

Knowledge Levels of Neonatal Intensive Care Nurses in Retinopathy of Prematurity and Affecting Factors

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Abstract

This study aims to measure the role, awareness, and knowledge level of nurses working in the neonatal intensive care unit in terms of retinopathy of prematurity. The study was planned in a descriptive type and was carried out in the neonatal intensive care unit of 5 different hospitals. A total of 190 nurses constituted the population of the research, the study was completed with 139 nurses. Data were collected using the "Personal Information Form" and the "Retinopathy of Prematurity Information Form". The nurses' knowledge about retinopathy of prematurity was found to be significantly lower. It was determined that gender affected the knowledge level of retinopathy of prematurity, and the knowledge level of male nurses was lower than that of female nurses. In order to prevent retinopathy, which is an important cause of blindness in premature infants, and to increase the level of knowledge of health care providers to a sufficient level, it was determined that the neonatal intensive care unit and premature baby care topics should be added to the nursing education curriculum and that premature baby care and retinopathy training should be continued regularly after graduation.

Keywords: Premature, Retinopathy, Nurse, Knowledge levels

Introduction

In premature infants born before completing 37 weeks of gestation, perinatal mortality accounts for approximately 75% of neonatal deaths and is a significant cause of numerous morbidities. Among the long-term complications observed in premature infants, one of the most critical is Retinopathy of Prematurity (ROP) [1]. Retinopathy of Prematurity is a vaso-proliferative retinal disorder that is a leading cause of visual impairment and blindness in prematurely born infants. It has been reported that ROP occurs in 40-50% of infants born before 30 weeks of gestation, with severe ROP present in 7-8% of these infants and 5-6% requiring treatment. The most significant risk factors include preterm birth and low birth weight [2, 3]. Approximately 50,000 children worldwide are reported to develop bilateral blindness due to ROP [4]. The prevalence of blindness due to Retinopathy of Prematurity varies between 3-60% depending on the level of development of the country [5]. In our country, the incidence of ROP is increasing in parallel with advancements in neonatal care. The pathogenesis of Retinopathy of Prematurity is significantly influenced by the oxygen therapy administered to premature infants and its duration. Continuous monitoring of the oxygen concentration during the neonatal intensive care unit stay and maintaining it at the lowest possible level are crucial protective factors against ROP. Therefore, neonatal nurses, whose primary

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responsibility is the administration of oxygen therapy, must possess a thorough understanding of ROP, its risk factors, and the preventive guidelines for its development [6, 7].

This study was designed to assess the roles, knowledge level, and awareness of neonatal nurses regarding Retinopathy of Prematurity (ROP). There is a lack of sufficient research in our country measuring nurses' knowledge levels about ROP. Therefore, while our study is significant in terms of preventing and halting the progression of ROP, which is a leading cause of bilateral blindness, it will also serve as a guide in identifying and addressing gaps in nurses' education on this topic.

Materials and Methods

Study design

This research is a descriptive study. The study was conducted in the neonatal intensive care units (NICUs) of five hospitals in Gaziantep, where neonatal specialists work and where premature infants are primarily cared for (two public hospitals and three private hospitals). The research was carried out between September 2016 and April 2017.

Population and sample

The study population consists of nurses working in the NICUs of hospitals in Gaziantep where neonatal specialists are employed. The total number of nurses working in these NICUs was determined to be 190. The entire population was included in the sample. Nurses who were not working due to various reasons (e.g., leave, reports) or who chose not to participate were excluded from the study. The research was completed with 139 nurses, representing 73% of the population.

Data collection

Data were collected using the "Personal Information Form" and the "ROP Knowledge Form." The necessary information regarding the forms was explained to the nurses in person. The forms, with instructions on how to complete them, were then provided to the nurses. Five days were allowed for form completion to accommodate the nurses' work schedules, including workload, shifts, and working hours, and to ensure they had sufficient time to complete the forms. The process of form completion and collection was completed between January and April 2017.

Data collection tools

The "Personal Information Form" used in the study was developed by the researcher. This form consists of 16 questions. The questions cover the nurses' demographic information, including age, gender, marital status, education, number of children, work experience, job satisfaction, and training related to senior accompaniment, oxygen therapy, and ROP. The "ROP Knowledge Form" was created by the researcher based on literature [8, 9]. This form includes 33 questions. The first 25 questions assess the level of knowledge about ROP. Of these, 12 questions measure general knowledge about ROP, 9 questions assess knowledge about ROP treatment, and 5 questions evaluate knowledge about the relationship between ROP and pain. The last 8 questions are designed to measure knowledge about the relationship between oxygen therapy and ROP development. These questions were formulated with two options: correct and incorrect. A score of 1 point was given for correct answers and 0 points for incorrect answers. Higher scores indicated a higher level of knowledge.

