

# **NATIONAL PROGRAMME FOR PREVENTION AND CONTROL OF DEAFNESS**

## **RESOURCE MATERIAL FOR ENT DOCTORS**



**Government of India**

*Adapted from W.H.O. "Primary Ear & Hearing  
Care Training Resource"*

# CONTENTS

Foreword

Acknowledgements

About the Programme

Preface

1 Prevalence, causes and prevention of deafness and hearing impairment **10**

2 Detection, screening and testing of hearing impairment **17**

3 Priorities Under the Programme **24**

4 Ear operations **34**

5 Aural habilitation, rehabilitation and education **39**

6 Hearing aids **44**

ROLES & RESPONSIBILITIES OF THE DISTRICT ENT DOCTOR **52**

Annexure **53**

## FOREWORD

Hearing loss is the most common sensory deficit in humans today. World over, it is the second leading cause for 'Years lived with Disability (YLD)' the first being depression. It is responsible for 24.9 million YLD globally and gives it a larger non-fatal burden than alcohol use disorders, osteo-arthritis and schizophrenia. As per WHO estimates in India, there are approximately 63 million people who are suffering from Significant Auditory Impairment, this places the estimated prevalence at 6.3% in Indian population. With such a large number of hearing impaired young Indians, it amounts to a severe loss of productivity, both physical and economic.

Over 50% of the causes of hearing impairment are preventable and a large percentage of causes are treatable by surgical methods while other patients can be rehabilitated with the use of hearing aids, speech and hearing therapy.

With this in mind, the Ministry for Health & family Welfare, Govt. of India launched the 'National Programme for Prevention and Control of Deafness'. This programme was initiated in 25 districts of the country on a pilot basis, which is now complete. It is now being expanded to gradually include other districts all over the country.

It has long been felt that in order allow the benefit of the programme to reach the grassroot level, it is important to first orient all the personnel involved in health care provision, towards the concept of hearing and ear care. As our country boasts of a well developed health care delivery system , it is has been the endeavour of the programme to involve all the key persons from the district to grassroot level in this system and to orient them towards prevention of deafness and hearing loss. All the concerned personnel have been undergoing and will undergo relevant training programmes, which form the keystone of this programme. The implementation of various aspects of the programme must be supplemented with proper monitoring and evaluation, so that its progress can be mapped over time.

This resource has been adapted from the training resource published by the WHO for training of Health care personnel in the various aspects of Ear and Hearing Care. The purpose of this resource is to provide baseline guidance to all levels of Health Care providers, so that the proposed programme may be implemented in a manner that will enable the people of this country to derive full benefit from it.

**Dr. R.K. Srivastava,**  
Director General, Health Services,  
Govt. of India

# ACKNOWLEDGEMENTS

The process of developing these training modules was initiated under the able guidance of Dr. R.K. Srivastava, Director General of Health Services and Dr. H.C. Goyal, Additional Director General of Health services.

The work of modification for adapting the WHO training modules to suit the needs of India, has been undertaken by Dr. Shelly Khanna Chadha, Professor of ENT, Dr. Suneela Garg, Professor of Preventive & Social Medicine, Dr. Achal Gulati, Professor of ENT, Dr. Alok Thakkar, Professor of ENT, Dr. Saurabh Varshney, Professor of ENT, Dr. Vijaylakshmi Basavraj, Director, All India Institute of Speech & Hearing, Mysore, Mr. R. Rangasayee, Director, Ali Yavar Jung National Institute of Hearing Handicap, Mumbai. The programme logo and cover of the manual have been designed by Dr. Vikas Malhotra, Assistant Professor of ENT.

We are highly grateful to Dr. Vinayak M. Prasad, Director, Ministry of Health & Family Welfare, Dr. Jagdish Kaur, C.M.O., Directorate General of Health Services and Dr. Vinay Hans, C.M.O. (NFSG), who have played an important role in the development and implementation of this programme. Heartfelt gratitude is also expressed towards the W.H.O., Country Office, India for their encouragement and support in this work.

We also wish to acknowledge the help and guidance provided by the Rehabilitation Council of India towards the development and implementation of the training scheme.



Dr. A.K. Agarwal,  
Director-Professor of ENT &  
DEAN, Maulana Azad Medical College,  
Additional Director General,  
Incharge, NPPCD

# ABOUT THE PROGRAMME

## NATIONAL PROGRAMME FOR PREVENTION AND CONTROL OF DEAFNESS(NPPCD)

Of the five special senses with which a human is gifted, the Auditory sense is particularly special as it is the sense that allows us to communicate with others. The sense of hearing is crucial for the mental development of a child and for the human abilities and social adaptation in life. At times, due to a variety of reasons, this sense is impaired. A person who suffers from a partial (Unilateral or bilateral) reduction in hearing acuity is said to be suffering with Hearing Loss or Hearing Impairment (Deafness). This may vary in severity from mild to profound. In its milder form, Hearing impairment causes difficulty in communication and improper speech development. When it is severe or profound and bilateral, it can lead to complete absence of speech development with its consequent social, educational and economic impact.

As per NSSO survey currently there are 291 persons per one lac population who are suffering from Deafness. As per WHO estimates 60 million in India people are already disabled. Rural population has been shown to be affected more often than the urban population. Poor economic background has also been held partially responsible. The common causes accounting for hear loss are Ear Wax, Chronic Otitis Media, Otitis media with effusion, Dry perforation of Tympanic Membrane, Congenital Deafness, Noise Induced Hearing Loss and Ototoxicity. The lack of health awareness and education has played a significant role in high incidence of hearing impairment.

Preventive measures can reduce the occurrence of ear and hearing disorders by over 50%. Prompt, suitable treatment and timely rehabilitative measures can benefit almost 80% of those who suffer with ear and hearing related diseases. Main emphasis of this programme (NPPCD) is on -Prevention of Hearing loss through awareness creation-Promotion of healthy ear care practices

- Early Detection, Treatment, both medical and surgical
- Rehabilitation, whenever required

### Rationale for the National Programme

- High prevalence of hearing loss, 6% as per WHO estimates
- Severe loss of productivity (physical and economical)
- Majority of causes are preventable or treatable
- Inadequate health resources related to hearing and speech in terms of manpower and infrastructure

### Programme Highlights

The National Programme for Prevention and Control of Deafness (NPPCD) was launched on a pilot basis from August 2006. Programme was initiated in 25 districts over 10 states, ie Andhra Pradesh, Assam, Gujarat, Karnataka, Manipur, Sikkim, Tamil Nadu, Uttranchal, Uttar Pradesh, New Delhi and 1 union territory of Chandigarh.

In 2008, the pilot phase has taken the shape of a full fledged National Programme and is to be

gradually being expanded to include 200 districts by the end of the 11th Five year plan. The programme has also been integrated with the National Rural Health Mission. For practical purposes this means that the programme is decentralized and implementation of the programme is being done through the State and District level Health Societies.

For the purpose of implementing this programme , the existing health infrastructure is to be utilized and upgraded.

The State Medical College would be the Centre of Excellence and will support the programme in the state with provision of expertise for training as well as patient care and referral.

The District Hospital will be the nodal point for the implementation of the programme. The government and private doctors as well as Audiologists will be involved. The District hospital would be strengthened with the provision of equipment to enable diagnostic as well as therapeutic and rehabilitative procedures to be carried out .

The Primary Health Center and Community Health Centres will be involved. The doctors here will be trained to reorient them to ear problems and will be provided with the basic diagnostic equipment, to enable them to diagnose, treat and refer the patients with hearing and ear diseases to higher facilities. The following equipment will be provided at the PHC:

- Otoscope
- Headlight
- Aural probe
- Tuning fork
- Noisemaker

Public Health Nurses, Multi Purpose Workers, Anganwadi Workers Supervisors and the grassroot functionaries Accredited Social Health Activists (ASHA) and Anganwadi workers( AWW) will be sensitized to the programme and to their specific roles in the programme. The function of the Health Care workers at the various levels within the health care delivery system will be defined and each person will be trained to perform that specific function.

The Schools will play a very important role in the programme. The School Teachers of the Primary section would be required to conduct a survey based on a questionnaire for the Primary children. Those found to be positive, will undergo an ear check up by the school health doctors where available or PHC doctors. The School health doctors or PHC doctors will be able to identify, treat and refer the children with ear and hearing disorders.

Activities for awareness creation would be an important and essential part of the programme.

The most important aspect of the programme is Service provision. This includes:

- Screening of persons for ear and hearing diseases. This shall take place through:
- Community based camps that are to be held in different parts of the district every month.

This camp shall help to identify persons with ear diseases as well as hearing loss.

Suitable therapy can be started at the camp, when possible or the patient will be referred to the district hospital for investigations and treatment.

- School based screening camps that will be held in the schools with the help of the school teachers
- Diagnosis & Medical Treatment: Patient will be able to seek treatment at the PHC as well as the District hospital. At the PHC, the medical officer will be able to examine the ear of the patient with the equipment provided under the programme. They can provide or start the treatment when

possible. Those patients who cannot be treated at the PHC, or who require investigation or special treatment will be referred to the District hospital.

- **Surgical treatment:** The district hospitals are being equipped to provide all possible surgical treatment options that are commonly required by a patient suffering with common ear disease.
- **Audiological diagnosis:** Most audiological diagnosis will be carried out at the District hospital with the help of the equipment provided (Pure Tone Audiometer, Impedance Audiometer, OAE Analyzer) by the Audiologist as well as the Audiological Assistant at this centre. Referral to tertiary centre will be required only for the purpose of special investigations such as the BERA .
- **Hearing Aid fitting:** Children under the age of 14 years who are identified under the programme and adjudged by the ENT Surgeon and Audiologist/ Audiological assistant to be in need of a Hearing Aid will be fitted with a hearing aid free of cost at the District hospital. The Hearing aid will be fitted with a custom made mould and maintained (other than batteries) free of cost by the Hearing aid supplier under the Programme. The same benefit can also be extended to other beneficiaries (above 14 years) under the programme at the discounted cost as per the government rate contract.
- **HEARING AND SPEECH THERAPY, REHABILITATION:** Will be provided to those needing it at the District hospital. The District Audiologist/Audiological assistant will provide this services. This will be accompanied by educational rehabilitation by a Special teacher at the District hospital.
- **Referral:** Under the Programme, all the Health care providers can refer any person with suspected ear diseases &/or Hearing loss to the suitable health care facility (PHC/CHC/District hospital) with a proper referral slip.

MONITORING & EVALUATION is a very important aspect of the Programme as it allows us to judge the progress made by us in various districts, states and the country as a whole. For this, it is imperative that all levels of trained personnel should fill in the Monitoring proformas that are allocated to them and send them to the Nodal Officer as well as the Centre.

#### **MANPOWER TRAINING & DEVELOPMENT:**

For the purpose of manpower training and development; modules have been developed for different categories of personnel involved. These include:

- 1) District level ENT specialists
- 2) District level Audiologists
- 3) Obstetricians /Gynecologists and Pediatricians
- 4) Primary Health Center Medical Officers
- 5) Multi purpose workers
- 6) Grassroot level workers including ASHA
- 7) Teachers

#### **CURRENT MODULE FOR ENT DOCTORS :**

- Prevalence and causes of deafness.
- Ear Operations
- Aural Rehabilitation and education.
- Priorities under the programme



## PREFACE

This advanced level training resource is designed to provide much needed information for the ENT officers working in Indian settings.

It addresses the occurrence, causes, prevention, detection of common ear diseases and hearing impairment. It also provides further information about aural rehabilitation and deaf education and a separate module on the provision, use and maintenance of hearing aids and services for them.

This information will enhance the knowledge and skills of ENT officers to help parents, care givers, teachers and employers, and community members to support and understand the needs of people who have ear diseases and/or are hard of hearing.

This resource is meant to serve as an information booklet about the NPPCD and its focus. It should be supplemented by use of standard ENT textbooks.

# 1 PREVALENCE, CAUSES AND PREVENTION OF DEAFNESS AND HEARING IMPAIRMENT

## 1.1 GLOBAL BURDEN

Hearing loss<sup>1</sup> is one of the commonest disabilities in the world and is often referred to as the hidden disability. The World Health Organisation estimated that in the year 2005 there were 278 million people in the world with disabling hearing impairment (moderate or worse average hearing impairment of 41db or greater in the better ear in adults and 31 dB or greater in children up to age 15 years); of these the loss began in childhood in 68 million people, and in adulthood in 210 million people. A further 364 million people are estimated to have a mild hearing loss (see figure for WHO definitions of grades of hearing impairment). Two thirds of the burden of hearing impairment is in developing countries and the estimates have increased progressively since they were first made in 1986.

