Retinopathy of Prematurity: Estimated Burden at Ayub Teaching Hospital

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Abstract:

Background: Retinopathy of prematurity (ROP) is a growing concern in Pakistan, leading to childhood blindness in over 50,000 cases worldwide annually. ROP contributes to 15-35% of childhood blindness in middle-income countries. While improved neonatal care has reduced infant mortality rates, the risk of ROP has significantly increased.

Objective: This study aims to estimate the disease burden of ROP within our setting to facilitate the establishment of an effective screening and rehabilitation program.

Methods: Cross-sectional study with retrospective data collection was carried out. We retrospectively examined records of preterm patients admitted to the NICU at Ayub Teaching Hospital with in the duration of 6 months. We assessed the number of monthly admissions, discharges, and mortalities. Categorical variables were expressed in terms of frequency and percentages.

Results: Total 540 preterm babies were admitted to the NICU at Ayub Teaching Hospital. Out of these, 315 were discharged, while 225 expired during this six-month period. The average mortality rate during this time was 41.6%. The highest admission rate (268) was observed in the weight range of 1 kg to 1.5 kg. 172 preterm babies had a gestational age of 32 to 33 weeks, with a mortality rate of 32%. Assuming an ROP incidence of 21.4%, it is estimated that 115 out of the 540 patients could develop ROP. The confidence interval for an incidence of 20% ranged from 16.7 to 23.3, and for an incidence of 32%, it ranged from 28 to 35.9.

Conclusion: ROP is a preventable cause of childhood blindness. A well-established screening program is crucial to reduce the disease burden on society. It requires proper screening, skilled personnel, and financial resources. Addressing this emerging epidemic is essential for a brighter future. *Al-Shifa Journal of Ophthalmology 2023; 19(1): 33-37. © Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan.*

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Introduction:

Retinopathy of prematurity (ROP) has become a significant concern in Pakistan, leading to childhood blindness in over 50,000 cases globally each year. ROP accounts for 15-35% of childhood blindness in middle-income countries.[1,2] Despite improvements in neonatal care services that have reduced infant mortality rates, the risk of ROP has surged significantly. A study by Gilbert et al,[2] found a negative correlation between the infant mortality rate (IMR) and the development of ROP-related blindness. Effective ROP screening can significantly reduce the incidence of blindness.

Low to middle-income countries, with IMRs ranging from 9 to 60 per thousand

live births, are at the highest risk for ROP development and related blindness, making it a major public health concern. This has been termed as the third epidemic of ROP, as neonatal care has improved, but comprehensive screening facilities for ROP are still lacking in many regions.[3] Pakistan's IMR dropped to 55.7 per thousand live births in 2023 from 82.5 per thousand live births in 2000, making it more susceptible to the ROP epidemic.[4] Several studies have highlighted that timely treatment can significantly reduce the risk of ROP-related blindness.[5,6,7,8]

However, there remains a lack of awareness about the disease among both medical professionals and the general public in our region. A previous study conducted at Ayub Medical College demonstrated that only 48% of doctors were aware of when ROP screening should commence, and 50% were unaware of treatment modalities.[9] The lack of proper counseling and delayed or absent treatment are major risk factors for ROP-related blindness.[10]

To establish an effective screening program, it is crucial to determine the disease burden in a specific area. With limited resources, understanding the actual burden of the disease is essential to manage financial resources for sustainable screening and rehabilitation programs.

Ayub Teaching Hospital serves as the sole tertiary care hospital in the region, catering to a population spanning from Khunjarab Pass to Hassan Abdal. Therefore, it is vital to determine the expected extent of the disease in this region to focus efforts on addressing this impending epidemic.

Materials and Methods:

Cross-sectional study with retrospective data collection was carried out. We analyzed data from 540 consecutive babies admitted to the nursery at Ayub Teaching Hospital. We comprehensively examined the records of the 540 consecutive preterm babies admitted to the NICU from November 2022 to April 2023, focusing on the number of admissions per month, expiries, and discharges. Data analysis was performed using SPSS version 10. Categorical variables were presented in terms of frequency and percentages. A confidence interval (20%-35.92%) for ROP was calculated based on national data. Continuous variables were presented as means. Percentages for preterm infants with low birth weight were categorized into three groups based on weight in grams, and the monthly number of patients was calculated in different categories according to gestational age. The total number of expiries in each group was also calculated.

Results:

A total of 540 preterm babies were admitted to the NICU at Ayub Teaching Hospital. Of these, 315 preterm babies were discharged, while 225 expired during this six-month period. The average mortality rate during this time was 41.6%, table 1.

Table 1: Descriptive analysis in context of duration.

MONTH	TOTAL ADMISSIONS	EXPIRIES	DISCHARGE	% EXPIRIES
NOVEMBER	75	30	45	40%
DECEMBER	65	26	39	40%
JANUARY	98	44	54	44%
FEBRUARY	110	50	60	45%
MARCH	105	43	62	40%
APRIL	87	32	55	36%
TOTAL	540	225	315	41.6%

The highest admission rate (268) was observed in the weight range of 1 kg to 1.5 kg. The average mortality rate for preterm babies weighing between 1 kg and 1.5 kg was 39%, compared to 89% for babies weighing less than 1 kg. A total of 196 preterm babies with a weight greater than 1 kg were admitted, with a mortality rate of 21%, table 2.

Table 2: Descriptive analysis in context of weight.

