonates to assess characteristics' the studied neonates; predesigned questionnaire sheet, observation checklists and attitude Likert type scale. **Results:** The results revealed that less than half of the studied nurses had an average level of total knowledge. More than half of them had an incompetent level of practice and a positive attitude toward nutritional therapy for high-risk neonates. There were statistically significant differences between the studied nurses' characteristics and their knowledge, practices and attitude regarding nutritional therapy for high-risk neonates. Finally, there was a positive correlation between the nurses' knowledge, practices and their attitude related to nutritional therapy for high-risk neonates. **Conclusion:** The study concluded that, less than half of the studied nurses had an average level of total knowledge, less than two-thirds of them had an incompetent level of practice and more than half of them had a positive attitude toward nutritional therapy for high-risk neonates by P-value < 0.05. **Recommendation:** the current study recommended that, establish a written updated protocol about nutritional therapy to improve the level of nurses' performance regarding the nutritional therapy for high-risk neonates and training program should be provided for all nurses working in NICUs to improve their performance regarding nutritional therapy for high-risk neonates.

Keywords: High-Risk Neonate, Nutritional Therapy, Nurses role.

Introduction

Proper nutrition of high-risk neonates is essential for normal growth, resistance to infection, long-term health and optimal neurologic and cognitive development. Providing adequate nutrition to high-risk neonates is challenging because of several problems, some of them unique to these small infants. These problems include immaturity of bowel function, inability to suck and swallow high risk of necrotizing enterocolitis, illnesses that may interfere with adequate enteral feeding and medical interventions that preclude feeding (Willis et al., 2015).

The improvement in possibilities of saving high-risk neonate's lives that have been done in the last years resulted in a growing number of neonates with dangerous abnormal development that require monitoring of quality and rate of development. High-risk neonates initially require parental and enteral feeding because of their immaturity and clinical problems (Costeloe et al., 2016).

There are two general approaches to the nutritional therapy of high-risk neonates; it includes enteral nutritional therapy and parenteral nutritional therapy. Enteral nutritional therapy makes use of the gastrointestinal tract; it may involve nutritional therapy

by mouth or by nutritional therapy tube. Meanwhile, parenteral nutritional therapy involves supplying nutrients through peripherally or centrally placed intravenous catheters. It is undertaken only when it is impossible to provide adequate nutrition enterally. In many cases, high-risk neonates are supported initially with parenteral nutritional therapy and then, are changed gradually to enteral nutritional therapy (Koletzko and Poindexter, 2014 & Aceti et al., 2015).

Nutrition for high-risk neonates involves comprehensive nutritional support of the high-risk neonates. Therefore, nurses should understand the nutritional components of nutritional therapy, the indications, side effects, and infusion limitations of each component. Nursing care of the high-risk neonates includes the initial nutritional assessment, screening for inborn errors of metabolism, developing and implementing comprehensive nutritional care plans and referrals as needed (Bertino et al., 2012 & Embleton, 2013 & Fenton et al., 2014).

Significance of Study

Nutritional therapy improves high-risk neonate's outcomes, decreases morbidity and shortens hospital stays. Thus, it is critical to adapt nutritional therapy practices and the composition of nutritional therapy to achieve optimal nutrition in high-risk neonates (Colaizy et al., 2012). The neonate's brain is uniquely sensitive to nutrition, other organs and tissues are also at critical developmental stages in early infancy; because it is an optimizing nutrient intake during the hospitalization in the Neonatal Intensive Care Unit (NICU). Also, it has the potential to benefit long-term neurodevelopment and health outcome (Burdall et al., 2017). The incidence of high-risk neonates who were received parenteral and enteral nutritional therapy in the Neonatal Intensive care unit at

Maternity and Gynaecological Hospital, and Children's Hospital affiliated to Ain Shams University in the last two years (2016 and 2017) were 987 neonates. So that, it was important to conduct this study to assess nurses' role toward nutritional therapy for high-risk neonates.

Aim of the work

This study aimed to assess the nurses' role toward nutritional therapy for high-risk neonates through assessment nurses' knowledge, attitude and practice regarding nutritional therapy for high risk neonates

Research question

- What is the nurses' role toward the nutritional therapy for high-risk neonates?

Subject and methods

I. Technical Design

Technical design included the research design, study setting, subjects and tools of data collection.

Research Design

A descriptive research design was used to conduct this study.

Study Setting

The study was conducted at Neonatal Intensive Care Unit at Children Hospital and Gynaecological Hospital affiliated to Ain Shams University where their capacity are 34 incubators.

Subjects

- The subjects of this study included a purposive sample composed of 50 nurses regardless their age, gender and years of experience who were working at Neonatal Intensive Care Unit at Children Hospital and Gynecological Hospital and allowed to care for and administer nutritional therapy for high-risk neonates.
- All available high-risk neonates regardless their gestational age, diagnosis, gender, birth weight, gestational age appropriateness and

current weight who were subjected for nutritional therapy throughout the period of data collection (n= 50).

Tools of data collection

Tools were developed by researcher based on the review of literatures including text books, articles and network search.

I: Assessment Sheet of High-Risk Neonates: It was used to assess characteristics of the studied high-risk neonates receiving nutritional therapy including gestational age, diagnosis, gender, birth weight, gestational age appropriateness, current weight and type of nutritional therapy.

II: Predesigned Questionnaire Sheet: This tool was designed by the researcher based on the review of literature and guidance of the supervisors in simple Arabic language and it was composed of two parts:

Part I: Characteristics of the studied nurses included: gender, age, level of education, years of experience in NICU and attendance of training courses.

Part II: This part was developed and adapted from **Al-Rafay and Al-Sharkawy, (2012), Mohamed and Taha, (2014), Al-Hawaly et al., (2016), Adel and Abdel-fattah et al., (2018)** to assess nurses' knowledge related nutritional therapy of high-risk neonates (28 Questions) as the following:

▪ **Nutritional therapy of high-risk neonates (7 items):**

- Definition of nutritional therapy.
- Nutritional needs of high-risk neonates.
- Methods of nutrition for high-risk neonates.
- Indications of nutritional therapy.
- Signs and symptoms of insufficient nutritional therapy.
- Laboratory test for assessment of the nutritional status of high-risk neonates.
- Indicator of successful nutritional therapy for high-risk neonates.

▪ **Parenteral nutritional therapy for high-risk neonates (10 items):**

- Indications of parenteral nutrition.
- Component of parenteral nutrition.
- Common veins are used for parenteral nutrition.
- Precautions of parenteral nutrition.
- Amount of parenteral nutrition during 24 hours and equation of flow rate.
- Nursing role (before, during and after) for high-risk neonates receiving parenteral nutrition.
- Complications of parenteral nutrition.
- Daily recording items for high-risk neonates with parenteral nutrition.
- Criteria for changing from parenteral nutritional therapy to gastric tube feeding.

▪ **Enteral nutrition therapy for high-risk neonates (6 items):**

- Indications of enteral nutrition
- Precautions of enteral nutrition
- Nursing role:
 - ❖ (Before, during and after) giving enteral nutrition for high-risk neonates.
 - ❖ Toward properties and acceptable amount of residual.
- Daily recording of nursing care during giving enteral nutrition.
- Complications of enteral nutrition
- Criteria for changing from gastric tube feeding to oral feeding.

▪ **Oral feeding (5 items):**

- Indications of oral feeding
- Precautions of oral feeding
- Nursing role:
 - ❖ (Before, during and after) giving oral feeding for high-risk neonates.
- Daily recording of nursing care during giving oral feeding.
- Complications of oral feeding.

