

# Ocular Manifestations in Children with Special Needs Presenting in A Tertiary Eye Hospital of Central Nepal

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## ABSTRACT

### Background

Children with special needs are at a substantially higher risk of visual impairment (VI) (10.5% compared with 0.16%) but also of ocular disorders of all types, including refractive errors and strabismus. VI and other potentially correctable ocular disorders are frequently unidentified in children with complex needs. Although assessment may be more challenging, identifying these potential additional barriers to learning and development may be critical.

### Methods

Detailed ophthalmic examination was carried out in all children with special needs presenting to the Pediatric OPD of Bharatpur Eye Hospital over 6 months (January to June 2023). Ophthalmic examination included case history, presenting distance visual acuity, cycloplegic refraction, binocular vision examination, anterior and posterior segment evaluation.

### Results

Out of the total of 55 participants, mean age was  $9.74 \pm 5.07$  years, majority were male 32 (58.18%). Quantitative visual acuity could be assessed only in 19 (34.55%) children, using picture chart 9 (16.36%) and Snellen chart 10 (18.18%). Strabismus 21 (38.18%) and refractive error 14 (25.45%) were the commonest visual disorders in our study children.

### Conclusions

With patience, suitably adapted methods, visual assessment is feasible in the majority of children with special needs. It is hoped that the formulation of proper vision care guidelines at a national level may help in early detection and management of visual disorders in this special population and enhance their quality of life.

**Keywords:** developmental delay; visual impairment; refractive error; strabismus.

## INTRODUCTION

Developmental delay is a delay in the process of development of a child.<sup>1</sup> Ocular and visual disorders are found to be more common in children with intellectual disabilities than in typically developing children.<sup>2</sup> Studies done in Nepal in 2014<sup>3</sup> and 2019<sup>4</sup> estimated childhood blindness and severe visual impairment (VA  $\leq 6/60$ ) as 70/100,000 and 30/100,000 respectively. Children with disabilities are at a substantially higher risk of visual impairment (10.5% compared with 0.16%) as well as refractive errors and strabismus.<sup>5</sup> Most causes of childhood

visual disabilities in low-income countries are either preventable or treatable.<sup>6</sup> Regular, effective sight tests are rarely performed in this population leading to further disability.<sup>7</sup> Statistics reveal that 15% of children aged 3 to 17 have special needs.<sup>8</sup> The study was planned (1) to know various ocular manifestations in children with developmental delay (2) to determine their demographic profile (3) to assess the correlation between ocular findings and various systemic conditions.

## METHODS

The diagnosis of the developmental delay was made

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either by the pediatricians who referred the case or by the ophthalmologist who assessed the general physical condition of the children and took history from the parent or guardian who accompanied the child. Relevant details regarding any disability, family history and birth history were also recorded. Patients were enrolled for the study after taking written consent. Ethics committee approval was obtained from Institutional Review Committee (IRC) Nepal Netra Jyoti Sangh (NNJS) (Reg. no 22/2024). Snellen's vision chart was used for assessing visual acuity (VA) in children who could read and cooperate. Can fix and follow light/object was used for children below 3 years. For children between 3 to 5 years of age, visual acuity was tested using KPT (Kay picture test). Cardiff's preferential-looking test was also done where indicated. Subjective correction of refractive errors was attempted in children who were cooperative. Cycloplegic retinoscopy was done in most of the children. Presenting VA of the better eye was considered to categorize Visual impairment (VI) and the WHO guidelines were followed.<sup>9</sup> According to these criteria, VA is classified as normal with no VI (VA better than or equal to 6/12 Snellen), mild VI (VA better than 6/12 and poorer than or equal to 6/18), moderate VI (VA poorer than 6/18 or equal 6/60), severe VI (VA 6/60-3/60), legally blind (VA 3/60-perception of light) and totally blind (no perception of light). Anterior segment evaluation was carried out with the use of a portable handheld slit lamp. Direct and consensual pupillary light reflexes were also checked. A detailed fundus examination after dilatation was done by indirect ophthalmoscope. The presence of any abnormal anterior or posterior segment finding was noted. For the purpose of study, a refractive error in one or both eyes of more than +3 D spherical equivalent (SE) was defined as hypermetropia, while myopia was labeled if SE was more than -0.50 D, and astigmatism was defined as cylinder powers of more than 1.00 DC.<sup>10</sup> Hirschberg's light reflex test and cover uncover test were used to evaluate the visual axis and strabismus. The amount of deviation, if present, was determined using the prism cover test, Hirschberg test or Krimsky test, whichever

