Nurses' Performance Regarding POINTS of Care for Prevention of Retinopathy of Premature Neonates

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Abstract

Background: Retinopathy of Prematurity is a multi-factorial preventive cause of childhood blindness. Using POINTS of care as preventive strategies may be significantly prevent occurrence of retinopathy of premature neonates. **The aim** of the study was to evaluate nurses' performance regarding points of care for prevention of retinopathy of premature neonates. **Subjects and Method**: The study design used was descriptive. **Setting:** It was conducted at Neonatal Intensive Care Units of Tanta Main University Hospital & International Teaching Hospital. **Subjects:** All nurses (120) who are working in the aforementioned places. **Tools**: two tools were used: **Tool I**: Retinopathy Structured Interview Questionnaire, **Tool II**: POINTS of Care Observational Checklists. **Results:** nearly three quarters of the nurses had low level of overall knowledge about retinopathy of prematurity and POINTS of care. More than half of the nurses had unsatisfactory practice regarding POINTS of care. **Conclusion:** Nurses had low level of knowledge & unsatisfactory practice about retinopathy of prematurity and POINTS of care. **Recommendations:** Designing a training course for neonatal nurses concerning retinopathy of prematurity. Applying POINTS of care standardized protocol for prevention of retinopathy of premature neonates at neonatal intensive care units.

Key words: Nurses' performance, POINTS of care, Premature neonates & Retinopathy prevention.

Introduction

Premature neonates are defined as neonates who are born alive before completing 37 weeks of pregnancy **Da Fonseca et al., (2022).** Preterm neonates can be categorized into three groups based on gestational age: Those born between 28 to 32 weeks are considered very preterm; those born between 32 and 37 weeks are considered moderate to late preterm; and those born before 28 weeks are considered extremely preterm **Song (2023).**

The majority of newborns admitted to Neonatal Intensive Care Unit (NICU) are preterm neonates **Basent et al., (2022)**. The immaturity of the preterm neonates places them at risk for neonatal health problems such as hyperbilirubinemia, neonatal sepsis, respiratory distress syndrome, and

retinopathy of prematurity **Bukhari et al., (2018).**

Retinopathy of prematurity (ROP) which is called Terry syndrome and retrolental fibroplasia (RLF) is a vaso-proliferative disorder affecting premature neonates. It is characterized by the aberrant and uncontrollably developing blood vessels in the developing retina, which can cause significant visual impairment if not identified and treated promptly **Dammann et al., (2023).**

The primary risk factors for ROP include low gestational age, low birth weight, and chronic exposure to supplementary oxygen **Gupta & Vaitheeswaran., (2019)**. premature newborns weighing less than 1500 grammes at birth and less than 30 weeks gestation. In addition to those whose gestational age was greater than 30 weeks and whose birth weight ranged from 1500 to 2000g. Those who have had unstable clinical course which makes them high risk for ROP. All of them must be screened for ROP according to American Academy of Ophthalmology recommendations **Wu & Lam (2021)**. Examination should be done between 4-6 weeks postnatal using binocular indirect ophthalmoscopy or through digital retinal photography **Lam & Suh., (2022).**

Retinopathy of prematurity is preventable disease. Neonatal nurses are the primary care givers for neonates at NICU their knowledge and clinical skills are essential for prevention of ROP. Providing high quality nursing care by applying POINTS of care for preterm neonates is associated with decreasing risk factors that is associated with development of ROP. **Murki & Kadam (2018)**.

POINTS of care are six preventive nursing interventions that including (**P-P**ain control, **O-O**xygen management, **I-I**nfection control, **N-N**utrition, **T-T**emperature control and **S-S**upportive developmental care) **Sitati et al., (2019)**. POINTS of care are considered the first role of nurses to prevent occurrence of retinopathy. Nurses have a significant role in early detection of ROP by counselling parents about screening procedure; prepare the neonate for pupil dilation procedure. Moreover, nurses assess neonate's condition during screening procedure. They have significant role in preventing complications and early treatment of ROP **Shalwani et al., (2021).**

Significance of the study:

Preterm neonates are still high risk for developing retinopathy of prematurity **Senjam & Chandra (2020).** It is the main global cause of childhood blindness. Globally, it is estimated that around 50,000 child suffers from visual impairment due to ROP annually **Subramaniam et al., (2023)**. For newborns with ROP, the death rate was 60.33 per 10,000. This is greater than the 24.2 per 10,000 infant mortality rate nationwide. **Alfaar et al., (2023)**. Retinopathy of prematurity can be prevented through providing high quality nursing care by applying POINTS of care. Because nurses' knowledge and skills significantly affect the care provided to premature neonates So, the study's objective was to evaluate nurses' performance in relation to POINTS of care for ROP prevention.

