Enhancing Nurses' Knowledge and Practice through Implementing Sleep Care Protocol at Neonatal Intensive Care Unit

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Abstract

Back ground: Sleep care is important aspect at Neonatal Intensive Care Unit (NICU) because the great effect on neonatal growth and development. **Aim of the study:** Was to enhance nurses' knowledge and practice through implementing sleep care protocol at NICU. **Research Design**: A quasi-experimental research design was used to conduct this study. **Settings**: This study was carried out in Neonatal Intensive Care Units of Benha University Hospital and Benha Specialized Pediatric Hospital. **Subjects**: A convenience sampling of 70 nurses and 70 neonates were included in this study**. Tools of data collection**: Two tools were used to collect the required data. I: A structured interview questionnaire sheet to collect nurses' and neonatal characteristics as well as nurses' knowledge about sleep care protocol. II: Observational check lists to assess nurse's practice regarding sleep care protocol and neonatal condition during sleep. **Results:** This study revealed that, total nurses' knowledge and practice were improved on post implementing sleep care protocol compared by pre protocol. There was a statistically significant difference with positive correlation between total nurses' knowledge and practices scores pre and post protocol. There was statistical significant improvement of the studied neonatal condition. **Conclusion**: Sleep care protocol was effective in enhancing nurses' knowledge and practices regarding sleep care protocol at NICU. There was a statistical significant difference with positive correlation between total nurses' knowledge, practice scores and neonatal sleep condition pre and post protocol. **Recommendations**: Continuing in service educational training programs should be conducted to nurses at NICU to improve their knowledge and practices about sleep care protocol.

Keywords: Nurses' knowledge, Neonate, Neonatal Intensive Care Unit, Practice, Sleep care protocol

Introduction

The neonatal period, is the first 4 weeks of child life, is considered a stage of vulnerability to child health by biological, environmental, social and cultural risks. This requires proper care, greater attentiveness and monitoring by health professionals, in order to ensure a better growth and development of the neonate. This period is also responsible for 60% to 70% of infant deaths in recent decades, occurring mainly until the 6th day of life, being the key indicator of quality of care to newborn **(World Health Organization, 2017).**

Sleep is a crucial human physiologic need. Infants in the NICU are exposed to noxious stimuli that often disrupt and shorten their sleep periods. Sleep disruption may have a negative effect on clinical outcomes, growth, and development and may also delay hospital discharge. Increasing evidence suggests that sleep quality is critical for brain development and synaptic plasticity and is associated with long-term neuro developmental outcomes (**White, 2019).**

Inadequate sleep in neonates has been associated with increased adiposity, poor emotional regulation, poor overall well-being. Because fetuses and neonates spend most of their day asleep, adequate sleep is particularly important for them. The negative impact of the NICU environment can be manifested in a number of ways by the preterm infant such as increased heart rate, decreased oxygen saturation, poor growth due to increased energy expenditure and prolonged hospital stay **(Vandenhoogen et al., 2017).**

Neonates at NICU have impaired sleep patterns for a variety of reasons, including certain underlying disease processes, frequent interventions, abnormal day-night cycles, around-the-clock lighting, and frequent, confused ambient noise. A growing body of literature shows that sleep disruption by even routine handling of neonates in the NICU is further affecting their brain maturation process **(Mony et al., 2019).**

Sleep care protocol is a special care to a range of evidence based nursing interventions designed to decrease exposure to stress in the NICU, allow optimal neurobehavioral development of the infant, standardizing care giving practices and optimize the NICU environment in order to facilitate the best outcomes for infants and their families (**Liao et al., 2019**).

Sleep care, is a part from developmental care that is designed to minimize the stress of (NICU) environment. Control of external stimuli (vestibular, auditory, visual and tactile) by noise and light reduction as well as minimal handling and clustering of nursery care activities **(White, 2019).**

Neonatal sleep care protocol is a unique and family center approach which reduces environmental stress and promoting overall well-being. Moreover, scientific evidence suggests that nurses' knowledge and improvement of their practice have an important role in sleep health **(Westrub, 2017**).

Nursing professionals play fundamental role in the defense, promotion and preservation newborn's sleep hospitalized in the NICU, given their constant presence throughout the hospitalization. Thus far, it is important to educate these professionals for the strategies that promote and protect newborn's sleep in this particular setting **(Ahmed & Hani, 2017**).

Significance of the study:

The rate of neonates referred to the NICU and demand intense cares due to prematurity or physical problems is increasing. In such a condition, meeting the necessary needs of such neonates is of a great importance. Sleep is an essential need of NICU neonates. They are in rapid brain growth stage and according to new studies, sleep plays a key role in brain development (**Couphlin et al., 2019).**

Aim of the study

The aim of the present study was to enhance nurses' knowledge and practice through implementing sleep care protocol at NICU.

Research hypothesis:

Nurses' knowledge and practice had been improved through implementing sleep care protocol at NICU and had an effect on neonatal out comes.

