Establishing basic standards for nursing management of neonates with hyperbilirubinemia

Fawzia Nabeel Mohammad[(1)] Amal Mohammed El-Dakhakhny[(2)] Hanaa Abd El-fatah[(3)] Saher Hamdy El-Sayed[(4)] Samah El-Awady Bassam[(5)]

[(1)] Assistant lecturer of Pediatric Nursing, Faculty of Nursing, Zagazig University [(2)] Professor of Pediatric Nursing [(3)]Professor of Pediatrics medicine [(4)] Professor of Nursing Administration [(5)] Assist. Professor of Pediatric Nursing

Abstract:

Background: Nursing management of newborn with hyperbilirubinemia requires a comprehensive approach. Jaundice is one of the most common conditions needing medical attention in neonates. Approximately 60% of term and 80% of preterm neonates develop jaundice in the first week of life. **Aim of the study** was to establish basic standards for nursing management of neonates with hyperbilirubinemia. **Subject & Methods: Research Design:** A descriptive qualitative design. **Setting:** The neonatal intensive care units of the University Children's Hospital at Zagazig University Hospitals. **Subjects:** Two groups of subjects were included: a expert group and nursing group. The expert group consisted of 37 experts including nurses' supervisors, head nurses and assistance of head nurses and they were 12 members, 19 medicine faculty members, and 6 nursing faculty members. The nursing group consisted of 33 nurses. **Tools of data collections:** Four tools were used to collect data: *structure interview sheet*,*Knowledge assessment sheet* ,*Observational checklist and Resources checklist:*. **Results:** The study revealed that there was general agreement from the expert group regarding the broad basic competencies and its underlined supported standards. Based on that result, standard of nursing care of neonates with hyperbilirubinemia was established. The proposed standards had acceptable face and content validity though agreement of a group of jury. **Conclusion:** It can be concluded that the study achieved its goal of establishing standard of nursing care for neonates with hyperbilirubinemia. The established standard includes structure, process, and outcome standards with emphasize on "process standard". **Recommendations:** It is recommended to apply the developed nursing standards in the study setting and also in similar settings in other hospitals.

Key words: Neonatal hyperbilirubinemia, Nursing care, Standards of nursing care

Introduction:

Jaundice is one of the most common conditions needing medical attention in neonates. Approximately 60% of term neonates and 80% of preterm develop jaundice in the first week of life, and about 10% of breastfed neonates are still jaundiced at 1 month of age. [(1)]

Jaundice is a serious problem in the first week of life. It is a cause of concern for the physician and a source of anxiety for the parents. High bilirubin level may be toxic to the developing central nervous system and may cause neurological impairment even in term newborns**.** [(2)]

Severe neonatal hyperbilirubinemia, with consequent encephalopathy, remains a common cause of morbidity and death in many regions of the world. Poor access to clinical laboratory resources and screening programs to measure plasma bilirubin levels is a major contributor to delayed treatment in developing countries, and the cost of existing point-of-care screening instruments precludes their dissemination. [(3)] The goal of neonatal hyperbilirubinemia management is to prevent neurotoxicity, encephalopathy, and kernicterus.[(4)] Thus, treatment of

hyperbilirubinemia can be prophylactic, when the purpose is to prevent further increase in the total serum (TSB) level, or therapeutic, when the objective is to rapidly decrease a TSB level that is a threat to the infant**.** [5]

Nursing management of newborn with hyperbilirubinemia requires a comprehensive approach. As members of the health care team, nurses share in the responsibility for early detection and identification, family education, management, and follow-up of the mother and newborn. Documentation of the timing of onset of jaundice is essential to differentiate between physiological and pathological jaundice. Nurse can improve care by offering their presence and supporting. [6]

Significance of the study

The purpose of standards is to describe the responsibilities for which registered nurses are accountable and provide a framework for this accountability. [7] The purpose of publishing, circulating, and enforcing nursing care standards are to improve the quality of nursing care, decreases the care costs, and determine the nursing negligence. [8]

In addition, measuring performance is impossible if standards have not been clearly established.[9] Standards are considered the first step in the evaluation process that determines the effectiveness of nursing care. [10] Measuring and comparing performance among health care providers and health organizations is important as it encourages better performance which results in good quality practice. [11] Standards are tools that serve as guides and legal measures that determine if care constitutes adequate, effective and acceptable nursing practice. [12]

Failure to prevent and manage neonatal hyperbilirubinemia results in permanent disabilities or even neonatal deaths, despite evidence–based guidelines for monitoring and treating hyperbilirubinemia. That means variation in care still persists. Establishing standards for nursing care is essential and vital because the main purpose of professional standards is to direct and maintain safe and clinically competent nursing practice as they provide an evaluation tool to ensure clinical proficiency and safety.

