Advanced Medical Journal, Vol.11, No.1, P.190-197,2026 https://doi.org/10.56056/amj.2026.444

Retinopathy of Prematurity Screening Criteria in Kurdistan Region

Barzeen Fareed Mohammed Ali* Khosro Senyar Tato Ahmed Ismail Alnaimy*****

Abstract

Background and objective: Retinopathy of Prematurity is a retinal vascular and capillary proliferation disease affecting premature infants undergoing oxygen therapy—the current study aimed to introduce adjusted screening criteria for children in the Kurdistan region.

Methods: A retrospective review of medical records was conducted to analyze patients who underwent Retinopathy of Prematurity screenings in the Kurdistan region (Duhok Eye Hospital) between 01.01.2019 and 30.03.2023. The screening procedure involved pupil dilation using 1.25% phenylephrine ophthalmic solution and 1% tropicamide. Examinations were conducted using indirect ophthalmoscopy. To optimize screening and ensure timely treatment, three criteria were applied to all 500 babies based on gestational age and birth weight: 33-35 weeks and/or 2500-3000 g, 31-33 weeks and/or 2100-2500 g, and ≤ 31 weeks and/or ≤ 2100 g.

Results: This study demonstrates a noteworthy association between gestational age and retinopathy of prematurity prevalence. Among neonates born at or before 31 weeks, 81.90% developed retinopathy of prematurity, while only 18.10% did not. For neonates delivered at 32-33 weeks, 27.37% experienced retinopathy of prematurity, with 72.63% avoiding it. At 34-35 weeks, 11.11% experienced retinopathy of prematurity, 88.89% did not. The data also reveals a relationship between birth weight and the requirement for retinopathy of prematurity treatment. Among neonates with a birth weight of less than 2100 grams, a substantial 56.27% required treatment, while 43.73% did not.

Conclusions: The study underscores the importance of tailored screening and intervention strategies for retinopathy of prematurity, especially in the vulnerable in the Kurdistan region.

Keywords: Criteria, Duhok, Retinopathy of Prematurity, Screening

*MBChB,Kurdistan Higher Council of Medical Specialties, Duhok Eye Teaching Hospital. E-mail: barzeen.fareed.1988@gmail.com. Corresponding Author
**PhD, Fellowship Vitreoretinal Surgery, College of Medicine, Duhok University. Email: khosrosenyar@yahoo.com.
***PhD, Hawler Medical University, College of Medicine. E-mail: Drahmmed@gmail.com

Introduction

Premature newborns receiving oxygen therapy are susceptible to a condition known as Retinopathy of Prematurity (ROP).[1] Oxygen therapy causes pathologic development of vessels in the retina, which can cause macular folds, retinal detachment, and permanent damage to the retina.[2] Although several factors influence the frequency and severity of disease development, gestational age, and birth weight are the basis for screening criteria for this disease.[3] Patient's visual prognosis has improved with early treatment of the condition with cryotherapy, laser photocoagulation, and anti-VEGF medication; early detection through screening is essential, though. A multidisciplinary strategy is needed to prevent ROP, starting before the baby is born and continuing throughout childhood.[4] The retina experiences physiological hypoxia when developing in utero. Retinal angiogenesis is facilitated by increased VEGF levels.[5] Vasculogenesis, which occurs from the 14th to the 21st week, and angiogenesis, which starts in the 22nd week and lasts until the retina is completely vascularized after term, are the two stages of normal vascular development.[6] Early Treatment for Retinopathy of Prematurity highlighted numerous significant epidemiological risk factors for ROP. This multicenter, randomized, prospective trial examined the safety of earlier versus traditionally timed peripheral retinal ablation.[7] For infants who are premature or have low birth weights (BW), screening for ROP is essential. Infants ≤ 30 weeks gestational age (GA) or ≤1500 g BW should be evaluated for ROP, according to guidelines from the American Academy of Ophthalmology, American Academy of Pediatrics, and the American Association for Pediatric Ophthalmology and Strabismus. Screening may also be beneficial for larger infants, depending on the clinical course.[8] Every newborn needs 3,4 serial exams on average.[9] Every infant weighing ≤1500g or less at birth and born at ≤30 weeks GA should have a dilated fundus exam. In the special newborn care unit or neonatal intensive care unit, screening should start at 4 weeks postnatal age or corrected GA of 30 to 31 weeks, though it can also be done outpatient.[10] Before the assessment, two 15-minute instillations of 1.25% phenylephrine hydrochloride and 1% tropicamide are used to dilate the pupils. It is important to take precautions against systemic absorption. Pupils with advanced ROP may not dilate.[11] An attending nurse should be present during the evaluation because newborns may exhibit bradycardia and apnea.[12] The Postnatal Growth and Retinopathy of Prematurity Screening Criteria (G-ROP) was created in an attempt to reduce the number of pointless tests while accurately identifying each case of ROP. These recommendations decreased the number of children examined by 30% and were 100% sensitive in a validation analysis involving 3981 infants.[13] Unlike conventional recommendations, this screening tool takes weight increase into account while determining whether or not to use it. Even though the 2019 study showed enhanced specificity and great sensitivity, all new prediction models need to be validated and tested to compare their performance to low-resource and clinical scenarios.[14] The classification is explained in terms of the disease's stage and zone.[1] Based on its zone and stage, ROP is ranked by the International Classification of Retinopathy of Prematurity (ICROP). Zone I, Zone II, and Zone III are the three zones that make up the retina. There are five stages of ROP severity, each of which corresponds to a distinct retinal and vascular pattern. Since ROP is thought to be caused by low serum IGF-1 levels, predictive models have been created to predict ROP, including sluggish postnatal weight gain.[2,3]

