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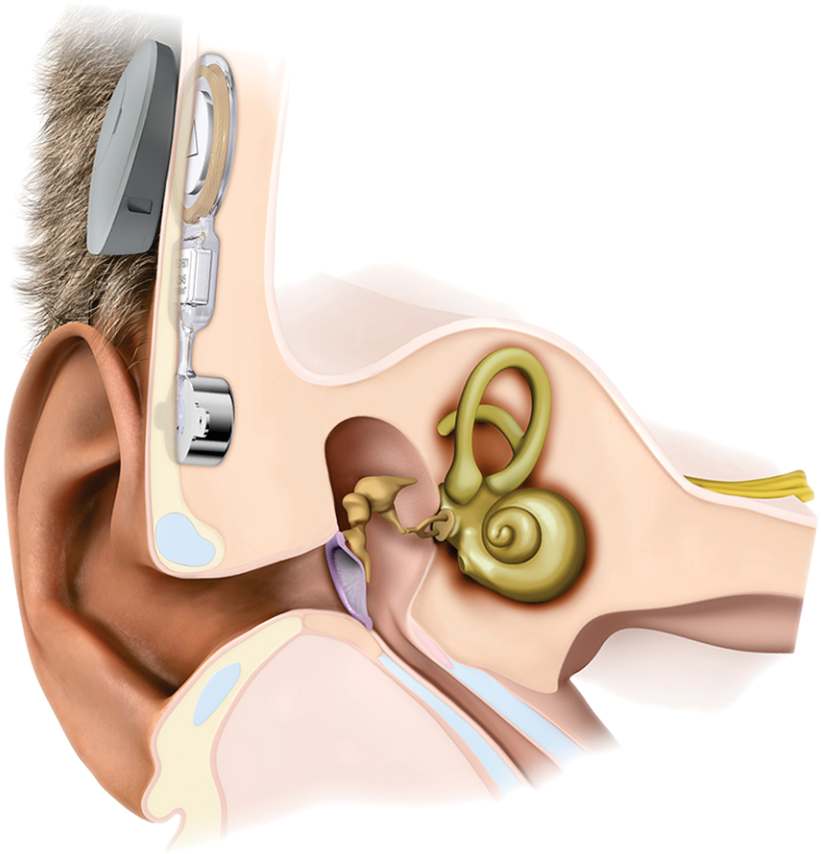
ISAM JOURNAL

Where Ear Meets Hearing

# JOURNAL

## INDIAN JOURNAL OF AUDIOLOGY



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- Setting up public professional interface for wider spread of services to affected people.
- Industry-Institution partnership for contemporising Audiology education.
- Referral Network of clinical establishments for optimal use of the Super Specialized Facility available in India
- Promoting local Researchers and local Academicians.
- Events to promote the profession and showcase the best available practices.
- Bringing all the stakeholders together for making common cause of Clinical Development.

*World Hears Better...!!!*

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Chairman

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# Editorial

**Prof. Satya Mahapatra**
**Director**

A determination to go ahead in spite of deterrents leads to success in the chosen venture, leads to learning new ways of doing things, leads to innovations and solutions. When the ISAM Journal was first published as a registered journal in 2010, it was to establish itself as the Indian Journal of Audiology. The focus was to establish a platform for showcasing Indian talents, Indian R & D, Indian academic excellence and Indian solution to the professional problems in Audiology and Audiological rehabilitation. But the task of mobilisation of resources and resource persons became increasingly tricky. You have to understand the Indian mindset to succeed in collective efforts. Typical issues that affect adversely the best of the agenda and puts the noblest intention to test had to be handled innovatively.

The Indian hearing care industry faced unprecedented aggressiveness and competition for commercialisation success. Somewhere in the rush for quick gain, the R & D was delegated the backseat. There were few takers for the industry institution partnership. Collaboration activities for delivery of services or increasing the reach of the professionals to far flung areas in India didn't receive any special focus or importance. The increasing cost of hearing instruments made people focus on quick gains, rather than optimal services and ideal solutions to the need of the clients. Conflict of interest has led to Audiologists fighting with other professionals rather than building team with clarity on the scope of practice. While Audiologists were suspiciously viewing the Otolaryngologist, Neuro-otologists, Special Educators in India, the world has moved to Intra operative monitoring (IOM) by the Audiologists.

The benchmarking of independent clinical practitioner at the level of Doctor of Audiology would have given the Audiologist the recognition and skill level to operate and co-exist with other medical and rehabilitation professional with a sense of pride and dignity. Instead, the focus has remained at creating more low skilled workers. Unfortunately, the AuD program is yet to start at Indian Universities. Even the Rehabilitation Council of India has not yet taken decision on benchmarking the service delivery at Doctorate level. The Audiologist thus faces an identity crisis at Hospital or Medical College set up, whether to be addressed as a doctor or to be treated as tech-professional. The intellectual leadership in the profession is inconspicuous with its confusion.

When you isolate the problem, you can dare to thrash it out for a solution. The problems that are confusing the professional fraternity are not impossible to solve. It is just that the leadership required to bridge the gap, bring relevant agencies, statutory bodies, policy planners and professional fraternity together to shape the future and give a direction of growth and progress. The dawn is certain no matter how dark is the night. India will make its presence felt in the global arena. So Indian professionals should be trained and mentored to meet the professional standards set by the global bodies in Audiology and Audiological medicine. Let the optimism thrive and lead the profession to a better future.

# Contents

# Scientific Section

# Developmental outcomes of Speech & Language in children with early identified hearing loss

**Authors:** Sharon Mary Oommen[1] , Jisma Rose George[2]

***Key Words :*** *hearing loss, speech, language development, AVT*

**INTODUCTION:** Infants are born with pre-adaptive abilities that empower them to respond to speech stimuli in an encouraging manner. Infants demonstrate amazing perceptual capabilities within few weeks after birth. Assistive listening devices improves hearing, but communication abilities also depend on different other factors, mainly on deafness duration without implant and implantation age and intervention strategies (Miyamoto & others, 1995).

**AIM:** The aim of the current research was to study the development of speech and language skills in children with hearing loss.

**METHOD:** A retrospective research design was carried out across five years with a total number 60 participants, of which 30 children were identified early (≤18 months) and 30 children were identified later (<5 years) with hearing loss. All the participants had different severities ranging from moderate to profound hearing loss and these children were divided according to their degree of hearing loss. All the participants were enrolled for AVT. Speech and language assessments were carried out of specific intervals to note the progress.

**RESULTS:** The children who were identified with hearing loss outpaced the children who were identified in the late ages and for all degrees of hearing loss. By 3.5 years of age, 90% of early identified participants in all the different severities scored age appropriate speech skills; 85% were within normal scores for receptive vocabulary; 90% achievement for receptive and expressive language. Progress was maintained and recorded.

**DISSCUSSION:** The ability to perceive speech helps in improving the communication skills as the child matures and this development is a complex interaction between the genetic pre-adaptive abilities and experience obtained from the language spoken in the environment.

**CONCLUSION:** Development of language is an important factor for overall development and later literacy skills. Hence it should be considered and monitored thoroughly during intervention for pre-lingual deaf children. The study also highlights the importance of considering critical periods of language development while planning rehabilitation for children with hearing impairment.

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# Social and emotional competences in tb patients due to hearing loss

**Authors:** Shubham Shaniware, Suvankar Parasar Mund, Mitali Thakkar

***Key Words :*** *Social, Emotional, TB, Hearing Loss*

**INTRODUCTION:** Multi Drug Resistant Tuberculosis (MDR-TB) involves the use of streptomycin and other ototoxic drugs that result in hearing loss. Hearing loss has effects on social and emotional aspect of an individual. Additional illness may cause greater social and emotional handicap as opposed to individuals with similar hearing loss but no other concomitant illness.

**NEED OF STUDY:** To see the effects of additional and concomitant illness along with hearing loss of moderately severe, severe or profound degree on social and emotional aspect of an individual.

**METHODOLOGY:** Study consisted of two groups of participants in age range 25-50yrs; Group I (n=30) patients with MDR TB and with diagnosis of moderately severe, severe or profound hearing loss. Group II (n=30) patients without MDR TB and diagnosis of moderately severe, severe or profound hearing loss. Hearing Handicap Inventory for Adults was administered on participants of both the groups. It consists of 25 items and 12 items were in social subscale and 13 items in emotional subscale, overall score was also calculated. Maximum possible score was 100.

**RESULTS:** Mean Score on Social Subscale for Group I and II are 43.18 and 32.7 respectively. Mean Score on Emotional Subscale for Group I and II are 46.23 and 43.86 respectively. Mean Overall Scores for Group I and II are 86.36 and 76.56 respectively. Unpaired t-test reveals that there exists a statistically significant difference between scores on both subscales and overall scale between the two groups (P= 0.1, 0.12 and 0.00 for social, emotional and overall scale respectively).

**DISCUSSION:** The presence of a concomitant illness aggravates the effects of hearing loss. Hence, a need to address such patients with additional support is indicated from this study.

**CONCLUSION:** MDR TB not only results in ototoxic hearing loss, but also its effects are pronounced on social and emotional aspect of an individual.

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# Does Blood Group Affect Differential Sensitivity For Frequency, Intensity and Duration – A Preliminary Study

**Authors:** Shoban Banoth[1] and Prashanth Prabhu[2]

**INTRODUCTION:** Noise susceptibility can be different between individuals depending upon several factors (Plontke & Zenner, 2004). Prabhu et al (2017) reported that ultra high frequency auditory sensitivity was poorer in those with blood group O compared to others. The poorer auditory perception may also affect the differential sensitivity in persons with different blood groups.

**OBJECTIVES OF THE STUDY:** The aim of the study was to determine if there are any differences in DLI, DLF and DLT between individuals with different blood groups (A positive, B positive, O positive and AB positive).

**METHOD:** Eighty normal hearing adults between the age of 18-27 years were considered for the study. They were divided into 20 participants each with blood group A, B, AB and O. There were equal number of males and females in each group. The rhesus (Rh) was positive in all the participants of the study. All participants are within normal hearing sensitivity with normal A type tympanogram. The differential sensitivity of the participants was assessed by the psychoacoustic tests using the MLP toolbox in the MATLAB software version 7.10.

**RESULTS AND DISCUSSION:** A descriptive statistical analysis was done for the collected data and the mean and standard deviation of DLI, DLF and DLT thresholds was determined.. Shapiro Wilk test of normality showed that the data was not normally distributed ($p<0.05$). Further, Mann Whitney U tests were done to determine if there is any significant difference in DLI, DLF and DLT between the blood groups. The results showed that the DLI, DLF and DLT thresholds were significantly poorer ($p<0.05$) for adults with blood group O compared to adults with other blood groups.

**SUMMARY AND CONCLUSIONS:** The study attempted to determine differences in DLI, DLF and DLT across persons with different blood groups. The results showed that

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# Evaluation of knowledge of welfare measures available for individuals with hearing impairment among practicing audiologists

**Authors:** Prashanth Prabhu[1], Chhandasi Shrikant[2], Sanket Satish[3], Mohini Shirish Acharekar[4] & Rashmi[5]

***Key Words :*** *Welfare measures, facilities, practicing audiologists, employment, schemes, hearing impairment.*

**INTRODUCTION:** Government of India has launched various schemes which the individuals with hearing impairment and other disabilities need to be aware. These individuals are in direct consultation with the audiologist during the diagnosis procedure. Thus, it is indeed necessary for the professionals to have awareness/knowledge of various schemes and facilities in order to impart appropriate guidance and counseling to the probable beneficiaries. Thus, the present study attempted to evaluate the level of knowledge of practicing audiologists regarding the facilities available in India for individuals with hearing impairment.

**METHODS:** A total of 100 practicing audiologists in the age range of 25-40 years (mean: 32.3, standard deviation 3.5) participated in the study. There were 68 female and 32 male participants. A questionnaire was designed considering different facilities provided by Government of India for individuals with hearing impairment. Questions were designed to evaluate the knowledge regarding the different schemes and welfare measures. A statement was provided to the participant. On agreement with the statement, the participant had to select YES and on disagreement to click NO. In the case of uncertainty, participant was expected to select DON'T KNOW. Filled questionnaire was further analyzed to assess the knowledge of professionals.