The study's Aim.

The study's purpose was to assess nurses' performance regarding points of care for prevention of retinopathy of premature neonates.

Research Question:

What is the performance level of nurses as regard to POINTS of care for prevention of retinopathy of premature neonates?

Subjects and Method

Research design: A descriptive method was utilized in this study. Setting: The research was carried out at Tanta University Hospital & International Teaching Hospital's neonatal intensive care units (NICUs), which are associated with the Scientific Research and Higher Education Ministry. **Subjects:** A convenience sampling of 120 nurses who work in the aforementioned locations was involved. The research sample was involved 120 premature neonates who had low birth weights and gestational ages lower than 37 weeks.

Tools of data collection:

Two different tools were utilized in the current study.

Retinopathy Structured Interview Questionnaire (Tool (I)):

The researcher developed it after reviewing the relevant literatures **Walinjkar (2021)** and **Sankar et al., (2022)**. It was divided into 3 sections:

Part 1: Socio demographic characteristics of Nurses: age, gender, education level, years of experience, & prior training program about retinopathy of premature neonates.

Part 2: Bio-socio demographic characteristics of Newborns: such as birth weight, current weight, method of delivery, and gestational age, method of oxygenation and length of stay at NICU.

Part 3: Nurses' knowledge in relation to ROP and POINTS of care.

A. **Nurses' knowledge regarding retinopathy of prematurity:** used to assess data about retinopathy such as definition, causes, risk factors, grades, diagnosis, indications of retinopathy screening in neonates, optimal time of examination for retinopathy, lines of treatment and follow-up schedule.

B. **Nurses' knowledge regarding POINTS of care:** It included data about POINTS of care for prevention of ROP as follow:

– **P** = **P**ain control such as methods of pain assessment and pain control measures for premature neonates.

– **O** = **O**xygen therapy as methods of oxygen delivery, optimal oxygen saturation & methods of measuring oxygen saturation for neonates.

– **I** = **I**nfection control measures and precautions for neonatal sepsis prevention.

– **N** = **N**utrition as assessment of nutritional status of neonates and daily requirements of energy for preterm neonates.

– **T** = **T**emperature control such as methods of heat loss in preterm neonates and signs of hypothermia.

– **S**= **S**upportive developmental care as definition and component of supportive developmental care.

Nurses' knowledge was scored two for correct and complete answers, one for correct and incomplete answers, while zero for incorrect and didn't know answers.

Nurses' overall knowledge was categorized as follows:

-A knowledge level of 80% or higher was considered high.

-60% to 80% was considered as a moderate level of knowledge.

- Less than 60% was seen as having a low level of knowledge.

Tool (II): POINTS of care Observational Checklists:

The researcher designed it following a review of relevant literatures **Sitati et al.,**

(2019) and **Ahmed & Abdallah (2022).** It was consisted of 6 main items:

1.   **P**ain control measures included:

− Pain assessment (5 items) such as assessment of oxygen saturation, heart rate, nasolabial furrow, eye squeeze, and brow bulge of neonate during painful procedures.

− Pain control measures (11 items) as grouping of diagnostic procedures, using distraction technique, gentle massage, tucking and swaddling.

2.   **O**xygen therapy:

− Application of pulse oximetry (13 items) such as preparation of equipment, clean spo_2 probe with 70% alcohol & applying saturation probe.

− Oxygen administration (10 items) such as preparation of equipment, set the parameters of oxygen concentration, check frequently oxygen saturation.

3-Infection control:

− Hand washing (10 items).

− Hand disinfection (4 items).

− Wearing and removing of PPE (gown, mask, face shield and gloves) (17 items).

− Equipment precautions (5 items).

− Daily care of incubator (10 items).

− Terminal care of incubator (14 items).

− Neonates' precautions including suctioning (14 items).

− Nasogastric tube insertion (11 items).

4- Nutrition:

− Gavage feeding (16 items) as check vital signs before feeding, do gastric aspiration, check color and amount of gastric aspirate, measure amount of feed given to neonate.

− Intravenous fluid therapy (9 items) such as fill the tubing and infusion pump line with infusate, attach tubing and infusion pump line to syringe or fluid container.

5-Temperature control measures: Including prevention of hypothermia, keeping skin of

the neonate dry. Total scores for these items were (14).

6-Supportive developmental care: included nesting, swaddling, gentle massage, hand containment, healing environment, protected sleep, and stimulation of neonate, non-nutritive sucking, optimal feeding, skin care and protection from pain. Total scores for these items were (25).

The steps in nurse's practice that were completed and done correctly received a score of (1), whereas wrongly done steps or didn't done received a score of zero.

