

## Nurses' Performance about Creating Healing Environment and Clustering Nursing Care for Premature Infants

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### Abstract

**Background:** Premature infants have markedly improved outcomes when the stress of environmental sensory overstimulation is reduced. Nurses, as the primary caregivers, play a crucial role in reducing infants' stress and promoting better outcomes. **Aim:** The study aimed to assess nurses' performance about creating healing environment and clustering nursing care for premature infants. **Method:** A descriptive research design was utilized in this study, all neonatal nurses (80) who were working at the time of the study were enrolled at our study. This study was carried out at Neonatal Intensive Care Units at Children Hospital and Maternity & Gynecological Hospital affiliated to Ain Shams University. **Tools:** The researchers employed two data collection tools: a pre-designed questionnaire to assess the nurses' characteristics and knowledge, and observation checklists. **Results:** Explained that knowledge score and training courses had high frequency positive effect on practice score at p value <0.01\*\*. While years of experience had high frequency negative effect on practice score at p value <0.01\*\* and age had slight frequency negative effect on practice score at p value <0.05\* **Conclusion:** The majority of the studied nurses demonstrated incompetent practice, while less than two-thirds exhibited poor knowledge about healing environment and clustering care. Furthermore, a high positive correlation was found between nurses' knowledge and practice, highlighting the importance of knowledge enhancement in improving nursing practice. **Recommendations:** Continuous training programs should be applied for nurses in the NICUs to improve their knowledge and practice regarding developmental supportive care, healing environment and clustering nursing care. On job training for neonatal nurses about applying healing environment and clustering nursing care.

**Keywords:** nurses' performance, premature infants, care clustering, therapeutic environment

### Introduction

Preterm infants are defined as neonates who are born alive before 37 weeks of pregnancy. There are about 15 million preterm infants born every year worldwide, accounting for 10% of the total number of newborns. Premature birth remains an important health priority around the world (Chung et al., 2020). The proportion of preterm infants ranges from 13.4% in North Africa to 8.7% in Europe (Chawanpaiboon et al., 2019).

Neonates admitted to the neonatal intensive care units (NICUs) need special care to survive. In NICU, newborns are exposed to painful and invasive procedures and environmental stimulus, such as light and

sound. In addition, they also experience noninvasive procedures, including changing diapers, nutrition, position change, weighting, and health care, which are stressful in many ways. Stress inflicted on newborns through various methods may result in neurological damage resulting in abnormal development (Suryandari et al., 2021).

A negative impact of the NICU environment can be manifested in a number of ways by the preterm infant. Typical markers of stress are physiological parameters such as increased heart rate and decreased oxygen saturation. Growth of the infant is negatively affected by increased energy expenditure which may occur during routine nursery care. The adverse effects of the environment might also

extend the infant's recovery from typical preterm illnesses. The preterm infant's rapidly developing brain is particularly vulnerable to a stressful environment (**Soni et al., 2022**).

Developmental cares are methods that are intended to adjust the NICU environment to diminish the stress, support the behavioral organization, improve physiological stability, keep sleep rhythms, and promote neural growth and maturation of infant (**Willson & Spence, 2022**). Developmental care is an approach that uses a range of medical and nursing interventions that aim to reduce the mismatches between extra- and intra-uterine environments, decrease the stress of preterm neonates and help them cope better with the NICU environment. It is focused to provide a specifically designed environment and routine care to prevent harmful and damaging effects on preterm infant's brain, support its development and respond to the infants' behavior keys (**Griffiths, 2020**).

The process of developmental care involves many of nursing interventions as clustering nursing care and creating healing environment. The healing environment, addresses the physical environment of the NICU, including space, privacy and safety, the sensory environment of temperature, touch, proprioception, smell, taste, sound, and light. Creating an environment for the premature infant to minimize stress, reduces pain and provides a developmentally appropriate sensory experience for the infant, promoting neurobehavioral organization and developing infant's self-regulatory skills (**Maria et al., 2021**).

