

# Nursing intervention guidelines regarding Care for Neonates with Necrotizing Enterocolitis: its effect on Nurses' Knowledge and Performance

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## Abstract

**Background:** Necrotizing enterocolitis (NEC) is a disorder affected only the internal lining of the large or small intestinal wall becomes damaged and leading to death. While the completely thickness of the internal tissue of the intestinal wall, may become affected eventually. The aim of this study was to evaluate the effect of nursing intervention guidelines on nurses' knowledge and performance regarding care for neonates with NEC at neonatal intensive care unit. Design: A quasi-experimental design, this study was conducted at neonatal intensive care units (medical and surgical) at Benha Specialized Children Hospital, Egypt. Sample: A purposive sample of 43 staff nurses and 50 neonates with NEC. Tools: predesigned questionnaire sheet and follow up observational checklist. The nursing intervention guidelines implementation was deliberate as reference guidelines for nurses. Results: The present study revealed that was highly statistically differences for mean scores pre and posttest as regards nurses 'knowledge and performance for neonates with NEC. Conclusion: Nurse's knowledge level and performance regarding care for neonates with NEC were improved after implementation of the nursing intervention guidelines than before. Recommendations: The present study was recommended that, periodic in-service training program must be design and implemented at intensive care unit as an essential for continuous promoting nurses' knowledge and practice regarding about caring for neonates with NEC.

**Key Words:** Neonatal Intensive Care Unit, Nurses' performance, Necrotizing enterocolitis.

## Introduction

High risk neonate is defined as, preterm baby refers to birth baby before to thirty seven weeks gestational age and susceptible to increase incidence to morbidity and mortality rate for immaturity, dysmaturity, physical disorders and complications at birth. From particular view, the study of newborn neurobehavioral, we may provide interpretation for subsequent behavioral results. From actual point of view, the early discovery of neonates with the health problem would promote the study of preventive management that could lowest the incidence of permanent complications (Ambalavanan, 2016)

The physical assessment is a particularly part for caring the high-risk neonates. A thorough the, feeding behavior, changes in mobility, vital signs, color and oxygen saturation oftentimes indicate an underlying disorder. The neonates whose extremely low birth weight aren't able to resist prolonged physiological stress and may going to die within few minutes of present the

abnormal symptoms if the underlying pathological process isn't managed. The professional nurses should be known of small changes and react immediately to perform interventions that improve quality for the high-risk neonates (Bucher, 2018).

Necrotizing enterocolitis (NEC) is a serious disorder that affects especially the intestine of neonates. The intestinal wall was invaded by the bacteria, which could cause localized infection and sever inflammatory process which able to destroyed the intestinal wall. For example large intestine destruction could leading to perforation of the intestinal and exits the stool into the abdominal cavity, which can lead to neonatal sepsis and death. (Dominguez and Moss, 2017).

The morbidity and mortality rate is increased between preterm babies, and prematurity increased susceptible rate for complications as NEC. It is more common in lower birth weight neonates and lower gestational age. Its incidence is highly variable worldwide

(Patel and Shah, 2017). It accounts for 1 to 3 cases per 1000 live births, affecting almost 12% of all neonates with severe low birth weight and up to 4% of admission to neonatal intensive care units (NICU), with a mortality rate of 20 – 30% (World Health Organization, 2019).

The most common clinical manifestations for NEC were bloody stool, vomiting, diarrhea, feeding intolerance, abdominal swelling, and diminished of bowel sounds. It may therefore be difficult to mild cases of NEC from other gastrointestinal problems. Advanced cases may with ascites, intestinal perforation, peritonitis, or shock (Gordon and Swanson, 2019).

The importance from preventing and management strategies are a challenge as the etiology of NEC remains uncertain. The most effective way to reduce morbidity and mortality rate from NEC would be to reduce the incidence of prematurity. Moreover, there are many evidence-based approaches to prevent NEC. These include, using enteral antibiotics, administering probiotic agents, feeding the neonate with breast milk and administering many different growth factors, anticytokine agents, and glucocorticoids (Zhou, et al., 2020).