**RESULTS AND DISCUSSION:** The result of the study showed that most of the audiologists are not aware of the different facilities offered by Government of India to individuals with hearing impairment and other disabilities. This suggests that there is a need to create awareness among the professionals regarding all the facilities especially those related to employment, different schemes, income tax deduction etc. This would facilitate the audiologists to inform their patients regarding the facilities. The curriculum of bachelors and audiology program should also stress more on creating awareness about the facilities available for individuals with hearing impairment and other disabilities. It is also essential that national wide awareness camps, seminars, advertisement in television, radio, and social media about these facilities would further enhance the awareness.

**CONCLUSIONS:** Thus, the study suggests that there is an urgent need to improve the knowledge of audiologists about these facilities which would benefit individuals with hearing impairment and other disabilities.

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# The Effectiveness of Cochlear Implant Surgery in Children: A Retrospective Observational Study

**Authors:** Lokanath Sahoo[1], Harshal More[2], Uma Patnaik[1], K Srikar[2], Saroj Kumar Patnaik[2]

***Key Words :*** *Cochlear Implant, Aided Audiometry, Sensorineural Hearing Loss, Auditory Verbal Therapy, Categories of Auditory Perception Score.*

**ABSTRACT:** The retrospective study is based on the outcome of Hearing Aid and Cochlear Implantation on the basis of a scoring system like Categories of Auditory Perception (CAP) and Aided Audiometry. In total, thirty (30) patients with congenital non-syndromic bilateral severe to profound hearing loss were evaluated who were implanted in a tertiary care teaching hospital, prior to implantation trial of hearing aidwas given. The outcome of both was evaluated. The patients taken for study were ofage range between 1year to 5years.

**1. INTRODUCTION:** "Hearing Disability" has been redefined as – "a hearing disable person is one who has the hearing loss of 60 dB or more in the better ear for conversational range offrequencies." This is a step in the right direction, as all person with severe hearingimpairment is now included in the hearing handicapped category [1]. 360 millionpeople in the world suffer from disabling hearing loss. This constitutes a substantial5.3% of the world's population. The prevalence and incidence of hearing impairmentin India also are substantially high. The high burden of deafness globally and in India is largely preventable and avoidable [2]. The prevalence of deafness in South EastAsia ranges from4.6% to 8.8%. In India, 63 million people (6.3%) suffer from thesignificant auditory loss. Four in every 1000 children suffer from severe to profoundhearing loss. With over 100,000 babies that are born with hearing deficiency everyyear. The estimated prevalence of adult-onset deafness in India was found to be7.6% and childhood-onset deafness to be 2% [3]. The National Sample Survey 58through (2002) surveyed disability in Indian households and found that hearingdisability was the 2nd most common cause of disability and topmost cause of the sensory deficit. Hearing impairment is a serious but grossly neglected condition inIndia. The country also suffers a huge economic impact due to lost productivity, higher unemployment, and lower wages for the hearing impaired [4]. The real issue in India is the woeful inadequacy of facilities of any type for the deaf. TheGovernment of India has launched the National Programme for Prevention and Control of Deafness (NPPCD). Since the program is also being implemented at the primary healthcare level, it envisages a reduction in the burden of deafness and prevention of future hearing loss in India. India celebrates the International Week for the Deaf in September, and September 26 is recognized as the "Day of the Deaf" in India [5]. It has been noted by the WHO that half the causes of deafness are preventable and about 30%, though not preventable, are treatable or can be managed with assistive devices like hearing aid. Thus, about 80% of all deafness can be said to be avoidable. It is important to note that without hearing a child cannot develop speech and language. Hence, the aim should be to recognize deaf child before the age of 1 year because from 1 to 3 years onward babies start hearing the speech. Unfortunately, hearing loss is often not detected until a child is 2, 3, or even 4 years old, especially in rural areas due to the poor awareness about deafness and its relation with speech and language development as well as lack of infrastructure such as the non-availability of ENT surgeon, audiologist, audiological equipment, and speech therapist [6]. A cochlear implant is one of the best inventions in the recent history of medical science for bilateral severe to profound hearing loss. It isthe first device that can restore one of the five senses. Cochlear implants have been found to be beneficial for children and adults with severe to profound hearing loss and sloping hearing loss who have limited or no benefit with hearing aids but havean intact auditory nerve.

While a hearing aid only amplifies acoustic energy on the basis of residual hearing, the cochlear implant directly stimulates the auditory nerve [7]. Cochlear implants bypass damaged hair cells and convert speech and environmental sounds into electrical signals and send these signals to the hearing nerve. A cochlear implant has two main components. An internal component i.e. electrode array that consists of a small electronic device that is surgically implanted under the skin behind the ear, connected to electrodes that are inserted inside the cochlea. An external component, usually worn behind the ear, that consists of a
speech processor, battery compartment and etc [8].

**2. MATERIALS & METHOD:** To study the effectiveness of the cochlear implant surgery, the total of 30 patients were taken. All the patients must be of minimum 1year of age at the time of Cochlear
implant Surgery as per USA FDA guidelines for cochlear implant.

2.1. Inclusion Criteria

i) Bilateral Congenital Severe to profound sensorineural hearing loss
ii) Age should not be more than 5years
iii) Should not have any other co-morbidities

2.2. Exclusion Criteria

i) Age below 1year and above 5years.
ii) Patients with any Middle Ear Infections

2.3. Data collection & Tools of measurement:

Patients with bilateral severe to profound sensorineural hearing loss undergoing cochlear implant procedure during the data collection were followed. The Data for the Study was collected by an observational study, study of documents and the interview method.

The study was carried out in a tertiary care teaching hospital from Jun 2017 to Dec 2019. Those children below the age of 5years reported to the Ent Dept of this hospital with a complaint of hard of hearing and delayed speech were under gone an audiological test battery to trace out the cause, type and severity of hearing loss. The audiological test battery comprises of Otoscopic Examination to check whether the
tympanic membrane is intact or not, Otoacoustic Emission (OAE) test to rule out the status of Outer Hair Cells (OHC), tympanometry test to rule out the middle ear, Brainstem Evoked Response Audiometry (BERA) to rule out the site of lesion, type of hearing loss and severity of hearing loss, Behaviour Observational Audiometry(BOA) to confirm the severity of hearing loss. After the administration of above-mentioned audiological test battery, if the child has confirmed diagnosis of Bilateral congenital severe to profound sensorineural hearing loss, then the child has to undergo trial and fitting of hearing aid. Parallelly the child used to refer for paediatric consultation to rule out syndromic association and to check the immunisation status, clinical psychologist consultation, Ophthalmologist consultation, Speech therapist opinion, HRCT Temporal Bone, MRI brain, TORCH, ECG. Simultaneously the child undergoes continuous Auditory Verbal Therapy (AVT) for three months. Then he patients were evaluated by using Categories of Auditory Perception (CAP) score and Aided Audiometry. CAP score is done prior to implant, at 6, 12, 24 & 36 months after Post-Implant. The aided audiogram is also taken from each patient at three different occasions [Chart-2]. First audiogram before any aid (unaided), second audiogram three months after giving Hearing Aid and third audiogram two years after cochlear implant surgery. Records of the sample population were evaluated retrospectively on the basis of documents kept in the department. The audiogram and CAP score of these thirty (30) individuals were evaluated.

The outcome of cochlear implantation was measured using Category of Auditory Performance (CAP) score described by the Shepherd Centre's revised version, based on Nottingham CI Program, 1995 [9].
The extent of auditory perception in terms of the utility of auditory mechanisms to pursue day to day tasks from awareness of environmental sounds to making telephonic conversations was assessed. The ability to discriminate and understand speech with or without lip reading was also assessed and the results were
categorized accordingly and a score was given, considering the number of months taken to achieve it. The documents were studied from the department and evaluation of the patients after two years of continuous auditory verbal therapy is done using CAP score and patients were evaluated with the following parameter. In CAP scores [Fig-1] there are total 12 levels, level 0 starts with unaware of environmental sounds
to level 12 as uses the telephone with unfamiliar speakers. Patients were evaluated 3 months after hearing aid trial and 2 years post cochlear implant surgery [Chart-1], as in our organization the AVT is given to 2 years post cochlear implant surgery.

**3. RESULTS AND DISCUSSION:** The patients are given auditory-verbal therapy by the speech therapist. The score gained by each patient after 3 months of continuous hearing aid usage and 2 years post cochlear implant surgery of the same patient given below.

| | |
|---|---|
| Level 0 | Unaware of environmental sound |
| Level 1 | Detects some environmental sound |
| Level 2 | Responds to some speech sound |
| Level 3 | Can identify some environmental sound |
| Level 4 | Understand some spoken words with additional performatives e.g. 'where is the duck that says quack', give me the car brmm |
| Level 5 | Understands common phrases e.g. pick it up, it's bath time |
| Level 6 | Understands some spoken words without performative e.g. give me the duck / go get the car |
| Level 7 | Responds appropriately to simple questions e.g . what is it? |
| Level 8 | Understands conversations with familiar speakers |
| Level 9 | Understands conversions with unfamiliar speakers |
| Level 10 | Follow recorded stories |
| Level 11 | Uses the telephone with familiar speaker |
| Level 12 | Uses the telephone with unfamiliar speaker |

**Fig-1 REVISED CAP (Categories of Auditory Perception) Scales:**
**The Shepherd Centre's revised version, based on Nottingham CI Program, 1995**

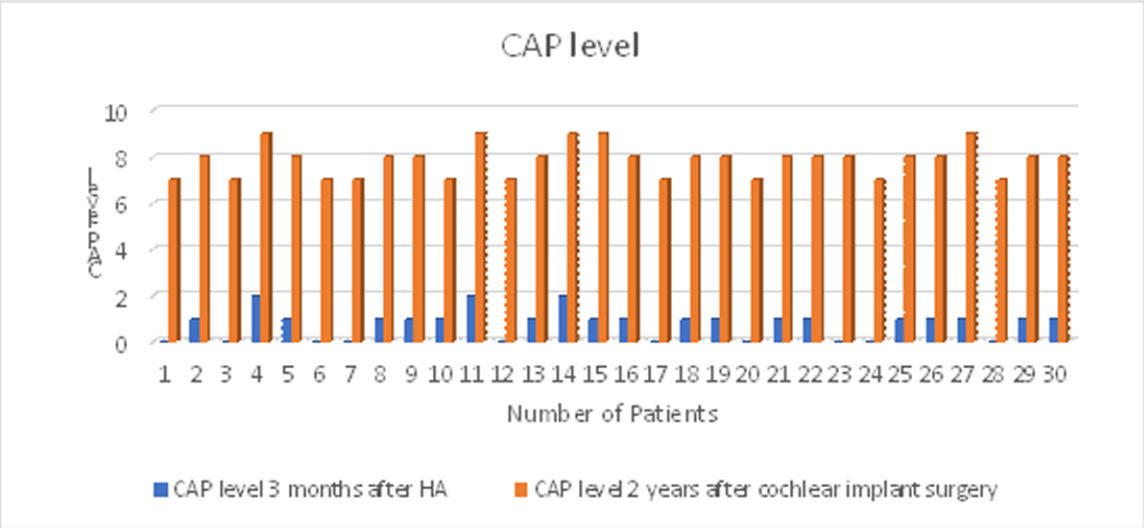


**Chart-1 CAP score post-intervention**

The hearing improvement is also evaluated by audiometry. Audiometry is done after three months of usage of hearing aid and 2 years after cochlear implant surgery with continuous auditory-verbal therapy. We had taken thirty (30) patients whose audiometry has been evaluated. It's shown in Chart-2.

