



A STUDY ON HEARING IMPAIRMENT AND ITS DEMOGRAPHIC DISTRIBUTION – A HOSPITAL BASED ANALYSIS

ENT

Dr. Mukul Patar Associate Professor Dept. of ENT, Jorhat Medical College

Dr. Rupanjita Sangma* Associate Professor Dept. of ENT, Jorhat Medical College*Corresponding Author

Dr. Hiranyaprova Saikia Professor & HOD, Dept of ENT Jorhat Medical College

Mr. Gautam Kalita Audiologist, Jorhat Medical College

ABSTRACT

Aim: This study aims to evaluate nature and distribution of hearing loss in patients attending a tertiary health care centre and to get knowledge about its magnitude and demographic distribution.

Materials and Methods: Retrospective study was conducted to describe the audiological findings in terms of degree and type of hearing loss in patients reported to Jorhat Medical College & Hospital, Jorhat, Assam over a period of three years (2015 to 2017) and effects of age and gender on the audiological profiles of the patients were also analysed.

Results: Audiological data (pure tone audiometry, BERA and tympanometry) of total 4815 patients were examined and reviewed for demographic details and for type and degree of hearing loss. 2002 cases (41.57%) were females and 2813 (58.42%) males (male:female; 1.4 : 1). Age range was 6 months – 87 years, with a mean age of 33 years (SD: 34.91). Paediatric age group (6 months to 14 years) constituted around 17.69%, adult group (15 – 60 years) 68.99 %, while the older adult including geriatric (61 years and above) group was 13.31%. Highest 30.01% presented with severe degree hearing loss, 23.32% with mild degree, 18.27% moderate degree, 12.77% moderately severe and 4.85% with profound degree hearing loss. Conductive hearing loss was highly observed followed by sensorineural in second place. Conductive type and severe degree (30.01%) of hearing loss were found to have higher prevalence compared to other types and degrees of hearing loss. Among the major causes of hearing impairment recorded the ear diseases contributed highest to 81.41% cases.

Conclusion: Severe degree of hearing loss is still prevalent in the communities and there is a strong need for identification and evaluation of hearing loss cases in community level and to implement effective rehabilitation programs. The major contributors or causes of hearing impairment among children, are largely preventable at primary or community care level.

KEYWORDS

Prevalence, Hearing Loss, Audiological Evaluation.

Introduction:

Ear diseases and hearing loss are generally neglected in most of the low and middle income countries. According to World Health Organization (WHO) about 360 million people worldwide have disabling hearing loss [328 million adults and 32 million children] (Abdulazeez A. et al., 2016). It is observed that the burden of disabling hearing impairment among both children and the elderly is thought to be greatest in the Asian Pacific area, southern Asia and sub-Saharan Africa'. Despite the improvement in education, immunization uptake and availability of primary and comprehensive health centres both in rural and urban India, it is troubling to observe that avoidable and preventable causes of hearing impairment are still prevalent. In India, as per the definition of 'hearing disability' published in Persons with Disability Act (PWD) 1995, the hearing disabled person should have hearing loss of 60 dB or more in the better ear for conversational range (500hz to 4000hz) of frequencies. Hearing loss is the second most common disability comprising of 18.9% of persons with disability and top most cause for the sensory deficit in the world². Prevalence of hearing disability is the highest (0.60%) when compared to other disabilities. In India, in children between 0-4 years, incidence is 0.28% and 5-9 years (0.32%) (Census of India, 2011). Incidence of congenital hearing loss in India is 5.6 per 1000 births (Nagapoomima et al., 2007 as cited in Ravi D. et al. 2017). In India, 63 million people (6.3%) suffer from significant auditory loss. India is also burdened with the highest prevalence of children with chronic suppurative otitis media (World Health Organisation [WHO], 2004), a common cause of acquired hearing loss.

Institution-based hearing screening programs are on the increase and are a welcome initiative. These studies have the advantage of a group of professionals attending patients and complete evaluation is possible over survey-based studies³. Though information obtained from Institutions may not represent the community at large or the study population, but accuracy of evaluation provides value to results and observations from these studies. So, there is a need for region and community based studies to properly plan evaluation programs and rehabilitation programs at the community level and also at national level. As per the census of the year 2011, total population of Jorhat

District of Assam is 10,91,295. But, to mention that our Hospital is the only Institute of Jorhat district and its neighbouring districts of Assam where modern audiological testing facilities available till date. In order to reach the country at large, the Ministry of Health and Family Welfare, Government of India, in 2006, launched the NPPCD (National Programme for Prevention and Control of Deafness) to promote early identification and prevention of congenital and acquired hearing loss.

