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Original Article

Neuro ophthalmological disorders in cerebral palsy and cortical visual Impairment patients

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Purpose: To find the types & proportion of various Neuro ophthalmological disorders in cerebral palsy patients. To find the proportion of nystagmus, fundus findings, refractive error and type of deviations.

Study Design and Method: It is descriptive cross sectional study. Data was collected by clinical examination and by self-designed Proforma. Visual acuity was checked on LogMar chart for distance Vision. Direct ophthalmoscope was used for fundoscopy, refractive error by retinoscope, and strabismus by cover test.

Results: Study included total of 113 patients. Out of 113 patients, 33 (29.20%) were males and 80 (70.80%) were females. Ocular history of the patients: 39 (34.51%) have visual inattention, 54 (47.79%) have no eye contact and 20 (17.70%) have searching eyes. Visual response: 33 (29.20%) have good visual response and 80 (70.80%) have poor visual response. 90 (79.65%) have nystagmus and 23 (20.35%) have no nystagmus. Type of deviation: 44 (38.94%) have esotropia, 35 (30.97%) have exotropia and 34 (30.09%) were orthotropic.

Conclusion: It is concluded that patients of cerebral palsies have a significant chance of having strabismus, refractive error, nystagmus and squint; all related with poor visual response. Hence, these patients must have complete ophthalmic examination.

Key Words: cerebral palsy, Cortical visual impairment, Strabismus.

Introduction

Branch of medical science which deals with the association of the eye with central nervous system is called Neuro-ophthalmology and many disorders containing cerebral palsy and cortical visual impairment refers to neuroophthalmological disorders.[1] Chronic disabilities in central nervous system which have poor control of posture movements occurring at early stage without any connection with neurological disease are known as cerebral palsies. It can be categorized into three major types: hemiplegia, diplegia and quadriplegia.[2]

Impairment of visual function because of damage or malfunctioning of the retrogeniculate visual pathways without any ocular disease is referred to as cortical visual impairment. Almost 50% of the brain is used for vision-related activities, including movement and vision of eyes. Neuro-ophthalmology related to both neurology and ophthalmology, requires training and expertise in dealing with problems of the eye, brain, nerves and muscles.[3] Some problems are worse and cause visual impairment, or can be life threatening. Sometimes the problem is confined to the optic nerve, the nervous system or general medical condition. Expensive medical testing can often be avoided by seeing a neuro-ophthalmologist or orthoptist.[4]

Common problems which need to be evaluated include: optic nerve problems, visual field loss, unexplained visual loss, transient visual loss, visual disturbances, abnormal eye movements, thyroid eye disease, myasthenia gravis, unequal pupil size, double vision, and eyelid abnormalities.[5] Some literature showed that 60 to70% of children with cerebral palsy also have manifest cortical visual impairment.[6] To analyze a few factors i.e. visual acuity, refractive error, ocular motility, stereopsis in patients of cerebral palsy, we use different techniques for every patient that depends on the type of factors that we use. For example, we will use the LogMar chart to find out visual acuity respectively.

Various studies confirm that visual dysfunction spectrum, associated with cerebral palsy secondary to hypoxic-ischaemic enphalopathy, is very broad.[7] Accordingly, a study established to assess the association of different types of cerebral visual impairment with different visual involvement patterns, showed that visual disturbance by diplegia was characterized particularly 75% by refractive errors, 90% with strabismus and 82% by decreased visual acuity and 86% with abnormal saccadic movements. Children with tetraplegia showed severe neuro-ophthalmological profile, characterized by ocular abnormalities and reduced visual acuity in 98%, oculomotor dysfunction in 100% cases.[1,2] A study was done to determine the prevalence of the specific findings in patients with cortical visual impairment (CVI). The CT scans of 49 patients with cerebral palsy were studied; CVI diagnosed in 36 patients; visual acuity was normal in 13 patients. In 8 patients, comparison with an MRI scan was possible as 6 with CVI, 2 with normal acuity. The CT scans were scored by using the criteria used by Van Nieuwenhuizen (1987) as follows: Normal, white matter abnormalities adjacent to the posterior horns of the lateral ventricles, abnormalities of the white matter located under the visual cortex, abnormalities of the visual cortex, and, other abnormalities elsewhere.[8] Abnormalities in the visual areas were found in 15% of the normal acuity group and in 53% of the CVI group. In 17 of the 19 CVI patients with abnormalities in the visual areas, the lesions were located in the white matter surrounding the posterior horns (89%). MRI imaging revealed the same abnormalities as the CT scans in 6 patients, but in one patient the abnormality was seen in more detail and in one patient the lesion in the occipital area was seen only on MRI. MRI examination seems to detect at least as many, but in some cases even more specific lesions in CVI patients compared to CT scanning, but the numbers were too small to allow any definitive conclusions to be drawn.[9] A research was conducted including almost 90 patients, among them 33 children under the age of 6 years were having cerebral palsy, rest were with other types of cerebral palsy i.e. diplegic, hemiplegic and tetraplegic. Visual sensory and higher level visual functions were measured. Results have shown that 73% patients had impairments which presenting difficulties in performing visuoperceptual and visuospatial tasks.[10] According to a study problemes in the visual areas were found in 15% of those with normal acuity and 53% in those with cerebral visual impairment. In almost 89% patients with cerebral visual impairments, the defect was located in posterior horns near the white matter.[11]