https://doi.org/10.56056/amj.2026.444


The current study's objective was to establish modified screening standards for children in Kurdistan, highlighting the necessity of tailored prevention, screening, and treatment plans for ROP that are in line with the unique needs of each of our nation's regions.

Patients and methods

A retrospective review of medical records was conducted to analyze patients who underwent ROP screenings in the Kurdistan region (Duhok Eye Hospital) between January 2019 and March 2023. The research adhered to the principles outlined in the Declaration of Helsinki. Informed consent was obtained in writing from parents before the procedure, and parents were informed about potential complications. ROP classifications and treatment decisions were based on the International Classification of ROP and ETROP study results. The classification is based on the location (zone) and severity (stage) of the disease. The ETROP study was a landmark clinical trial conducted to investigate the effectiveness of early intervention in treating severe ROP. Screening procedure steps were done as follows, the pupil dilation in the study was accomplished by using a combination of 1.25% phenylephrine Ophthalmic Solution and 1% tropicamide. The dilation allows for a more detailed examination of the structures at the back of the eye. In the study, all examinations were performed utilizing indirect ophthalmoscopy, specifically employing the Omega 500 instrument manufactured by HEINE Optotechnik in Herrsching am Ammersee, Germany. Indirect ophthalmoscopy involves using a light source and a hand-held lens to examine the retina, providing a wide and detailed view of the back of the eye. Additionally, scleral indentations, a technique involving gentle pressure on the outer surface of the eye, were consistently administered by the same ophthalmologist. In the study, infants meeting the criteria of being born at gestational ages (GAs) of ≤36 weeks and having birth weights (BWs) of ≤3000 g underwent initial ROP screenings. These screenings were scheduled for the 31st week of gestational age or 4 weeks after birth, whichever occurred later. This approach ensures that premature infants, who are at a higher risk of developing ROP, are systematically monitored for the condition. Subsequent examinations were carried out based on the disease status of the infants, and the screenings continued until retinal vascularization was complete. This strategy allows for ongoing assessment and intervention as needed, providing a comprehensive approach to managing ROP in the vulnerable population of premature infants. To optimize screening procedures while ensuring timely treatment, three specific criteria were applied to all 500 babies in the study based on their gestational age (GA) and birth weight (BW): 33-35 weeks and/or 2500-3000 g: Infants falling within this range of gestational age and/or birth weight were subjected to the defined screening criteria. 31-33 weeks and/or 2100-2500 g: Another category included infants with gestational ages between 31 and 33 weeks and/or birth weights ranging from 2100 to 2500 g. ≤31 weeks and/or ≤2100 g: The third criterion encompassed infants born at 31 weeks or earlier and/or with birth weights of 2100 g or less. These criteria provided a systematic approach to categorizing infants based on their risk factors related to gestational age and birth weight, enabling a targeted and efficient screening process. Exclusion criteria included infants born after 36 weeks of gestation, infants with a birth weight exceeding 3000 g, infants whose parents did not provide written informed consent for the screening procedure, infants who missed the initial screening or follow-up ROP screenings for any reason, infants with congenital ocular anomalies or other pre-

https://doi.org/10.56056/amj.2026.444


existing eye conditions that could interfere with ROP diagnosis. Inclusion criteria included infants born at ≤36 weeks gestation, and infants with birth weights of ≤3000 g. The Kurdistan Higher Council of Medical Specialties Ethics Committee accepted the study protocol. Computerized statistical analysis was performed using the SPSS (ver. 23) statistic program. A comparison was carried out using Chi-square (X^2). The p value> 0.05 was considered statistically significant while those whose p value was > 0.05 were considered non-significant statistically.