Subjects and Method

Research design:

A quasi-experimental research design was used to carry out this study.

Setting:

This study was carried out at Neonatal Intensive Care Units (NICUs) of Benha University Hospital and Benha Specialized Pediatric Hospital.

Subjects:

A convenience sampling of: -

1- Seventy nurses, (29 nurses from Benha specialized pediatric hospitals and 41 nurses from Benha university hospitals), regardless of their age, gender, place of work and years of experiences.

2- Seventy neonates admitted to the Neonatal Intensive Care Units (NICUs) within 6 months starting from beginning of (February to the end of the July 2020).

Tools of Data Collection:

Data were collected by using the following tools**:**

Tool I: A structured Interview Questionnaire:

It was developed by the researcher after reviewing the related literatures. It included two parts:

Part (1)

(a): Personal data of nurses such as; age, level of education, years of experience, attendance of training courses related to sleep care at NICU and place of work (five questions).

(b): Neonatal characteristics and clinical data such as: age, gender, gestational age, birth weight, diagnosis and type of feeding (six questions).

Part (2): Nurse's Knowledge about sleep care of neonates at NICU

It was designed by the researcher in the light of relevant studies and researchers. It was used to assess nurses' knowledge about sleep care protocol of neonates at NICU which included:

- Sleep and its importance for neonates (14 questions).
- Environmental stressors and its effect on neonates (5questions).
- Sleep care protocol and overcoming on environmental factors to improve neonatal sleep (9 questions). 28 questions covering the items related to sleep care at NICU.

Scoring system for nurses' knowledge:

Correct and complete answers were scored **(2)**, correct and incomplete answers were scored **(1)** and the incorrect answers or not answered questions were scored zero. The total scores were ranged from 0-56 mark.

Total nurses' knowledge scores were classified as the following:

- Poor knowledge: (0-<50%) .
- Average knowledge: (50-<75%).
- Good knowledge: (75-≤100%).

Tool II: Observational check list:

It included two parts;

Part (1): Nurses' practice related to sleep care protocol at NICU.

It was adapted from **The Northern Neonatal Network**, (**2014)**, to assess nurses' practice regarding sleep care. It contained of 21 items divided in to (8) items for routine care, (7) noise, (4) light and vision and smell (2).

Scoring system for Nurse's practice:

The scoring system consisted of two points: If done one score was given, if not done zero score was given the score of the items was summed -up and the total divided by the numbers of the items, giving a mean score for the part. These scores were converted into present score. The total mark of 21 items were 21 degrees.

Total nurses' practice scores were classified as the following:

- Satisfactory practice: (≥85%) of total practice score (≥17 degree).
- Un satisfactory practice :(< 85%) of total practice score (<17 degree).

Part (2): Observational check list to assess neonatal condition during sleep

It was developed by **Osullivan et al., (2016**), modified and used by the researcher to assess neonatal condition during sleep. It contained **(**7) items. It was used to assess neonatal condition during sleep such as sleep pattern (relaxed, easily disturbed by noise and light, restlessness). Facial expression (relaxed, grimace). Respiration (regular, irregular). Heart beat (normal, abnormal). Movement during sleep. Crying during sleep. Sleep position (back, prone, side lying position).

Scoring system of neonatal condition during sleep was classified as follows:

- If the condition was normal one score was given, if it was abnormal zero score was given, to sleep pattern (relaxed was taken 1, easily disturbed by noise and light was taken score 0),
- facial expression (relaxed and normal was taken score 1, grimace, score 0), respiration (regular was taken score 1, irregular score 0), heart rate (normal was taken score 1, abnormal rate score 0),
- movement during sleep (little movement was taken score 1, more movement score 0), crying during sleep (no crying was taken score 1, crying score 0), sleep position (on back was taken score 1, prone or side lying position score 0).
- Total scores were ranged from (0-7), score less than 60% was considered disturbed sleep, while a score more than or equal 60 % were considered quiet and relaxed sleep.

Content Validity:

It was ascertained by panel of 3 experts in the field of Pediatric Nursing from Benha Faculty of Nursing as they reviewed the tools of data collection for clarity, relevance, comprehensiveness, simplicity and applicability, and gave their opinion. Their comments were taken into considerations. This phase took one month from (beginning of December to the end of December 2019).

Reliability:

Reliability for tools was applied by the researcher for testing the internal consistency of the tools by administration of the same tool to the same subjects under similar condition. The researcher used Cronbach‘s Alpha coefficient .It was 0.65 for knowledge structured questionnaire sheet and 0.71 for the observational check list of nurses’ practice.