### Grades of Hearing Impairment

Grade 0 None Hears	25dB or less	No/slight whispers	problems	
Grade 1 Slight in	26–40 dB	Hears/repeats normal voice at 1m	words	
Grade 2 Moderate	Child 31–60 dB Adult 41–60 dB	Hears/repeats in	words raised voice in 1m	} <b>Disabling hearing impairment</b>
Grade 3 Severe	61–80 dB	Hears into	words shouted better ear	
Grade 4 Profound	81 dB or more	Cannot hear/understand	voice	

Average 0.5, 1, 2, 4 kHz in better Ear

<sup>1</sup> DEFINITIONS: *Hearing loss* means any reduction of or difficulties with hearing. *Hearing impairment* means any level or grade of hearing loss. *Deafness* here means profound hearing impairment.

Burden of disease is compared according to the percentage of total Disability Adjusted Life Years (DALYs), in the world, that each cause contributes. DALYs are a measure of the years of healthy life lost (YLL) due to premature death together with the years lived with disability (YLD); hence this method takes much more account of the burden of chronic conditions, including disability, than with previous indicators that focused only on death rates. In the global burden of disease, adult-onset hearing loss ranks 12th in the year 2005, coming after perinatal conditions, lower respiratory infections,

HIV/AIDS, depression, heart disease, diarrhoea, strokes, road accidents, tuberculosis, malaria, chronic lung disease in that order of ranking. If one excludes SLL and focuses on disability alone and using the assessment of years lived with disability, adult-onset hearing loss ranks third at 4.8% of total YLD (after depressive disorders and other unintentional injuries which rank first and second with 12.1% and 4.8% of the total).

Thus hearing loss imposes a huge social and economic burden on society so the prevention of hearing impairment by governments and other organizations would be an excellent investment.

**INDIAN SCENARIO:** In India, there are an estimated 63 million persons with significant hearing loss. A large proportion of these are children. Wax is the commonest ear problem encountered in the population. A large part of the population (over 5%) suffers with Otitis media, which is a leading cause of hearing impairment in children. Congenital hearing loss occurs in approximately 2 out of every 1000 live born babies. This leads to severe to profound deafness and often results in the child's inability to develop verbal communication. Presbycusis is prevalent and often under reported. Noise Induced Hearing loss and Ototoxicity are under-reported factors.

### **MEASURING THE BURDEN**

Reliable, standardised, population-based data on the causes of hearing impairment are scarce. WHO has published a protocol developed by an expert group for conducting population-based prevalence, causes and needs surveys of ear and hearing disorders. This protocol includes software for data entry and analysis and comprises a section on survey methods, and a questionnaire for each person to record information on their hearing level, ear examination, family history, diagnosis of ear diseases and cause of hearing impairment, and actions needed. A set of coding instructions provide definitions and instructions for each item in the questionnaire. So far, surveys using this protocol have been carried out in more than ten countries and figures for disabling hearing impairment have been determined. More population-based information of quality is needed.

## **1.2 TYPES AND EFFECTS OF HEARING IMPAIRMENT**

Hearing impairment (including deafness) may be sensori-neural (due to damage to the inner ear or the auditory nerve), conductive (due to blockage or reduction of sound waves passing through the outer or middle ear), or a mixture of the two. They have a profound effect on individuals: they may delay development of speech and language, slow educational progress, cause difficulty in obtaining, performing and keeping a job, cause social problems, and lead to being stigmatized (unfairly thought of as undesirable or discreditable) at all ages.

### **1.3 EARLY IDENTIFICATION**

There is good evidence that early identification of hearing impairment leads to significant improvement in language and education, but late identification of hearing impairment leads to poor remediation. Therefore neonatal hearing screening services have been set up in most developed countries to identify children with a congenital hearing impairment. However these services are expensive to implement and identification of hearing loss during the first year of life may be a more feasible option.

## 1.4 CAUSES

(1) Sensori-neural hearing loss. This is the result of an abnormality of the cochlea in the inner ear or the auditory pathway. In general, 1-2 in 1,000 babies born have profound hearing loss, the majority of which is sensorineural. It is also common in later life.

### a. Inherited Causes

The majority of cases of this congenital hearing loss will be caused by dominant, recessive or sex-linked genes (recessive genes need to be inherited from both parents to show an effect, whereas dominant genes show an effect when inherited from only one parent; sex-linked genes are attached to the y or x chromosomes, the "sex" chromosomes). Most inherited hearing loss is the result of abnormal, autosomal (i.e. not sex-linked) recessive genes while the remaining hereditary causes are caused by autosomal dominant genes giving rise to some well known syndromes causing hearing loss (e.g. Waardenbergs or Ushers syndromes).

### b. Acquired congenital hearing loss

- maternal rubella, maternal syphilis, cytomegalovirus (CMV), toxoplasmosis
- birth trauma and hypoxia, hyperbilirubinemia (neonatal jaundice), these are more common in developing countries.

### c. Acquired after birth

- Meningitis, malaria, cytomegalovirus, or other infections such as mumps, toxoplasmosis and measles occur. These are particularly common in poor developing countries.
- Excessive noise, either social or industrial. India has legislation limiting the noise exposure at work to no more than 90dBA. Unfortunately these laws are often not enforced resulting in severe, highfrequency hearing loss in old age. It has been shown that the damage caused to the hearing by noise adds to the natural hearing loss of old age (presbycusis). In recent years the impact of social and recreational noise has become apparent and studies indicate that young people are losing some high frequency hearing from loud music in enclosed places such as clubs, or when using personal stereos. Much talk is made about the need to raise awareness of the problem but very few countries have sufficiently robust legislation to protect the public.
- Ototoxicity is a common cause of hearing loss. It is well known that many powerful drugs such as some antibiotics, or cytotoxics (anti-cancer drugs) can damage the hearing with some people being more susceptible than others. However, in life threatening conditions hearing loss may be a lesser consideration. Some infections like meningitis and malaria can themselves cause hearing loss but the treatment can sometimes do the same. Drugs that are known to cause hearing loss most often are the drugs whose names end with micin or mycin (e.g. gentamicin, streptomycin). If the drugs are given in a properly controlled fashion, they should not affect hearing. Control is best done by regularly measuring blood levels of the drug during treatment in order to reduce the dose if levels go too high. In developing countries, drug choice is often directed by cost, and effective, non-ototoxic drugs are expensive.
- Presbycusis is the hearing impairment of ageing and is sensori-neural in type. The cause is unknown and there is no specific treatment apart from hearing rehabilitation.

(2) Conductive hearing loss is common and accounts for much moderate hearing impairment. Most of these conditions, which can affect the outer and middle ear, can be treated successfully and restore normal hearing.

- Impacted wax (wax that blocks the whole ear canal and affects hearing). This is probably the commonest cause of mild to moderate hearing loss.
- Otitis media with effusion is common and may lead to hearing impairment.
- Ear infections are common in India and frequently lead to chronic suppurative otitis media (CSOM) and hearing impairment; sometimes 5% or more of all children have discharging ears from CSOM. Risk factors include poor personal hygiene, contact with dirty water, upper respiratory tract infections. It is usually preceded by acute otitis media (AOM) and results in a perforation of the tympanic membrane and a moderate hearing loss in the affected ear. AOM is common in HIV positive babies and in malnourished children. It is common when babies are not breastfed, when there is overcrowding, when there is smoking in the home, and when children are in contact with other children who have runny noses and coughs. Treatment recommended is detailed further in the book. If the ear dries up the perforation may remain and provide a site for further infection.
- Cholesteatoma is a more serious ear disease but is less common. It can have a devastating effect on hearing as well as causing brain abscess and facial palsy.
- Tumours. Malignancy of the ear is rare but when present is extremely painful and difficult to treat. Tumours of the brain are uncommon but tumours of the VIII nerve, such as acoustic neuromas, often present as unilateral hearing loss usually accompanied by tinnitus and vertigo. They must be managed in a specialised unit, if possible. Acoustic Neuromas are slow growing and a "Watch and See" policy is usually kept.
- Otitis media with effusion and chronic suppurative otitis (chronic discharging ears) are prevalent in people with HIV/AIDS. Although the evidence is still not conclusive, sensorineural hearing loss from HIV/AIDS and/or from some anti-retroviral drugs may occur.

## PREVENTION

At least 50% of the burden of hearing loss can be prevented. Programme planners are often not aware of the opportunities for prevention; management and rehabilitation of hearing loss and ear disease and their prevention should be the goal in the strategic management of this often unseen disability.

An example of prevention reducing hearing impairment occurs following the introduction of immunisation programmes against rubella, where a significant reduction is found in the number of children born deaf. Immunisation against rubella, mumps and measles is reasonably cheap and effective.

Prevention can be considered as primary, secondary and tertiary prevention. **Primary prevention** prevents the occurrence of the disease or other factor that would otherwise lead to hearing impairment. It includes interventions such as hearing conservation for noise induced hearing loss, immunization against infections causing hearing loss, treatment of acute otitis media and the rational use of ototoxic drugs.

**Secondary prevention** includes actions to prevent a disease actually causing a hearing impairment, or to prevent a hearing impairment becoming a disability (that is, preventing a hearing impairment in the ear affecting the ability of a person to hear well), and includes activities such as early detection

by screening, prompt treatment of infections such as meningitis or chronic suppurative otitis media and sometimes surgery to prevent or minimize the degree of hearing impairment.

### Pre-Natal Prevention

Disorder	1y prevention	2y prevention	3y prevention
Rubella	Immunisation Screening		
Syphilis	Health education, Screening Treatment of the mother		
Toxoplasmosis	Health education, Screening treatment of the mother	Early detection by screening all or high-risk groups and treatment, if available	Hearing aids Special education Rehabilitation
Ototoxicity	Avoidance, rational use		
Genetic causes	Health education, Counselling, identification of carriers		
Congenital malformations	None	Surgery, when appropriate	

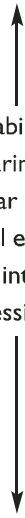
## Peri-Natal/Neonatal Prevention

Disorder	1 <sup>y</sup> prevention	2 <sup>y</sup> prevention	3 <sup>y</sup> prevention
Low birth weight	Nutrition, ante-natal care		
Birth trauma, hypoxia	Improved bith practice,		
Herpes simplex	Caesarian section	Early detection	
Cytomegalovirus	Personal hygiene health education	by screening all or high-risk groups and treatment, if available	Hearing aids Special education Rehabilitation
Jaundice	Detection of at-risk groups		
Ototoxicity	Avoidance, rational use		
Noise-induced hearing loss from noisy incubators	Reduction in noise		

## Prevention in Childhood

Disorder	1 <sup>y</sup> prevention	2 <sup>y</sup> prevention	3 <sup>y</sup> prevention
Impacted ear wax, Otitis externa, Foreign bodies	Personal hygiene Health education (e. g. avoid use of ear buds)		
Acute & Chronic otitis media	Personal hygiene, better living conditions, Proper management of upper respiratory tract infections (URTIs), better nutrition, breast feeding	Health education & screening for early recognition of disease and hearing loss, prompt treatment of disease and/or complications	Surgery, Hearing aids, Special education, Rehabilitation Social integration as appropriate
Measles, mumps	Immunization	Case follow-up	
Cerebral Malaria	Vector reduction and prophylaxis		
Meningitis	Prophylaxis, Immunization		
Ototoxicity	Avoidance, Rational use		

## Prevention in Adults

Disorder	1 <sup>st</sup> prevention	2 <sup>nd</sup> prevention	3 <sup>rd</sup> prevention
Ototoxicity	Avoidance rational use	Early detection	
Noise – induced hearing loss	Education, hearings conservation laws	Early detection	
Presbycusis		Early detection	
Trauma	Helmets, seat belts laws	Surgery	
Otosclerosis		Surgery	

**Tertiary prevention** can be considered to prevent a disability becoming a handicap for an individual functioning in his or her environment and includes provision of hearing aids services, special education, accessibility and social integration. This framework is illustrated in the tables 1–4 which show the activities that can be done for each type of prevention according to different causes. WHO has recently developed a new classification of disability (*The International Classification of Functioning, Disability and Health*) which takes

a more positive approach to disability and addresses social, environmental and personal factors. However the classification used here is still useful in understanding the different types of management and rehabilitation that should be used.