Aim of the study:

The aim of this study was to establish basic standards for nursing management of neonates with hyperbilirubinemia

Research question:

What are the basic standards for nursing management of neonates with hyperbilirubinemia?

Subjects and methods:

Research design

A descriptive qualitative design was used in this study.

Study Setting

This study was carried out at the neonatal intensive care unit (NICU) of the University Children's Hospital at Zagazig University Hospitals

Study Subjects

Two groups of subjects were included in this study, the expert group and nursing group.

Group I: Expert group

It consisted of 37 experts including three categories. The first category included all NICU nurses' supervisors, head nurses and assistance of head nurses and they were 12 members. The second categories included 19 medicine faculty members at

Zagazig University in the field of neonatology. The third category included 6 nursing faculty members at different Egyptian universities.

Group II: Nursing group

It consisted of 33 nurses in the neonatal intensive care unit including only 20 nurses who are providing direct care for neonates with hyperbilirubinemia in the above mentioned setting.

Tools of Data Collection

Four tools were used for conduction of this study.

Tool I:

A structured questionnaire sheet was developed by the researcher in order to identify the expert's opinions regarding the basic competencies required by critical neonatal nurses during the provision of care for neonates with hyperbilirubinemia.

Tool II:

Knowledge assessment sheet was developed by the researcher to evaluate critical care nurse's theoretical knowledge related to the direct nursing care that should be given for neonates with hyperbilirubinemia.

Tool III:

An observational checklist was developed by the researcher to identify the actual nurse's performance providing direct care for neonates with hyperbilirubinemia. It was aimed at testing the applicability of the developed nursing care standards.

Tool IV:

A resource checklist was developed by the researcher to assess the availaiability of resources needed for nursing practice of neonates with hyperbilirubinemia. It was consisted of two parts:

- Human resources (man power).
- Material resources (equipment and supplies).

Scoring system for nurses' knowledge

Percent scores for nurses' knowledge regarding each item were classified into three levels as following:

1. Complete answers: the score of answer was equal or more than 75%
2. Incomplete answer: the score of answer was equal to 60% or more.
3. Incorrect or no answer: score of answer was less than 60%

Scoring system for nurses' performance level

Percent scores for nurses' competencies were classified into three levels as following:

1. Competent: competent level of performance was achieved by the nurse at a score of 75% or more.
2. Not competent: incompetent level of performance was at a score less than 75%.
3. Not done: competencies were considered as not done at a score less than 50%.

Content Validity and reliability

Tools for data collection were validated by three experts in the field for both face and content validity Reliability analysis (Cronbach's Alpha): it allows studying the properties of measurement scale and the items that make them up. The reliability analysis procedure calculates a number of commonly used measures of scale reliability and provides information about the relationships between individual items in the scale. It is a model of internal consistency based on the average inter-items correlation. Alpha must be > 0.7 to be considered reliable.

Fieldwork:

The actual fieldwork of the study was started from the beginning of August, 2013 and accomplished by the end of January, 2014. The field work was achieved through the following five phases:

- ***First phase:*** concerned with eliciting the opinions of expert group regarding basic competencies and its underlined activities that should be done by neonatal nurses for management of neonatal hyperbilirubinemia.

- ***Second phase:*** concerned with designing the proposed nursing care standards for neonates with hperbilirubinemia. This proposed standard was designed by the researcher based on comprehensive reviewing of international and national literature concerned with nursing care management for neonates with hyperbilirubinemia and nursing care standards.

- ***Third phase:*** aimed at testing the validity of the proposed standards. Two types of validity tests were used in this phase: face validity and content validity. *Face validity* aimed at inspecting the items to determine whether the tool measures what it supposed to measure. Content validity was conducted to determine whether the tool covers the appropriate and necessary content, as well as its relevance to the tool aim. The proposed nursing standards were distributed to the members of the jury group to elicit their opinion regarding opinionnaire items (face validity) and its contents (content validity). It was self-administered, and it was returned back to the researcher within two weeks. The proposed nursing care standards were modified according to the juries' opinion.

- ***Fourth phase:*** it aimed at determining staff nurses' opinions about the importance of proposed standards criteria. The aim of the study and the questionnaire format was explained to the directors, as well as to the head nurses of the units. Then the questionnaire was distributed to all staff nurses present at the shift. Each nurse received a copy of the questionnaire form that was self-administered. Each one completed her/his copy and handed it back to the researcher at the same session. This technique provided a high response rate and allowed the researcher to offer a clarification for any ambiguities if there are confusing questions. The average time of filling the questionnaire was 45-60 minutes.