Ethical considerations:

- Ethical approval was obtained from scientific research ethical committee of Faculty of Nursing Benha University, hospital administrators and head of NICU department of Benha university hospital and Benha specialized pediatric hospital before starting the study and ensured each participants approval was involved in the study before collection any data and after explanation the aim of the study in simple and clear manner.
- They were assured that information obtained used only for the purpose of the study and the study is harmless. The privacy was maintained and oral consent was taken for participation.
- Confidentiality of the gathered data and results were secured. Additionally, each participant has the right to withdraw from the study at any time without harm and any effect on the study.

Pilot study:

A pilot study was conducted on 10 % of the studied neonates and nurses (7) working in NICU at Benha university hospital and Benha specialized pediatric hospital to test clarity, applicability, relevance, feasibility of study tool, sequence of questions to maintain consistency and time needed. The nurses under pilot study were included in the study. This phase took one month from (beginning of January to the end of January 2020).

Field work:

The researcher interviewed each nurse individually at the NICU at morning and afternoon to take their consent. The researcher assessed nurses' knowledge using tool (I) and also assessed nurses' practice regarding sleep care protocol for neonates at NICU (tool II, part 1) as well as neonatal condition during sleep using (tool II, part 2). The protocol was conducted in different sessions, theoretical and practical part. Each session was taken 30–40-minute, different teaching methods and media were used during the protocol implementation to facilitate nurses' understanding and divided in to groups according to nurses' availability at the shifts and their numbers. The nurses were evaluated immediately after the implementation this protocol.

Protocol Intervention:

It was designed by the researcher after reviewing the related literature according to the actual needs of nurses. It consisted of theoretical and practical sessions and composed of three phases;

-First phase:

A pretest was carried out using the (tools I and II) to assess nurses' knowledge and practice about sleep care of neonates at NICU. The process of data collection was carried out from the beginning of February to the end of March 2020. The researcher attended NICU of Benha university hospital and Benha specialized pediatric hospital, two days weekly, on Sunday and Wednesday (morning &afternoon) to collect the required data by using the previous tools. The researcher interviewed the available nurses at NICU and explained to them the aim of the study and their oral approvals to participate in the study were taken prior to data collection. The researcher observed the nurses' performance (knowledge &practice) about sleep care protocol at NICU by using tool I and II.

Firstly, the questionnaire sheets were administered by the researcher to all nurses to assess their knowledge about neonatal sleep care at NICU. The average time to complete the questionnaire sheets (by nurses) in the present of the researcher was between 15-25 minutes.

Secondly, the researcher observed nurses' practice in providing sleep care at NICU and neonatal condition during sleep using the observational checklist, this observation was done (by researcher). The average time needed to complete each observation was between 10-15 minutes; this period of pretest (knowledge and practice), took 4 weeks.

Second phase:

The pretest findings were analyzed to detect actual needs of nurses' knowledge and practice, general and specific objectives of intervention protocol was stated and implemented to satisfy the nurses' actual needs.

Protocol construction

Sleep care protocol was designed by the researcher according to nurses' needs. It was constructed, revised and modified by the researcher after reviewing the related literature to improve nurses' knowledge and practice.

Statement of objectives

The general objectives of the sleep care protocol were to enhance nurses' knowledge and practice regarding sleep care protocol at NICU and improve neonatal condition during sleep.

Specific objectives:

By the end of this protocol each nurse was be able to:

- Recognize purpose of the protocol and expected out comes.
- Define sleep.

- Mention importance of sleep for neonates.
- Enumerate hormones that secreted during sleep and its' importance for neonatal growth and development.
- List stages of sleep and its' importance.
- Describe normal average hours of neonatal sleep.
- Determine effect of sleep disturbances on neonatal condition.
- Mention factors that disturb neonatal sleep at NICU and its' effect on their condition.
- Define sleep care protocol.
- Mention aim of sleep care protocol.
- Apply measures to manage neonatal sleep disturbance like light and smell reduction at NICU.
- Perform measures to manage source of sleep disturbance like noise elimination at NICU.
- Apply measures to improve routine care and promote neonatal sleep at NICU.

Implementation of the sleep care protocol:

The implementation phase was achieved through (8) sessions at a period of two month beginning from (April to the end of May 2020), each session started by a summary of the previous session and objectives of the new one; Taking in to consideration, the use of Arabic language that suits the nurses' educational level. Motivation and reinforcement during session were used to enhance motivation for sharing in this study and observed neonatal sleep condition by using tool II, part 2 pre and post protocol .

The researcher was available at the previously mentioned setting two days per week at each hospital. The first day was for the theoretical part intervention for two hospitals, the second day for practical part application. The total numbers of sessions were 8, (5 for knowledge and 3for practice). The nurses divided into 10 groups; each group contains 7 nurses. The theoretical sessions were conducted at morning shift (from 10:00 am to 12:00pm) at Benha university hospital and Benha specialized pediatric hospital.

The theoretical parts, these parts contain information related to sleep and sleep care at NICU as definition, importance neonates, effect of sleep disturbance on neonatal condition, stages of sleep, hormones that secreted during sleep and its importance for their growth and development, definition of sleep care protocol and its importance, environmental factors that disturb neonatal sleep at NICU and measures taken to overcome the stressors which disturb neonatal sleep. Each nurse was supplemented with audio visual material to facilitate their understanding.

