Assessment of Nurses' Performance Regarding Prevention of Retinopathy of Premature Infant in Neonatal Intensive Care Units

Asmaa Mohamed Rayan Ali [1], **Dr. Huwida Hamdy Abd-Elmonem** [2], **Prof. Dr. Safaa Salah Ismail** [3]

Abstract:

Background: Retinopathy of prematurity (ROP) is a vasoproliferative disease of an immature retina in premature neonates and it is the commonest cause of preventable blindness in infancy and childhood. **Aim:** This study aimed to assess nurses' performance regarding prevention of retinopathy of premature infant in neonatal intensive care units. **Design:** A descriptive research design was used. **Setting:** This study was conducted at neonatal intensive care unit in Mostafa Hassan Hospital affiliated to University Hospital and General Hospital affiliated to Ministry of Health. **Sample:** A purposive sample that was consisted of 60 nurses who providing care for premature and low birth weight infants in NICUs in the previous mentioned settings. **Tools:** Two tools were used for data collection **1ˢᵗ tool**: A structured interview questionnaire to assess nurse's knowledge regarding prevention of retinopathy of premature infant in neonatal intensive care units. **2ⁿᵈ tool:** Observational checklist to assess nurses' practices regarding of prevention of Retinopathy of Premature Infant in Neonatal Intensive Care Units. **Results:** Revealed that, the mean age of the studied nurses was 27.62±5.2 years and 73.3% of the studied nurses had unsatisfactory knowledge regarding prevention of retinopathy of premature infant. Also, there was a positive correlation between the studied nurse's knowledge and practices. **Conclusion**: Based on results of the present study, it can be concluded that: nearly three quarter of the studied nurses had unsatisfactory knowledge regarding prevention of retinopathy of premature infant and nearly two third of them had incompetent practices regarding prevention for infant with retinopathy of prematurity. **Recommendations:** Constantly educational training program for pediatric nurses working in NICUs to improve their knowledge and practices regarding prevention of retinopathy of premature infant in NICUs.

Keywords: Premature Infant, Retinopathy of Prematurity, Nurses, Knowledge, Practices.

[1] Clinical Instructor at Faculty of Nursing Fayoum University, Egypt, [2] Assistant Professor of Pediatrics Nursing , Fayoum University, Egypt , [3]Professor of Pediatric Nursing, Helwan University, Egypt.

Introduction

Prematurity is a major global health issue leading to high mortality and morbidity among the survivors. However, Neurodevelopmental disability (NDD) and retinopathy of prematurity (ROP) are the most common complications of prematurity. In fact, ROP is the second leading cause of childhood blindness in the world **(Akkawi et al., 2018).** Therefore, good vision from early neonate is essential for normal child development as vision co-ordinate other sensory inputs and helps the child to understand his environment and develop psychomotor and cognitive functions **(Noor et al., 2022).**

Retinopathy of Premature infant (ROP) is a retinal disorder of low birth weight premature infants. ROP can be mild with no visual defects, or it may become aggressive with new vessel formation and progress to retinal detachment and blindness. Therefore, the stimulus for the abnormal growth of blood vessels comes from the peripheral immature retina. Meanwhile, nearly one third to half of neonates undergoing screening may show some degree of ROP which fortunately regresses on its own in majority of affected infants. In a few, ROP progresses to the stage of retinal detachment and blindness. However, with timely screening and treatment of

ROP can prevent blindness and minimize visual handicaps **(Sankar et al., 2021).**

The major risk factors for ROP are very low birth weight, prematurity and high oxygen concentration. Moreover, associated risk factors include acidosis, apnea, Patent Ductus Arteriosus (PDA), sepsis, intra-ventricular hemorrhage and blood transfusion. Meanwhile, international classification of ROP (ICROP) is used for classifying ROP based on the severity of the disease into stages from zero to five, location of the disease into 3 zones from one to three , extent of the disease based on clock hours around twelve hours and the presence of plus **(Gaber et al., 2021).**