Results

In Table (1), the distribution of studied neonates based on the occurrence of Retinopathy of Prematurity (ROP) is presented. Out of a total of 500 neonates, 294 of them (58.8%) experienced ROP, while 206 neonates (41.2%) did not develop ROP. This table demonstrates that the majority of the studied neonatal population has ROP.

Table (1): Distribution of studied neonates according to occurrence of Retinopathy of Prematurity (ROP)

Studied neonates	No.	%
ROP	294	58.8
No ROP	206	41.2
Total	500	100

In Table (2), the distribution of neonates with ROP is categorized based on the need for treatment. Among the 294 neonates with ROP, 163 of them (84.02%) required treatment, while 131 neonates (15.98%) did not require treatment. This table underscores the importance of early intervention and treatment for a significant proportion of neonates diagnosed with ROP. Table (3), presents a comprehensive distribution of studied neonates concerning their occurrence of ROP and the gestational age at which they were delivered. The data demonstrates a noteworthy association between gestational age and ROP prevalence. Among neonates born at or before 31 weeks, a substantial 81.90% developed ROP, while only 18.10% did not. In contrast, for neonates delivered at 32-33 weeks, 27.37% experienced ROP, with 72.63% avoiding it. Similarly, at 34-35 weeks, the incidence of ROP was much lower at 11.11%, while the majority, 88.89%, remained ROP-free. P-value: <0.01.

Table (2): Distribution of ROP neonates according to treatment requirements

Neonates with retinopathy of prematurity	No.	%
Required treatment	163	55.44
Not required treatment	131	44.56
Total	294	100

Table (3): Distribution of studied neonates according to Retinopathy of Prematurity (ROP) and gestational age of delivery

Gestational age (week)	ROP		No ROP		Total	
	No.	%	No.	%	No.	%
≤31	258	81.90	57	18.10	315	100
32-33	26	27.37	69	72.63	95	100
34-35	10	11.11	80	88.89	90	100
Total	294	58.80	206	41.20	500	100

Table (4), provides a breakdown of neonates with ROP who required treatment, categorized by their gestational age at delivery. The data demonstrates a significant correlation between gestational age and the necessity for ROP treatment. Among neonates born at or before 31 weeks, the majority 60.85% needed treatment, whereas 39.15% did not. For those delivered at 32-33 weeks, only 15.38% required treatment, 84.62% did not. Similarly, among neonates born at 34-35 weeks, 20.00% required treatment, with 80.00% not needing it. P-value (<0.01).

https://doi.org/10.56056/amj.2026.444

Table (4): Distribution of neonates who required treatment of ROP according to gestational age of delivery

Neonates with retinopathy of prematurity						
Gestational age (week)	Required treatment		Not Required treatment		Total	
	No.	%	No.	%	No.	%
≤31	157	60.85	101	39.15	258	100
32-33	4	15.38	22	84.62	26	100
34-35	2	20.00	8	80.00	10	100
Total	163	55.44	131	44.56	294	100

Table (5) and Figure (1), demonstrates a compelling relationship between body weight (BW) and the prevalence of ROP. Among neonates with a BW of <2100 g, 73,04% develop ROP. Neonates with a BW of 2100-2500 g,16.67% experienced ROP. In the 2500-3000 g weight range, only 5% experienced ROP. Table (6) and Figure (2), provides a detailed distribution of neonates who needed treatment for ROP, categorized by their birth weight. The data reveals a compelling relationship between birth weight and the requirement for ROP treatment. Among neonates with a birth weight of less than 2100 grams, a substantial 56.27% required treatment, while 43.73% did not. In the 2100-2500gram weight range, a lower but notable 38.46% needed treatment, with 61.54% not requiring it. For the neonates with a birth weight of 2500-3000 grams, the requirement was evenly split at 50%. p-value <0.01.

