

Frequency and Severity of Auditory Impairment in Children with Cerebral Palsy in a Selected Tertiary Health Care Centre

Sanchita Biswas ¹, Debatosh Paul ², Mesbah Uddin Ahmed ^{3*}, Md Mizanur Rahman ⁴

¹ Senior Lecturer, Department of Community Medicine, National Medical College Hospital.

² Chairman, Department of Laboratory Medicine, Bangabandhu Sheikh Mujib Medical University.

³ MS in Microbiology, Bangladesh University of Health Sciences.

⁴ Professor, Department of Paediatric Neurology, Bangabandhu Sheikh Mujib Medical University.

***Corresponding Author:** Mesbah Uddin Ahmed, MS in Microbiology, Bangladesh University of Health Sciences.

Received Date: 27 April 2022 | **Accepted Date:** 10 May 2022 | **Published Date:** 19 May 2022

Citation: S Biswas, D Paul, Mesbah U Ahmed, Md M Rahman. (2022) Frequency and Severity of Auditory Impairment in Children with Cerebral Palsy in a Selected Tertiary Health Care Centre. *Journal of Clinical and Laboratory Research*. 5(5); DOI:10.31579/2768-0487/084

Copyright: © 2022 Mesbah Uddin Ahmed. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Abstract

Cerebral palsy is the most common chronic motor disorder in children and frequently associated with sensorineural pathology. Deafness is very important public health concern. Because it determines long-term life span disability in individuals, decrease their quality of life. To observe the rate of occurrence of hearing impairment in children with cerebral palsy (CP) and to assess the severity of hearing impairment children with CP and correlate the auditory impairment with different types of CP were aim of the study. Total 50 children with Cerebral Palsy were taken. A structured questionnaire was filled up including history of patient and important variables related to hearing status like family history of deafness, consanguinity, antenatal history, preterm LBW, perinatal asphyxia, kernicterus, neonatal septicemia, neonatal seizure and meningitis were included in study. Physical examination and neurological examination like hearing, vision, motor, cognitive, speech delay were assessed. In this study, among the 50 children with CP, Tympanometry showed that negative middle ear pressure was 32% in spastic quadriplegia (SQ), 24% in spastic hemiplegia (SH), 16% in spastic diplegia (SD) and 24% in mixed type. Eustachian tube dysfunction was 62.5% in spastic hemiplegia. Secretory otitis media was 36.4% in spastic quadriplegia. Auditory brain stem response revealed severe sensorineural hearing loss was 8% in spastic quadriplegic type. Moderate sensorineural hearing loss was 2% in spastic hemiplegia group. Hearing loss was frequent in children with Cerebral Palsy. Spastic Quadriplegic cerebral palsy patients had the maximum incidence of hearing impairment.

Key words: cerebral palsy; auditory impairment; tertiary care

Introduction

Cerebral palsy is the 'most prevalent childhood motor disability' today with approximately 8000 infants with cerebral palsy born in the United States annually [1,2]. The international working group on definition and classification of cerebral palsy, defined cerebral palsy as a group of permanent disorder of development of movement and posture causing activity limitation that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain [3]. Most common risk factors are low APGAR score (26.6%) then seizures (13.3%), prematurity (10%) and lastly low birth weight. Intrauterine infections like cytomegalovirus and rubella, difficult labour kernicterus are least common risk factors [4]. The prevalence of CP is increased among the low-birth-weight infants particularly those weighting less than 1000 gm at birth, primarily because of intracerebral hemorrhage and

periventricular leukomalacia [5]. About 5-10% of children developed cerebral palsy is due to cytomegalovirus [6]. These children suffer from involuntary movement and or disturbance in gait and motility. Children with cerebral palsy may also experience a range of additional problems that may require treatment including impairment of vision, hearing or speech with consequent learning difficulties, mental retardation, seizure, difficulties in bladder and bowel control and feeding problem [4]. Hearing loss accounts for 25% of cerebral palsy population in Western Europe. These abnormalities are thought to be associated with prenatal, perenatal and postnatal problems often multifactorial in nature [7]. There are many ways to detect hearing impairment in children. To formulate a protocol for infant hearing screening in developing countries enabling it to be later incorporated into their national deafness screening programs. the screening tool should be sensitive in detecting hearing loss in infants with

