

Refractive Error Among Healthy Infants in Tertiary Eye Care Centre of Nepal

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Abstract:

Objective: To determine the prevalence of non-physiological Refractive error among all infants attending the hospital.

Methods: This Retrospective cross-sectional study was conducted among healthy infants attending the Department of Pediatric Ophthalmology in Kedia Eye Hospital, Birgunj, Nepal from January 2023 to June 2023. Informed consent from the infant's parents was taken. Cycloplegic refraction was performed using retinoscopy to diagnose the refractive errors. Hyperopia of $> + 4.00$ D, Myopia of < -1.50 D, and Astigmatism of < -1.75 D were included in the study.

Results: A Total of 966 infants (0-12 months) were enrolled in the study. Number of male and female infants were 594 (61.5%) and 372 (38.5%) respectively (Table 1). The mean age was 6 months. The prevalence of Refractive error in infants was 21.5%. Astigmatism was found in 92 infants (9.5%), Myopia in 62 infants (6.4%), and Hyperopia in 52 infants (5.6%).

Conclusion: Refractive error is one of the major ocular morbidities affecting children. Detecting Refractive errors early in infancy is an advantage to the children's education, quality of life, and social development. Screening all the infants for Refractive errors along with other systemic illness can be recommended. *Al-Shifa Journal of Ophthalmology 2024; 20(3): 106-110.* © Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan.

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Introduction:

Refractive errors occur when the shape of the eye prevents light from focusing and forming an image on the retina and if remains uncorrected leads to permanent vision loss. Corrective Spectacles, contact lenses, and Refractive surgeries are the modalities of treatment for errors of refraction. Timely intervention remains the key factor for the management of Refractive Error. Diagnosing early during infancy might enhance the quality of children's lives and future careers. If left uncorrected children may develop amblyopia, disparity in binocular vision, and strabismus leading to visual impairment and blindness in children.¹

Refractive Error is the second leading cause of preventable visual loss and the first cause of visual impairment. Refractive Error accounts for 43 % of visual impairment worldwide.^{2,4} The World Health Organization approximates that 19 million children and adolescents 5 to 15 years of age are having Visual Impairment among

which 12.8 million cases are due to uncorrected refractive errors. Consequences of Uncorrected refractive error may be harmful for children in their educational opportunities, productivity, and overall quality of life since vision develops during infancy.³

Many studies have been conducted and published on the Prevalence of Refractive Error in Children in Nepal and worldwide but very few studies on refractive errors in infants. For effective treatment of Refractive error early detection might be helpful. The main objective of the study was to determine the prevalence of Refractive error among all infants attending the hospital.

Materials and Methods:

This Retrospective observational study was conducted among healthy infants attending the Department of Pediatric Ophthalmology at Kedia Eye Hospital, Birgunj, Nepal. Informed consent from the infant's parents was taken and recorded. The hospital's ethical committee provided ethical approval. All the Infants attending the hospital for any vision problem were screened for refractive errors. The ocular motility examination was done using a torch light. Gross eye examination, adnexa and anterior segment inspection was done using a direct ophthalmoscope. Fundus evaluation was completed with indirect ophthalmoscopy and cycloplegic refraction was done using Retinoscope. All infants received 2 drops of 0.5 % of cyclopentolate and refraction was done 40 minutes after installation. This cycloplegic retinoscopy procedure is the gold standard for all children.

All infants attending the hospital were included in the study. Physiological Refractive Error, Children over 1 year of age, Hyperopia of less than + 4.00 D, Myopia of less than -1.50 D, Astigmatism of less than -1.75 D, Premature and low birth weight newborns were excluded.

Systematic sampling method was applied in this study.

Results:

A Total of 966 infants (0-12 months) were enrolled in the study. Number of male and female infants were 594 (61.5%) and 372 (38.5%) respectively. (Table 1). The mean age was 6 months. Refractive error was diagnosed in 208 infants (21.5%). (Table 2) Astigmatism was found in 92 infants (9.5%), Myopia in 62 infants (6.4%), and Hyperopia in 54 infants (5.6%). (.Table 3). Among 208 infants with refractive errors, 150 infants were male (25.2 %) and 58 infants (15.6%) were female. The result of chi square test showed that there was a significant association between gender and refractive Error ($p < 0.001$). In infants with Refractive Error Astigmatism was found in 72 male (78.3%) and 20 female (21.7%) infants. Myopia was detected in 42 male (67.7%) and 20 female (31/3%) infants. Hyperopia was the refractive error in 36 (66.6%) male and 18 female (33.7%) infants. There was insignificant association between types of refractive error and gender of patients ($p = 0.185$) though the results showed that all types of refractive error were found mostly in male patients as compared to female patients.