The practical sessions, was achieved through 5 sessions each session contain from 7nurses according their availability at each shift, it was started on Sunday (from 10:00 Am to2:00 pm at Benha university hospital and on Wednesday from 10 :00 Am to 2:00 pm at Benha specialized pediatric hospital). The practical parts cover nursing care related how to promote neonatal sleep and managing NICU environment as how to manage light and smell, control sources of noise and improving routine care to promote neonatal sleep. Teaching methods were used as lecture, group discussion, demonstration, and remonstration; brain storming, teaching media utilized were handouts, visual material like videos for proper understanding of the nurses.

A guide booklet: -

The guide booklet was designed by the researcher using simple Arabic language and different illustrated pictures and videos in order to facilitate nurses understanding and intervention protocol was implemented.

Third phase (Evaluation): -

1- **Nurses evaluation**

Evaluation was carried out immediately after the implementation of intervention protocol using the same pretest format as a post test. This helped to evaluate the effect of implemented protocol. This was done after intervention. This helped to evaluate the immediate effect of the implemented protocol.

2-**Neonatal evaluation**

It was done to ensure satisfaction of nurses' practice which indicated by improving of neonatal condition during sleep.

Statistical analysis:

The collected data were organized, coded, computerized, tabulated, categorized and analyzed by using the Statistical package for social science version 20. Quantitative data were described using numbers and percentages. Association between categorical variables was tested using Chi-square and Pearson correlation tests. When more than 25% of the cells have expected count less than 5, Fisher 's exact test was used. Continuous variables were presented as mean ±SD (standard deviation).

All above mentioned statistical tests done, the threshold of significance is fixed at 5% level (p- value).

The results were considered:

- Highly significant at p ≤0.001.
- Significant at p ≤0.05.
- Non significant at p> 0.05.

Results

Table (1): Presents Percentage distribution of the studied nurses regarding their personal data. It was indicated that,. Less than two thirds of them (62.9%) were in age group between20-<30 years (22.48± 3.79 years). More than two fifth (45.7%) had nursing technical institute. Regarding years of experiences, two fifths of them (40%) had experiences in neonatal intensive care unit from one year to less than five years (2.97±3.04years) and all of them didn't attend any training program related to neonatal sleep at NICU.

Table (2): Presents percentage distribution of the studied neonate regarding to neonatal characteristics and clinical data**.** It was revealed that more one third of studied neonates (37.1%) their ages were between 7-<14 days (13.21±6.21). slightly than half of the studied neonates (51.4%) were female. The gestational age of half of them (50%) were between 35-<37 weeks, with mean age 36.33±2.83. Regarding their weight, more than two fifth of them (44.3%), their weight between 1500-<2000 grams with mean 1800.4±343.21, nearly half of them (45.7%), their feeding was oral feeding.

Figure (1): Shows Percentage distribution of nurses 'total knowledge regarding sleep care pre and post protocol (N=70). It was found that**,** total scores of nurses' knowledge about sleep care protocol showed that about one fifth (20 %) of the studied nurses had good knowledge pretest compared by most of them (88.5%) posttest.

Figure (2): Total scores of nurse's practice regarding items related to care during neonatal sleeping (N=70). It was observed that slightly more than one quarter (28.6 %) of the studied nurse had in competent practice related to total practices items care to improve neonatal sleep pre- protocol implementation, as the majority (90 %) of them had competent practice post protocol.

Table (3): Presents Assessment of neonatal condition during sleep**.** It was revealed that that, there was a highly statistically significant improvement of the studied neonate's condition during sleep posttest compared by pre- test (p=0.000) except sleep position no statistical significance differences (p.091).

Table (4): Presents Relation between nurses' knowledge and their personal data pre and post protocol. It was found that, there were no statistically significant differences between nurses' knowledge and their years of experience, level of education pre –test, while there was statistically significant differences between nurses' knowledge and their age at posttest (p=0.012).

Table (5): Presents relation between total scores of nurses' practices and their personal data**.** It was revealed that there was no statistically significant relation between total nurses' practice and their age, level of education and years of experiences.

Table (6): Presents correlation between total scores of nurses' knowledge and practices related to sleep care protocol at NICU. It was found that **,**there was a statistically significant differences with positive correlation between total scores of nurses' knowledge and practices regarding sleep care protocol at NICU pre-test , there were highly statistically significant differences between total scores of nurses' knowledge and practices regarding sleep care protocol at NICU posttest (p0.01 &0.000).

Table (1): Percentage distribution of the studied nurses regarding their personal data (n=70).