Clustered care is clustering several routine or nursing care events together rather than spacing them out over time. The main goal of clustering care is allowing the infant to have longer periods of rest. At the same time, clustering, or scheduling of routine care in infants being born at lower gestational age, was associated with lower oxygen saturation, more behavioral responses related to stress and negative stress responses (**Vaughan & O'Connor, 2022**).

In order to promote optimal outcomes for preterm neonates and their families in the

neonatal intensive care unit (NICU), it is imperative that neonatal nurses possess the requisite knowledge and skills to facilitate a healing environment and cluster nursing care. Neuroprotective therapies are employed to mitigate the potential negative impacts of the NICU environment on short- and long-term outcomes. Standardization of nursing care practices for newborns requires effective training programs, and as such, it is crucial for neonatal nurses to continually update their knowledge and performance skills for the successful implementation of neuroprotective developmental care and consistent nursing care practices (**Macho, 2018**).

### **Significant of the study:**

Preterm infants necessarily are developing in environment that is stressful on different aspects for them. Also, for keeping on their life, they need for intensive care and invasive procedures (**Wang et al., 2021**). The imposed stress on infants by these procedures may cause neurological damage and as a result abnormal development of infant. Especially due to developing brain vulnerability in preterm infant, activities that may cause adverse outcomes are not limited to invasive or painful procedures but may include routine care or normal handling (**Mizan, 2021**).

In 2019, approximately 570 premature infants were admitted to the neonatal intensive care units (NICUs) at Children Hospital and Maternity & Gynecological Hospital, both affiliated with Ain Shams University. The NICU environment is characterized by numerous technological devices emitting alarm sounds, multiple nursing activities, medical and physician rounds per shift, and crowding of neonates and medical staff. These factors, coupled with the frequent handling of premature infants, can cause premature stress, which in turn can have negative effects on the behaviors, sleep patterns, and physiological responses of these infants.

The concept of developmental care is founded on fundamental principles of nursing science, specifically highlighting the nurse's role in fostering a healing environment and clustering care. Effective implementation of

training programs focused on healing environments and clustering care may serve to improve the application of these approaches, which aim to mitigate pain and stress and promote a calming environment for premature infants.

### **Aim of the Study**

The study aimed to assess nurses' performance about creating healing environment and clustering nursing care for premature infants.

#### **Research questions:**

Q<sup>1</sup>: What is the level of knowledge and practice among nurses related creating healing environment and clustering nursing?

Q<sup>2</sup>: What are factors affecting nurses' knowledge and practice related creating healing environment and clustering nursing?

#### **Subjects and Methods:**

##### **Design**

Descriptive research design.

##### **Setting**

This study was carried out in the NICUs at Children Hospital and Maternity & Gynecological Hospital affiliated to Ain Shams University. Whereas NICU at Children Hospital is specialized in medical conditions and consists of three rooms, each one has eight incubators, Meanwhile NICU in Maternity & Gynecological Hospital consists of four rooms, and each one contains nine incubators.

##### **Subjects**

A convenience sample composed of all neonatal nurses (80) who are working at the previous mentioned settings at the time of the study, regardless their age, gender, qualifications, and years of experience.

#### **Tools of the study**

##### **Tool I: A Pre-designed Questionnaire:**

It was designed by the researcher after reviewing the related literature and reviewed by supervisors. It was written in the Arabic language to gather data in relation to the following parts:

**Part I: Nurses' characteristics** as age, gender, marital status, residence, qualifications, years of experience, working hours, and attended training courses.

**Part II: Neonatal nurses' knowledge regarding healing environment and clustering nursing care:** It was designed by the researcher after reviewing literature reviews as Wang et al., 2021 & Alemdar & İnal, 2020, which included 11 questions at MCQ form and two open end questions. These questions as aim of developmental care, concept of developmental care, concept of cluster nursing care, concept of minimal handling, positive effect of clustering care, concept of healing environment, component of healing environment, ways of noise control at NICU, allowed sound level at NICU ways of control extensive light at NICU, short term effect of incubator covers, avoid strong perfume during dealing with neonate, smelling of mother's milk is one of the ways to protect the sense of smell.

