Novelty Journals

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 7, Issue 3, pp: (142-152), Month: September - December 2020, Available at: www.noveltyjournals.com

Effect of Nursing Intervention on Care of Neonates Suffering from Hyperbilirubinemia

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Abstract: **Hyperbilirubinemia is one of the most common problems during the neonatal period. The aims of the study: were to assess nurses' knowledge and practices regarding care of the neonates suffering from hyperilirubinemia, design and implement the nursing intervention for nurses about care of the neonates suffering from hyperbilirubinemia based on needs assessment and evaluate the effect of the nursing intervention for both nurses and the neonates. Setting: The study was conducted at the Neonatal Intensive Care Unit at Obstetric and Gynecological Hospital affiliated to Ain-Shams and Cairo University. Subjects: The study subjects included a convenient sample of 50 nurses and 170 neonates. Tools of the study: three tools were used, Structured questionnaire to assess the knowledge of the studied nurses about neonatal hyperbilirubinemia, observational checklists to assess the studied nurses' practices and the neonates' outcome sheet to identify the clinical outcomes of neonates with hyperbilirubinemia. Results: The study results revealed that, the majority of the studied nurses had an adequate knowledge and a competent practices regarding care of the neonates suffering from hyperbilirubinemia post intervention. As well, there was a highly significant difference regarding phototherapy related complications among the studied neonates in the pre and post intervention groups. Conclusion: the study concluded that, there was statistical significant difference between total nurses' knowledge and practices regarding care of neonates with hyperbilirubinemia post intervention. As well, the clinical outcomes of the neonates with hyperbilirubinemia were improved in the post intervention group. Recommendation: Continuous follow up of the neonates suffering from hyperbilirubinemia for occurrence of phototherapy related complications.**

Keywords: **hyperbilirubinemia, nursing intervention, neonates' outcome.**

1. INTRODUCTION

Neonatal Hyperbilirubinemia (NHB) is an abnormally elevated serum bilirubin levels. The serum bilirubin level varies with birth weight, gestational age, chronological age and internal milieu of the body. When total serum bilirubin (TSB) levels exceeds 5 mg per dL (86 µmol per L), it is a frequently encountered problem Approximately 60% of term and 80% of preterm newborns during the first week suffered from hyperbilirubinemia, and about 10% of breastfed neonates are still jaundiced at 1 month **(Kliegman et al., 2016)**.

Although (NHB) is a benign self-limiting and fairly common condition, severe (NHB) can lead to Kernicterus and irreversible brain damage. Excessive amounts of bilirubin build up in the bloodstream and cause brain damage and can result in problems with vision and hearing difficulties, mental retardation, and lifelong illnesses which can lead to death **(Adebami, 2015).**

Management of the neonates with hyperbilirubinemia is directed toward alleviating anemia, removing maternal antibodies and sensitized erythrocytes, increasing serum albumin levels, reducing serum bilirubin levels, and minimizing the consequences of hyperbilirubinemia. Therapeutic methods of management of hyperbilirubinemia include phototherapy, exchange transfusion, infusion of albumin, and pharmacologic management **(Olusanya, et al., 2016).**

Nurses play an important role in the implementation of universal screening for increased bilirubin levels in the newborn **(Khudhair, 2016)**. Neonatal nurses' should acquire advanced up-to- date knowledge and practices to save neonates' life **(Ashor, 2016).**

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Aim of the study:

This study aimed to:

1- Assess nurses' knowledge and practice regarding care of the neonates suffering from hyperilirubinemia.

2- Design and implement the nursing intervention for nurses about care of the neonates suffering from hyperbilirubinemia based on their actual need assessment.

3- Evaluate the effect of the nursing intervention for both nurses and the neonates.

Research hypothesis:

It was hypothesized that, the implementation of nursing intervention will be effective for nurses in terms of their knowledge and practice which consequently will improve care given for neonates suffering from hyperbilirrubineemia.

2. SUBJECT AND METHODS

Technical Design:

The technical design for the study includes research design, setting of the study, subjects and tools for data collection.

Research design:

A quasi-experimental design was used in this study.

Setting:

The study was carried out at the Neonatal Intensive Care Unit at Children's Hospitals affiliated to Cairo and Ain-Shams University.