Items	**No**	**%**
Age in years		
▪ <20	12	17.1
▪ 20-<30	44	62.9
▪ ≥-30	14	20.0
Mean ±SD	**22.48± 3.79**	
Level of education		
▪ Diploma of nursing school	8	11.4
▪ Nursing technical institute	32	45.7
▪ Bachelor degree in nursing	30	42.9
Experience (years)		
▪ <1	13	18.6
▪ 1-<5	28	40.0
▪ 5-<10	21	30.0
▪ ≥-10	8	11.4
Mean ±SD	**2.97±3.03**	
Attending previous training program related to neonatal sleep at NICU		
▪ yes	0	00.0
▪ N0	70	100.0

Table (2): Percentage distribution of the studied neonate regarding to neonatal characteristics and clinical data (n=70).

Characteristics	No	%
Age in days		
▪ 1-<7	15	21.4
▪ 7-<14	26	37.1
▪ 14-<28	24	34.4
▪ >28	5	7.1
Mean ±SD		**13.21±6.21**
Gender		
▪ Male	34	48.6
▪ Female	36	51.4
Gestational age in weeks		
▪ 35-<37	35	50.0
▪ 37-<39	10	14.3
▪ 39-<41	12	17.1
▪ >41-	13	18.6
Mean ±SD	**36.33±2.83**	
Weight at birth in grams		
▪ 1000-<1500	14	20.0
▪ 1500-<2000	31	44.3
▪ 2000-<2500	12	17.1
▪ >2500	13	18.6
Mean ±SD	**1800.4±343.21**	
Type of feeding		
▪ By oral	32	45.7
▪ Tubal feeding	28	40.0
▪ intravenous	10	14.3

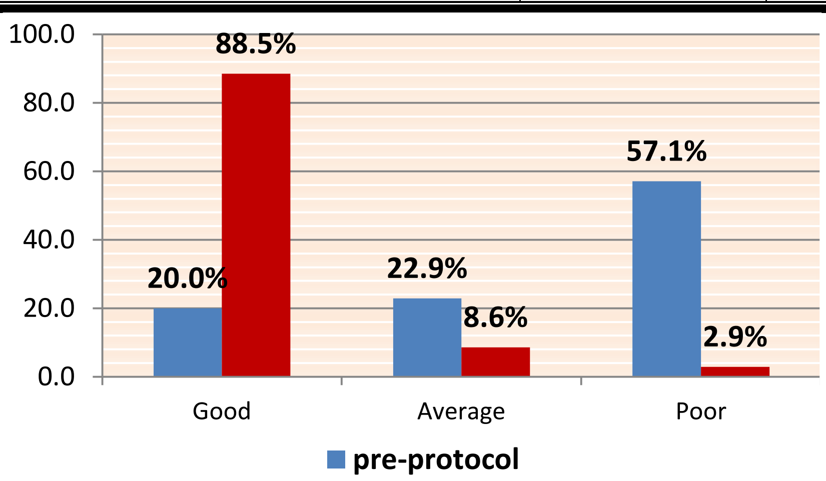

Fig (1): Percentage distribution of nurses 'total knowledge regarding sleep care pre and post protocol implementation (N=70) .

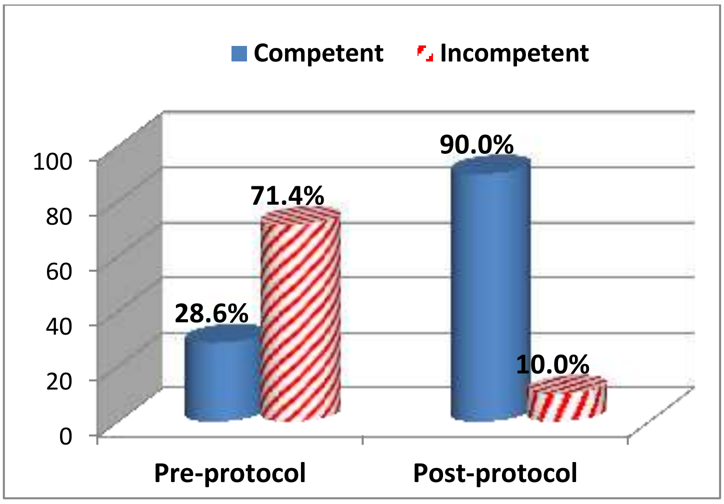

Fig (2): Total scores of total nurses' practice regarding care during neonatal sleeping (n=70).

Table (3): Assessment of neonatal condition during sleep pre and post protocol implementation (n=70).