Almost the NEC cases are treated by the medical intervention, but severe cases may needed to surgical removal of the necrotic tissue. The severity of NEC influences the decision for medical or surgical intervention. (Afrazia, et al., 2016).

The nurse plays an essentially role in postoperative care. The nurse should check physician's orders postoperative for the neonates. First she should check for the neonate's airway clearances and breathing; she must check the neonate's consciousness level, check the skin color for any signs of cyanosis and closed observation for the neonatal vital signs (Kim, 2020).

### Significance of the study

The insufficiency of nurses' knowledge level and performance may be a barrier to fulfill the neonatal improvement from NEC. Nevertheless, many studies have revealed that, nursing intervention guidelines would improve nurses' knowledge level and performance regarding care for neonates with NEC. So that,

the appropriately way for improving the nurses' knowledge and performance is the nursing intervention guidelines.

### The study Aim

The current study was aimed to evaluate the effect of nursing intervention guidelines on nurses' knowledge and performance regarding care of neonate with NEC at neonatal intensive care units. Through:

- 1) Assessing of nurses' knowledge and performance regarding care of neonate with NEC
- 2) Designing and implementing nursing intervention guidelines based on level of nurses' knowledge and performance regarding care of neonate with NEC
- 3) Evaluating the effect of nursing intervention guidelines on nurses' knowledge and performance regarding care of neonate with NEC

### Research Hypothesis:

The nurses' knowledge and performance regarding care for neonates with NEC will be significantly improved after implementation of nursing intervention guidelines than before.

### Patient and Methods

#### Research design

A quasi-experimental pre/posttest design was used with a single group.

#### The study setting

The present study was took place at NICUs (medical and surgical) affiliated to Benha Specialized Pediatric Hospital, Egypt. The capacity of medical unit is 28 incubators and the surgical unit 12 incubators. For the highest capacity of neonates and nurses.

#### Sample and sample size

##### Nurses sample:

A convenient sampling of 43 nurses (23 from medical unit + 20 from surgical unit) who working in the previously mentioned setting.

##### Patient sample:

A purposive sample of 50 neonates with NEC whose were admitted at NIUs was included in the sample.

**Inclusion criteria for sample selection:**

- The inclusion criteria for the nurses included:
  - (1) Nurses who providing direct care for neonates with NEC.
  - (2) Accept to participate in the study.
- Neonates diagnosed with NEC of both genders and free from any congenital anomalies or congenital infection to prevent further complications for neonates.

**Instruments**

The researchers were utilized two tools for collecting the data, which included:

**Tool I: Structured interviewing questionnaire sheet.** It was designed by the researchers after reviewing related literature by simple Arabic language. It consisted of three parts:

**Part 1: Characteristics of studied nurses.** It included items related to qualifications, age, and attendance of previous training programs regarding care for neonates with NEC and experience years

**Part 2: Characteristics of studied neonates:** It included items related to weight at the time of study, birth weight, gender, gestational age and chronological age.

**Part 3: Nurses' knowledge about nursing intervention guidelines regarding care for neonates with NEC (pre /posttest).** It contained 60 questions were 10 true/false questions and 50 multiple choice (MCQ). MCQ covered definition (5 questions), clinical picture (6 questions), risk factors (6 questions), high risk groups (5 questions), complications (9 questions), prevention (4 questions), prognosis (3 questions) and nursing management for neonates with NEC (on admission, during hospitalizations and at discharge) (12 questions). Also, 10 questions were true/false covered nursing guidelines pre/post nursing implementation.

