

Present Scenario of Childhood Deafness: A Tertiary Level Health Care Study

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ABSTRACT

Introduction

Hearing loss is the most common sensory deficit in humans today. Approximately 63 million people in India suffer from significant auditory impairment.

Materials and Methods

Fifty children of 0-7 years age group, presented to a tertiary level center in Kolkata were assessed by objective and behavioural audiological tests.

Result

Mean age of presentation was found to be 40.5 months. No risk factor could be identified in 72% of the cases. 47% fell into the profoundly deaf category.

Discussion

Numerous studies agree that half of the infants with sensorineural hearing loss have no risk factors at birth and thus would be missed by a targeted hearing screening.

Conclusion

India certainly faces a worse situation regarding childhood deafness. Implementation of universal neonatal hearing screening along with pre-school hearing assessment can certainly change the scenario.

Keywords

Deafness; Child, Preschool; Incidence; Audiometry; Evoked Potentials, Auditory, Brain Stem; India

Hearing loss is the most common sensory deficit in humans today. As per WHO estimates in India, there are approximately 63 million people, who are suffering from significant auditory impairment; this places the estimated prevalence at 6.3% in Indian population. As per NSSO survey, currently there are 291 persons per one lakh population who are suffering from severe to profound hearing loss (NSSO, 2001). Of these, a large percentage is children between the ages of 0 to 14 years. With such a large number of hearing impaired young Indians, it amounts to a severe loss of productivity, both physical and economic. An even larger percentage of our population suffers from milder degrees of hearing loss and unilateral (one sided) hearing loss.¹

In countries like India, where “Universal Neonatal Hearing Screening” has not yet been established, only a small EHDI program under the ‘Project Deaf India’ started in 1998 in the city of Mysore by Dr. Rajendra Desai is in effect;² identification of children with PCHI is still dependent on parental or teacher suspicion,

locally arranged behavioural screening programmes and preschool screening. In a questionnaire based study in Nigeria, only 12 percent of parents of a child with hearing loss suspected hearing difficulty by the age of 6 months. Parental suspicion occurred mostly at 12 – 24 months, compared with 8 – 14 months in developed countries. The most common mode of detection was a child’s failure to respond to sound (49 percent).³

Review of literature

Permanent disabling hearing impairment (> 40 dBHL) significantly increases the global burden of disease on individuals, families, communities and countries at large,

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affecting about 250 million people worldwide as in the year 2005.⁴ There were 120 million people suffering from disabling hearing impairment when the World Health Assembly (WHA) passed a resolution on the Prevention of Hearing Impairment which asked member states to “prepare national plans for the prevention and control of major causes of avoidable hearing loss, and for early detection in babies, toddlers and children, as well as in the elderly, within the framework of primary health care” in the year 1995.⁵

The incidence of moderate to severe bilateral sensorineural hearing loss ranges from 1-2/1000 among healthy newborn infants⁶ to 4-5% in high risk newborns.⁷ But according to available published data, in India this picture seemed a little more grim. In India, 4 out of every 1000 newborns suffered from severe to profound hearing loss.⁸ Another community based disability survey supported by ICMR had detected the incidence of congenital hearing loss at 10/1000 in rural and 20/1000 in urban India.^{9,10} Another study more recently in rural Karnataka had revealed the figure of congenital hearing loss to be a staggering 8 children per 1000 screened.¹¹