high specificity [8]. Tympanometry or immittance Audiometry is used to check the movement of the tympanic membrane. Tones are "bounced" off the tympanic membrane to determine the amount of sound that is reflected back through the ear canal. Middle air pressure, compliance and stepidial reflex threshold (SRT) could be measured by tympanometry. Transient Evoked Otoacoustic Emission (TEOAE) is reproducible, diagnostically accurate, easy to perform and minimally invasive [9]. TEOAE represents a quick, inexpensive, frequency specific, valid method for testing cochlear function. But it can be misleading in case of wax packed ear canal, middle ear effusion, external noise as these conditions often confound the real audiological output. Moreover, TEOAE cannot identify auditory neuropathy [10].

Materials & Methods

This cross-sectional study was conducted in the Department of Paediatrics neurology unit and Autolaryngiology-Head and Neck Surgery Department of BSMMU. Duration of the study was from March 2011 to September 2011. Diagnosed CP patients who fulfilled the inclusion and Exclusion criteria were selected purposively as study population. After taking informed written consent, proper history and clinical examinations was done and severity of hearing loss was assessed by different tools of hearing in the auditory department of Otolaryngology – Head and Neck Surgery.

Results

Characteristics	Frequency	Percentage
Sex		
Male	32	64.0
Female	18	36.0
Age group (yrs)		
1-3	22	44
3-6	16	32
6-15	12	24
Socio-economic status		
Poor	26	52.0
Middle class	22	44.0
Higher class	02	04.0
Residence		
Rural	27	54.0
Urban	23	46.0

Table 1: Demographic characteristics of study population (n=50).

Table-1 shows male was 64% and female was 36% of study population. About 44% children were 1-3 years' age group, 32% children were 3-6 years' age group and 24% children were 6-15 years' age group. Mean age

in year was 5.57±3.89. Regarding socioeconomic status, poor was 52%, middle class was 44% and higher class was 04%. About 54% children came from rural area, and 46% children from urban area.

Type of CP	Frequency	Percentage
Spastic Quadriplegia (SQ)	21	42.0
Spastic Hemiplegia (SH)	11	22.0
Spastic Diplegia (SD)	08	16.0
Athetoid	02	04.0
Mixed	08	16.0
Total	50	100.0

Table 2: Type of CP in the study population (n=50).

Table- 2: shows out of 50 patients 42%, were spastic quadriplegia, 22% were spastic hemiplegia, 16% were spastic diplegia, 4% were athetoid and 18% were mixed CP.

Tympanometry	Type of CP					Total n (%)
	SQ n (%)	SH n (%)	SD n (%)	Mixed n (%)	Athetoid n (%)	
Negative middle ear pressure	8(32)	6(24)	4(16)	6(24)	1(4)	25 (50)
Eustachian tube dysfunction	2(25)	5(62.5)	1(12.5)	0(0)	0(0)	08 (16)
SRT (Absent)	4(36.4)	4(36.4)	0(0)	2(18.2)	1(9.1)	11 (22)

Table 3: Tympanometry report of various type of CP (n=50).

Coefficient value 0.40, (p=0.12)

Tympanometry result shows negative middle ear pressure was 32%, Eustachian tube dysfunction was 25%, 24% was negative middle ear pressure, 62.5% was Eustachian tube dysfunction in SH, SRT was absent in 36.4% in SQ and SH. P=0.12 that was not statistically significant.

Etiology	Frequency	Percentage
Perinatal asphyxia	26	52
Prematurity	17	34
Meningitis	12	24
Neonatal septicemia	11	22
Brain malformation	08	16
Kernicterus	02	04

Table 4: Etiology of CP among the study population (n=50).

Table 4 shows etiology in the study population. Perinatal asphyxia, prematurity, meningitis, neonatal septicemia, brain malformation and kernicterus were 52%, 34%, 24%, 22%, 16% and 12%.

Type of CP	Normal	Mild hearing loss	Moderate hearing loss	Severe to profound hearing loss	Total sensorineural hearing loss
Spastic quadriplegia	05(10%)	02(4%)	01(2%)	01(2%)	04 (8%)
Spastic hemiplegia	05(10%)	00	01(2%)	00	01(2%)
Spastic diplegia	02(10%)	01(2%)	00	00	01(2%)
Athetoid	01(4%)	01(2%)	00	00	01(2%)
Mixed	04(2%)	00	00	00	00

Table 5: Level of hearing impairment by Auditory Brainstem Response (ABR) in various type of CP (n=50)

Coefficient value 0.75, p value 0.15

Result of auditory brain stem response revealed mild, moderate and severe to profound sensorineural hearing loss were 8% in spastic quadriplegic type, moderate sensorineural hearing loss was 2% in spastic hemiplegic group and mild hearing loss was 2% in spastic diplegic and athetoid group of CP.