The questions were in the form of open, closed-ended questions.

❖ **Scoring system:**

The correct answers scored one grade, and the incorrect answer scored zero. These scores summed up and converted into a percent score. The total score of questionnaires was 100 % and three score levels accordingly as the following, more than 75% was considered a good level of knowledge, from 60% to 75% considered the average level of knowledge and less than 60% considered the poor level of knowledge

III: Observational Checklists: It was adopted from **Bowden & Greenberg, (2012)** and **Macdonald & Ramasethu, (2013)** it used to assess nurses' competency level of practices regarding nutritional therapy for high-risk neonates, included the following procedure:

- Care of neonates with intermittent Naso/ Orogastric tube (47 steps).
- Administration of bolus feeding (20 steps).
- Connecting & administrate neonatal TPN solutions (31 steps).
- Disconnecting TPN (10 steps).
- Bottle-feeding (9 steps).
- Measuring weight (15 steps)
- Measuring abdominal circumference (11 steps)
- Assessment of skin integrity (15 steps).

❖ Scoring System

Each step was scored one grade if done correctly and scored zero if done incorrectly or not done. These scores summed up and converted into a percent score. The total score of checklists was 100 %: However, the total score was categorized into, the competent level (more 85%) and the incompetent level (less than 85 %).

IV: An attitude Likert type scale: This tool was developed and adapted from **Hassan, (2014)**, **Nalukenge, (2016)** and **Weshahy et al., (2019)** and used to assess nurses' attitudes regarding nutritional therapy for high-risk neonates; it consisted of (12 items). Each response for each item was ranged from agreeing,

sometimes agree and disagree about the nutritional therapy for high-risk neonates.

❖ Scoring system

The scoring system was determined according to the studied nurses' responses as the follow disagree, sometimes and agree. It is 3 points Likert-type scale; the scoring system is as follows: 1 grade for Disagree, 2 grade for sometimes agree and 3 grade for agree; A reverse score was considered in items that present negative attitude. These scores summed up and converted into a percent score. The total score of scale was 100% (36 grade) and two score levels accordingly as the follow, score from 60% \geq 100% was referred to a total positive level of attitude, and score < 60% was referred to the total negative level of attitude

II. Operation Design

The operational design for this study consisted of three phases, namely preparatory phase, pilot study and fieldwork.

Preparatory Phase

This phase included reviewing literature related to nutritional therapy for high-risk neonates. This was served to develop the study tools for data collection. During this phase, the researcher also visited the selected places to be acquainted with the personnel and the study settings. Development of the study tools was accomplished under the supervisors' guidance and experts' opinions were considered.

Validity and Reliability:

Content Validity:

It was ascertained by a group of experts in pediatric nursing (three professors) to test its content validity by reviewing the tool's clarity, relevance, comprehensives, and simplicity. Their opinions were elicited regarding the format, layout, consistency, accuracy, completeness however, a minor modification was done.

Reliability:

The tool was tested to ensure that an assessment tool produces stable and consistent results overtime's reliability of the study tools used Alpha Cronbach test. The values of Cronbach's alpha of the reliability of the knowledge assessment questionnaire, attitude scale and the observational checklist were (0.86), (0.83) and (0.82) respectively.

$$\alpha = \frac{N \cdot r}{1 + (N - 1) \cdot r}$$

N: is equal to the number of items and r- the bar is the average inter-item correlation among the items.

Pilot Study

A pilot study was carried out on 10% of the studied nurses (5) who are working in the NICUs in previously mentioned setting and allow to care for and administer nutritional therapy for high-risk neonates and all available high-risk neonates who have met the study criteria and subjected to nutritional therapy throughout the period of data collection. To test the applicability of the constructed tools and the clarity of the included questions related to nurses' role toward nutritional therapy for high-risk neonates. The pilot has also served to estimate the time needed for each subject to fill in the questions. According to the results of the pilot, some modifications on tools were performed by adding some questions about daily nursing records during giving parenteral nutrition, enteral nutrition and oral feeding and omission some questions about criteria of the residual, acceptable amount of it and nursing role toward residual. The pilot study participants were not included in the main study sample.

Fieldwork

Data collection was done for a period of six months, started in November 2018 and ended in May 2019. The researcher attended to Neonatal Intensive care unit at Maternity and Gynaecological Hospital, and Children's Hospital 4 days per week (Sunday, Monday, Tuesday,

Wednesday), 4 hours per day from 9 am to 1 pm.

Verbal approval was obtained from the studied nurses before inclusion in the study, a clear and simple explanation about the aim of the study was given. The questionnaire and attitude scale were filled by the nurses, the time consumed to fill out the questionnaire and attitude scale for each nurse ranged from 20 to 30 minutes on the same day and the researcher was observed the nurses during their work and checked all observational checklists for each nurse working with high-risk neonates received nutritional therapy. The assessment sheet of high-risk neonates filled by the researcher from the medical records.

IV. Administrative Design

To carry out the study, approval was obtained from the medical and nursing director of the Neonatal Intensive care unit at Maternity and Gynaecological Hospital, and Children's Hospital affiliated with Ain Shams University. A letter was issued to them from the Faculty of Nursing, Ain-Shams University, explaining the aim of the study to obtain their permission and cooperation.

Ethical consideration

The ethical approval was obtained from the scientific research ethical committee of the faculty of nursing- Ain Shams University before starting the study. Verbal approval was obtained from the nurses before inclusion in the study, a clear and simple explanation about the aim of the study. The nurses informed that they are allowed to choose to participate or not in the study and they have the right to withdraw from the study at any time. They secured that all the gathered data was confidential and used for research purposes only.

Statistical Analysis

Data collected from the studied sample was revised, coded and entered using PC. Computerized data entry and statistical analysis were fulfilled using the Statistical Package for Social Sciences (SPSS) version 25. Data were presented using descriptive statistics in the form of frequencies, percentages. Chi-square test(X^2) was used for comparisons between qualitative variables and the correlation coefficient was used to test the

correlation between variables. The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following:

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

Results

Table (1): As regards the characteristics of the studied nurses it was found that, 26% of the studied nurses their age ranged between 30 :< 35years old and 88% of them were females with mean age 28.2 ± 1.9 years. In relation to nurses' qualifications level, this table revealed that 40% of them were diploma nurses. Moreover, the mean years of nurses' experience was 9.4 ± 0.6 years.

Figure (1): This figure illustrates that, 56% of the studied nurses attended training courses related to nutritional therapy for high- risk neonates.

Table (2): This table illustrates that, 44% of the studied neonates their gestational age ranged between 32:< 34 weeks with mean 33.2 ± 1.1 weeks. Moreover, 58% of them were male.

Figure (2): This figure illustrates that, 46% of the studied neonates, their weight at delivery ranged between 2000:< 2500 gram.

Figure (3): This figure illustrates that, 60 % of the studied neonates were small for gestational age.

Figure (4): This figure shows that, 50% of neonates their current weight ranged between 2500: \leq 3000 gram

Figure (5): This figure shows that, 72% of the studied neonates were preterm neonate and more than half of them (58%) were diagnosed as respiratory distress syndrome.

Figure (6): This figure illustrates that, 50 % of the studied neonates received enteral nutrition.

Figure (7): Shows that, 66% of the studied nurses had incorrect knowledge regarding parenteral nutritional therapy for high-risk neonates.

Figure (8): Shows that, 64% of the studied nurses had incorrect knowledge regarding enteral nutritional therapy for high-risk neonates.