Acoustic stimulation in the first 18 months of life is very crucial for the development of central auditory pathway (Finitoz, Albright, O'Neal, 1998 as cited in Grill et al., 2006, page 1). Early identification and intervention of hearing impairment is always necessary to avoid delayed development of speech and language. This delay is not easily recovered when rehabilitation is provided later than 2 years of age (Grill et al., 2006 as cited in Ravi D et al., 2017). If detected early, majority of hearing loss and its sequelae can be prevented or avoided. Congenital and/or child-onset hearing loss is also a concern as many cases of hearing loss can be found among children with risk factors such as: low birth weight, birth asphyxia, low socioeconomic status, lack of hygiene, respiratory tract infections, among others⁴.

In the recent years Govt. of India has launched many programs to provide hearing device like hearing aids, cochlear implants free of cost. However, the prerequisite for these programs is the evidence-based information on nature of hearing loss (type and degree) and prevalence across gender and age groups. Therefore, knowledge about the magnitude of hearing loss, the need for preventive measures, early diagnosis and intervention cannot be overemphasized⁵.

Aims & Objectives:

The aim of present study is to evaluate nature and distribution of hearing loss in patients attending a tertiary health care centre and to get knowledge about the magnitude and demographic distribution of hearing impairment.

Materials and Methods:

The present retrospective study was conducted to describe the

audiological findings in terms of degree and type of hearing loss in patients reported to Jorhat Medical College & Hospital, Jorhat, Assam over a period of three years (1st January 2015 to 31st December, 2017). In the same time, the effects of age and gender on the audiological profiles of the patients were also examined.

Data Management-

Audiometric data of pure tone audiometry, impedance audiometry and BERA of total 4815 patients who attended the audiology section, Department of Otorhinolaryngology from January 2015 to December 2017 were collected and analysed. The participants were in the age range of 6 months to 87 years and majority from Jorhat district of Assam. Demographic details such as age and gender, type and degree of hearing loss were retrieved from the audiogram copies, BERA and tympanometry reports. Age and gender-wise comparisons with different type and degree of hearing loss were then conducted. Patients with incomplete audiometric results and demographic details were excluded from our study.

Procedure-

Patients who visited Department of Otorhinolaryngology and Head and Neck Surgery, Jorhat Medical College and Hospital with complain of hearing impairment were examined clinically and a brief case history was taken for every patient. The patients were then taken to Audiological Unit, where pure tone audiometry, BERA and/or tympanometry were done depending on their age, provisional clinical diagnosis and subjective behavior. BERA was performed as per standard procedure in a sound-treated room using the BERA equipment 'MEDULLA 201'. For all the patients advised for BERA, preparatory instructions for BERA were given on first visit and testing was conducted on subsequent visit. In pure tone audiometry Hughson-Westlake procedure was used for estimation of air and bone conduction thresholds and it was performed in a sound-treated room using 'MAICO – MA52' audiometer. Here, testing was conducted on the first day of their visit. Speech Reception Threshold and Speech Identification scores were also measured. The degree of hearing loss was divided into - hearing within normal limit, mild, moderate, moderately severe, severe and profound hearing loss. The patients were divided into three age groups - 6 months to 14 years, 15 to 60 years and 61 years and above. The three types of hearing loss considered for analysis were conductive, sensorineural and mixed hearing loss.

Results:

A total of 4815 patients were examined and tested for hearing loss by BERA and pure tone audiometry. To accomplish the objectives of the study a total of 4591 audiograms and 224 BERA reports were reviewed for demographic details like age, gender and details like type, degree of hearing loss evaluated. Out of total 4815 cases, 803 cases had also undergone tympanometry testing in addition to PTA and/or BERA and their test results were also reviewed for possible causes of hearing loss. In our study, 2002 cases (41.57%) were females and 2813 (58.42%) males, giving male preponderance (male:female; 1.4 :1) (Table -1). Patients age range was 6 months – 87 years, with a mean age of 33 years (SD: 34.91) (Table - 2). Among the total cases reviewed, 4297 cases (89.24%) found to have hearing loss, while other 518 cases (10.75%) had hearing within normal limit.