##### **Scoring system:**

The nurses' knowledge was checked with a model key answer and accordingly, the nurses' knowledge was categorized into either "correct answer was scored a single point" or "incorrect answer was scored a zero point". These scores were summed up and converted into a percentage score. It was classified into three categories:

- **Good** if score > 75%
- **Average** if score from 60-75%
- **Poor** if score <60%

**Tool II. Observation Checklists:** It was adapted from Altimier & Phillips, (2016) and Sathish et al., (2019). It was used to assess nurses' practices regarding creating healing environment and clustering nursing care, including sound and noise (eight) steps, light and vision (five) steps, taste and smell (four) steps, touch (five) steps and cluster care (five) steps.

**Scoring system:** Each item was evaluated as "done," which was take "one score," and "not done" was take "zero score." These scores were summed up and converted into a percentage score. It was classified into two categories:

- **Competent:** if score  $\geq 90\%$
- **Incompetent:** if score  $< 90\%$

**Validity and Reliability:** The tools of data collection were ascertained by a group of experts in neonatal nursing (three) to assess the adherence of a measure to existing theory and knowledge of the concept being measured (construct) and the extent to which the measurement covers all aspects of the concept being measured (content). Reliability is checking the consistency of results across time, across different observers, and across parts of the test itself, it was measured through coronach alpha test

Tools	Cronbach alpha score	Estimated
Knowledge	0.810	Good reliability
Practice	0.908	Excellent reliability

#### Ethical Considerations:

The study was approved by the research ethical Committee of Faculty of Nursing, Ain Shams University in November 2020.

#### The ethical research considerations include the following:

- The researcher was clarified the aim and objectives of the study to nurses included in the study before starting.
- Verbal approval was obtained from the nurses before inclusion in the study. They secure that all the gathered data was confidential and used for research purpose only.
- The researcher assuring maintaining anonymity and confidentiality of nurse's data include in the study.
- The researcher assuring no harmful for nurses included in the study.
- The nurses were informed that they allowed for withdrawal from the study at any time.

#### Pilot Study

The pilot study was carried out on eight neonatal nurses at the NICU of Maternity and Pediatric Hospital affiliated to Ain Shams University Hospitals, who represent 10% of the estimated sample size in order to test the applicability of the constructed tools and the

clarity of the included questions related to nurses' knowledge and practice. The pilot also served to estimate the time needed for each subject to fill in the questionnaire. According to the results of the pilot, neither corrections nor omissions of items were performed, so the nurses were included in the pilot study, sharing in the study sample.

#### Fieldwork

The fieldwork for this study was conducted from January to July 2021, during which the researcher was available on-site for two days per week.

The researcher introduced the study's objectives and tools to the participating nurses and distributed a questionnaire to assess their knowledge. Observational checklists, designed previously, were used to evaluate the nurses' practices in creating a healing environment and applying clustered nursing care for premature infants.

#### Statistical Analysis

The collected data was coded and entered into the statistical package for social sciences (SPSS) (SPSS Inc; version 24; IBM Corp., Armonk, NY, USA). After completing entry, the data was explored to detect any errors. Then, it was analyzed by the same program for presenting frequency tables with percentages. Qualitative data was presented as a number and percent. Furthermore, quantitative data was described as mean or standard deviation, as appropriate. linear regression is a linear approach for modelling the relationship between a scalar response and one or more explanatory variables. Correlation coefficients are used to measure how strong a relationship is between two variables. The results were considered statistically significant at  $P \leq 0.05$  and highly significant at  $P < 0.01^{**}$ .

#### Results

Table 1 showed that more than one third of the studied nurses (37.5%) their age ranged between 25 to less than 30 years with mean  $\pm$  SD  $28.99 \pm 7.43$  years, and less than three quarters (73.7%) of them were females, nearly two thirds (66.2%) of them married. Regarding educational level, more than half of nurses (52.5%) had technical health institute in nursing, more than one quarter of them (28.7%) had 10 to less than 15 years of experience with mean  $\pm$  SD  $9.45 \pm 3.87$  years. Regarding working hour, less than three

fifths of nurses (58.7%) had worked for full time, and more than one quarter (27.5%) of them had attended training courses.