Figure (9): reveals that, 66% of the studied nurses had incorrect knowledge regarding oral feeding for high-risk neonates.

Figure (10): illustrates that, 46% of the studied nurses had an average level of knowledge regarding nutritional therapy for high-risk neonates, while 34% of them had poor level of knowledge and

only 20% of them had good level of knowledge.

Figure (11): shows that, 66% of the studied nurses were incompetent in their practice regarding the care of enteral feeding using OGT/NGT for the high-risk neonates.

Figure (12): shows that, 64% of the studied nurses were incompetent in their practices regarding connecting & administrates TPN solution for high-risk neonates.

Figure (13): shows that, 60% of the studied nurses were incompetent in their practices regarding disconnecting TPN for high-risk neonates.

Figure (14): shows that, 64% of the studied nurses were incompetent in

their practices regarding bottle-feeding for high-risk neonates.

Figure (15): shows that, 62% of the studied nurses had incompetent total practices regarding nutritional therapy for high-risk neonates.

Figure (16): As regards the studied nurses 'attitude regarding the nutritional therapy for high-risk neonates, this figure found that, 55.2% of the studied nurses had a positive attitude toward nutritional therapy for high-risk neonates, while 44.8% of them had negative attitude.

Table (3): This table illustrates that, there is a positive correlation between nurses' knowledge, practices and their attitude regarding nutritional therapy for high-risk neonates.

Table (1): Number and percentage distribution of studied nurses according to their characteristics (n=50).

Characteristics	No.	%
Age in years		
<20	1	2
20:<25	7	14
25:<30	12	24
30:<35	13	26
35:<40	11	22
40: ≤ 45	6	12
Mean ±SD	28.2± 1.9	
Gender		
Male	6	12
Female	44	88
Qualification		
Bachelor	5	10
Technical institute	15	30
Diploma & specialty	10	20
Diploma	20	40
Years of Experience in NICU		
1:<5	7	14
5:<10	23	46
10:<15	16	32
15 and more	4	8
Mean ±SD	9.4± 0.6	

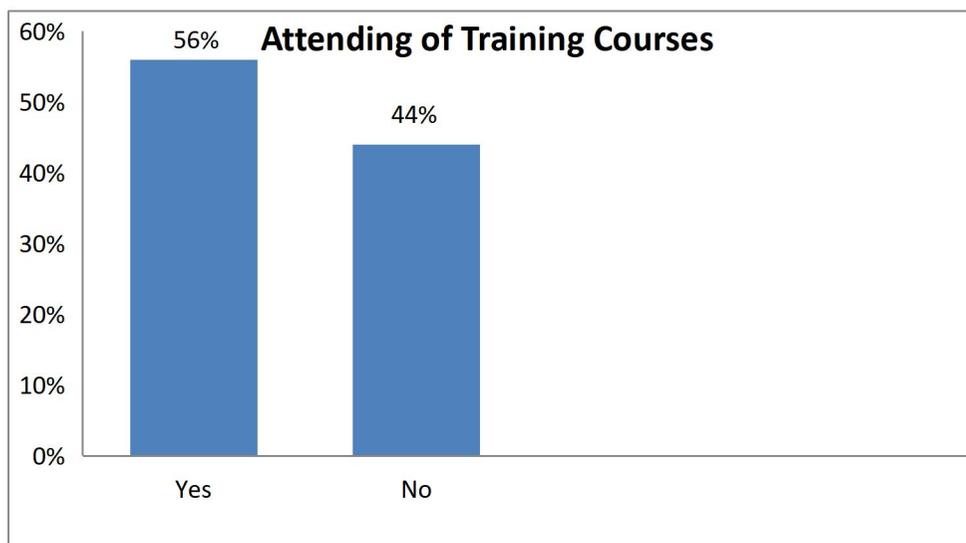


Figure (1): Distribution of the studied nurses according to attending of training courses (n=50).

Table (2): Number and percentage distribution of the studied neonates according to their characteristics (n=50).

Characteristics	No.	%
Gestational age in weeks		
<30	1	2
30:< 32	3	6
32:< 34	22	44
34:< 36	16	32
36: ≤ 38	8	16
Mean ±SD	33.2± 1.1	
Gender		
Male	29	58
Female	21	42

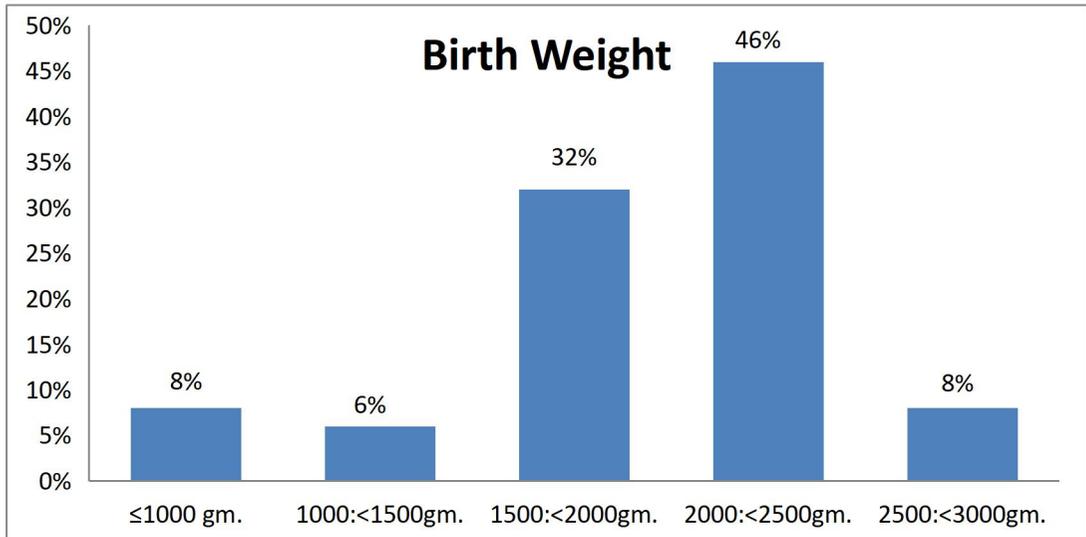


Figure (2): Distribution of the studied neonates according to their weight at delivery (n=50).

