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Ocular Manifestations in Childeren with Developmental Delay-Clinical Study

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ABSTRACT

Aim: The purpose of this study was to investigate the various causes of visual morbidity in children aged 6 months to 5 years who had delayed milestones, with the goal of improving early detection of ocular abnormalities in these children.

Methodology: This study was performed in children aged 6 months to 5 years, with delayed developmental milestones, who attended the Ophthalmology out-patient department (referred from Paediatric O.P.D.).

Results: In our study, we have concluded that, 73 out of the 100 children had ocular manifestations. The most common ocular manifestation is refractive error (53%), which when treated as early as possible, can prevent the development of amblyopia. The second most common manifestation was strabismus (21%), which is again a treatable cause of visual impairment. The one other treatable cause of blindness was cataract, which was seen in 2% of the cases. Other manifestations seen were nystagmus (3%), optic atrophy (4%) and CVI (2%). Among the children with ocular manifestations, 15 had antenatal events, 15 had history of preterm birth and 36 had history of perinatal risk factors, most common being perinatal asphyxia, which was commonly seen in association with optic atrophy, nystagmus and CVI. The most common form of developmental delay was Global developmental delay (59%). In a child with developmental delay, it becomes crucial to help the child lead a normal life, personally, socially and academically. Thus it is very important toscreen these children for associated ocular abnormalities, when uncorrected, can impede the normal activities of their daily life. It is also important to diagnose the preventable risk factors at an early stage.

Conclusion: Our study concluded that, a complete ocular examination should become an integral part of clinical work up of all children with delayed milestones, even if there is no evidence of gross ocular dysfunction. Early recognition of such abnormalities may prove critical in managing all cases that areamenable to treatment.

Keywords: Occular Manifestations, Nystagmus, amblyopia, Perinatal risk factors

INTRODUCTION

Denver Developmental Screening Test defined a Significant delay is present when development or ability is two standard deviations or more below the mean [2]. prevalence of developmental delay in India is about 2.5% of the pediatric population under five years. Several studies were done to rule risk factors for developmental delays.these studies analyzed the risk factors and emphasized early detection and screening for these delays. maternal, genetic, perinatal, postnatal, and social factors play a role in the impairment of development [3]. children with mental and developmental delays have reported a higher incidence of visual abnormalities. ocular signs are often missed in handicaps due to coexistent functional domains leading to visual impairment, ocular changes as well as the general developmental delay of the child.

several researches have put forward that there is the influence of Numerous forms of sensory deprivations on ocular and visual development. [1-5]

NEED FOR THE STUDY

Children with delayed milestones, is of high importance, owing to the visual impediment's lifelong impact on other functions development.

AIM OF THE STUDY

The purpose of this study was to investigate the various causes of visual morbidity in children aged 6 months to 5 years who had delayed milestones, with the goal of improving early detection of ocular abnormalities in these children.

The three primary goals were as follows:

- To investigate the various ocular manifestations in children who have missed developmental milestones.
- Research antenatal, natal, and postnatal factors in children with ocular manifestations.
- To investigate the various types of developmental delays seen in children with ocular manifestations.

MATERIALS AND METHODS

This study was performed in children aged 6 months to 5 years, with delayed developmental milestones, who attended the

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Ophthalmology out-patient department (referred from Paediatric O.P.D.).

INCLUSION CRITERIA

Children aged 6 months to 5 years, diagnosed with any type of developmental delay (global or otherwise), attending the ophthalmologyoutpatient department (referred from paediatric O.P.D.) were included inthe study.

EXCLUSION CRITERIA

- Children with neuromuscular disorders causing motor abnormalities wereexcluded.
- Children with associated syndromes were excluded from the study.

After prior consent from the parent/guardian, a detailed historyregarding:

- Antenatal period
- Natal period
- Postnatal period, were obtained from the parent/guardian.
- History regarding attainment of developmental milestones in all four domains (gross motor, fine motor, language, social) was elicited.
- A preliminary general examination of the child was done.
- **Detailed ophthalmic examination** was done, consisting of:
- Visual acuity assessment-Methods of acuity assessment varied according toage.
- Children up to 3 years- Central Steady Maintained (C.S.M.) method was used, for the purpose of standardization, as other methods were not reliable in some of these children with cognitiveand language delays.