The incidence of ROP varies widely across different countries and is linked to the socioeconomic developments as well as the quality and accessibility of health care facilities. In the low and middle-income countries an "epidemic" of ROP blindness is currently going on. In 2010 accounted for nearly two- thirds of all cases of visual impairment due to ROP. In India, ROP has been reported to occur in 21.7% − 51.9% of low birth weight neonates. Meanwhile, the mean birth weight of neonates developing ROP to be above 1250 g and the incidence of severe ROP ranging from 5.0 − 44.9% **(Katoch& Dogra, 2018).** In

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addition to **(Bai et al.,2022)** reported that, a wide range of ROP incidence (23%–56.2%) has reported, the frequency of ROP was 9.1% in neonates who weighed more than 2000 g, and 13.6% in neonates over 32 weeks of GA.

The discrepancy in the criteria used for screening and in regional conditions of neonatal care, together with the small sample sizes, result in wide variability in reporting and indefinite conclusions. In this prospective, multi centric screening effort, we utilized expanded ROP screening criteria to establish the incidence rate and risk factors for ROP development in an urban setting within greater Cairo, Egypt. The aim was to provide reference data as a preliminary step for establishing national tailored guidelines for ROP screening **(Abdel Aziz et al., 2022).**

Screening guidelines for ROP should be tailored for different countries as the cutoffs for gestational age (GA**)** and BW have been shown to vary. This is often attributable to difference in primary prevention, where NICUs in less equipped settings especially rurally lack sophisticated oxygen titration and measurement capabilities. For example, the latest policy statement by the American Academy of Pediatrics and American Academy of Ophthalmologists (AAP/AAO) recommends screening infants of GA ≤ 30 weeks and/or BW ≤ 1500 g, while in India the screening cutoffs are set to a GA ≤ 34 weeks and/or BW ≤ 2000 g, highlighting the importance of proper documentation in each setting to develop tailored protocols that limit outlier cases **(Li et al., 2022).**

Prevention is either primary with better access to safe and standardized prenatal care, secondary with tailored and enforced screening guidelines for early detection and intervention, or tertiary with management of complications and visual rehabilitation. In Egypt, few reports about10 to12 suggest a high burden of ROP over the past decade, reflecting the increase in neonatal survival rates. However, no established screening guidelines exist to date. Further, rural regions within the country are likely to be inflicted by more severe forms of the disease due to lower standard of care **(Raghuveer& Zackula, 2020).**

Neonatal nurses are the pillars of NICU. Their knowledge and clinical expertise for standard practices are essential for preventing ROP related visual impairment. Nurses spent more time with the inpatient preterm infants and are expected to provide developmentally supportive care, monitor desired oxygen targets, ensure aseptic practices in NICU, meet the nutritional needs of these babies with special focus on breast feeding, keep a record of daily weight, plan and prepare the infants for screening and assist the ophthalmologist in screening procedure. In addition, they maintain a good rapport with the parents and provide the

necessary information and support to the parents **(Sankar et al ., 2021).**

The role of nursing staff is critical in the successful management and prevention of ROP induced blindness. The neonatal nurses assist the ophthalmologists in the examination process and providing early treatment of ROP to preterm infants also, they provide counseling on the importance of follow‑ up examination after discharge **(Thuileiphy et al., 2021).**

Significance of the study:

Retinopathy of premature infant is a main leading cause of childhood blindness with over 3, 00,000 neonates affected worldwide. However, a worldwide incidence of ROP ranging from 24% to 47% among high-risk neonates. Although, the survival rate of premature neonates has improved owing to the increased availability and accessibility to neonatal care. But neonates are still prone to develop this potentially blinding eye disorder especially in the developed countries which the screening guidelines for ROP are not strictly followed. So, early detection and timely intervention can help in reduce the burden of blindness **(Chow etal., 2019).**

The average prevalence of blindness ranges from0.5 to 1.5%, in Egypt. The World Health Organization (WHO) global action plan on universal eye health from 2014 to 2019 aims to support efforts by member states to achieve a measurable reduction of 25% compared with 2010 of avoidable visual impairment with a particular focus on developing national action plans for prevented blindness in developing countries *(Othman, 2018).* So the researcher's point of view it's important to conduct the current study to highlight on nurses' performance regarding prevention of retinopathy of premature infant at NICUS.