Table 5: Main causes of hearing loss

High proportion	Moderate Proportion	Low Proportion
Genetic causes	Excessive noise	Nutritionally-related
Otitis media	Ototoxic drugs & chemicals	Trauma-related
Presbycusis	Ante- & peri-natal problems	Menière's disease
	Infectious causes	Tumours
	Wax and foreign bodies	Cerebrovascular disease

In order to further develop the public health approach to prevention WHO has grouped the different causes according to their frequency (see table 5). This enables the development of strategies for prevention to focus on causes with high and moderate frequency and to ignore those of lower frequency even though for individuals these may of course mean significant disability.



## 2 DETECTION, SCREENING AND TESTING OF HEARING IMPAIRMENT

### 2.1 DETECTION OF A HEARING LOSS

Early detection and rehabilitation of a hearing loss is important for infants and young children. There is evidence to show that if an infant, who has a congenital sensorineural hearing impairment, is detected and rehabilitated in the first six months of life, speech and language development is much better than for those identified and rehabilitated late

Detection of a hearing loss early is also important for the older child who might otherwise become isolated and misunderstood. Frequently, he or she is suspected of having a behavioural problem and may not receive the type of help needed.

### 2.2 METHODS OF SCREENING

Hearing loss in infants and very young children may be suspected by parents and any parent voicing a suspicion of hearing loss in the child, has considered it carefully first. Others in contact with hearing impaired children may be able to compare their responses to sound with those of other children they are in contact with and mention their suspicions. All such suspicions should be taken seriously and the infant/child's hearing tested.

Detection methods have also been devised for use in this age group. These methods include:

- attention to "at risk" factors
- check lists
- questionnaires
- screening tests

**2.2.1 RISK FACTORS** for hearing impairment are found in Module 1. Using risk factors to identify hearing impairment in infants and young children has been only partially successful. Around 50% of hearing loss is undetected. Some types of inherited hearing loss may not be obvious from the history and infections during pregnancy do not always give clear symptoms.

As per the report of the Joint Committee:

Following are the indicators that can be used to assess neonates for hearing loss when Universal Screening is not available.

- Family history of Hereditary childhood sensorineural hearing loss
- In utero infection (eg TORCH)
- Craniofacial anomalies
- Birthweight < 1500 gms
- Hyperbilirubinemia at serum levels requiring exchange transfusion
- Ototoxic medications including but not limited to the aminoglycosides used in multiple courses or in combination with loop diuretics

- Bacterial meningitis
- APGAR Scores of 0-4 at 1 minute or 0-6 at 5 minutes
- Mechanical ventilation for 5 days or more.
- Stigmata or other findings associated with a syndrome known to include sensorineural and/or conductive hearing loss.

This high risk register is helpful in identifying those children who are a greater risk for hearing loss deafness.

**2.2.2 CHECK LISTS.** A list can be made and given to new mothers, indicating the signs to be expected in a normal hearing infant and young child. Such a list can assist in the identification of some of those having a moderate or more severe hearing loss. The typical checklist would include responses to sound and milestones for developing speech and language (table 1).

**Table 1: Check List for parents or carers**

Newborn	Startles to a loud sound
0–3 months	Soothed by moderately loud voice or music
3–4 months	Turns towards the source of a sound
6–8 months	Turns and locates the source of a quiet sound Babble sounds appear eg. Dada
12 months	Increased babble and the first word is heard Understands one or two simple instructions eg. “clap hands”
18 months	Says at least six words
2 years	Joins two words together
3 years	Talking in sentences. Speech mainly clear.

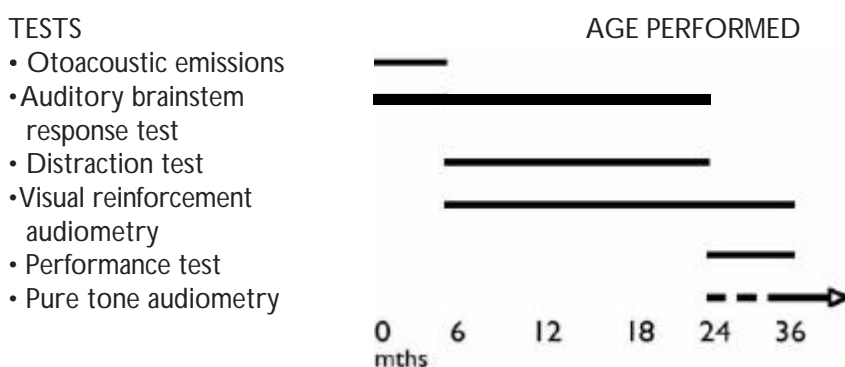
**2.2.3 QUESTIONNAIRES** have been employed with babies and older children with varying success. Questionnaires depend upon observation, and so a slight hearing impairment or a unilateral hearing loss may be missed using this method. They have the advantage, however, of being an inexpensive method of detecting more severe hearing loss in children with both ears affected (eg. See table 2).

**Table 2 Questions for infants 6–8 months**

- Do you think your baby has normal hearing?
- Does your baby startle to loud noises?
- Does your baby notice the sound of a car horn or bicycle bell?
- If you speak normally to your baby, does he/she turn to look at you?
- If you speak very quietly to your baby does he/she turn to look at you?

**2.3.3 SCREENING TESTS** can be used at various ages based upon the level of development that the infant/child has reached (Fig. 1). All such tests require the tester to first acquire training. A loud sound is required to elicit a behavioural change in an infant, so specialised tests are needed at this age. As the infant matures, responses can be obtained to quieter sounds until at around six months when an infant can turn and locate the source of a sound made at ear level. This ability to turn towards a sound is the basis of the Distraction Test (described later). Other tests can also be used with older children until they are capable of co-operating in pure tone audiometry, which is the test that provides the most information.

**Fig. 1 Screening tests of hearing**



### 2.3.4 NEWBORN HEARING SCREENING

Tests have been developed to detect a hearing impairment in newborns. These do not depend upon a behavioural change in response to sound and so all degrees of hearing loss can now be determined. The tests use otoacoustic emissions and/or auditory brainstem responses.

#### Otoacoustic emissions:

- are sounds made by outer hair cells in the cochlea in response to a sound signal.
- are not usually recorded if there is too much debris in the outer ear or if there is middle ear fluid.
- are of two main types used in testing hearing in infants:— transient evoked otoacoustic emissions (TEOAEs) and distortion product otoacoustic emissions (DPOAEs).
- TEOAEs are elicited using a click sound and are absent if there is a hearing loss >25–30dB.
- DPOAEs are the result of the interaction between two tones close in frequency and introduced simultaneously. They can be recorded in ears with up to 45dB HL hearing loss. So, their absence indicates hearing loss greater than 45 dB under the programme, OAE machine will be available at the District Hospital.

**NOTE: There are hand held instruments available for testing with OAEs or it is possible to use automated equipment.**

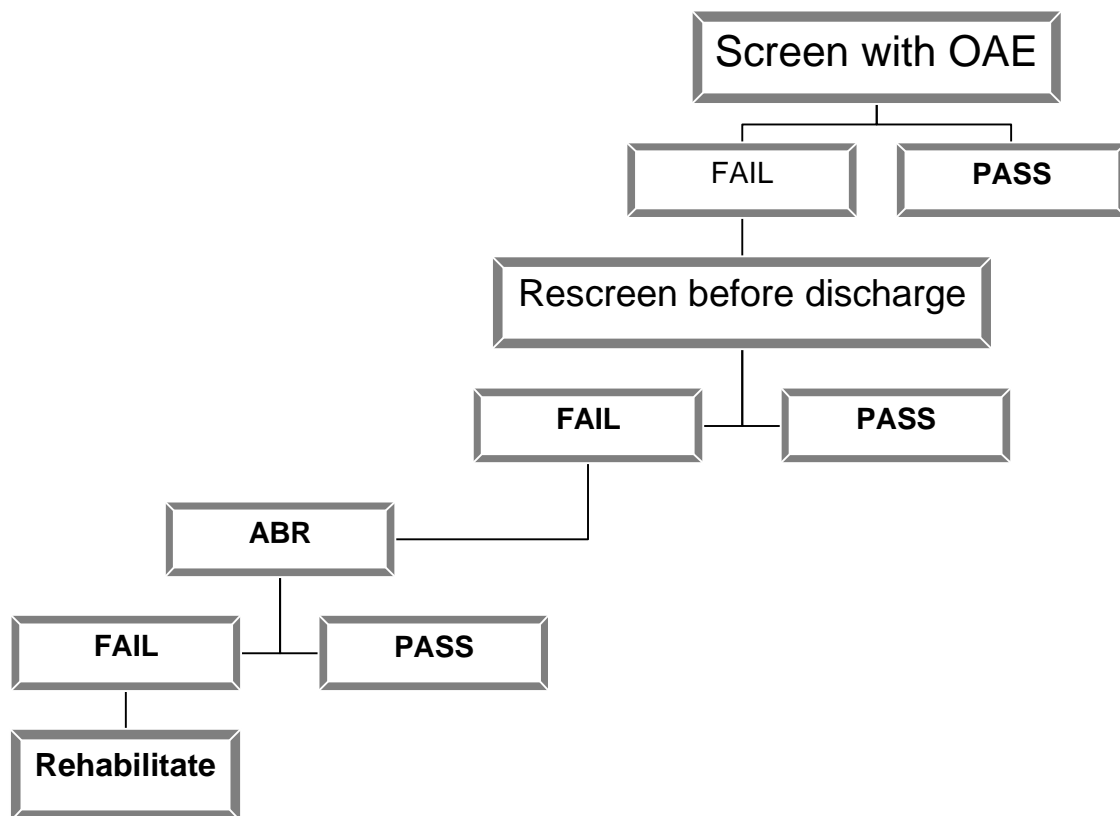
#### The auditory brainstem response test (ABR)

In this test responses to a sound are recorded at three electrode positions on the surface of the skull. The responses are seen as a waveform and one wave, wave V, is the wave which needs to be identified. A click sound is usually used to obtain the response. The click contains frequencies across

a wide range, and stimulates the cochlea along its length, but the responses are in the frequency region 1–4kHz, mainly around 3kHz. The test, therefore, only gives information relating to high frequency hearing. Newborns can be tested whilst asleep.

### Newborn screening programmes

Otoacoustic emissions are often used initially for screening hearing of newborns. In some screening programmes those who have no emissions are re-tested a month later. If again there are no emissions the newborns are referred for the ABR test.



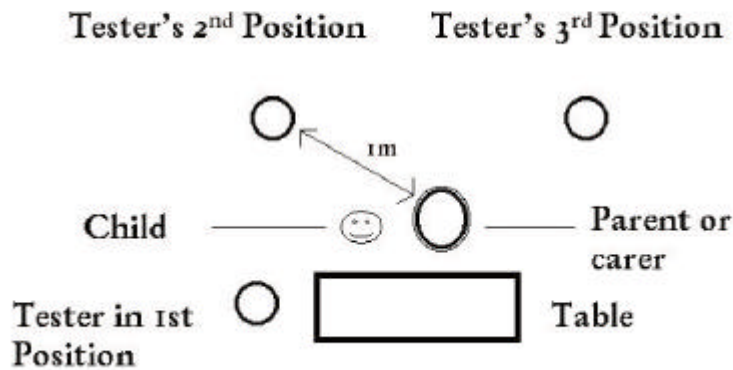
### 2.3.5 SCREENING THE HEARING OF OLDER INFANTS AND CHILDREN.

Behavioural tests of hearing may be used when an infant reaches the developmental age (as opposed to the chronological age) of six months.

Infants not at this level of development and some of those with more than one disability will need to be tested by the methods already described. The rooms used for testing need to be very quiet.

**2.3.6 DISTRACTION TEST.** A distraction test may be performed if an infant is sitting and able to turn and locate the source of a sound. It is carried out with the infant sat upon an adult's knee facing forwards where a distractor controls the infant's attention using toys. The tester introduces the sound signals from 45degrees behind, on a level with the ear and about one metre behind (Fig. 2a).

Fig. 2b Positions for performance testing



High, mid and low frequencies (i.e. high, mid and low pitched sounds) are tested separately in order to detect hearing loss restricted to one part of the frequency range. The sound stimuli used may be :-

- High frequencies      high frequency rattle, "ss" sound or \*warble tones at 4kHz
  - Middle frequencies    warble tones at 1kHz
  - Low frequencies      voiced hum or warble tones at 500Hz
- (\*warble tones are tones which vary slightly around a central tone.

The sounds are introduced at very quiet levels (35dBA). Care has to be taken not to give clues as to the tester's position other than the test signal.