- **Fifth phase:** It was aimed at testing the applicability of the developed nursing care standards. The observation was performed during the morning, afternoon and night shifts. It was done for staff nurses in the neonatal intensive care units. The researcher visited each setting twice per week during the morning, afternoon or night shifts, according to the time available to the researcher. During the visit, the researcher observed nurses' performance using the observation checklist three times for each one. The average duration of the observation was from three to four hours per shift except for night shift (the duration was from two to three hours). Additionally, the structural standards were observed once for each unit.

Pilot study:

A pilot study was done for testing clarity and applicability of the tools, and time needed for filling them. The pilot study was done on 10% of the nurses chosen from the study settings. The tools of data collection were distributed to the nurses and collected

at the same day. The respondents were asked to fill in the questionnaire. Some modifications were done based on the findings of the pilot. The average time for filling the questionnaire was 45-60 minutes. Subjects included in the pilot study were not included in the study sample.

Administrative & Ethical considerations:

To carry out the study at the selected settings, official letters were addressed from the Dean of the Faculty of Nursing at Zagazig University to the directors of the selected hospitals. All the head nurses of the both units were also contacted and their help sought for carrying out the fieldwork. All principles of ethics in research were followed. The research proposal was approved by pertinent committees. The participants were informed about the purpose and procedures of the study, and their verbal informed consent was obtained. They were informed about their rights to refuse participation or withdrawing at any time. They were also reassured that all obtained information will be confidential, and will only be used for the purpose of research. The study maneuvers could not entail any harmful effects on participants.

Statistical analysis

Data entry and statistical analysis were done using SPSS 14.0 statistical software package. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables and means and standard deviations for quantitative variables.

Results:

Table (1) illustrates general characteristics of the nurses included in the study. It was found that, 87.9% of the study nurses were more than 30 years old, with mean age of 35.8 ± 5.2 years. Regarding their education, 72.7% are secondary school graduate, 21.2% have baccalaureate degree in nursing and only 6.1% have a technical institute certification.

Unfortunately, the results revealed that 60.6% of nurses had training courses in nursing as general, but none of them attended any training courses in nursing as specific to neonatal care.

Table (2): clarifies that 96.9% of the study nurses gave complete definition for neonatal hyperbilirubinemia, while 90.7% of them gave no and incorrect answers regarding causes and risk factors. In addition, it was found all of the study nurses gave no answer in relation to phases of acute bilirubin encephalopathy.

Regarding investigations for neonatal jaundice, 81.8% of nurses gave complete correct answer. Unfortunately, 72.7% of nurses gave incomplete answer regarding factors that affecting efficacy of phototherapy, while the same percentage (72.7%) gave complete correct answer regarding treatment methods.

Table (3): illustrates expert group opinions regarding basic competencies of nursing care for neonates with hyperbilirubinemia. It is clear that the majority of the participants of expert group agreed upon nursing competencies by percentage ranged from 51% to 100%.

Regarding on admission nursing assessment, the lowest percentage of participants agreement was related to nursing assessment for signs of bilirubin encephalopathy as only 51% of the total participants agreed for that competency, followed by taking medical history by the nurse (54% agreed) and then followed by early detection of severe hyperbilirubinemia by the nurse (57% agreed).

The highest percentages were related to nursing assessment regarding

respiratory rate and body weight (100% agreed), followed by nursing assessment for neonatal alertness (93% agreed), and then body color (91% agreed) in addition to urine and stool assessment (91% agreed).

In relation to providing nursing measures to reduce unconjugated hyperbilirubinemia, it was found that all participants of expert group agreed upon all the criteria in percentage of 100%. In regard to providing nursing measures for effective nursing care, it was clarified that the participants of the expert group agreed upon nursing competencies by percentage that ranged from 72% to 100%.

Regarding maintaining fluids and electrolyte balance, 72% of the expert group agreed followed by maintaining adequate caloric intake in a percentage of 81% and then followed by reducing and managing neonatal pain in a percentage of 89%. On contrary, the highest percentages were related to all the other criteria.

Table (4): illustrates nurses' level of performance. The table indicates that there are many competencies that were not done by any of nurses such as assessment for emergency signs, taking history, physical examination, assessment for risk factors of neonatal jaundice, as well as assessment for early signs of bilirubin encephalopathy.

On contrary, the same table illustrates that 100% of the studied nurses have competent level of performance in relation to measuring vital signs, measuring weight as well as noting the extent of jaundice.

