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Hearing Impairment in Under Five Year Age Group Children: Associated Factors

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ABSTRACT
A considerable difference in the prevalence rates of ear disease is evident between developed countries and developing countries. Some of the reasons for this disparity include the lack of regular screening programs for ear disease, poverty, malnutrition, ignorance and paucity of accessible health care and its proper utilization in developing countries. Taking into consideration the estimated sample size of 96 and the inclusion criteria, all children ranging from zero to five years of age consulting in ENT and Pediatric neurology OPD were recruited as study participants. Thus, a total of 100 children were included in this study and hence 200 ears were evaluated. Consanguinity in parents was in 36 cases (36%) out of which 26 (72.22%) were having hearing loss. Family history of hearing loss was in 15 cases (15%) out of which 12 (80%) were having hearing loss. Hyperbilirubinemia was in 12 cases (12%) out of which 6 (50%) were having hearing loss. Ear malformations was in 11 cases (11%) out of which 10 (90.91%) were having hearing loss.

INTRODUCTION

Hearing loss is a prevalent and significant disability that impairs functional development and educational attainment of children in developing countries. The detection and identification of hearing loss in pre-school and school age children has over the past decades, developed into an integral aspect of school health maintenance programs all over the world, more so in the west[1]. In India, school screening programs have been conducted since 1965 as per reports available. However, no annual screening programs for the detection of hearing impairment at a national or state level exists. Fisch (1981) argued that school screening is very effective and should be done in all areas of health aspects[2]. Studies in developed countries., like Finland (in 1986) reported a 2.5% prevalence rate of hearing impairment in school children., while another study in Denmark reports it as 11.57%. A study in Atlanta reported annual prevalence of 1.1 per 1000 children aged three to ten years[3]. A considerable difference in the prevalence rates of ear disease is evident between developed countries and developing countries. Some of the reasons for this disparity include the lack of regular screening programs for ear disease, poverty, malnutrition, ignorance and paucity of accessible health care and its proper utilization in developing countries[4]. Sporadic studies done targeting different sections of the community at different intervals of time from 1961-1992, report a prevalence of hearing loss in school children varying from 5.4%-34%. The National Sample Survey Organization (NSSO), Govt. of India, 1991 Report claims that in rural India, the prevalence rate of hearing impairment in children of age group zero to 14 years is 2.7%. In the same age group, urban statistics was 3.0%. Various studies done between 1996-2004 report prevalence ranging from 11.7-15.96% as compared to the earlier studies[5]. Studies in North India report a higher prevalence of hearing loss ranging from17.6%-34% while studies done in South India report a prevalence of hearing loss ranging from 8.3%-11.9%[6]. According to Indian Council of Medical Research (ICMR) survey of 1983, prevalence of hearing loss was 10.7% in rural areas and 6.8% in urban areas. The higher prevalence in rural population may be attributed to low literacy levels, lack of health awareness, superstitions and quackery prevalent in these areas.

MATERIALS AND METHODS

Study Design: Cross-sectional study.

Method of Data Collection: Children below 5 years of age consulting or referred to ENT OPD and Pediatric neurology OPD who fulfill the inclusion criteria of study are included after taking informed consent.

Sampling Procedure: All children fulfilling inclusion criteria, with informed consent from parents/guardian were enrolled in this present study.

Sample Size: Various studies showed the prevalence of hearing impairment in children as 60%.

$n=4pq/d^2$

Where,

n=sample size

p=60. I.e. Prevalence

q=100-P. i.e. 40.

d=Absolute error, 10

So,

n=4×60×40÷102.

n=96. Sample size will be 96.

Taking into consideration the estimated sample size of 96 and the inclusion criteria, all children ranging from zero to five years of age consulting in ENT and Pediatric neurology OPD were recruited as study participants. Thus, a total of 100 children were included in this study and hence 200 ears were evaluated.

Study Hypothesis: Hearing impairment are common among children which could be conductive or sensorineural in nature. Prevalence of hearing impairment and hearing sensitivity among children will help us to know the burden of disability among children of below 5 years of age group, hence early diagnosis and rehabilitative procedure can be started early which will help in speech and language development.

Selection Criteria:

Inclusion Criteria: Children of under five years of age with.

- Delay or no speech and language development.
- Inconsistent response to sound or inability to respond to sound.
- History of high risk factors.
- Deafness in the family.
- Consanguineous marriage in parents.
- Difficult/obstructed labor.
- Prematurity/low birth weight in infants.
- Administration of ototoxic drugs likes amino glycosides either in mother during pregnancy or in the child.
- Maternal infections like toxoplasmosis, rubella, cytomegalo virus, herpes.
- Children with ear malformations/infection.
- Children brought with concern of parents about hearing sensitivity, learning disability noticed in school/craniofacial malformations.