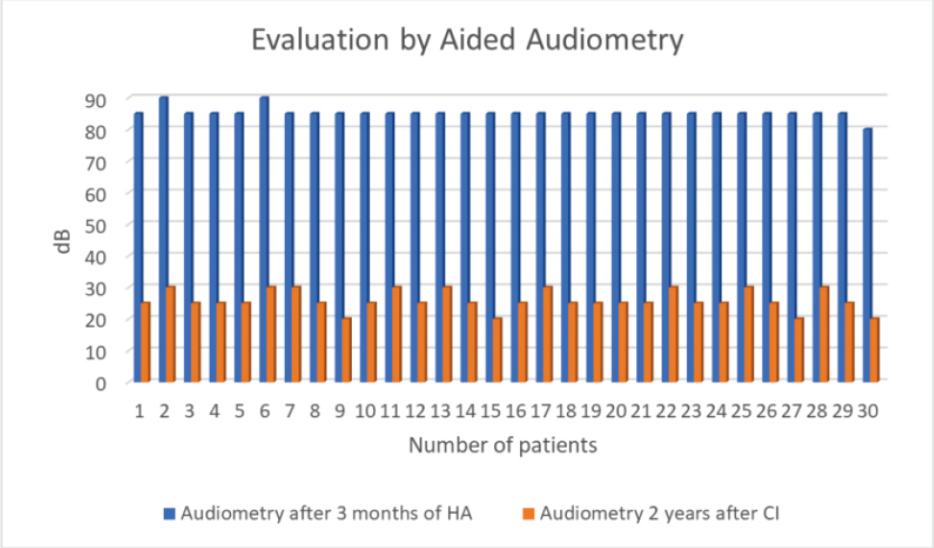


**Chart-2 Evaluation by Aided Audiometry**

The patient is considered to have severe to profound hearing loss when hearing loss more than 90 dB in the better ear as per WHO [10,11]. In this organization as per policy, the audiometry is performed after three months of hearing aid fitting. The average dB where the patient can hear is 85.16 dB with hearing aid hence the average improvement in the audiometry is 4.84 dB after using a hearing aid in bilateral sensorineural severe to profound hearing loss. As per policy, the audiometry is performed after 2 years of cochlear implant surgery. The average threshold where the patient can hear is 25.83 dB with cochlear implant hence the average improvement in the audiometry is 64.17 dB after using a cochlear implant in severe to profound sensorineural hearing loss. As per the WHO criteria audiometry threshold average 0-25 dB considered to be normal. So, in this study it was being found that 100% of the patient achieved age appropriate speech and language with cochlear implant surgery and going to normal school and competing efficiently with their normal counter parts and also living an independent life. During the study it was also been seen that some of the children with cochlear implant were doing better than their normal counterparts. Among the thirty patients some were using Cochlear Implant of Cochlear Company, some were using the Implant of Medel Company and Some were using the Implant of Advanced Bionic. During the study it was being observed that the change in company of implant does not make any difference in overall performance or output.

**1.CONCLUSION**: The study shows that the cochlear implant surgery is one of the most effective management options available for an individual with bilateral congenital severe to profound hearing loss. The study is also planned to calculate a cost for each procedure and to calculate the cost-effectiveness of cochlear implant in future.

**RECOMMENDATION:** It is recommended to keep a copy of all the record of each and every patient for future reference. All the investigations, documents pertaining candidacy meeting, audiogram, CAP score at the time of screening, post hearing aid and post cochlear implant should be preserved at the cochlear implant centre.

**DATA AVAILABILITY:** No data were used to support this study

**CONFLICTS OF INTEREST:** The authors declare that there is no conflict of interest regarding the publication of the paper.

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[8] American academy of otolaryngology, head and neck surgery.

[9] Auditory Habilitation Theory 3 Revised CAP (Categories of Auditory Perception) Scales.

# Inter-Session variations in frequency turning of Ocular Vestibular Evoked Myogenic Potentials in healthy individuals

**Author:** Chandana Raul

**IINTRODUCTION:** Vestibular evoked myogenic potential (VEMP), ever since their discovery in the modern incarnation in 1992 [1], have assumed major clinical significance in the diagnosis of balance dysfunction. The two major variants, namely cervical and occular VEMP (cVEMP & oVEMP) have made it possible to evaluate both otolith organs and both vestibular nerve branches [2] and therefore, along with video head impulse test, have played a major role in completing the test battery for comprehensive peripheral vestibular assessment [3]. They have been found to be useful in identification of Meniere's disease [4], Benign paroxysmal positional vertigo [5; 6], vestibular neurolabyrinthitis [2], superior semicircular canal dehiscence [7], auditory neuropathy spectrum disorders [8] and music induced vestibular loss [9], among others. The above studies point towards a plethora of clinical applications of oVEMP.

**NEED FOR STUDY:** Frequency tuning of oVEMP has been used to diagnose cases with Meniere's disease and differentiate them from cases with benign paroxymal positional vertigo with high degree of sensitivity and specificity [5]. However, this measure of oVEMP is carved out of the peak-to-peak amplitude and studies on test-retest reliability of amplitude of oVEMP have shown moderate-to-excellent reliability of amplitude [10; 11; 8]. This would theoretically render the frequency tuning of oVEMP susceptible to variations across multiple recordings. This being the case, erroneous conclusions regarding the presence of Meniere's disease could be made if the frequency tuning varies between recordings. However, there is no published report regarding the test-retest reliability of frequency tuning measure of oVEMP even in healthy individuals, to the test of our knowledge, Therefore, there is a need to study the test-retest reliability of frequency tuning of oVEMP in healthy individuals.

**AIM AND OBJECTIVES:** The present study aimed at examining the test-retest reliability of frequency tuning of oVEMP when administered over four different sessions.

**METHOD:** The study included 20 healthy adults in the age range of 18-25 years after obtaining informed written consent. All participants had normal auditory and vestibular functions as ascertained by detailed structured case history, otoscopic examination, pure-tone audiometry, speech audiometry, immittance evaluation, oto-acoustic emissions, auditory brainstem response, Fukuda stepping test, sharpened Romberg test, Tandem gait test, finger-to-nose test, diadokinetic test and head impulse test. All participants underwent oVEMP evoked by tone-bursts at octave and mid-octave frequencies from 250 Hz to 2000Hz, from electrodes placed directly below the centre of lower eyelid (non-inverting), 2cm below the non-inverting (inverting) and forehead (ground). The tone-burst at each each frequency were presented using an intensity of 95 dB nHL and repetition rate of 5.1 Hz. The responses were band-pass filtered between 0.1 and 1000 Hz. The obtained electromyography activity was amplified by a factor of 30000 and averaged over 200 sweeps per recording per frequency. The order of frequency presentation was randomized to avoid order effect. Using the above parameters, the responses were obtained at all frequencies in each of the four sessions, with minimum and maximum gaps of 1 day and 2 weeks respectively between the adjacent sessions. Frequency tuning was defined as the frequency with largest peak-to-peak amplitude among all the frequencies within a session. Shapiro-Wilk's test of normality revealed non-normal distribution of frequency tuning in all sessions for both ears ($p<0.001$). Therefore further statistical analyses were accomplished using non-parametric statistical procedures. Wilcoxon signed rank test was used to compare the frequency tuning between left and right ears in each sessions. Intra-class correlation coefficient (ICC) and Cronbach's alpha test were used to obtain test-retest reliability of frequency tuning of oVEMP.

**RESULTS AND DISCUSSION:** The mean (median, standard deviation) of frequency tuning in sessions 1, 2, 3 and 4 were 662 (750, 146), 637 (750, 127), 675 (750, 142) and 625 (625, 128) Hz, respectively in the right ear and 637 (750, 127), 637 (750, 127), 650 (750, 125) and 637 (625, 151) Hz, respectively in the left ear. The comparison of frequency tuning between the ears revealed no significant difference in session 1 [Z= -0.57, p=0.564], session 2 [Z=0.00, p=0.00], session 3 [Z=-0.63, p=0.52] and session 4 [Z=-0.37, p=0.70]. Therefore the data for ears were combined for further statistical analyses. The test-retest reliability of frequency tuning of oVEMP assessed using ICC produced a coefficient of 0.857. The Cronbach's alpha coefficient was also found to be 0.857. Regarding the gradation of the test-retest reliability coefficients, Versino et al (2003) recommended to use terminologies of 'excellent', 'moderate' and 'poor' test-retest reliability when the coefficient value were >0.7, 0.4-0.7 and <0.4, respectively. Using this gradation system in the present system, the frequency tuning of oVEMP showed excellent test-retest reliability. Frequency tuning of oVEMP is an amplitude dependent parameter [5]. Although variations of amplitude of different frequencies between sessions has not been reported, moderate to excellent reliability of oVEMP amplitude in response to 500 Hz tone-burst has been reported [10; 11; 8]. Moderate test-retest reliability of amplitude was reported by two studies [10; 11] however, they did not exercise sufficient control over gaze angle elevation between recordings. Studies on effects of gaze angle elevation on oVEMP amplitude have shown changes in amplitude with variations in gaze angles as small as 5o [12; 8]. Therefore lesser degree of test-retest reliability in Nguyen et al and Tseng et al might be attributed to gaze angle variations due to non-use of a fixed target angle. When controlling of this variable, a study found excellent test-retest reliability of oVEMP amplitude [8]. Since frequency tuning depends on amplitude over multiple recordings, excellent test-retest reliability of frequency tuning of oVEMP can be explained. Thus, with excellent test-retest reliability, frequency tuning of oVEMP is ready to render itself to applications requiring repeated measurements such treatment outcomes by comparing between pre- and post-treatment frequency tuning of oVEMP. Further, excellent test-retest reliability also confirms that the finding of altered frequency tuning in Meniere's disease, as reported in several studies [13; 14; 5], are not merely a result of inherent variations in frequency tuning, rather they are produced by the pathology per se.

**SUMMARY AND CONCLUSIONS:**

The ICC values revealed excellent test-retest reliability of frequency tuning of oVEMP. Therefore, frequency tuning of oVEMP can have a future utility in applications requiring repeated evaluations such as evaluation of treatment outcomes.

# Presence of temporary threshold shift during exposer to loud noises in movie theatres

**Authors:** M.Mubasshira Tasneem, P.Jayashri, P. Priyanga, P. Pavithra, G. Aslin Gibiah

**INTRODUCTION:** A temporary threshold shift refers to the temporary shift in the auditory threshold. These are the sudden changes that occur when exposed to loud sounds having high level of noise for a shorter or longer period of time whereas in many cases individuals experience reduced hearing.

Temporary threshold shift results in temporary hearing loss. This happens when the delicate hair cells in the inner ear get exposed to high frequency sounds resulting in fatigability. The sudden change in the hearing ability causes acoustic trauma, loss of sleep, tinnitus, difficulty in understanding speech, stress factors, quickened pulse rate and fatigue.

**NEED FOR STUDY:** Temporary threshold shift is common among individuals who are frequently exposed to loud noises for a longer period of time. If an individual is consistently exposed to these temporary threshold shift it may result in permanent threshold shift or hearing loss.

**AIM:** To analyze the temporary threshold shift in individuals who are exposed to loud sounds for about 2to 3 ½ hours.

**METHOD:** In this study 100 participants were involved. Individuals were involved within the age range of 18 to 30 years, without any previous history of otological complications. In a closed room acoustic that is the exposure of sound in the movie theatre was extracted using a sound level meter. PTA and OAE were evaluated for the individuals before and 5 minutes after exposure to the high level noise.

**RESULT:** A significant difference was noticed in threshold of all the participants after noise exposure in the theatre. It has been found that PTA thresholds were evaluated and OAE emissions were diminished after exposure of movie noise. This shows the decreased firing of outer hair cells when exposed to a noise of 109db for 3 ½ hours of duration.

**CONCLUSION:** This study reveals that the room acoustics of theatres can be modified such that individuals can preserve their hearing from getting affected. Individuals who are susceptible of hearing loss and who have experienced a threshold shift can use preventive measures for healthy hearing.