OBSERVATIONS AND RESULTS

- The total number of children with ocular manifestations among the 100 was 73.

Table 1. Total Number of patients

Study Subjects	Number	%
Ocular Manifestations +	73	73.00
Ocular Manifestations -	27	27.0

OCULAR MANIFESTATIONS

- Among the manifestations, the most common was found to be **refractiveerrors**, with a prevalence of 53 cases.
- The second most common manifestation was **strabismus** (21 cases)

- Other ocular manifestation seen were- Optic atrophy (4 cases), Cataract (2 cases), Nystagmus (3 cases) and cortical visual impairment (2 cases).
- Among these,there were 8 cases with refractive error and strabismus, 1 case with nystagmus and optic atrophy and two cases with nystagmus and refractive error.

Table 2. Occular Manifestations

MANIFESTATION	NUMBER	PERCENT AGE (%)
Strabismus	12	16.43
Refractive error plus Strabismus	8	10.95
Optic Atrophy	3	4.10
Nystagmus plus Optic Atrophy	1	1.36
Nystagmus plus		

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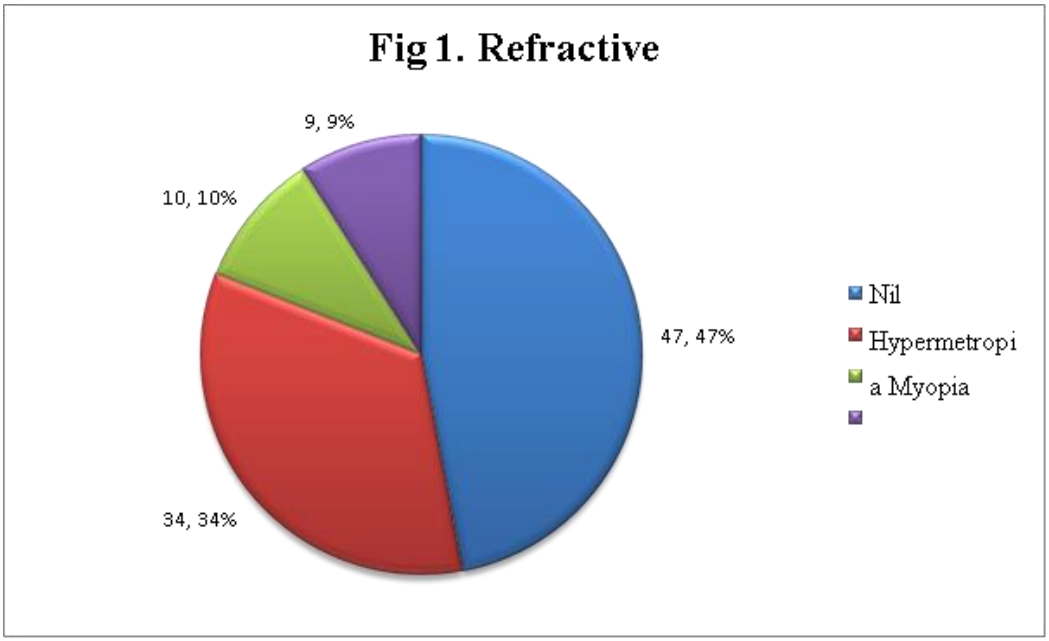
Refractive error	2	2.73
Cataract plus exotropia	1	1.36
Cataract	1	1.36
CVI	2	2.73
TOTAL	73	100
CVI	2	2.73
TOTAL	73	100

REFRACTIVE ERRORS

Out of the 53 cases of refractive errors, the most common error was **hypermetropia** (**34 cases**). 10 cases had myopia and 9 had astigmatism.

- Among astigmatism-5 were compound myopic, 3 were compound hypermetropic and 1 wasmixed astigmtism.

OTHER OCULAR MANIFESTATIONS



- The second most common manifestation was strabismus (21 cases), with **13** cases having **esotropia** and 7 cases having **exotropia**.
- Other ocular manifestation seen were- **Optic atrophy** (4 cases), **Cataract** (2 cases), **Nystagmus** (3 cases) and **Cortical Visual Impairment** (2 cases).
- The type of cataract seen in both cases was diffuse and the type of nystagmus noted in the 3 cases was horizontal jerky.
- Optic atrophy seen in all 4 cases was primary optic atrophy.