Table: 1. Sex distribution of participants

SL. No.	Sex	Frequency	Percentage
1	Male	2813	58.42 %
2	Female	2002	41.57 %
	Total	4815	

In the present study, paediatric age group (6 months to 14 years) constituted around 17.69% , whereas adult group (15 – 60 years) was 68.99 % , while the older adult including geriatric (61 years and above) group was 13.31%. In severity of hearing loss, out of total 4815 cases, highest 1445 cases (30.01%) presented with severe degree hearing loss , 1123 cases (23.32%) with mild degree, 880 cases (18.27%) moderate degree , 615 cases (12.77%) moderately severe and lastly 234 cases (4.85%) presented with profound degree hearing loss. In our study, among the three types of hearing loss, conductive hearing loss was highly observed followed by sensorineural hearing loss in second place and mixed hearing loss in third place. It is also observed that,

conductive type and severe degree (30.01%) of hearing loss were found to have higher prevalence compared to other types and degrees of hearing losses irrespective of age and gender (Table - 3).

Table: 2. Age Distribution of participants

SL. NO.	Age	Frequency	Percentage
1	6 months -5 years	174	3.61 %
2	6 – 14 years	678	14.08 %
3	15 – 60 years	3322	68.99 %
4	61 years and above	641	13.31 %
	Total	4815	

Table: 3. Distribution of Severity of hearing loss pattern among participants

SL. NO.	Degree of Hearing Loss	No. of cases	Percentage
1	Hearing Within Normal Limit (0 – 25 dB)	518	10.75 %
2	Mild Hearing Loss (26 – 40 dB)	1123	23.32 %
3	Moderate Hearing Loss (41 – 55 dB)	880	18.27 %
4	Moderately Severe Hearing Loss (56 – 70 dB)	615	12.77 %
5	Severe Hearing Loss (71 - 90 dB)	1445	30.01 %
6	Profound Hearing Loss (91+ dB)	234	4.85 %
	TOTAL	4815	

In paediatric (6 months - 14 years) age group, conductive type and mild degree hearing loss were highly prevalent followed by sensorineural and severe degree of hearing loss. Similarly, the sensorineural hearing loss had the highest frequency of occurrence in the adult group (15 – 60 years) followed by conductive hearing loss. In addition, in adult and geriatric age group, there was higher occurrence of severe sensorineural hearing loss followed by mixed hearing loss, a second higher frequency. In the present study it was also observed that, the conductive and severe degree of hearing loss had the least prevalence in older adults and geriatric population. In our study, the major causes of hearing impairment recorded were ear diseases in highest 3920 cases (81.41%), genetic causes 191 (3.96%), undetermined or unknown causes 134 (2.78%) and infectious diseases 52 cases (1.07%) (Table -4).

Table: 4. Major causes of hearing impairment observed among different age groups.

SL NO.	Causes of hearing impairment	6 months – 5 years of age	6 – 14 years of age	15 – 60 years of age	61 years and above	Total
1	Normal ears/ hearing	98(56.32 %)	105(15.4%)	315 (9.4%)	NIL	518
2	Ear disease	44(25.2 %)	527(77.7%)	2737(82.3 %)	612(95.4 %)	3920
3	Infectious diseases	3 (1.7%)	9 (1.3%)	38 (1.1%)	2 (0.3%)	52
4	Genetic conditions	18 (10.3%)	19 (2.8%)	137 (4.1%)	17 (2.6%)	191

DISCUSSION:

In the present study it is seen that hearing loss was proportionally higher in adults between the ages of 15-60 years compared to children (< 14 years of age). There were more male participants (58.42%) than females (41.57%) (table - 1). Out of total 4815 cases, “disabling hearing loss” (≥60 dB in better ear, as per PWD Act. 1995) was recorded in 1498 cases (31.11%). Many studies conducted on this subject reveal male preponderance in hearing loss prevalence 5,6,7,8,9. Hospital based study conducted by Ravi et al., (2017)³ reported high prevalence of hearing loss in males (56.87%) compared to females (43.13%). Another institution based study

conducted by Devadiga et al (2013)⁶ reported the prevalence of auditory disorders to be 62% (among communication disorders) in Manipal, Karnataka. Hospital data based study conducted by Balasubramanian et al (2015)⁷ at Tanjavur, Tamilnadu and Kanjekar et al (2015)⁸ in Bidar, Karnataka have also revealed a high prevalence of hearing loss in males compared to females. They also found the sensorineural hearing loss to be present more in elderly individuals and conductive hearing loss to be present more in younger individuals. A study conducted by Kulakarni et al (2014)¹⁰ in Nashik district, Maharashtra, revealed Chronic Suppurative Otitis Media (CSOM) to be highly prevalent in females. Study conducted by Sinha SK et al.5 in rural parts of Gujarat revealed prevalence rate of ear related problems to be 3.3%. Saud et al (2014)¹¹ in his study conducted in schools of Ghaziabad, Jammu and Kashmir revealed the incidence of hearing loss to be 9.3%. A review by some Authors (Olusanya BO et al., 2005) in Southwestern Nigeria also reiterates that permanent childhood hearing loss is a significant health problem and its detection through screening is feasible in target populations¹².

In the present study, among different type of hearing loss, severe degree (30.01%) and sensorineural hearing loss had higher prevalence followed by mild degree (23.32%) and conductive hearing loss. A study conducted by Saud et al (2014)¹¹ reported high prevalence of mild degree (34.41%) and conductive hearing loss (87.10%) in school going children in the age range of 6 - 12 years (N = 1000). Whereas, Kalpana and Chamyal (1997)¹³ found Chronic Suppurative Otitis Media (CSOM) as the prime cause of hearing loss in school going children in the age range of 4 to 17 years (N = 1200). These studies reported lower socio-economic state as one of the major cause of this observation.

In paediatric population, presence of hearing loss increases the risk of speech-language, academic, psychosocial and emotional difficulties compared to normal peers^{14,15,16,17,18}. In the present study the paediatric age group (6 months to 14 years) has constituted 17.69% of the total cases. In our study, out of total 4297 cases found to have different degree and type of hearing loss, 649 cases (15.10%) were from paediatric population. Study conducted by Ravi et al (2017)³ reported hearing loss only in 5% cases of paediatric age group (1 - 14 years), whereas adult group 35.23%, older adult group 35.91% and geriatric group was 23.86% of total population. Dunmade et al. in a retrospective study in Ilorin, also reported a high proportion of hearing loss (28.7%) among children 1-3 years of age in their study group¹⁹.

The present study revealed a higher prevalence of hearing loss in adults (68.99%) and elderly individuals (13.31%). Sensorineural hearing loss was found to be more in adults and elderly population compared to paediatric group. Studies conducted by Kanjekar et al (2015)⁸ and Balasubramanian et al (2015)⁷, are in agreement with the present study. The possible reasons for present observation may be the presbycusis, commonly witnessed in older individuals^{3,7,8}.

In our study, among different causes of hearing impairment, ear diseases was ranked highest in 3920 cases (81.41%) compared to other causes. Study conducted by Abdulazeez Ahmed et al (2016) in a semi-urban community in North-Western Nigeria, recorded ear diseases highest in 38.5%, unknown causes 16.5%, infectious diseases 11.0% such as measles, meningitis and probably rubella²⁰. Genetic/hereditary causes accounted for about 3.96% in our study, while it was 3.3% in study conducted by Abdulazeez Ahmed et al.20 and less than 2% in the study conducted by Al Khabori M et al. (2007) in Saudi Arabia²¹. Different congenital or genetic causes may be considered responsible for genetic origin hearing loss appearing at birth or later part of life. Although consanguinity is not common in India, involvement/affection of a first degree relative, a history of consanguinity in a subject adjudged to have hearing loss is considered genetic/hereditary in origin (Abdulazeez Ahmed et al., 2016)²⁰. Unknown/undetermined causes accounted for 2.78% of total patients, much less than studies conducted by Al'shazhahi I. et al.²² and Abdulazeez Ahmed et al.²⁰. The possible reasons for this observation may be development of different modern diagnostic procedures/tests for early detection, treatment and prevention of otological diseases.