Table (5): clarifies nurses' level of performance to reduce bilirubin level. The table illustrates that 80% of the studied nurses have competent level of performance regarding ensuring early feeding and adequate hydration. In regard to preparation for phototherapy, 100% of nurses have competent level of performance. In addition, 90% of nurses have competent level of performance in regard to providing nursing care for neonates under phototherapy.

All of the study nurses were competent in regard to equipment preparation for exchange transfusion. Conversely, 80% of them didn't demonstrate competent level of performance regarding nursing monitoring for Post-exchange potential complications.

Table (6): represents nurses' level of performance regarding monitoring risk factors of bilirubin encephalopathy and routinely care provided for neonates with hyperbilirubinemia. It is clear from the table that 100% of the studied nurses have incompetent level of performance regarding all criteria that related to monitoring risk factors of bilirubin encephalopathy.

Table (7) clarifies availability of the necessary equipment and supplies at the NICU. It is clear that most necessary equipment are available except for eye shields, transcutaneous bilirubinometry, and Portable surgical illumination.

Discussion

Hyperbilirubinemia is a common problem that needs attention during the neonatal period age. Edmonds & Dewhurst's [1] Neonatal jaundice, if not managed properly, can progress to severe neonatal jaundice (SNNJ) leading to death or permanent disability Abai et al [13] .Severe indirect hyperbilirubinemia may induce irreversible toxic consequences mainly in the nervous system if left untreated. Furthermore, direct (conjugated) hyperbilirubinemia may be along with serious underlying causes Kliegman [14].

Findings of the present study showed that all nurses of the present study were females. The majority of them were more than 30 years old with mean age of

35.8±5.2 years. The low percentage of the studied nurses (less than one quarter) had bachelor degree and none of them had postgraduate degree. This may be due to that all nurses who had nursing school diploma are the responsible for direct patient care so, they represent the majority. Years of experience of the studied nurses ranged from 6 to 25 years with mean of 17.4±5.9 years. These findings are consistent with El Sayed study [15] which found that 60% of the nurses were 30 to less than 40 years old, with mean age were 31 ± 6 and 67.1% of them are secondary nursing school.

According to results of the current study, more than half of nurses reported their attending to training or educational courses in nursing as general but, none of them attended any courses or workshops in nursing as specific to neonatal care. This result needs deep insight. This may be due to shortage of nurses and increased workload in Neonatal Intensive Care Unit that make it impossible for nurses to attend any training or educational courses. In addition, there is a lack of motivation for training and negligence or omission from the officials as well as absence of continuing education department in the hospital. The findings of the current study are in line with El Sayed [15] who figuring out that, most of nurses didn't attend any previous in-service training program related to neonatal care at NICU.

Knowledge of nurses

The present study assessed nurses' knowledge and found that the majority of nurses defined neonatal jaundice completely correct. This may be due to the appearance of the disease itself or may be due to the many cases that the nurses deal with as a result of years of their experience. This result was in consistent with a study conducted by Abai et al. [13] who found the same as the majority of nurses were able to define jaundice. On contrary, the study which conducted by Ogunfowora & Daniel [16] showed that only the half of the respondents gave a correct definition of neonatal jaundice.

The study of Abai et al. [13] showed that more than half of nurses were able to identify the risk factors that causing jaundice and less than half of them were able to detect jaundice while high percentage of them knew sign of Kernicterus. On contrary, findings of the present study revealed that the majority of the studied nurses gave no answer or incorrect answer regarding causes and risk factors. They justified that as the causes or risk factors must be known by the physician, not by nurses, to detect the method and plan of treatment which the nurses carry out it only.

According to the National Association of Neonatal Nurses [17] , it is our responsibility as nurses to recognize these variables as risk factors for a rising serum bilirubin concentration after an infant is discharged from the nursery and is no longer under our watchful eyes. We must supplement our subjective assessment skills with objective technology and, combined with the latest and best evidence, identify newborns that require closer monitoring or treatment to eliminate the threat of bilirubin encephalopathy.

Regarding consequences and complications of severe hyperbilirubinemia, the present study found that nearly half of nurses demonstrate incomplete answer. Their incomplete answer may indicate their need for more theoretical knowledge because we think that their answers depended only on their experience in this area. On the same line, a study by Berhe et al. [18] showed that most of participants showed inadequate knowledge regarding complications of jaundice. On the opposite side, Ogunfowora & Daniel [16] revealed that

less than half of the respondent knew all of the correct answer about complications of neonatal jaundice.

Results of the present study showed that the high percentage of the studied nurses (more than half of them) gave incomplete answer regarding early signs of bilirubin encephalopathy. On contrary, Abai et al. [13] illustrated that the high percentage of nurses knew sign of Kernicterus. This may reflect the extent of our need for more effort to improve the level of knowledge among nurses in order to have the full information. Educational banners and booklets can be useful in this area to improve their knowledge.