The ROP knowledge level is the dependent variable of this study. The independent variables include the nurses' age, gender, marital status, educational background, number of children, years of experience in nursing and in the NICU, satisfaction with the unit, and their level of knowledge about ROP.

Evaluation of data

Data were analyzed using computer software, and a p-value of <0.05 was considered statistically significant. In the assessment of nurses' demographic characteristics, satisfaction levels, and information acquisition levels, percentage methods were employed. For the comparison of mean ages, the Pearson correlation test was used. The comparison of gender, marital status, number of children, education received about oxygen therapy, education received about ROP and average ROP knowledge scores were performed using the t-test. To compare educational levels, professional working durations, time spent in the Neonatal Intensive Care Unit (NICU), duration of senior accompaniment in the NICU, and average values of NICU satisfaction levels with ROP knowledge scores, One-way ANOVA test was utilized.

Ethical considerations of the study

Ethical approval for the study was obtained from the Clinical Research Ethics Committee with approval number 2016/05 and decision number 3, dated December 14, 2016. The principle of "informed consent" was upheld, as

nurses voluntarily participated in the study. The limitation of this study is that it was not conducted across all NICUs nationwide. Therefore, the results are generalizable only to the nurses included in the study sample.

Results and Discussion

The demographic characteristics of the participating nurses are presented in **Table 1**.

Table 1. Distribution of demographic characteristics of nurses

Demographic Characteristics (S=139)	Number	%
Age		
19 and under	10	7.2
20-30	106	76.3
31 and above	23	16.5
Gender		
Male	40	28.8
Woman	99	71.2
Education Status		
High school	76	54.7
Associate Degree	21	15.1
License	42	30.2
Marital Status		
Married	45	32.4
Single	94	67.6
Number of Children		
No	111	79.9
There is	28	20.1
GeneralUptime		
2 years and less	66	47.5
2-3 years	38	27.3
3 years and above	35	25.2
Working Time in the NICU		
2 years and less	53	38.1
2-3 years	37	26.6
3 years and above	49	35.3
Senior Assisted Working Time at the NICU		
Never	15	10.8
1 week	30	21.6
2 weeks	40	28.8
3 weeks	21	15.1
1 month and older	33	23.7

A total of 76.3% are in the 20-30 age group. The youngest nurse is 18 years old, and the oldest is 43 years old, with an average age of 25. In terms of gender, 71.2% are female. Educational background reveals that 54.7% have completed high school, and 30.3% have a bachelor's degree. Regarding marital status, 67.6% are single, and 79.9% do not have children. The duration of employment in the Neonatal Intensive Care Unit (NICU) ranges from a minimum of 1 month to a maximum of 32 years, with an average of 3.5 years. A total of 35.3% have worked in the NICU for 3 years or more. Additionally, 89.2% of the nurses have worked under senior supervision.

The satisfaction levels regarding the working environment in the NICU are shown in **Table 2**. Job satisfaction within the NICU is high (87.1%). Most NICU nurses are satisfied with their interactions with doctors in the unit (94.2%), other nurses (97.9%), and staff (94.2%).

Table 2. Distribution of nurses' satisfaction with the working environment

Satisfaction (n=139)	Number	%
Work Satisfaction		
Good	121	87.1
Bad	7	5.0
I'm undecided	11	7.9
Relationship with Intensive Care Physicians		
Good	131	94.2
Bad	8	5.8
Relationship with Intensive Care Nurses		
Good	136	97.9
Bad	3	2.1
Relationship with Intensive Care Staff		
Good	131	94.2
Bad	8	5.8

Table 3 displays the training received on ROP and oxygen therapy in the last 6 months. It was found that 64.7% of NICU nurses had not received any training on oxygen therapy. The minority of nurses who had received training did so through in-service training provided by their institution. It was determined that a significant portion of the nurses showed no interest in written and digital sources related to ROP.