was possible. The size of the deviation, if any, was classified as small ( $\leq 15^\circ$ ), moderate ( $>15$  to  $30^\circ$ ) and high ( $>30$  degree). In addition, presence of nystagmus or any ocular motility disorders was noted.<sup>2</sup> Methods used in the study were modified to suit the needs of the individual child. Use of interesting toys, flashing lights, positive reinforcement with stickers and gifts was applied to successfully complete the visual assessment. In addition, author MS is a highly skilled Pediatric Ophthalmologist who has over 5 years of experience working with children. The data generated was managed with Microsoft Excel 2016 (Microsoft Corporation, Redmond, Washington, United States) and Epi info version 7.02 (Centers for Disease Control, Atlanta, Georgia, United States). Frequency, statistical summary, and cross-tabulations were used for the descriptive analysis of the entered data. Chi-square was used to determine associations and Students' t- test was used to compare two means. A p-value of  $<0.05$  was taken as significant.

## RESULTS

The total number of children enrolled in this study was 55, out of which more than half were male 32 (58.18%). Majority of parents had educational qualification of Secondary and higher secondary level 31 (56.36%), followed by Primary 13 (23.64%), Illiterate 6 (10.91%) and Bachelors and above

Variable	Frequency (%)
<b>Gender</b>	
Male	32 (58.18%)
Female	23 (41.82%)
<b>Parent's Educational Qualification</b>	
Illiterate	6 (10.91%)
Primary	13 (23.64%)
Secondary and higher secondary	31 (56.36%)
Bachelors and above	5 (9.09%)
<b>Parent's Profession</b>	
Housewife	19 (34.55%)
Farmer	11 (20.0%)
Labour	1 (1.82%)
Foreign employment	1 (1.82%)
Service	11 (20.0%)
Teacher	5 (9.09%)
Business	4 (7.27%)
Driver	3 (5.45%)

5(9.09%). Most of the presenting parents were housewife 19(34.55%), followed by Farmer 11 (20%), service holder 11 (20%), Teacher 5 (9.09%), Business 4 (7.27%), Driver 3 (5.45%), Labour 1 (1.82%) and Foreign employment 1(1.82%) (Table 1).

Only 4 (7.3%) children were born prematurely and their mean birth weight was  $2.64 \pm 0.71$  kg. Mean age was  $9.74 \pm 5.07$  years. Systemic associations were Developmental delay in 42 (76.36%), Autism in 8(14.55%), deaf and mute in 2 (3.64%), cerebral palsy in 1 (1.82%) and epilepsy in 2 (3.64%) . Mean age of diagnosis of Developmental delay was  $3.63 \pm 2.25$  years.

Quantitative visual acuity could be assessed in 18 (32.72%) children only, using a picture chart in 9 (16.36%) and a Snellen chart in 9 (16.36%). Normal vision was seen in 7 (12.73%), Mod VI in 6 (10.91%), Severe VI in 1 (1.82%), Blind in 4 (7.28%), Central Steady Maintained in 27 (49.09%) and Doesn't follow light in 10 (18.18%) (Table 2).

Visual acuity category	Frequency (%)
Normal	7(12.73%)
Moderate visual impairment	6(10.91%)
Severe visual impairment	1(1.82%)
Blind	4(7.28%)
Central steady and maintained	27(49.09%)
Doesn't follow the light	10(18.18%)

Refractive error was seen in 14 (25.45%) of the children, out of which myopia was 7 (12.73%), Hyperopia was 3 (5.45%) and astigmatism in 4 (7.27%). The majority of the refractive error was seen in children with developmental delay (10 out of the total refractive error children 14) and 50% of them had myopia (Table 4).

Strabismus was detected in 21 (38.18%) of the children. Among the children with strabismus, exotropia was more prevalent 16 (29.09%) than esotropia 5(9.09%). The magnitude of deviation was moderate in 14 (66.7%) of children followed by high deviation in 5 (23.8%). The deviation was mild in only 2 (9.5%) of the children (Table 3).