Nurses' practice Scoring:

− Satisfactory practice was ≥ 80%.

− Unsatisfactory practice was < 80%.

Method

1-A formal permission was acquired from Tanta University's Dean of the Faculty of Nursing & Neonatal Intensive Care Units (NICUs) director.

2-Ethical considerations:

- Ethical consent was received from Faculty of Nursing Committee of Scientific Research Ethics Code No. 119/11/2022 and from the Faculty of Medicine Ethical Committee Code No. 36106/11/22.

- Nurses who were involved in the study gave their consent.

- The participant nurses received assurance that the data they provided would be kept confidential and utilized mainly for the study's objectives.

- Study's nature didn't injure or harm the whole sample.

- Nurses had the right to withdraw from the study at any time.

3-Tools development: In order to gather data for the current study, the researcher developed two tools. Retinopathy Structured Interview Questionnaire (Tool I) and POINTS of care Observational Checklists (Tool II).

4-Content validity: The study's tools were examined for validity by five pediatric nursing specialists. No significant modification was done accordingly.

5- A pilot study: was tested on 10% of the study group in order to assess the tools' feasibility, clarity &applicability, which included 12 nurses and 12 premature newborns. The necessary modification was done, and the pilot sample was included.

6- Content reliability: the study tools were tested for reliability. Cronbach alpha test was 0.852 for knowledge and 0.824 for practice indicating high reliability of tests.

7- Data collection:

Began in early February and ran until the end of July in 2023. Three days a week from 9:00 am to 2:00 pm the researcher attended to the study settings. After explaining the purpose of the study, the researcher conducted interviews with the participating nurses prior to data collection. Individual interviews with each nurse were conducted to obtain socio-demographic attributes with the use of tool I portion (1). The researcher collects data related to neonates with the usage of tool I section (2). Nurses' knowledge as regard to retinopathy of premature neonates and POINTS of care was obtained using (tool I). The questionnaire sheet took about 10-15 minutes to be completed.

Each nurse was observed individually throughout caring of the neonates. The researcher observed nurses practice during routine care including assessment of neonatal pain during painful procedures and observation of heart rate and oxygen saturation. Nurses were also, assessed for applying strategies and to decrease pain such as distraction, swaddling, gentle massage, tucking and non-nutritive sucking. The researcher observed nurses during administration of oxygen and application of pulse oximeter for the neonates. Also, nurses' practice regarding infection control measures as hand washing, hand disinfection, donning and removing of personal protective equipment were observed.

Equipment precautions as daily and terminal care of incubator and nurses' practices during invasive procedures as suctioning, nasogastric tube insertion, peripheral intravenous catheter insertion, preparation and administration of formula feeding and intravenous fluids were also observed by the researcher.

Application of developmental supportive care as nesting, swaddling, hand containment, gentle massage, healing environment by decreasing noise and light, protected and undisturbed sleep and protection from pain were observed and recorded immediately in the observational checklist.

Statistical analysis: After the data were input into the computer, IBM SPSS software package version 20 was utilized for analyzing the data. Percentage and number were used to describe the qualitative data. Standard deviation, mean, and range were used to describe quantitative data. The 5% level was used to assess the results' significance. Chi-square test and Pearson coefficient correlation were used. Reliability statistic was assessed using Cronbach's Alpha.

Results

Figure (1): Demonstrates age of the nurses under study. It was clear that the age range of less than two thirds (60%) of the nurses in the study was from 25 to less than 35 years old. 20.8% of them their age was $\geq$35 years while 19.2% of them their age was <25 years.

Figure (2): Shows educational level of the nurses under study. It was observed that 45.8% of the nurses in the study had a technical institute of nursing. A bachelor's degree in nursing sciences was held by slightly more than one-third of them (34.2%). while 15.8% had diploma of nursing. A few percentages (4.2%) of the studied nurses had post graduate certificate.

Figure (3): Represents years of experience of the studied nurses at NICU. It was clear that 31.7% of the studied nurses had 1< 5 years of experience, while 15.8% had 10< 15 years of experience at NICU.

Figure (4): Presents percentage distribution of the studied nurses according to previous training program about retinopathy. It was found that all nurses (100%) had not participated in any educational courses about retinopathy of premature neonates.

Table (1): Presents percentage distribution of the studied neonates according to their bio-socio demographic characteristics. It was illustrated that 22.5% of the neonates had gestational 28<32 weeks and 35% of them had gestational age 32<34 weeks while 42.5% of them their gestational age was 34-36 weeks. Regarding birth weight, 77.5% of the neonates under study had birth weight ranged from 1500<2500 grams. it was observed that 80% of the neonates their current weight ranged between 1500& less than 2500 grams. Most of the neonates (85.8%) were delivered by cesarean section.

