THE ASSOCIATION BETWEEN OXYGEN EXPOSURE AND NEONATAL MORBIDITY AND THE DEVELOPMENT OF RETINOPATHY OF PREMATURITY IN PRETERM INFANTS

Khashimova Shakhnoza Isroil qizi
Tashkent State Medical University
Email: shahnozelm@gmail.com
ORCID: 0009-0000-3469-2453

Introduction

Retinopathy of prematurity (ROP) is a potentially sight-threatening disorder affecting the developing retinal vasculature of infants born prematurely. Although advances in neonatal intensive care have improved survival among very preterm infants, these children remain vulnerable to complications associated with incomplete organ development. ROP is particularly important because severe disease may result in permanent visual impairment, while timely detection and appropriate treatment can prevent many adverse outcomes. Gestational age and birth weight are well-established indicators of ROP susceptibility. However, infants with similar birth characteristics may experience different disease outcomes depending on their clinical condition after delivery. Respiratory instability, prolonged oxygen supplementation, bronchopulmonary dysplasia, sepsis, and other neonatal complications may provide additional information about the likelihood of ROP development. Understanding these associations is important for improving clinical risk assessment and identifying infants who require particularly careful ophthalmological surveillance. To examine the relationship between oxygen exposure, major neonatal complications, and the development of ROP in preterm infants, with particular attention to factors associated with severe or treatment-requiring disease.

A narrative review approach was used to synthesize findings presented in the supplied review article and its cited studies. Evidence concerning supplemental oxygen, duration of oxygen therapy, respiratory morbidity, bronchopulmonary dysplasia, neonatal sepsis, blood transfusion, and other systemic complications was considered. Gestational age and birth weight were treated as essential baseline characteristics because of their close relationship with both neonatal morbidity and ROP susceptibility. Studies addressing any-stage ROP were distinguished, where possible, from those investigating severe or treatment-requiring disease. The findings were interpreted qualitatively, without performing a new statistical analysis or generating original patient data.

The reviewed evidence indicates that oxygen exposure is an important component of ROP risk assessment, although its relationship with the disease is complex. Supplemental oxygen is often necessary to support infants with respiratory immaturity; however, prolonged exposure has been associated with an increased likelihood of severe ROP. Findings from two Postnatal Growth and Retinopathy of Prematurity study cohorts, comprising 8,949 infants, showed that the number of days receiving supplemental oxygen during the first 28 days of life remained associated with severe ROP after adjustment for gestational age and birth weight. This suggests that the duration of respiratory support may provide additional prognostic information beyond characteristics recorded at birth. Other findings support the importance of considering oxygen exposure together with respiratory morbidity. Infants requiring prolonged oxygen therapy or mechanical ventilation are frequently those born at the earliest gestational ages and those experiencing a complicated neonatal course. Bronchopulmonary dysplasia may therefore serve as an additional indicator of vulnerability. Nevertheless, these associations should not automatically be interpreted as proof that a single respiratory intervention directly causes ROP,

© 2026 London International Monthly Conference on Multidisciplinary Research and Innovation. All Rights Reserved.

because prematurity, illness severity, and treatment requirements frequently overlap. Systemic complications also contribute to the clinical picture. Sepsis and necrotizing enterocolitis have been associated with ROP in preterm populations, while blood transfusions and early postnatal glucose fluctuations have been identified as additional predictors in some studies. A multivariable prediction model developed for infants born at or before 34 weeks incorporated several clinical variables and achieved a C-index of 0.923. Although this result indicates promising discrimination within the studied population, further external validation is necessary before assuming comparable performance in other neonatal settings. The evidence also highlights an important distinction between predicting any ROP and identifying infants who will develop severe disease. A factor associated with the occurrence of mild retinal changes may not necessarily predict progression to treatment-requiring ROP. Therefore, risk assessment should focus not only on the presence of complications but also on their timing, duration, and relationship with the infant's overall clinical condition.

The findings support a multidimensional interpretation of ROP development. Gestational age and birth weight establish the infant's baseline susceptibility, whereas oxygen exposure and neonatal morbidity provide information about subsequent clinical developments. Evaluating these factors together may improve risk stratification compared with relying exclusively on birth characteristics. However, oxygen therapy should not be withheld when clinically necessary. Its use requires careful management according to appropriate neonatal protocols, balancing the need for adequate oxygenation against potential complications. Similarly, the presence of sepsis, bronchopulmonary dysplasia, or other neonatal conditions should prompt appropriate clinical assessment rather than being regarded as a definitive prediction of ROP. Differences in neonatal populations, treatment practices, and screening criteria may also influence the predictive value of individual factors. Consequently, models developed in one healthcare system should be evaluated before implementation elsewhere. This is particularly relevant in settings where neonatal resources and patterns of premature infant survival differ from those in the original study populations.

Conclusion

Oxygen exposure and neonatal morbidity provide clinically relevant information for assessing ROP risk in preterm infants. Prolonged oxygen supplementation, bronchopulmonary dysplasia, sepsis, and selected systemic complications have been associated with increased disease risk, although their individual contributions may be influenced by gestational age, birth weight, and overall illness severity. Combining these variables may support more individualized surveillance and earlier recognition of infants at risk of severe ROP. Prospective studies and external validation are needed to determine how reliably these factors can guide screening decisions across different neonatal populations.

References

1. Yu CW, Popovic MM, Dhoot AS, et al. Demographic risk factors of retinopathy of prematurity: a systematic review of population-based studies. Neonatology. 2022;119(2):151–163. doi:10.1159/000519635.
2. Bahmani T, Karimi A, Rezaei N, Daliri S. Retinopathy of prematurity: a systematic review and meta-analysis study based on neonatal and maternal risk factors. The Journal of Maternal-Fetal & Neonatal Medicine. 2022;35(25):8032–8050. doi:10.1080/14767058.2021.1940938.
3. Estrada MM, Tomlinson LA, Yu Y, Ying GS, Binenbaum G; G-ROP Study Group. Daily oxygen supplementation and risk of retinopathy of prematurity. Ophthalmic Epidemiology. 2023;30(3):317–325. doi:10.1080/09286586.2022.2111687.

© 2026 London International Monthly Conference on Multidisciplinary Research and Innovation. All Rights Reserved.

4. Shemesh R, Strauss T, Zaslavsky-Paltiel I, et al. Perinatal and neonatal risk factors for retinopathy of prematurity in very low birthweight, very preterm twins: a population-based study. Eye. 2024;38:902–909. doi:10.1038/s41433-023-02801-8.
5. Shen L, Zheng R, Sun X, Chen S. Development and validation of a multivariate nomogram for predicting retinopathy of prematurity in infants with gestational age ≤34 weeks. Frontiers in Pediatrics. 2025;13:1576979. doi:10.3389/fped.2025.1576979.
6. Akkawi MT, Shehadeh MM, Shams ANA, et al. Incidence and risk factors of retinopathy of prematurity in three neonatal intensive care units in Palestine. BMC Ophthalmology. 2019;19:189.

© 2026 London International Monthly Conference on Multidisciplinary Research and Innovation. All Rights Reserved.