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Table 3. Distribution of nurses' status of receiving oxygen therapy training and obtaining information about ROP in the last six months

Access to Information (n=139)	Number	%
Receiving O2 Therapy Training		
Yes	49	35.3
No	90	64.7
Reading a Book About ROP in the Last 6 Months		
Yes	26	18.7
No	113	81.3
ROP Website Review in the Last 6 Months		
Yes	39	28.1
No	100	71.9
Reading Articles About ROP in the Last 6 Months		
Yes	19	13.7
No	120	86.3

The lowest score obtained on the ROP knowledge form was 10, and the highest score was 26, with an average score of 20.4 (**Table 4**). This table shows that there are statistically significant differences in ROP knowledge average scores based on gender ($p < 0.05$). However, other demographic characteristics did not show significant

differences ($p>0.05$). It was also determined that the level of satisfaction with the working environment did not affect the ROP knowledge level ($p<0.05$).

Table 4. Comparison of the mean ROP information scores of nurses according to their demographic characteristics

Demographic Characteristics	N	Mean± SD	Test	Significance
Age	139	24.9 ± 5.4	r = 0.030	P = 0.725
Gender				
Male	40	16.1 ± 4.3	t = 2.131	P = 0,035
Woman	99	14.6 ± 3.4		
Education				
High school	76	15.1 ± 3.3	F = 0,200	P = 0,819
Associate	21	14.6 ± 2.0		
License	42	15.0 ± 4.8		
Marital Status				
Married	45	14.5 ± 3.6	t= 1.007	P = 0,316
Single	94	15.2 ± 3.7		
Number of Children				
No	111	14.9 ± 3.4	t = 1.311	P = 0.192
Yes	28	15.9 ± 4.6		
Overall Uptime				
2 years and less	66	15.1 ± 2.9	F = 1.645	P = 0.197
2-3 years	38	15.7 ± 4.5		
3 years and above	35	14.2 ± 3.9		
NICU Study Time				
2 years and less	53	15.1 ± 3.1	F = 0.121	P = 0,886
2-3 years	37	14.8 ± 2.3		
3 years and above	49	15.0 ± 3.7		
Senior Assisted Working Time at the NICU				
Never	15	14.7 ± 3.3	F = 1.337	P = 0.259
1 week	30	15.0 ± 2.1		
2 weeks	40	15.8 ± 5.0		

3 weeks	21	15.6 ± 4.2
1 month and older	33	14.0 ± 2.4

Table 5 compares the average ROP knowledge scores based on training received on oxygen therapy and information acquisition on ROP in the past six months. The comparison of average ROP knowledge scores between groups with different levels of training on oxygen therapy and information acquisition on ROP in the past six months revealed no statistically significant differences ($p > 0.05$).

Table 5. Comparison of the mean ROP knowledge scores of nurses according to their status of receiving oxygen therapy training and obtaining information about ROP in the last six months

Learn	N	MEAN ± SD	Test	Significance
Receiving O2 Therapy Training				
Yes	90	47.9 ± 3.8	t = 0.161	P = 0,872
No	49	47.8 ± 2.4		
Reading a Book About ROP				
Yes	26	47.5 ± 2.2	t = 0.648	P = 0,512
No	113	47.9 ± 3.5		
ROP Website Review				
Yes	39	47.2 ± 2.1	t = 1.420	P = 0,158
No	100	48.1 ± 3.7		
Reading an Article About ROP				
Yes	19	47.3 ± 2.0	t = 0.657	P = 0.512
No	120	47.9 ± 3.5		

There is a lack of sufficient research in the current literature regarding the knowledge levels of nurses responsible for the care of premature infants on the topic of Retinopathy of Prematurity (ROP). Therefore, the findings of our study have been discussed in the light of existing literature, and it is believed that this study, which we consider to be the first of its kind both globally and in our country, will make a significant contribution to the field of nursing [10].

Our study found that nurses' knowledge levels regarding neonatal pain are also inadequate. It was determined that, except for gender, other demographic factors do not significantly affect ROP knowledge levels among NICU nurses.

The majority of nurses participating in the study reported high levels of satisfaction with their work environment in the NICU, and their relationships with doctors, other healthcare providers, and staff within the unit are generally positive. This indicates that nurses work harmoniously and comfortably in their units, which is likely to have a positive impact on their job performance.

It was identified that a significant number of nurses had not received any training on oxygen therapy, and most had not utilized any resources (books, online sources, scientific journals) related to ROP in the past six months. For professionals to improve their performance, it is essential to continuously enhance or update their theoretical and practical knowledge related to their field. Otherwise, the quality of the healthcare services they provide may

be compromised. Knowledge and scientific technology continue to advance, develop, and evolve without pause [11].