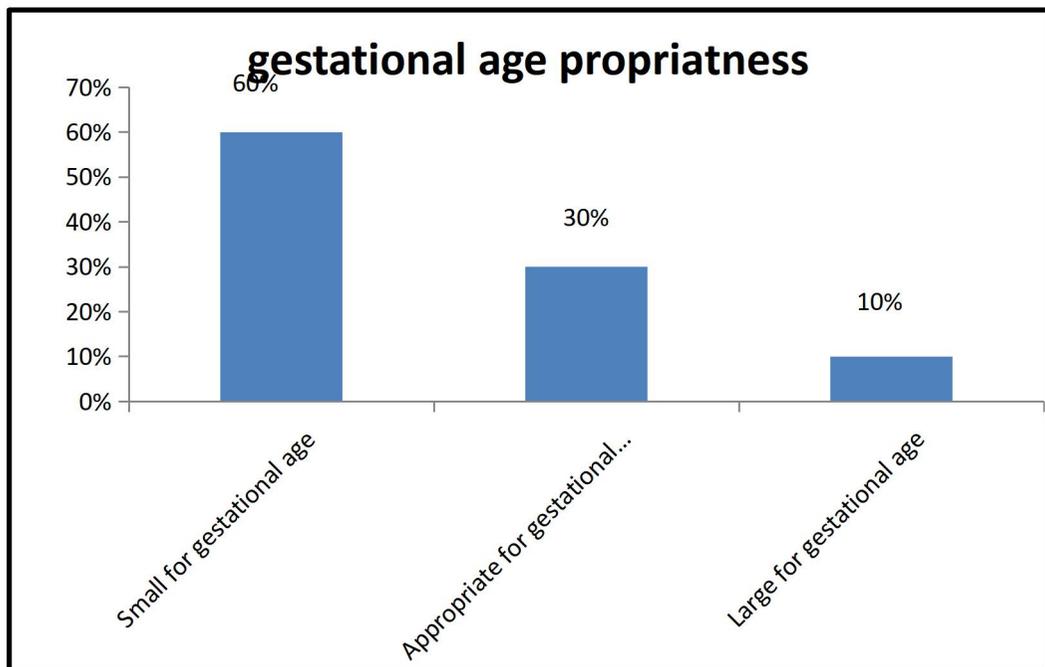


Figure (3): Distribution of the studied neonates according to their gestational age of the studied neonates (n=50).

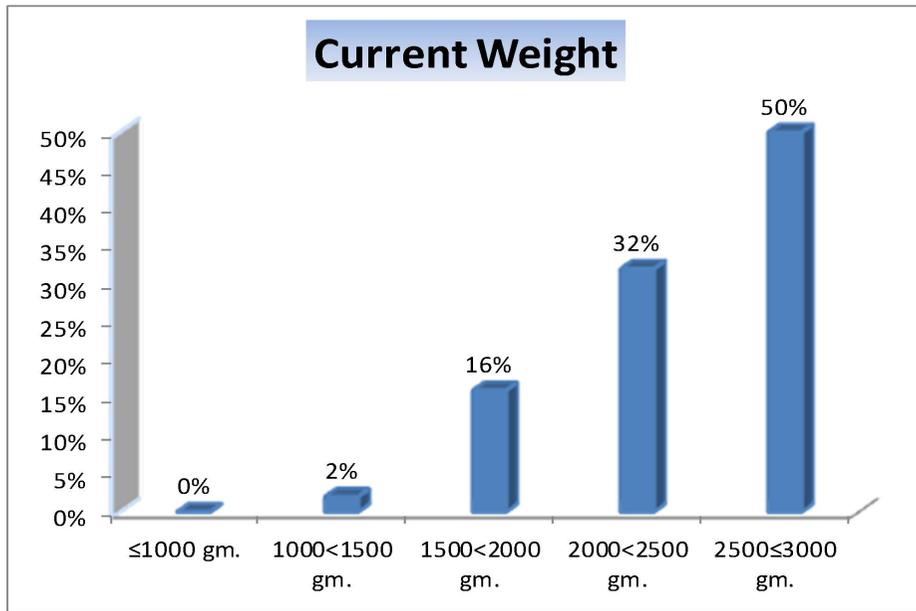


Figure (4): Distribution of the studied neonates according to their current weight (n=50).

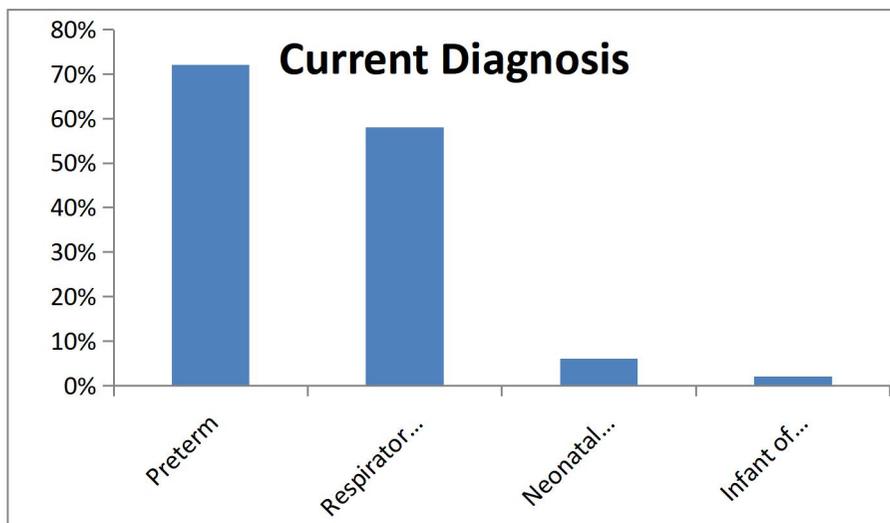


Figure (5): Distribution of the studied neonates according to their current diagnosis (n=50).

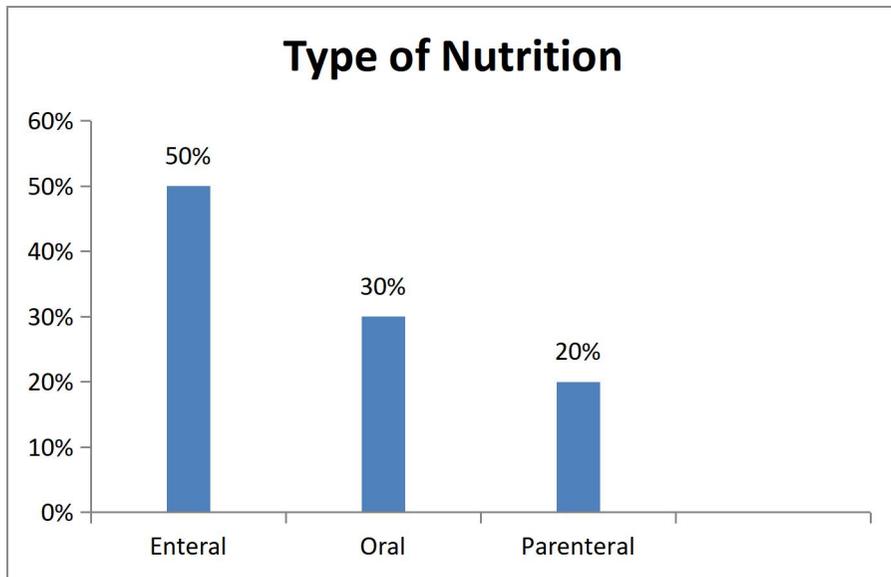


Figure (6): Distribution of the studied neonates according to their type of nutrition (n=50).

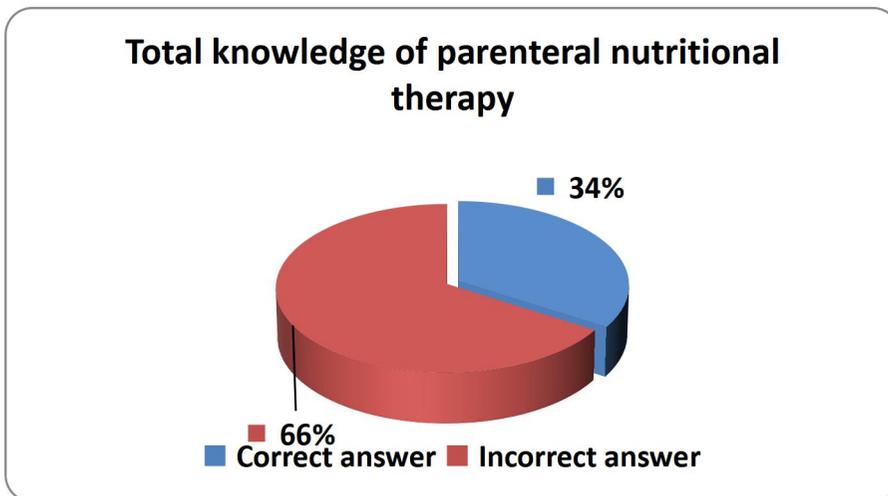


Figure (7): Distribution of the studied nurses according to their total knowledge regarding parenteral nutritional therapy for high-risk neonates (n=50).