Subject:

The study sample included a convenient sample of 50 nurses and 85 neonates diagnosed with hyperbilirubinemia who fulfilled the study criteria for sample selection.

Inclusion criteria:

- All nurses giving care for neonates suffering from hyperbilirubinemia regardless to their gender, years of experience and qualification.

- All the neonates suffering from hyperbilirubinemia and exposed to either phototherapy, regardless to the cause of hyperbilirubinemia and their gestational age.

Data collection tools:

Data was collected through the use of the following tools:

I- Structured Questionnaire by interviewing: this tool was designed by the researcher based on scientific literature review. It was composed of the following items:

- Characteristics of the studied nurses such as; age, qualification, and years of experience.

- Characteristics of the studied neonates such as; gender, gestational age and birth weight.

- Knowledge of the studied nurses regarding neonatal hyperbilirubinemia such as; definition, bilirubin metabolism, normal level of indirect bilirubin, causes, complications, types of hyperbilirubinemia diagnosis and management.

- Knowledge of the studied nurses regarding care of neonates suffering from hyperbilirubinemia undergiong phototherapy such as; definition, aim, mechanism of action, types of light, precautions and complications.

Scoring system:

Knowledge obtained from the nurses was checked with a key model answer. The questionnaire was consisted of 42 questions and each question scored as: (one mark) for correct answer and (zero) for each incorrect answer. The total score of the questionnaire was 42 grades (equal100%). The total score was converted into percentage and categorized into: less than 60% considered an inadequate knowledge and more than 60% considered adequate knowledge.

II- Observation checklist:

The observation checklist was adopted from **Una, (2013) & Neonatal Patient Care Teams, (2015).** It involved observation of the actual nursing care provided for the neonates undergoing phototherapy. The observational checklist contained 39 steps of nursing care for neonates under phototherapy.

Scoring system:

Scoring system was followed to obtain the outcome of nurses 'practices. It consists of 39 steps and scored as: (one grade) for the step which done correctly and (zero) for the step which done incorrectly. The total score was converted into percentage and categorized into: less than 75% considered incompetent and more than 75% considered competent practice.

III- The Neonate's Outcome Sheet: It was prepared by the researcher to assess the outcomes of the neonates suffering from hyperbilirubinemia in both pre and post intervention groups. It included the following items: total serum bilirubin level, duration of phototherapy and complications of phototherapy.

Operational Design:

The operational design was consisted of the following phases: The preparatory phase, pilot study and field work.

The Preparatory Phase:

Review of the past and current national and international related literature using articles**,** journals**,** scientific periodicals, text books and web site to be acquainted with the various aspects of the research problem**.**

Validity:

The structured questionnaire and the neonates' outcome sheet were reviewed by a panel of 5 experts in the field of pediatric nursing to test the face and content validity. Modifications of the tools were done according to the panel judgment on clarity of sentences, appropriateness of content and sequence of items.

Reliability:

The reliability was established by using a Cronbach's Alpha test for the questionnaire and the neonates' outcome sheet. The test correlation was found to be r=0.8 and 0.9 respectively. So tool was found to be highly reliable for data collection.

Pilot study:

A pilot study was conducted including eight nurses that represent 10% of the study nurses, to evaluate tools for applicability and clarity and to estimate the time needed for filling in tools. Data obtained from the pilot study were analyzed and the necessary modifications were done as revealed from the pilot study by addition and omission of some items of the questionnaire. Those who participated in the pilot study were excluded from the main study sample.

Field work:

The actual field work started from the first of September 2016 to the end of August 2017. The study was carried out in the following phases; planning, implementation and evaluation phase as the following:

The preparation Phase: at this phase the tools of data collection were prepared and designed. An official permission was obtained from the medical director of each study setting to carry out the study, through an issued letter from the Dean of Faculty of Nursing / Ain-Shams University, which containing the aim of the study and its expected outcome. The research approval was obtained from the Ethical Committee / Faculty of Nursing / Ain Shams University. An oral consent was also obtained from the studied nurses providing care to the neonate suffering from hyperbilirubinemia and from the mothers of the studied neonates. Confidentiality was secured for each study subject. Each study subject was informed that they have the right to withdraw from participation in the study at any time.