Though the idea of early detection of deafness and subsequent early intervention was not new, it did not gain a strong foothold in India. Way back in 1971, Nikam and Dharamraj had attempted infant hearing screening.¹⁰ Thereafter, Basvaraj et al (1984), had carried out screening for hearing impairment in Bangalore.¹¹ In the year 1985, in Mumbai, the Ali Yavar Jung National Institute for the Hearing Handicapped had conducted a 3 year project on screening pre-school children for early identification and intervention of hearing loss, using the high risk register (HRR) approach.¹² Hearing screening of neonates has already gained momentum in those admitted in Neonatal ICUs in Wadia Children’s Hospital, Mumbai and AIIMS, New Delhi.¹³ But the effectiveness of these techniques, to identify early hearing impairment was already being questioned. The reason for this being that the above studies or procedures only took into account the high risk babies. Thus, leaving aside a large population of apparently healthy ‘non-risk’ babies. In practice, due to the difficulty experienced by maternity services in reliably identifying a family history of permanent childhood hearing loss, the proportion of the

target population identified by ‘at risk’ screening was rarely above 40 percent.¹⁷ Numerous studies agree that around half of all affected infants have no risk factors at birth and thus would be missed by a targeted hearing screening.^{18,19,20,21}

JCIH in its 2007 Position Statement suggested that “to maximize the outcome for infants who are deaf or hard of hearing, the hearing of all infants should be screened at no later than 1 month of age. Those who do not pass screening should have a comprehensive audiological evaluation at no later than 3 months of age. Infants with confirmed hearing loss should receive appropriate intervention at no later than 6 months of age from health care and education professionals with expertise in hearing loss and deafness in infants and young children.²²

Materials and methods

Study area: Department of ENT at a tertiary level health care center in Kolkata (W.B.).

Study period: January, 2014 – June, 2015.

Study sample: Fifty children (age group 0 – 7 years) attending the out-patient department with deafness.

Study design: Prospective, non-randomized trial.

Ethical clearance: Institutional ethics committee clearance was taken prior to the commencement of the study.

Study technique: A complete case history was obtained from the child’s parent or primary care giver which included developmental history, prenatal and perinatal history, risk factors for infant hearing loss and progressive / late onset hearing loss (JCIH, 2007), parent / caregiver’s judgments regarding responsiveness to sound in real world environments, performance at school and any other general ENT related complaints (otorrhea etc). Routine ENT examinations with special emphasis on Ear examination, Otoscopic evaluation and Examination under Microscope (EUM). Subsequently, all children below 7 years of age underwent click-evoked auditory brainstem response (CABR) and transient-evoked otoacoustic emission (TEOAE), and children between 3 and 7 years of age additionally underwent behavioural conditioned play audiometry (CPA).

Result and analysis

Among fifty children, 26 (52%) were male. The age at which the children were presented to us ranged from 5 months to as late as 7 years, i.e. 84 months. The mean age of presentation, irrespective of sex, is 40.5 months, whereas median age of presentation is 43 months. In male population, the mean age of presentation is 41.7 months and median 48 months; whereas, in females, mean is 39.1 months and median 36 months. Thirty six children (72%) hailed from urban region, where rest were from rural area.

Thirty children (60%) were delivered through normal vaginal route (NVD) and twenty (40%) were by caesarean section (CS). Regarding place of delivery it was found 46 deliveries (92%) were institutional (ID). Thirty seven children (74%) were presented to us with parental concern of hearing impairment (HI), 10 (20%) with non-development of speech (NDS) and 3 (6%) with poor academic performance at school (PPS), where respective teachers raised the concern. Parents of only 2 children (4%) gave history of delayed onset hearing loss. In majority (72%) cases, no definite risk factor could be assessed; whereas prematurity was found to be the leading cause (10%), followed by neonatal hyperbilirubinemia (6%). Two children with delayed onset hearing loss suffered from meningitis and head trauma respectively.

When correlation between the mode of delivery and the risk factors were done, it was found that –

1. In cases of normal vaginal deliveries (NVD) performed in institutions (n = 26), history of MS was found in 1 child, NHB in 2, PM in 3, and NRF in 18 children (69.23%).

2. If NVD is taken into account, whether delivered at home or institution (n = 30), it came out that NRF could be identified in 22 children (73.33%).

3. In cases of CS (n = 20), FHD and NHB were identified in 1 child each, HIE and PM were identified in 2 children each, and NRF in 14 children (70%).