Table (2): Indicates percentage distribution of the nurses' knowledge about POINTS of care. It was clear that, correct and complete answer were reported by 16.4%, 36.9% of the nurses in relation to pain control measures and oxygen therapy respectively. Nearly equal percentage of (44.7% and 41.4%) had correct and complete answer about infection control measures and neonatal nutrition respectively. Less than one quarter (21.5%) and (23.3%) of the nurses reported correct and complete answer about temperature control and supportive developmental care respectively.

Table (3): Presents total score of nurses' practice as regard to POINTS of care for prevention of retinopathy of premature neonates. It was clear that supportive developmental care represents the most unsatisfactory practice that was noticed between 73.3% of the nurses followed by temperature control measures 71.7%, 64.2% for pain control and 51.7% for infection control and nutrition. It was evident that over half of the nurses (57.5%) had unsatisfactory practice concerning POINTS of care while 42.5% of them had satisfactory practice.
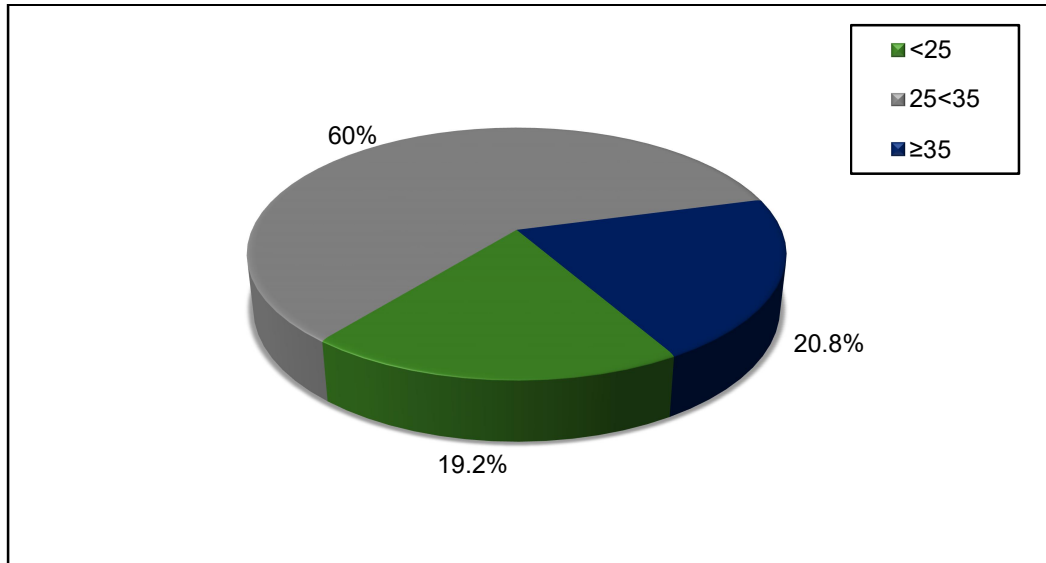
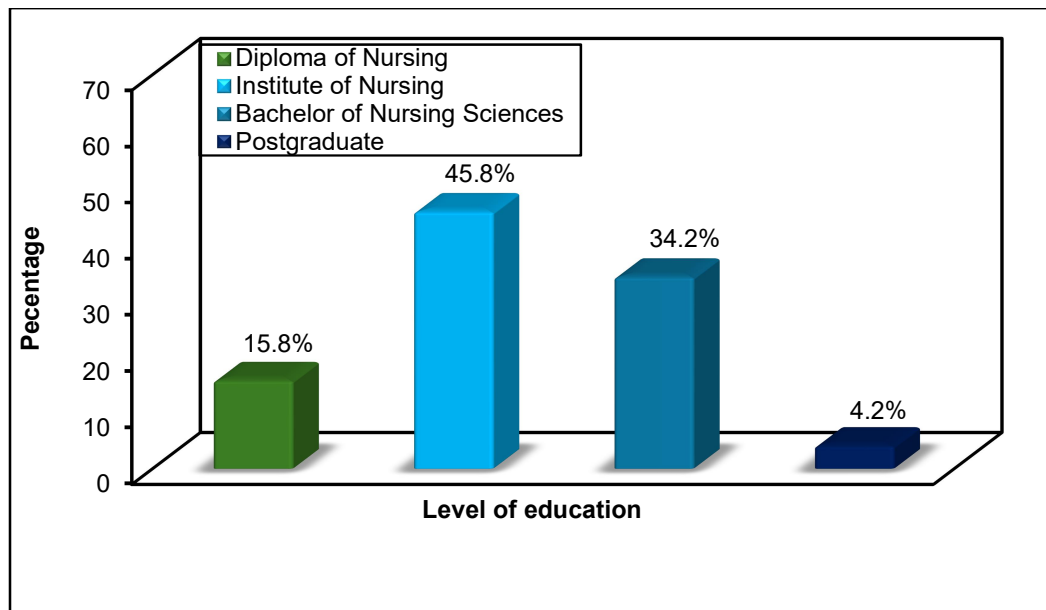**Figure (1): Age of the studied nurses in years (n = 120).**