### 2.3.7 VISUAL REINFORCEMENT AUDIOMETRY

Equipment is needed for this test – a sound source and a lit up toy or flashing light. The sound source is an audiometer and the sounds can be introduced via loudspeakers or headphones (or small earphones). If loudspeakers are used then warble tones of 500Hz, 1, 2 and 4kHz are used; if headphones are used then pure tones can be employed. The two loudspeakers are placed at an angle of about 60 degrees to the side of the infant/child being tested so that there is the need to turn and look at the light source that is usually placed on top. This helps the tester to recognise a response during the test.

At first, an infant is shown a light whenever a sound is heard. Once the infant has learned to look for the light whenever a sound is made the test itself can start i.e. once the infant has been conditioned.

In the test the sound is made first and the light is only introduced after the infant has turned to look for it. In this way sounds of different frequency can be introduced at the screening level chosen, usually 30/35 db at the ear, when using loudspeakers.

Discuss why the Distraction test is used as a method for screening infants.

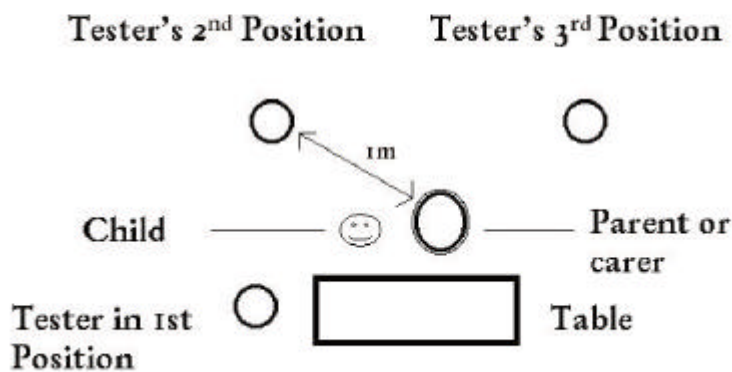
### 2.3.8 PERFORMANCE TESTS

A child is shown how to wait until a sound is heard before carrying out an action. Once this can be done the test is performed at a metre distance and from behind (Fig. 2b). The test may be performed using

- 1 "Go" for low frequencies, "S" for high frequencies , introduced at the quietest voice levels  
OR
- 2 Warble tones at 500Hz, 1or 2kHz and 4kHz introduced at a very quiet level corresponding to normal hearing.

The child is said to have "passed" the screen if there are two responses at the quietest level.

Fig. 2b Positions for performance testing



Explain the difference between Distraction tests and Performance tests and when they could be used to test hearing.

**2.3.9 PURE TONE AUDIOMETRY** Screening of hearing may be performed using pure tone audiometry. Pure tones are introduced using headphones and testing carried out by air conduction and bone conduction at frequencies from 250Hz to 8000 Hz. each ear can be tested separately.

The sounds are often introduced at a level of 20dB HL. They are then increased or decreased till the Hearing threshold is established.

## 2.4 MEASUREMENT OF HEARING

All the tests described in Figure 1, with the exception of otoacoustic emissions, may be used to quantify the degree of hearing loss in children as well as screen. This is done by starting at the level of loudness used for screening and then, if there is no response, raising the level of the sound until a response is obtained, and measuring that level with an instrument called a sound level meter. Some infants and young children have so severe a hearing loss that they do not hear any sound but respond very quickly if touched or if an object is seen. Others may not seem to respond due to additional disabilities. These two groups can be difficult to test so those infants and children who fail a screening test of hearing should always then be tested by experienced trained testers.

The auditory brainstem response test is limited in only testing to brainstem level and not giving information about low frequency hearing. The behavioural tests, with the exception of pure tone audiometry, provide information about the hearing levels of the better ear only. They may indicate a difference between the two ears, by showing difficulties in locating the source of a sound, without indicating the size of the difference. Information about the hearing level of both ears separately may be obtained using visual reinforcement audiometry.

Pure tone audiometry is the gold standard. This test can be used with most children from the age of three years and in some several months earlier. Adults are usually tested using pure tone audiometry. Where there is an asymmetrical hearing loss, a procedure known as "masking" is necessary if the hearing level of both ears is to be determined. Masking puts a noise into the better ear whilst the hearing threshold in the poorer ear is measured.

## 2.5 TYMPANOMETRY

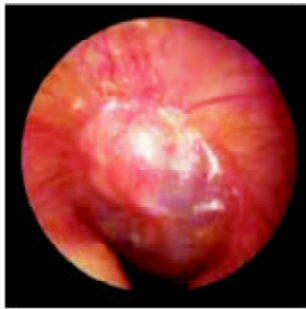
This is a test of the middle ear and is not a test of hearing. It is often used in addition to hearing tests, for adults and children, to help determine the type of hearing loss found. Tympanometry can indicate whether the middle ear is normal or has fluid in it, whether a perforation is present, if grommet tubes are working or are blocked. It involves a soft plastic tip being placed in the outer part of the external auditory canal and a tone being introduced into the ear. The amount of sound reflected back is measured and indicates whether fluid is present or not. The size of the space beyond the plastic tip indicates if the tympanic membrane (eardrum) is perforated or not. A test can also be performed to see if the contraction of the stapedius muscle can be detected. A contraction is not detectable if there is fluid in the middle ear.

## SUMMARY

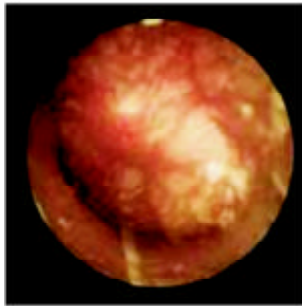
It is essential to detect hearing impairment and to rehabilitate those affected as early as possible. Tests are available for screening and measuring hearing loss in newborns, older infants, children and adults and for identifying the type of hearing loss. Not all such tests require expensive equipment but all need some measure of training before they are carried out.

## 3 PRIORITIES UNDER THE PROGRAMME

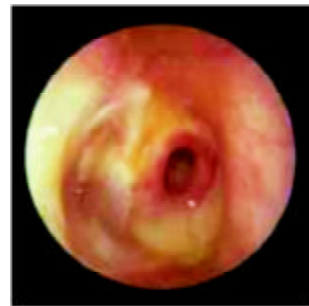
Though detection of deafness, congenital and acquired, as discussed in the previous module is a very important component of the programme, it is equally important to diagnose and treat ear diseases that can lead to hearing loss that may be mild, moderate or severe. Some of the priority diseases under the programme include:



Acute otitis media. Early stage



Acute otitis media, bulging. Suppurative stage



Perforated acute otitis media

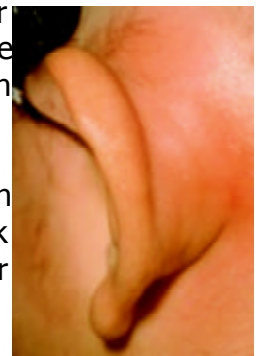
### 3.1 ACUTE OTITIS MEDIA (AOM)

In order to prevent chronic otitis media and complications, prompt diagnosis & suitable antibiotic treatment is recommended.

### 3.2 MASTOIDITIS

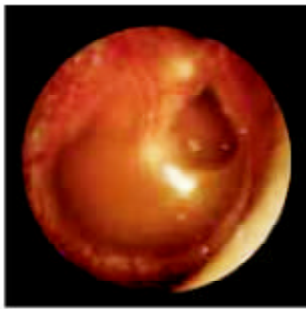
A mastoiditis can develop after inadequate treatment of acute otitis media or as a complication of CSOM, when the pathogens are very virulent or when the patient has low resistance. It can also occur after an acute exacerbation of an otitis media with cholesteatoma.

The suppurative process spreads from the middle ear to the mastoid and with faulty drainage causes bone necrosis of the mastoid cells. The pus can break outwards through the mastoid surface behind the pinna or inwards to the inner ear, dura or facial canal.



Start treatment with Benzylpenicillin (50,000 units/kg every 6 hours IV) and Chloramphenicol (25 mg/kg every 6 hours IV or IM) and refer to hospital. If there is delay in performing a mastoidectomy, then aspiration with a thick needle or an incision and drainage of the abscess should be done in the hospital and administration of IV antibiotics according to the culture and sensitivity test result.





Otitis media with effusion



Resolving OME with air-fluid hairline



OME with posterior retraction

### 3.3 OTITIS MEDIA WITH EFFUSION (OME)

A child suffering with OME may complain of earache or blockage in the ear. However, many a times the child does not come forward with this problem. The parents or teachers may notice that the child seems to hear less and is regularly asking for commands to be repeated or increases the volume of the television/radio.

At times, these factors too may go unnoticed. The hearing loss associated with OME will affect the speech development of such a child and may even have an adverse effect on his/her academic performance. You must stress to the teachers, parents, paediatricians as well as medical officers that they must be vigilant and in case a child shows any of the

above symptoms, he/she must be referred for an Ear & hearing check up at the district hospital.

Treat upper respiratory tract infections. Do not overlook Adenoid hypertrophy & sinusitis. Most cases in children resolve spontaneously after some months. Surgical treatment may be required if the middle ears don't clear up and the hearing impairment persists after 3 months. In chronic otitis media with effusion, adenoidectomy with myringotomy is effective in children. Insertion of grommets may be recommended.

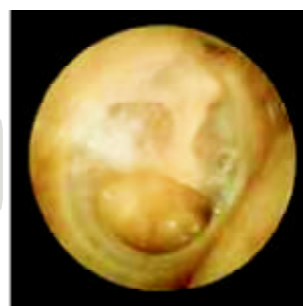
#### ACTIVITY

- Discuss the predisposing factors of OME
- Suggest some preventive measures for OME

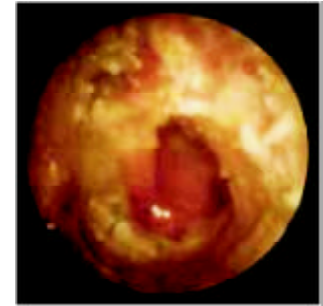
### 3.4 CHRONIC SUPPURATIVE OTITIS MEDIA (CSOM)

The aim of treatment is to get the chronically discharging ears dry, to stop further deterioration of the hearing and to prevent complications. Oral antibiotic treatment may not be effective against chronic ear infections. Do not give repeated courses of oral antibiotics for a draining ear.

- Teach the patient how to dry mop ears.



Dry, medium size, perforation



Chronic suppurative otitis media



Dry total perforation



CSOM



Epitympanic polyp, hiding cholesteatoma

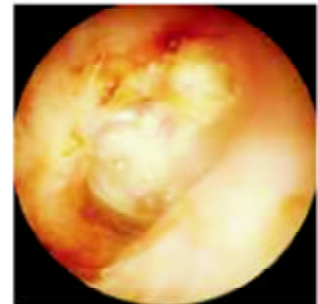


Patient should dry mop 3 times a day.

- Follow up in 5 days. If the ear discharge still persists, continue dry mopping and start with antiseptic eardrops.
- See patient as often as possible to repeat dry mopping or syringing and putting in eardrops- daily or weekly- and repeat examination of the ear and behind the ear each time.
- Test the hearing in both ears when the infection has cleared.
- Advise the patient to avoid water entering into the ear.
- Take up the patient for Tympanoplasty after the ear is dry and remains so for 6 weeks.



Cholesteatoma



Epitympanic defect with cholesteatoma

### 3.5 CHRONIC OTITIS MEDIA WITH CHOLESTEATOMA

All patients with cholesteatoma need surgical intervention, as serious, even fatal complications may occur. In principle the treatment is surgical in order to eradicate the disease and to save what is left of the hearing. In selected cases restoration or improvement of the hearing is possible. Surgery takes the form of Mastoidectomy


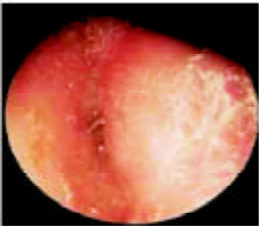

#### ACTIVITY

Identify the causes of **CHRONIC OTITIS MEDIA WITH CHOLESTEATOMA** and recommend treatment

If a patient develops a complication:

He/she needs urgent attention & suitable medical or surgical treatment.