Exclusion Criteria:

- Children above 5 years of age.
- Cases refusing to give consent were excluded from our study.

RESULTS AND DISCUSSIONS

Table 1: Age Distribution

	Distribution (n=100)	
Age (Years)	**Number**	**Percentage**
Neonates	16	16%
1 month to <1 years	27	27%
1-3 years	38	38%
4-5 years	19	19%
Total	**100**	

Out of 100 cases neonates were 16 (16%), children of 1 month to <one year were 27 (27%), one to three years were 38 (38%), 4-5 years were 19 (19%). The average age was 1.72 years.

Table 2: Sex Distribution

	Distribution (n=100)	
Sex	**Number**	**Percentage**
Male	58	58%
Female	42	42%
Total	**100**	

Table 3: Associated Factors with Hearing Loss

	Distribution (n=100)		Cases with hearing loss	
Factors	**Number**	**Percent**	**Number**	**Percent**
Consanguinity	36	36%	26	72.22%
Family history of hearing loss	15	15%	12	80%
Hyperbilirubinemia	12	12%	6	50%
Ear malformation	11	11%	10	90.91%
Cerebral palsy	5	5%	5	100%
Mental retardation	4	4%	4	100%
Ototoxic drugs	4	4%	4	100%
Meningitis	3	3%	3	100%
Prolonged labour	3	3%	3	100%
Low birth weight	3	3%	2	66.67%
Respiratory distress	3	3%	3	100%
Maternal infections	2	2%	2	100%
Head injury	1	1%	0	-
Sepsis	1	1%	0	-

The Present Study Showed:

- Consanguinity in parents was in 36 cases (36%) out of which 26 (72.22%) were having hearing loss.
- Family history of hearing loss was in 15 cases (15%) out of which 12 (80%) were having hearing loss.
- Hyperbilirubinemia was in 12 cases (12%) out of which 6 (50%) were having hearing loss.
- Ear malformations was in 11 cases (11%) out of which 10 (90.91%) were having hearing loss.
- Head injury and sepsis were seen in 1% of 100 cases but with no hearing loss.
- Cerebral palsy was in 5 cases (5%), mental retardation in 4 cases (4%), ototoxic drugs in 4 cases (4%), meningitis in 3 cases (3%), prolonged labour in 3 cases (3 %), low birth weight in 3 cases (3%), respiratory distress in 3 cases (3%), maternal infections in 2 cases (2%), out of which all of them had hearing loss.
- The present study males were 58 (58%) and females were 42 (42%). Male preponderance was seen in our study.

Consanguinity: The present study showed consanguinity among parents in 36 cases (36%) out of which 26 (72.22%) were having hearing loss. A study conducted by Reddy M.V.V. in 2006 showed consanguinity in 22.36% and out of which 41.73% were hearing impaired. This shows high degree of prevalence in those with a history of consanguinity among parents[7] and genetic counseling is needed for parents for future pregnancy for association of consanguinity with hearing loss and various other syndromes. Genetic disturbances caused due to consanguinity disturb the pathway of Planar Cell Polarity (PCP), which is involved in the formation of the polarized structure of the auditory sensory organ and regulates the embryonic development[7].

Family History of Hearing Loss: Positive family history seen in 15 cases (15%) out of which 12 (80%) were having hearing loss. Saunders J. E. *et al.* study in 96 cases showed family history of hearing loss in 33%[8]. Another study conducted by Cone B. K. *et al.* in 6581 children reported 25% of cases positive family history[9]. Rout N *et al.* reported 9.27% with positive family history of hearing loss in 1000 cases[10]. This most likely directly reflects the inherent variations expected out of various epidemiological., geographical differences in various parts of the world.

Hyperbilirubinemia: In this study hyperbilirubinemia was noted in 12 cases (12%) out of which 6 (50%) were having hearing loss. Sculerati N *et al.* reported 0.6% of 168 cases with hyperbilirubinemia[11]. Roth D *et al.* reported hyperbilirubinemia in 4.7% of 337 cases with hearing loss[5,4].

Ear Malformation: Ear malformations were seen in 11 cases (11%) out of which 10 (90.91%) were having hearing loss. Two of the microtia cases showed right sided facial weakness but no other craniofacial malformations and systemic examination was normal. Hence these two cases were not attributed to any syndrome. In a study conducted by Cone B. K. *et al.* in 6581 children 4.2% reported with ear malformations[9]. Saunders J. E. *et al.* reported 8.3% of ear malformations in a group of 96 children[8].