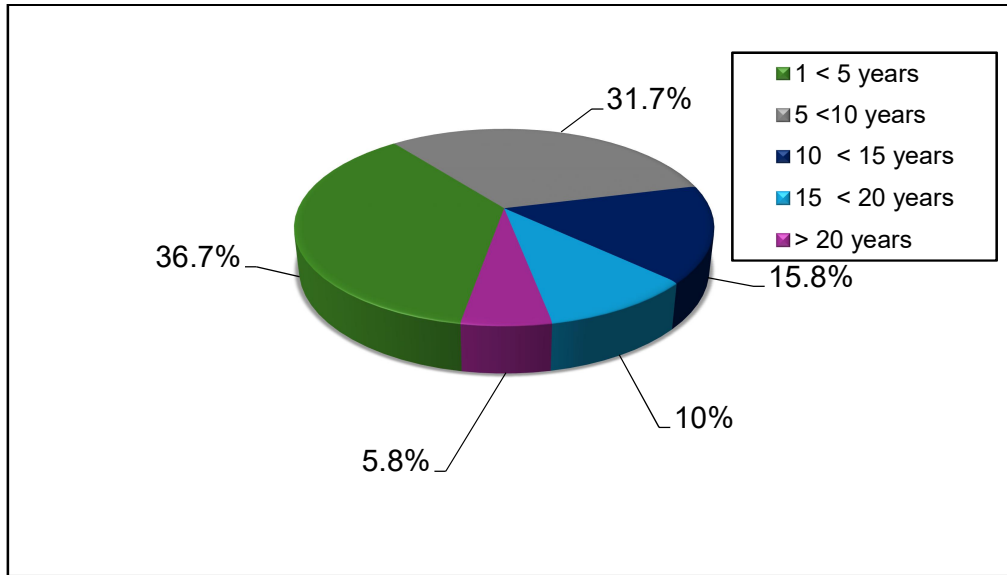**Figure (2): Level of education of the studied nurses (n = 120).**

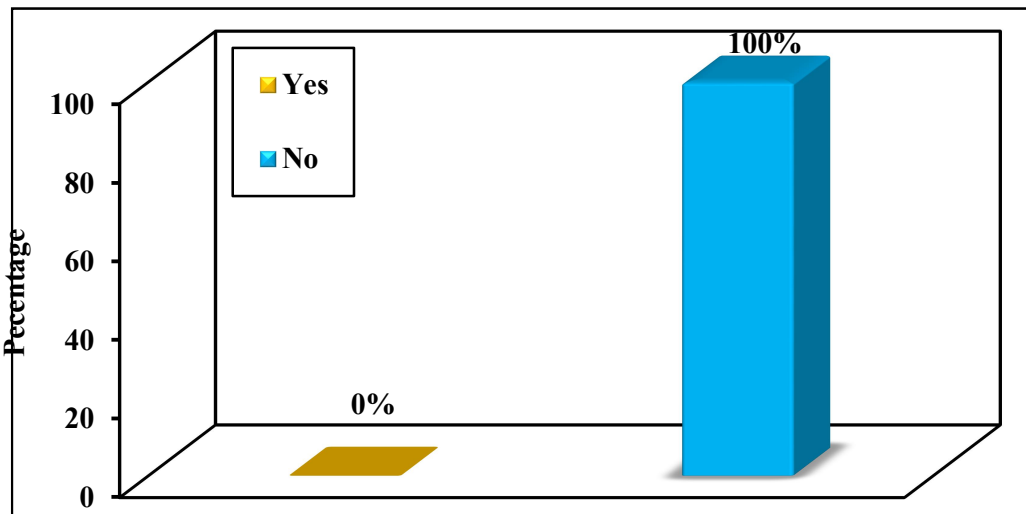**Figure (3): Experience of the studied nurses at NICU (n = 120).**

Figure (4): Nurses previous training program about retinopathy (n = 120).

Table (1): Percentage distribution of the studied neonates according to their bio-Socio demographic characteristics (n = 120).