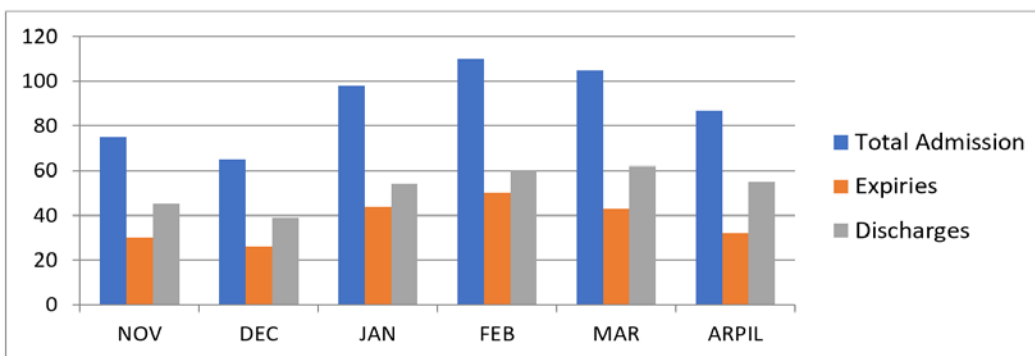| GESTATIONAL WEIGHT	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	TOTAL ADMISSIONS	TOTAL EXPIRIES
LESS THAN 1 KG	A=14 E =12	A=12 E=10	A=18 E=16	A=14 E=13	A=10 E=9	A=8 E=8	76	68 89%
1.01 – 1.5 KG	A=36 E=10	A=30 E=10	A=45 E=22	A=56 E=26	A=58 E=22	A=43 E= 14	268	104 39%
1.51-2.5 KG	A=25 E=8	A=23 E=6	A=35 E=8	A=40 E= 11	A=37 E= 11	A=36 E= 10	196	54 28%

Fig 1: Bar graph month wise report.

Concerning gestational age, the highest number of admissions occurred in the group of preterm babies with a gestational age of 28 to 31 weeks, with an expiry rate of 45%. In contrast, an 88% expiry rate was observed in the group with a gestational age of less than 28 weeks. A total of 172 preterm babies were admitted with a gestational age of 32 to 33 weeks, and they had an expiry rate of 32%.

Assuming an incidence of ROP of 21.4%, it is estimated that 115 out of the 540 patients could develop ROP, fig 2. The confidence interval for an incidence of 20% ranged from 16.7 to 23.3, while the confidence interval for an incidence of 32% ranged from 28 to 35.9.
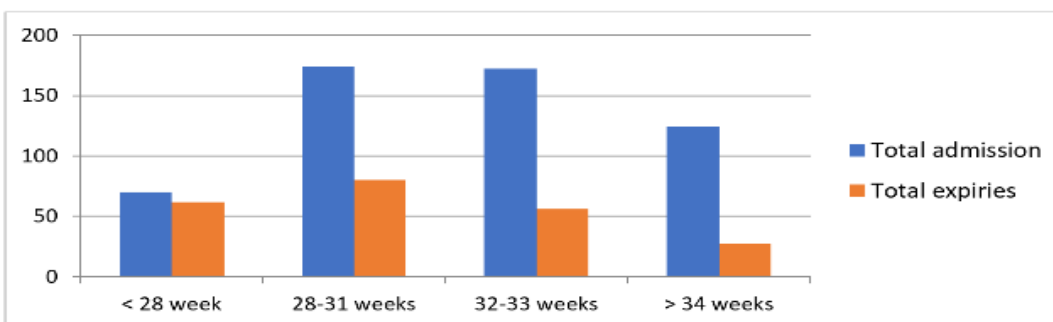

Fig 2: Bar graph gestational age wise report.

Discussion:

ROP is a preventable cause of blindness that predominantly affects the peripheral retina due to immature vessels in preterm infants.[11,12] Worldwide, approximately 1.4 million blind children exist, with 50% of them attributed to ROP.[13,14] A substantial 23% of this population resides in low to middle-income countries.

Infants with ROP are at high risk of developing other eye problems later in life, such as retinal detachment, myopia, and visual field defects. Early identification of these conditions allows for effective control and treatment.

While the incidence of ROP in Pakistan is yet to be precisely established, various studies from different centers suggest a range between 10.5% to 32.4%.[15] Assuming an average incidence of 21.4%, our study estimates that 115.5 out of 540 preterm babies could develop ROP in six months. This represents a significant number, considering the financial and social impact on families and society as a whole.

In our study, we observed a high admission rate of preterm babies with a weight between 1 kg and 1.5 kg, with a 39% mortality rate. This group is potentially at higher risk for developing ROP.

High incidence of ROP in low to middle-income countries can be attributed to factors such as preterm birth, lack of awareness among family practitioners and parents, shortage of skilled personnel and financial resources for screening, and a lack of screening programs in most neonatal units.[16]

There is a significant correlation between ROP and the degree of prematurity, with more severe disease observed in infants born at an earlier gestational age.[17] Our study found that more than 80% of infants born with a gestational age of less than 28 weeks developed ROP, and 60% of preterm infants born at 28 to 31 weeks had ROP.[18]

Notably, infant mortality rates are highly correlated with ROP. The 2023 statistics for Pakistan indicate a significant decrease in IMR, with 55.7 deaths per thousand live births, down from 67.1 per thousand in 2012 and 88 per thousand in 2000. This is a concerning trend, signaling the potential for an impending ROP epidemic.

Conclusion:

ROP remains a preventable cause of blindness in children. The implementation of a comprehensive screening program can substantially reduce the disease burden on society. However, this endeavor necessitates the availability of proper screening infrastructure, trained personnel, and financial resources. To establish a sustainable screening and rehabilitation program, it is imperative to assess the need based on the actual disease burden. Ayub Teaching Hospital serves as the only tertiary care facility covering the Hazara division, which has a population of more than 4 million according to the 2017 census. Addressing this emerging epidemic requires both short-term and long-term planning for a better and brighter future.

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