# Measuring hearing aid outcomes of government funded hearing aids in India

**Authors:** Aravinda H.R[1], Chetan K[2], Priyanka N[3]

***Key Words :*** *Hearing aids; Outcome measures; Government funded; Survey*

**INTRODUCTION:** Hearing loss is one among the persistent sensory deficiency in human populations, involving more than 250 million public in the world. Hearing aids are electrical equipments that aid in optimizing acuity of speech or other sounds. Outcome measures have been of rising concern to audiologists and consumers. The Satisfaction with Amplification in Daily Life (SADL), accomplishes the need for a clinically practical tool, which provides useful insight to the multidimensional aspects of satisfaction.

**METHOD :** The study was done on patients who were provided with behind the ear hearing aids in a free hearing aid distribution camp under ADIP scheme. A survey was done for 100 subjects by administering the (SADL).

**RESULTS :** The SADL satisfaction scores showed high satisfaction ratings for almost all the aspects of the questionnaire. Approximately 80 % of the individuals using the hearing aids provided a positive feedback and were tremendously satisfied with the performance of the hearing aid.

**DISCUSSION:** The results determined that, in general there was a great level of partaker contentment with amplification of the hearing aid. This is in agreement with abundant other studies done on Australian hearing aid users by Worrall L et.al, 1999. Outcome of the current study is in agreement to the SADL data given by Broadbent C et al, 2001, which had participants of almost similar age and gender.

**CONCLUSION:** Hence to conclude, ADIP scheme hearing aids do satisfy the users in most of the features such as speech understanding, speaking over phone and enhanced hearing, but lacks in minor aspects like the overall build quality, reduced fitting range and limited programming options.

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# Prevalence of CSOM in the Paediatric Hearing Impaired and hard of Hearing Semi-Urban and Rural Population

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**ABSTRACT:** C.S.O.M, with its typical clinical presentation and both mucosal and bony complications is posited as a common entity in children of south-east Asian countries including India. It incurs high mortality, > 2million DALYs and delay in speech, language, educational and socio-economic development of the suffering children as consequences of significant hearing impairment during the developing years. However, there is a dearth of analytic epidemiological literature in India, correlating CSOM and hearing impairment in children, which is necessary for a clearer picture of the scenario and also in formulating preventive strategies. This study aims to provide a large sample data regarding the overall prevalence of CSOM in school age children in semirural West Bengal and specific prevalence of CSOM in hearing impaired; either prelingually or postlingually. It also aims for a qualitative description of the types of pathologies and hearing losses. Children with CSOM were identified via standard operating protocol of a government-based hearing-identification project. Of a total population of 2600 the overall point prevalence was found to be 5.97% and specific prevalence for hearing-impaired subgroup to be 12.5% both of which was strikingly high. It also demonstrated qualitatively the ill-effects of CSOM and its complications on speech-language development.

**INTRODUCTION:** CSOM is described as a chronic inflammation of the middle ear cleft resulting in perforation of the tympanic membrane. Exact definition of Chronic Suppurative Otitis Media and the diagnostic criteria is abound in literature and has been standardized by the fraternity. W.H.O in their status report "Chronic suppurative otitis media: Burden of illness and Management Options", 2004, has defined CSOM as chronic inflammation of the middle ear and mastoid cavity, which presents with recurrent ear discharges or otorrhoea through a tympanic perforation. Richard A. Chole and Robert Nason in Ballenger's Otorhinolaryngology (centennial edition, 2009, ed. Snow and Wackym) described CSOM as intractable pathology of the middle ear of greater than 3 months duration with permanent T.M defect and persistent otorrhoea. Histopathological events associated with CSOM, is generally associated with irreversible tissue disease. This tissue disease includes bony changes (osteitis, osteogenesis, bone destruction), fibrosis of the mucoperiosteum, granulation tissue, subepithelial glandular formation, tympanosclerosis, TM perforation, polyp formation, cholesteatoma, and cholesterin granuloma. (Pathology of chronic suppurative otitis media; WL Meyerhoff ,- Annals of Otology, Rhinology & Laryngology, 1988 journals.sagepub.com) ; ORL 1974;36:251–274 karger.com(DOI:10.1159/000275182), Pathology of Chronic Suppurative Otitis Media A Histological and Histochemical Study, Ferlito A. The chronic inflammatory process causes in most cases severe and wide-spread lesions of the mucosa and bone, the extent and variety of which varies considerably. Two major variants of CSOM have been identified in literature, namely the safe or tubo-tympanic type and the unsafe or attico-antral type.

CSOM has been identified as a major cause of acquired hearing loss in children, especially in the developing countries. Apart from the significantly high mortality rate from untreated CSOM in developing countries, these chronic changes in the middle ear, and, often extending to the inner ear, would obviously bring significant functional deficits. Researches show significantly low scores in health-related quality of life scores (HR-QOL). Of more concern is that the persisting tympanic membrane perforation would lead to learning disabilities, speech and language deficits and poor educational performance. W.H.O estimates 65–330 million individuals globally with CSOM involvement, 60% of whom (39–200 million) suffer from significant hearing impairment.

CSOM accounts for 28000 deaths and a disease burden of over 2 million DALYs. Significantly, >90% of the burden is borne by countries in the South-east Asia and Western Pacific regions, Africa, and several ethnic minorities in the Pacific rim. Of these, WHO puts India into the group of highest prevalence (>4%); and concern, with a specific prevalence of 7.8%. However, the estimates are based on retrospective review of literature and the survey figures of India is limited to only 284 school-age children of a specific locality. Furthermore, the survey does not give any information regarding nature of the CSOM, presence of perforation or otorrhea. A study by Biswas et al (2005) on 225 rural school-age children put the prevalence rate at 12.44%, the majority of which belonged to the lower income group. Basak et al (2014) showed in 1717 patients, CSOM was seen to occur mostly in the 11-30 yrs of age group, with a rate of 40.50%. tubo-tympanic type was more common than atticoantral type and tympanic membrane perforation was present in all the cases. Of them, 106 patients presented complications. Wankar and Golhar (2014) found the overall prevalence of C.S.O.M in school-children between 5 years to 10 years in a rural district to be 6.56%, of which 5.83% were safe type while 0.72% was unsafe type. Remarkably, there was statistically significant association of CSOM with low socio economic strata and low level of sanitation.

Hearing loss in CSOM has been reported in literature to be ranging from mild to severe degree and of conductive or sensorineural or mixed type. Islam et al (2011) found the degree of hearing loss in CSOM ears to range from moderate to moderately severe degree of hearing loss depending on the site and size of perforation. Although CSOM would typically produce mild to moderate degree of conductive hearing loss, greater degrees of loss may be found in cases with complications including ossicular destruction. Sensorineural involvement may develop due to effects of bacterial toxins and / or ototoxic antibiotics on the cochlear hair-cells and auditory nerve. In the previously cited study of Wankar and Golhar, a very high incidence of permanent hearing loss in school age children with CSOM has been reported.

The burden of CSOM is profound, and as per studies by Klien JO (2000) and Vergison A etal (2010), includes complications like mastoiditis as well as sequel as hearing loss. CSOM, thus has been identified as an important cause of preventable hearing loss, particularly in the developing world (Berman S,1995), and a reason of serious concern, particularly in children, because it may have long-term effects on early communication, language development, auditory processing, psychosocial and cognitive development, and educational progress and achievement (Acuin J, 2004). In the same study, the incidence of hearing impairment in CSOM cases were shown to be highest in the 1st 5 yrs of life and highest in south east Asian developing countries. In fact deafness, and its natural outcome of deficiencies in communication and educational skills, is a common clinical finding in India in the pediatric population.

**NEED OF STUDY:** There is a dearth of such analytic epidemiological literature in the Indian context regarding correlation between CSOM and hearing impairment in the pediatric population; even though the disease burden would be one of the highest in the world; and more tragically is preventable. A large population study on the Indian school age children suspected of having some degree of hearing impairment and / or speech-language deficiency regarding presence of CSOM and analysis of their audiological profile would give a clearer picture of the scenario and also help in formulating strategies to reduce the disease burden.

**AIM OF STUDY:** The overall objective of this study was to provide a preliminary epidemiological data regarding CSOM in school age population and more specifically, in the school age deaf population. In this regard its aims to find out firstly, using a large sample, the overall prevalence of CSOM within a population of school age (primary and middle school) children in districts of semirural West Bengal. Furthermore, it also aims to find out, more specifically, the prevalence of CSOM in those school-children within the larger population, who has some degree of hearing loss; either prelingually or postlingually. It also aims to provide a qualitative description of the types of pathologies encountered most commonly in the population with CSOM and a descriptive statistics of the relative proportion of the different types and degrees of hearing loss in the children with CSOM.

**METHODOLOGY:** Pratibandhi Kalyan Kendra was deputed to conduct identification camps for hearing impairment under the Sarvya Siksha Mission (SSM) project in the districts of West Bengal within classes I to VIII , i.e age range of 6yrs to 14 yrs. As per convention, school teachers of each circle refer a student suspected of having communication, loco-motor or visual impairment to the special educator of the circle resource room. The special educator refers the student with suspected communication or hearing deficit to the hearing identification camp. Pure tone audiometry, Tympanometry, Otoscopic examination were administered at the camp. Children with conductive (outer / middle ear) pathologies were referred for consultation with otologist; Feedback taken from the otologists as regards the final diagnosis of the referred children. Children whose audiological and otological diagnosis confirmed the presence of CSOM were listed. The speech-language and educational status of the children with CSOM were collected from the circle resource room. Statistical analyses of the cumulative data were performed. The following statistical parameters were calculated:

a) Point Prevalence of CSOM in the total school-age population i.e a closed cohort using the formula: no. of cases / total no of population

b) Point Prevalence of CSOM in the total school-age population with communication (speech-language) deficits i.e a closed cohort using the formula: no. of cases / total no of population with communication deficits.

c) The relative proportion of children with CSOM with the following categories of hearing loss: mild, moderate, severe and profound degrees of conductive, sensorineural and mixed hearing loss represented by descriptive statistics.

**RESULT & DISCUSSION:** The total population of school age children within the criteria stipulated by the SSM were 2600. Of these, 156 children were diagnosed with some degree of CSOM, confirmed by the presence of some degree of conductive hearing loss, tympanometric findings, and otological diagnosis. The point prevalence was found to be 5.97% which is a substantial proportion and an issue of grave concern. (Figure1)diagrammatically illustrates this. 250 children out of the total population of 2600 had delayed speech and language development. Of these 250 children, 32 had CSOM putting the prevalence for this subgroup to be 12.5% which is strikingly high compared to the overall population (fig-2). It indicates an unfortunate state of affairs: school children in rural and semiurban areas have very low awareness of hygiene and health habits including hearing health and this is more predominant in children with some form of impairment. Even within this subgroup, 6 children with prelingual deafness had worsened thresholds and therefore un-aidable ears due to CSOM. In these cases, it may be said that the overlay of CSOM has contributed to worsening of the ill-effects of preexisting but manageable sensorineural deafness. Of the number of children with CSOM, moderate conductive loss ranked highest followed by severe mixed and profound mixed losses respectively which highlights a disproportionately high impact of CSOM (Figure 3). 3 children had post-lingual profound sensorineural loss as sequale of CSOM which highlights the unfortunate outcome of untreated CSOM. Although the effect of long standing hearing loss due to CSOM on speech-language development per-se could not be studied, the overall impact was clearly evident. All reported frequent otorrhea. 1.3% had unsafe CSOM while 3.6% presented some form of complication (Figure 4). Such high prevalence have been attributed to poor hygiene & health-habits in the rural India.