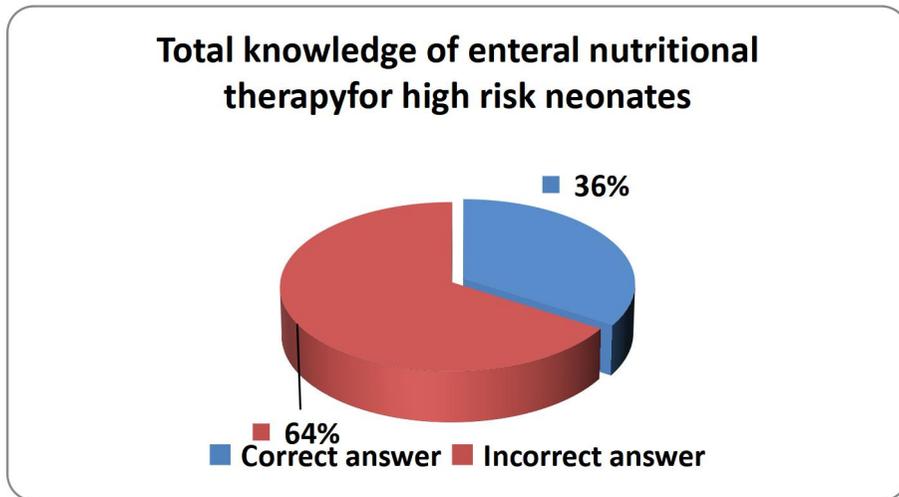


Figure (8): Distribution of the studied nurses according to their total knowledge regarding enteral nutritional therapy for high-risk neonates (n=50).

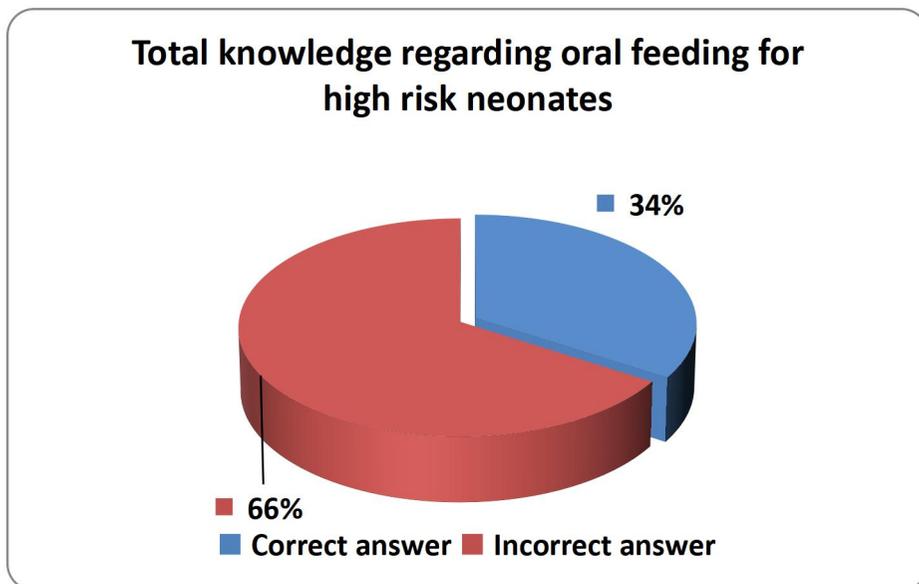


Figure (9): Distribution of the studied nurses according to their total knowledge regarding oral feeding for high-risk neonates (n=50)

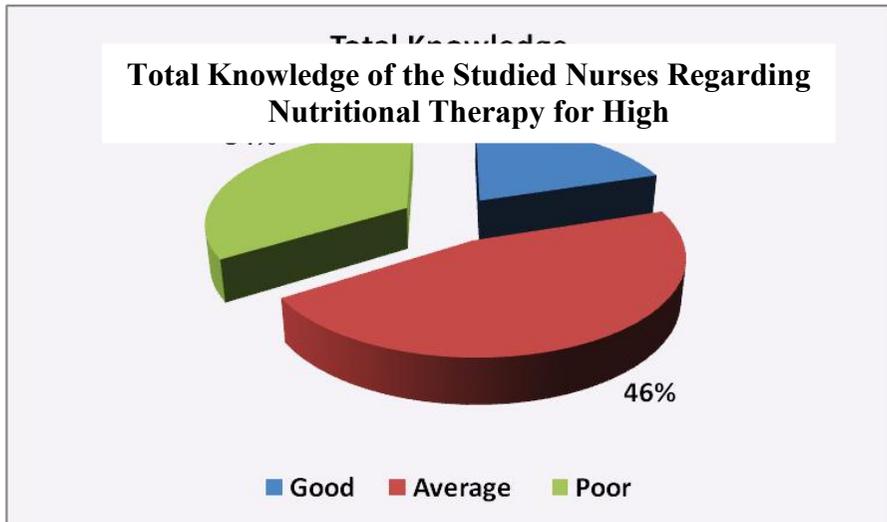


Figure (10): Distribution of the studied nurses according to their total knowledge regarding nutritional therapy for high-risk neonates (no=50).

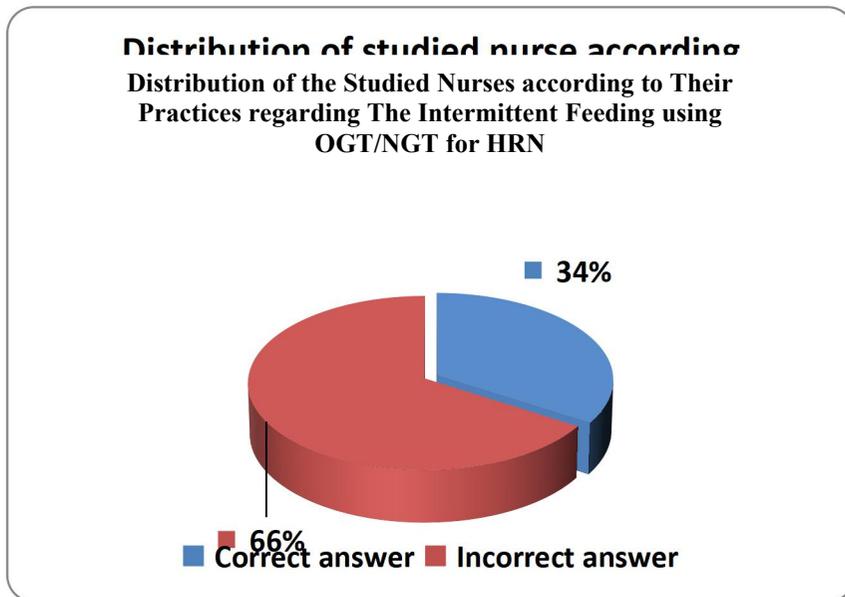


Figure (11): Distribution of the studied nurses according to their practices regarding the care of enteral feeding of high-risk neonate using OGT/NGT (n=50).