Figure 1 indicated that less than two thirds (62.4%) of the studied nurses had poor knowledge about healing environment and clustering nursing, while less than one fifth (16.3%) had good knowledge.

Figure 2 noticed that the majority (83.7%) of studied nurses had incompetent practice about healing environment and clustering nursing, while less than one fifth (16.3%) of them had competent practice.

Table 2 demonstrated that there was high significant model for nurses' practice with their characteristics detected through F test value with p value. 000. This model explain 59% of the variation in knowledge scores detected through R<sup>2</sup> value 0.591. Also, explained that education level, practice score and training courses had high frequency positive effect on knowledge score at p value <0.01\*\*. While years of experience had high frequency negative effect on knowledge score at p

value <0.01\*\* and age had negative effect on knowledge score but without any significant at p value >0.05.

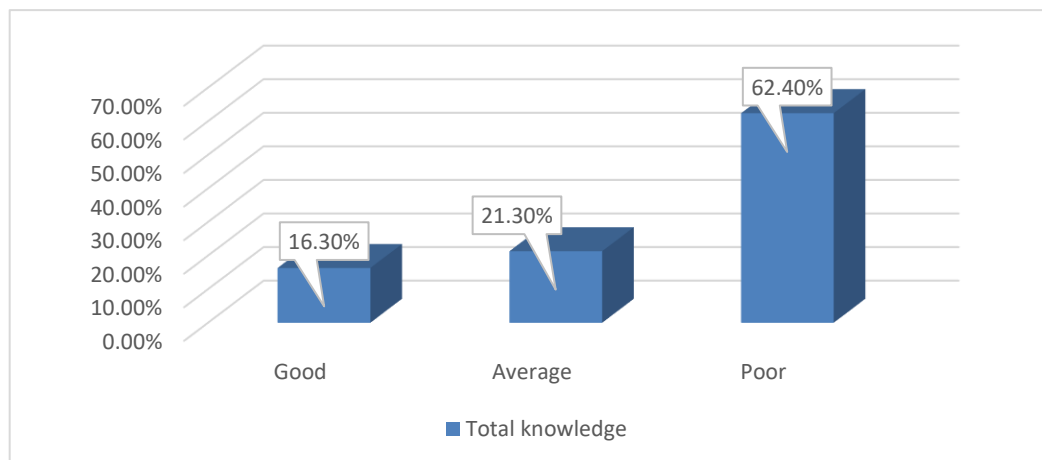
Table 3 stated that high significant model for nurses' practice with their characteristics detected through F test value 18.777 with p value. 000. This model explain 68% of the variation in practice scores detected through R<sup>2</sup> value 0.680. Also, explained that knowledge score and training courses had high frequency positive effect on practice score at p value <0.01\*\*. While years of experience had high frequency negative effect on practice score at p value <0.01\*\* and age had slight frequency negative effect on practice score at p value <0.05\*. On the other hand, educational level had positive effect but without any significant at p value >0.05.

Figure 3 revealed that there was high positive correlation between nurses' knowledge and their practice scores at r. 981 and p value .000.