The present study found that, physical examination was not done by any one of the studied nurses during observation. They only notify the physician with the obvious thing that was discovered by the chance as an abnormal. This may be due to absence of continuous nursing training especially for physical examination. West [19] clarified that because physical assessment was traditionally viewed as part of the doctor's role, it has not routinely been taught in nurse training. Now and with the advancement of nursing roles, it has been argued that physical assessment has become a key nursing skill.

In addition West [19] emphasized that the ability to physically assess the patient in a principled and systematic fashion, in conjunction with routine health assessment, is a necessary skill for the modern nursing professional working in critical care. It is further argued that, within the current climate of advancing nursing practice, the acquisition of this skill is important for all nurses, to improve patient care, not to supplant the skills of the junior doctor.

May be due to the same reasons, there are many nursing competencies that were not done by the nurses according to findings of the present study through our observations. These competencies include taking patient history, physical examination, assessment for risk factors of neonatal jaundice, assessment for early signs of bilirubin encephalopathy, and finally assessment and monitoring for neonatal Pain. These competencies need to be demonstrated by high qualified nurse when the responsible for direct care of patients in most Egyptian hospitals are the nurses who had secondary nursing school (nursing diplome).

Findings of the present study revealed that most of the studied nurses administrated competent level of performance regarding preparation of phototherapy unit, providing care for neonates under phototherapy, giving medications as prescribed, as well as preparation and assisting in exchange transfusion. Nurses' competent level of performance (although their dependency on physician orders) indicates that they only need more detailed and more training which are very important criteria of our standard to improve quality of patient care.

The present study found that all of the studied nurses were unable to identify phases of acute bilirubin encephalopathy. However, the majority of them gave complete answer in regard to laboratory investigations. This may be due to their responsibility for the daily collection and transportation of samples. This may reflect their good awareness. We think that they have good aptitude for learning so we must take advantage of this. There must be continuous education centers in the field of neonatology for nurses.

According to results of the present study, all the studied nurses showed incompetent level of practice regarding reducing environmental stressors and promoting growth and development. On contrary, more than half of them showed competent level regarding family support

and involvement. On the same context, according to a study conducted by Mohammed et al. [20] found that all of nurses implement developmental care steps before procedure incompletely. Solhaug, Bjork & Sandtro[21] clarified that admission of the newborn infants to the NICU means being exposed to a series of painful and stressful stimuli for which it is not prepared. These stimuli will not only trigger acute responses, but will also affect the structure and function of their immature brain.

CONCLUSION

It is concluded that this study achieved its goal of establishing standard of nursing care for neonates with hyperbilirubinemia. The established standard includes structure, process, and outcome standards with emphasize on "process standard" as it identifies what is expected from each nurse and describes what the nurse should do.

RECOMMENDATIONS

- The established standards should be translated into Arabic to be applied in the NICU in order to improve the quality of nursing practice.
- The established standards should be revised periodically to be up-to-date with the current rapid changes in the medical technology.

Table 1: General Characteristics of Nurses in the Study Sample

Demographic characteristics	No.	%
Age (years):		
≤30	4	12.1
>30	29	87.9
Mean±SD	35.8±5.2	
Nursing Education:		
Diploma in Nursing	24	72.7
Associate of science in nursing degree **(ASN)**	2	6.1
Bachelor degree **(BScN)**	7	21.2
Postgraduate degree	0	0.0
Years of Experience in nursing specific to neonates:		
≤10	6	18.2
11:20	13	39.5
>20	14	42.3
Mean±SD	17.4±5.9	
Attend Training Courses in nursing as general:		
No,	13	39.4
Yes,	20	60.6
Attend training courses in nursing as specific to neonatal care:	0	0.0
No,	33	100
Yes,	0	0.0

Table (2): Nurses' Level of Knowledge Regarding Neonatal Hyperbilirubinemia (n=33)