The researcher was assessed the needs of the studied nurses using the data collection tools. In additionally, the studied neonates were assessed using the pre outcome sheet.

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ISSN 2394-7330

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The Implementation Phase: accordingly, the nursing intervention prepared and implemented with suitable teaching methodology.

Evaluation phase: evaluation was done for both the studied nurses and neonates by using the same assessment tools.

Statistical Design:

The collected data were revised**,** coded**,** tabulated and analyzed using the number**,** percentage distribution**,** mean score**,** standard deviation (SD)**,** proportion probability of error (P-value) and chi-square X^2**.** Statistical analysis was performed using Statistical Package for Social Science (SPSS)**,** version 22**.** Statistically significance set at P < 0**.**05 and no statistical significance set at P > 0**.**05**.**

3. RESULTS

Table (1) clarified that, 38 % of the studied nurses were aged from 22: < 26 years. The X ± SD of age was 30.08 ± 4.16 years. Concerning years of experiences, The X ± SD of experience years was 9.46 ± 5.7 years. It was clear that, more than half of them had diploma nursing.

Table (2) showed that, 61.2% & 54.2% of the studied neonates were males in both pre and post intervention groups respectively. In relation to the gestational age the X± SD was 34.24 ± 2.24 & 34.14 ± 1.86 weeks among the studied neonates in both pre and post intervention groups respectively. The X ± SD weight was 1829.64 ± 768.06 & 1917.18 ± 622.20 gm among the studied neonates in both pre and post intervention groups respectively. There was a statistical significant differences in relation to gender and gestational age of the studied neonates in both pre and post intervention groups.

Table (3) clarified a statistical significant difference (p<0.05) of the studied nurses' knowledge pre and post intervention regarding neonatal hyperbilirubinemia.

Table (4) cleared a statistical significant difference (p<0.05) of the studied nurses' knowledge pre and post intervention regarding care of the neonates suffering from hyperbilirubinemia undergoing phototherapy in relation to mechanism, time of turn off the phototherapy device and complications of phototherapy.

Figure (1) showed that, only 6% of the studied nurses had adequate knowledge pre intervention compared with (86%) of them post intervention.

Figure (3) showed that, 26% of the study subject were competent pre intervention regarding their total care practices of the neonates suffering from hyperbilirubinemia compared with 82% of them post intervention.

Table (5) illustrated a significance difference (P < 0.05) of the studied neonates in the pre and post intervention groups regarding bilirubin level, duration of phototherapy. Concerning the phototherapy related complication, it was cleared that, there was a statistical significant difference of the phototherapy related complications among the studied neonates in both pre and post intervention groups.

Table (5): clarified that, there was a highly statistical significant correlation post intervention r = 0.81.

Table (1): Percentage distribution of the studied nurses in relation to their characteristics (n=50).

Items	No.	%
Age in years		
18 : < 22	5	10
22: < 26	19	**38**
26 : < 30	10	20
30 : < 34	2	4
34 : < 38	10	20
38: ≤ 42	4	8
$\overline{X}$ ± SD 30.08 ±4.16		

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Years of experience in NICU		
1: < 4	9	18
4: < 7	9	18
7: < 10	18	**36**
10: < 13	10	20
13: ≤ 15	4	8
$\overline{X}$ ± SD 9.46±5.7		
Qualifications:		
Diploma Nursing	35	**70**
Diploma and specialty	2	4
Technical Institute of Nursing	11	22
Bachelor Nursing	2	4

Table (2): Percentage distribution of the studied neonates pre and post intervention regarding to their characteristics (n=170).

Items	Study groups				X^2	p-value
	pre intervention (n =85)		post intervention (n=85)			
	No.	%	No.	%		
Gender						
Female	33	38.8	39	45.8	0.86	**0.35***
Male	52	**61.2**	46	**54.2**		
Gestational age in weeks						
28: < 32	51	60	73	85.9		
32: < 36	22	25.8	7	8.3	14.5	**0.00***
36 :≤ 40	12	14.2	5	5.8		
$\overline{X}$ ± SD	**34.24±2.24**		**34.14±1.86**			
Weight in gm. at admission						
1500 : < 2500	70	82.3	63	74.1	4.98	0.08
2500 : < 3500	10	11.8	20	23.5		
3500 : ≤ 4500	5	5.9	2	2.4		
$\overline{X}$ ± SD	**1829.64±768.06**		**1917.18 ±622.20**			

*Significant at the level of < 0.05

Not significant at the level > 0.05

Table (3): Percentage distribution of nurses' knowledge regarding neonatal hyperbilirubinemia pre and post intervention (n= 50).