## 3.6 MANAGEMENT OF EAR INFECTIONS

Disease	What is it?	Symptoms	Treatment
Otitis Externa(OE) 	Infection of the outer ear canal and/or pinna	<ul style="list-style-type: none"> <li>• Itching</li> <li>• Pain</li> <li>• Scaling skin or scanty discharge</li> <li>• Redness of the skin</li> <li>• Oedema in severe cases</li> </ul>	<ul style="list-style-type: none"> <li>• Clean the canal with suction, syringing or mopping</li> <li>• Topical treatment – no oral antibiotics (unless cellulitis or swollen glands)</li> <li>• Silversulphadiazine cream for the pinna</li> <li>• Icthamol glycerine pack in ear canal</li> </ul>
Acute Otitis Media (AOM) 	Acute infection of the middle ear	<ul style="list-style-type: none"> <li>• Fever</li> <li>• Irritability</li> <li>• Earache</li> <li>• Hearing impairment</li> <li>• Redness of the eardrum</li> <li>• Later bulging of the eardrum</li> </ul>	<ul style="list-style-type: none"> <li>• Oral Antibiotics (Amoxicillin or Co-trimoxazole) for 5–7 days</li> <li>• Paracetamol as long there is fever and pain</li> <li>• No ear drops</li> </ul>
Acute Otitis Media with perforation 	Acute infection with a small perforation	<ul style="list-style-type: none"> <li>• Discharge of the ear</li> <li>• Fever and pain subside</li> <li>• Perforation of the eardrum</li> </ul>	<ul style="list-style-type: none"> <li>• Oral Antibiotics (Amoxicillin or Co-trimoxazole) for 5–7 days</li> <li>• Dry mopping &amp; suction</li> </ul>

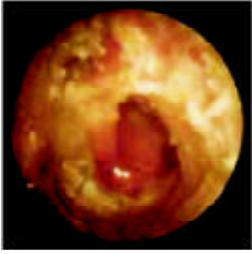
## Disease

## What is it?

## Symptoms

## Treatment

Chronic Suppurative Otitis Media (CSOM)

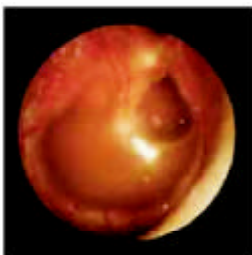


Infection of the middle ear for more than 2 weeks with a perforation of the ear drum

- Ear discharge
- Perforation of the ear drum
- Hearing impairment

- Suction cleaning
- Wicking or mopping at home
- Ciprofloxacin ear drops. Not longer than 2 weeks
- No oral Antibiotics
- No water should enter

Otitis media with effusion ('glue ear', OME)



Accumulation of fluid or mucus in the middle ear

- Blocked ear
- Hearing impairment
- Tinnitus

- < 3 months: expectant ('wait and see')
- > 3 months: refer to ENT

## 3.7. EAR WAX

- Ear wax needs to be removed, when it occludes the ear canal and causes hearing impairment or when it hinders otoscopy. Otherwise, a little wax does not need to be removed.
- Advise your patients not to clean their ears with cotton buds. This is ineffective and actually pushes the wax deeper into the ear canal. The bud may accidentally remain behind in the ear canal as a foreign body.



Impacted ear wax



Cotton wool in ear canal

### Remove the Wax by:

- Suction
- Probing
- Syringing



Holding child for cleaning of the ear

### 3.8. TRAUMATIC EAR DRUM PERFORATION:

This can be caused by a sudden air pressure wave in the ear canal from e.g. a blow on the ear or the shock waves from an explosion. Poking in the ear with pins etc., welding sparks and lightning can cause a perforation. Ear syringing may cause a perforation, especially in thin eardrums and when too much force has been used.

Most, including large, perforations close spontaneously after a couple of weeks or months time. No immediate surgical intervention is necessary. Infection must be prevented, by prescribing antibiotics (amoxycillin) for 7 days. Patients should avoid water entering the ear. If there is a discharge, then the treatment is the same as with CSOM, being dry mopping/suction cleaning and antibiotic ear drops.

Allow the perforation to heal spontaneously if the perforation fails to heal in 6 months, it would need surgical repair

### 3.8. FOREIGN BODIES.

- There are two types of foreign bodies (FB), such as vegetable, like seeds or beans and non-vegetable, such as cotton wool buds, sticks of wood, stones, eraser-rubber and insects. Both types can cause an otitis externa, when they remain in the ear canal long enough.
- Small seeds laying loosely in the ear canal can be syringed out. Impacted seeds should not be syringed, but removed with hooks or with a grasping micro-forceps. Sometimes in children general anaesthesia is necessary. All non-vegetable FB may be syringed out.
- Insects, buzzing in the ear canal, can as a home measure, be silenced with a few drops of clean vegetable oil and syringed out later
- Do not try to remove round objects, like a bead, with a forceps. It will slip off the forceps and be propelled deeper into the ear canal. Remove this type of FB by syringing or with a hook. Handle carefully to avoid trauma to the ear canal skin and eardrum.

#### ACTIVITY

What are the 2 different types of FB?  
Explain how you would remove a seed from the ear canal.

### 3.9 THINGS TO EXPLAIN TO A PATIENT

#### Dry-mopping/wicking:

- In general otitis externa (OE) and chronic suppurative otitis media (CSOM) are treated with topically applied medicines, such as ear drops. To be effective, debris and pus have to be removed first. Mopping & wicking is recommended. Dry-mopping can be done with a cotton wool mop on a cotton wool carrier or orange stick. Make sure, that the cotton wool is wrapped beyond the end of the stick. Wicking can be done with a rolled piece of clean cloth.

- In case of a chronically discharging ear (CSOM) instruct the mother or carer to dry-mop or wick the ear several times a day, before instilling the ear drops. This should be repeated until all the pus has been removed. Especially keep the outer ear clean to avoid contamination of the face and impetigo.

#### **Instilling ear drops:**

- Ear drops cannot be effective, if the ear canal is full of pus or debris. So clean out the ears first.
- The patient lies down with the ear to be instilled uppermost or tilts his head accordingly. Pull the pinna backwards and outwards as with the otoscopy. Instil the drops into the ear canal, without touching the ear with the dropper in order to avoid contamination of the bottle. Then press the tragus repeatedly to force the drops through the perforation into the middle ear. The patient should keep his head tilted for ten minutes before the other side can be instilled. It is not advisable to have patients themselves instil the drops, because drops will be spilled and also it is difficult to avoid the bottle from getting contaminated.
- If more than one member of a family are treated with ear drops, then each of them need their own bottle. The same applies for nose drops and eye drops.
- There is no need to keep an opened bottle in the fridge, but unfinished bottles have to be discarded after two weeks.

### **3.10. TEACHING THE PATIENT TO CARE FOR HIS/HER EARS**

Patients should be taught to:

- put in eardrops at home
- clean their ears by dry mopping or wicking
- put the eardrops in regularly
- Patients should return to the clinic regularly until the infection has cleared up.

#### **Ear Hygiene**

DO only use medication in your ears that has been prescribed for you

DO use clean towels to dry your ears

DO NOT put anything into your ear

DO NOT try to clean your ears with hair pins, tooth picks or anything else!

DO NOT let dirty water go into your ears

DO NOT leave cotton wool in your ears

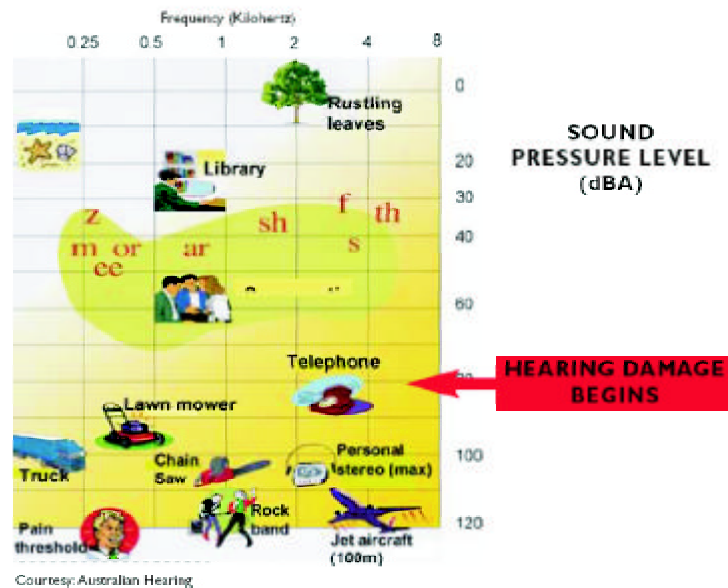
### **3.11. WHAT IS NOISE INDUCED HEARING IMPAIRMENT?**

Excessive noise such as produced by drilling, sawing and hammering machines and engines is the most common occupational hazard. Hazardous noise is also found outside the workplace, e.g. from loud music due to loudspeakers or headphones. Immediate loss of hearing can be caused by exposure to sudden intense forms of acoustic energy such as explosions and blasts or changes in barometric pressure. Excessive noise over a prolonged period of time gradually worsens the hearing by damaging the outer hair cells in the inner ear. Once the damage is done, it is irreversible. A rough estimate that noise is at a hazardous level is when one cannot have conversation with someone at

a distance of 2 meters.

The first signs are difficulty in hearing a conversation against a noisy background and often there is ringing in the ear – a condition called tinnitus.

## FREQUENCY AND INTENSITY OF FAMILIAR SOUNDS



## PREVENTION

- Employees should not be required or permitted by their employers to work in an environment in which they are exposed to noise equal to or exceeding a sound pressure level of 85 dBA (90dBA, as per Indian Factories Act) without appropriate hearing protection. There should also be a system of regular hearing screening. Without regular hearing screening the hearing impairment will only be noticed when it is too late.
- Machines and equipment should be designed and insulated to emit less noise.
- Hearing protectors exist in different forms, such as ear muffs, ear plugs and custom-made ear moulds. Some ear moulds contain a filter that allows speech to pass through. Hearing protectors should fit well and be worn consistently.
- Enactment and enforcement of legislation can make these provisions mandatory in the workplace, and for the setting up of compensation schemes. Awareness of the bad effects of social as well as occupational noise should be raised amongst the public and those with a higher risk of exposure.



### ACTIVITY

How would you explain the need for ear and hearing protectors to workers in a factory?

### INDIAN FACTORIES ACT, 1948

As per the Indian Factories act, the maximum limit of exposure to noise is 90dB for eight hours. Maximum level of exposure permitted and the time is as given below:

Total time of exposure (continuous or a number of short term exposures) per days in hours	Sound pressure level in dBA
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
3/4 (45 min.)	107
1/2 (30 min.)	110
1/4 (15 min.)	115

For Impulse Noise, the limits are as given below:

Peak sound Pressure level in dB	Permitted number of impulses or impacts per day
140	100
135	315
130	1000
125	3150
120	10000



Noise Induced Hearing loss is a Notifiable disease as per the Indian Factories Act. As per this act, any Medical practitioner attending a patient with NIHL must, without delay send a report in writing to the office of the Chief Inspector of Factories (of the area) stating

- (a) the name and full postal address of the patient,
- (b) the disease from which he believes the patient to be suffering, and
- (c) the name and address of the factory in which the patient is, or was last employed

## 4 EAR OPERATIONS

Ear operations should be performed by an ENT-surgeon, who is specialised in micro-surgery of the middle ear. Operations are done with help of an operating microscope under local or general anaesthesia.

### 4.1 AIMS OF EAR SURGERY IN OTITIS MEDIA:

- stopping the ear disease and prevention of further deterioration of the hearing
- prevention and treatment of disabling and fatal complications
- restoring the hearing

### 4.2 MINOR OPERATIONS:

#### 4.1.1 MYRINGOTOMY:

**Definition:** A small tympanic membrane incision and evacuation of middle ear fluid.

**Indications:**

- (sub)acute otitis media, not responding to medical treatment
- acute otitis media with complications
- otitis media with effusion

The myringotomy opening heals usually in a couple of days.

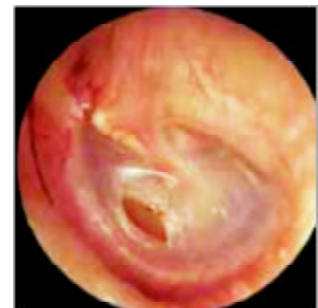
#### 4.1.2 GROMMETS

**Definition:** Myringotomy and insertion of a grommet in the tympanic membrane.

**Indications:**

- chronic otitis media with effusion, longer than 3 months duration, 25 dB or more hearing impairment in the better hearing ear
- recurrent acute otitis media.

Myringotomy and grommet insertion can be combined with an ADENOIDECTOMY, when indicated.



Myringotomy



Grommet in situ

## PATIENT INFORMATION

### **GROMMETS (ALSO CALLED TYMPANSTOMY TUBES):**

Hearing loss lasting for some time could be caused by fluid behind the eardrum. In order to improve hearing, the fluid must be removed from the middle ear. To drain the fluid from the middle ear a small ventilation tube or grommet is inserted through the eardrum. The fluid is then able to flow out of the middle ear through the grommet and then out of the ear. Once the middle ear is ventilated, the accumulation of fluid usually stops.