Nurses' Knowledge regarding neonatal hyperbilirubinemia	Complete answer		Incomplete answer		Incorrect Answer/no answer	
	No.	%	No.	%	No	%
Definition	32	96.9	1	3.1	0	0.0
Types	7	21.3	21	63.5	5	15.2
Causes and risk factors	0	0.0	3	9.3	30	90.7
Consequences or complications	0	0.0	17	51.5	16	48.5
Early signs of bilirubin encephalopathy	0	0.0	23	69.6	10	30.4
Phases of bilirubin encephalopathy	0	0.0	0	0.0	33	100
Laboratory investigations	27	81.8	6	18.2	0	0.0
Methods of treatment	24	72.7	9	27.3	0	0.0
Factors affecting efficacy of photothery	9	27.4	24	72.7	0	0.0
Role of nurse pre-phototherapy	4	12.1	29	87.9	0	0.0
Role of nurse during phototherapy	26	78.7	7	21.3	0	0.0
Role of nurse after phototherapy	0	0.0	4	12.1	29	87.9
Side effects of phototherapy	0	0.0	22	66.7	11	33.3
Indications of exchange transfusion	0	0.0	15	45.5	18	54.5
Equipment for exchange transfusion	30	90.9	3	3.1	0	0.0
Role of nurse pre-exchange transfusion	2	6.1	31	93.9	0	0.0
Role of nurse during exchange transfusion	27	81.8	6	18.2	0	0.0
Role of nurse post-exchange transfusion	0	0.0	12	36.4	21	63.6

Table (3): Agreement of expert group on basic competencies of nursing care for neonates with hyperbilirubinemia (n=37)

Basic competencies	Nursing expert group n=18		Medical expert group n=19		Total n= 37	
	No.	%	No.	%	No.	%
On Admission Nursing Assessment						
1. Assess for emergency signs	17	94	10	52	27	73
2. Take medical history	11	61	9	47	20	54
3. Assess for risk factors	18	100	11	57	29	78
4. Assess for early detection of severe jaundice	10	55	11	57	21	57
5. Assess for signs of bilirubin encephalopathy	9	50	10	52	19	51
Providing measures to reduce unconjugated hyperbilirubinem						
1. Ensure early feeding and adequate hydration	18	100	19	100	37	100
2. Implement phototherapy as ordered and provide related nursing care	18	100	19	100	37	100
3. Give IVIG (intravenous immunoglobulie) as prescribed	18	100	19	100	37	100
4. Assist in exchange transfusion	18	100	19	100	37	100
Providing measures for effective nursing care						
1. Ensure safety measures	18	100	19	100	37	100
2. Apply infection control	18	100	19	100	37	100
3. Maintain fluids and electrolyte balance	17	94	10	52	27	72
4. Maintain adequate caloric intake	17	94	13	68	30	81
5. Maintain neonates' body temperature	18	100	19	100	37	100

6. Reduce environmental stressors on neonates	18	100	19	100	37	100
7. Reduce and manage neonatal pain	18	100	15	79	33	89
8. Satisfy the psychological needs of neonates.	18	100	19	100	37	100
9. Support neonates/parents attachment	18	100	19	100	37	100
10. Offer parents verbal and written information	18	100	19	100	37	100
11. *Communicate data with staff members*	18	100	19	100	37	100

Table (4): Nurses' level of performance on admission care of jaundiced neonate (bedside nurses n= 20)

Nursing competencies	Competent (score ≥75)		Not competent (score ≥ 50)		Not done score<50	
	No.	%	No.	%	No.	%
• Assessment for emergency signs	0	0.0	0	0.0	20	100
• Identification (name, sex, date of birth, mother' name)	20	100	0	0.0	0	0.0
• History taking	0	0.0	0	0.0	20	100
• Vital signs	20	100	0	0.0	0	0.0
• Measuring weight	20	100	0	0.0	0	0.0
• Physical examination	0	0.0	0	0.0	20	100
• Assess for risk factors of neonatal jaundice	0	0.0	0	0.0	20	100
• Report bilirubin levels in terms of a newborn's age in hours (not days) to assess accurately for kernicterus risk	0	0.0	10	50.0	10	50.0
• Note the extent of jaundice (Kramer's rule) to estimate the level of bilirubin	20	100	0	0.0	0	0.0
• Assess for early signs of bilirubin encephalopathy	0	0.0	0	0.0	20	100
• Transcutaneous measurement of bilirubin	0	0.0	0	0.0	20	100
• Collecting blood specimen for prescribed investigation	0	0.0	20	100	0	0.0
• obtaining and handling other routine laboratory investigations	0	0.0	20	100	0	0.0
• Monitoring for complications associated with the phlebotomy procedure and the need for sample recollection and/or rejection	0	0.0	20	100	0	0.0

Table (5): Nurses' level of performance to reduce bilirubin level (bedside nurse = 20)