Aim of the study:

The aim of this study was to assess nurses' performance regarding prevention of retinopathy of premature infant in neonatal intensive care units.

Research question:
1. What are the level of nurses' knowledge and practice regarding prevention retinopathy of premature infant at NICU?
2. Is there a relation between nurses' performance regarding prevention of ROP at NICU and their characteristics?

Subjects and Methods:
Research design:
A descriptive research design was used for conducting this study.
Setting:
The study was carried out in neonatal intensive care units at Mostafa Hassan Hospital

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affiliated to University Hospital and Fayoum General Hospital affiliated to Ministry of health.

Sampling:

A purposive sample was used to select all available nurses (60) in NICUs in the previous mentioned settings who are providing care for premature and low birth weight infants. They are choses based on the following criteria:

Inclusion criteria: all nurses at NICUs who providing care for premature and low birth weight infants admitted to NICUs from both sex.

Exclusion criteria: infants who have any other disorders such as congenital anomalies, blindness and hydrocephalus.

Tools for data collection:

Data was collected through using the following two tools:

Tool I: Nurses' Pre-designed Questionnaire Sheet: (AppendixII)

It was prepared by the researcher in an Arabic language after reviewing the related literature **sankar and papa, (2018**) to assess nurses' knowledge and practice regarding ROP. It consisted of the following parts:

Part I: Personal characteristics of studied neonates such as; gestational age, birth weight, chronological Age , current weight of newborn infant, gender, diagnosis, type of delivery.

Part II: Personal characteristics of the studied nurses such as; age, educational level, years of experience and Attendance of training courses in retinopathy of prematurity.

Part III: **Nurses' level of knowledge regarding prevention of retinopathy of premature infant at NICU:**

This part was concerned with assessment of nurses' knowledge regarding ROP at NICUs. The total number of questions were 28 in closed ended questions; (12) questions concerned with nurse's knowledge regarding ROP, (6) questions concerned in risk factor, causes and complication of ROP & (10) questions concerned with treatment and follow up of ROP.

Scoring system:

Knowledge of nurses was scored and calculated according to their answers, it was evaluated using the models answers sheet that was prepared by the researcher, each question had a score ranged 0- 1grade , whereas correct and complete answer had score 1 grades and score zero was for an incorrect or unknown answer. The total score was 28 grades (equal 100%). Studied nurses answers were categorized into:
• Satisfactory (60% & more)
•Un satisfactory (less than 60%).

Tool II: observational checklists (Appendix III):

There were consist of 4 observational checklists to assess nurses' practice regarding

prevention of retinopathy of premature infant at NICU as regard; it include eye examination procedure adapted from (**Kalyan G. & Moxon, S. (2017**), eye care procedure adapted from (**Ellwein, L. B., & Urato, C. J. (2002),** phototherapy procedure adapted from (**Santhi, V., Nalini, S., & Joseph, L. (2020)** and oxygen therapy procedure adapted from (**Saskatoon Health Region Nursing Practice Committee, (2006)**.

Scoring system:

Nurses' practice regarding retinopathy of prematurity was scored and calculated according to their answers, each complete and accurate response was scored " one" and those done incorrectly or not done were scored " zero" . The total score of nurses' practice was 75 scores (equal 100%) and categorized into incompetent → less than 85% and competent practice → 85% & more.

II. Operational Design:

The operational design includes preparatory phase, content validity, pilot study and fieldwork.