Grommets are also called 'PE (pressure equalising) tubes' or 'ventilation tubes'

The procedure takes a few minutes and will be done under general or local anaesthesia.

After insertion of the grommets your hearing will be better straight away, unless there is an infection. Once the grommets are in place a person cannot feel them. They usually stay in the eardrum for 6–12 months, sometimes shorter, sometimes longer, depending on their size and shape and will be ejected by themselves into the ear canal.

A worsening of hearing means that the grommets have come out or are blocked and the glue in the middle ear has build up again. It may be necessary to replace the grommet.

The ear may become runny, especially if dirty water has gone into the ear. This infection is treated with cleaning and instillation of antibiotic drops. Always avoid getting water in the ear whilst washing. Swimming, but not diving, is allowed using earplugs made of cotton wool with Vaseline or silicon custom-made earplugs.

Sometimes a small eardrum perforation may be left after extrusion of the grommet.

Some patients need grommets several times.

## 4.3 MAJOR OPERATIONS:

### **4.2.1 SIMPLE MASTOIDECTOMY:**

**Definition:** A complete mastoidectomy with dissection of all accessible cells.

An incision is made behind the ear and the mastoid bone is opened with a micro-drill. The bony wall of the ear canal is kept intact.

**Indications:**

acute mastoiditis with impending or existing complications which do not resolve after appropriate antibiotic therapy and myringotomy. CSOM, not responding to intensive, conservative treatment

## PATIENT INFORMATION

### MASTOIDECTOMY

The doctor has diagnosed an infection in the bone behind the ear. The infection has not healed using medicines alone and needs to be cleared with an operation.

An incision is made behind the ear and all the infected bone is cleaned out. The operation is done under general anaesthesia and may take an hour.

Once the source of infection has been removed, the ear has a better chance of being dry and trouble-free.

### 4.2.2 MODIFIED RADICAL MASTOIDECTOMY:

**Definition:** An operation to eradicate disease of the middle ear and mastoid in which the mastoid and epitympanic spaces are converted into an easily accessible common cavity by removal of the posterior and superior external canal walls. In this operation the tympanic membrane (remnant) and functioning ossicles are left intact. This operation is combined with a TYMPANOPLASTY and with a MEATOPLASTY.

#### Indications:

- chronic otitis media with cholesteatoma
- chronic mastoiditis with destruction of the posterior bony ear canal wall

## PATIENT INFORMATION

### MODIFIED RADICAL MASTOIDECTOMY:

The surgeon has diagnosed a longstanding ear disease that cannot be treated with medicines, but only with an operation. A pocket of skin with dirt is growing deep in the ear and may damage the hearing.

Without treatment there is a great risk of complications such as hearing loss, dizziness, facial palsy and brain infections. The operation is not completely without any risk. However, if the ear is not operated on, there is a greater risk of developing severe complications.

The goal of the operation is to make the ear safe and to preserve the hearing.

The ear is opened from behind or just in front and the bone behind the ear (the mastoid bone) is opened and all disease is removed. The eardrum will be closed and when possible the small hearing bones (ossicles) will be repaired.

The operation results in a common cavity of the drilled-out mastoid and the ear canal. Hearing improvement cannot be expected if there is too much destruction of the ear by the disease.

In order to help aeration, inspection and cleaning, the surgeon will widen the opening of the ear canal. The operation is done under general anaesthesia and may take a couple of hours. Life-long, regular check-ups are necessary for cleaning the ear and to see if the disease has come back. Sometimes a second operation may be necessary.

Earwax doesn't come out by itself from the cavity and needs to be removed at follow-up visits.

Always avoid getting water in the ear. Water in the cavity can cause infection and an attack of dizziness. Some of the cavities discharge constantly and are difficult to keep dry. The doctor may propose an operation to deal with this.

#### 4.2.5 TYMPANOPLASTY (MYRINGOPLASTY AND OSSICULOPLASTY):

**Definition:** Repair of the tympanic membrane (myringoplasty or tympanoplasty type I) and/or repair of the ossicular chain (ossiculoplasty) utilising tissue graft in order to close the middle ear and improve the hearing.

The operation can be combined with a mastoidectomy.

**Indications:**

- dry perforations and/or ossicular chain disruptions/fixations (inactive CSOM or post- traumatic)
- in combination with modified radical mastoidectomy.

### PATIENT INFORMATION

#### TYMPANOPLASTY (MYRINGOPLASTY AND OSSICULOPLASTY)

Hearing loss lasting for some time could be caused by a hole in the eardrum that doesn't heal. There is also a chance of ear infections, especially when water or dirt gets into the ear and these will make the hearing worse.

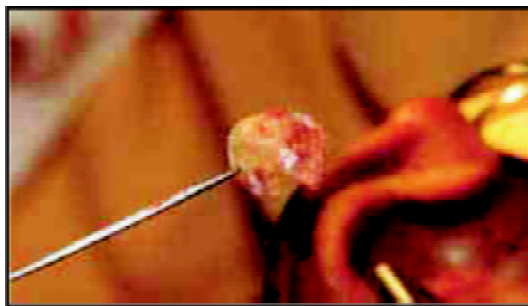
The hole in the eardrum will be closed with an operation using the patient's own tissue, which is taken from a cut in the skin near the ear. It looks a bit like patching a tyre. During the operation the doctor will also look at the hearing bones (ossicles) in the middle ear and check if they are intact and move well. When possible these little bones (ossicles) will be repaired. The operation will take 30 to 60 minutes. The patch or 'graft' will grow together with the remaining eardrum over a couple of weeks.

In over 80% of the cases eardrum repair is successful. In less than 20% the eardrum doesn't heal and the hole will remain as it was or be smaller. The result of repair of the small hearing bones is less predictable. The operation can be done again if necessary.

To ensure good healing it is important to keep the ear dry for the first month at least and to take the medicines and eardrops as prescribed by the doctor.

The hearing will improve over a couple of months.

It is important to keep the follow-up appointments.



Graft (fascia of the temporal muscle)



Graft in place (underlay)

List the minor ear operations and describe the need for each one.

Explain the need for aMODIFIED RADICAL MASTOIDECTOMY. Describe how you would explain this operation to the patient.

# 5 AURAL HABILITATION, REHABILITATION AND EDUCATION

## 5.1 AURAL HABILITATION AND EDUCATION:

### INTRODUCTION:

Deaf students are typically visual learners. Most, but not all, deaf learners have some capacity to learn to speak and read speech (Lip-read). Proficiency in speech for someone who has never heard clear speech requires intensive training. Language, a set of codes for vocabulary and grammatical rules, can be learned independently from speech. Sign language is a legitimate language. Its grammar structure, however, is different from spoken languages. Therefore, reading and writing in the dominant spoken language is difficult and often delayed for the DeafAs with spoken languages, sign languages vary across cultures. There is no universal sign language.

### 5.3.1 COMMUNICATION METHODS USED IN DEAF EDUCATION

**Speech Training, Sign Language, Total Communication and Education:** There is no singularly successful method in teaching the deaf.

The following approaches to teaching deaf learners are listed according to their proximity to the spoken dominant language.

**Oral/Aural Methods:** Learners are taught almost exclusively through speech and speech is expected from the learners. Signs and gestures are discouraged in the classroom. Aural habilitation is stressed to develop listening and speech and speech reading skills. **Suitability:** Used primarily for learners who are hard of hearing and deaf students with useful hearing and capacity to speak well.



Mixing oral and manual deaf learners Holy Cross Services, Trichy, India

**Total Communication Method:** Learners are taught through a combination of communication methods to suit individual needs (see Fig. 1). Includes simultaneous communication method wherein the teacher speaks and concurrently signs the words she speaks. The grammar of this approach is the same as the spoken language (manually coded language). Modern TC methods allow the teacher to individualize using the local sign language (e.g. FSL - Filipino Sign Language) grammar with some learners and spoken language e.g. (English or Tagalog) with others in the course of a lesson. **Suitability:** Can be used in an inclusive classroom with hearing, hard of hearing and deaf learners or in a classroom for deaf learners.

**Bilingual-Bicultural Method:** Classroom instruction and discussions are conducted in the learners' first language, the local sign language. The national and other languages are taught through reading

and writing. Deaf history, Deaf culture and advanced sign language are included in the curriculum and often taught or transmitted through Deaf teachers. Suitability: This is the preferred method of instruction for culturally Deaf learners who depend on sign language.

**Figure 1: Total Communication**



How could the teacher and parents/families work together to encourage skills in listening, speech and speech reading (lip-reading) of a hearing impaired child?



## **AURAL HABILITATION FOR THE HEARING IMPAIRED**

Aural or auditory Habilitation is the training given to learners who have not yet developed listening, speech, and language skills. The interventions are tailored to meet each learner's individual needs and include assessment, sound and speech perception training, speech and language therapy, sign language, and dominant language literacy. Interventions provided in the early years have the greatest effect.

To be effective, these interventions require the following hardware supports:

- Hearing aids
- Group / individual speech trainers
- Mirrors, sound producing toys, etc.
- Visual aids and learning materials
- Noise reduced, well-lighted classrooms

### **5.3.2 TEACHING STRATEGIES IN DEAF EDUCATION**

Effective teaching strategies in classrooms for deaf learners are visual and gestural and can be simultaneously verbal. The use of group and individual hearing aids for amplified speech assist in perfecting skills in listening, speech and speech reading, especially for those who have enough hearing to benefit from speech and for very young hearing impaired children. This combined use of five communication modes in the education of the deaf is Total Communication, previously mentioned and illustrated in Figure 1. Educators of the Deaf are skilled in using multi-media approaches in the classroom.

The Visual – Gestural Communication approach capitalizes on the visual learning styles of the Deaf. The strategy goes far beyond the traditional talk and chalk methods common to hearing classrooms. The emphasis is on language learning which leads to improved cognitive development. Academic subjects taught through visual and experiential teaching strategies can result in boosting confidence in learning and personal self-image.

Language and thinking skills are taught through communication (oral and/or signed) interactions including strategies such as question and answer cycles, problem solving as well as through visualizations of concepts categorized in logical sets to facilitate long-term visual memory and structured language.

## **5.2 COCHLEAR IMPLANTS**

### **5.2.1 WHAT IS A COCHLEAR IMPLANT?**

A cochlear implant is different from a hearing aid.

Hearing aids amplify sounds. Cochlear implants compensate for damaged or non-working parts of the inner ear. The device receives and transmits sound waves but bypasses the outer and middle ear and directly stimulates the hearing nerve through fine wires, allowing the person to perceive the sounds. An operation under anaesthetic is needed to insert the wires through the skull into the cochlea of the inner ear.

Discuss the differences between a hearing aid and a cochlear implant. Explain how a cochlear implant would help a 3 year old acquire speech and language.

## 5.2.2 WHO COULD BENEFIT FROM A COCHLEAR IMPLANT?



Children (over 2 years) and adults with profound hearing impairment are the most appropriate candidates for implantation.

A cochlear implant could also benefit adults with severe to profound hearing impairment as it helps them understand speech without needing visual cues such as lip-reading or sign language. Usually anyone who could benefit well from a hearing aid is not a candidate for a cochlear Implant.

### 5.2.3 REHABILITATION:

Recipients of cochlear implants need to be taught how to interpret sounds into meaningful speech. Once the implant is switched on the recipient must attend intensive speech and language therapy as well as counselling and educational, medical and technical supports. Implantation should not be done unless the necessary medical, educational, technical, psychological and hearing therapist resources and services are available. Without these support structures in place the patient will obtain almost no benefit from the cochlear Implant.

### 5.2.4 COSTS AND AVAILABILITY:

The financial cost of a cochlear Implant is extremely high, hence especially expensive for most people in our country. In addition, most cochlear Implants run on six or more hearing aid batteries that need to be replaced every week or so. Where there are limited resources for a hearing health programme, it will be more effective to use these resources to prevent a larger burden of hearing loss in a greater number of people by using less expensive interventions.

## 5.3 DEAFBLINDNESS

### 5.3.1 WHAT IS DEAFBLINDNESS?

Deafblindness is a distinct disability. It involves the dual sensory loss of sight and hearing. We understand 90% of the world around us through our senses of sight and hearing, our two major distance senses. Deafblindness leaves the person isolated, unaware of his surroundings, with difficulties in communicating with the world around him, and hinders moving around the environment.

The deafblind have to rely on spatial memory, touch, smell, and kinesthetic sense to better understand the world around them.

There is no single medical condition that causes deafblindness. There are several disorders, syndromes, infectious diseases and other adventitious conditions (acquired) that may result in an individual being deafblind.

The deafblind person may show a wide range of visual and hearing losses.