Table (5): Distribution of studied neonates according to Retinopathy of Prematurity (ROP) and birth weight

Birth weight (Gram)	ROP		No ROP		Total	
	No.	%	No.	%	No.	%
<2100	279	73.04	103	26.96	382	100
2100-2500	13	16.67	65	83.33	78	100
2500-3000	2	5.00	38	95.00	40	100
Total	294	58.80	206	41.20	500	100

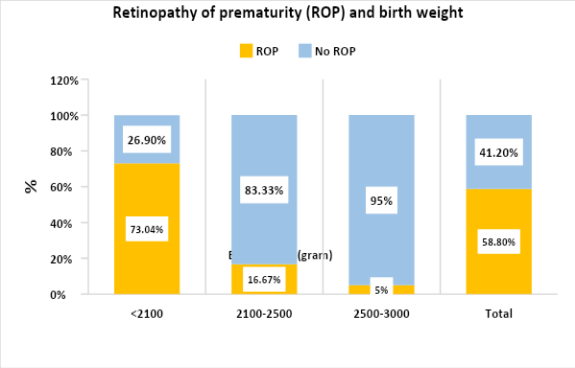

Figure (1): Distribution of studied neonates according to Retinopathy of Prematurity (ROP) and birth weight

Table (6): Distribution of neonates who required treatment of ROP according to their weights

Birth weight (Gram)	Neonates with retinopathy of prematurity					
	Required treatment		Not Required treatment		Total	
	No.	%	No.	%	No.	%
<2100	157	56.27	122	43.73	279	100
2100-2500	5	38.46	8	61.54	13	100
2500-3000	1	50.00	1	50.00	2	100
Total	163	55.44	131	44.56	294	100

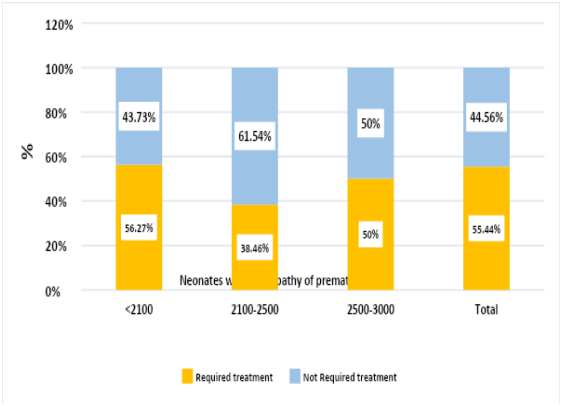

Figure (2): Distribution of neonates who required treatment of ROP according to their weights:

Discussion

Derived from a cohort of at-risk infants, this group is a comprehensive representation of those undergoing ROP examinations in North

https://doi.org/10.56056/amj.2026.444

America. The cohort is notably diverse, encompassing variations in race/ethnicity, geography, and neonatal intensive care unit settings.[15] The criteria employed for ROP risk assessment are designed for simplicity and familiarity among clinicians. Utilizing routinely collected data, these criteria involve minimal calculations, ensuring a negligible impact on the workflow within neonatal intensive care units. Infants meeting either the birth weight (BW) criterion or the gestational age (GA) criterion are eligible for examinations. The substantial increase in ROP prevalence among neonates born at or before 31 weeks is consistent with the established understanding that lower gestational age is a significant risk factor for ROP. Premature infants, particularly those born at extremely low gestational ages, often exhibit incomplete retinal vascularization, contributing to the higher likelihood of ROP development. This finding resonates with studies such as those conducted by the Cryotherapy for Retinopathy of Prematurity Cooperative Group and the Early Treatment for Retinopathy of Prematurity Cooperative Group, which have consistently highlighted the vulnerability of extremely premature infants to ROP.[16] Conversely, the lower prevalence of ROP among neonates delivered at 32-33 weeks and 34-35 weeks is in line with the concept that as gestational age increases, the risk of severe ROP decreases. This inverse relationship is well-documented in studies such as the multicenter study by the American Academy of Pediatrics Section on Ophthalmology, reinforcing the understanding that more mature infants are generally less susceptible to severe ROP.[17] The study showed a significant correlation between gestational age at birth and the necessity for ROP treatment. Notably, neonates born at or before 31 weeks exhibit a substantial demand for treatment (60.85%), in contrast to 39.15% who did not require intervention. This trend persists as gestational age increases, with a mere 15.38% of neonates born at 32-33 weeks needing treatment, and an even lower 20.00% in the 34–35-week category. These findings emphasize the critical role of gestational age in assessing the risk and necessity for ROP treatment in neonatal care. Neonates with a birth weight of less than 2100 grams exhibit a substantial demand for treatment at 56.27%, contrasting with 43.73% who did not require intervention. This relationship persists, albeit with decreasing percentages, as birth weight increases. In the 2100-2500gram range, 38.46% needed treatment, while 61.54% did not, and for the very few neonates with a birth weight of 2500-3000 grams, the need was evenly split at 50%. These findings highlight birth weight as a critical risk factor for ROP, with a diminishing need for treatment as birth weight increases. Several procedures were used in this study to identify all the patients who need therapy and to prevent oversampling. [18] For the USA (<1500 g), Australia (<1250 g), and Canada (<1250 g), <30 weeks of GA is the recommended screening criterion.[19-21]. In Turkey, research by Basmak et al. suggested a screening technique based on ≤2000 g of birth weight (BW) or ≤34 weeks of gestational age. [22] In our study infants were heavier and older compared to USA, Australia, and Canada but they were comparable to those from Turkey. Numerous risk factors, like blood transfusions, poor postnatal weight gain, sepsis, and necrotizing enterocolitis, have been linked to the development of ROP.[23-25] Since our screening criteria needed to be more precise and uncomplicated, we did not assess the other risk factors in our investigation. The observed trends have substantial clinical implications for healthcare practitioners involved in neonatal care. The data reaffirms the need for tailored screening and intervention strategies, particularly for very-low-birth-weight