Bio-socio demographic characteristics of the studied neonates	No.	%
Gestational age in weeks		
<28	0	0.0
28<32	27	22.5
32<34	42	35.0
34-36	51	42.5
Mean ± SD.	32.84 ± 2.25	
Birth weight in grams		
< 1000	4	3.3
1000< 1500	23	19.2
1500< 2500	93	77.5
Mean ± SD.	1771.25 ± 441.43	
Current weight in grams		
< 1000	4	3.3
1000< 1500	19	15.8
1500<2500	96	80.0
2500-3500	1	0.8
Mean ± SD.	1778.50 ± 434.45	
Type of delivery		
Normal	17	14.2
Cesarean Section	103	85.8
Method of oxygenation		
Nasal Cannula	19	15.8
High frequency nasal cannula	13	10.8
CPAP	26	21.7
Ventilator	42	35.0
Head box	3	2.5
Oxygen incubator	17	14.2
Oxygen concentration		
Nasal Cannula/ Head box & Oxygen incubator	**(n = 39)**	
Mean ± SD.	4.0 ± 2.10	
High frequency nasal cannula / CPAP & Ventilator	**(n = 81)**	
Mean ± SD.	49.95 ± 20.24	
Duration of oxygenation		
Mean ± SD.	4.54 ± 2.55	
Length of stay of neonate in NICU		
<1 week	43	35.8
7 days < 15 days	33	27.5
15days<30days	27	22.5
>30days	17	14.2
Mean ± SD.	13.97 ± 11.12	

Table (2): Percentage distribution of the studied nurses' knowledge regarding POINTS of Care (n=120).

Nurses' knowledge regarding POINTS of Care	Incorrect and don't know		Incomplete and correct		Complete and correct	
	No.	%	No.	%	No.	%
Pain control	17	14.4	83	69.2	20	16.4
Oxygen therapy	12	10.0	64	53.1	44	36.9
Infection control	29	23.8	38	31.5	54	44.7
Nutrition	20	16.7	50	41.9	50	41.4
Temperature control	4	3.5	90	75.0	26	21.5
Supportive developmental care	16	12.9	77	63.8	28	23.3

Table (3): Total score of nurses' practice regarding POINTS of care for prevention of retinopathy of premature neonates (n = 120).

POINTS of care items.	Unsatisfactory		Satisfactory	
	No.	%	No.	%
Pain control	77	64.2	43	35.8
Oxygen therapy	46	38.3	74	61.7
Infection control	62	51.7	58	48.3
Nutrition	62	51.7	58	48.3
Temperature control	86	71.7	34	28.3
Supportive developmental care	88	73.3	32	26.7
Total Practice	**69**	**57.5**	**51**	**42.5**

Discussion

Prematurity is an increasing problem and is considered a major cause of neonatal mortality and morbidity including retinopathy of prematurity (ROP). Retinopathy of Prematurity is a preventable disease that requires knowledgeable and skilled nursing staff. **Murki & Kadam (2018)**. POINTS of care prevention strategies can help to inhibit occurrence of ROP. So, the purpose of the current study was to evaluate nurses' performance in relation to POINTS of care for retinopathy of prematurity prevention Kalan **& Moxon (2016).**

Concerning socio-demographic characteristics of the studied nurses, the result showed that less than two thirds of the studied nurses in the current study their age ranged from 25 to less than 35 years at NICU. This may be because hiring new nurses to work at NICU because they are full of power to care for neonates and have a passion to learn and train. This result was compatible with **Ali et al. (2023)** who mentioned that half of nurses in their study their age was ranged between 25 and 35 years.

Also, **Sankar et al. (2022)** were in the same line with the present study findings. They mentioned that the age range of two thirds of nurses was 20 to 30 years old. Concerning level of educational of nurses, less than half of nurses in the current study had technical institute of nursing. Because of more nurses graduate from technical institutions of nursing than from nursing faculties. This finding was in harmony with **Ali et al. (2023)** who clarified that nearly

two thirds of nurses in their study had technical institute of nursing.

A study done by **Thuilephy et al. (2021)** was contradicted with the current findings. They noticed that majority of nurses in their study were graduated from universities.

In relation to years of experience, the current study's findings showed that over one-third of nurses had worked in NICUs for fewer than five years. The young age of nurses may be connected to this. This result was matched with **Bambam et al. (2021)** who stated that over one-third of the study's nurses had less than five years of NICU experience. On the other hand, a study done by **Ali et al. (2023)** did not agree with the present results because, according to their study, most of nurses had worked in NICUs for fewer than five years.

It was clear from the present study that not all nurses participated in ROP-related training courses. It may be due to decrease training courses about ROP in the continuing education plan for nursing staff. Also, due to the shortage of nurses' number at NICU and work overload preventing them from attendance of any training programs.

In the same context a study done by **Thuilephy et al. (2021**) clarified that all nurses in their study didn't receive any training programs about ROP. On the contrary a study by **Ahmed & Abdallah (2022)** clarified that about one fifth of nurses in their study had participated in ROP educational programs.