A- Preparatory phase:

P-value >0.05 was considered insignificant. P-value <0.05* was considered significant. P-value <0.001* was considered High significant.

B-Validity:

The content validity of the tool was reviewed by 3 experts from faculty of nursing - Helwan University and Fayoum university (1 experts specialized in pediatrics health nursing , one expert in pediatric health medicine and one expert in ophthalmology, to test the content validity of the tools for clarity, relevance, comprehensiveness, understanding and applicability. Minor modifications of the tools were done according to the expert's comments on clarity of sentences, appropriateness of content and sequences of items.

C- Pilot study:

A pilot study was conducted on (10%) of the sample equal 6 nurses and 6 premature infants based on sample criteria to test the clarity, applicability and understand ability of the tool. little modification was done as replacing and arrangements of some items. The involved nurses of the pilot study were excluded later from the main study sample.

D- Field work:

The actual field work was carried out for data collection over 6 months started from (April 2022 years) till ended off (September2022years). The researcher was available two days/week by the rotation in the previously mentioned study settings during the morning shifts from 9 am to 12 pm, the purpose of the study was explained by the researcher to each nurse providing care for preterm and low birth weight infants at NICUs before data collection in addition to clear and brief idea about aim of the study and its expectation. The average time needed for completion of each questionnaire

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sheet was approximately 30 minutes, the researcher clarify some questions of the questionnaire and observe the nurses when working with the infants and making the score for their practice ,the researcher taken from 2:3 nurses each week consisting about 9 nurses per month, total number of nurses equals 60 nurses.

Reliability:

Reliability of the tools was tested by using cronbach's Alpha for testing internal consistency of the tools. The reliability was 0.856 for nurses' knowledge questionnaire sheet and 0.822 for nurses' practice. The reliability was scaled as follows: <0-0.25 weak reliability, 0.25-0.75 moderate reliability, 0.75-<1strong reliability and 1 is optimum. The reliability for this questionnaire was 0.84.

Ethical considerations:

An official permission to conduct the proposed study was obtained from the Scientific Research Ethics Committee Faculty of Nursing Helwan University. Participation in the study was voluntary and subjects were given complete full information about the study and their role before signing the informed consent and they had the right to refuse to participate. The ethical considerations included explaining the purpose and nature of the study, stating the possibility to withdraw at any time, confidentiality of the information where it was not accessed by any other party without taking permission of the participants. Ethics, values, culture and beliefs was respected.

III- Administrative design:

After explanation of the study aim and objectives, an official permission was obtained from the dean of faculty of nursing, Helwan University, and the director of each previously mentioned hospital as well as head of Neonatal Intensive Care Units (NICUs) asking for cooperation and permission to conduct the study.

Statistical analysis:

The collected data was organized, categorized, tabulated, entered and analyzed using Statistical Package for the Social Science (SPSS), IBM SPSS Statistics for Windows, and Version 20.0. Armonk, NY: IBM Corp. Statistical presentation and analysis of the present study was conducted, using the mean, standard deviation (SD), chi-square test (X^2) was used to compare between groups in qualitative and linear correlation coefficient was used for detection of correlation between two quantitative variables in one group. Statistical significance was considered at (P-value <0.05), P value >0.05 mean Non significant, while P value <0.001mean High significant.

Results:

Table (1): Distribution of the studied neonates according to their Characteristics (N=60).

