Ocular Associations in Children With Developmental Delay

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Abstract
Descriptive study conducted in children with various types of developmental delay, to describe the prevalence, diagnoses & aetiology of ocular abnormalities in children with developmental delay.

Materials and Methods
- Children with developmental delay attending the child development services clinic of medical college Calicut in the age group of 6m-3yr were studied for any associated antenatal, perinatal and postnatal factors and underwent a complete ophthalmic examination to detect ocular visual anomalies, if any. The data collected was analysed by statistical methods.

Results
- 125 children with developmental delay were studied over a period of 12 months and ocular manifestations were seen in 75.2% of cases. Amongst the various ocular manifestations, refractive errors was found to be the most common finding (51.2%), the second common diagnosis was optic atrophy (21.6%) followed by strabismus (18.4%) and CVI (11.2%).

Antenatal factors were, on statistical analysis, significantly related with CVI, cataract, and vision abnormalities in the newborn. Perinatal and postnatal factors were found to be statistically significant in relation to optic atrophy, nystagmus and poor vision in the newborn. Global developmental delay is related significantly with poor vision, optic atrophy, CVI and cataract.

Aims of the Study
To describe the
2. To study associated antenatal, perinatal and postnatal factors which may be contributory.
3. To ascertain the type of developmental delay and its relation with ocular manifestations.

Materials and Methods
Study design-descriptive case series study

Subjects attending the specialty clinic for children with developmental delay at the outpatient department of the Institute of Maternal & Child Health, Calicut in the age group of 6 months to 3 years are included in the study.

Scale used to assess developmental delay
- Denver development screening test

Only children fulfilling criteria of developmental delay in this test as assessed by a paediatric specialist are included in the study.

Patients are included in the study only after obtaining informed consent from the parents. Detailed history is taken regarding antenatal, natal and postnatal complications as well history regarding attainment of developmental milestones. Family history regarding consanguinity or affected family members are asked for.

Ocular complaints regarding visual inattention, deviation of eyes, nystagmus, abnormal head posture are enquired. General examination is done in detail.

Ophthalmological assessment included routine ocular examination with special reference to structural observation of external eye, examination of strabismus, complete cycloplegic refraction (with atropine) and detailed fundus examination. Other ocular investigations like slit lamp examination, IOP (Intra Ocular Pressure) measurement are done in indicated cases. Relevant systemic investigations such as EEG, CT, MRI, Thyroid function tests, auditory assessment including BERA (Brainstem evoked response audiometry) and also neurometabolite screening are done if indicated in individual cases. The data obtained is evaluated for statistical significance by applying the chi-square test.

Results
1. Age At Presentation
In this study, most of the children were in the age group of 6m-1yr (33.6%), 20.8% were between 19m-24m, 20% in 13-18m, 15.2% between 31-36m, and 10.4% between 31-36m.

2. Gender
Of the total 125 children included in the study, 79 were males and 46 were females forming 63.2% and 36.8% respectively.

3. Consanguinity
Consanguinity between parents was seen in 2 cases.

4. Antenatal Complications
The antenatal period was uneventful in 99 cases (79.2%), while 9 had history of intrauterine growth retardation (7.2%).
mothers had history of fever without rashes(4%), 5 had pregnancy induced hypertension(4%), 3 had gestational diabetes mellitus(2.4), 2 had epilepsy and antiepileptic medications in the antenatal period(1.6%). Threatened abortion was seen in 1 case(0.8%) and oligohydramnios in 1 case(0.8%).

5. Birth Weight

Low birth weight (less than 2.5 kg) was seen in 41 babies and normal weight was seen in 84 cases.

6. Postnatal Complications

Of 125 cases, birth asphyxia was present in the immediate postnatal period in 34 cases and hypoglycemia in 1 case while the rest of the 90 cases had no complications.

7. Neonatal Period

Complications requiring NICU admission were seen in 38 cases and included causes like respiratory distress (15), seizures in 10, sepsis in 8, and neonatal hyperbilirubinemia in 5. 87 children had an uncomplicated neonatal period.