Nurses' Knowledge related to Hyperbilirubinemia	Pre intervention				Post intervention				X^2	p-value
	Correct		Incorrect		Correct		Incorrect			
	No.	%	No.	%	No.	%	No.	%		
Definition	21	42	29	58	39	78	11	22	5.40	**0.02***
Bilirubin Metabolism	11	22	39	78	40	80	10	20	16.49	**0.00***
Bilirubin level	11	22	39	78	46	92	4	8	21.49	**0.00***
Causes	25	50	25	50	46	92	4	8	6.21	**0.01***
Types	21	42	29	58	43	86	7	14	37.78	**0.00***
Diagnosis	3	6	47	94	43	86	7	14	7.56	**0.00***
Complications	12	24	38	76	50	100	0	0	23.29	**0.00***
Management	40	80	10	20	50	100	0	0	1.11	0.29

*Significant at the level of < 0.05

Not significant at the level > 0.05

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Table (4): Percentage distribution of nurses' knowledge pre and post intervention regarding care of neonates suffering from hyperbilirubinemia under going phototherapy (n= 50).

Nurses' Knowledge related to Care of Neonates undergoing phototherapy	Pre intervention				Post intervention				X^2	p-value
	Correct		Incorrect		Correct		Incorrect			
	No.	%	No.	%	No.	%	No.	%		
Definition	43	86	7	14	47	94	3	6	0.18	0.67
Mechanism	12	24	38	76	43	**86**	7	14	17.47	**0.00***
Types	46	92	4	8	50	100	0	0	0.17	0.68
Time of turn off the phototherapy device	13	26	37	74	47	94	3	6	19.27	**0.00***
Precautions against phototherapy	33	66	17	34	50	100	0	0	3.48	0.06
Complications of phototherapy	24	48	26	52	49	98	1	2	8.56	**0.00***