Discussion

This descriptive study was conducted in the Department of Pediatrics, (Pediatric Neurology unit) BSMU. This study was carried out to observe the Frequency and Severity of Auditory Impairment in children with Cerebral Palsy. It has been noted that roughly 20 percent or one fifth of children with cerebral palsy suffer from hearing loss. Typically the hearing loss is sensorineural. Beyond that, not much research has been done to date on hearing loss and cerebral palsy. It is important, however, that children with cerebral palsy also have their hearing assessed by an audiologist, especially if they also have a visual impairment. A large number of those with CP will have additional impairments, such as visual, auditory, seizures, cognitive and behavioral disabilities [6]. Of those with hearing loss 30.2% will have an additional disability [11]. Cerebral palsy can an associated disability, hearing loss, visual impairments, epilepsy, speech and language disorders, and cognitive impairments [6]. It is a hidden disability for which early detection is usually missed. But early detection and intervention can prevent severe psychosocial, educational and linguistic repercussion. Out of 50 children, thirty-two (64%) were male and eighteen (36%) were female. 44% children were 1-3 years age group, 32% children were 3-6 years age group and 24% children were 6-15 years age group. Mean age 5.57 years, SD±3.89 age range 1-15 years. In the study of Liptak GS, et al' [11] mean age was 9.6 years SD ±4.6 that is dissimilar in this study, 59% were male 41% were female that is

approximately similar with this study. In this study, normal delivery was 78 % and caesarean section was 22% in children with CP. In study of Mezaal M A, et al. [12] 82% were normal delivery and 18% were caesarean section. That study is similar with this study. In the study of hearing impairment was associated with preterm low birth weight 34%, perinatal asphyxia 52%, severe Jaundice 04%, neonatal septicemia was 22% and neonatal seizure were 24%. In the study of Shilpi Arora and LK Kochher [13] risk factors for hearing loss was low birth weight 41.42% which near to similar, hyperbilirubinemia 25.71%, septicemia 4.28% and asphyxia 7.14% that is dissimilar in my study. In the study of Behairy E H. et al [4]. represents the associated problems in their cases which are from the most common to the least common; seizures (63.3%) auditory (53.3%), speech (46.7%), visual (46.7%) and lastly swallowing problems in (16.6%) of the cases. Associated problems in this study motor delay were forty-two (84%), speech delay were thirty nine (78%), seizure were thirty five (70%), hearing impairment were twenty nine (58%), cognitive delay were twenty nine (58%), visual impairment were twenty (40%), swallowing difficulty were nineteen (38%) and dental problem were fourteen (28%). This study is approximately similar Behairy E H [4]. study. In another study Mezaal M A et al, 48 motor disabilities was 60%, most common followed by epilepsy 42%, hearing loss 63%, cognitive delay 40%, speech delay 30% that study approximately similar to in this study. In Mezaal M A et al, [12] study visual impairment 2% that is distinct in this study. In this study out of 50 patients, 42% were spastic quadriplegia, 22% were spastic hemiplegia, 16% were spastic diplegia, 18% were mixed CP. In the study of Behairy E H. et al. [4] demonstrates 76.6% were spastic quadriplegia which nearly similar, 6.67% were spastic hemiplegia and 3.33% were spastic diplegia which is not similar in this study. In study of Mezaal M A et al, [12] 32% were spastic hemiplegia, 18% were spastic quadriplegia which was dissimilar but 12% were spastic diplegia, 16 % were mixed CP that was almost similar with