Head Injury and Sepsis: In the present study, the head injury and sepsis were seen in 1% among each. The case which sustained head injury was of less severity and child did not have any hearing loss. Rout N *et al.* reported 8% in 1000 cases of sensory neural hearing loss with acquired postnatal head trauma[10]. Jerry Halpem reported 5% of 820 cases with sepsis in postnatal period[12]. Roth D *et al.* reported 17.8% of 337 cases with sepsis in postnatal period[13]. Since in the above studies sample size of cases was

substantially more than our sample size, the results of our study cannot be relatively compared. In this study cerebral palsy was seen in 5 cases (5%), mental retardation in 4 cases (4%), ototoxic drugs in 4 cases (4%), meningitis in 3 cases (3%), prolonged labor in 3 cases (3%), low birth weight in 3 cases (3%), respiratory distress in 3 cases (3%), maternal infections in 2 cases (2%), out of which all of them had hearing loss. Rout N *et al.* reported meningitis in 4%, respiratory distress in 11.49% in 1000 cases[10]. Halpem J. reported 10% of hearing loss in children with maternal TORCH infections in 820 cases[12]. Saunders J.E. *et al.* reported 4% of 96 patients with rubella and varicella infections, 31% with gentamicin exposure, 13% of 96 cases with history of low birth weight, 29% with respiratory distress at birth and meningitis in 12%[13,14]. Sculerati N *et al.* reported each 2% of 168 cases with cytomegalo virus infection, bacterial meningitis and low birth weight/prematurity[11].

CONCLUSION

Factors such as consanguinity among parents 36 cases (36%), positive family history of hearing loss 15 cases (15%), hyperbilirubinemia 12 cases (12%) and ear malformations 11 cases (11%) were seen in more number in the study population compared to other factors like cerebral palsy (5%), meningitis (3%), respiratory distress (3%), ototoxic drug usage (4%), mental retardation (4%), low birth weight (3%), head injury (1%), sepsis (1%).

REFERENCES

1. Kalpana, R. and P.C. Chamyal, 1997. Study of prevalence and aetiology of the hearing loss amongst school going children. Indian J. Otolaryngology Head Neck Surg., 49: 142-144.
2. Rao, R.S.P., M.A. Subramanyam, N.S. Nair and B. Rajashekhar, 2002. Hearing impairment and ear diseases among children of school entry age in rural South India. Int. J. Pediatr. Otorhinolaryngol., 64: 105-110.
3. Tuli, B.S., T.L. Parmar and S. Kumar, 1988. Incidence of deafness in school going children. Indian J. Otolaryngology, 40: 137-138.
4. Sharma H., V. Bhushan, D. Dayal and S. Mishra., 1992. Preliminary study of hearing handicap in school going children. Indian, J. Laryngol, Otol. Head, Neck, Surg. 1: 119-124.
5. Ashoor, A., 1983. Hearing levels of school children in Dammam. J. Laryngology Otology, 97: 37-41.
6. Hatcher, J., A. Smith, I. Mackenzie, S. Thompson and I. Bal *et al.,* 1995. A prevalence study of ear problems in school children in Kiambu district, Kenya, May 1992. Int. J. Pediatr. Otorhinolaryngol., 33: 197-205.
7. Reddy M.V.V., B.L. Hema, P.P. Reddy and R.P. Usha., 2006. Role of Consanguinity in Congenital Neurosensory Deafness Int. J. Hum, Genet., 6: 357-358.
8. Saunders, J.E., S. Vaz, J.H. Greinwald, J. Lai, L. Morin and K. Mojica, 2007. Prevalence and Etiology of Hearing Loss in Rural Nicaraguan Children. The Laryngoscope, 117: 387-398.
9. Cone, B.K., M. Wake, S. Tobin, Z. Poulakis and F.W. Rickards, 2010. Slight-Mild Sensorineural Hearing Loss in Children: Audiometric, Clinical and Risk Factor Profiles. Ear. Hearing, 31: 202-212.
10. Rout, N., S. Parveen, D. Chattopadhyay and M.T. Kishore, 2008. Risk factors of hearing impairment in Indian children: A retrospective case-file study. Int. J. Rehabilitation Res., 31: 293-296.
11. Sculerati, N., 2000. Analysis of a Cohort of Children With Sensory Hearing Loss Using the SCALE Systematic Nomenclature. Laryngoscope, 110: 787-798.
12. Halpern J., H. Hosford-Dunn and N. Malachowski., 1987. Four factors that accurately predict hearing loss in "high risk" neonates. Ear Hear., 8: 21-25.
13. Roth, D.A.E., 2006. Low prevalence of hearing impairment among very low birth weight infants as detected by universal neonatal hearing screening. Arch. Dis. Childhood, Fetal Neo. Edi., 91: 257-262.
14. Ross, D.S., S.N. Visser, W.J. Holstrum, T. Qin and A. Kenneson, 2010. Highly Variable Population-Based Prevalence Rates of Unilateral Hearing Loss After the Application of Common Case Definitions. Ear, Hearing, 31: 126-133.