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A survey on common types of ocular problems among children with cerebral palsy at urban community in Bangladesh

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Abstract

Background: Cerebral palsy (CP) is a group of disorders affecting movement, balance, and posture, making it the most common motor disability in childhood. Since visual processing involves a large part of the central nervous system, brain damage leading to CP, such as hypoxic-ischemic encephalopathy (HIE), often results in vision problems. Common ocular issues in children with CP include visual acuity deficits, refractive errors, strabismus, nystagmus, cataracts, and other types of visual impairments.

Objective: To identify the prevalence of common ocular problems in children with CP for early assessment and intervention.

Methods and Procedure: This will be an observational cross-sectional study. Children with cerebral palsy (CP) will be recruited from the Outpatient Department (OPD) of the Institute of Paediatric Neurodisorder and Autism (IPNA), BSMMU, where they regularly visit for diagnosis and management of neurodevelopmental disorders. With parental consent, clinically diagnosed CP children will be referred to the Ophthalmology Department at Bangabandhu Sheikh Mujib Medical University for evaluation by a specialist to detect ocular problems. After assessment, the findings will be recorded in a semi-structured questionnaire for analysis.

Results: Out of 147 patients, 110 (75%) were male and 37 (25%) were female, with 93 (63%) in the 1-14-month age group. A total of 125 (85%) had ocular problems associated with cerebral palsy (CP). Of the patients, 97 (66%) had reduced visual acuity, 80 (54%) had developmental cataracts, 41 (27%) had refractive errors, 20 (12%) had diffuse disc pallor, and 14 (10%) had congenital glaucoma. Ocular problems in CP were significantly associated with visual acuity, refractive errors, and strabismus.

Conclusion: We could say that the findings emphasize the need for an early ocular examination in patients with CP. With this study it will be determined the prevalence of different type of ocular abnormalities in children with CP in Bangladesh.

Keywords: CP children, ocular abnormalities

Introduction

A collection of conditions known as cerebral palsy (CP) impact a person's mobility, balance, and posture. The most typical motor impairment in children is cerebral palsy. The word cerebral refers to brain-related matters. Palsy is a term used to describe muscle weakness or dysfunction. A person's inability to coordinate their muscles due to improper brain development or brain damage during development is the cause of cerebral palsy (CP). There are four main types of CP: Spastic Cerebral Palsy, Dyskinetic Cerebral Palsy (also includes athetoid, chore athetoid, and dystonic cerebral palsies), Ataxic Cerebral Palsy, Mixed Cerebral Palsy [1].

Cerebral palsy (CP) is a condition characterized by motor function impairments. Both genetic and environmental factors can play a role in the development of cerebral palsy, but it is most often caused by infant brain damage that occurs shortly before birth, in the course of giving birth, or in the early postnatal stage.

A significant portion of the central nervous system is used in visual processing. This is why visual issues are often a side effect of brain damage types that cause cerebral palsy, particularly hypoxic-ischemic encephalopathy (HIE). Brain damage to the white matter of the brain called periventricular leukomalacia (PVL) is frequently linked to both cerebral palsy and cerebral vision impairments [2].

The most common ocular problems could be found with CP children are, Visual Acuity, Refractory errors, Squint or Strabismic errors, Nystagmus, Cataract, any types of visual impairment etc.

The severity of vision loss tends to increase with the severity of cerebral palsy, as measured by the GMFCS score [2], and with the number of limbs affected [2, 3]. Approximately 50% of children with cerebral palsy have some form of visual impairment [3]. In general, visual impairments are thought to be more common in children with spastic cerebral palsy than those with athetoid or ataxic types [4]. In Bangladesh among CP children at least 10.2% have visual problem, of which strabismus (28.5%) is most common [5].

Strabismus, accounting for 55.7 percent of visual issues associated with cerebral palsy, and refractive errors, accounting for 20.7 percent, are the most frequent vision abnormalities in children with the condition. While all of these diseases might be mild, serious visual loss affects 18.9% of children with cerebral palsy [3].