### **5.3.2 VISUAL & HEARING IMPAIRMENTS COMBINED**

Individuals may have:

- hearing impairment and visual impairment with vision loss being the primary disability
- hearing impairment and visual impairment with hearing impairment as the primary disability
- hearing impairment and blindness
- hearing and visual impairment
- deafness (profound hearing impairment) and visual impairment
- deafblindness

The majority of those who are classified as having concomitant visual and hearing impairment have some useful residual vision or hearing. Total absence of vision or hearing is rare.

Often individuals who are deafblind may have other impairments like mental retardation, epilepsy, physical disabilities, or other types of disabilities.

### **5.3.3 WAYS OF COMMUNICATING WITH THE DEAFBLIND:**

- Interpreter
- Expressive Speech = voice
- Receptive speech = lip-reading & hearing
- Spelling Out Words
- Writing and Reading print on paper
- Finger Braille
- Writing words in palm
- Tadoma = a deafblind person using Tadoma places his thumb lightly on the lips of the speaker to feel breath sounds (s, sh, ch, & f) and lip movements (to tell vowels from consonants & diphthongs) the index finger is placed along the side of the nose to detect nasal sounds (m, n, ng)
- Sign Language
- Hand over Hand communication

#### **ACTIVITY**

Describe what Deafblindness is and the impact it has on the individual's ability to communicate.

## 6 HEARING AIDS

### 6.1 WHAT ARE HEARING AIDS?

A hearing aid is an electrical device worn on the ear. They enable hearing impaired people to hear sounds better and louder.

### 6.2. WHO CAN USE HEARING AIDS?

Almost everyone, young and old, who has a hearing impairment can be helped with hearing aids. Mostly, patients with sensorineural hearing loss need hearing aids. Those with conductive hearing loss who cannot or do not wish to undergo surgery, can also use hearing aids.

How successful is the use of hearing aids depends on many things:

- at what age the hearing impairment occurred
- whether the hearing impaired person has already developed spoken language
- how soon hearing aids are fitted after a hearing impairment is discovered
- the degree of hearing impairment - slight, moderate, severe, profound
- the type of hearing impairment - conductive, sensorineural
- how motivated the hearing aid wearer is towards using hearing aids
- how well hearing aids are fitted and maintained
- the quality of the hearing aid and ear mould
- the help and support available to learn to use hearing aids – especially for young children
- where hearing aids are used - quiet or noisy surroundings
- if the wearer has been given instructions on how to listen/use the hearing aid

In general, people with a hearing impairment in only one ear do not need to use a hearing aid, because they receive enough information in their good ear.

### 6.3 WHY ARE HEARING AIDS NEEDED?

Hearing impaired people need hearing aids to help them communicate. Hearing aids can help people hear and understand speech and other sounds around them. The ability to hear all these sounds not only improves the quality of life of hearing impaired people, but can also significantly improve their ability to learn at home, at school or in the workplace. Hearing aids can help hearing impaired people become active members of their families and community instead of being isolated and alone.

## 6.4 WHEN SHOULD HEARING AIDS BE FITTED?

Hearing aids should be fitted as soon as a hearing impairment has been discovered. This is especially true for babies and young children. It is important that young children can hear well in order to develop speech and language.

Important language learning can be missed when young hearing impaired children are not fitted with hearing aids.

## 6.5 WHERE CAN HEARING AIDS BE OBTAINED FROM?

Hearing aids are not ornaments or pieces of jewelry that can be bought "off the shelf" in a shop. Hearing aids need to be fitted following an accurate hearing test.

Hearing aids (including the ear moulds) then need to be properly fitted into the ear. At the same time new wearers must be given instructions and help on how to use hearing aids and look after them. Follow up visits are needed to give further assistance to the wearers and their carers. Hearing aids are available at the District Hospital for children less than 15 yrs.

Hearing aids for young children requiring it will be available at the District hospital.

Why is a hearing aid called an "aid"?  
In what way does it help the person hear sounds more clearly?

Early identification of hearing impairment in babies and children is very important for successful use of hearing aids  
Remember – hearing aids are not a miracle cure for hearing impairment, they are an "aid" that helps hearing impaired people to hear sounds better

## 6.6 TYPES OF HEARING AIDS AND HOW THEY WORK

### 6.6.1 HOW DO HEARING AIDS WORK?

**Microphone** – the sound is picked up through the microphone and changed from a sound signal to an electronic signal.

**Amplifier** – The electronic signal from the microphone is made stronger by the amplifier

**Receiver** – The receiver works like a loud-speaker and changes the amplified electronic signal back to a sound signal. It transmits the amplified sounds to the ear

**On-off switch** on a hearing aid is usually labelled 'O T M'

O = Off position

T = Telecoil used with specially adapted equipment to cut out background noise

M = On position (M stands for microphone)

Sometimes the on-off switch is part of the battery drawer. In this case the hearing aid is switched off by slightly opening the battery drawer.

**Volume control** alters the loudness of the sound going into the ear from the receiver. The volume can be adjusted by the hearing aid wearer.

**Battery drawer** is where the battery is kept and is usually positioned at the bottom of the hearing aid.

**Battery** is the power supply for the hearing aid.

**Ear hook** (BTE hearing aids only) – this rigid plastic hook fits over the top of the ear to hold the hearing aid in position. It is also connected to the plastic tubing of the earmould.

**Cord** – (BW hearing aids only) – the receiver is attached to the main part of the hearing aid by a cord. This cord can be single (for one receiver), or double (for two receivers).

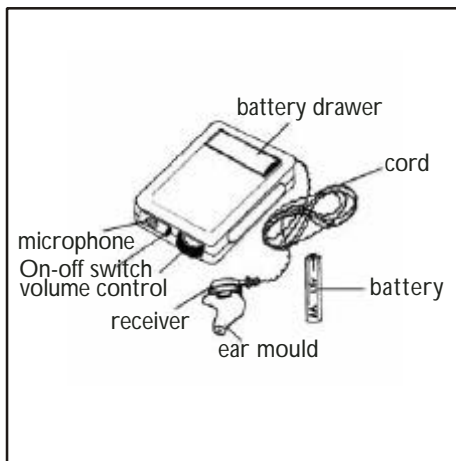


Diagram of BW hearing aid

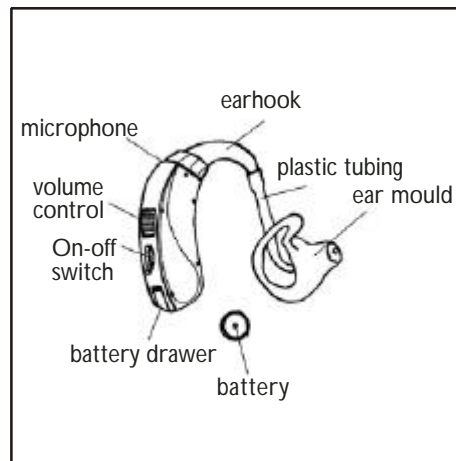


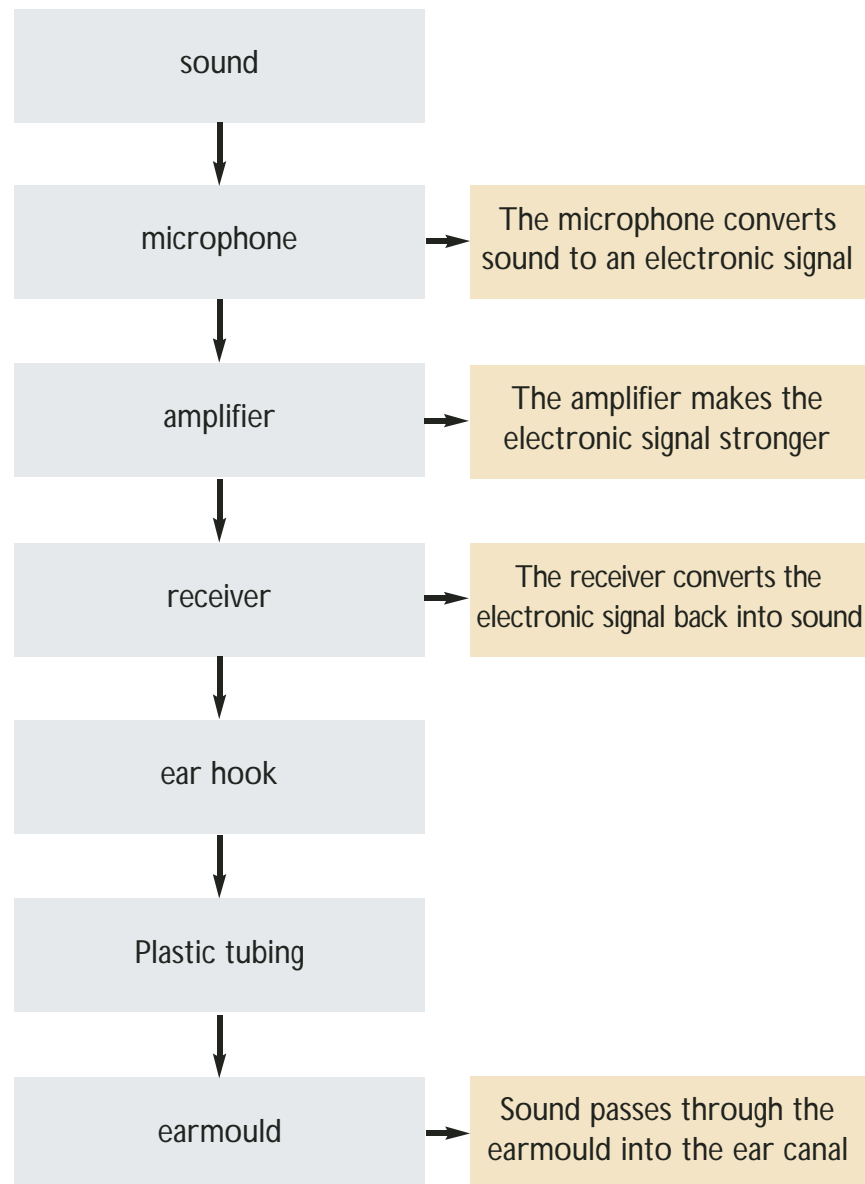
Diagram of BTE hearing aid

### 6.6.2 HOW DOES SOUND TRAVEL THROUGH HEARING AIDS?

The hearing aid picks up sound through the microphone on the top of the hearing aid. The microphone converts the sound to an electronic signal that is then made stronger by the amplifier.

This is then passed on to the receiver where it is converted back to sound again. In a BW hearing aid the receiver is outside the main part of the hearing aid and is connected by a cord. The sound enters the ear through the ear mould that is clipped onto the receiver. In a BTE hearing aid the sound travels down the ear hook from the receiver and then through the plastic tubing in the ear mould into the ear canal.

## Flow diagram of how sound travels through a BTE hearing aid



### 6.6.3 TYPES OF HEARING AIDS

#### Body-worn (BW) hearing aids

A BW hearing aid consists of a small box worn on the front of the body with a cord leading to the receiver that is clipped into an ear mould in the ear. They are usually used for severe and profound hearing impairment.

#### Behind-the-ear (BTE) hearing aids

BTE hearing aids are worn behind the ear and are connected by a short length of plastic tubing to an ear mould in the ear. They can be used for all levels of hearing impairment.

## **Solar rechargeable hearing aids**

A few solar rechargeable BW hearing aids have been designed specifically for people in developing countries. They include a solar panel built into the housing which, when exposed to direct sunlight, charges a rechargeable battery. Solar rechargeable BTE hearing aids are also currently being developed.

How does sound travel through the ear to the brain?

## **6.7 TYPES OF BATTERY**

The correct batteries must be used or the hearing aid will not work properly.

For BW hearing aids any standard AA size 1.5 V battery can be used, but long life alkaline batteries are advised (these are more expensive but will last much longer). For BTE hearing aids special hearing aid batteries must be used. The battery life depends on how often the hearing aid is used, at what volume and the power of the hearing aid itself. Batteries may last from just a few days to almost a month.

Remember – the circular LR44 watch/camera batteries should not be used as they will damage a BTE hearing aid.

### **6.7.1 FITTING A NEW BATTERY INTO A HEARING AID**

For BW hearing aids place the battery in the battery drawer matching the positive signs together. For BTE hearing aids remove the paper from the battery and place the battery in the battery drawer (not inside the hearing aid) matching the positive signs together. Gently close the battery drawer – do not force it shut. Do not touch the face of the battery as it can clog the air cells that are used in a zinc battery.

Note: the paper cannot be replaced and the battery cannot be put back in the packet to be used later.