*Nurses' knowledge reliability was measured by using Cronbach's alpha test which was reliably at ( $r = 0.82$ ).*

**Scoring system for knowledge:**

Scoring items	Score
Complete and correct	2
Incomplete correct answer	1
Wrong answer	0
True	2
False	0

Total scoring system for nurse's knowledge

- Satisfactory knowledge: > 60%, score 71-120
- Unsatisfactory knowledge: ≤ 60%, score 1-70

**Tool II: observational checklist for nurses' performance regarding care for neonates with NEC (pre /posttest).** It was designed by the researchers after review the related literature (**Centers for Disease Control and Prevention, 2016**). It consisted of 120 statements related to nursing care for neonates with NEC at neonatal intensive care units. It was divided into 8 categories; observational checklist to assess nurses' performance during hand washing (15 statements), during putting on and removing protective personal equipment (PPE) (12 statements), during wound care (18 statements), pre and postoperative care (13 statements), during I.V infusion care (20 statements), during nasogastric tube care (18 statements), on checking stools for blood (12 statements), during discharge care plan (12 statements) for neonates with NEC.

**Scoring system for performance:**

Scoring items	Score
Incompetent	0
Competent	1

The score of checklists were 120 grades classified into:

- Incompetent ≤ 85%, score 1-101
- Competent : >85 %, score 102-120

*Reliability of this instrument was estimated among 10 participants by using test retest method with two weeks apart between them. Then Cronbach' alpha was calculated between the two scores and it was 0.88 which indicates that the tool is reliable to detect the objectives of the study.*

**Nursing guidelines program:** Construction the nursing guidelines program for caring the neonates with NEC at intensive care units. The application of nursing intervention guidelines in this study was guided according to **Centers for Disease Control and Prevention, 2016**. The nursing intervention guidelines were then designed after assessed the nurses' needs through reviewed the related literature, then evaluation was conducted. The nursing

intervention guidelines implementation were included the knowledge and performance. During the nursing intervention guidelines implementation, the researchers used various teaching methods such as; lectures, group discussion, power point presentation, watching videos, posters and, demonstration and re-demonstration, finally booklet for caring the neonates with NEC at intensive care units, which was developed by the researchers in simple Arabic language was distributed for the studied sample. Two professors of pediatric nursing and one professor of medical surgical nursing were revised the nursing intervention guidelines booklet for clarity and validity. After that, the researchers were done the necessary modifications for finalized form of the nurses' intervention guidelines booklet. Nurses' knowledge and practice were evaluated two times (pre and post) nursing intervention guidelines implementation by using the study tools.

### **Tools validity**

The tools were reviewed by three professionals included two professors of pediatric nursing and one professor of medical surgical nursing, who's reviewed the tools for relevance, clarity, understanding, easiness comprehensiveness and applicability. After their revision the modifications were carried out.

### **Ethical considerations**

After the researchers were took the approval of the Ethical Scientific Research Committee from Faculty of Nursing, South Valley University, Egypt, and the approval from the directors of Benha Specialized Pediatric Hospital, the pilot study was done. Written informed consent from participants was taken and their participations were voluntary. Anonymity and confidentiality were maintained and monitored at the research study. At the first interview the participants were taken the complete explanation related to the study aim and the participants were informed by the researchers that no known risks would be associated with the participation or non-participation in the study.

### **Pilot study**

The study was piloted in order to test the applicability of the designed tools and the clarity of the included statements and questions and the time which will required for each nurse to fill in the statements and questions. That applied done on 10% from the total nurses were 4 not included in the study sample.

### **Procedure**

#### **Implementation phase**

The study began on third May (2019) up to the end of December (2019) for collecting the data and implementing the nursing intervention guidelines. The researchers began to visit the study setting, three days weekly (Sunday, Tuesday and Thursday) from 9:00 am to 3:00 pm. The researchers began to introduce themselves and give the complete clarification regarding the study aim and the predicted results for the participants; the researchers were taken the nurses consent to contribute in the study and interviewed each nurse individually. All studied sample constituted 43 nurses, were utilized as a single group. The researchers were collected the characteristics of studied nurses, after that was assessed their knowledge's level regarding care for neonates with NEC, pre/post nursing intervention guidelines implementation. A pretest distributed for the participants and the researchers were completed the follow up observation checklist during the nurses work. The nursing intervention guidelines were implemented after assessed the actual nurses' needed, through reviewed the related literature. The nursing intervention guidelines were covered the practical skills and theoretical parts, regarding care for neonates with NEC. It was aimed to promote the nurse's knowledge and practice about caring the neonates with NEC. Nurses participants were divided to small groups, the nursing intervention guidelines were conducted over 10 demonstrated session; five theoretical and five practical sessions (within 30-60 minutes for each session) at the morning shift by three sessions weekly. It was given over a period of eight weeks. Various teaching methods have been applied by the researchers during the implementing nursing intervention guidelines such as; lectures, group discussion, posters, power point presentation, watching videos, demonstration and re-demonstration finally the hand-out to care the neonates with NEC.