People's ability to see and comprehend images has a significant influence on their daily lives. Lack of precise visual acuity may exacerbate developmental delays in children with cerebral palsy, many of whom already have difficulties with mobility and speech. The inability to see makes already challenging situations worse.

Impaired vision is common in children with Cerebral Palsy. There is a higher likelihood that a child will have trouble seeing if they have severe Cerebral Palsy. To further complicate matters, A typical symptom of cerebral palsy in youngsters is impaired eyesight. If a kid has severe cerebral palsy, there is a greater chance that they will experience visual difficulties. Complicating matters even more, if the appropriate supports and interventions are not put in place early in a child's infancy, vision impairment may result in a shorter life span [6].

A collection of conditions known as cerebral palsy (CP) impact a person's mobility, balance, and posture. The most typical motor impairment in children is cerebral palsy. The word cerebral refers to brain-related matters. Palsy is a term used to describe muscle weakness or dysfunction.

A person's inability to coordinate their muscles due to improper brain development or brain damage during development is the cause of cerebral palsy (CP). A collection of non-progressive mobility or postural problems is known as cerebral palsy (CP). A visual impairment may directly affect a patient's psychosocial status in CP patients [7]. The earlier children receive a diagnosis and treatment, the better, as eyesight plays a crucial role in their emotional and cognitive development [8]. Because of this, a parent must be cognizant of their child's visual impairment and seek out remedies that augment or replace the child's visual impairment. Through this study, it will be possible to determine which types of CP children are more likely to experience specific types of ocular issues. In order for the identified types of CP children to improve their cognitive and psychosocial condition in addition to their ocular improvement, they should be evaluated for their eyes as soon as possible [9].

Materials and Methods

A cross-sectional study was conducted over a period of 12 months. Children aged between 8 months to 18 years with cerebral palsy (CP) were recruited as cases from the Outpatient Department (OPD) of the Institute of Paediatric

Neurodisorder and Autism (IPNA), BSMMU, along with other Child Development Centers (CDC), where patients regularly visited for diagnosis, assessment, and management of various neurodevelopmental disorders. The sample size was 147. A semi-structured questionnaire was employed to collect demographic data, and the results of ocular examination reports were incorporated into the same questionnaire.

Study Procedure

Children with CP were recruited as cases from the OPD of the Institute of Paediatric Neurodisorder and Autism, BSMMU, and other Child Development Centers (CDC) in Dhaka city. These centers provided regular services for diagnosing, assessing, and managing neurodevelopmental disorders. Once clinically diagnosed with CP, the children were referred to the Ophthalmology Department at Bangabandhu Sheikh Mujib Medical University to detect any existing ocular problems.

Visual impairment was determined based on medical history, available medical records, and clinical assessments of visual acuity and functional vision, including tests like counting fingers, hand motion, and light perception. A monocular cover-uncover test was performed to assess strabismus. Visual behavior was also evaluated by: (a) asking the parents about their child's visual behavior, (b) Snellen's visual acuity test, (c) determining whether the child fixated on and followed light, (d) checking the visual axis, (e) identifying the presence of nystagmus, (f) testing whether the child allowed occlusion of either eye, and (g) observing the child's ability to follow a moving object 33 cm away.

A comprehensive ocular examination followed. Cycloplegic refraction was performed using atropine ointment in children under seven years of age or those with esotropia. In other cases, 1% cyclopentolate drops were used for cycloplegia.

Upon completion of the ocular assessment, the patients returned to the researcher, and all relevant details were documented in the semi-structured questionnaire. Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 25.0. Range and consistency checks were conducted after data entry, followed by descriptive statistical analysis.

Ethical Consideration

After getting the approval of IRB of Bangabandhu Sheikh Mujib Medical University (No. BSMMU/2021/2774); the purpose and procedure of the study will be properly explained to the parents of CP children and or their guardian and informed written consent will be taken. The study will not be involving any additional burden to the patients. All participants in a research study have a right to have the information they provide to be kept confidential. Additionally, in order to conduct a research study, it is imperative to consider any harm that might occur to participants. Furthermore, the purpose of the study will be clearly indicated to participants prior to the study being conducted. An informed consent section will be included as the first page of the study.