8. Ocular Features

A. Vision

B. Cataract

Cataract was seen in 4 children out of 125 constituting 3.2%.

C. Refractive Status

D. Strabismus

Strabismus was seen in 23 children (18.4%) out of which esotropia was seen in 12% and exotropia in 6.4%.

E. Cortical Visual Impairment

<table>
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<tr>
<td>Total</td>
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F. Optic Atrophy

G. Nystagmus

8 children of the total 125 examined had nystagmus constituting 6.4% of cases.

H. Glaucoma

Increased intraocular pressure was recorded in 2 children

I. Miscellaneous Features

J. Developmental Delay

K. Vision in Various Types Of Developmental Delay
Discussion

The present study was conducted on 125 children between the ages of 6 months-3 years.

Of the 125 children studied, 79 were males and 46 were females forming 63.2% and 36.8% respectively. In a study by Wu H J et al, sex distribution was found to be 68% males and 32% females. Age at presentation was 6m-12 months in 33.6%, 13m-18m in 20%, 19-24m in 20.8%, 25-30m in 10.4% and 31-36m in 15.2%.

History of consanguinity was present in only 2 cases out of 125 (1.6%). A positive family history of mental retardation, developmental delay among close relatives was found in 10.4% cases.

Antenatal history was uneventful in 99 cases, while 9 cases had history of intrauterine growth retardation, 5 cases had fever without rash, 5 cases had pregnancy induced hypertension, 3 had gestational diabetes mellitus, and epilepsy was present in 2 cases. Threatened abortion and oligohydramnios were seen in the antenatal period in 1 case each.

Delivery occurred at term in 113 cases and post term in 1 case. History of preterm delivery was found in 11 cases (8.8%). In a study by Chen et al, 13.95% had preterm delivery. Low birth weight was seen in 41 babies (32.8%) and birth weight adequate for gestational age was seen in the remaining 84 cases (67.2%).

In the perinatal period, birth asphyxia was seen in 34 cases (27.2%) and hypoglycemia in 1 case. In a study by Neilson et al, it was found that visual impairment was due to prenatal factors in 11%, perinatal in 6% and postnatal factors in 1.4%. Complications requiring admission in the neonatal intensive care unit was seen in 38 cases. Causes include respiratory distress in 15(12%), seizures in 10(8%), sepsis in 8(6.4%) and jaundice in 5 cases(4%).

Ocular manifestations in children with developmental delay were seen in 75.2% cases in this study. This is comparable with studies conducted by Akinci A et al, who reported that 77% of children with intellectual disability had ocular features. Another study by Katoch S et al found that 68% of children with cerebral palsy had visual morbidity.

The most common ocular manifestation noted in this study were refractive errors (51.2% cases). Optic atrophy was the second most common finding, seen in 21.6% cases. Strabismus was seen in 18.4% of cases, cortical visual impairment in 11.2%, nystagmus in 6.4%, cataract in 3.2%, glaucoma in 1.6%, epicanthus, telecanthus and hypertelorism were noted in 5.6%, 0.8% and 3.2% respectively. Chorioretinal scars and pigmentary retinal degeneration due to intrauterine infection (TORCH) were seen in 3 cases (2.4%). Other findings include microcornea and megalocornea in 2 cases each, corneal oedema in 1 case, ankyloblepharon and albinotic fundus in 1 case each.

Bankes et al studied 200 children with developmental delay and found refractive errors in 49%, squint in 37%, nystagmus in 7.5% and other features like cataract, optic atrophy and retinopathy of prematurity. Akinci A et al studied refractive errors and ocular findings in children with multiple disabilities and found that 77% of patients with intellectual disability had ocular findings. Children with intellectual disability had more strabismus, nystagmus, hypermetropia and astigmatism than controls and increasing severity of intellectual disability was related to higher prevalence of the above features. Mets M B et al studied causes of childhood blindness and visual loss in an institution for severely mentally retarded children and found bilateral optic atrophy to be the most common cause of visual loss (65%). The second most common cause was cortical visual impairment followed by chorioretinal scars.