*Significant at the level of < 0.05

Not significant at the level > 0.05

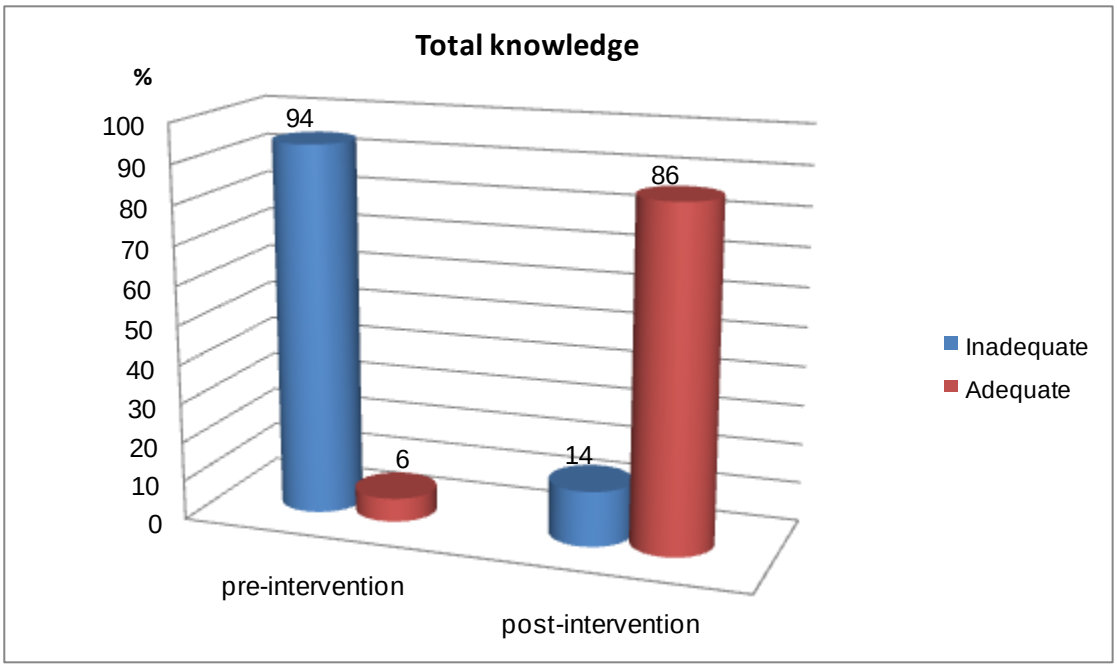

Figure (1): Percentage of Nurses' total knowledge regarding neonatal hyperbilirubinemia pre and post intervention (n=50).

Novelty Journals

ISSN 2394-7330

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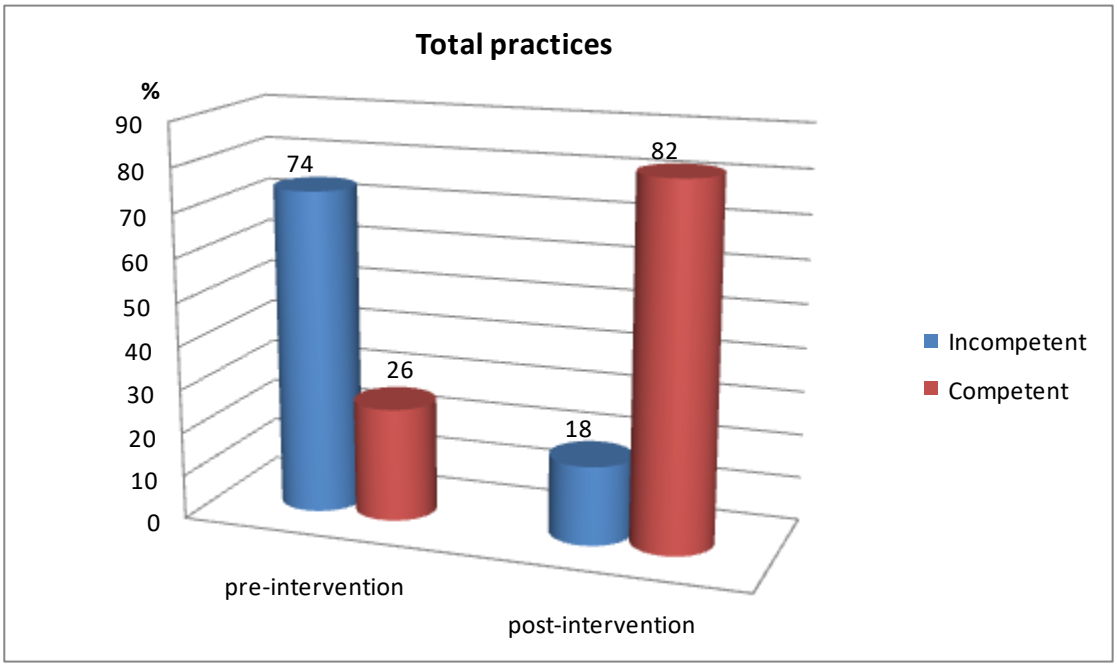

Figure (2): Percentage distribution of the studied nurses' total practices pre and post intervention regarding care of neonates undergoing phototherapy (n=50).

Table (5): Percentage distribution of the studied neonates' outcome pre and post intervention regarding bilirubin level, duration and complications of phototherapy (no=170).

Neonates' Outcome	Studied groups				X^2	p-value
	Pre intervention no=85		Post intervention no=85			
	No.	%	No.	%		
Indirect Bilirubin level:						
1 : < 5	12	14.1	28	32.9	31.3	**0.00***
5 : < 10	16	18.9	36	42.4		
10 : < 15	46	54.1	15	17.6		
15 : ≤ 20	11	12.9	6	7.1		
Duration of phototherapy in days:						
2 : < 5	35	41.2	51	60	10.84	**0.00***
5 : < 8	39	45.9	19	22.4		
8 : ≤ 11	11	12.9	15	17.6		
Complications of phototherapy:						
Skin					53.1	**0.00***
Normal	25	29.4	70	82.3		
Rash	4	4.7	2	2.3		
Dry	35	41.2	10	11.8		
Ulcer	9	10.6	0	0		
Burn	1	1.2	0	0		
Dry & rash	11	12.9	2	2.4		
Dry & ulcer	0	0	1	1.2		