When children delivered institutionally either by NVD (NVID) or by CS were compared using Chi-square test, the result was found to be insignificant (chi-square statistic – 0.0032,

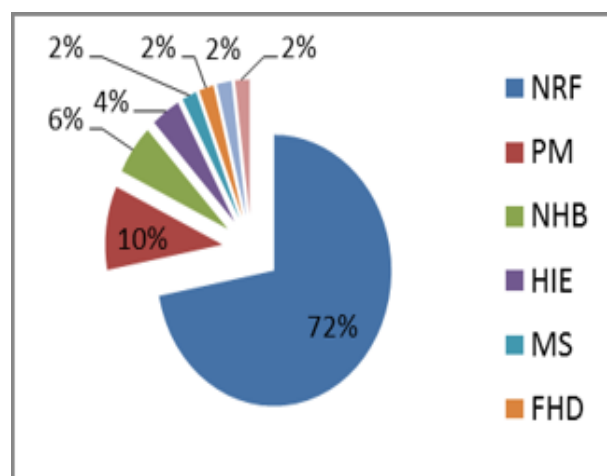


Fig. 1: Pie diagram showing possible etiologies; No risk factor (NRF) – 72%, prematurity (PM) – 10%, neonatal hyperbilirubinemia (NHB) – 6%, hypoxic ischemic encephalopathy (HIE) – 4%, and maternal syphilis (MS), family history of deafness (FHD), meningitis (ME) and head trauma (HT) – 2% each.

P value – 9.55176; significance level – 0.05).

Table I: Chi-square test showing comparison between NVID and CS, and NRF and risk factors present (RF).

	NVID	CS	MARGINAL ROW TOTALS
NRF	18 (18.09) [0]	14 (13.91) [0]	32
RF	8 (7.91) [0]	6 (6.09) [0]	14
Marginal Column Totals	26	20	46 (Grand Total)

Next, total NVD children (HD + ID) were compared using Chi-square test again. The result came out to be insignificant again (chi-square statistic – 0.0661, P value – 0.797046; significance level – 0.05).

Table II: Chi-square test showing comparison between NVD and CS, and NRF and RF.

	NVD	CS	MARGINAL ROW TOTALS
NRF	22 (21.6) [0.01]	14 (14.4) [0.01]	36
RF	8 (8.4) [0.02]	6 (5.6) [0.03]	14
Marginal Column Totals	30	20	50 (Grand Total)

In 0-3 years age group (n=20), all children were found to have cochlear deafness ranging from moderately severe to profound category. Wave V could not be recorded till 100 dBnHL in 11 children, placing them in profoundly deaf category. Overall, 50 children i.e. 100 ears were evaluated by TEOAE, cABR and CPA (pure tone average of 0.5, 1 and 2 KHz). No deafness (NoD) was found in 3 ears (include both ears of a child with auditory processing disorder and another with unilateral hearing loss) (3%), mild deafness (MiD) in 2 ears (2%), moderate deafness (MoD) in 7 ears (7%), moderately severe deafness (MoSeD) in 20 ears (20%), severe deafness (SeD) in 21 ears (21%), and profound deafness (PrD) in 47 ears (47%) (Fig. 2).

Discussion

The critical review (1997) of new born hearing screening carried out as part of the UK's Health Technology Assessment program revealed that the median age in the UK for moderate or greater bilateral congenital permanent hearing loss based on current screening tests was around 22 months. In the present study, the mean age of identification is 40.5 months and median age is 43 months, irrespective of sex, which is worse when compared to the international figure. No sex

preponderance was noted with male to female ratio being 1.08:1.