Most of the newborns included in this study were born by cesarean section; this may be due to complication occurred during pregnancy as premature rupture of membrane, bleeding and mothers' previous

cesarean section. This finding was correspondence with the study of Hateb **et al. (2022)** and **Awad (2021)** as they found that nearly most of the neonates in their study delivered by cesarean section.

Concerning length of stay at NICU, the current results clarified that mean days of neonates' hospital stay was 13.97 ± 11.12. This long period of hospitalization is due to nature of prematurity that necessitate critical and intensive care for a long time to prevent complications. This finding was accordance with **Tawfic et al. (2021)** who stated that the length of stay of neonates at NICU was 12-30 days.This result also, was in the same line with **Gomaa & Elshewy (2021)** who showed that mean length of stay of neonates was 59.25 ± 24.31days.

As regards duration of oxygenation, The results of the current study displayed that mean duration of oxygenation was 4.54 ± 2.55 day. This result was matched with **Awad (2021)** who found that duration of oxygenation was less than one week. On the other hand, **Gomaa & Elshewy (2021)** were contradicted with the current findings as they reported that duration of oxygenation was 44.68 ± 20.3 days.

Concerning nurses' knowledge about pain control, the results of the study indicated that over two thirds of them had correct incomplete answers regarding pain control. Because the majority of nurses know about concept of pain assessment in general, but they didn't have complete knowledge about pain assessment and pain control strategies pertained to premature neonates specifically. This result congruent with the study of **Wari et al. (2020)** who found that more than two thirds of nurses had average knowledge.

This result wasn't matched with **Mateteli et al. (2019)** who noted that nearly three quarters of nurses had low level of knowledge.

Concerning nurses' knowledge about oxygen therapy, the present study demonstrated that more than half of nurses had correct incomplete answers and more than one third of them had correct & complete answers regarding oxygen therapy. Good knowledge about oxygen therapy may be because oxygen therapy is a routine care at NICU. **Arasi et al. (2023)** was comparable with the findings of the present study, who revealed that majority of nurses had good knowledge regarding oxygen therapy. **Al wily & Aziz. (2020)** weren't in harmony with the current study who stated that majority of nurses had low level of knowledge concerning oxygen therapy.

Post-natal infection is strongly associated with ROP. So, nurses' knowledge about infection control measures is the pillar of prevention of ROP **Wang et al., (2019)**. The present study found that more than half of the studied nurses had correct in complete or didn't know answers regarding infection control. According to researcher point of view, this is may be related to inadequate educational programs about infection control measures at NICU and also, low experience and educational level.

This result was contracted with **El fiky et al. (2022)** who clarified that slightly more than two thirds of nurses had satisfactory knowledge regarding infection control. Regarding nurses' knowledge about nutrition of premature newborns, the current finding represented that more than half of the nurses had correct but incomplete and didn't know

answers regarding nutrition of preterm neonates. This may be due to absence of written guideline protocols related to nutrition of preterm neonates, little scientific educational seminars at NICU and also, less experience of the participant nurses.

El morsy et al. (2020) corresponded to the present result who found that two thirds of nurses had insufficient knowledge regarding nutrition of premature neonates. **Hesham et al. (2022)** wasn't agreed with this result, they found that nearly half of nurses had average knowledge in relation to nutrition of premature neonates.

Regarding nurses' knowledge about temperature control and prevention of hypothermia for premature neonates, the present study illustrated that three-quarters of nurses had correct & incomplete answers related to temperature control. This may be due to that nearly two thirds of neonatal nursing staff have less than 5years of experience. They know the importance of temperature control but didn't have complete information about mechanism of heat loss.

Adam & El Sayed (2022) were compatible with the present study as they revealed that three quarters of nurses had moderate knowledge about prevention of hypothermia.

Also, **Balel et al. (2023)** were in agreement with the current study's finding. They showed that more than half of nurses had average knowledge regarding temperature control for premature neonates. On the contrary, **Abdel Rasoul et al. (2017)** disagreed with this finding as they stated that two thirds of nurses had poor knowledge about temperature control, and

prevention of hypothermia for premature neonates.

The developmental supportive care is significant concept to prevent prematurity complication as retinopathy of prematurity **Pavlyshyn et al., (2022)**. Regarding nurses' knowledge about supportive developmental care, the study findings presented that less than one quarter of the participant nurses had complete correct answers and less than two thirds of them had incomplete answers about supportive developmental care. This may be because lack of educational training programs about it. Also, nursing staff neglect to refresh and update their knowledge. Another potential reason for this lack of knowledge may be related to that developmental supportive care is a novel concept in neonatal nursery.