### Evaluation phase

The researchers were used the same study tools of pretest, for the posttest that done, after the nursing guideline implementation, to evaluate the nurses' knowledge and practice, that to evaluate the effect of nursing intervention guidelines. The conclusion and recommendations of this study were distributed to the participants, the booklet of the nursing intervention guidelines are available for the all staff nurses at the medical and surgical ICU at Benha Specialized Pediatric Hospital.

### Statistical design

The data were obtained interpreted and analyzed by using the statistical package for social science (SPSS) version 20, was utilized to perform the data analyses. Quantitative data were illustrated as mean and standard deviation (SD). Qualitative data were illustrated as percentage (%).and finally was used t-test to determine the differences. The significance was at  $p < .05$ .

### Results

As observed from table1, the distribution of the nurses' sample in regards to the mean nurses' age were  $26.63 \pm 4.25$  years and around two thirds of them (62.7%) were diploma in nursing. Also, the mean years of experience were  $7.31 \pm 3.81$  years. On the other hand, more than half of them (83.7%) don't take attended a previous training course, while only (16.3%) of nurses' had attended of previous training course regarding care for neonate with NEC.

Table2. Shown, more than half of the neonates' sample in regards to the gestational age from was 30 to less than 34 weeks and their mean gestational age ( $30.8 \pm 2.1$ ). Moreover, approximately (58%) their chronological age from 20 to less than 30 days with their mean birth weight was ( $1723.54 \pm 413.5$ ) grams and mean weight in the time of

study were ( $1980.8+269.7$ ). On the other hand, approximately half of studied neonates (50%) were weighted in the time of study  $2000 < 2500$  gm.

Table3. Represent the nurses' knowledge regarding care for neonates with NEC pre/post implementation of nursing intervention guidelines mean scores, were on neonatal admission, during hospitalization and at neonatal discharge pre implementation of nursing intervention guidelines were  $4.72 \pm 1.03$ ,  $4.81 \pm 0.96$  and  $4.93 \pm 0.99$  respectively. While, the nurses' knowledge on neonatal admission, during hospitalization and at neonatal discharge post implementation of nursing guidelines the mean scores were,  $8.81 \pm 0.88$ ,  $8.88 \pm 1.05$  and  $8.88 \pm 0.88$ . It was revealed that implementation of nursing guidelines improved the nurses' knowledge regarding care of neonates with NEC than before. The t-test revealed a significant difference between pre-implementation of nursing intervention guidelines and post nursing intervention guidelines implantation where,  $t (*-24.536)$  at  $p$  value (0.000).

Table4, Represented the nurses' performance regarding care for neonates with NEC total mean scored pre nursing intervention guidelines implementation were ( $51.74 \pm 15.68$ ). While, total mean score for the nurse's performance post nursing intervention guidelines implementation were competent to ( $113.42 \pm 4.85$ ) respectively. It was revealed the nursing intervention guidelines were leaded to increase competency of the nurses performance regarding care for neonate with NEC than before, where  $t$  test ( $*-25.593$ ) at  $p$  value (0.000).

It was cleared from table5, the nursing intervention guidelines was improved nurses' knowledge and practice about caring neonate with NEC. The correlation clarified, the knowledge of suggested guidelines basically was reflected appropriate practice and remained an essential step toward the evidence based the nursing intervention guidelines implementation for caring neonate with NEC.