Nursing competencies	Competent (score ≥75)		Not competent (score ≥ 50)		Not done score<50	
	No.	%	No.	%	No.	%
1. Ensure early feeding and adequate hydration	16	80	4	20	0	0.0
2. Implement phototherapy as ordered and provide related nursing care						
• Preparation of phototherapy unit	20	100	0	0.0	0	0.0
• provide care for neonates under phototherapy	18	90	2	10	0	0.0
• assess for side effects of phototherapy	0	0.0	20	100	0	0.0
• monitoring for side effects of phototherapy	0	0.0	20	100	0	0.0
• accurate charting of phototherapy	0	0.0	20	100	0	0.0
3. Offer parents information on phototherapy						
	3	15	17	85	0	0.0
• Verbal	0	0.0	0	0.0	20	100
• Written						
4. Give IVIG (intravenous immunoglobulie) as prescribed	20	100	0	0.0	0	0.0
5. Offer parents information on IVIG	0	0.0	0	0.0	20	100
6. Assist in exchange transfusion						
• Offer parents information on exchange transfusion immediately when it is prescribed	0	0.0	20	100	0	0.0
• preparation of equipment	20	100	0	0.0	0	0.0
• Pre-procedure precautions & general preparation	20	100	0	0.0	0	0.0
• Preparation of the Infant	20	100	0	0.0	0	0.0
• Nursing care during procedures of exchange transfusion	20	100	0	0.0	0	0.0
• After procedure	2	10	18	90	0	0.0
• Nursing monitoring for post exchange potential complications	0	0.0	4	20	16	80
• *Documentation for exchange transfusion*	20	100	0	0.0	0	0.0

Table (6): Nurses' level of performance regarding monitoring risk factors of bilirubin encephalopathy and routinely care provided for neonates with hyperbilirubinemia (bedside nurse = 20)

Nursing competencies	Competent		Not competent		Not done	
	No.	%	No.	%	No.	%
Monitoring risk factors of bilirubin encephalopathy						
1. Nursing monitoring for metabolic acidosis	0	0.0	20	100	0	0.0
2. Nursing monitoring for lowered serum albumin	0	0.0	20	100	0	0.0
3. Nursing monitoring for sepsis or intracranial infections	0	0.0	20	100	0	0.0
4. Nursing monitoring for abrupt increases in blood pressure,	0	0.0	20	100	0	0.0
5. Nursing monitoring for hypoxia	0	0.0	20	100	0	0.0
6. Nursing monitoring for hypothermia,	0	0.0	20	100	0	0.0
7. Nursing monitoring for hypoglycemia	0	0.0	20	100	0	0.0
8. Nursing monitoring for prematurity, anemia,	0	0.0	20	100	0	0.0
9. Routinely care						
10. Respiratory Support	0	0.0	9	45	11	55
11. Thermoregulation	4	20	10	50	6	30
12. Infection control	0	0.0	20	100	0	0.0
13. Nutrition and hydration	17	85	3	15	0	0.0
14. Skin Care	20	100	0	0.0	0	0.0
15. Minimal Stress	0	0.0	20	100	0	0.0
16. Monitoring neonatal Pain	0	0.0	0	0.0	20	100
17. Care to Promote Growth and Development	0	0.0	20	100	0	0.0
18. Family Support and Involvement	4	20	16	80	0	0.0
19. Discharge Planning and Home Care	0	0.0	20	100	0	0.0
20. Ensuring safety measures	11	55	7	35	2	10

Table (7): Availability of the necessary equipment and supplies at neonatal intensive care unit

Equipment	Availability
phototherapy lights	Available
Eye shields	Unavailable
Emergency ("code" or "crash") cart with emergency drugs with size/weight appropriate neonatal unit dose; defibrillator;	Available
Neonatal surgical cut-down trays (including equipment for umbilical vessel catheterization, thoracostomy, chest and pericardial tube placement, peripheral vessel cutdown, and exchange transfusion);	Available
Suction devices;	Available
Incubators;	Available
Radiant heat device	Available
Heart rate/respiratory rate/blood pressure monitors;	Available
Pulse oximeter;	Available
Neonate scale(s), 10 kilogram;	Available
500 gram scale(s), with one gram inc;rements;	Unavailable
Infusion pumps (with microinfusion capability);	Available
Intravenous stands;	Available
suction pressure regulators;	Available
suction/drainage bottles;	Available
Suction catheters in a range of sizes, (i.e. 10, 8, 6 French [Fr], and smaller);	Available
Feeding tubes # 5 and # 8 Fr; &	Available
Stethoscopes, infant size appropriate;	Available
Neonate laryngoscope with # O and # 1 laryngoscope blades, spare batteries, and bulbs;	Available
endotracheal tubes, sterile and disposable, sizes 2.5, 3.0, 3.5, 4.0 mm with malleable stylets;	Available
Oral airways;	Available
Portable surgical illumination/procedure lamp;	unavailable
ECG	Available
Refrigerators;	Available
Freezer for storage of breast milk.	unavailable
blood warming apparatus;	unavailable
Oxygen-air blenders; and flow meters; Oxygen humidifier	Available