The evaluation of the ROP knowledge form revealed that both the highest and average scores were low. The determination that neonatal nurses' ROP knowledge scores are very low indicates that they lack sufficient knowledge about ROP, which is one of the major causes of morbidity in premature infants. Given that most of the infants under their care in the intensive care unit are premature, these nurses must be well-informed about ROP. Recent technological advancements in neonatal care have increased the survival chances of very small premature infants. As the number of surviving infants increases, the risk of ROP also rises correspondingly [8, 12]. Neonatal nurses, who spend more time with infants than anyone else, are key members of this team. They are expected to solve problems in the complex and stressful environment of intensive care using swift and rational methods, and to be adaptable, observant, curious, and proactive [9]. Given that neonatal nurses spend extensive time with premature infants, they need to have up-to-date knowledge and experience regarding ROP risk factors, strategies for preventing ROP, treatment options, and eye examination methods. However, our study found that nurses' knowledge about ROP is notably insufficient. Although prematurity is a primary risk factor for ROP, other significant risk factors include oxygen therapy, cardiac and respiratory issues, mechanical ventilation, central nervous system problems, bronchopulmonary dysplasia, hypoxia, hyperoxia, hypocapnia, hypercapnia, metabolic acidosis, asphyxia, hypothermia, endocrine problems, infections, blood transfusions, exchange transfusions, and multiple pregnancies [7]. These risk factors are critical aspects that neonatal nurses must be thoroughly knowledgeable about and should work to minimize. Timely monitoring of ROP examination schedules for premature infants in the NICU is crucial, as missing these examinations can lead to permanent vision loss. It is emphasized in many sources that nurses in the NICU should record when ROP examinations are due and ensure that the examinations are conducted at the appropriate times (postnatal week 4, postmenstrual week 32) [7, 13, 14]. Mydriasis should be initiated about an hour before the ROP examination begins. Drops of 2-3 times every 5 minutes of 2.5% phenylephrine and 0.5% tropicamide should be applied to dilate the pupils. The best time for pupil dilation is 45-60 minutes after the application of drops. Vital signs may deteriorate suddenly during the examination, so emergency resuscitation equipment should be readily available [7].

Compared to older children, newborns experience a greater degree of pain. The Neonatal Intensive Care Unit (NICU) is a setting where numerous painful procedures are performed, including blood draws, intravenous line insertions, endotracheal suctioning, and intubation. Fluctuations in oxygen and carbon dioxide levels during these painful procedures can be a significant risk factor for ROP. The ROP examination itself is also a painful procedure. Therefore, pain management is crucial for ROP care. Both pharmacological and non-pharmacological pain relief methods can comfort the baby, have no side effects, and make the examination more comfortable [9, 15]. Consequently, neonatal nurses need to have a high level of knowledge regarding pain management and treatment. Dizer and colleagues [16] reported that nurses often lose their professional enthusiasm, with burnout significantly contributing to this loss. Burnout diminishes their interest in their work and erodes their inclination towards research and learning over time. Günüşen and colleagues [17] found no difference in burnout levels among nurses of different ages. These findings suggest that age is not a crucial factor when hiring nurses for the NICU. Instead, selecting nurses who can adapt to the stressful and complex environment of the NICU and who are inquisitive, observant, and have good research skills is important. Our study did not measure burnout levels among nurses; however, the finding that age does not affect knowledge levels supports the literature mentioned above.

Our study found that gender influences ROP knowledge levels ($p < 0.05$). Female nurses were found to have higher ROP knowledge levels compared to their male counterparts. The nursing profession in Turkey was defined as a female-dominated profession by legislation enacted in 1954, which remained in effect for over 50 years. In 2007, the law was amended, eliminating gender discrimination in nursing. With the entry of male nurses into the profession, both societal and educational biases and barriers were encountered. Obstacles in higher education included sexist textbooks (where only women were depicted in nursing-related images), gender-focused curriculum design, and teaching staff primarily consisting of female nurses [18]. Zamanzadeh and colleagues [19] reported that in male-dominated developing societies, men working in professions associated with women often show disinterest and detachment from their work. Similarly, in Turkey, the perception of nursing as a female profession has led to a lack of engagement among male nurses. These reasons explain why male nurses might have significant knowledge gaps regarding their profession. However, medical practice and patient care are gender-neutral fields, and there should be no distinction between male and female nurses [10].