https://doi.org/10.56056/amj.2026.444

infants.[26] The heightened demand for treatment in the lower birth weight range accentuates the critical window of vulnerability during retinal development. Identifying and addressing ROP risk based on birth weight categories can contribute to more effective management and improved outcomes for preterm infants, safeguarding their visual health as they progress through critical stages of development. [27,28] In our study there were some limitations as we relied on data from Duhok Eye Hospital which potentially limits its generalizability, Factors like socioeconomic status, maternal health, and prenatal care were not considered. The study excluded infants without follow-up screenings or consent, potentially introducing selection bias. It did not assess long-term outcomes.

Conclusions

Gestational age and birth weight are pivotal determinants in understanding, predicting, and addressing the prevalence and treatment needs of ROP in neonates. The findings emphasize the necessity of individualized care plans, vigilant monitoring, and early interventions to mitigate the impact of ROP, particularly among extremely premature infants with lower birth weights. We recommend screening premature patients of ≤ 34 weeks of GA or ≤ 2500 g of BW for our region.

Conflicts of interest

The author reports no conflicts of interest.

References

1. Dogra MR, Katoch D, Dogra M. An Update on Retinopathy of Prematurity (ROP). Indian J Pediatr. 2017 Dec;84(12):930-36.
2. Pastro J, Toso BR. Influence of oxygen in the development of retinopathy of prematurity. Rev Bras Enferm. 2019 Jun 27;72(3):592-99.
3. Zhu Z, Hua X, Yu Y, Zhu P, Hong K, Ke Y. Effect of red blood cell transfusion on the development of ROP: A systematic review and meta-analysis. PLoS One. 2020;15(6): e0234-66.
4. Kim SJ, Port AD, Swan R, Campbell JP, Chan RVP, Chiang MF. ROP: a review of risk factors and their clinical significance. Surv Ophthalmol. 2018 Sep-Oct;63(5):618-37.
5. Fierson WM., American Academy of Pediatrics Section on Ophthalmology. American Academy of Ophthalmology. American Association for Pediatric Ophthalmology and Strabismus. American Association of Certified Orthoptists. Screening Examination of Premature Infants for Retinopathy of Prematurity. Pediatrics. 2018 Dec;142(6): e20183061.doi: 10.1542/peds.2018-3061/
6.Binenbaum G, Tomlinson LA, de Alba Campomanes AG, Bell EF, Donohue P, Morrison D, et al.Validation of the Postnatal Growth and Retinopathy of Prematurity Screening Criteria. JAMA Ophthalmol. 2020 Jan 01;138(1):31-37.
7. Ying GS. A Prediction Model for Retinopathy of Prematurity-Is It Ready for Prime Time? JAMA Ophthalmol. 2020 Jan 01;138(1):29-30.
8. Agarwal K, Jalali S. Classification of retinopathy of prematurity: from then till now. Community Eye Health. 2018;31(101): S4-S7.
9. Snyder LL, Garcia-Gonzalez JM, Shapiro MJ, Blair MP. Very Late Reactivation of Retinopathy of Prematurity After Monotherapy with Intravitreal Bevacizumab. Ophthalmic Surg Lasers Imaging Retina. 2016 Mar;47(3):280-3.
10. Natarajan G, Shankaran S, Nolen TL, Sridhar A, Kennedy KA, Hintz SR, et al. Neurodevelopmental Outcomes of Preterm Infants with Retinopathy of Prematurity by Treatment. Pediatrics. 2019 Aug;144(2): e20183537.doi:10.1542/peds.2018-3537/
11. Sen P, Jain S, Bhende P. Stage 5 retinopathy of prematurity: An