Table 1. Percentage distribution of the studied nurses characteristics

Nurses' characteristics	Total number = 43 (100%)	
	No.	%
<b>Age in years</b>		
1. < 20 years	14	32.5
2. 20 - < 25 years	5	11.6
3. 25 - < 30 years	4	9.3
4. 30 - < 35 years	18	41.8
5. ≥ 35 years	2	4.6
<b>Mean ±SD</b>	<b>26.63 ± 4.25</b>	
<b>Level of education</b>		
1. Diploma in nursing	27	62.7
2. Diploma with specialties	7	16.2
3. Technical institute of nursing	4	9.3
4. Bachelor in nursing	5	11.6
<b>Experience years</b>		
1. <5 years	20	46.5
2. 5-<10years	7	16.4
3. 10<15years	5	11.6
4. ≥15 years	11	25.5
<b>Mean ±SD</b>	<b>7.31 ± 3.81</b>	
<b>Attendance of previous training courses about care for neonates with necrotizing enterocolitis</b>		
1. Yes	7	16.3
2. No	36	83.7

Table 2. Percentage distribution of the studied neonates' characteristics

Neonates' characteristics	Total number = 50 (100%)	
	No.	%
<b>Gestational age (weeks)</b>		
1. 26 - < 30	5	10%
2. 30 - < 34	27	54%
3. 34 - < 38	16	32%
4. 38 - < 42	2	4%
<b>Mean ±SD</b>	<b>30.8 ± 2.1</b>	
<b>Gender</b>		
1. Female	27	54%
2. Male	23	46%
<b>Chronological age (Days)</b>		
1. 1 < 10	16	32%
2. 10 < 20	5	10%
3. 20 ≤ 30	29	58%
<b>Weight at birth (Grams)</b>		
1. <1000	-	
2. 1000-<1500	4	8%
3. 1500-<2000	19	38%
4. 2000<2500	22	44%
5. ≥2500	5	10%
<b>Mean ±SD</b>	<b>1723.54 ± 413.5</b>	
<b>Weight at the time of study (gm)</b>		
1. < 1500	7	14%
2. 1500 < 2000	18	36%
3. 2000 < 2500	25	50%
4. 2500 and more	-	-
<b>Mean ±SD</b>	<b>1980.8±269.7</b>	

**Table 3.** Mean scores of nurses' knowledge regarding care for neonates with NEC pre/post implementation of nursing intervention guidelines

Knowledge questions	Total number=43(100%)			
	Pre -implementation of nursing intervention guidelines Mean $\pm$ SD	Post- implementation of nursing intervention guidelines Mean $\pm$ SD	t-test	P value
1. Knowledge about care for neonates on admission	4.72 $\pm$ 1.03	8.81 $\pm$ 0.88	*-23.752	0.000
2. Knowledge about care for neonates during hospitalization	4.81 $\pm$ 0.96	8.88 $\pm$ 1.05	*-20.853	0.000
3. Knowledge about care for neonates at discharge	4.93 $\pm$ 0.99	8.88 $\pm$ 0.88	*-19.284	0.000
<b>Total mean scores of nurses knowledge</b>	14.47 $\pm$ 2.45	26.58 $\pm$ 2.63	*-24.536	0.000

\* Significance difference at nurses' knowledge pre/post nursing intervention guidelines implementation

**Table 4.** Mean scores of nurses' performance regarding care for neonate with NEC pre/post nursing intervention guidelines implementation.

