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Original Research Article

A Hospital-Based Study to Find Out the Prevalence of Non- Strabismic Binocular Vision Anomalies in Children with Hearing Impairment

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Abstract

Aim: The aim of the present study was to find out the prevalence of Non- Strabismic Binocular Vision Anomalies in children with hearing impairment.

Methods: The study was conducted among hearing-impaired children in the Department of Ophthalmology, Nalanda Medical College and Hospital, Patna, Bihar, India from April 2016 to Jan 2017. Children were included in this study based on the inclusion and exclusion criteria of the study. Hearing-impaired students age ranges 8-20 years were included in the study. Among a total of 103 children screened.

Results: When compared between severe and profound HI, there was no statistically significant difference in NPA. The response of accommodation did not show a statistically significant difference when compared between severe and profound HI. NRA and PRA values did not show any statistically significant difference when the values were compared between subjects with severe and profound HI. Similarly, binocular and monocular AF also did not show any significant difference when compared between subjects with severe and profound HI. There was no statistically significant difference in NPC break and recovery, NFV break (distance and near), and PFV break (distance and near) values when compared between the children with severe and profound HI.

Conclusion: Non-strabismus binocular vision anomalies were found among profound and severe hearing-impaired subjects. So, it is important to consider binocular evaluation among hearing-impaired subjects.

Keywords: hearing impairment, binocular vision, refractive error, NSBVA

Introduction

Hearing disorder is one of the important health issues which significantly affect the quality of life. [1,2] The prevalence of this problem has been reported from 1.4% in children aged 5–14 years to 9.8% in those who are 14 years or older. [3] In severe hearing loss, the remaining senses are more important. [4]

Vision is one of the important senses which has more value for communication in deaf people compared to ordinary people, and it has been shown that a coincidence of visual disorders with hearing impairment, especially in the early years of life, can negatively impact development of communication and cognitive skills. [4,5] Several studies reported that some visual disorders are more prevalent in the deaf population, which has been reported up to 60%. [5-8] Refractive errors, stereopsis problems, amblyopia, strabismus, and reduced vision are among the most important visual disorders in the deaf. Some of these studies have shown that refractive errors are more prevalent in deaf subjects compared to other visual disorders. [4,7,9,10]

Nevertheless, the condition of refractive errors in this population compared to the normal population cannot be judged because the majority of studies were descriptive and did not have a control group. [6,11] Previous studies confirm that refractive errors are the most prevalent visual disorder in not only deaf children but also the older deaf population. [6,11]

The aim of the present study was to find out the prevalence of Non- Strabismic Binocular Vision Anomalies in children with hearing impairment.

Materials and Methods

The study was conducted among hearing-impaired children in the Department of Ophthalmology, Nalanda Medical College and Hospital, Patna, Bihar, India from April 2016 to Jan 2017. Children were included in this study based on the inclusion and exclusion criteria of the study. Hearing-

impaired students age ranges 8-20 years were included in the study. Among a total of 103 children screened.

The prospective study started with taking permission from the respective hearing impairment school and fixed the date for evaluation after that every child was informed about the purpose and procedure of the study. Lack of test co-operation, visual acuity less than 0.5 log MAR, and those who have not heard threshold value record were excluded from the study. Demographic data were recorded; participants' brief ocular history was taken that included a history of any ocular examination optical correction and ocular injuries. Hearing impairment history was also taken (acquired or congenital hearing loss, family history of hearing disorder, threshold of hearing impairment through medical record). The severity of hearing impairment was classified as slight (26-40 dB), moderate (41-60 d), severe (61-80 dB), profound (81 dB or >) [23]. The screening included vision and refraction [subjective and objective], Sensory evaluation, Motor evaluation, Accommodative test & Vergence test. The examination was performed in the schoolroom with proper illumination. The examination included Visual acuity with log MAR chart at 4 meters, near vision using Snellen near vision acuity chart at 40 cm. non-cycloplegic refraction was done followed by sensory tests like stereopsis, W4DT, colour vision test using Ishihara color vision chart. Motor tests (Cover test, modified Thorington, AC/a ratio), accommodative tests (near the point of accommodation, monocular estimation method retinoscopy, accommodative facility, negative relative accommodation, and positive relative accommodation.) and vergence tests (near the point of convergence, negative fusional vergence, positive fusional vergence, and vergence facility) were performed.

Data were analysed with SPSS. The data were analysed using the statistical package SPSS software version 2.1. Independent t-test formula and chi-square were used as a part of statistical analysis.

Results

Table 1: Comparison of NPA among children with severe and profound HI

Test	Hearing impairment	Mean ± SD	p-value
NPA-OD	Severe	7.21±2.59	0.60
NPA-OD	Profound	6.97±2.04	
NPA-OS	Severe	6.96±2.46	0.44
NPA-OS	Profound	6.64±1.58	
NPA-OU	Severe	6.62±1.67	0.95
NPA-OU	Profound	6.64±1.58	

When compared between severe and profound HI, there was no statistically significant difference in NPA.