Results

Socio-demography of study children

Table 1 shows that among 147 patient whose information was collected, 110 (75 percent) were males and 37 (25

percent) were females. Table 1 also shows that among 147 patient whose information was collected, 93 (63 percent) were in 1-14 months age group; 64 (43.5 percent) were completed primary education; 61 (41.5 percent) were completed primary education; 55 (37.4 percent) had occupation rather than agriculture, business or service; 99 (67 percent) were home maker; 133 (91 percent) had monthly income less than 20,000 taka; 130 (88percent) were live in own house.

Table 2: Socio-demographic characteristics of the study children’s parents (n=147)

Variables		Frequency (n)	Percentage (%)
Sex of children	Male	110	75
	Female	37	25
Age of children	1-24 months	93	63
	25-48 months	21	14
	49-96 months	23	16
	97-144 months	10	07
Father’s education	Illiterate	5	3.4
	Primary	64	43.5
	Secondary&	23	15.6
	Higher secondary	25	17.0
Mother’s education	Graduation and above	30	20.4
	Illiterate	7	4.8
	Primary	61	41.5
	Secondary&	39	26.5
Father’s occupation	Higher secondary	20	13.6
	Graduation and above	20	13.6
	Agriculture	6	4.1
	Business	32	21.8
Mother’s occupation	Service holder	8	5.4
	Others	55	37.4
	Agriculture	11	08
	Business	15	10
Family’s Monthly income	Service holder	16	11
	Home maker	99	67
	Others	06	04
	<20,000	133	91
Family’s housing status	20,000-39,000	8	5
	40,000-59,000	0	0
	>60,000	6	4
	Own house	130	88
Family’s housing status	Govt. house	00	00
	Rented house	17	12

Table 2 shows that among 147 patient whose information was collected, 24 (16 percent) were come from Dhaka district.

Table 2: Residence district of study children’s parents (n=147)

Districts	frequency	Percentage (%)
Dhaka	34	23
Comilla	24	16
Gazipur	10	7
Mymensingh	18	12
Munshigonj	11	8
Natore	6	4
Chandpur	14	10
Bhola	10	7
Barishal	17	12
Capainababgonj	3	2
Total	147	100

Table 3. shows that among 147 patient whose information was collected, 90 (61percent) were diagnosed with only CP

and 57 (39 percent) were diagnosed CP with comorbidity.

Table 3: Cerebral Palsy and other comorbidities of study children (n=147)

Status	Frequency	Percentage (%)
only CP	90	61
CP with other comorbidity	57	39
Total	147	100

Table 4. shows that among 147patient whose information was collected, 125 (85 percent) had ocular problems with CP.

Table 4: Ocular problems of diagnosed CP children (n=147)

Status	frequency	Percentage (%)
Present	125	85
Absent	22	15
Total	147	100

Table 5. shows that among 147patient whose information was collected, 97 (66 percent) had visual acuity, 80 (54 percent) had developmental cataract, 41 (27 percent) had refractory error,20 (12 percent) had diffuse disc pallor, 14 (10 percent) had congenital glaucoma.

Table 5: Ocular problems of study person’s (n=147)

Ocular problems	Present		Absent		M±SD
	Frequency	Percent (%)	Frequency	Percent (%)	
Visual acuity	97	66	50	34	1.3±.47
Squint	80	54	67	46	1.4±.49
Refractory error	41	27	106	43	1.2±.43
Nystigmus	5	3	142	97	1.9±.18
developmental cataract	6	4	141	96	1.9±.19
Temporal disc pallor	8	5	139	95	1.9±.22
Diffuse disc pallor	20	12	127	88	1.9±.35
Congenital Glaucoma	14	10	133	90	1.9±.29

Discussion

Children with developmental disabilities such as cerebral palsy (CP) have a high prevalence of ocular defects, which has been reported in various studies. Srivastava, Laisram, and Srivastava (1992) identified significant rates of visual impairment in children with CP [10], highlighting their vulnerability to vision problems. In our study, which assessed visual disabilities in 147 CP patients, 85% were found to have significant visual morbidity, showing a notably higher prevalence compared to earlier research. This indicates that visual impairment substantially affects this population.