Assessment of neonatal condition during sleep	Pre				Post				X^2	p-value
	normal		abnormal		normal		abnormal			
	No	%	No	%	No	%	No	%		
- **Sleep pattern**	13	18.6	57	81.4	55	78.6	15	21.4	50.44	.000**
- **Facial expression**	27	38.6	43	61.4	58	82.9	12	17.1	28.77	.000**
- **Respiration**	46	65.7	24	34.3	66	94.3	4	5.7	17.85	.000**
- **Heart rate**	45	64.3	25	35.7	60	85.7	10	14.3	8.57	.003**
- **Movement during sleep**	24	34.3	46	65.7	57	81.4	13	18.6	31.90	.000**
- **Crying during sleep**	28	40.0	42	60.0	70	100.0	0	0.0	60.00	.000**
- **Sleep position**	30	42.9	40	57.1	40	57.1	30	42.9	2.85	.091

FR: Friedman test ** highly statistically significance at p≤0.01

Table (4): Relation between total nurses' knowledge and their characteristics pre and post sleep care protocol .

Relation between nurses' knowledge and their personal data	Pre						X^2	p-value	Post						X^2	p-value
	Poor (n=40)		Average (n=16)		Good (n=14)				Poor (n=2)		Average (n=6)		Good (n=62)			
	No	%	No	%	No	%			No	%	No	%	No	%		
Age in years																
>20	5	12.5	3	18.8	4	28.6	5.04	0.283	2	100.0	2	33.3	8	12.9	12.84	0.012*
20->30	26	65.0	12	75.0	6	42.9			0	0.0	2	33.3	42	67.7		
≤30	9	22.5	1	6.3	4	28.6			0	0.0	2	33.3	12	19.4		
Level of education																
Diploma of nursing school	4	10.0	4	25.0	0	0.0	5.04	0.283	0	0.0	0	0.0	8	12.9	4.19	0.381
Nursing technical institute	18	45.0	6	37.5	8	57.1			2	100.0	2	33.3	28	45.2		
Bachelor degree in nursing	18	45.0	6	37.5	6	42.9			0	0.0	4	66.7	26	41.9		
Experience (years)																
<1	6	15.0	2	12.5	5	35.7	11.23	0.081	1	50.0	0	0.0	12	19.4	5.43	0.49
1-<5	19	47.5	7	43.8	2	14.3			0	0.0	4	66.7	24	38.7		
5-<10	13	32.5	5	31.3	3	21.4			1	50.0	2	33.3	18	29.0		
≥-10	2	5.0	2	12.5	4	28.6			0	0.0	0	0.0	8	12.9		

Fr: friedman test *: Statistically significance at p≤0.05

Table (5): Relation between total scores of nurses' practices and their characteristics pre and post sleep care protocol.

Relation between total scores of nurses' practices and their personal data	Pre Incompetent (n=50)		Pre Competent (n=20)		X^2	p-value	Post Incompetent (n=7)		Post Competent (n=63)		X^2	p-value
	No	%	No	%			No	%	No	%		
Age in years												
▪ >20	6	12.0	6	30.0	4.47	0.107	1	14.3	11	17.5		
▪ 20->30	35	70.0	9	45.0			5	71.4	39	61.9	0.255	0.88
▪ ≤30	9	18.0	5	25.0			1	14.3	13	20.6		
Level of education												
▪ Diploma of nursing school	8	16.0	0	0.0	3.64	0.162	1	14.3	7	11.1	3.218	0.20
▪ Nursing technical institute	22	44.0	10	50.0			1	14.3	31	49.2		
▪ Bachelor degree in nursing	20	40.0	10	50.0			5	71.4	25	39.7		
Experience (years)												
▪ <1	6	12.0	7	35.0	10.653	0.014*	0	0.0	13	20.6	7.235	0.065
▪ 1-<5	18	36.0	10	50.0			1	14.3	27	42.9		
▪ 5-<10	20	40.0	1	5.0			5	71.4	16	25.4		
▪ ≥-10	6	12.0	2	10.0			1	14.3	7	11.1		

Table (6): Correlation between total scores of nurses' knowledge and practices related to sleep care protocol at NICU pre and post protocol.

	Total Knowledge			
	Pre		Post	
	r	P-value	r	P-value
Total practices	0.28	0.01*	0.71	0.000**

Discussion

Sleep care is an essential element of developmental care in term and preterm neonates. It helps nurses to provide neonates with the best fit care solution to improve neonatal sleep through managing environment and improving their practice to enhance neonatal sleep and prevent complication from sleep deprivation **(Colombo &Debon, 2017).**

As regards to nurses' age, findings of the present study revealed that, less than two thirds of the studied nurses were in age group between 20 < 30 years and the mean and standard deviation were 22.98 ± 3.79. This finding disagreed with **Nasrin et al., (2016)** in a study entitled "Nurses Awareness of Pre Term Neonates Sleep in the NICU", they found in their study that the majority of the studied nurses their ages between 30<35 years with the mean age range of 31.4 ± 4.8.

Regarding educational level of the studied nurses, the present study revealed that, more than two fifths of them had Technical Institute of Nursing. From the researcher point of view this may be due to the fact that Technical Institute of nursing provide the community with large numbers of nurses than other agencies such as faculties of nursing. This finding disagreed with **Nasrin et al., (2016)**. They found in their study that three quarters of their subjects were had bachelor degree.