this study. In this study, Tympanometry result shows negative middle ear pressure (secretary otitis media) was 32%, Eustachian tube dysfunction was 25% (combined were 57%). 24% was negative middle ear pressure, 62.5% was Eustachian tube dysfunction in SH, SRT was absent in 36.4% in SQ and SH. Behairy E. H. et al, found that, abnormal tympanometry in the form of secretary otitis media, eustachian tube dysfunction, was present in 52% of spastic quadriplegic patients while other types of cerebral palsy had normal tympanometry. This is similar to in this study. In this study, TEOAE report pass was 52% and refer was 48% in children with CP. Theodre et. al showed in their study pass 73,4% and refer 26.2% which is not consistent with in this study. In this study audiotory brain stem response revealed mild, moderate and severe sensorineural hearing loss were 8% in spastic quadriplegic type and the spastic diplegia and athetoid group were 2% only mild. Moderate sensorineural hearing loss were 2% in spastic hemiplegia group. Morales et.al revealed that sensorineural hearing loss affected 60% of cerebral palsy patients, while Odding et al, states that the incidence of hearing loss is 25% of cerebral palsy patients in Western Europe.

Conclusion

Hearing loss was frequent in children with Cerebral Palsy. Management of this problem is difficult because of the motor disorder and the associated pathology. Early audiological assessment is very important to improve the language outcome in these children. Spastic Quadriplegic cerebral palsy patients had the maximum incidence of hearing impairment. Though the cases of athetoid CP were less but all of them had hearing impairment. Perinatal asphyxia and prematurity were the main risk factor of hearing impairment.

References

- Johnston MV, Hoon AH. (2004). Cerebral palsy. *Neuro Molecular Medicine*. 8:435-450.
- Wu YW, Croen LA, Shah SJ, Newman T B, Najjar DV. (2006). 'Cerebral palsy in a term population: Risk factors and neuroimaging findings'. *Pediatrics*. 118:690-697.
- Palisano RP, Rosenbaum, Walter S. (1997). Development and reliability of system to classify gross motor function in children with cerebral palsy. *Dev. Child Neurol*. 39:214-223.
- Behairy HE, Alyan L, Menshawy AE. (2010). Auditory impairment in children with Cerebral Palsy. *Aust. J. of Basic and Applied Science*. 4:6239-6243.
- Michael VJ. Encephalopathies. Behrman RE, Kliegman RM., Jenson HB, Stanton BF. (2008). Cerebral palsy. In: *Nelson Text book of Pediatrics*, 18th edn, Philadelphia, Saunders Elsevier. 2494-2995.
- Stanley F, Blair E, Alberman E. (2000). Cerebral palsies. *Epidemiology and causal pathways*. Lavenham: Mackeith press. 55-56.
- Odding EM, Hendrick R. (2006). The epidemiology of cerebral palsy, incidence, impairment and risk factors. *Disability and Rehabilitation*. 28:183-191.
- Bansal S, Gupta A, Nagarkar A. (2008). TEOAE in hearing screening programme- protocol for developing countries. *Int. J Pediatr. Otorhinolaryngol*. 72:1059-1063.
- Pelosi G, Hatzopoulos S, Chierici R, Vigi V, Martini A. (1998). Valutazione di un protocollo TEOAE lineare nello screening audiologico neonatale: studio di fattibilita. *Acta Otorhinolaryngol Ital*. 18:213.
- Amin M.N. (2004). Seminar on hearing disability. Society for assistance to hearing impaired children, Dhaka.
- Liptak GS, O'Donnell M, Conaway M, Chumlea W C, Worley G, Henderson RC et al, (2001). Health status of children with moderate to severe cerebral palsy. *Dev. Med. Child Neurol*. 43:364-370.
- Mezzaal M A, Kasid A, Abdul S, Nadeem A, Alsafar K, Naerif, et al. (2009). Cerebral palsy in adult consequences of non progressive pathology: The open neurology journal. 324-326.
- Shilpi Arora and L. K. Kochhar. (2010). Incidence Evaluation of Snhl in High-Risk Neonates. *Indian Journal of Otolaryngology and Head & Neck Surgery*. 55(4):246-250.



This work is licensed under Creative Commons Attribution 4.0 License

To Submit Your Article Click Here:

[Submit Manuscript](#)

DOI: [10.31579/2768-0487/070](https://doi.org/10.31579/2768-0487/070)

Ready to submit your research? Choose Auctores and benefit from:

- fast, convenient online submission
- rigorous peer review by experienced research in your field
- rapid publication on acceptance
- authors retain copyrights
- unique DOI for all articles
- immediate, unrestricted online access

At Auctores, research is always in progress.

Learn more <https://auctoresonline.org/journals/journal-of-clinical-and-laboratory-research->