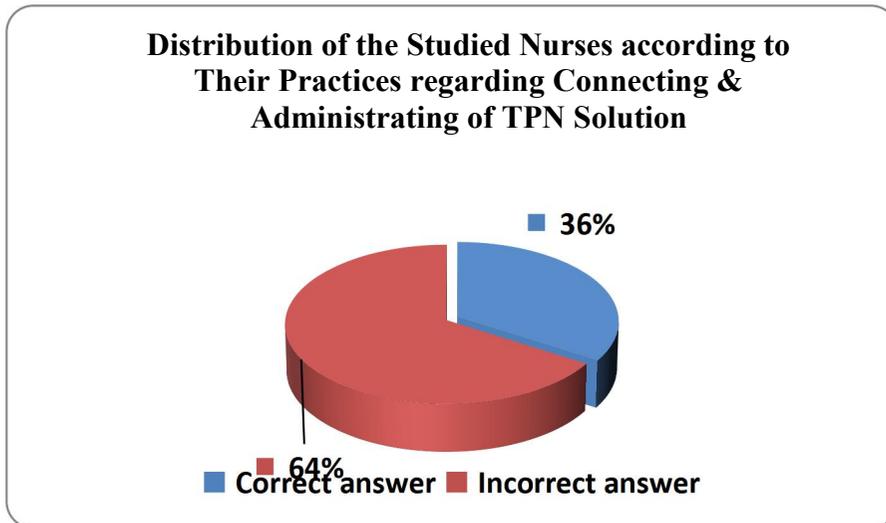


Figure (12): Distribution of the studied nurses according to their practices regarding connecting & administrating TPN solutions (n=50).

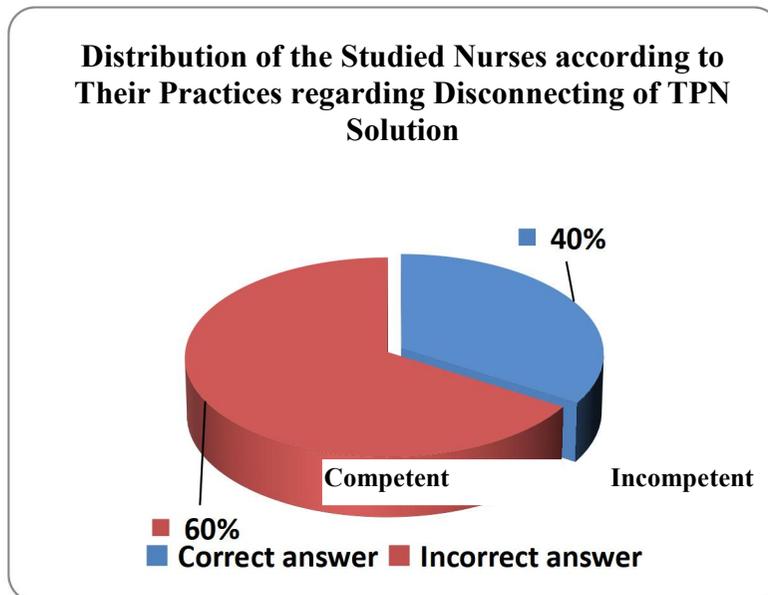


Figure (13): Distribution of the studied nurses according to their practices regarding disconnecting TPN for high-risk neonates (n=50).

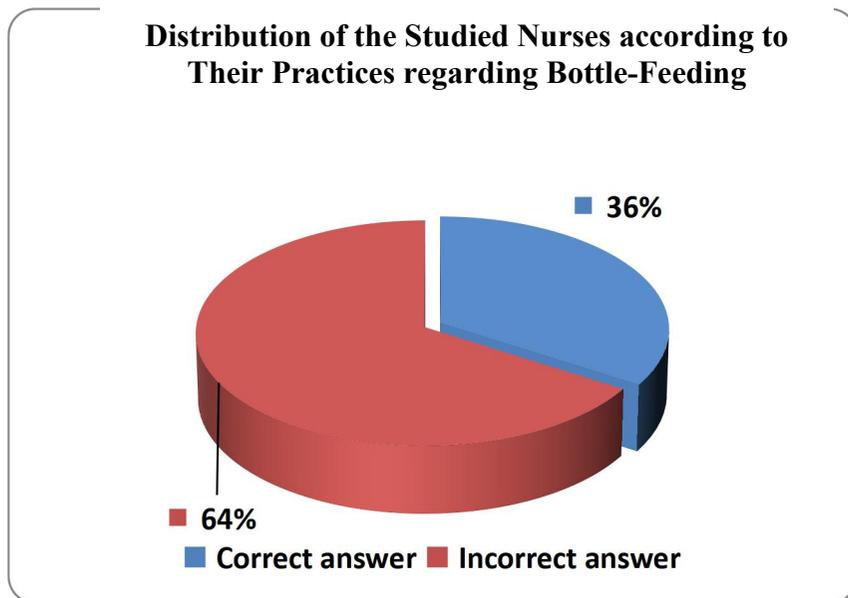


Figure (14): Distribution of the studied nurses according to their practices regarding bottle-feeding for high-risk neonates (n=50).

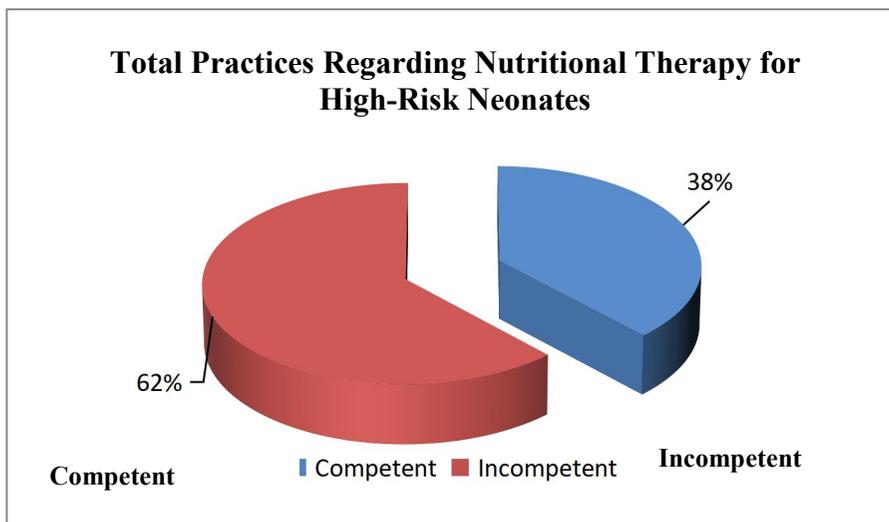


Figure (15): Distribution of the studied nurses according to their total practices regarding nutritional therapy for high-risk neonates (n=50).

