

International Journal of Biomedical Research

ISSN: 0976-9633 (Online); 2455-0566 (Print)

Journal DOI: [10.7439/ijbr](https://doi.org/10.7439/ijbr)

CODEN: IJBRFA

Original Research Article

**Challenges in the detection and intervention of childhood deafness:
Experience from a developing country**

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Abstract

The Objectives: To determine the age of suspicion, confirmation and amplification of hearing handicap in children and to assess the burden of parental delay in the evaluation of hearing loss.

Methods: A prospective study was done at a tertiary academic hospital in South India on 61 children with bilateral sensory neural deafness who either warrant hearing aid fitting for amplification or those hearing aids found ineffective. Any significant motor, visual, sensory or genetic disorders were excluded. Interviewer administered a questionnaire to the parents, guardian or older children for evaluations of their awareness and knowledge of the special needs.

Pure tone audiometry was done for all children older than 5 years and Auditory Brainstem Evoked Response (ABER) audiometry was done in those younger than 5 years and older children who were mentally challenged. All the children were prescribed hearing aid after a trial and those who were already aided were evaluated for the performance of the aid. From the data, the age of suspicion, identification and the amplification were determined. The various factors were noted; data entered and analyzed using Statistical Programme for Social Science (SPSS – Version 6). Design: Prospective case study

Results: The mean age in months at first suspicion, identification and the amplification was 19.59 months, 24.82 months and 29.28 months respectively. The average delays between the age of suspicion and identification was 5.23 months and the time interval between the identification and amplification was 4.46 months. In 70.48% of children the hearing loss was suspected after one year of age and only 1.6% have confirmed to have hearing loss and amplified before 6 months.

Conclusion: The substantial parental delay of suspicion and its subsequent delay in identification and the amplification of childhood deafness indicate that the attainable realistic goal of EHDI has not yet been achieved. Setting up EHDI through UNHS is a challenge in developing countries, however an unavoidable strategy. Hence cost effective national policies with community support should be considered to give greater chance of linguistic, psychological and social development to the hearing impaired children.

Keywords: Childhood deafness, suspicion, detection, amplification, developing country

1.Introduction

Childhood deafness is one of the most prevalent sensory disorders and often described as silent epidemic.[1] Out of 123 million babies that are born annually in developing countries, 7,37,000 are

born with permanent congenital early onset hearing loss.[2][3] The overall prevalence of hearing loss in various school surveys across the world ranges from 11.7% to 13 %.[4][5][6] Optimal speech and

language development is crucial at this age to maximize communicative competence and literacy development, the delay of which has negative impacts on psychosocial and cognitive skills.[7][8] Therefore early hearing detection and intervention strategy (EHDI) through Universal Neonatal Hearing Screening (UNHS) has been endorsed by the National Institutes of Health, the Joint Committee on Infant Hearing (JCIH) and the American Academy of Pediatrics.[9][10][11]

In developed countries, the current protocol follow UNHS with more than 95% - 98% screening rate and has proven to be beneficial for early detection of hearing loss and subsequent intervention that leads to linguistic, speech and cognitive development which is comparable to normally hearing peers.[12] Hence EHDI has become a standard practice in these countries. However the scenario is different in developing countries that do not have the prospect of screening or early detection either due to lack of professionals, resource constraints or delay in its detection.[13][14] In this part of the world, a bulk of the health expenditure is usually spent on curative measures as well as for treatment of life-threatening conditions; the rehabilitation and preventive care often receiving lesser financial attention. The achievement of EHDI goals depends on a strong political will in the form of allocation of funds and community awareness and this is often not the case in many developing countries.

In India 2 deaf babies are born every hour (1 in 2000 to 1 in 6000 live births).[15] The Prevalence of childhood hearing loss is between 11.7% and 12.5%.[16][17] A community based study of 284 children (1997) in our institution also noted almost a similar figure of 11.9%.[18] National government survey in 2003 reported there are 21.54 million children residing in India with hearing impairment with inadequate health care, 8.15 million being school going children.[19] Such a high prevalence of hearing loss necessitates strategies aiming to EHDI. However current situation reserve such screening facility available to predominantly in tertiary referral hospitals.[20][21] In places such as India, China and South Africa where UNHS has not yet been strongly implemented, hearing loss is often detected as a consequence of parental concerns regarding delays in speech and language development.[22] Inadequate data and lack of a national programme for the prevention of hearing impairment necessitate an organized plan to prevent and combat this problem in a structured fashion.[23] With this background this study was undertaken to find out the age of suspicion,

identification and amplification of hearing handicap in children in a tertiary center taken into consideration of parental awareness with the consistency of hearing aid usage.