Regarding years of experiences of the studied nurses, revealed that, two fifth of them had experiences in NICUs from one year to less than 5 years with mean 2.97±3.03. This findings of the present study disagreed with the findings of **Marizieh et al., (2017)** in a study entitled, "The Impact Of Neonatal Sleep Care Training Program On Nurses Knowledge And Performance In Neonatal Intensive Care Units", they found in their study that, the years of experience of the most of their subjects were 1<18 years with mean 8.20±5.38. But this finding agreed with **Sajiad et al., (2018)** in a study entitled "Evaluation of Nurses Knowledge in Management of Pre-Mature Baby in Neonatal Units" they found in their study the most of the participants had experience from 1<5 years**.**

The entire subject didn't attend any training program related to sleep care at NICU, from the researcher point of view may be due to lack of training courses, because there is no training center present in the units subsequently there is no interest with training and continuous education within the units and shortage of nursing staff that lead to work over load. The training courses for nurses about sleep care are very important to improve their knowledge and their performance, and will affect positively on quality of sleep for neonates. This previously finding in agreement with **Marizieh et al., (2017)**. They found that, the majority didn't participate in any educational program regarding sleep care at NICU,

Concerning the characteristics and clinical data of the studied neonates, it was noted that, more one third of the studied neonates their age between 7<14 days and with mean age 13.21± 6.21, these findings of the present study dis agreed with **Nathalie et al., (2015)** in a study entitled "Polysomnography Assessment Of Sleep And Wakefulness In Preterm Newborns" who reported that half of their age in days was (2<20) days with mean 9.9±6.1.

Regarding gender of the studied neonates, more than half of them were female, These findings of the present study dis agreed with **Nathalie et al., (2015).** They found that nearly two thirds of the studied neonates were male.

As regard gestational age of half of them were between 35<37 weeks with mean age 36.33±2.83, this finding agreed with

Marjan et al., (2019) in a study entitled" effect of clustered nursing care on sleep behaviors of the preterm admitted to NICU", who reported that the gestational age of his studied neonates was 35<37 weeks.

Nearly more than two fifth of them, their weight were between 1500<2000 grams with mean age 1800.4 ± 343.21. According to the researcher interpretation, this may be due to difference in times of the study. These findings of the present study disagreed with **Nathalie et al., (2015)**. They found that the most of birth weight of their studied neonates in grams were (1290<2030) with mean 1742.3 ± 223.6.

Half of the studied neonates were diagnosed with RDS. From the researcher point of view this is revealed that, the neonates admitted to the NICU usually suffer from RDS especially who were preterm. This finding agreed with **Marjan et al., (2019**). They found that, the majority of their studied neonates their diagnosis was RD.

Regarding to their feeding, more than two fifth, their feeding were oral. These finding agree with **Jennifer et al., (2017**) in a study entitled "Impact of Hands-on Care on Infant Sleep in The Neonatal Intensive Care Unit" they found that the most of the subject their feeding was oral feeding because all their subjects were stable.

Concerning to total scores of nurses' knowledge pre and post protocol implementation, the present study showed that, about one quarter of nurses had good knowledge pre protocol, while most of them had good knowledge posttest. According to the researcher interpretation, it could be due to the impact of implementation of protocol on developing the knowledge of the studied nurses and their adherence to research guideline booklet as well as, different teaching methods which used to deal with nurses during giving instructions**.**

These finding was similar with **Marzieh et al., (2018).** They mentioned that there was highly statistically significant improvement in nurses' knowledge at posttest compared by pretest, due to the effect of training program. This finding were consistent with **Kristina et al., (2016)** in a study about" Improving Safe Sleep Practices For Hospitalized Infants", they reported that, there were highly statistically significant improvement in nurses knowledge regarding infant sleep .

Concerning total scores of nurses 'practices pre and posttest, the current study illustrated that, one quarter of the studied nurses had competent practice related to total practices care to improve neonatal sleep care pretest. While the majority of them had competent practices posttest. From the researcher point of views, it may be due to the effect of implementing sleep care protocol which lead to improvement of nurses' knowledge and their practices. This result disagreed with **Marzieh et al., (2017),** they mentioned that, there was no statistical significant improvement in nurses' practices regarding sleep care, due to low numbers of training sessions therefore it is recommended to implement long term training program in this field.

Regarding assessment of neonatal condition during sleep, the current study revealed that, there was a highly statistical significant improvement of the studied neonates condition during sleep posttest compared to pretest, except sleep position, no statistical significant. From the researcher point of views, it may be because of lack of awareness of the studied nurses about the importance of back position for sleep and this prevent SIDS and more safe about prone position or side lying. This finding disagreed with **Kenderal et al., (2016)**, in a study about "Nurses' Knowledge and Adherence to Sudden Infant Death Syndrome Prevention

Guidelines", they mentioned that majority of the studied infant were in supine position after their guidelines to the studied nurses.