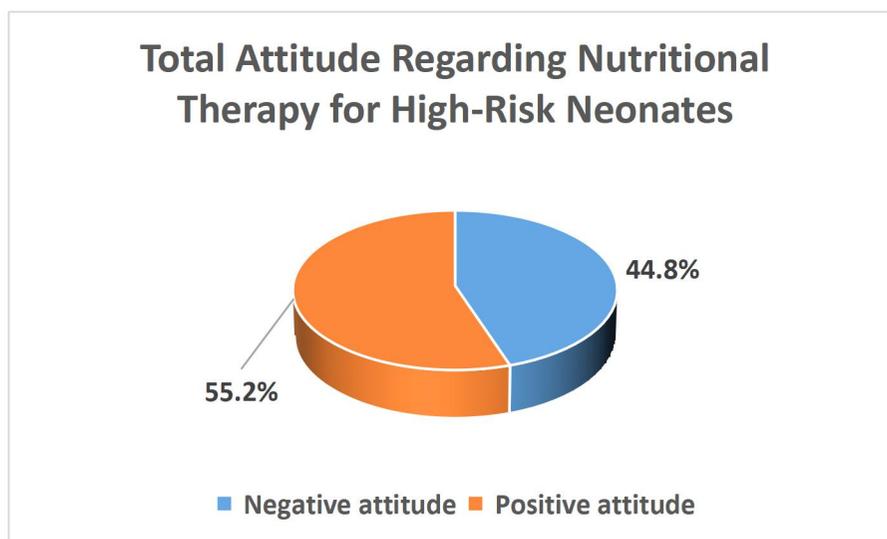


Figure (16): Distribution of the nurses' total attitude regarding nutritional therapy for high-risk neonates (n=50).

Table (3): Correlation between the studied nurses' knowledge, practices and their attitude in relation to nutritional therapy for high-risk neonates (n=50).

Item	Knowledge	Practices	Attitude
Knowledge	—	r→ 0.71 p-value→*0.02	r→ 0.79 p-value→*0.01
Practices	—	—	r→ 0.64 p-value→*0.04

(*) Statistically significant at $p < 0.05$

Discussion

Nutritional therapy is a regular part of neonates' care, it should be started as soon as possible after admission to the Neonatal Intensive Care Unit (NICU) and should be maintained as long as the infant doesn't feed adequately. The initial goal of nutritional therapy is to minimize losses and preserve existing body stores, it progresses to provide nutrition in order to promote growth and development (Academy of Nutrition and Dietetics, 2016 and Burdall et al., 2017).

Nursing managements for high-risk neonates is known by the neonatal needs and consider an adequacy of knowledge, practices and previous background. When nurses have a good comprehension about necessary concepts in nursing skills, help in promote nursing practices. Knowledge and skills of the nurses regarding nutritional therapy for high-risk neonates are two essential factors in preventing errors. While, nursing care quality more affected at neonatal outcomes. So, positive progress in neonatal integrity can be carried out by

proper nursing practices (**Grover et al., 2012**).

Therefore the current study aimed to assess the nurses' role toward nutritional therapy for high risk neonates.

Regarding the characteristics of the studied nurses, the results of the current study showed that, the majority of them were females, the mean age was 28.2 ± 1.9 years. The current findings are not in agreement with **Mula (2011)**, who conducted a study titled as "Assessment of nurses' knowledge and practice about pediatrics enteral nutrition in special care units" showed that, the age of the majority of the studied nurses was between 35-45 years old. Also, the present findings are consistent with **Abdelhady et al., (2020)**, who studied the effect of implementing a guideline protocol on nurses' knowledge about the nutritional requirements of low birth-weight infants and found that, more than half of the studied nurses' age was between 20 to 30 years old, with a mean age of 28.92 ± 6.71 years. This result could be related to the junior nurses, who were working as a staff nurse in neonatal intensive care units which considered a dynamic and fast-moving environment that needs active young nurses. Also, the passion and the females familiar feeling this reason for the high percentage of the female in the present study, also she was able to deal with their sense of mother had newborn making them successful at work in NICU.

The findings of the current study illustrated that nearly half of them had graduated from diploma of secondary nursing school. This finding is in an agreement with **Salah and Hassan (2017)**, who conducted a study about "Nurses' performance in premature transition from gavage to breast feeding

at NICU in Cairo University Hospitals" and found that, more than half of nurses had a diploma of secondary nursing school. This is may be due to the fact that nursing secondary school provides the community with large number of graduated diploma nurses than other agencies such as faculties of nursing and technical nursing institute.

Regarding nurses' years of experience, the findings of the current study clarified that, nearly half of them had 5 to less than 10 years of working experience in the NICU with the mean years of experience was 9.4 ± 0.6 years. The current result is in disagreed with **Metwaly et al., (2013)**, who conducted a study with title "Nurses' performances regarding naso-gastric tube feeding in neonatal intensive care units" and clarified that, one third of them had years of experience range between 1: 4 years. Also, this result is in an agreement with **Ezenduka et al., (2016)** who conducted a study about "the knowledge, attitude, and practices of nursing management of birth asphyxia in Nigeria" and stated that one-third of the studied nurses fall within 6-10 years of experience. This is may be due to the majority of the studied sample were in diploma.

In relation to the studied nurses' attending of training courses, the finding of the present study revealed that more than half of them attended training courses related to nutritional therapy for high- risk neonates. The current results are supported by **Metwaly et al., (2013)**, who clarified that, more than half of the studied nurses attended previous training courses. This result may be due to lack of in-service education and staff development in hospital.

Concerning the characteristics of the studied neonates, the findings of the

present study showed that, the mean gestational age was 33.2 ± 1.1 weeks and more than half of them were males, and less than half of them were their birth weight at delivery ranged between 2000:< 2500 gram. Moreover, more than half of them were small for gestational age while, more than two thirds of them were preterm and half of them received enteral feeding. These findings are in accordance with **Karagol et al., (2013)**, who conducted a study entitled “Randomized controlled trial of slow vs. rapid enteral feeding advancements on the clinical outcomes of preterm neonates” and concluded that, two thirds of the studied neonates were preterm, and were small for gestational age and more than half of them were males. This may be due to that; the male gender of neonates is more susceptible to health problems than female. In addition, the essential need for preterm and small of gestational age neonate is, to establish the nutritional status.

Concerning the total knowledge of the studied nurses regarding parenteral nutritional therapy for high-risk neonates, the findings of the present study showed that, almost two thirds of them had incorrect total knowledge. the findings of the current study are supported by **Al-Rafay and Al-Sharkawy (2012)**, who indicated low total knowledge score before implementation of the guidelines. Also, these findings are in accordance with the study of **Mohamed and Taha (2014)**, who conducted a study titled as “critical care nurses’ knowledge and practice regarding administration of total parenteral nutrition at critical care areas in Egypt” and clarified that, more than half of the studied nurses had unsatisfactory knowledge score related to administration parenteral nutrition therapy. Also, these findings are in a similar study by **Abdel-Fattah et al.,**

(2018), who Concluded that, more than three quarters of the studied nurses had unsatisfactory level of total knowledge scores. This may be due to lack of knowledge resulted from lack of supervision, absence of standard guidelines and continuous in-service training programs for neonatal nurses to improve the advanced nursing role.

The result of the present study showed that, less than two thirds of the studied nurses had incorrect total knowledge regarding enteral nutritional therapy for high-risk neonates. These finding are in accordance with the study of **Metwaly et al., (2013)**, who clarified that more than half of studied nurses had unsatisfactory level of knowledge regarding enteral feeding administration. Also, these finding are in agreement with **Nalukenge (2016)**, who conducted a study titled as “knowledge, attitude and practice toward nasogastric tube insertion among the nurses in international hospital” and pointed that the knowledge of the nurses about enteral nutrition in the critical care department was low. And in similar with **Mohamed et al., (2019)**, who conducted a study titled as “assessment of nurses’ knowledge and practices regarding nasogastric tube at neonatal intensive care unit in Baghdad hospital” and showed that the more half of the participants had poor knowledge regarding nasogastric tube in NICU. And in dis agreement with **Morphet et al., (2016)**, who conducted a study titled as “intensive care nurses’ knowledge of enteral nutrition” and stated that three fifth of respondent had good level of knowledge about enteral nutrition and minority was excellent. This may be due to absence of guideline written protocols related to enteral nutrition and absence of scientific teaching activities in clinical field made by direct supervisor in hospital to refresh the nurses’ knowledge.