Performance statements	Maximum score	Total number=43(100%)			
		Pre - implementation of nursing intervention guidelines Mean $\pm$ SD	Post- implementation of nursing intervention guidelines Mean $\pm$ SD	t-test	P-value
1- Hand washing	15	7.16 $\pm$ 2.27	14.05 $\pm$ 0.90	*-19.704	0.000
2- During putting on and removing protective personal equipment (PPE).	12	6.37 $\pm$ 2.02	11.40 $\pm$ 0.66	*-15.868	0.000
3- Wound care and equipment	18	6.84 $\pm$ 3.15	16.98 $\pm$ 0.80	*-20.656	0.000
4- Pre and postoperative care	13	5.88 $\pm$ 2.16	12.19 $\pm$ 1.01	*-18.263	0.000
5- I.V infusion care	20	8.33 $\pm$ 2.35	18.93 $\pm$ 0.94	*-26.729	0.000
6- Nasogastric tube care	18	6.02 $\pm$ 2.27	17.12 $\pm$ 0.93	*-31.384	0.000
7- Checking stools for blood	12	5.81 $\pm$ 2.79	11.33 $\pm$ 0.71	*-13.120	0.000
8- Discharge care plan	12	5.33 $\pm$ 2.06	11.44 $\pm$ 0.83	*-18.091	0.000
<b>Total mean scores of nurses' performance</b>	120	51.74 $\pm$ 15.68	113.42 $\pm$ 4.85	*-25.593	0.000

\*Significance difference at nurses' performance pre/post nursing intervention guidelines implementation

**Table 5.** Correlation between total nurses' knowledge scores and total performance scores regarding care neonate with NEC

Total knowledge	Pre -implementation of nursing intervention guidelines (N = 43)		Post- implementation of nursing intervention guidelines (N = 43)	
	R	p-value	r	p-value
<b>Total performance</b>	0.945**	<0.001	0.395**	0.009

\*P < 0. 000 (Highly statistical significant difference)

## Discussion

Necrotizing enterocolitis is a dangerous disease that affects mostly the intestines of premature babies. It almost happens within the initially two weeks after the birth for the neonate, especially who are take formula feeding. In this disease, the micro-organism can invade the intestine wall. If not treated, it can lead to

septicemia and going to death **Abdel-Halim, 2017**. The current study aimed to evaluate the effect of nursing intervention guidelines on nurses' knowledge and performance regarding care of neonate with NEC at NICU.

The present study illustrated that, nurses' ages were ranged between 30- <35years were (41.8 %) with mean age of 26.63  $\pm$  4.25 represented the highest percentage of the studied

sample. The study results were agree with **Abdel-Halim, 2017** stated that, in excess of half (50.9%) of the participants their age ranged between 30-35 years old with mean age of  $26.12 \pm 2.42$  and parallel with **Afrazia, 2016** were present that 50% of the participants in their study < 35years.

Regrettably, the present study results estimated that, the majority of the participants' nurses (83.7%) hadn't attended previous training course. Moreover < half of them (46.5 %) had < five years of experience at NICUs regarding care for neonates with NEC. This result was agreement with **Ahmed, 2018** who found that the peak percent (42.9%) were employed in PICU for < five years experienced and the majority of participants hadn't presented training programmer regarding care for neonate with NEC.

The majority of participants, nurses at hospital had diploma in nursing; thence any defect will affect the neonatal nursing care quality. So that, the participants were required continues check for the caring which delivered to the neonates and periodically training programs. The aim from continuous training is to promote knowledge and performance for the nurses. Finalized that can improve the characteristic of nursing care which provided to the patients. Contrariwise, a study for **Ball, et al., 2017** focused on periodically tanning for the registered nurses' whose act as a method for continuous education and evaluation of their knowledge promote their performance. Hence, the present study aimed; evaluate the effect of nursing intervention guidelines on nurses' knowledge level and practice about caring the neonate with NEC (**Ball, et al., 2017**).

As regards the characteristics of participants neonates regards to characteristics, the results of this study shown that, > half (54%) of them were females, their mean gestational age was  $30.8 \pm 2.1$ weeks; the neonates mean birth weight was  $1723.54 \pm 413.5$  grams. Also, > half of them were (58%) their chronological age from 20 < 30 days. These findings were in contrasting with **Ambalavanan, 2016**. Therefore **Ameri, et al, 2020** study represent, the infants diagnosed with NEC mean GA and birth weight were significantly < the non- necrotizing enterocolitis group. Also the study was reflected that, premature babies were increased incidence for diagnosing by NEC.