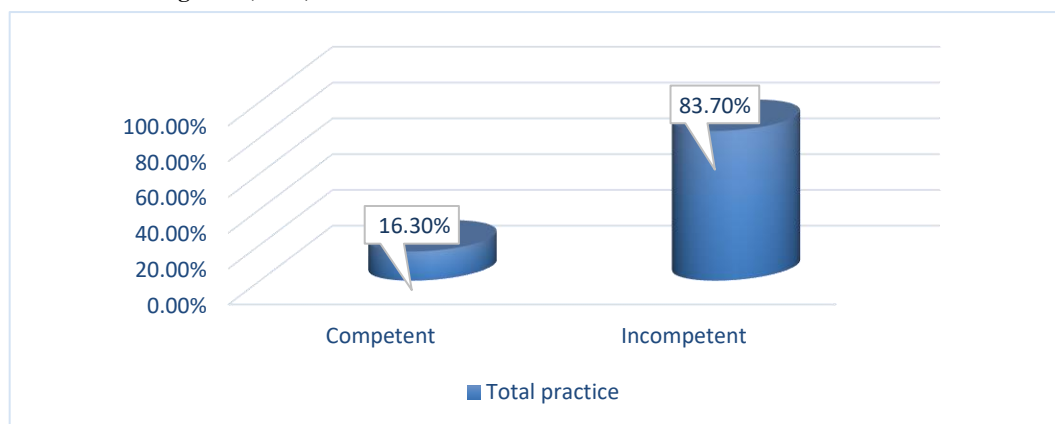
**Table 1: Distribution of studied nurses regarding their characteristics (n=80)**

Nurses' characteristics	n	%
Age in years:		
20 - <25	13	16.3
25- <30	30	37.5
30- <35	22	27.5
≥35	15	18.7
Mean ±SD	28.99±7.43	
Gender:		
Male	21	26.3
Female	59	73.7
Marital status:		
Married	53	66.2
Unmarried	27	33.8
Educational level:		
Diplom of nursing	22	27.5
Technical health institute	42	52.5
Bachelor of nursing	14	17.5
Postgraduate	2	2.5
Years of experience:		
1 - <5 years	22	27.5
5 - <10 years	19	23.8
10 - <15 years	23	28.7
≥15	16	20
Mean ±SD	9.45±3.87	
Working hours:		
Full time	47	58.7
Part time	33	41.3
Attendance of training courses:		
Yes	22	27.5
No	58	72.5

**Figure 1: Distribution of studied nurses' knowledge regarding healing environment and cluster of nursing care (n=80)**



**Figure 2: Distribution of studied nurses total practice level regarding healing environment and cluster of nursing care (n=80)**



**Table 2: Linear regression associated of perceived nurses' knowledge scores (n=80)**

Model	Unstandardized B	Coefficient St. Error	Standardized Coefficient Beta	t	sig
(Constant)	3.590	1.424		2.522	.024
Age	-.653	.454	-.100	1.439	.172
Practice pre	.198	.059	.398	3.364	.005
Education level	.893	.163	.278	5.475	.000
Training	.109	.034	.353	3.240	.006
Experience	-.372	.053	-.821	7.027	.000
<b>Model summary</b>					
R	R square	F		sig	
.769	.591	29.786		.000	

Dependent variable: Knowledge

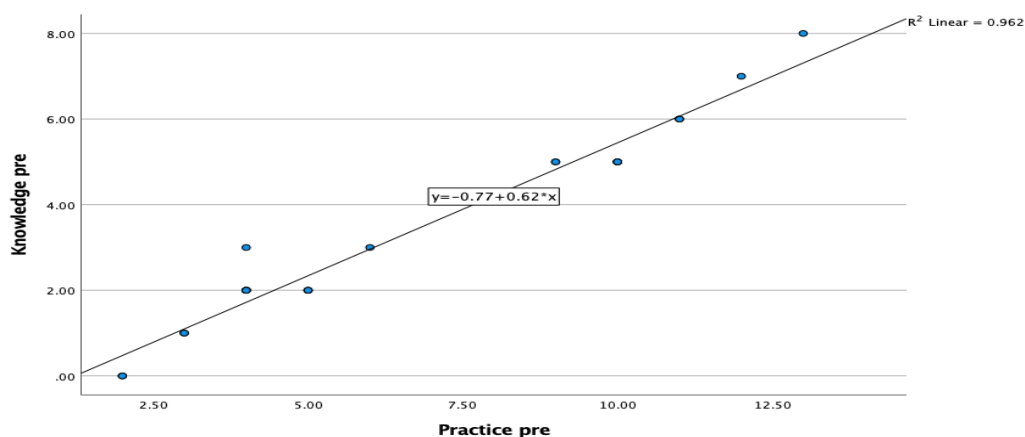
Predictors: (constant), Age, practice, education level, training, experience