Items	NO	%
Gestational age (weeks)		
32 ≤ 34	23	38.3
34≤36	31	**51.7**
> 36	6	10
X ± S D	34.28±2.11	
Birth weight(Grams)		
<1.5 kg	30	**50.0**
1.5 < 2.5 kg	26	43.3
2.5 ≥ 3.5 kg	4	6.7
X ± S D	2514.6±453.65	
Chronological Age (Days)		
1< 10	37	**61.7**
10 ≤20	15	25
>20	8	13.3
X±SD	2.67±1.75	
Current weight of newborn infant(Grams)		
< 1.5 kg	23	38.3
1.5 < 2.5 kg	28	**46.7**
2.5 ≤ 3.5 kg	9	15
X ± S D	1727.60±609.78	

Table (1): Regarding the studied neonates 'characteristics, this table showed that, more than half of them (51.7%) were in gestational age from 34 ≤ 36 weeks with X±SD was 34.28±2.11 weeks and 50% of them were less than 1.5 kg with X ±SD was 2514.6±453.65kg. According to chronological age this table showed that, more than half of them (61.7%) between 1< 10 days with X±SD was 2.67±1.75 and their mean current weight was 1727.60±609.78 grams.

Table (2): Distribution of the studied nurses according to their characteristics (N=60).

Items	NO	%
Age in years		
20 < 25	25	41.7
25< 35	30	**50**
≥35	5	8.3
X ± S D	27.62±5.2	
Qualification		
Bachelor	21	35
technical Institute	39	**65**
years of experience at(NICU)		
1< 5	49	**81.7**
5 <10	10	16.6
≥10	1	1.7
X ± S D	6.42±3.07	
Attendance of training courses in retinopathy of prematurity		
Yes	1	1.7
No	59	**98.3**

Table (2): As observed from this table, the mean age of nurses was 27.62±5.2 years. Regarding their qualifications and years of experience, it was found that, 65% of them had technical nursing institute and 81.7% of them had years of experience ranged from1<5 years. This table also illustrated that, the majority (98.3%) of nurses had not attended training courses about ROP.

Table (3): Distribution of the studied nurse's knowledge regarding to routine eye examination for retinopathy of prematurity (N=60).

Items	Correct		Incorrect	
	No	**%**	**No**	**%**
-Ideal place for eye examination.	30	50.0	30	50.0
-Responsible eye examination specialist.	7	11.7	53	**88.3**
-Basic criteria to confirm diagnosis.	26	43.3	34	56.7
-Appropriate time for the first eye examination.	19	31.7	41	**68.3**
-Role of pediatric nurse during eye examination.	7	11.7	53	**88.3**
Total	18	30.0	42	70.0

Table (3): This table clarified that, almost of the studied nurses (88.3%) had incorrect knowledge about responsible eye examination specialist and the role of pediatric nurse during eye examination. Also, this table demonstrated that, more than two third (68.3%) of the studied nurses had incorrect knowledge about the appropriate time for the first eye examination.

Table (4) & Figure (1): Distribution of the studied nurses according to their total knowledge regarding retinopathy of prematurity (N=60).

Total knowledge	No	%
Satisfactory	16	**26.7**
Unsatisfactory	44	**73.3**
Total	60	100

Table (4) & figure (1) revealed that, nearly of three quarter (73.3%) of the studied nurses had unsatisfactory knowledge regarding retinopathy of prematurity while 26.7% of them had satisfactory knowledge.

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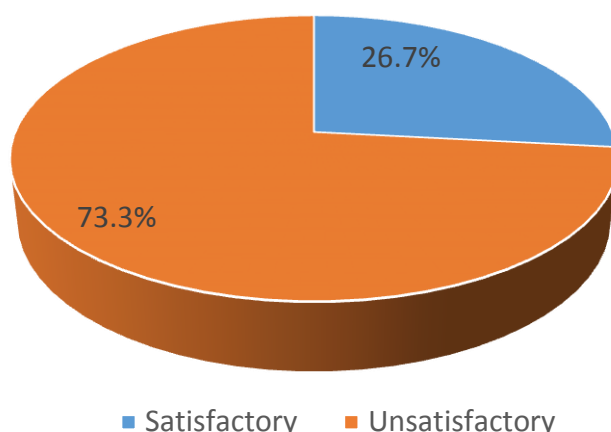
Figure (1)

■ Satisfactory　　■ Unsatisfactory

Table (5): Distribution of the studied nurse's performance regarding to eye examination for the studied neonates at neonatal intensive care units　(N=60).