This result was matched with **Lavanya et al. (2023)** who illustrated that average knowledge of supportive developmental care was considered acceptable among more than two-thirds of nurses. **Riad et al. (2023)** were in disagreement with the present study as they found that regarding supportive developmental care, the majority of nurses have inadequate information.

Nurses' practice about pain control measures showed that nearly two-thirds of nurses in the present study had unsatisfactory practice regarding pain control, because most of nursing staff considered pain assessment and control in neonates is notoriously difficult because of their physical, cognitive and behavior characteristics.

These current results were in agreement with **Wari et al. (2020)** who indicated that more than two thirds of nurses had poor practice regarding pain control.

In the current study slightly less than two thirds of nurses had satisfactory practice regarding oxygen therapy. This may be due to that nurses know that oxygen is a drug used to save life of neonates and aware about consequences of oxygen administration malpractice.

This result was consistent with **Mostafa et al. (2019)** who found that majority of nurses in their study had satisfactory practice regarding oxygen therapy.

As regards total score of nurses' practice regarding infection control, the current study showed that over half of nurses had unsatisfactory practice in regard to infection control. It may be as a result of deficiency of resources used for infection control measures such as shortage of gloves and aprons. This result was matched with studies conducated by **El fiky et al. (2022)** and **Abou El fadl et al. (2023)** that agreed with the current results as they found that nurses had unsatisfactory practice regarding infection control. On the contrary, this result wasn't in harmony with **Gulis et al. (2022)** who found that more than half of nurses had good practice regarding infection control.

In relation to total score of nurses' practice regarding nutrition, the present study showed that more than half of the nurses had unsatisfactory practice regarding nutrition this may correlates to low nurses' knowledge about nutritional requirements for preterm neonates in the current study as only two fifth of the studied nurses reported complete correct answer about nutrition.

A study done by **Hesham et al. (2022)** was in agreement with the present results as they reported that less than two thirds of nurses

had incompetent practice regarding nutrition.

On contrary a study by **Frederic (2021)** disagreed with the current results as he clarified that nurses had high level of practice about nutrition.

Regarding total score of nurses' practice for temperature control, the present study clarified that less than three quarters of the studied nurses had unsatisfactory practice regarding temperature control, this may be related to nurses' incomplete knowledge about temperature control for neonates and nurses' ignorance to update their knowledge because of work pressure and large number of cases.

Belal et al. (2023) were in the same line with the current findings as they reported that over two thirds of nurses had poor practice in relation to temperature control.

Contrary, a study by **Abdel Rasoul et al. (2017)** was contradicted with the current findings as they mentioned that majority of nurses in their study had competent practice concerning temperature control.

Regarding nurses practice of supportive developmental care, the current study clarified that nearly three-quarters of nurses had unsatisfactory practice about supportive developmental care. Because of inadequate training courses about developmental supportive care, and the reality that developmental care is considered relatively a new approach and some NICUs didn't support the application of developmental supportive care. Another reason is due to shortage of nursing staff and workload at NICUs.

A study done by **Riad et al. (2023)** were matched with the present findings. They

clarified that two thirds of nurses had incompetent practice about supportive developmental care. Another study by, **Mousa et al. (2021)** were corresponded with the current results. They clarified that more than half of nurses had inadequate practice concerning supportive developmental care.

On the other hand, **Rupashree (2023)** was disagreed with the present results as he mentioned that majority of nurses in his study had satisfactory practice regarding supportive developmental care.

In the current study, total score of nurses' practice regarding POINTS of care, showed that more than half of nurses had unsatisfactory practice regarding POINTS of care for prevention of ROP. This result might be related to that low experience at NICUs and graduation from technical institute of nursing. Another cause of unsatisfactory practice for POINTS of care was related to low level of knowledge about POINTS of care.

Recent studies done by **Ali et al. (2023) and Ahmed & Abdallah (2022)** were in accordance with the current findings. They reported that nurses in their studies had incompetent practice regarding prevention of ROP.

Conclusions

Based on the current study's findings, it can be concluded that, majority of nurses had low level of knowledge regarding retinopathy of premature neonates. The study proved that more than half of the studied nurses had low level of knowledge and unsatisfactory practice in regard to POINTS of care for prevention of retinopathy of premature neonates.

Recommendations

1. Training programs about ROP should be developed for nurses at NICU.
2. Standardized protocol of care about prevention for retinopathy of premature neonates should be developed and applied at NICUs.
3. Guidelines booklet for nurses about ROP should be available at the NICU.
4. Nurses should have access to training programs on developmental supportive care in order to enhance their skills and knowledge in this area.
5. To allow for the generalization of the findings, this study should be repeated with a larger sample size in various NICUs.

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