**CONCLUSION:** The study throws light on the huge disease burden of CSOM in pediatric population, and tries to sensitize the issue of early identification and prevention measures of CSOM in children. A history of ear discharge, swimming in local pools, recurrent respiratory infections, and overcrowded housing were the strongest predictors for CSOM. There is a clear need for better ear care and screening programs for early detection and management of this disease. Awareness programs on aural hygiene, health habits, and common indicators of impeding ear disease in schools may be taken up. Regular otological and audiological screening camps may be organized in the schools

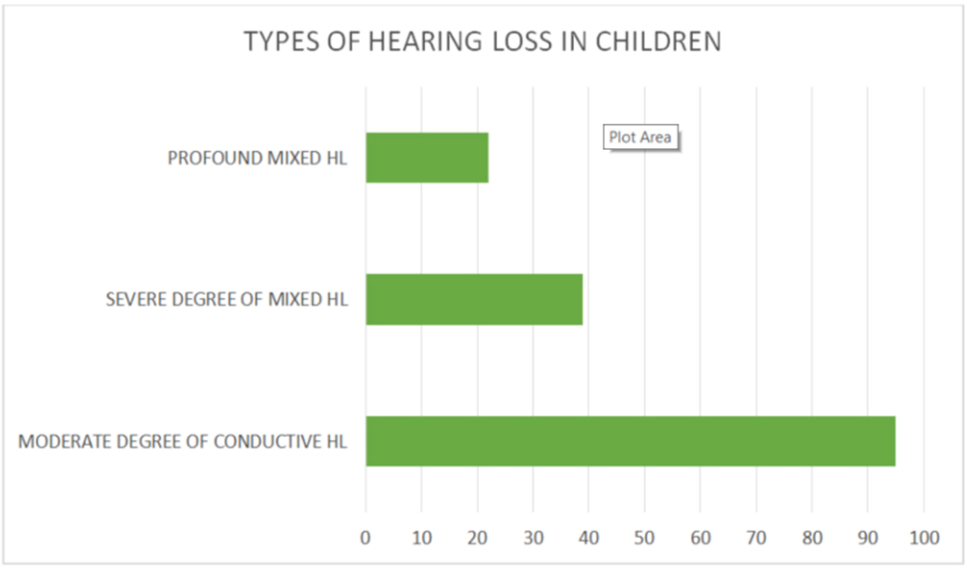


Figure 3: TYPES OF HEARING LOSS IN CHILDREN

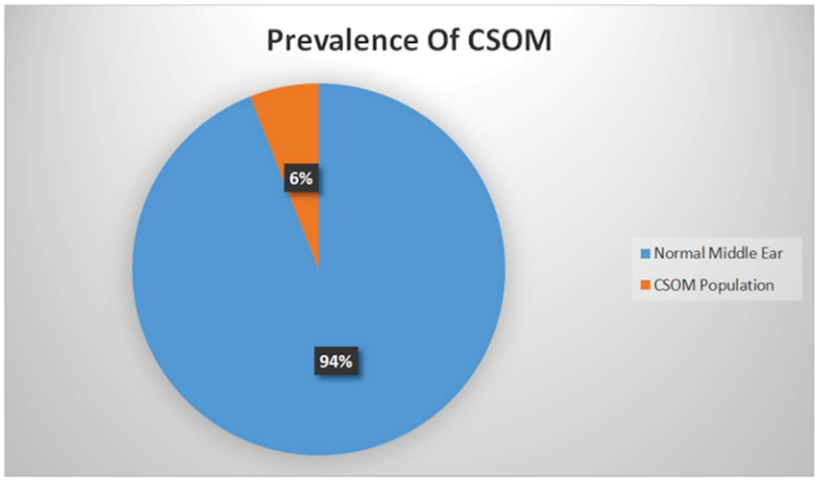


Figure 1: Prevalence Of CSOM

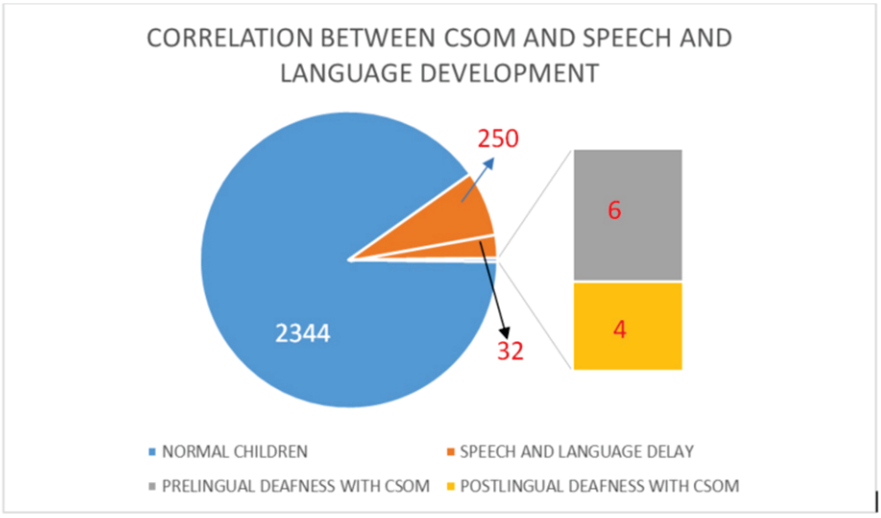


Figure 2: CORRELATION BETWEEN CSOM AND SPEECH AND LANGUAGE DEVELOPMENT

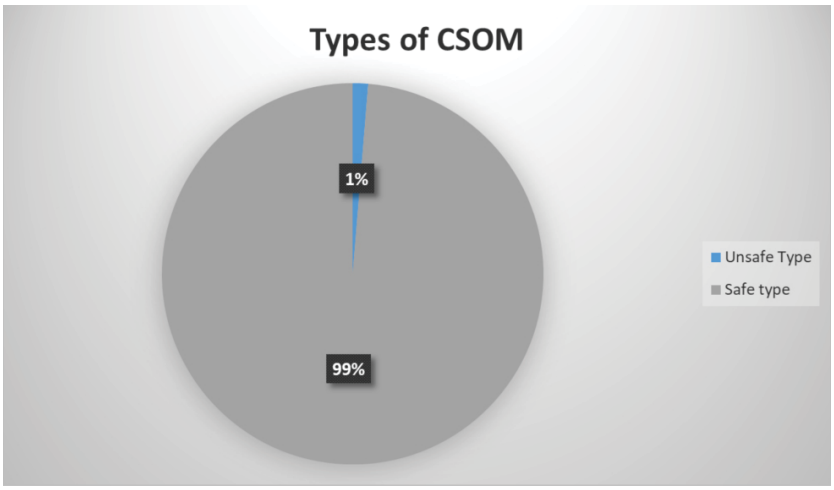


**Figure 4: Types of CSOM**

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# Challenges In Rehabilitation And Issues In Disability Services

**Authors:** Anoop Kumar Singh

**Introduction:** Any restriction or lack of ability to perform an activity in a manner or within the range considered normal for the human beings, resulting from impairment is termed as disability. The types of disability include loco-motor, hearing, speech, visual and mental disability. WHO in 2000 which has been used in the Multi-Country Survey Study during 2000 and 2001 and the World Health Survey Program in 2002 and 2003 to measure health status of the general population in 71 countries. The ICF considers that every human being can experience some degree of disability and it is a continuous process from attainable level of health. With this background, the paper discusses various issues and challenges related to disability and rehabilitation services in India.

**Review of Literature:** Recent data was collected from Medline and various other sources. Information gathered was summarized for Indian context and analyzed for discrepancies. Information was depicted under categories of problem burden of disability and its socio-demographic characteristics, determinants, service delivery under community-based rehabilitation, challenges ahead and recommendations to address the problem in the country.

**Problem Burden:** Globally, around 785-795 million persons aged 15 years and older are living with disability based on 2010 population estimates. Of these, the World Health Survey estimates that 110 million people (2.2%) have very significant difficulties in functioning while the Global Burden of Disease Survey estimates 190 million have (3.8%) have severe disability.Including children, over a billion people (about 15% of the world's population) were estimated to be living with disability.

In contrast, the National Sample Survey Organization (NSSO) report and Census data of 2001 stated that its prevalence was as low as 2% in India. A recent community-based study in India found the prevalence of all types of disability as 6.3% out of which mental disability was found to be the most common type of disability (36.7%). A study in Chandigarh reported that 87.5% of elderly people had minimal to severe disabilities.Another study in Dehradun showed that visual disability was the most common (74.1%) among the geriatric age group. A community-based study conducted in Rajasthan among children below 14 years found that 7% of them had at least one or other form of disability.Another study in Gorakhpur found that in children below the age of 6 years the disability rate was 7638 per lakh population.In India, NSSO reported that a total of 1,40,85,000, and 44,06,000 people are disabled in rural and urban areas, respectively. Overall, 1846 and 1499 per lakh population had any type of disability during the survey in

rural and urban areas respectively.With respect to gender distribution, some studies showed proportionately more disability among males, while some other studies more among females. Lack of education among disabled is an important barrier for effective delivery of services and 54.7% of disabled belonged to illiterate category according to NSSO 2002 survey findings.The differences observed in various studies are mainly due to difference in methodology adopted, conceptual framework, the scope and coverage of surveys undertaken,

operational definitions used for various types of disabilities along with difference socio–cultural, and risk factors prevailing in that area.

**Determinants:** The global burden of disease study (GBD) provides a standardized approach for epidemiological assessment and uses a standard unit called as the disability adjusted life year (DALY), to aid international comparison. DALYs express years of life lost to premature death and years lived with disability (YLD), adjusted for the severity of disability. One DALY is one lost year of healthy life.Only about one-quarter of the total disability burden at global level is due to Group I conditions that includes communicable, maternal and perinatal factors reported mainly from South Saharan Africa and India. In terms of numbers or years lived with a disability, there is more non-communicable disability in India than in the Established Market Economies. As countries pass through the health transition, the distribution of YLD shifts away from Group I conditions. In 1998, an estimated 43% of all DALYs globally were attributable to non communicable diseases and in low and middle income countries, the figure was 39%. In India, although both communicable and non-communicable diseases are prevalent in urban and rural areas, there is paucity of data on these factors causing various types of disability and to assess its rural-urban differences. But, the deaths from non-communicable causes are projected to almost double from about 4.5 million in 1998 to about 8 million a year in 2020.

**Community-Based Rehabilitation:** CBR is a comprehensive approach at primary health care level used for situations where resources for rehabilitation are available in the community. In addition to transfer of knowledge related to skill development in various types of rehabilitation methods, community also will be involved in planning, decision making, and evaluation of the program with multi-sectoral coordination. Besides, referral system will be there for those disabled who cannot be managed at community level and referred to district, provincial, and national levels.
There are many measures initiated by Ministry of Social Justice and Empowerment and Health and Family Welfare in India.

1. District Rehabilitation Center (DRC) Project started in 1985.

2. Four Regional Rehabilitation Training Centers (RRTC) have been functioning under the DRCs scheme at Mumbai, Chennai, Cuttack, and Lucknow since 1985 for the training of village level functionaries and DRCs professionals, orientation and training of State Government officials, research in service delivery, and low cost aids. Apart from developing training material and manuals for actual field use, RRTCs also produce material for creating community awareness through the medium of folders, posters, audio-visuals, films, and traditional forms.

3. National Information Center on Disability and Rehabilitation

4. National council for Handicapped Welfare

5. National Level Institutes—NIMH, NIHH, NIVH, NIOH, IPH.

6. A new scheme District Disability Rehabilitation Centre for persons with disabilities launched by the Hon'ble Minister of Social Justice and Empowerment, Government of India in Jan/Feb. 2000 is a step towards providing rehabilitation services and implementation of Persons with Disability Act. 1995. The Government has decided to set up District Disability Rehabilitation Centres (DDRCs) in a phased manner. Presently, 199 DDRCs have been sanctioned and 100 new DDRCs are to be set up during the remaining two years of the 11th Plan. The DDRCs were established with the objective of providing comprehensive services to the persons with disabilities at the grass root level. The services include awareness generation, survey, identification and early intervention, counseling, assessment of need for assistive devices, provision/fitment of assistive devices, and their follow up/repair, therapeutic services like Physiotherapy, Occupational Therapy and Speech Therapy, referral and arrangement for surgical correction through Government and Charitable Institutions, facilitation of issue of Disability Certificates and bus passes, sanction of bank loans, and promotion of barrier-free environment.

7. The National Policy for Persons with Disability 2005 is the recent development and welcome step by the Government of India.