update. Taiwan J Ophthalmol. 2018 Oct-Dec;8(4):205-15.
12. Piermarocchi S, Bini S, Martini F, Berton M, Lavini A, Gusson E, et al. Predictive algorithms for early detection of retinopathy of prematurity. Acta Ophthalmol. 2016;95(2):158-64.
13. Binenbaum G, Ying GS, Tomlinson LA; Postnatal Growth and Retinopathy of Prematurity (G-ROP) Study Group. Validation of the Children's Hospital of Philadelphia Retinopathy of Prematurity (CHOP ROP) model. JAMA Ophthalmol. 2017;135(8):871-77.
14. Honavar SG. Do we need India-specific retinopathy of prematurity screening guidelines? Indian J Ophthalmol. 2019 Jun;67(6):711.
15. Binenbaum G, Tomlinson LA. Postnatal growth and retinopathy of prematurity study: rationale, design, and subject characteristics. Ophthalmic Epidemiol. 2017;24(1):36-47.
16. Hansen ED, Hartnett ME. A review of treatment for retinopathy of prematurity. Expert Rev Ophthalmol. 2019 Mar 4;14(2):73-87.
17. Darlow BA. Primary prevention of ROP: more can be done in all settings. Expert Rev Ophthalmol. 2023 May 4;18(3):177-91.
18. Wilson CM, Ells AL, Fielder AR. The challenge of screening for retinopathy of prematurity. Clin Perinatol. 2013 Jun 1;40(2):241-59.
19. Fierson WM; American Academy of Pediatrics Section on Ophthalmology; American Academy of Ophthalmology; American Association of Certified Orthoptists. Screening examination of premature infants for retinopathy of prematurity. Pediatrics 2013; 131:189–95.
20. Binenbaum G, Ying GS, Quinn GE, Dreiseitl S, Karp K, Roberts RS, et al; Premature Infants in Need of Transfusion Study Group. A clinical prediction model to stratify retinopathy of prematurity risk using postnatal weight gain. Pediatrics 2011; 127:607–14.
21. Jefferies A. Retinopathy of prematurity: Recommendations for screening. Paediatr Child Health 2010; 15:667–74.
22. Başmak H, Niyaz L, Sahin A, Erol N, Gursoy HH. Retinopathy of prematurity: screening guidelines need to be reevaluated for developing countries. Eur J Ophthalmol 2010; 20:752–56.
23. Bas AY, Demirel N, Koc E, Ulubas Isik D, Hirfanoglu İM, Tunc T; TR-ROP Study Group. Incidence, risk factors, and severity of retinopathy of prematurity in Turkey (TR-ROP study). Br J Ophthalmol. 2018 Mar 8. doi: 10.1136/bjophthalmol-2017-31178/
24. Phelps DL. Retinopathy of prematurity. In: Martin RJ, Fanaroff AA, Walsh MC, editors. Fanaroff and Martin's neonatal-perinatal medicine: diseases of the fetus and infant. Arch Dis Child Fetal Neonatal Ed.2006 Nov; 91(6): F468.
25. Bernstein IM, Horbar JD, Badger GJ, Ohlsson A, Golan A. Morbidity and mortality among very-low-birth-weight neonates with intrauterine growth restriction. Am J Obstet Gynecol. 2000; 182:198–206.
26. Wardle SP, Drury J, Garr R, Weindling AM. Effect of blood transfusion on lipid peroxidation in preterm infants. Arch Dis Child Fetal Neonatal Ed. 2002;86: F46–8.
27. Hesse L, Eberl W, Schlaud M, Poets CF. Blood transfusion. Iron load and retinopathy of prematurity. Eur J Pediatr. 1997; 156:465–70.
28. Dani C, Reali MF, Bertini G, Martelli E, Pezzati M, Rubaltelli FF. The role of blood transfusions and iron intake on retinopathy of prematurity. Early Hum Dev. 2001; 62:57–63.

https://doi.org/10.56056/amj.2026.444