Community based study conducted by Abdulazeez A. et al. observed ear diseases that contributed greatly to hearing impairment especially among children were chronic suppurative otitis media 35(38.5%), followed by wax 19 (20.9%), otitis media with effusion 10 (11.0%),

acute otitis media 7 (7.7%), otitis externa 6 (6.6%), and foreign body 2 (2.2%). In our study also, ear diseases were the commonest causes of hearing loss and this is corroborated by several studies²², with perhaps poverty as a common contributory factor^{23,24}. Among the ear diseases, chronic suppurative otitis media (CSOM) followed by wax (mostly impacted) accounted for the first and second highest contributors to hearing impairment respectively and almost similar to results observed by Abdulazeez A. et al.(2016)²⁰. Reports from some other studies had shown cerumen way ahead of CSOM as the commonest contributor to hearing loss^{25,26,27}. Considering the above results, programs for early identification of hearing loss in the form of school screening programs are advocated as long-standing hearing loss may lead to auditory deprivation and its sequelae³. Similarly, in adults and elderly people, hearing loss may have an adverse effect on quality of life and overall functioning^{28,29}.

Conclusion:

The prevalence of hearing impairment in the community may be quite high and calls for concerted efforts by relevant authorities to reduce the burden of hearing loss in the communities. Therefore, need for a national survey on hearing impairment in the communities, considering the current risks in our environment cannot be overemphasized. Recently, recruitment of professionals under National Program for Prevention and Control of Deafness (NPPCD) in the state of Assam, India has increased access to evaluation facilities for hearing loss. It is observed that chronic suppurative otitis media, eustachian tube dysfunction/otitis media with effusion and wax (mostly impacted) are the major contributors to hearing impairment among children, which may have serious impact on their future, affecting speech-language, academics and social behavior. These factors are largely preventable at primary or community care level. As high prevalence of severe degree of hearing loss is found in the present study, there is a strong need for identification and evaluation of hearing loss cases in community level and to implement effective rehabilitation programs.

References:

- [1] World Health Organization. Global estimates on prevalence of hearing loss. Geneva, Switzerland: World Health Organization; 2012 [January 8, 2015]; Available from: http://www.who.int/pbd/deafness/WHO_GE_HL.pdf?ua=1.
- [2] Mathers C, Smith A, Concha M. Global burden of hearing loss in the year 2000. *Global Burden of Disease 2000*; 8(4):1-30.
- [3] Ravi D, Hanumanth PM, Lakshmi MS, Sahana P. A tertiary care hospital-based retrospective study evaluating age and gender differences in audiological findings. *J. Evolution Med. Dent. Sci.* 2017; 6(21):1678-1682.
- [4] Ullauri A, Smith A, Castrillon R, Salazar C, Garces P. WHO Ear and Hearing Survey-Ecuador 2009. *Otolaryngology -- Head and Neck Surgery.* 2010; 143 (2 suppl): P254.
- [5] Sinha SK, Shivaswamy J, Barman A, et al. Prevalence of communication disorders in a rural population at taluq level of Gujarat, India. *Clinical Epidemiology and Global Health* 2016.
- [6] Devadiga D, Varghese AL, Bhat J. Epidemiology of communication disorders and its role in rehabilitation. *International Journal of Innovative Research and Development* 2014;3(13).
- [7] Balasubramanian GK, Thirunavukkarasu R, Kalyanasundaram RB, et al. Assessment of hearing status by pure tone audiogram-an institutional study. *International Journal of Otolaryngology and Head & Neck Surgery* 2015; 4 (5):375-80.
- [8] Kanjekar S, Doddamani A, Malige R, et al. Audiometric analysis of type and degree of hearing impairment and its demographic correlation: a retrospective study. *Journal of Advanced Clinical & Research Insights* 2015;2:189-92.
- [9] Konadath S, Chatni S, Lakshmi MS, et al. Prevalence of communication disorders in a group of islands in India. *Clinical Epidemiology and Global Health* 2016.
- [10] Kulkarni S, Burse KS, Patil D, et al. Retrospective study of clinical profile of patients with chronic suppurative otitis media at a tertiary health centre. *MVP Journal of Medical Science* 2014;1(1):7-12.
- [11] Saud LC, Sajad H, Lateef I, et al. A prospective study of hearing impairment in school going children of Ghaziabad city attending a tertiary care hospital. *Online J Otolaryngol* 2014;4(4):28-41.
- [12] Olusanya BO, Luxon LM, Wirz SL. Screening for early childhood hearing loss in Nigeria. *J. Med Screen.* 2005; 12: 115-8.
- [13] Kalpana R, Chamyal PC. Study of prevalence and aetiology of the hearing loss amongst school going children. *Indian J Otolaryngol Head Neck Surg* 1997; 49(2):142-4.
- [14] Davis JM, Elfenbein J, Schum R, et al. Effects of mild and moderate hearing impairments on language, educational, and psychosocial behavior of children. *J Speech Hear Disord* 1986;51(1):53-62.
- [15] Crandell CC. Speech recognition in noise by children with minimal degrees of sensorineural hearing loss. *Ear Hear* 1993;14(3):210-6.
- [16] Bess FH, Dodd-Murphy J, Parker RA. Children with minimal sensorineural hearing loss: prevalence, educational performance, and functional status. *Ear Hear* 1998;19(5):339-54.
- [17] Most T. The effects of degree and type of hearing loss on children's performance in class. *Deafness & Education International* 2004; 6(3):154-66.
- [18] Daud MK, Noor RM, Rahman NA, et al. The effect of mild hearing loss on academic performance in primary school children. *Int J Pediatric Otorhinolaryngol* 2010;74(1):67-70.
- [19] Dunmade AD, Segun-Busari S, Olajide TG, Ologe FE. Profound bilateral sensorineural hearing loss in Nigerian children: any shift in etiology? *J Deaf Stud Deaf Educ* 2007; 12 (1): 112-8.