**Table 3: Linear regression associated of perceived nurses' practice scores (n=80)**

Model	Unstandardized B	Coefficient St. Error	Standardized Coefficient Beta	t	sig
(Constant)	12.017	2.609		4.607	.000
Age	-.125	.050	-.201	2.511	.025
Knowledge pre	.580	.186	.295	3.113	.008
Education level	.270	.157	.029	1.719	.108
Training	1.097	.345	.126	3.178	.007
Experience	-.736	.079	-.770	9.354	.000
<b>Model summary</b>					
R	R square	F		sig	
.825	.680	18.777		.000	

Dependent variable: Practice

Predictors: (constant), Age, knowledge, education level, training, experience

**Figure 3: Correlation between nurses' total knowledge and total practice (n=80)**

r.981 p value .000

## Discussion

Premature infants are the most susceptible population worldwide, it is estimated that 15 million infants are born preterm, and this number is rising. Stress is one of the main complications among preterm infants admitted to a neonatal unit, which has short- and long-term effects on their health status, growth, and development. The neonatal team can minimize the amount of stress in preterm infants by monitoring stress levels and intervening when necessary (Carroll et al., 2022; Sathish et al., 2019).

Neonatal nurses being primary caregivers in the NICU, they are in a key

position to minimize premature infants' stress, and to promote normal and healthy growth by providing a conducive environment. The researcher elaborated on the study findings based on Egyptian workplace environment, resources, and the work culture.

Among a total of 80 staff nurses included in this study, the finding of current study revealed that the mean age of them was  $28.99 \pm 7.43$  years, and less than three quarters of them were females. According to experience, more than one quarter of them had 10 to less than 15 years of experience with mean  $\pm$  SD  $9.45 \pm 3.87$  years. A similar finding showed in a quasi-experimental research study, carried out on 77 nurses by Ahmed & Mohammed. (2019), which revealed that the mean age of

studied nurses was  $28.9 \pm 3.3$  years, the mean years of experience was  $7.5 \pm 2.5$  years. Also, cohort with the study carried by **Abd El- Aziz et al. (2018)** who found that the mean age of studied nurses was  $30.6 \pm 2.7$  years, and more than two-fifths of them had 10 years and more of experience working as a neonatal nurse. Meanwhile, disagree with **Mohammed et al. (2018)** who found that, the mean age of nurses was  $37.52 \pm 8.01$  years and more than one-third (40%) of the nurses had 15 to less than 20 years of experience.

Regarding educational level of nurses, the finding of the current study detected that more than half of nurses graduated from technical health institute in nursing. This result disagreed with **Abd El- Aziz et al. (2018)** who found that more than half of the nurses had a bachelor's degree in nursing science and **Mehnoush et al. (2017)** who found that the majority of the participating nurses had a bachelors' degree of nursing. Furthermore, the current finding inconsistent with **Khalil et al. (2021)** who found that more than two-thirds of the studied nurses (69.4%) had a bachelor's degree, while less than one-fifth of them had secondary technical school of nursing.

As regards nurses' attainment of previous training courses, the finding of current study showed that about three-quarters of them had not attended training courses about developmental care. It was not unexpected that such a low number of respondents had training regarding developmental care covered in their orientation whereas the largest group of nurses had 10 to 15 years' experience working in the NICU and DC was not a standard component of orientation 15 years ago. Since, developmental care has become a standard of care in the NICU over the past 20 years, it was surprising that only 27.5 % ( $n = 22$ ) had received in-service training regarding developmental care and clustering of nursing care. The researcher justified this finding by lack of in-service education, continuous training, and staff development in the study settings. These findings were consistent with **Mohammed et al. (2018)** who reported that all nurses (100%) did not attend any program or courses regarding developmentally supportive care of preterm neonates and **El-Sayed et al. (2013)** who stated

that, the most of nurses did not attend in-service training program before related to neonatal care at the NICU.