In this study, visual acuity assessment revealed normal vision in 71 cases (56.8%). Poor vision associated with normal ocular examination was seen in 14 cases while 40 cases of children with poor vision revealed some ocular abnormality.

On assessing developmental delay in the present study, global developmental was seen in 58.4% cases, isolated speech delay in 16.8% cases, speech and motor delay in 16%, speech and social delay in 1.6%, motor and social delay in 2.4%, and delay in motor milestones in 4.8%. In a study by Chen et al, 51.2% had global delay, 21.9% had speech delay and 13.95% had motor delay.

Statistical Analysis of Ocular Manifestations

Vision

Antenatal factors like fever without rash, pregnancy induced hypertension, gestational diabetes and epilepsy were related with vision abnormalities in the newborn (p value 0.002).

Statistically significant relation was also seen with postnatal events like birth asphyxia, neonatal jaundice, sepsis and seizures (p value 0.003).

Poor vision was seen more in children with global developmental delay when compared with vision in other groups of developmental delay (p value 0.000).

Optic atrophy

Optic atrophy was seen to be more in children below 18 months of age (p value 0.017) but this may be due to the fact that earlier diagnosis occurs due to more severe impairment of vision.

Optic atrophy was seen to be related with neonatal complications like seizures, neonatal jaundice and respiratory distress (p value 0.001).

With regard to type of developmental delay, optic atrophy
was seen to be significantly related to global delay as well as motor and social delay (p value-0.018)

Cortical visual impairment (CVI)

CVI was seen more in children of mothers who had history of gestational diabetes, pregnancy induced hypertension, fever without rash and intrauterine growth retardation (p value-0.017)

Cvi was also seen exclusively in children with global delay and this was found to be statistically significant (p value-0.047)

Cataract

Cataract was significantly related to antenatal factors like gestational diabetes and fever without rash (p value-0.045)

Cataract also had a statistically significant relation with global developmental delay (p value-0.007)

Nystagmus

Nystagmus was seen to have significant relation with postnatal factors like birth asphyxia (p value-0.001)

Studies by Akinci et al3 showed that increasing severity of intellectual disability was related to more severe ocular abnormalities. Neilson et al7 also concluded in their study that refractive errors and squint correlated with the level of IQ.

Conclusions

- 125 children with developmental delay were studied over a period of 12 months and ocular manifestations were seen in 75.2% of cases.

- Amongst the various ocular manifestations, refractive errors was found to be the most common finding (51.2%). The second common diagnosis was optic atrophy (21.6%) followed by strabismus (18.4%) and CVI (11.2%)

- Of 125 children, global developmental delay was seen in 58.4%, isolated speech and language disorder in 16.8%, motor and speech delay in 16%, delay in motor milestones alone in 4.8%, motor and social delay in 2.4%, speech and social delay in 1.6%.

- Antenatal factors were found in 20.8% cases and included causes like intrauterine growth retardation (7%), pregnancy induced hypertension (4%), fever without rash (4%), gestational diabetes mellitus (2.4%), epilepsy (1.6%), threatened abortion and oligohydramnios in 0.8% each.

- Antenatal factors were, on statistical analysis, significantly related with CVI, cataract, and vision abnormalities in the newborn.

- Delivery was preterm in 8.8% cases and post term in 0.8% cases. Low birth weight was seen in 32.8% cases.

- Perinatal complications were seen in 28% cases as birth asphyxia (27.2%) and hypoglycemia in 0.8% cases. Neonatal factors were found in 30.4% cases as respiratory distress in 12%, seizures in 8%, sepsis in 6.4% and jaundice in 4%.

- Perinatal and postnatal factors were found to be statistically significant in relation to optic atrophy, nystagmus ad poor vision in the newborn.

- Global developmental delay is related significantly with poor vision, optic atrophy, CVI and, cataract.

Children with multiple disabilities often undergo rehabilitation in motor system development, speech rehabilitation and other such tasks but often visual problems are overlooked in these children, which in turn can delay efforts at rehabilitation. Early diagnosis and appropriate management of ocular problems can help the child evolve to his maximum potential.

References