Deviation	Frequency (%)
Mild	3 (5.45%)
Moderate	14 (25.45%)
High	5 (9.09%)
Orthophoria	24 (43.64%)
Couldn't be assessed	9 (16.36%)

Systemic association	Category of Refractive Error		
	Myopia	Hyperopia	Astigmatism
Developmental delay	5	2	3
Autism	2	1	-
Deaf and mute	-	-	1
Cerebral palsy	-	-	-
Epilepsy	-	-	-

Chi square (p-value) 19.98 (0.99)

Diagnosis	Systemic association					Chi-square (p-value)
	Developmental delay n(%)	Autism n (%)	Deaf and mute n (%)	Cerebral palsy n (%)	Epilepsy n (%)	
Myopia	5 (71.43%)	2 (28.57%)	0	0	0	19.9765 (0.9966)
Hyperopia	2 (66.67%)	1 (33.33%)	0	0	0	
Astigmatism	3 (75%)	0	1 (25%)	0	0	
Exotropia	11 (68.75%)	2(12.50%)	0	1 (6.25%)	2(12.50%)	
Esotropia	5 (100%)	0	0	0	0	
Cortical Blindness	4 (80%)	1 (20%)	0	0	0	
Temporal pallor	2 (100%)	0	0	0	0	
Cataract	1 (100%)	0	0	0	0	
No abnormal finding	7 (70%)	2 (20%)	1 (10%)	0	0	
Macular scar	1 (100%)	0	0	0	0	
Pre-phthisis	1 (100%)	0	0	0	0	

There were no abnormal findings in 10 (18.18%). Cortical blindness was detected in 5 (9.09%). Temporal disc pallor was seen in 2 (3.64%). Cataract was detected in 1 (1.82%). Macular Scar was seen in 1 (1.82%). Pre-phthisis bulbi was seen in 1 (1.82%). Nystagmus was present in only 3 (5.45%) children. Comparison of ocular diagnosis and systemic association was not found to be statistically significant (Table 5).

## DISCUSSION

Ocular manifestations are seen in children with developmental delays. Comprehensive examination of these children is therefore very essential. In our study, 81.82% of children with developmental delays had ocular findings. In a study done in children with developmental delay in South India, ocular findings were seen in 85.93% of children.<sup>10</sup> A study done by Kaur et al. showed the presence of ocular manifestations in 43%.<sup>13</sup> Despite the high prevalence of ocular findings, our study showed no statistical association between ocular findings and the various systemic associations in developmental delay. The study shows a predominance of males over females (58.18% vs. 41.82%), which is not an unexpected finding in a society where boys are preferred over girls, also observed in other similar studies.<sup>10-16</sup> The overall prevalence in our study of strabismus was 21 (38.18%) with exotropia (29.09%) being more common than esotropia (9.09%) which is similar to the study of Hedge et al who found strabismus in 50.78% (esotropia in 28.1%, exotropia in 28.66%).<sup>10</sup> In other studies of children with developmental delay, the prevalence of strabismus varied from 14.3 to 26.8%.<sup>13-16</sup> Similarly, nystagmus was present in 3 (5.45%) children in our study. Afroze et al<sup>1</sup>, reported nystagmus in 11 (10.8%) children with developmental delay and 19 (14.84%) of similar children had nystagmus in a study done by Hedge et al.<sup>10</sup> Refractive error was seen in 14 (25.45%) of the children, out of which myopia was 7 (12.7%), Hyperopia was 3 (21.4%) and astigmatism in 4 (7.27%) was observed in this study. Ghising et al. (2007) in Kathmandu reported the prevalence of refractive error as 67.9%, and simple hypermetropia (50.3%) was the most

common type of refractive error.<sup>12</sup> Studies done in Northern India (2016) found refractive error in 23% of the study population, and myopia (13.1%) was more prevalent.<sup>13</sup> Sandfeld Nielsen et al. (2007) in Denmark reported a refractive error in 44% of the study population, where the majority were hyperopic (24%).<sup>14</sup> Working hand in hand with various pediatric professionals will improve the outcome and lead to an improved quality of life for these children.<sup>2</sup> Furthermore, a study conducted by Das et al has provided us with strong evidence that children with special needs require vision assessments.<sup>7</sup> The need for eye care often goes unnoticed in children with developmental delays as these children have multiple health problems. There is a need to impart health education to the parents about the need for early eye screening. The onus of counseling the parents about the ocular condition of these children and also the management rests on the ophthalmologist. Vision could be restored to a useful level in a significant number of students with refraction. This indicates the need for scaling up refraction services at health facilities and screening for visual potential at the time of school enrollment.

## CONCLUSIONS

Children with disabilities (other than visual disability) are entirely dependent on the visual inputs for their personal and educational needs. If a visual handicap gets added to their already existing disability, it will affect the overall development of the child much more than it will affect a normal child. Thus, a simple and timely intervention in the form of spectacles can make a huge difference in the lives of children with other disabilities. The very fact that the majority of the causes of visual impairment like refractive errors, amblyopia and strabismus are easily treatable, signifies the need for regular ocular examination in children with disabilities.<sup>13</sup>

## Limitations

This was a cross-sectional study. These children require long-term follow-up. Hence, a longitudinal study would have been better. The degree of developmental delay was not considered in this study.

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