Performance Items	Done		Not done	
	No	%	No	%
-Wash hands prior to the procedure at Aseptic Non Touch Technique (ANTT).	19	31.7	41	68.3
-Insert the pupil dilating eye drops approximately 30 minutes prior to the eye examination once prescribed.	13	21.7	47	78.3
- The nurse wrap the infant by blanket then holds the infant head and gently secure the infant head in appropriate position.	21	35.0	39	**65.0**
-Monitor and record vital signs and o2 saturation level during examination.	23	38.3	37	**61.7**
-Open and inspect the eye examination pack and sterilization date.	15	25.0	45	75.0
-Administer Sucrose 24%w/v as prescribed if indicated.	16	26.7	44	73.3
- Instills topical local anesthetic eye medication and then inserts the lid speculum to separate the eye lids.	24	40.0	36	**60.0**
-Once the doctor is finished examining the eye,　gently remove the lid speculum.	20	33.3	40	66.7
-Remove the O2 saturations monitor leads	15	25.0	45	75.0
Total	15	25.0	45	75.0

Table (5): Concerning nurses' performance regarding eye examination for newborn infant at NICUs, this table illustrates that, more than half (65%, 61.7% and 60%) of the studied nurses not done wrap the infant by blanket then holds the infant head and gently secure the infant head in appropriate position, Monitor and record vital signs and o2 saturation level during examination and Instills topical local anesthetic eye medication and then inserts the lid speculum to separate the eye lids respectively.

Figure (2): Distribution of total nurses' performance regarding retinopathy of prematurity **(N=60).**
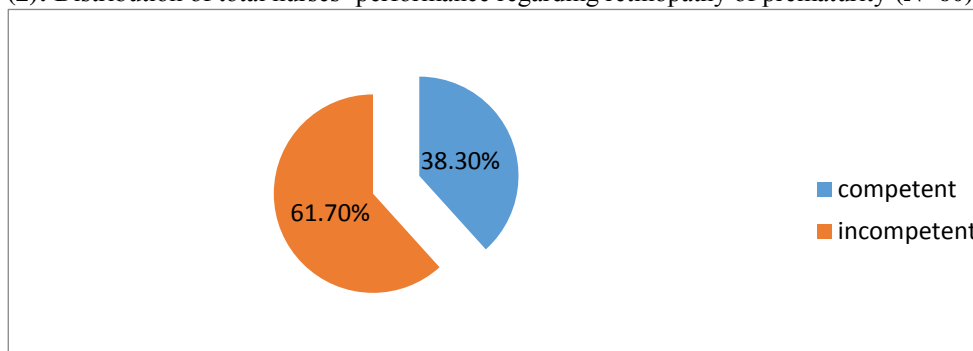

■competent
■incompetent

Figure (2): This figure showed that, 61.7% of total actual nurses' practices   were incompetent, while the rest (38.3%) of them their practices were competent.

Table (6): Relation between the studied nurses' knowledge and their characteristics (n=60):

Nurses' Knowledge Nurses' Characteristics	Total knowledge						
	Satisfactory		Unsatisfactory		Total	Chi-square	
	N	%	N	%		X^2	P-value
Age							
20 < 25	2	8.0	23	92.0	25	18.375	<0.001**
25< 35	9	30.0	21	70.0	30		
≥35	5	100.0	0	0.0	5		
Academic qualification.							
Bachelor	12	57.1	9	42.9	21	15.345	<0.001**
Technical Nursing Institute	4	10.3	35	89.7	39		
Years of experience in NICUs.							
1-< 5	10	20.4	39	79.6	49	6.516	0.038*
5- <10	5	50.0	5	50.0	10		
≥10	1	100.0	0	0.0	1		
Attendance of educational courses about ROP.							
Yes	1	100.0	0	0.0	1	2.797	0.094*
No	15	25.4	44	74.6	59		