Continuous oxygen analyzers with alarms;	unavailable
Oxygen temperature detectors with alarms;	Available
Oxygen hoods; nasal prongs,	Available
Mechanical ventilators;	Available

References:

1. Edmonds K. Dewhurst's Textbook of Obstetrics and Gynaecology.8th ed. John Wiley & Sons; 2011:387
2. Yadav RK, Sethi RS, Sethi AS. The evaluation of the effect of phototherapy on serum calcium level. People's Journal of Scientific Research. 2012;5(2):1–4.
3. Coda Zabetta CD, Iskander IF, Greco C, et al. A Low-Cost Point-of-Care System to Measure Total Plasma Bilirubin. *Neonatology* 2013; 103:177–181.
4. Fleisher G R & Ludwig S. *Textbook of Pediatric Emergency Medicine*. 6th ed. Philadelphia, PA: Lippincott Williams and Wilkins; 2010: 630-640
5. Bertini G, Dani C. Bilirubin metabolism, unconjugated hyperbilirubinemia, physiological neonatal jaundice. In: Buonocore G, Bracci R, Weindling M. Neonatology: *A Practical Approach to Neonatal Diseases.* Springer Science & Business Media; 2012.
6. Ricci SS & Kyle T. *Maternity and Pediatric Nursing*. Philadelphia, Lippincott Williams & Wilkins; 2009:543
7. Shippee-Rice R, Fetzer S , Long J. Gerioperative Nursing Care: Principles and Practices of Surgical Care for the Older Adult. New York : Springer Publishing Company; 2012. Available at: https://books.google.com.eg/books.
8. Basavanthappa BT. *Nursing Administration*. 2nd ed., Jaypee Brothers Publishers (P) LTD;2003:441-445. Available at: https://books.google.com.eg/books.
9. Marquis BL & Huston CJ. Leadership roles and management functions in nursing: *theory and application*. 6th ed. Lippincott, Williams & Wilkins; 2009:540-553.
10. Potter PA & Perry AG. *Fundamentals of nursing*. 7th ed. Mosby. Elsevier; 2009: 293.
11. Hughes RG. Tools and strategies for quality improvement and patient safety: Patient Safety and quality: An evidence-based hand book for nurses: *J Nurs Adm*, 2008 38(*1*): 40-46
12. Kyle T & Carman S. *Essentials of Pediatric Nursing*. 2nd ed., Philadelphia: Lippincott Williams & Wilkins; 2012. Available at: https://books.google.com.eg/books
13. Abai G., Henry J., Lian C. B., et al. (2011): Improving the Knowledge and Practice on Early Detection of Neonatal Jaundice by

Nurses in Kuching District. *International Journal of Public Health* , pp92-99

14. Kliegman R.M., Behrman R.E., Jenson H.B and Stanton B. (2007): Nelson Textbook of Pediatrics. 18th ed., Saunders, UK., ISBN-10: 1416040048.

15. El sayed S. M., Sabry Y. Y., Sharkawy H. M. (2013): Establishing Basic Standards of Nursing care protocol at Neonatal Intensive care unit. Nature and Science 2013; 11(4). Available at: http://www.sciencepub.net/nature

16. Ogunfowora & Daniel (2006): Neonatal jaundice and its management: knowledge, attitude and practice of community health workers in Nigeria. *BMC Public Health*. 2006 Jan 27;6:19.

17. National Association of Neonatal Nursing (2014): Advanced practice registered nurse: Role, preparation, and scope of practice, Position statement #3059. Retrieved from NANN. org

18. Berhe D. F., Palani S., Joseph N. M. (2011): knowledge, practice and attitude towards jaundice among hospital health workers in Ayder Referral Hospital. 2 (12), 191-195. Available at: www.irjponline.com

19. West S. L. (2006): Physical assessment: whose role is it anyway? Nurse Crit Care. 2006 Jul-Aug;11(4):161-7. Available at: http://www.ncbi.nlm.nih.gov/pubmed/

20. Mohammed S. A., Bayoumi M. H., & Mahmoud F., SH. (2014): The Effect of Developmentally Supportive Care Training program on nurses' performance and behavioral responses of newborn infant in NICU. *Journal of Education and Practice*, Vol.5, No.6, 2014.

21. Solhaug M., Bjork I., and Sandtro H. (2010): Staff perception of one year after implementation of the newborn individualized developmental care and assessment proram (NIDCAP). *Journal of Pediatric Nursing*; 25(2).89-97