Table 3. Other Ocular Manifestations

Other Ocular Manifestations	**Number**	**%**
Strabismus – Esotropia	13	17.81
Strabismus – Exotropia	7	9.59
Cataract	2	2.74
Nystagmus	3	4.11
Optic Atrophy	4	5.48
Cortical Visual Impairment	2	2.74
Refractive error	42	57.53
Total	73	100.00

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Age

Out of the **37** children between **6 months to 1 year**, 28 had ocular manifestations, whereas 24 out of the **33** children between **1 year to 3years** and 21 out of **30** children between **3 to 5 years** had ocular manifestations

GENDER

Out of the 100 children with developmental delay, **60** were **male** out of which **46** had ocular manifestations and **40** were **female** out of which **27**had ocular manifestations.

ANTENATAL RISK FACTORS

- History of antenatal events was seen in **22 cases** (7-PIH, 7-GDM, 7-IUGR, 2-Fever with rash), out of which **15** children had **ocular manifestations**.

Table 4. Antenatal Risk factors

ntenatal Events	Ocular Manifestatins +	%	Ocular Manifestations -	%	Overall	%
Uneventful	58	79.45	19	70.37	77	77.00
PIH	5	6.84	2	7.40	7	7.00
IUGR	4	5.47	3	11.11	7	7.00
GDM	4	5.47	3	11.11	7	7.00
Fever With Rash	2	2.74	0	0.00	2	2.00
Total	73	100.00	27	100.00	100	100.00

PERINATAL RISK FACTORS

History of **perinatal events** was positive in **46 children** (Asphyxia-23, Seizures-9, Asphyxia with seizure-8, Asphyxia with TORCH-1, Jaundice-2, Sepsis-1, Hypoglycemia-2), out of which **36** had **ocular manifestations**

Table 5. Perinatal Events

ostnatalEvents	Ocular Manifestations +	%	Ocular Manifestations -	%	Overall	%
Uneventful	37	50.68	17	62.96	54	54.00
Asphyxia	19	26.02	4	14.81	23	23.00
Seizures	6	8.21	3	11.11	9	9.00
Asphyxia with seizure	6	8.21	2	7.40	8	8.00
Asphyxia with TORCH	1	1.37	0	0.00	1	1.00
Jaundice	1	1.37	1	3.70	2	2.00
Sepsis	1	1.37	0	0.00	1	1.00
Hypoglycemia	2	2.73	0	0.00	2	2.00
Total	73	100	27	100	100	100

TYPE OF DEVELOPMENTAL DELAY

Among types of developmental delays, the most common was found to be **Global developmental delay** with **59 children** having it, out of which **49** had **ocular manifestations**. Other types seen were, speech delays (10 cases), with 6 having manifestations, speech and motor (3 cases) with 3 having manifestations and motor with social delays (2 cases) with 1 having ocular manifestations.

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Table 6. Type of Developmental delay

Type of Developmental Delay	Ocular Manifestations +	%	Ocular Manifestations -	%	Overall	%	P value Chi Squared Test
Global	**49**	67.12	**10**	37.04	59	59.00	**0.0343**
Motor	**14**	19.18	**12**	44.44	26	26.00	**0.0266**
Speech	**6**	8.22	**4**	14.81	10	10.00	**0.6483**
Speech and Motor	**3**	4.11	**0**	0.00	3	3.00	**0.2887**
Motor with Social	**1**	1.37	**1**	3.70	2	2.00	**0.2234**
Total	**73**	100.00	**27**	100.00	100	100.00	

VISUAL ACUITY < 3 YEARS

Out of the **36 cases** with **C.S.M.** vision, **22** had **ocular manifestations**.15 out of the **16** cases with **CUSM**, 6 out of the **7** with **CUSUM**, **2** cases with **eccentric fixation** and all **6** of the children **not fixing/following light** had ocular manifestations.

Table 7. VISUAL ACUITY < 3 YEARS

Out of the **12** cases with **6/6-6/9 vision**, only **1** child had **ocular manifestation**. **4** children with **6/12-6/18**, **14** children with **6/24-6/60** and **3** with vision **less than 6/60** had ocular manifestations.