Material and Methods

It was a descriptive cross sectional study. Data were collected by clinical examination and by self-designed proforma. Visual acuity on Log Mar chart for distance Vision. For fundoscopy we used direct ophthalmoscope, refraction was done by Retinoscopy, and strabismus was elicited by Cover test. Data were collected by recording findings on the proforma and analyzed by SPSS 22.

Results

Figure 1: Distribution of age

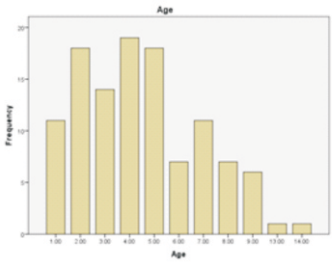
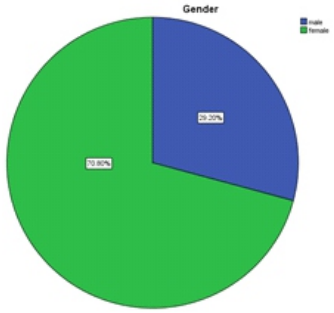
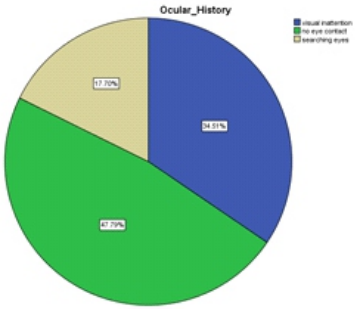


Figure 2: Distribution of Gender



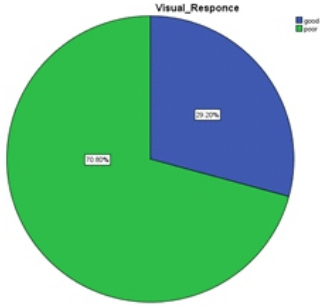
Out of 113 patients, 33 (29.20%) were male and 80 (70.80%) were female (fig. 2).

Figure 3: Ocular History



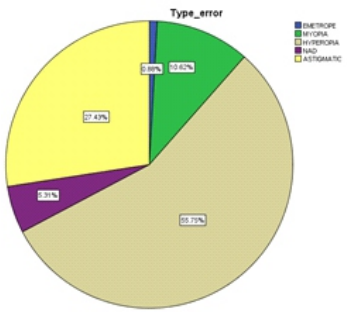
39 (34.51%) have visual inattention, 54 (47.79%) have no eye contact and 20 (17.70%) have searching eyes (fig. 3).

Figure 4: Visual Response



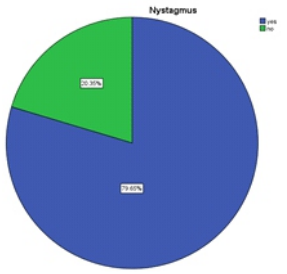
33 (29.20%) have good visual response and 80 (70.80%) have poor visual response (fig. 4).

Figure 5: Type of Refractive error



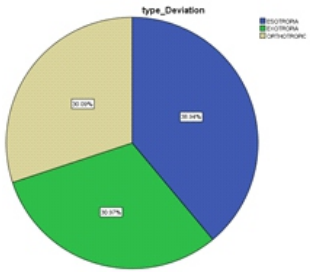
One (0.88%) was emmetropes, 12 (10.62%) were myopic, 63 (55.75%) were hyperopic, 31 (27.43%) were astigmatic and 6 (5.31%) not able to be diagnosed (fig. 5).

Figure 6: Nystagmus



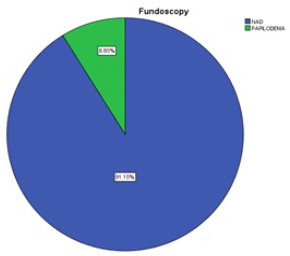
90 (79.65%) had nystagmus and 23 (20.35%) have no nystagmus (fig. 6).