- [20] Abdulazeez A, Hamisu A, Nafisa BM, Emmanuel SK, Kazeem J, Mustapha S, Lateef L, Mohammed S, Haruna K, Abdulhakeem AA, Abdulrazak A, Muhammad GH, Fatimah IT. Hearing Impairment in a Semi-urban Community in North-Western Nigeria. *European J. of Preventive Med.* 2016;4(5):113-119.
- [21] Al Khabori M, Khandekar R. Unilateral hearing impairment in Oman: a community-based cross-sectional study. *Ear, nose, & throat journal.* 2007; 86 (5): 274, 7-80. Epub 2007/06/22.
- [22] Al'shardzhabi I, Tsygankova ER. The prevalence of hearing impairment among the elementary school pupils in the city of Sana, the capital of Yemen. *Vestn Otorinolaringol.* 2014 (2): 54-7. Epub 2014/05/02.
- [23] Yiengprugsawan V, Hogan A, Strazdins L. Longitudinal analysis of ear infection and hearing impairment: findings from 6-year prospective cohorts of Australian children. *BMC pediatrics.* 2013; 13: 28. Epub 2013/02/26.
- [24] Czechowicz JA, Messner AH, Alarcon-Matutti E, Alarcon J, Quinones-Calderon G, Montano S, et al. Hearing impairment and poverty: the epidemiology of ear disease in Peruvian schoolchildren. *Otolaryngol Head Neck Surg.* 2010; 142 (2): 272-7. 119 Abdulazeez Ahmed et al.: Hearing Impairment in a Semi-urban Community in North-western Nigeria.
- [25] Ahmed AO, Kolo ES, Abah ER, Oladigbolu KK. An appraisal of common otologic disorders as seen in a deaf population in North-Western Nigeria. *Annals of African Medicine.* 2012; 11 (3): 153-6.
- [26] Adhikari P, Kharel DB, Ma J, Baral DR, Pandey T, Rijal R, et al. Pattern of otological diseases in school going children of Kathmandu valley. *Arq Int Otorhinolaringol.* 2008; 12: 502-5.
- [27] Garg S, Chadha S, Malhotra S, Agarwal AK. Deafness: Burden, prevention and control in India. *The National Medical Journal of India.* 2009; 22: 79-81.
- [28] Laforge RG, Spector WD, Sternberg J. The relationship of vision and hearing impairment to one-year mortality and functional decline. *J. Aging Health* 1992;4(1):126-48.
- [29] Mulrow CD, Aguilar C, Endicott JE, et al. Association between hearing impairment and the quality of life of elderly individuals. *J Am Geriatr. Soc* 1990;38 (1):45-50.