Eye						
Normal	11	12.9	70	82.4	84.1	**0.00***
Redness	30	35.3	7	8.2		
Discharge	15	17.6	0	0		
Inflammation & discharge	29	34.1	8	9.4		
Body temperature						
Normal	23	27.1	62	72.9	42.4	**0.00***
Increased	62	72.9	22	25.9		
Decreased	0	0	1	1.2		
Urine and stool characteristics						
No signs of dehydration	4	4.7	10	11.8	10.0	**0.01***
Signs of dehydration:						
Diarrhea	42	49.4	39	45.9		
Fluid and electrolyte disturbances	24	28.2	11	12.9		
Fluid & electrolyte disturbances & diarrhea	15	17.6	25	29.4		

*Significant at the level of < 0.05 not significant at the level > 0.05

Normal range of bilirubin levels (American Association of Clinical Chemistry, 2019):

Total Bilirubin Level: 0.3 to1.0 mg/dL.

The indirect (unconjugated bilirubin): less than 5.2 mg/dL.

The conjugated (direct) bilirubin: less than 0.3 mg/dl.

Table (6): The correlation between the studied nurses' total knowledge and practices regarding neonatal hyperbilirubinemia post intervention (n=50).

Variable	Total knowledge	
	r	P- value
Total practices	**0.81**	**0.00***

*Significant at the level of < 0.05

Not significant at the level > 0.05

4. DISCUSSION

Providing care to neonates with hyperbilirubinemia is a condition that requires knowledge and skills to achieve optimal health outcomes **(Hay, 2018).**

The findings of the present study indicated that, more than one third of the studied nurses were aged from 22 to less than 26 years, this finding was supported with **Ahmed & Hani, (2017),** who conducted study about "Assessment of Nurses' Knowledge and Practices working in District Hospitals at Minia Governorate about Neonatal Hyperbilirubinemia" and revealed that, half of the studied nurses aged below 26 years. As regards qualification, more than half of the studied nurses had Diploma Nursing. This is consistence with **Khudhair, (2018),** who conducted a research about "Assessment of the Nurses' Knowledge regarding Jaundice in Basra Hospitals" and found that, more than one quarter of the studied nurses had Secondary Nursing School. The researcher believed that, the secondary schools of nursing provide the health agencies with large numbers of graduated diploma nurses.

Finding of the present study revealed that, more than one third of the studied nurses had 7 to less than 10 years of experience. This finding was not agreed with **Joy, (2018),** who conducted study about "Knowledge and Practices regarding Phototherapy Management among Nurses Working in Pediatric and Maternity Wards in Selected Hospitals" and stated that, more than one three quadrants of the studied nurses had experience from 1 to less than 5 years in NICU. The researcher believed that, the years of experience have a significant positive effect on the nurses' knowledge and performance which result in improving quality of care provided for the neonates.

Concerning the characteristics of the studied neonates, the results of the current study revealed that, more than half of the studied neonates were males among pre and post intervention groups. This finding was in agreement with **Garosi et al., (2016),** who conducted study about "The Relationship between Neonatal Jaundice and Maternal and Neonatal Factors" and found that, more than half of the studied neonates suffering from hyperbilirubinemia were males.

According to the results of the current study, the X ± SD of gestational age was 34.24±2.24 & 34.14±1.86 weeks among the studied neonates in both pre and post intervention groups respectively. This result was in accordance with **Singla et al., (2017),** who studied "Evaluation of Risk Factors for Exchange Range Hyperbilirubinemia and Neurotoxicity in Neonates from Hilly Terrain of India" and reported that, the majority of the neonates were between 35 and 37 weeks. The researcher believed that, the preterm neonates had already taken home by their parents and did not undergo the examination at the time of routine control in the hospital.