>0.05 Non significant   <0.05* significant   <0.001** High significant

Table (6): Demonstrated that, there were highly statistically significant differences between total nurses' knowledge and their characteristics namely   age (X^2 =18.375, P<0.001) and academic qualifications (X^2= 15.345, P <0.001) when p-value <0.001**, while there were statistically significant differences between total nurses' knowledge and their years of experience (X^2 6.516 , P =0.038*) and attendance of educational courses about retinopathy of prematurity (X^2 2.797 , P =0.094).

Table (7): Correlation between the studied nurses' total knowledge and total performance (n=60):

	Total Knowledge	
	R	P-value
Total performance	0.910	<0.001**

Table (7): Show positive statistically significant correlation between total nurses' knowledge and total performance when r= 0.910 with p-value <0.001**.

Discussion:

The characteristics of the studied neonates (table, 1) are consistent with **Abuzayd et al.,(2022)** conducted a study entitled **"**low weight gain as risk factor for retinopathy of prematurity in preterm infant in Egypt**", Braimah et al., (2020)** who conducted a study entitled" incidence and risk factors of retinopathy of prematurity in Korle-Bu Teaching Hospital**"** and **Sabri et al.,(2022)** who conducted a study entitled" retinopathy of prematurity: a global perspective and recent developments"**.** But on contrary with **Çevik & Perente, (2018)** who conducted a study entitled" retinopathy of prematurity screening criteria in Turkey's South Marmara region**",** ELNAHRY et al.,(2022)** who conducted a study entitled" Screening for Retinopathy of Prematurity in a Sample of Preterm Infants from Three Egyptian Governorates" and **Kara et al.,(2022)** who conducted a study entitled" effect of topical anesthesia on reducing pain associated with

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mydriatic eye drops during retinopathy of prematurity screening" **.**

While the characteristics of the studied nurses (table, 2) are consistent with **Deorari & Darlow, (2017)** who conducted a study entitled" Preventing sight-threatening ROP: a neonatologist's perspective", **Webb et al., (2022)** who conducted a study entitled" Neurodevelopmental outcomes associated with intravitreal bevacizumab injections for retinopathy of prematurity" and **Sankar et al., (2022)** who conducted a study entitled" effectiveness of developmentally supportive education program on nursing knowledge of retinopathy of prematurity in neonatal intensive care unit in Iranian". And contrary with **Hariharan et al., (2018)** who conducted a study entitled" Reducing blindness from retinopathy of prematurity (ROP) in Argentina through collaboration, advocacy and policy implementation" , **Kindinger et al., (2019)** who conducted a study entitled" The role of the obstetrician in the prevention of retinopathy of prematurity " and **Pirelli et al., (2019)** who conducted a study entitled" Literature review informs clinical guidelines for pain management during screening and laser photocoagulation for retinopathy of prematurity".

The findings of the present study (table, 3) clarified that, almost of the studied nurse's had incorrect knowledge regarding the role of pediatric nurse during eye examination. This findings of the present study agree with the findings of **Grover et al., (2016)** who studied "Programs for Detecting and Treating Retinopathy of Prematurity: Role of the Neonatal Team in Indian " and found that, more than three quarters of studied nurses had incorrect knowledge about the role of pediatric nurse during eye examination. While the previous findings of studied nurses' knowledge disagree with the findings of the study conducted by **Aydemir et al,. (2019)** who studied**"** Employing a nutrition nurse in neonatal intensive care unit improved nutrition and growth outcomes in preterm neonates" and reported that , more than three quarters of studied nurses had correct knowledge about the role of pediatric nurse during eye examination. The researcher attributed this contradiction to different number of cases and place between the current study and another study.