As regards to the studied nurses' knowledge regarding developmental care and cluster care, the results of current study revealed that less than two-thirds of the studied nurses had poor knowledge about developmental care. Very few of studied nurses had correct knowledge about concept of minimal handling and positive effect of clustering care pre intervention. These results as same line with the study by **Ahmed & Mohammed. (2019)**, who illustrated that majority of studied nurses had unsatisfactory knowledge about developmental care. On the other hand, the current study finding was contradictory with **Khalil et al. (2021)** in a descriptive study carried on 180 nurses at the governmental hospitals at Mansoura, they concluded that 64.4% of the studied nurses had satisfactory level of knowledge regarding developmental supportive care for preterm and low birth weight infants.

Concerning to nurses' practice about healing environment and clustering nursing care, the current study indicated that the majority of studied nurses had incompetent practice about developmental care. From the researcher's point of view, it strongly agrees that lack of nurses' knowledge and training about healing environment measures act as a barrier for applying it. These results go in the same way with **Youssef (2022)** who reported that the majority of nurses had unsatisfactory score in their practices. Also, **Khalil et al., 2021** who stated that more than half of studied nurses had inadequate practice related developmental care.

Concerning to Linear regression model for nurses' knowledge, the current study revealed that there was high significant model detected with p value. 000. This model explained 59% of the variation in practice scores detected through  $R^2$  value 0.591. Also, explained that education level, practice score training had high frequency positive effect on knowledge score. While years of experience had high frequency negative effect on knowledge score and age had negative effect on knowledge score but without any significant. These results



attributed to nurses had bachelor education and attended training courses had high knowledge score, most of the older nurses had a nursing diploma, so they were lacking knowledge about clustering and healing environment. These results supported with the study by **Jalali et al. (2022)** who showed that training courses had positive effect on nurses' knowledge. In addition, **Baghlani et al., 2019** revealed that there were significant differences were found with respect to being married ( $p = 0.019$ ), having an MSc degree ( $p = 0.034$ ), and employment experience ( $p = 0.001$ ).

Concerning to Linear regression model for nurses' practice, the current study revealed that there was high significant model detected with  $p$  value. 000. This model explained 68% of the variation in practice scores detected through  $R^2$  value 0.680. Also, explained that knowledge score and training had high frequency positive effect on practice score. While years of experience had high frequency negative effect on practice score and age had slight frequency negative effect on practice score. On the other hand, education level had positive effect but without any significant. These results attributed to attending training courses can positively impact nurses' ability to create a healing environment, cluster nursing care, and enhance their knowledge levels. This, in turn, enables nurses to establish a theoretical foundation that can facilitate the development of best practices in the field. These results inconsistent with the study performed by **Zhang et al. (2016)** who indicated that higher patient caseloads, fewer work hours per day, higher level of education, and fewer years worked in NICUs are the significant predictors for lower implementation of developmental care. On the other hand, supported with the study by **Park & Kim (2019)** revealed that clinical and educational experience regarding developmental care and working environment was not associated with developmental care practice among NICU nurses.

Regarding the correlation between nurses' knowledge and their practice level about healing environment and clustering nursing care, the current finding of the present study stated that there was high positive correlation between nurses' knowledge and their practice

scores. These results consistent with the study by, **Arabie et al., 2022** who reported that there was positive significance correlation between total nurses' knowledge, perception, and practices. Also, **Al Mutair et al., 2022** stated that there was positive correlation between nurses' knowledge and practice about skin-to-skin care.

### Conclusion:

The study's results indicate that a majority of the studied nurses demonstrated incompetent practice, while less than two-thirds exhibited poor knowledge about healing environment and clustering care. Furthermore, a high positive correlation was found between nurses' knowledge and practice, highlighting the importance of knowledge enhancement in improving nursing practice.

### Recommendations:

1. Continuous training programs should be applied for nurses in the NICUs to improve their knowledge and practice regarding developmental supportive care, healing environment and clustering nursing care.
2. On job training for neonatal nurses about applying healing environment and clustering nursing care.
3. Designed a procedure manual about the developmental supportive care for preterm and low birth weight infants in NICUs based on evidence-based practice guidelines.

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