The level of education acquired before entering a profession is positively associated with an increase in knowledge, skills, and experience [20]. In Turkey, there was a period when both higher education and secondary education institutions trained nurses with the same title but different levels of professional knowledge and skills. Nurses trained at these different educational levels still work together in the same positions in NICUs [21]. Our study indicated that this educational disparity does not affect ROP knowledge levels. Although ROP is a highly specialized topic, both secondary and higher education graduates work in intensive care units dealing with this issue. The main reason for the lack of impact of educational level on knowledge might be the insufficient coverage of ROP in the curricula of both higher and secondary education institutions [21].

Marital status and number of children do not affect ROP knowledge scores. Consistent with our findings, the literature indicates that marital status and the number of children do not influence knowledge and skill levels [22, 23].

Our study found that the duration of professional experience did not affect ROP knowledge scores. Neither general nursing experience nor experience specifically in the Neonatal Intensive Care Unit (NICU) had an impact on ROP knowledge levels. The lack of improvement in ROP knowledge with additional NICU experience suggests that post-graduate education for nurses is insufficient. Research indicates that post-graduate education significantly enhances professional knowledge levels [24-26]. High weekly working hours in the NICU often leave nurses with limited time outside of work, affecting their ability to attend in-service training and focus during such training. Additionally, the low monthly salaries of nurses prevent them from allocating sufficient financial resources for professional seminars and conferences. These factors explain why, despite increased working hours in general and within the NICU, nurses' professional knowledge levels remain unaffected.

It was observed that experience working in a senior role in the NICU did not influence knowledge levels. This can be attributed to the fact that even nurses who have been in the unit for a long time and hold senior titles still exhibit low levels of knowledge.

The quality of relationships between neonatal nurses and other staff within the same unit did not impact their professional knowledge levels. Nursing is an autonomous profession that requires significant knowledge, the ability to apply, analyze, and implement information effectively. Saluvan and colleagues [27] demonstrated that good communication among staff in a unit is closely related to outcomes such as mortality, morbidity, patient safety, disease development, hospital stay durations, the technical quality of care provided, and meeting the needs of patients' families. Adıgüzel and colleagues [28] identified factors hindering the development of nursing autonomy. Factors such as the predominance of female nurses, their roles being predominantly supportive to physicians, and the perception of nurses primarily as physician assistants contribute to a subservient working attitude. Consequently, nurses in Turkey have lost self-confidence, and they have accepted that their relationships within the unit will improve if they perform their supportive functions well. This attitude ensures unit satisfaction but diminishes efforts to enhance professional knowledge and skills. The tendency to follow orders without validating them through professional sources results in low knowledge levels among nurses who have good relationships with their teams.

Our study also found that whether NICU nurses received training on oxygen therapy or followed relevant resources did not affect their ROP knowledge levels. Nurses were able to answer about half of the questions related to oxygen use correctly. Oxygen support is a critical but dangerous aspect of care for premature infants. Both low and high blood oxygen levels in premature infants can be extremely hazardous. Lim and colleagues [29] highlighted the significance of blood oxygen saturation levels in premature infants, noting that insufficient oxygen use can lead to hypoxia, which impairs neurodevelopment and increases mortality, while excessive oxygen use can cause hyperoxia, leading to severe lung damage and ROP. Their study emphasized the need to maintain oxygen saturation within a narrow range. Due to the harmful effects of hypoxia and hyperoxia, nurses must administer oxygen in a manner that maintains normoxia and avoids complications associated with oxygen therapy. Nurses use pulse oximeters and NICU monitors to ensure oxygen levels. Maintaining oxygen saturation between 90-95% in premature infants can reduce neurological impairment, ROP risk, and mortality rates [30, 31].

Conclusion

Neonatal nurses are key personnel in the care of premature infants. The professional competency expected of neonatal nurses is particularly high, especially in developed countries. However, even in advanced countries, the general nursing programs used in nursing education remain insufficient for neonatal intensive care practices. Retinopathy of Prematurity (ROP) is a condition that significantly impacts the quality of life, is influenced by a multitude of factors, and can be prevented through relatively simple, straightforward screening and treatment methods. Nurses working in neonatal units need to have a thorough understanding of ROP, including its risk factors and the relationships between ROP, oxygen therapy, and pain management. It is essential to enhance ROP-related knowledge among neonatal nurses through their professional training and to increase post-graduation education focusing on ROP risk factors, prevention, and monitoring.

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