**Service Delivery System for Community-Based Rehabilitation:**

1. At district or provincial level which caters around 20% of the disabled requires
general physicians, intermediate level supervisors, orthopedic technicians, resource teachers and vocational trainers. National level professionals will be involved in delivery of complex rehabilitation services as well as training and supervision of personnel for district, provincial, and national levels.

2. Efforts

**Challenges**

1. Mystification of knowledge

2. Resources

3. Lack of intersectoral coordination

4. Lack of coordination between Government and others.

**Recommendations**

1. Advocacy for mainstreaming the systems and services. It requires commitment across all sectors and built into new and existing legislation, standards, policies, strategies, and plans.

2. Invest in specific programs and services for people with disabilities. In addition to mainstream services, some people with disabilities may require access tospecific measures, support services, or training. In this process, involvement of persons with disability is of paramount importance as they give insight into their problems and suggest possible solution.

3. Capacity building of health care providers and program managers. Human resource capacity can be improved through effective education, training, and recruitment. A review of the knowledge and competencies of staff in relevant areas can provide a starting point for developing appropriate measures to improve them. Manpower generation by promoting new courses and initiating degree and diploma courses like Physical Medicine and Rehabilitation will address the problem of shortage of manpower in long run.

4. Focus on educating disabled children as close to the main stream as possible.

5. Increase public awareness and understanding of disability. Governments, voluntary organizations, and professional associations should consider running social marketing campaigns that change attitudes on stigmatized issues such as HIV, mental illness, and leprosy. Involving the media is vital to the success of these campaigns and to ensuring the dissemination of positive stories about persons with disabilities and their families.

6. Generating representative community-based data will help to plan and execute
appropriate measures to address the problems of persons living with disability.

7. Strengthen and support research on disability.

# The Effect of Filtered Speech on Speech Identification Scores of Young Normal Hearing Adults in Telugu

**Authors:** Chavati Naresh,Supraja Prabhu, Sudha Rani Andugula,Banoth Shoban, Aparna Ravichandran

***Key Words :*** *High-pass cut off frequency, Low-pass cut off frequency, Spectral Modification..*

**ABSTRACT**: Speech contains both spectral and temporal information which is important for the perception of speech. However, there are variations across languages in the way these spectral/temporal cues contribute to the perception of speech. There are spectral and temporal variations such as differences in formant frequencies and changes in speaking rate across languages. Spectrally modified speech stimuli like filtered speech have been used in Monaural Low Redundancy tests to assess Auditory processing disorders (APD). Filtered speech helps understand the contribution of different frequencies in the perception of speech.

**METHOD :** Thirty young adults (mean age 21.5 years) with normal hearing abilities (hearing sensitivity less than or equal to 15 dB HL) participated in the study. In the present study, phonetically balanced word lists in Telugu were used for spectral modification to determine Speech Identification Scores (SIS) in young adults having normal hearing. Each list was filtered using low-pass cut-off frequencies of 800, 1200, 1500 and 1700 Hz; and high-pass cut-off frequencies of 1700, 2100, 2500 and 3000 Hz using Adobe Audition software and the attenuation rate of 115 dB/octave obtained using Butterworth filters. The participants obtained greater than 70% scores for low-pass cut-off frequency of 1200 Hz or higher and high-pass cut off frequency of 2100 Hz or lower. The discrepancy in the low-pass cut-off frequency for Telugu (1200 Hz) in comparison with English (1500 Hz) could be due to the predominance of low frequency information in Telugu language. The study showed that the spectral information between 1200 Hz and 2100 Hz are important for perception of speech in Telugu. It was also found that slightly lower low cut-off frequency is important to perceive the speech in Telugu compared to English language.abilitation services in India and emphasize to strengthen health care and service delivery to disabled in the community.

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# ASSESSMENT OF KNOWLEDGE REGARDING NOISE POLLUTION ACTS OF INDIA AMONG ASLP STUDENTS AND PRACTICING AUDIOLOGISTS

**Authors:** Prashanth Prabhu**, *, Sanket Satish*, Chhandasi Shrikant*, Rashmi Acharekar* & Mohini Shirish

***Key Words :*** *Noise pollution, acts, practicing audiologists, students.*

**INTRODUCTION:** The noise causes hazardous effects on human wellbeing. To avoid such effects, in the 1970s, the Government provided few environmental acts and policies in India. As audiologists play an important role in noise control, it is included as a part of the academic curriculum in the audiology and speech-language pathology courses. The study aims to assess the awareness and knowledge of noise control acts among undergraduate, post-graduate, and practicing audiologists also to check if there is any need to provide intensive education regarding noise control in the academic curriculum.

**METHODS:** A questionnaire was designed considering the different Noise pollution acts by the Government of India. Questions were designed to evaluate the knowledge regarding these acts and their rules and regulations. A questionnaire was administered on 50 final year/internship undergraduate ASLP students, 50 post-graduate students and 50 practicing audiologists having a minimum of 1-year experience. A statement was read to the participant. In agreement with the statement, the participant had to say YES, and on disagreement, he/she has to say NO. In the case of uncertainty, the participant was expected to say DON'T KNOW. The scores obtained were further analyzed to assess the knowledge of the participants.

**RESULTS AND DISCUSSION:** The result of the study shows that in general, most of the students and professionals are not aware of most of the noise laws and rules and regulations laid by the Government of India to control noise pollution. The awareness about these rules and regulations is higher in practicing audiologists, followed by postgraduate students and undergraduate students. This suggests that there is a dire need to create awareness among the students and professionals regarding the noise laws and steps taken to control noise pollution in India. The curriculum of audiology students can also stress more about creating awareness about noise laws and the harmful effects of noise pollution.

**CONCLUSIONS:** The present study attempted to evaluate the knowledge among the ASLP students and practicing audiologists regarding the noise pollution acts of India. Thus, to improve the knowledge, better awareness programs, intensive education, and implementation of such laws is essential and need of the hour.

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# Effect of Early Neonatal Sepsis on Oto acoustic Emission

**Authors:** Darshan D[1], Bhavya M[2]

***Key Words :*** *Neonatal sepsis, Early sepsis, Sepsis On OAE.*

Hearing is essential for humans to communicate with one another. There are various risk factors which can cause neonatal hearing loss and is indicated by absence of Oto acoustic emissions (OAE) on screening. Hyperbilirubinemia, cytomegalovirus (CMV) infection and hypoxia are few risk factors which causes neonatal hearing loss. However, there are other postnatal infection associated with an increased risk of neonatal complications. Neonatal sepsis is one such clinical syndrome of bacteremia characterized by systemic signs and symptoms of infection in the first month of life. In India neonatal sepsis can be seen in 30/1000 live births. Neonatal sepsis can be categorized as Early-onset neonatal sepsis which manifests itself within 72 hours of birth and caused by Group B streptococcal infection and Late-onset neonatal sepsis which manifests between 7- 28 days of birth.

The present study was aimed to investigate the effect of early onset neonatal sepsis on OAE due to dearth of studies.

60 full term Neonates in the age range of 1-3days were taken and divided into two groups. (1) control group consists 30 neonates (17 males and 13 females) without any risk factors and (2) experimental group consists 30 neonates (19 males and 11females) diagnosed with sepsis. Detailed case history followed by High-risk register was administered. DPOAE testing was carried out for both the groups in wards after feeding and asleep. Each ear was tested separately, the response was considered positive at each frequency when the OAE's captured were 6 dB higher than the noise by present and absent criteria.

Data obtained were subjected to statistical analysis by using SPSS version 17 software. Statistical analysis showed no significant difference between two groups.

We speculate that vulnerability to infections may be reduced in term born infants due to mature immune system and hypothesize that the effect of early onset sepsis on ear in the initial days of birth may not be present and needs frequent evaluation. Hence present study indicated that neonatal sepsis has no effect on OAE on initial days of life.

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# Awareness of ear infections among swimmers

**Authors:** Shubham Shaniware, Suvankar Parasar Mund, Mitali Thakkar

***Key Words :*** *Swimmers, Middle ear, infection*

**INTRODUCTION:** Swimmers are at greater risk of developing ear related infections. Otitis media and otitis externa are two most commonly occurring pathologies in children and adult swimmers. A need for assessing their awareness levels about the ear related infections, its symptoms and appropriate referrals needed is imperative. Need of the Study: Study will assess awareness levels of swimmers and thereby help to identify in case of poor awareness among swimmers (i.e. child as well as adults), there needs an action on part of hearing health care professionals to improve awareness and prevent the occurrence of consequences of fluctuating hearing loss among young children. Methodology: Study consisted of two groups. Group I adult swimmers in the age range of 25-40yrs. And Group II consisted of parents of child swimmers in the age range of 5-10yrs. Respondents were swimming for atleast 6-7hours weekly in non-marine water, with head immersion technique. A questionnaire was developed by researcher, which consisted of 15 yes/no questions with maximum possible points being 10. Questionnaire was validated by ENT and Audiologist. Questions were concerning symptoms of ear infection, its causes and also appropriate referrals needed in case of ear infections. Also questions about the use of ear plugs while swimming were included. Results: Mean Score of Group I on questionnaire was 8 and that of Group II was 7.5, suggestive of poor awareness among both the groups. Group I had 20% of participants using ear plugs and Group II had 14% of participants. Comparative analysis reveals that there exists a statistically significant difference between the awareness levels of two groups (Z= +2.1 and P= 0.01). Discussion: Poor awareness about ear infections among both the groups has been observed and this can be attributed to the fact that ear infections result into fluctuating hearing loss, which may go unnoticed in case of children and thereby a delay in diagnosis may occur. Also, the poor awareness levels indicate the lack of proactive and collaborative involvement of team approach in creating necessary awareness.

**CONCLUSION:** There exists poor awareness among adult and child swimmers about the ear infections and it is largely a responsibility of hearing health care professionals to create necessary awareness.

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# Effect of Auditory Deprivation on Some Aspects of Temporal Processing and Speech Perception Abilities

**Authors:** Supraja Prabhu,Banoth Shoban,Sudha Rani Andugula, Naresh Chavati and Aparna Ravichandran

**INTRODUCTION:** Hearing loss,apart from loss in the peripheral hearing sensitivity is known to impair auditory processing abilities. Moore (2008) attributed such impairments to reduced frequency selectivity, temporal processing and compressive non-linearity associated with peripheral damage. The impairments in the gross and fine temporal processing are in turn known to translate into impaired speech perception.In addition to the auditory processing deficits attributable to the damage of peripheral auditory system, an untreated longstanding hearing loss is believed to deteriorate auditory processing. Such deterioration is known to be because of the auditory deprivation. There have been several studies which have shown the effect of early otitis media on auditory perception abilities at later stages in school and adulthood (Gravel, Wallace, & Ruben, 1995; Gravel et al., 2006; Maruthy & Mannarukrishnaiah, 2008; Sandeep & Jayaram, 2008). These studies have shown that auditory deprivation caused by episodes of otitis media lead to affected neural processing leading to longer conduction times and consequent speech perception.

**NEED FOR THE STUDY:** Auditory deprivation due to adventitious sensorineural hearing loss can also have similar deleterious effects on auditory perception. Studies on the effect of auditory deprivation consequent to adventitious sensorineural hearing loss are very scarce. The experimental findings about effect of hearing loss obtained in developmental periods has been blindly generalized to that of adults. However, it is not necessary that the matured auditory system responds to the hearing loss in the same way as that of developing auditory system.

An important clinical question is whether the duration of untreated hearing loss has effects on the auditory perception and if so what is the cut off time beyond which effects of auditory deprivation are negligible.Generally, it is often taken for granted that the longer the duration of hearing loss, greater is the effect on auditory perception. However, there is no systematic and empirical evidence for the same.

Considering the move towards evidence based clinical practice and patient care and counselling, it is important that stakeholders be given a realistic picture about their prognosis based on empirical evidence. There is a dire need to generate empirical evidence regarding the influence of auditory deprivation on perceptual outcomes, which would enable us in providing evidence based rehabilitation options and counselling in individuals with hearing loss. Hence the present study was taken up.