As regarded the oral feeding of high-risk neonates, the current study findings showed that, almost two thirds of the studied nurses had incorrect total knowledge regarding oral feeding for high-risk neonates. These result is in disagreement with the study of **Ahmed (2013)**, who stated that the great majority of the nurses have an average and good level of knowledge about the bottle feeding. Also, this result is in disagreement with the study of **Aisa et al., (2019)**, who conducted that, most of nurses had correct knowledge regarding bottle feeding. This may be attributed to lack of attending training program to update nurses' knowledge about oral feeding.

Nursing profession is one of the largest resources in the field of health care. Nurses have direct impacts on the neonates care as well as, its consequent outcomes. The results of the present study revealed that, only, less than quarter of them had good level of total knowledge regarding nursing role toward nutritional therapy for high-risk neonates. These finding is in agreement with **Abdalla (2019)**, who conducted that nurses' knowledge was inadequate regarding feeding of preterm. Also, these finding is in agreement with **Abdelhady, et al., (2020)**, who found that, two thirds of the studied nurses had insufficient knowledge about nutritional therapy of low-birth-weight infants. This may be due to lack of written protocols or resources of information regarding nutritional therapy, lack of supervision and absence of in-service training program.

Regarding the competency level of the studied nurses for care of neonate with Naso/Orogastric tube, the finding of the present study clarified that, almost two thirds of the studied nurses were incompetent. The finding of the present study was supported by **Ahmed et al.,**

(2018), who concluded that the most of the studied nurses were incompetent regarding care of neonate naso-gastric tube regarding pre-educational program. This could be attributed, to that they didn't attend previous training courses about care of tube feeding.

The finding of the current study showed that, more than two thirds of the studied nurses were incompetent regarding intermittent neonate feeding using OGT/NGT. Moreover, two thirds of them were incompetent regarding administration of neonate bolus feeding. These finding is in agreement with **Premji (2015)**, who conducted a study about "Enteral feeding for high risk neonates: A digest for nurses into putative risk and benefits to ensure safe and comfortable care" and concluded that, nearly two thirds of the studied nurses were incompetent regarding enteral nutrition for neonate. This may be due to nurses' shortage of staff and lack of supervision.

Regarding the nurses' competency level about connecting, administrating and disconnecting neonatal TPN solutions, the findings of the present study showed that, almost two thirds of them were incompetent in their practices. The present findings are supported with the study by **Hamidreza et al., (2013)**, who conducted a study titled as "Auditing preterm neonatal nutrition nursing care" and showed that, three quarters of the studied nurses had incompetent total performance scores about nursing care of parenteral nutritional therapy for high-risk neonate. Also, these findings are supported by **Abd Elfattah et al., (2018)**, who concluded that, more than two third of the studied nurses had incompetent total practices scores about nursing care of parenteral nutritional therapy for high-risk neonate. This may be due to lack of standard policies and procedures regarding total parenteral nutritional therapy.

Concerning the competency level of the studied nurses about bottle feeding, the finding of the current study clarified that, two thirds of them were incompetent. These findings are not supported by the study of **Ramdan et al., (2019)**, who conducted a study titled as “the assessment of nursing practice regarding neonates with hyperbilirubinemia” and found that, nurses had satisfactory level of practice regarding bottle and gavage feeding. This may be due to lack of attending in- service training program about bottle feeding.

Concerning the competency level of the studied nurses in the present study regarding measuring weight, measuring abdominal circumference and assessment skin integrity concluded that, less than half of the studied nurses were incompetent regarding measuring weight. Meanwhile more than two thirds of them were incompetent regarding measuring abdominal circumference and assessment skin integrity. These finding are supported by **Mohamed et al., (2019)**, who conducted a study titled as “assessment of nursing care provided to neonates undergoing phototherapy” and concluded that more two thirds of the studied nurses had poor level of practice regarding measuring weight. This may be due to the nurses not knowing the importance of measuring of weight, abdominal circumference and assessment of skin integrity due to lack of continuous training programs about importance of anthropometry measurement.

Regarding the total practices of the studied nurses about nutritional therapy for high risk neonates, the finding of the current study reported that, more than half of them were incompetent in their practices. These finding is in accordance with **Ameri et al., (2016)**, who conducted a study titled as “Effect of a Comprehensive Total Parenteral Nutrition Training Program on Knowledge and Practice of Nurses in

NICU” and revealed that, nearly two thirds of the studied nurses were incompetent concerning their practices about nutritional therapy for high-risk neonates preprogram implementation. Also, these results are in agreement with **AL-Hawaly et al., (2016)** who conducted a study titled as “assessment of nurses' knowledge and performance regarding feeding patients with nasogastric tube in Ismailia General Hospital” and found that more than half of the studied nurses had an unsatisfactory level of practice regarding enteral feeding administering. This may be due to resistance of nurses to change, in additions to that most of staff nurses were carry out procedures without following the standerized nursing procedures, that may be attributed to the fact that the actual care regarding nutritional therapy for high-risk neonates did not performed by those who have experience and previous training programs, adding to lack of supervision from professionally trained head nurses, who can teach and guide them.

Regarding the total attitude of the studied nurses about nutritional therapy for high-risk neonates, the finding of the current study reported that, more than half of the studied nurses had a positive attitude toward nutritional therapy for high-risk neonates. These findings are in agreement with **Weshahy et al., (2019)**, who studied knowledge, attitude and practice among medical staff toward breastfeeding management and concluded that, more than half of studied nurses had a positive attitude regarding breastfeeding. Also, these finding is in agreement with **Ramuada (2017)**, who studied assessment of knowledge, attitude and practice of nurses regarding enteral nutrition at a military hospital and stated that nurses had a positive attitude toward enteral nutrition. This result may be to those nurses working with high-risk neonates should have a positive attitude

toward all aspects of caregiving for those fragile high-risk neonates.

In the result of the present study, it was found that, there was positive correlation between the nurses' knowledge, practices and their attitude about nutritional therapy for high-risk neonates. These results are supported by **Thoene et al., (2018)**, who conducted a study entitled "Improving Nutrition Outcomes for Infants < 1500 Grams with a Progressive, Evidenced-Based Enteral Feeding Protocol" and reported that, there was positive correlation between the knowledge and the practices of the studied nurses regarding nutrition of high-risk neonates. Also, these results are supported by **Macho (2018)**, who clarified that, there was significant moderate positive correlations between knowledge, attitude and perceived self-competency. This may be due to the impact of nurses' level of knowledge on their level of practice and attitude regarding nutritional therapy for high-risk neonate.

Conclusion

The current study concluded that, less than half of the studied nurses had an average level of total knowledge regarding nutritional therapy for high-risk neonates. Also, less than two-thirds of them had an incompetent level of practice in relation to nutritional therapy for high-risk neonates and more than half of them had a positive attitude toward nutritional therapy for high-risk neonates.

Recommendations

- Establish a written updated protocol about nutritional therapy to improve the nurses' performance regarding nutritional therapy for high- risk neonates.

- Training program should be provided for all nurses working in NICUs to improve their performance regarding nutritional therapy for high- risk neonates.
- Periodically assessment for nurses' knowledge level and practices regarding nutritional therapy for high-risk neonates.
- Replication of this study on a larger probability sample from the different geographical locations at the Arab Republic of Egypt and further research.

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