Figure 7: Type of Deviation



44 (38.94%) have esotropia, 35 (30.97%) have exotropia and 34 (30.09%) were orthotropic (fig. 7).

Figure 8: Fundoscopy



On fundoscopy 10 (8.85%) had papillodema. The rest had normal fundi (fig. 8).

Figure 9: Cross Tabulation of Gender with Deviation

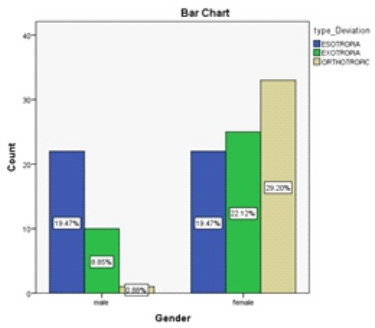
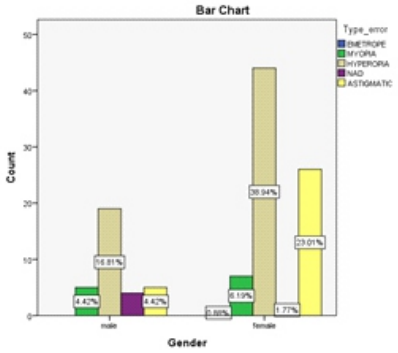


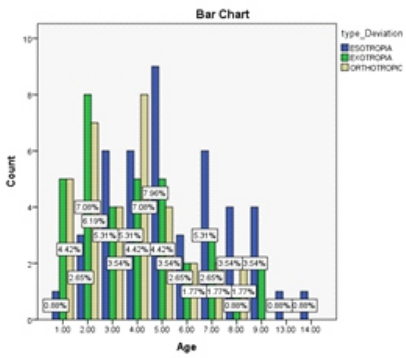
Fig. 9 shows, out of 33 males, 22 (19.47%) have esotropia, 10 (8.85%) have exotropia and 1 (0.88%) were orthotropic. Similarly, out of 80 females, 22 (19.47%) have esotropia, 25 (22.12%) have exotropia and 33 (29.20%) were orthotropic. The results were highly significant (p=.000) meaning that squints were associated with female gender.

Figure 10: Cross Tabulation of Gender with Type of Error.



Bar chart shows out of 33 males, 5 (4.42%) were myopic, 19 (16.81%) were hyperopic and 5 (4.42%) have NAD (no abnormality detected) and Nystagmus. Similarly out of 80 females, 1 (0.88%) was emmetropes, 7 (6.19%) were myopic, 44 (38.94%), 2 (1.77%) have NAD (no abnormality detected) and 26 (23.01%) have Nystagmus. The results are statistically significant (p=0.018) implying that refractive errors were associated with refractive error.

Figure 11: Age * Type Deviation Cross Tabulation.



Bar chart shows total 44 patients were esotropia out of 44, 9 (7.96%) have maximum esotropia.35 were exotropia out of 35,8 (7.08%) have maximum exotropia and 34 were orthotropic, 8 (7.08%) have maximum orthotropic.

Figure 12: Age * Type Error Cross Tabulation.

Age (years)	Esotropia	Exotropia	Orthotropia
1-5	25	27	28
6-10	17	7	5
11 -15	2	1	1
	44	35	34

The table showed that there was no significant association between age group and type of deviation (chi square statistic = 7.1746, p= 0.17)

Discussion

This cross sectional study was done at Mayo hospital, Ophthalmology department with collaboration of Neurology department of the same hospital. One hundred and thirteen children diagnosed with having Cerebral Palsy were examined for presence of different ocular anomalies. Ocular anomalies mainly found included refractive errors (Myopia, hyperopia as well as astigmatism), Squint (Esotropia as well as Exotropia), Nystagmus, papilledema etc. Whereas the prevalence of ocular disorders in our study was quite high (93% had a refractive error, 80% had nystagmus and 70% had squint), variable proportion of ocular anomalies has been found in various studies. For example, a study in UK showed 84 % of the patients with CP had ocular disorders of whom squint was present in more than 50% and refractive errors were found in more than 52%.[12] An Italian study had, 129 cases of cerebral palsy. Of these patients with diplegia showed squint (75%), refractive errors (90%) and reduced visual acuity (82%). Patients with hemiplegia showed squint in 71% and refractive error in 88% along with visual field defects in 64% of the children. Children with tetraplegia were most affected with 98% showing visual defect, 100% oculomotor defects and 98% showing ocular abnormalities.[13]

Conclusion

It is concluded that patients of cerebral palsies have a high likelihood of having strabismus, refractive error, nystagmus and squint related with poor visual response, so these patients must have complete ophthalmic examination and management by a trained Paediatric neuro-ophthalmologist preferably.

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