Table 2: Comparison of MEM among children with severe and profound HI

Test	Hearing impairment	Mean ± SD	p-value
MEM-OD	Severe	0.58±0.58	0.59
MEM-OD	Profound	0.51±0.73	
MEM-OS	Severe	0.61±0.59	0.53
MEM-OS	Profound	0.53±0.77	

The response of accommodation did not show a statistically significant difference when compared between severe and profound HI.

Table 3: Comparison of NRA and PRA among children with severe and profound HI

Test	Hearing impairment	Mean ± SD	p-value
NRA	Severe	2.82±0.71	0.23
NRA	Profound	3.00±0.76	
PRA	Severe	-2.83±0.31	0.20
PRA	Profound	-2.87±0.36	

NRA and PRA values did not show any statistically significant difference when the values were compared between subjects with severe and profound HI.

Table 4: Comparison of AF among children with severe and profound HI

Test	Hearing impairment	Mean (±)	p-value
AF-OD	Severe	14.08±3.69	0.37
AF-OD	Profound	13.44±3.47	
AF-OS	Severe	13.89±3.40	0.29
AF-OS	Profound	13.09±4.23	
AF-OU	Severe	14.94±3.62	0.55
AF-OU	Profound	14.46±4.45	

Similarly, binocular and monocular AF also did not show any significant difference when compared between subjects with severe and profound HI.

Table 5: Comparison between NPC among children with Severe and Profound hearing impairment

Test	Hearing impairment	Mean (±)	p-value
NPC-BREAK	Severe	4.87±1.13	
NPC-BREAK	Profound	4.88±1.08	0.94
NPC-REC	Severe	6.72±1.69	0.37
NPC-REC	Profound	7.02±1.69	

Table 6: NFV Distance and near among children with severe and profound HI

Test	Hearing impairment	Mean ± SD	p-value
NFV-BRK-D	Severe	10.55±3.99	0.20
NFV-BRK-D	Profound	11.59±4.32	
NFV-REC-D	Severe	8.26±4.09	0.36
NFV-REC-D	Profound	9.02±4.23	
NFV-BRK-N	Severe	12.96±4.88	0.26
NFV-BRK-N	Profound	14.02±4.69	
NFV-REC-N	Severe	9.60±4.40	0.14
NFV-REC-N	Profound	10.85±4.03	

Table 7: PFV for distance and near among children with severe and profound HI

Test	Hearing impairment	Mean ± SD	p-value
PFV-BRK-D	Severe	18.85±6.18	0.93
PFV-BRK-D	Profound	18.97±6.15	
PFV-REC-D	Severe	15.51±5.16	0.99
PFV-REC-D	Profound	15.51±5.59	
PFV-BRK-N	Severe	24.50±14.84	0.92
PFV-BRK-N	Profound	16.67±5.59	
PFV-REC-N	Severe	17.52±6.23	0.72
PFV-REC-N	Profound	16.62±5.23	

There was no statistically significant difference in NPC break and recovery, NFV break (distance and near), and PFV break (distance and near) values when compared between the children with severe and profound HI. Table 5-7

Discussion

Deafness or hearing impairment is a relatively common form of sensory deficit found in children. The number of infants who are born deaf is 1 for every 1000 infants [12] with more children acquiring various degrees of hearing impairment within the first 2 years of life. [13] These numbers remarkably are similar in most countries. [14]

When compared between severe and profound HI, there was no statistically significant difference in NPA. The response of accommodation did not show a statistically significant difference when compared between severe and profound HI. NRA and PRA values did not show any statistically significant difference when the values were compared between subjects with severe and profound HI. Similarly, binocular and monocular AF also did not show any significant difference when compared between subjects with severe and profound HI. There was no statistically significant difference in NPC break and recovery, NFV break (distance and near), and PFV break (distance and near) values when compared between the children with severe and profound HI. In a study done by J BIST P et al in 2010, out of 279 students, [15] subjects (5.37%) were found to have strabismus in the cover test.[15] A study done by SEBNEM et al in 2003, included 104 subjects (7-20)

years, 42 children have an ophthalmic defect. [16] Out of which 18.2% have strabismus, 56 have normal stereopsis, 25% have reduced stereopsis and 6.8% have an absence of stereopsis. A study done by RICHARD et al found 32% of reduced stereopsis. Similarly, colour vision deficiency was present in 6(5.8%). [17] NIRANJAN k et al [18] found strabismus 2% whereas these results contradict the current study. As all Hearing-Impaired children in the current study are trichromatic with normal stereopsis, colour vision & EOM. The previous study found strabismus among hearing-impaired children that could be the reason for stereopsis also affected among them whereas in the current study none of the children have strabismus so stereopsis is also normal and none of the subjects have amblyopia.

Conclusion

Non-strabismus binocular vision anomalies were found among profound and severe hearing-impaired subjects. So, it is important to consider binocular evaluation among hearing-impaired subjects.

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