Table no.1: Frequency distribution of Gender

Gender	Frequency(n)	Percentage (%)
Male	594	61.5
Female	372	38.5

Table no.2: Prevalence of Refractive Error

Refractive Error	Frequency(n)	Percentage (%)
Yes	208	21.5
No	758	78.5

Table no.3: Frequency distribution of types of Refractive Error

Refractive Error	Frequency(n)	Percentage (%)
Hyperopia	54	5.6
Myopia	62	6.4
Astigmatism	92	9.5

Table no.4: Association between Refractive Error and Gender

Gender	Refractive Error		Total	P value
	Yes, n (%)	No, n (%)		
Male	150(25.2)	444(74.8)	594	<0.001
Female	58(15.6)	314(84.4)	372	

Table no.5: Association between Types of Refractive Error and Gender of patients

Refractive error	Male, n (%)	Female, n (%)	Total	P value
Myopia	42(67.7)	20(32.3)	62	0.185
Hyperopia	36(66.6)	18(33.7)	54	
Astigmatism	72(78.3)	20(21.7)	92	

Discussion:

Timely diagnosis and intervention remain the priority in the treatment modality of all types of refractive errors. The major objective of the study was detection of non-physiological Refractive Error in first year of life which can prevent visual impairment and visual loss. In a Meta-analysis done by Jeewanand Bist et al in Nepalese children Prevalence of refractive errors in Nepalese children was estimated to be 8.4 %.⁵ However in our study, Refractive Error was found in 21.5 % of 966 infants. So, this study compared to the meta-analysis done by Jeewanand et al showed that most of the refractive errors might be since birth. Astigmatism was the major type of refractive error in this study. Among 966 infants 9.5 % had Astigmatism. In a study of changes in Astigmatism between ages of 1 and 4 years of age done by Abrahamsson

et al all children (299) had Astigmatism of 1 D and concluded that there was a significant decrease within 4 years of age.⁶ Considering the changes in the magnitude of Astigmatism in first and second trimester of infants Astigmatism of < 1.75 D was excluded in our study.

Myopia (near-sightedness) is a condition in which images are formed in front of the retina which causes blurring of vision for far objects and as the eye grows it becomes elongated and more nearsighted. If untreated Myopia leads to serious eye issues later in life. In this study, Myopia was found in 6.4 % of 966 infants which resembles the study done by Lu Huo et al where Myopia was detected in 5.1 % of 583 infants.⁷ In our study the age taken was 0-12 months whereas in the study done by Huo et al infants of age 1-18 months were included. Also, the infants with low birth

weight and premature newborns were excluded from this study so the results of Myopia in infants in this study do not coincide with the results of Quinin et al which concluded that myopia can be strongly predicted by low birth weight and retinopathy of prematurity.⁸

Eyeballs at birth are Hyperopic due to shorter axial length and this condition resolves as the eye grows which is known as Physiological farsightedness. In the study done by Semeraro et al values between $+0.50 \leq D \leq +4.00$ was considered as physiological refraction at birth and they concluded that 88.03 % of 12427 newborn were in this range.¹ In our study the infants with Hyperopia of less than +4.00 D were excluded. The prevalence of Hyperopia in our study was 5.6 % of 966 infants of age =12 months. In the study done by Yahya et al in Malaysia prevalence of Hyperopia was 12.7 %. However, the age range involved in the study of Yahya et al was 6- 36 months and the number of children were 151.⁹

Refractive error prevalence in boys and girls was 25.2 % and 15.6 % respectively with p-value of < 0.001 . In this study of 966, only 38.5% of girls were screened which might be the reason for the higher prevalence in boys. This also explains that parents are more concerned about the health aspects of boys more than girls.

The small sample size, unable to convince many parents for cycloplegic refraction, and lack of coordination with other hospitals and pediatricians are the limitations of our study. A larger sample size with the involvement of other districts of Nepal would have added accuracy in data and the results.

Conclusion:

Astigmatism, Myopia, and Hyperopia are the major causes of non-physiological Refractive Error in Infants. Diagnosing refractive error in Infancy might be an advantage to all parents who are always concerned about their child's future objectives. Refractive error is one of the major ocular morbidities affecting children.

Detecting Refractive error early in infancy is an advantage to the children's education, quality of life, and social development. Screening all the infants for Refractive error along with other systemic illness can be recommended.

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