Regarding to the relation between the total scores of nurses' knowledge and their characteristics pre and posttest**,** the current study showed that, there were no statistically significant relation between nurses' knowledge and their years of experiences, level of education at pretest. According to the researcher interpretation it may be due to the fact that, knowledge a simulation didn't require special characteristics. While there was statistical significant relation between the studied knowledge and their age at posttest (p=0.012). From the researcher point of views this may due to the older nurses had the ability to be more understand than younger nurses.

This finding was disagreed with **Elnabawy et al., (2020)** in a study entitled "Effect of Instructional Sessions on Nurses' and Doctors' Knowledge and Practice Regarding Developmental Care in NICU in Albha City" they mentioned that, there were significant differences in the relationships between nurses' knowledge and their years of experiences and their education

Concerning relation between total scores of nurses' practices and their personal data pre and post protocol, the current study revealed that, there were no statistical significant relation between nurses' practice and their age ,level of educations and years of experience .This study not' consistent with **Elnabawy et al., (2020).** They reported that, there were statistically significant in relation between years of experiences, age, education of the studied nurses and their practices

Correlation between total scores of nurses' knowledge and their total practices scores about sleep care protocol at NICU pre and post protocol, revealed that, there was statistical significant differences with positive correlation between total scores of nurses' knowledge and their practices regarding sleep care protocol at NICU on pretest (p=0.01),and there was a highly statistical significant differences between total scores of nurses' knowledge and practices about sleep care protocol at NICU on posttest (p=0.000). According to the researcher interpretation, the knowledge and practice of nurses were poor before implementation of the protocol pretest .While; in posttest knowledge and practice of nurses were improved due to implementation of good point of sleep care protocol .

This result was supported by **Mary &Kristine, (2018**) in a study about "Barriers To And Interventions That Increase Nurses' And Parents' Compliance With Safe Sleep Recommendations For Pre Term Infants" .They recommended that, providing nurses with information regarding sleep at NICU is essential, it can promote adherence to best practice, self-assessment and lead to positive effect on neonate out comes.

Conclusion

The research hypothesis is accepted. While it was focused that the implementing sleep care protocol was effective in improving nurses' knowledge and practice regarding sleep care protocol at NICU after protocol implementation compared by pre protocol.
There was a highly statistical significant improvement of the studied neonates' condition during sleep posttest compared by pretest .

Recommendations

-Emphasizing the importance of continuing in service education for nurses regarding sleep care protocol at NICU to update their knowledge and practice.

-Developing a comprehensive booklet including guidelines about sleep care protocol for neonates at NICU.

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تعزيز معلومات وممارسات الممرضات من خلال تنفيذ بروتوكول العناية بالنوم داخل وحدات العناية المركزة لحديثي الولادة

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يعتبر النوم جزءاً هاماً من الوظائف الحيويه للجسم كالتنفس والغذاء ،حيث انه يلعب دوراً هاماً في نمو المخ . وقد أثبتت الدراسات الحديثه ان النوم له دوراً هاماً في تنظيم درجة الحراره وحفظ الطاقه لذلك يعتبر تعزيز النوم في الأطفال حديثي الولادة عنصراً ضرورياً في توفير الرعايه المناسبه للرضع في وحدات العناية المركزة. لذلك هدفت الدراسة إلي تعزيزمعلومات وممارسات الممرضات من خلال تنفيذ بروتوكول العناية بالنوم داخل وحدات العناية المركزة للأطفال حديثي الولادة.وقد أجريت هذه الدراسة في وحدات العناية المركزة للاطفال حديثي الولادة بمستشفي الأطفال التخصصي ومستشفي بنها الجامعي علي ٧٠ ممرضة يعملن في الأماكن السابق ذكرها ، كما إشتملت العينة أيضاً علي ٧٠ طفل حديثي الولادة تتراوح أعمارهم من ١ إلي ٢٨ يوم. حيث كشفت النتائج عن انه لا توجد علاقة ذات دلالة احصائية بين معلومات الممرضات وسنوات الخبرة ومستوي التعليم في مرحلة ما قبل البروتوكول بينما كانت هناك علاقة ذات دلالة احصائية بين معلوماتهن و أعمارهن .لوحظ أيضاً عدم وجود علاقة ذات دلالة احصائية بين العمر ومستوي التعليم وسنوات الخبرة وممارسات الممرضات في مرحلة ما بعد البروتوكول. كما أن هناك علاقة طردية ذات دلالة احصائية بين مستوي معلومات وممارسات الممرضات في مرحلة ما بعد البروتوكول. وأوصت الدراسة بأن هناك حاجة إلي توفير برنامج توجيهي للممرضات حول العناية بالنوم للطفل داخل وحدات العناية المركزة لحديثي الولادة والتقييم المستمر لمعلومات وممارسات الممرضات اللاتي يعملن بوحدات العناية المركزة لحديثي الولادة .