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RISK FACTORS IN EACH MANIFESTATION:

Table 8. The risk factors present in the various manifestations were as follows:

Factor	Refractiveerror(53)	Strabismus(21)	Optic Atrophy(4)	agmus (3)	Cataract(2)	CVI(2)
Consanguinity	2	2	-		1	1
Antenatal	9(4 P.I.H., 2 G.D.M., 1 Fever With Rash, 2 IUGR)	3(1 P.I.H.,1 G.D.M., 1 IUGR)	2 (1GDM, 1IUGR)	ventful	1(Fever with rash)	Uneventful
Natal	8 preterm	4 preterm	3preterm	eterm	-	2 preterm
Perinatal	22(12Asphyxi4 Asphyxia/Seiz ure, 4 seizure, 1 jaundice, 1hypoglycemia)	11(3 Asphyxia,1 TORCH, 3 Seizure, 1 Sepsis, 2Asphyxia/Seizure , 1 Hypoglycemia)	4(3Asphyxia, 1Seizure)	sphyxia zure)	2(1Asphyxia, 1TORCH),	2(1Asphyxia ,1 Seizure)
Type of Developmental delay	GDD-35Motor- 12, Speech-5, Motor & Social-1	GDD-15,Motor-2 , Speech & Motor-2,Speech-2	GDD-4	)2, or-1	GDD-1, Motor-1	GDD-2

- Among these, the most significant risk factors were seen in Optic atrophy, Nystagmus
- cataract and CVI. Asphyxia and preterm were seen as significant risk factors for optic atrophy and asphyxia was seen as a common risk factor innystagmus, cataract and CVI.

DISCUSSION

Our study included 60 male and 40 female children with developmental delay, in the age range of 6 months to 10 years and found a prevalence of ocular manifestations in 73% of the cases, with the most common manifestation being refractive error, followed by strabismus.

In a study by KatochS ***et al***[1] on 41 children with developmental delay, sex distribution was seen to be 68% males and 32% females. This study showed ocular manifestations in 56.1%. The mean age range included in the study was 3.53+/-2.25 years.

The study conducted by Sandfeld Nielsen,***et al*** [2] was done in children with intellectual disability out of which 77% had ocular manifestations.

Akinci A ***et al***[3] conducted the study on 125 children with developmental delay, between the age groups of 6 months to 3 years in Calicut Lambert S.R [4] studied 149 cerebral palsy children in which prevalence of ocular abnormalities were found to be 28.2%, out of which 61.9% were completely blind.

Another study conducted by **Katoch S *et al***[1] on 200 cases between 8 months to 21 years with cerebral palsy, showed 68% of the cases had visual morbidity.

REFRACTIVE ERRORS:

A study by Menacker SJ ***et al***[5] included 200 children with developmental delay and concluded that refractive errors were seen in 49%, squint in 37%, nystagmus in 7.5% and other manifestations like cataract, retinopathy of prematurity and optic atrophy.

Other Manifestations:

Other than refractive errors, the **Nielson *et al*** [2] **study** showed 8.8% optic atrophy and 11.7% cataract. Cortical Visual Impairment (CVI) was seen in 2% of the children in our study whereas in the Nielson study, CVI was seen in 47.05% of

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children with ocular impairment with perinatal risk factors and in 51.4% of the children in the study conducted by Elmenshaw.

CONCLUSION

In the present study, the most common form of developmental delay was Global developmental delay (59%). In a child with developmental delay, it becomes crucial to help the child lead a normal life, personally, socially and academically. Thus it is very important toscreen these children for associated ocular abnormalities, when uncorrected, can impede the normal activities of their daily life. It is also important to diagnose the preventable risk factors at an early stage. Moreover, as already discussed above, vision in interlinked with other domains of development. Thus the impairment in visual function, can adversely affect their development, causing a further retardation or delay.

This problem can be averted, if visual screening is carried out and correctable or preventable blindness is managed appropriately. In cases where the visual impairment is not treatable, appropriate management is given, as in cases of amblyopia.

Thus, a complete ocular examination should become an integral part of clinical work up of all children with delayed milestones, even if there is no evidence of gross ocular dysfunction. Early recognition of such abnormalities may prove critical in managing all cases that areamenable to treatment.

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Conflict of Interest None
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