**AIMS AND OBJECTIVES:** The current study thus aimed to systematically evaluate the effects of duration of hearing loss on perceptual abilities in individuals with hearing loss.

**METHOD:** Twenty adults (40 ears) with hearing loss in the age range of 19-57 years participated in the study. The hearing loss in these participants ranged from minimal to severe degree with conductive, mixed or sensorineural type of loss. The duration of hearing loss ranged from 10 days to 15 years. None of them were rehabilitated for their hearing loss earlier. All the participants were proficient in speaking Telugu.

A detailed case history was obtained using a special proforma. Special emphasis was given to the duration (actual), type of hearing loss, nature of progression of hearing difficulty, presence of tinnitus, speech perception difficulties, and presence and duration of other medical conditions like diabetes and hypertension. They were evaluated for their hearing using pure tone audiometry and their middle ear status was assessed using immittance audiometry. Subsequently, with their informed written consent, they were subjected to a set of tests to document their auditory processing and perceptual abilities. pronounced.

These tests included word recognition scores (WRS), speech perception in noise (SPIN), acceptable noise levels (ANL), gap detection test (GDT), Difference limen for frequency modulation (FMDLs), concurrent vowel identification (CCV). Standardized procedures of each of these tests were used for the purpose.

The performance on each of these tests were related to their duration of hearing loss to determine the presence/absence of auditory deprivation and if present, identify the cut off duration beyond which the effects of auditory deprivation are pronounced.

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The performance on each of these tests were related to their duration of hearing loss to determine the presence/absence of auditory deprivation and if present, identify the cut off duration beyond which the effects of auditory deprivation are pronounced.

**RESULTS AND DISCUSSION:** The effect of duration of hearing loss on auditory perceptual skills was tested statistically in 2 ways. To begin with, duration of hearing loss was correlated with each of the measured auditory perceptual skills using Pearson product moment correlation. Results showed a significant correlation of duration of hearing loss with GDT ($r = 0.571$, $p = 0.000$), ANL ($r = 0.395$, $p = 0.012$), WRS ($r = -0.390$, $p = 0.013$), and SPIN ($r = 0.-357$, $p = 0.024$). However it did not significantly correlate with CCV and FMDL. The results suggested that there is definite influence of duration of hearing loss on temporal processing and speech perception measures. As the duration of unattended hearing loss increases, the temporal processing skills and the speech perception skills seems to be reducing. This is in line with the studies in early onset otitis media wherein longer duration of hearing loss has been shown to lead to greater auditory deprivation.

To determine the cut off duration below and above which auditory deprivation significantly differ, the participant groups were divided based on duration of hearing loss. That is, the group was split into two based on the duration of hearing loss. The cut off durations for dividing the group was 1, 2, 3, 4 and 5 years. The comparison of the groups across these 5 cutoff durations showed interesting results. When groups were divided keeping one year as the cutoff duration of hearing loss, Mann Whitney U test showed a significant difference between the two groups on GDT ($U = 39.5$, $p < 0.05$) and ANL ($U=94.0$,$p < 0.05$) while the other measures were not statistically different. With 2 years as cutoff duration there was a significant group difference on GDT ($U= 36.0$,$p < 0.05$), ANL($U= 96.5$,$p < 0.05$) and SPIN($U= 99.5$,$p < 0.05$). With three years as cut off duration, groups differences were observed in GDT($U= 70.0$,$p < 0.05$) , ANL($U= 121.0$,$p < 0.05$) , WRS($U= 108.0$,$p < 0.05$) , SPIN($U= 113.0$,$p < 0.05$) and FMDL($U= 113.5$,$p < 0.05$). With 4 years cut off, the two groups differed in GDT($U=62.5$,$p < 0.05$),ANL($U=92.0$,$p < 0.05$) , WRS($U=84.0$,$p < 0.05$),SPIN($U=97.5$,$p < 0.05$) and FMDL($U=118.5$,$p < 0.05$). Overall, as the cutoff duration increased, more number of measures showed group difference and also the significance of difference increased.

These results suggested that temporal resolution and noise tolerance are the most susceptible attributes for auditory deprivation. It also showed that the effects of deprivation are evident right in the first year of onset of hearing loss. Further, if untreated, as the duration of hearing loss increases, effects of deprivation are more pronounced and wide spread.

**Conclusions:** Results of the present study showed empirical evidence for auditory deprivation secondary to adventitious hearing loss. The present findings indicates auditory deprivation right from the first year of life and progresses if not rehabilitated.

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# SELF- RATING OF HEARING BY WORKERS EXPOSED TO HIGH LEVEL OF INDUSTRIAL NOISE

**Authors:** Mr. Nilanjan Paul, , Mrs. Rima Das, Mr. Shrutinath Banerjee,Ms. Rubina Yasmin Mondal, Ms. Sreemoyee Panda, Mr. Ganendra Prasad Sue, Ms. Riyanka Choudhury

**ABSTRACT:** The aim of the present study was to investigate the effect of awareness of - compensation benefits on self-perception of hearing by workers with high noise exposure in industrial set-up. Two group of subjects participated in the experiment- 100 factory workers, (age range 30 to55 years) exposed to high noise level and could avail compensation and 100 persons with high frequency hearing loss who were not exposed to high noise level and hence were not eligible for claiming compensation. An attempt was made to explore whether there was any effect of awareness of compensation claims on rating about self-perception of hearing among employees who were exposed to industrial noise. This study revealed that employees in industrial set up who developed a permanent noise induced hearing loss due to exposure of high level of noises have rated an unbiased perception of hearing similar to control group. Hence there was no significant relationship between hearing loss of experimental group and their self-perception about their hearing due to benefits from compensation claims. There was no significant difference in the rating of hearing between the experimental and control groups. The findings of self- rating of the experimental group in our study could be a result of lack of awareness among most of the subjects about compensation benefits available for them.Though unbiased rating could also be due to ethical reasons which have motivated them to correctly rate themselves as per their self-perception of hearing, since few employees who were aware of the compensation benefits and the procedure of claims also rated a similar perception of hearing as the control group

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# Clinical findings in Johansson Blizzard Syndrome-A single case study

**Authors:** Deepti Tiwari[1], Mariyam Hamsa Wajeeh[2], Nidhi Desai[3], Susmitha C.G[4]

***Key Words :*** *Johanson- Blizzard Syndrome, autosomal recessive disorder, hearing loss, Audiological findings*

**ABSTRACT:** Johansson-Blizzard syndrome, is a very rare, autosomal recessive genetic condition with multi-system involvement and a characteristic facies. The severity of the symptoms in JBS varies as some may exhibit life-threatening complications and hearing loss at birth while some develop them later during life. We present a case of five year old male child with a diagnosis of Johansson Blizzard Syndrome with a complaint of hearing, speech and language difficulties. Detailed audiometric evaluation along with speech and language assessment was done. This case report highlights the significance of audiological and speech language intervention in the management of children with this syndrome. The comprehensive profiling of Johansson -Blizzard syndrome in terms of hearing, speech and language characteristics will assist the audiologists and speech-language pathologists for deficit specific assessment as well as rehabilitation.

**Deepti Tiwari[1], Mariyam Hamsa Wajeeh[2], Nidhi Desai[3], Susmitha C.G[4]**

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# Awareness and knowledge of ear and hearing health amongst general public of Manipur

**Authors:** Nalini Keisham, Ritika Singh

***Key Words :*** *Awareness, Hearing health, Hearing loss, Survey*

Hearing impairment is a significant source of morbidity worldwide. It is estimated that over 278 million people in the world experience moderate to profound hearing loss. Impoverished conditions, lack of health infrastructure, and lack of resources, such as immunizations against childhood illnesses, may lead to hearing impairment and its associated economic repercussions.

Unlike blindness, deafness often provokes ridicules rather than sympathy. A deaf person is so isolated from family and friends and greeted by unsympathetic attitude he/she is often depressed and needs psychological counselling. The consequences for a child born with hearing loss are quite severe.

Though the World Health Organisation (WHO, 2012) has detected a common urgent need for action to prevent and manage ear and hearing loss. Public awareness of audiological issues has never measured among general public.
In 5 November 2016, under NPPCD, by fitting 3911 people with hearing aids, Manipur entered the Guinness book of world record. This record was set in 8 hours of time, which show there are lots of hearing impairments in Manipur. The study sets out to know the level of awareness among general public of Manipur (Remote) about the prevention, treatment and causes of hearing loss.

A total of 200 participants of Imphal region participated in the present study and answered questions in a survey format.

Questionnaire contained total of 30 questions which was divided into the three subsections. Subsection I contained the 4 questions regarding the prevention of hearing loss and disorders. Subsection II contained total of 20 question regarding the cause and identification of hearing loss and hearing disorders whereas subsection III included the 6 questions regarding the treatment options for hearing loss and disorder.

The present study result showed that most of the people are aware of the prevention of ear and hearing health as compare to the treatment and causes of the hearing loss. They had knowledge about how to prevent hearing loss but have very little knowledge of how to deal with hearing loss if there is any. Even the causes of hearing loss were also known lesser to them. The participants are mostly educated but they don't know not about cochlear implant for the treatment of hearing, they still believe that hearing loss can be prevented through medication or through surgical procedures.

Overall we can found that almost about 58.69% of population had knowledge and awareness about the ear and hearing health which is indicative of average population had awareness about the ear & hearing care. This showed that there is need of more awareness programme wherever the lacking knowledge can be seen.

# MRI negative central vertigo diagnosed with help of VNG.

**Authors:** Mr Sanal M J , Ms Harsha V

**Introduction:** Vertigo is a subjective feeling of internal or external spinning sensation. Diagnosis and treatment are often challenging.

Videonystagmography (VNG) is a complete diagnostic system for recording, analysing and reporting eye movements using video imaging technology. VNG includes a series of tests used to determine whether a vestibular pathology is the cause of balance disturbance or dizziness. It helps to detect peripheral and central pathology.

**Case Report**

A 60 year old gentle man presented with following complaints for a duration of 2 days

- Sudden onset giddiness
- Vomiting
- heaviness in the head
- hearing loss on left side
- Co-morbidities: uncontrolled T2DM

**Examination Findings:**

- Blood pressure was 122/82 mmHg,
- Pulse rate of 93 per minute,
- Respiratory rate of 16 per minute,
- Blood sugar of 292 mg,
- Gaze evoked nystagmus ,
- Left UMN facial lag,
- Left bulbar weakness,
- Swaying to right side,
- ENT findings : TM intact, Nasal examination showed mild mucoid sensation.

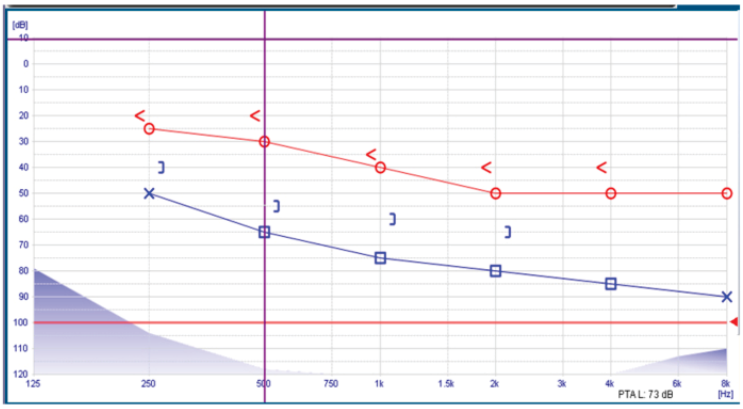
Clinical provisional diagnosis – Acute vestibular syndrome with posterior circulation stroke.

MRI findings: (Day 1 )- Minimal mucosal thickening in bilateral ethmoid and right sphenoid sinuses – Sinusitis, No evidence of acute infarct or brain stem lesion

(Day 3) – Pan-sinusitis , No evidence of acute infarct or brain stem lesion.