2.Methods

A prospective study was done on 61 children (41 boys and 20 girls) in ENT department of Christian Medical College at Vellore in India. The criteria for enrollment was bilateral sensory neural deafness who either warrant hearing aid fitting for amplification or those who were already fitted with hearing aid but having inconsistent use or found ineffective. Any significant motor, visual, sensory or genetic disorders were excluded. Also those with surgically or medically correctable hearing deficits were not counted. A prior informed consent was sought before embarking into relevant audiological tests. Interviewer administered a questionnaire to the parents, guardian or older children for evaluations of their awareness and knowledge of the special needs.

Pure tone audiometry was done for all children older than 5 years and Auditory Brainstem Evoked Response (ABER) audiometry was done in those younger than 5 years and older children who were mentally challenged. Any discrepancies in the evaluation of hearing loss were confirmed by ABER. Neonatology and developmental pediatric consultation were sought in relevant cases to rule out systemic and genetic causes of hearing loss. All the children were prescribed hearing aid after a trial and those who were already aided were evaluated for the performance of the aid.

2.1 Statistical Analysis

From the data, the age of suspicion, identification and the amplification were determined. The various factors were noted; data entered and analyzed using Statistical Programme for Social Science (SPSS – Version 6).

3.Results

Audiological evaluation of all children indicated bilateral severe to profound degree of sensorineural hearing loss, 8.2% of them had associated middle ear effusion which was corrected before putting the hearing aid. Hearing loss was first suspected by parents in 54 (88.5%) children. Grandparents were the first to suspect the hearing deficit in 4 (6.6%) cases, teachers in two (3.3%) and the local guardian in one case.

In 44 (72.1%) children the presenting complaint was lack of response to noise. Delay in speech development or absent speech prompted parents to seek medical advice in 12 children (19.7%)

and five children showed inattentiveness in class room as revealed by the teachers.

The mean age at first suspicion was 19.59 months and the mean age of identification was 24.82 months (Table 1). The children were fitted with the hearing aid for amplification at a mean age of 29.28 months. The average delays between the age of suspicion and identification was 5.23 months and the time interval between the identification and amplification was 4.46 months (Table 2).

Only 29.5% of the cases were suspected to have hearing loss before one year of age, however only 9.79 % of them were confirmed the deficit in the same period. In 11.47 % cases, the hearing losses

were suspected and in 27.86 % the hearing loss were confirmed at a later age of 3 years or above (Table 3). Majority of the patients had referred to higher centers for hearing tests and or specialist therapy (44.3%) or was advised hearing aid (31.1%). However, 14.8% of them were advised to wait till the child gets older. Eighteen patients were already using hearing aid at the time of enrollment. 77% children were prescribed strong class Hearing aid. Though 27% of the patients were on hearing aid, all of them were represcribed due to suboptimal benefit. In 8%, even the strongest hearing aid was found not to be beneficial.

Table 1: Age ranges with the mean age of suspicion, detection an amplification of hearing loss in the study group (in months)

	Mean age	Minimum age	Maximum age	Standard Deviation
Suspicion	19.59	2	42	11.72
Confirmation	24.82	5	48	11.53
Amplification	29.28	6	56	11.78

Table 2: The average intervals and the mean ages of suspicion and detection, and detection and amplification of hearing loss in the study group (in months)

	Mean difference	
Suspicion-Confirmation	5.23	3.60
Confirmation-Amplification	4.46	4.47

Table 3: The table showing the percentage distribution of ages of suspicion, confirmation and amplification of hearing loss in months

	0-6	6-12	12-24	24-36	>36
Suspicion	6.55	22.95	39.34	19.67	11.47
Confirmation	1.6	8.19	59.01	3.27	27.86
Amplification	1.6	3.27	54.09	13.11	27.86

4. Discussion

There is a growing body of literature indicating the benefits in receptive and expressive language skills if intervene before 6 months of age supporting the early identification and intervention of hearing loss in children.[24][25][26][27] JCIH has pointed out that the intervention occur no later than 6 months of age who are deaf or hard of hearing, the infants perform as much as 20 -40 percentile higher on school-related measures (vocabulary, articulation, intelligibility, social adjustment, and behavior) and hence endorses EHDI programs through universal newborn hearing screening for early detection of hearing handicap and amplification.[8]

However In developing countries such as India the aural rehabilitation is initialed by the parents and often gets significantly delayed. Literature shows the age of suspicion of hearing loss ranges from 8 months to 12.5 months and the mean age of identification ranges from 13 months to 24 months. Those children were fitted with hearing aid at 26.5 months with the mean age of intervention at

33.0 months.[28][29][30][31] In a survey from Malaysia among parents of school-aged hearing impaired children indicated that majority of parents (68.6%) suspected hearing loss after one year of age, 41.3% being diagnosed after 3 years.[32] The mean age of delay from the time of suspicion to the detection of hearing loss ranges from 5 months to 12 months in various studies.[28][30][32][33][34] To the best of our knowledge only two similar studies have done earlier in Indian context. Rout et al in 2010 reported that the parents suspected hearing loss in their children at a median age of 1.5 years but confirmed at an average age of 2.4 years with a significant delay of 9 months.[22] In another study from eastern India, children with hearing impairment was detected at a mean age of 3.03 years and the aural habilitation commenced by a mean age of 7.3.[35] In our study, 29.5% % of the children were suspected to have hearing loss by the first year of age. However, only 9.79 % were confirmed during the same period. In majority of the children (90.14 %) the confirmation was later than 12 months of age.