Improvement knowledge was considered as a basic part for caring the neonate with NEC. The role of continuous and periodically training in nursing is improving the knowledge level and practice to enhance the quality of care released to neonate **Bucher,et al, 2018**. Moreover, the present study results were clarified, a highly significant differences between nurses' total knowledge level pre and post nursing interventions guidelines implementation. Moreover, **Cassir, et al., 2020** added that, promoting in the most nurses' knowledge level related to care for neonate with NEC post implementation which was statistically significant; however, it has been suggested, the most of the recruited nurses take their knowledge level from the training programs. More clarified over, the studied sample characteristics data also illustrated, almost of the participants' nurses were diploma in nursing holders. So that revealed that nursing intervention guidelines had promoted the nurse's knowledge regarding care for neonate with NEC at NICU.

The mean scores of nurses' knowledge about the nursing care of neonates with NEC pre nursing intervention guidelines implementation before, during and after neonatal care were  $4.72 \pm 1.03$ ,  $4.81 \pm 0.96$  and  $4.93 \pm 0.99$  respectively. While, the mean scores about the nursing role before, during and after neonatal care post nursing intervention guidelines implementation were  $8.81 \pm 0.88$ ,  $8.88 \pm 1.05$  and  $8.88 \pm 0.88$ . That shown participants knowledge was improved after the nursing intervention guidelines implementation in comparison to pre nursing intervention guidelines implementation. This result was confirming from **Clark, et al., 2016** identified that; one from the causes for nurses' lack of knowledge might be the poor training. In the present study were 42% of the nurse were not having attained any education related caring for neonate with NEC and 41% never attendance previous training programmer related caring for neonate with NEC. These findings were reflected the nursing guidelines intervention implementation was proficiency on nurses' knowledge level regarded caring the neonate with NEC.

From the studied sample, total mean scores of participants' nurses' performance about care for neonates with NEC, pre implementing the nursing intervention guidelines were  $51.74 \pm 15.68$ , while post implementing the nursing

intervention guidelines were promoted to  $113.42 \pm 4.85$  respectively in compared pre nursing intervention guidelines implementation, with statistical significant differences. This result was concurrent by **Daniel, 2018**. The study was done in 5 Jordanian hospitals at NICUs to evaluate the nurses' knowledge and performance regarding care the neonates with NEC, through implementation nursing intervention guidelines: It was reported; the participants' knowledge level & performance were increased and promoted post implementing the guidelines. It revealed the nursing intervention guidelines competency of the nurse's performance about caring the neonates with NEC.

With respect the present study was reflected a highly significance difference between' participants' nurses knowledge & performance pre and post implementing the nursing intervention guidelines. For that, we can predicate increasing the periodically education & training offered in the hospitals can increase the opportunities for promoting the nurses' performance and knowledge regarding care neonates with NEC (**Ebrahim, 2019**).

Eventually, continuous training programs developed for promoting the nursing care and decrease the gap between nurses' knowledge level and practice **Dominguez, 2017**, through improvement of nurses' total practice regarding care for neonates with NEC was expected. This may clarify that, knowledge of suggested guidelines basically represent proper performance and still it consider the primary step toward the implementation for caring neonates with NEC at NICU.

## Conclusion

The role of nurses at NICU is multifaceted; therefore, the present study was established nursing intervention guidelines for nurse's knowledge and performance regarding care for neonates with NEC were improved after implementation of the nursing intervention guidelines than before at the previous mentioned setting.

## Recommendations

1- An orientation programmer must be designed for the newly nurses staff at NICUs and

including in policies and strategies neonates with NEC.

- 2- In-service training program developed periodically was an essential for promoting the nurses' knowledge and performance regarding care for neonates with NEC.
- 3- Continuous evaluation for nurses' knowledge level and practice is important, to assess factors affecting their performance in NEC and the nurses' needs.

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