Audiological evaluation: figure 1

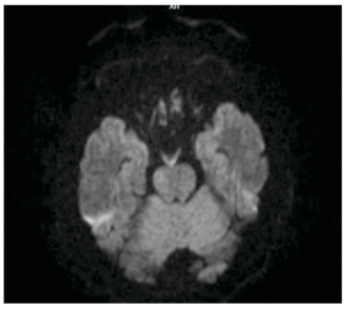
Table 1



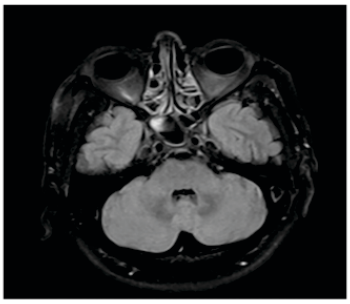

| | |
|---|---|
| Tympanogram | Bilateral "A" type tympanogram |
| Audiogram | Right Ear: Mild to Moderate sloping SNHL.<br>Left Ear: Moderate to profound sloping SNHL. |

**Imaging:** figure 2

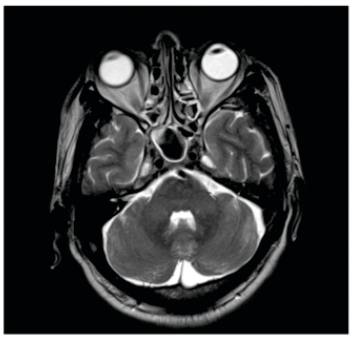
DWI



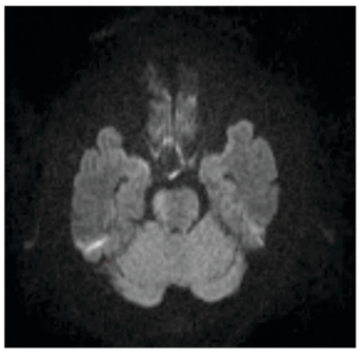
FLAIR

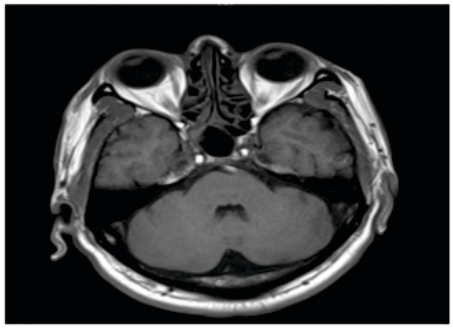


T2 WI



Repeated DWI

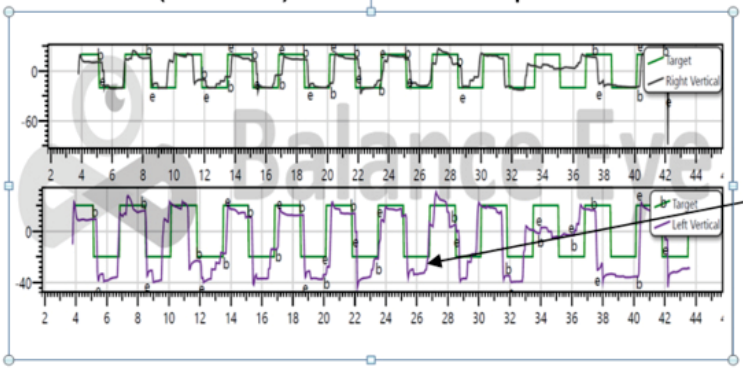




T1W1

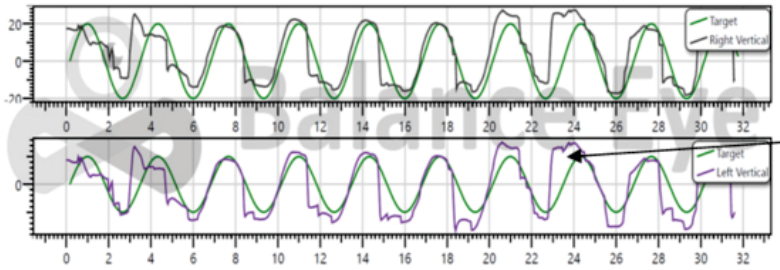
**Videonystagmography Report :** Figure 3

Saccades (vertical): Horizontal aspects were on normal limits,



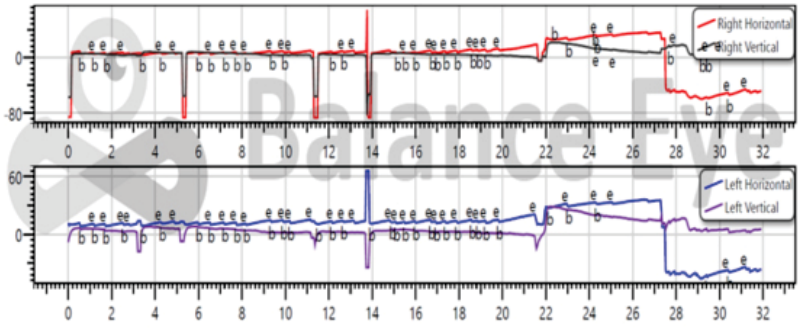

Vertical aspects are broken (hyper metric)

Smooth pursuit (vertical): Horizontal aspects were on normal limits



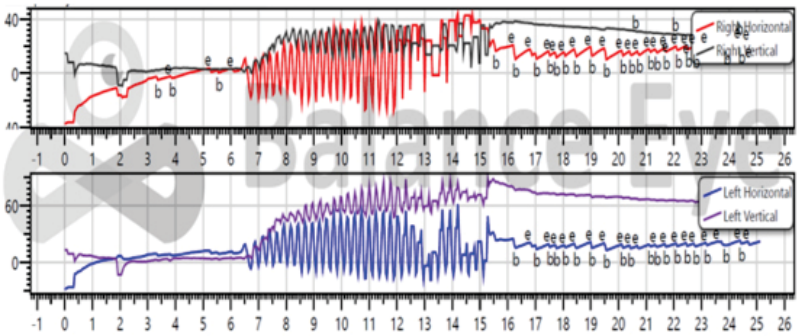

Vertical aspects are broken (hyper metric)

## Nystagmus on dark



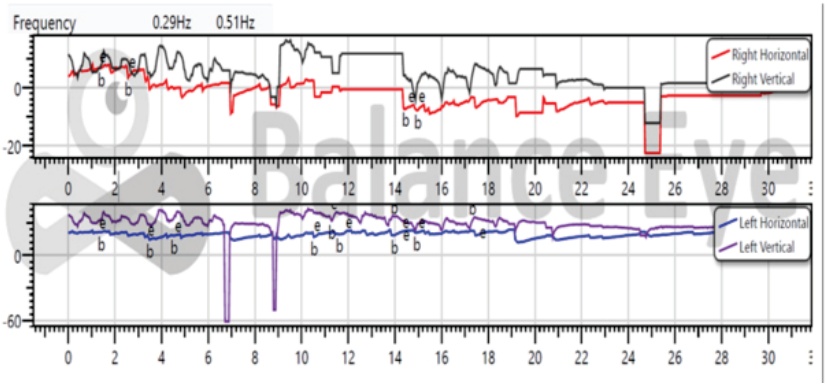

Sponatenous Left beating nystagmus

## High frequency Headshake

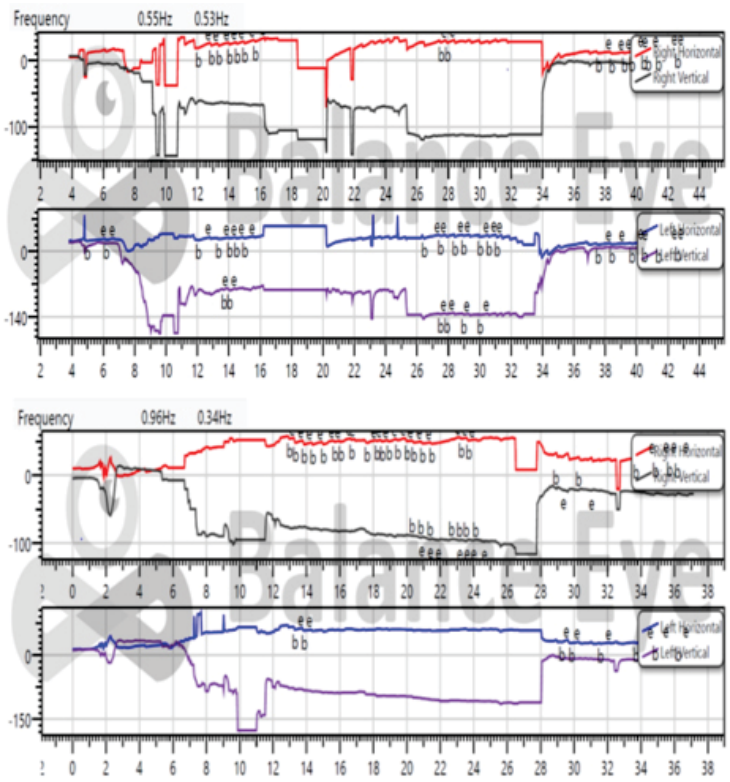



Left beating nystagmus (grade 3)

## Hyper ventilation




Left beating nystagmus.

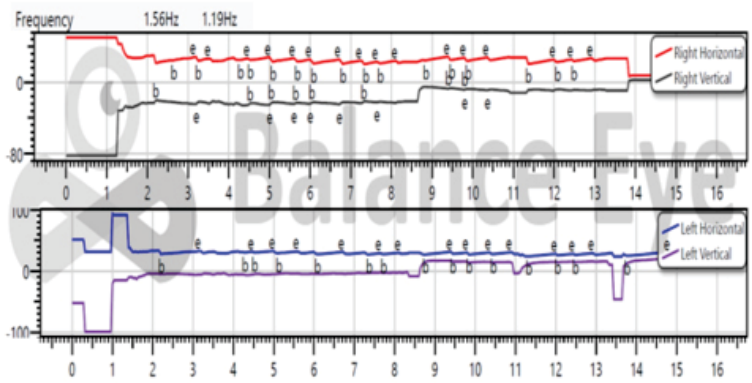



Right side

Left side

Left beating horizontal nystagmus on every Position (grade 3) (L>R)

McClure-Pagnini: Supine Head Neutral




Left beating horizontal nystagmus on every Position (grade 3) (L>R)

VNG report:- In view of abnormal oculomotor function ,Gaze stabilization and position tests showed features suggestive of central pathology.

**Discussion:**The primary aim of evaluating patients presenting with acute vestibular syndrome is to differentiate central lesion from peripheral vestibular pathology. MRI is the cornerstone of this process. VNG is also useful for the same purpose. Central vestibular dysfunction are still difficult to recognize in outpatient and emergency department, nearly 30% of patients with non-disabling stroke can have non-contributory imaging,1 Diffusion weighted imaging (DWI) - negative stroke patients should receive secondary prevention. In such, clinical scenario a positive VNG adds confidence in diagnosing central pathology.

In our case the patient presented to us with symptoms of central vestibular dysfunction with non-contributory imaging, considering clinical possibility of stroke he was further evaluated in neurotology department, Audiological evaluation showed asymmetrical hearing loss. (fig 1), And his VNG tests showed abnormal oculomotor function and gaze stabilization which are suggestive of central pathology.(fig 3), Positional tests showed position triggered nystagmus of central type.

In view of VNG findings, MRI repeated on 3rd day to check for delayed MRI changes. However, it was again negative. Although, this patient had negative MRI in two occasions, we clinically diagnosed him to have MRI negative stroke as supported by his clinical finding of bulbar palsy, UMN type facial nerve palsy and VNG findings. He was treated with anti-platelets, statins and neuro-supportive measures. Patient responded to these measures in a positive manner and made a full recovery in one week's time.

**Conclusion:** Central and peripheral vestibular lesions shows many overlapping symptoms and differentiating them poses a great challenge for the treating team. In spite of much advancement in diagnostic approach it still remains as a challenging situation. Functional tests like VNG, audiogram, VHIT proven to be a great help in differentiating the central type of vertigo particularly when MRI is non-contributory.

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