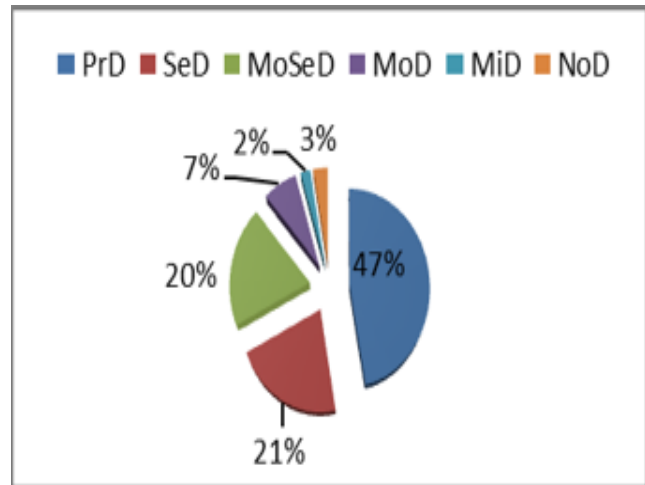


Fig. 2: Pie diagram showing severity of deafness in 100 ears (50 children); PrD – 47%, SeD – 21%, MoSeD – 20%, MoD – 7%, MiD – 2% and NoD – 3%.

A study conducted by the Department of Otolaryngology, PGIMER, Chandigarh²³ found the incidence of hearing loss is 6.31% in the urban group and 32.81% in the rural group. This is contradictory to the present study, where 72% hailed from urban area against the 28% from rural area. This difference may be because of two reasons. Firstly, the study conducted by IPGIMER was a screening program. Secondly, may be due to increased literacy, increased awareness and better accessibility to healthcare facilities in the urban population.

A hearing impaired child usually raises parental concern about not reacting to loud noises, not responding to their voice and / or making simple sounds that taper off.²⁴ These children also present with none or poorly developed speech.²⁵ Compromised outcome also noted to be associated with literacy²⁶ and educational achievement.²⁷ In this study, majority (74%) of the children presented with parental concern of hearing impairment, followed by non-development of speech (20%) and poor academic performance at school (6%).

A study by Naarden KV et al. titled “Prevalence and Characteristics of Children With Serious Hearing Impairment in Metropolitan Atlanta, 1991 – 1993”²⁷ showed that a probable etiology could only be found for

22% of cases born in the study area. E. Marlow, L. Hunt and N. Marlow²⁸ showed that prematurity is another risk factor for childhood sensorineural deafness. The present study can be well corroborated with these as in majority of the cases (74%), no risk factor could be identified, distantly followed by prematurity (10%).

When number of cases where an established risk factor was identified and in cases where no risk factor could be identified were compared between two groups of institutional normal vaginal delivery and caesarean section using Chi-square test, the result came out to be statistically insignificant. The result was insignificant even when all children delivered vaginally, irrespective of home and institutional delivery were compared with children delivered by caesarean section. This concludes, whatever may be the mode of delivery, home or institutional, normal vaginal delivery or caesarean section; all children bears the same risk of hearing impairment. This very well supports the fact why in universal neonatal hearing screening (UNHS) all children are given equal importance and why UNHS is better than High-risk Screen alone.^{17,18,19,20,21,29}

Lastly, when 100 ears were categorized, it was found that 47% had profound deafness, 21% had severe deafness and 20% had moderately severe deafness; whereas, moderate and mild deafness comprised only 7% and 2% respectively. This warns about the gloomy situation in India when compared to western part of the world.^{6,7,8,30,31} This may be because mild to moderate deafness are still overlooked in this country as these two groups are least likely to raise parental concern about their child's hearing impairment apparently.

Conclusion

The present study strongly recommends implementation of universal neonatal hearing screening; parental awareness of childhood deafness – its symptoms, its influence over child's development and potential benefits of early intervention; pre-school hearing assessment; and lastly awareness program of school teachers regarding early childhood deafness.

Compliance with ethical standards

Funding: The study was conducted in a Government aided institution where every facility is provided free of cost to the bearers.

Ethical approval: All procedures performed in this study were in accordance to the institutional ethical standards.

Informed consent: Informed consent was obtained from the parents of all children included in the study.

healthcare facilities in the urban population.

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