As regards the weight of the studied neonates, the current findings revealed that, the X ± SD of the weight was 1829.64 ± 768. 06 & 1917.18 ± 622.20 gm among pre and post intervention groups respectively. **Nurani et al., (2017),** who studied "Incidence of Neonatal Hyperbilirubinemia Based on their Characteristics at Dr. Hasan Sadikin General Hospital Bandung Indonesia" was supported the current finding where the majority of the studied subject weigh less than 2500 gram. The researcher believed that, the low birth weight was considered the risk factor for neonatal hyperbilirubinemia.

Concerning knowledge of the studied nurses regarding neonatal hyperbilirubinemia and care of the neonates undergoing phototherapy, the study results clarified a statistical significant difference ($p<0.05$) of the studied nurses' knowledge pre and post intervention in relation to neonatal hyperbilirubinemia. This result was similar to **Adebami, (2015),** who study "Knowledge on Causes and Care of Neonatal Jaundice at the Nigerian Primary and Secondary Health Institutions" and revealed that many of the health workers at both primary and secondary heath care facilities had good knowledge about neonatal jaundice causes, treatment and complications.

Regarding the total nurses' knowledge of neonatal hyperbilirubinemia, the current finding revealed that, the majority of the studied nurses had adequate knowledge post intervention compared with pre intervention knowledge. This finding is supported with **Pandya & Ravindra, (2015)** who studied "The Effectiveness of Planned Teaching Program on Knowledge regarding Care of the Neonate under Phototherapy among Diploma Internship Nursing Students in Selected Nursing Schools at Gujarat State" and found that, the X ± SD of the studied nurses' total knowledge were 15.58±3.27 & 25.71±2 pre and post test respectively. Therefore the findings of the current study revealed that, the intervention with knowledge about neonatal hyperbilirubinemia was highly effective.

Concerning the total practices of the studied nurses' for the neonates suffering from hyperbilirubinemia undergoing phototherapy, the current findings revealed that, the majority of the studied nurses had higher level of competency post intervention. This result was in the same line with **Abdel Khalek, (2016)** who studied "The Impact of an Educational Program on Nurse's Knowledge and Practices regarding Neonatal Jaundice" and concluded that, there was a highly statistically significant difference between pre and post educational program intervention regarding the level of knowledge and practices of the nurses.

The current results clarified a statistical significant difference of the bilirubin level and duration of the phototherapy. In the same line, **Aziznejadroshan et al., (2020),** who perform a study about "Comparing the Effect of Kangaroo Mother Care and Field Massage on Serum Bilirubin Level of Term Neonates with Hyperbilirubinemia under Phototherapy in the Neonatal Ward", reported that, bilirubin levels were higher in control group than intervention groups.

In relation to phototherapy related complications, the study findings revealed a statistical significance difference ($P < 0.05$) regarding phototherapy related complications among the studied neonates in pre and post intervention groups. This result was supported with **Ashor, (2016),** who conducted study about "The Effect of a Designed Nursing Care Protocol on

Clinical Outcomes of Neonates with Hyperbilirubinemia" and reported that, most of the studied neonates had fewer side effects of phototherapy than before the application of the protocol of care for neonatal hyperbilriubinemia. The researcher believed that, the current results were attributed to increased knowledge of the nurses as well as their practical performance regarding nursing care intervention for neonates with hyperbilirubinemia.

There was a highly statistical significant correlation between the studied nurses' total knowledge and practices post intervention regarding neonatal hyperbilirubinemia (r = 0.39). This result was supported with **Santhi, (2020)** who performed a study namely as" A Study to Assess the Effectiveness of Protocol on Care of Newborn in Phototherapy on Knowledge and Practice among Nurses at Selected Hospitals in South India" and found a highly correlation (r = 0.80) between the overall mean improvement level of knowledge and practices of nurses regarding care of newborn in phototherapy.

5. CONCLUSION

There was statistically significant difference between total nurses' knowledge and practices regarding care of neonates with hyperbilirubinemia post intervention. As well, it improved the clinical outcomes of the neonates with hyperbilirubinemia in the post intervention group.

Recommendations: in the light of the findings of the current study the following: recommendations are suggested:

1- Continuous follow up of the neonates suffering from hyperbilirubinemia for occurrence of phototherapy related complications.

2- Continuous assessment of the nurses providing care to neonates suffering from hyerbilirubinemia.

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