The findings of the present study (table, 4 & figure 1) clarified that, nearly of three quarter of the studied nurses had unsatisfactory knowledge regarding retinopathy of prematurity while rest of them had satisfactory knowledge. This finding is coordinated with the finding of the study conducted with **Chen et al., (2017)** entitled "Using the D elphi method to develop nursing- sensitive quality indicators for the NICU" who found that, three quarter of the studied nurses had unsatisfactory knowledge regarding ROP. On

contrary **Salehnezhad et al., (2022)** who studied "The effect of education based on the health belief model in improving anxiety among mothers of infants with retinopathy of prematurity" who found that, more than half of the studied nurses had satisfactory knowledge regarding ROP. From the researcher's point of view, it may due to lack of continuous training and educational programs for pediatric nurses about ROP.

Concerning studied nurses' practice regarding eye examination for newborn infant at NICUs (table,5), the finding of the present study showed that, more than three quarters of studied nurses don't insert the pupil dilating eye drops approximately 30 minutes prior to the eye examination. This finding is in an agreement with **Grover et al., (2016)** who conducted a study entitled "Programs for Detecting and Treating Retinopathy of Prematurity: Role of the Neonatal Team in Indian" and found that, three quarters of studied nurses don't insert the pupil dilating eye drops approximately 30 minutes prior to the eye examination. On contrary, **Ying et al., (2019)**who conducted a study entitled "Perinatal risk factors for the retinopathy of prematurity in postnatal growth and ROP study" found that, more than half of studied nurses insert the pupil dilating eye drops approximately 30 minutes. From the researcher's point of view, it may due to lack of equipment and supplies are required for screening and make examination for ROP in the current study compare with another study.

Concerning the relation between the studied nurse's characteristics and their total knowledge and their total actual practice (table, 6), the findings of the present study clarified that, there were highly statistically significant differences between total nurses' knowledge and their characteristics namely, age and academic qualifications. These findings were supported by the findings of the study done by **DeJoie& Buscemi (2022)** who conducted a study entitled "Improving Anesthesia Care Provider Knowledge of Analgesia in Procedures for Retinopathy of Prematurity" and noted that, a highly statistically significant differences between total nurses' knowledge and their characteristics namely, age and academic qualifications.

Concerning the correlation between total nurses' knowledge and total performance (table, 7), the current study findings revealed that, there were positive statistically significant correlation between total nurses' knowledge and total performance. This finding was in an agreement with the study of **Somogyvári etal., (2019)** who conduct a study entitled "Training Hungarian neonatal transport nurses in screening for retinopathy of prematurity with telemedicine", and found that, there were positive statistically significant correlation between total nurses' knowledge and total performance for

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ROP. The researcher's point of view that, these findings reflected that nurses' performance based on the nurses knowledge and practice. This explained that, improving nurse's performance depends on improving nurse's knowledge.

Conclusion:

In light of the current study findings it can be concluded that, nearly of three quarter of the studied nurses had an unsatisfactory knowledge regarding retinopathy of prematurity. Nearly two third of the studied nurses had an incompetent total actual level of performance regarding ROP. Also, it was showed a positive statistically significant correlation between total nurses' knowledge and their total performance.

In the light of the current study findings, the following recommendations are suggested:

➢ Training programs should be applied for nurses in the neonatal intensive care units to improve their knowledge and practice regarding retinopathy of prematurity.

➢ Enrollment and screened for all premature, low birth weight and infant who received oxygen therapy in neonatal intensive care units for ROP.

➢ Provision of the essential equipment and supplies necessary to application of retinal examination.

➢ Retinal examinations in preterm infants should be performed by an ophthalmologist who has sufficient knowledge and experience to accurately identify the location and sequential retinal changes of ROP.

➢ A standardized manual procedure in NICU should be available about examination and care of neonatal eye.

➢ Replication of this study using large sample size in different NICU over all Egypt for better generalization of the results.

➢ Simple illustrated booklets, posters and guidelines for nurses and family about retinopathy of prematurity and its prevention.

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