The mean age at first suspicion was 19.59 months and the mean age of identification was 24.82 months (**Table 1**). The children were fitted with the hearing aid for amplification at a mean age of 29.28 months. The average delays between the age of suspicion and identification was 5.23 months (**Table 2**). These figures are later than the JCIH 2007 targets.[8][35] It was parents in majority of cases who suspected the hearing loss (88.5%) followed by grandparents (6.6%) and the teachers (3.3%). Robertson et al also identified that the parents were the first to suspect the possibility of a hearing loss in 58% case and it was 44% in Watkin's group.[31][36] The substantial delay in detection of hearing defect from the suspicion can be attributed to parental attitude, child rearing practices and the unjustified use of traditional wisdom as exemplified by previous studies in India.[22] Our study too reaffirms the importance of the parental history in suspecting the hearing loss in children. A parental attitudinal scale had been put forward by Kumar S et al as a screening tool which could help in understanding the feelings of parents about the hearing impairment of their child which serve as a guideline for counseling the parents for an early detection.[37]

In 1999, Mukhari et al reported that hearing aids were fitted with an average of 5.32 years and In Mauritius, the median age of fitting hearing of hearing aid was found to be 30 months.[30][32] In yet another study the average delay between diagnosis and hearing and fitting was 3 months.[34] In the article of Sjoblad et al, the interval was reported to be 8 months.[38] We have also noticed an undue delay in the amplification by putting hearing aid to those who have detected to have deafness with a mean age of 29.28 months. The average delay after confirmation was 4.46 months (**Table 2**). 29.5% patients were already using the hearing aid on arrival. On analyzing their usage, only 11% were consistently using the hearing aid. However, only 27.7% of the parents were of the opinion that the hearing aid was beneficial to their children. All these patients had to have a change in their hearing aid. Majority of the patients (44.3%) were referred to the higher centers while 31% of patients were advised hearing tests. However, 14.8% were advised to wait till the child gets older. This implies the myth that the hearing improves with age still prevails among health care providers. Even though the access to assistive technology such as hearing aids is a basic right for persons with hearing impairment, the affordability of it, chronic shortage of professionals and rehabilitative services, lack of awareness and the tropical climates that impact on life term of the hearing aid are the

challenges in developing countries.[39] Production of low cost ear moulds as do in China and India, loaner hearing aid banks, custom made two stage or one stage instant ear moulds, low cost rechargeable batteries or solar powered hearing aids, telehealth, awareness campaigns on the benefit of amplification, weather proofing hearing aids etc have been proposed as practical remedies.[39][40][41]

The implementation of UNHS is the most effective way to attain the goal of early detection before three months and intervention through interdisciplinary programme for infants before 6 months of age.[8] This has added benefit in developing country such as India as parental delay is an important factor in the detection of hearing defect, as parents are no longer likely to be initiating the identification process rather neonates would be screened for hearing loss before hospital discharge. However national priorities in developing countries will often be geared towards higher profile issues and cost effectiveness of such a programme in resource restrained situations are still not established.[42] In this context certain studies put forward alternative and viable cost effective strategies such as centralized screening facility to every hospital in the city, lower technology and lower cost developing world medical practices, and targeted newborn hearing screening (TNHS).[14][43][44] National health systems in most developing countries are too weak to bear the added burden without external technical and financial support and hence should have worldwide initiative to enhance the capacities of national health systems to implement national programme for early detection and intervention of childhood hearing loss consistent with and necessary for the existing campaigns of the World bank, UNICEF and UNESCO.[45][46]

It was found that the family involvement and age of enrollment have significant influence in language development and hence the involvement of family has a positive outcome for the development of children with hearing impairment. Also early interventional strategies depend on the attitude of parents or care providers, their motivation, responsiveness to the child, and the social support, all of which can influence long term outcomes.[27] It has also pointed out that the parents who become involved in intervention have been found to communicate better with their children and to contribute more to the child's progress than who do not participate in such programs. Hence effective intervention also should be family centered and parents need to consider from the time of amplification.[27][46]

5. Conclusion

The substantial delay of identification and the amplification of childhood deafness and relatively high prevalence of hearing impairment indicate that the attainable realistic goal of EHDI has not yet been achieved. It may be consequent on lack of parental knowledge about the handicap and its identification, dearth of hearing healthcare professionals and resource constraints. Setting up EHDI through UNHS is a challenge in developing countries, however an unavoidable strategy. Hence cost effective national policies with a well structured scientific educational programme with community support should be considered to give greater chance of linguistic, psychological and social development to the hearing impaired children.

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