When compared to other research findings, one study involving 200 CP patients reported that 40% of them had ocular causes for poor vision, while 28% were diagnosed with cortical visual impairment (CVI). In contrast, our study found that 66% of the patients had reduced visual acuity. Previous studies from India estimated that 9% to 54% of children with CP have visual disabilities, which is significantly lower than the 85% found in our study¹¹. Differences in study populations, methodology, or the extent of neurological damage may explain the variance in prevalence rates.

One common ocular condition in children with CP is

strabismus (squint). In our study, the incidence of strabismus was found to be 54%, much higher than the 3% typically seen in the general population. This is consistent with Pigassou-Albouy and Fleming's (1975) study [12], which reported a 50% incidence of strabismus in CP patients. The high prevalence of strabismus in children with CP is thought to be linked to subcortical oculomotor or cerebellar lesions, which interfere with binocular vision. However, unlike other studies, our research did not observe any cases of dyskinetic strabismus, which is often associated with CP patients having an athetoid component.

Additionally, amblyopia (lazy eye) was present in some cases of unilateral esotropia (one eye turning inward). In these cases, occlusion therapy was applied but yielded limited success, suggesting that amblyopia in children with CP has both functional and neurological causes, contributing to its poor prognosis [13].

Our study also confirmed a strong association between CP and refractive errors, with 27% of children exhibiting such conditions. This supports findings from other studies linking ocular problems to CP. Furthermore, we found that 12% of children had optic disc pallor, a condition similar to what Lossef (1962) reported in 88 CP children. Other ocular issues documented in our study include nystagmus, developmental cataracts, temporal disc pallor, and congenital glaucoma, further contributing to the complex spectrum of visual impairments in CP patients.

Overall, our findings underscore the high prevalence of visual disabilities in children with CP, with a broad range of conditions. The interplay of functional and neurological factors suggests that early identification and targeted intervention are crucial for managing visual morbidity in this population.

Limitations

In this study, several limitations affected the overall findings and conclusions. One of the primary limitations was the sample size, as only 147 samples were surveyed due to constraints in both time and budget. A larger sample size would have provided more robust and generalizable results, but the researchers had to limit the scope of their study because of these resource limitations. Small sample sizes can reduce the statistical power of a study, which makes it more difficult to detect significant effects or trends and may limit the confidence in the results.

Another major limitation was the issue of case dropouts. Dropouts refer to participants who begin the study but, for various reasons, do not complete it. This can introduce bias into the study results, especially if the reasons for dropout are related to the variables being studied. For instance, participants with more severe symptoms or those from disadvantaged backgrounds might be more likely to drop out, skewing the results and making the findings less representative of the wider population. Dropouts reduce the sample size further and complicate the analysis, as the missing data may need to be accounted for through statistical adjustments or assumptions, which can affect the study's accuracy.

Furthermore, these restrictions might potentially affect the study's external validity, or how broadly the results apply to different groups of people in different contexts. With only 147 participants and a certain number of dropouts, the study might not fully capture the diversity or range of experiences and outcomes in the broader population.

Lastly, the time constraint could have limited the

researchers' ability to conduct a more in-depth analysis or follow-up with participants, potentially leading to incomplete data collection or oversight of important factors that could influence the study's findings.

Addressing these limitations in future research would be critical, such as increasing the sample size, improving retention rates, and securing additional resources for a more comprehensive investigation.

Conclusion

In conclusion, we could say that the findings emphasize the need for an early ocular examination in patients with CP. A substantial portion of CP children's overall disability is related to their visual impairment. It is imperative that pediatricians who are involved in the care of these children are motivated to pursue ophthalmologic evaluation as a component of a comprehensive multidisciplinary strategy for their therapy.

Conflict of Interest

There is no conflict of interest

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