### **6.7.2 CHECKING THE BATTERY**

- Remove the hearing aid from the ear and take off the ear mould.
- Switch the hearing aid on and turn the volume control to the highest setting
- Place the hearing aid in the palm of your hand. For a BW hearing aid place the receiver next to the microphone.
- If there is a continuous whistling sound the battery is working
- If there is no whistling sound the battery is used. Replace the battery
- If there is still no whistling sound with a new battery then there is a problem with the hearing aid



## 6.8 EAR MOULDS

### 6.8.1 WHAT ARE EARMOULDS AND WHY ARE THEY NEEDED?

Ear moulds connect the hearing aid itself to the ear. They are made individually for each person so that they fit exactly into the ear. If an ear mould is the wrong size or has been put in the ear incorrectly there may be a loud whistling sound. An ear mould that does not fit properly will be uncomfortable and may even be painful. Ear moulds need to be replaced every one to two years. Children, whose ears grow very quickly, will need new ear moulds every few months.

The ear mould is an essential part of any BTE or BW hearing aid.

Solid Ear moulds are used with BW hearing aids and are connected to the receiver by a small plastic or metal ring. Shell Ear moulds are used with BTE hearing aids and are connected to the hearing aid by a short length of flexible plastic tubing. The left ear mould is a mirror image of the right ear mould. Hold the ear mould with the canal part at the bottom and the helix at the top. With the concha (crescent shape) at the back, the direction of the ear canal indicates the ear into which the ear mould is to be fitted.

### 6.8.2 FITTING THE EAR MOULD ONTO THE HEARING AID

For a BW hearing aid the ear mould simply clips on to the receiver and can then be fitted into the ear.

For a BTE hearing aid the plastic tubing needs to be cut to the right length. If it is too long the hearing aid will not stay behind the ear properly. If it is too short then the ear hook of the hearing aid will be pulled down on the top of the ear and be uncomfortable.

Remember – the tubing on a BTE hearing aid must not get twisted as this will block the pathway of the Sound

### 6.8.3 FITTING THE EAR MOULD INTO THE EAR

Fitting an ear mould into the ear correctly is not easy and can take some practice:

- Hold the ear mould between the thumb and middle finger. Your first finger helps support the hearing aid.
- Fit the canal part of the mould into the ear canal first.
- Now press the mould into the ear so that it fits into the shape of your ear.

## **6.9 HEARING AID CARE AND MAINTENANCE**

### **Guidance to Patients**

#### **6.9.1 LOOKING AFTER HEARING AIDS**

- Do not to drop them – hearing aids are delicate.
- Do not leave hearing aids in direct sunlight or on top of a heater
- Do not wear hearing aids without medical advice if you have any ear discharge from an infection.
- Do not use a pin, paper-clip or any sharp object to remove dirt from hearing aids or ear moulds.
- Store hearing aids in their box, in a cool, dry place out of the reach of other children and animals. Don't just put them in a pocket.
- Only use the on-off switch and the volume control – all other controls should only be changed by a trained person.
- Remove hearing aids before putting on perfume or hair spray
- Never try to repair hearing aids yourself – if they break return them to the place where they were fitted.
- Keep cords of BW hearing aids free of knots and do not wind them tightly around the hearing aids.
- Do not get hearing aids wet – remove them for washing and swimming. If hearing aids do get wet, do not put them in the oven or the sun to dry out. Remove the batteries, leave the battery drawers open and put them somewhere safe for a day or two and they may dry out.
- Keep hearing aids in a "stay dry" or plastic bag/box with rice or silica gel crystals to absorb moisture.

#### **6.9.2 LOOKING AFTER BATTERIES**

- Batteries should be stored in a cool, dry place, away from small children and animals that may swallow them. If a battery is accidentally swallowed seek medical help immediately. In very hot, humid climates batteries can be stored in a refrigerator. Used batteries must be disposed of carefully and not thrown in the fire or left where small children or animals can reach them.
- When the hearing aid is not being used it should be switched off to save the batteries. In hot, humid climates or if the hearing aid is not going to be worn for a long time the battery should be removed from the hearing aid altogether.
- Batteries for BW hearing aids can be bought at local shops. Batteries for BTE hearing aids can usually be bought at hearing centers. Batteries should always be bought well within their expiry date.
- For zinc air batteries do not remove the tab on the top of the battery until it is going to be inserted into the battery drawer. Removing the tab causes the battery to discharge.

#### **6.9.3 LOOKING AFTER EAR MOULDS**

It is very important to keep ear moulds clean, so they need to be washed every two or three days:

- Detach the ear moulds from the hearing aids
- Wash the ear moulds in warm soapy water. Do not use strong detergent or spirit.
- Any wax still stuck in the hole through the ear moulds can be carefully removed using a toothpick / thin stick. Be careful not to push the wax further down the tube.
- Rinse the ear moulds in clean water and blow through the tubing to remove any drops of water

- Dry the ear moulds with a soft cloth or tissue and replace them the correct way around on the hearing aids.

Condensation (small drops of water) sometimes forms in the plastic tubing and can block the ear mould. If this happens, remove the ear mould and tubing from the hearing aid and blow through the tubing.

NOTE: Do not blow into the hearing aid itself

## **ROLES & RESPONSIBILITIES OF THE DISTRICT ENT DOCTOR**

This programme is based on the concept of the "Healthy Ear District" and the District is the main focus of the programme. The entire programme is centered on the District hospital and its services. The ENT Specialist at the District hospital along with his/her team of other specialists (if available), audiological staff and rehabilitation staff are the key persons of this programme.

- The ENT specialist is the overall coordinator of this programme in his/her district and must work in close cooperation with District level nodal officer, State nodal officer and faculty of the designated State medical college.
- The ENT specialist has the responsibility of diagnosing and treating patients with ear and hearing disorders.
- The patients referred from the PHC/CHC or other centres within the district must be suitably diagnosed and treated.
- The ENT surgeon has to undertake surgeries related to the ear diseases and hearing problems in his centre. When required, he/she can go back to the designated medical college for upgradation of his/her surgical skills.
- Patients with a complication or any such problem that cannot be dealt with at the District hospital must be referred to the tertiary centre, the designated medical college.
- He/she must ensure that the audiological investigations required under the programme are being carried out properly at the district hospital by the designated audiological staff.
- He/She must ensure that the equipment designated under the programme is procured following the correct procedure, guidelines and timelines, in collaboration with the District level nodal officer. The Utilisation certificate for the same must be submitted to through the proper channel to the Central Coordination Committee at the Directorate General of Health Services., New Delhi.
- He/she must ensure that the screening camps are carried out in different parts of the district. For this, he/she must give suitable inputs and guidance to the NGO identified for this purpose within their district.
- He/she must supervise the fitting of the hearing aids and ensure that the correct procedure and guidelines are followed
- He/she will act as resource person/trainer for the trainings of the manpower in the district. These trainings will be done in consultation with the state and district level nodal officers.
- He/she will be responsible for sending the monthly report to the District, State and Centre. This report must include the reports received from the PHCs of the district as well as the centre report from the District hospital.

With your cooperation and support, the programme will be able to reduce the morbidity due to ear diseases, hearing loss and deafness in our country.

# Screening Proformas under the NPPCD

## SCHOOL SCREENING PROFORMA (For Ear & Hearing Diseases)

Ldwy eadku , oaJo.k l ædkh jkækdh tlp djusgrqijQkekZ

Child's Name /cPpsdk uke% \_\_\_\_\_ Sex /fyæ \_\_\_\_\_

Age /vk; q \_\_\_\_\_ Class /d{kk \_\_\_\_\_

Name of School /Ldwy dk uke : \_\_\_\_\_

Father's Name /fi rk dk uke : \_\_\_\_\_

Mother's Name /ekrk dk uke : \_\_\_\_\_

1. Has the child ever had discharge from the ear?  
D; k dHh cPpsdk dku cgk g\$ Yes/No  
gk@ugh
2. Does he/she have pain in the ear?  
D; k cPpsds dku eannZjgrk g\$ Yes/No  
gk@ugh
3. Does the child have any difficulty in hearing properly?  
cPps dks l uuseadkbz i j s kkuh gkrh g\$ Yes/No  
gk@ugh
4. Does the child have problem in understanding what you are saying?  
D; k cPpsdksvki dh ckr l e>useæfdy gkrh g\$ Yes/No  
gk@ugh
5. Is the child's speech in any way different from normal (not clear enough to be understood by people other than his/her immediate family)?  
D; k cPpsdh clyh l k/kj .k clyh l sdN vyx g\$ tksfd ml ds i fjokj o Yes/No  
djch ykæadsvfrfjDr fdl h vkj dks l e>useæfdy gk\$ gk@ugh

Teacher's signature: \_\_\_\_\_

v/; ki d dsgLrk{kj% \_\_\_\_\_

If answer of any question is "YES" refer the child for ear check up.

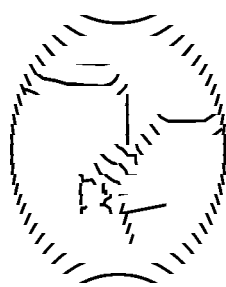
vxj fdl h Hh izu dk mRRj ^gk^ g\$ rscPpsdsdku dh tlp djok, A

Ear Examination

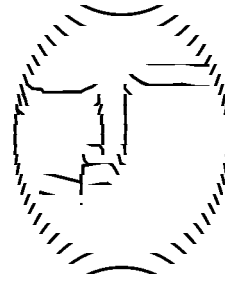
(A) External Ear :

- (i) Any deformity. Yes/No  
If yes - describe
- (ii) Wax Yes/No  
If yes removed or medication advised
- (iii) Any Other Pathology Yes/No  
Otitis externa/Otomycosis  
Ear Discharge  
Foreign bogy

(B) Tympanic Membrane:



Right



Left

(C) Tuning Fork Test:

	Right	Left
Rinne's		
Weber's		
ABC		

Diagnosis: \_\_\_\_\_

Advise: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(Signature & Name of Doctor)

**2. Letter for school children, to be given at the time of the screening programme (suitable translation to be done at the state level)**

**Dear \_\_\_\_\_,**

**Our ears are one of nature's marvels and a true gift to mankind. You must take good care of them so that they may serve you well all through life. For this purpose, you must follow the suggestions given below.**

- 1. Never insert a stick, pin or oil into your ears.**
- 2. Never have your ears cleaned by the local ear-cleaners.**
- 3. Never bathe in ponds, lakes or unclean water.**
- 4. Never hit anyone over the ears.**
- 5. Protect your ears from the loud sounds of Crackers, Loudspeakers, loud radio or T.V., Walkman, loud horns etc.**
- 6. If you have a cough and cold, get it treated by a doctor.**
- 7. If you have any of the following ear problems such as**
  - Ø Water / pus coming from the ear,*
  - Ø Itching in the ear.*
  - Ø Difficulty in hearing in class.*

**Consult a doctor immediately.**

**If you take these few precautions, you will have the benefit of good ears and hearing in all the years to come and forever enjoy the wonder of the beautiful sounds around you.**

### 3. AWW/ASHA: Home visit proforma (suitable translations to be undertaken at the state level)

Questionnaire To Be Filled In By The Anganwadi Worker/ ASHA  
During Home Visits

Name of head of family: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_

Number of members of family: \_\_\_\_\_

Number of children below 5 years of age: \_\_\_\_\_

5 to 15 years of age: \_\_\_\_\_

Number of persons above 60 years: \_\_\_\_\_

Is any member of the family suffering from hearing loss: Yes/ No

No. of such members: \_\_\_\_\_

Names & ages:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Is any of the persons at home suffering with:

Ear Discharge? Yes/No

Recurrent episodes of pain in the ear? Yes/No

Heaviness in the ear? Yes/No

Speech problems such as non development of speech/ unclear speech? Yes/No

Is there any family history of Deafness? Yes/No

Names & Ages of the affected persons:

\_\_\_\_\_  
Any other congenital anomaly (please specify) \_\_\_\_\_



#### 4. Screening proforma for early detection

**National Programme for Prevention and Control of  
Ministry of Health & Family Welfare,  
Govt. of India**

**Questions to be asked of the mother at the time of the child's visit to the Subcentre for**

**Immunization**

- Does the mother feel that the child can hear normally?
- Does he turn his head towards a loud noise/ bang?
- Does he/she notice the sound of a car horn or bicycle bell?
- Does he/she look at you when you speak normally?
- Is startle reflex (sudden startle response on hearing a loud noise) present?
- Make a loud sound from behind the child and look for response:

Present/Absent



## 7. Referral slip for Health workers

**Referral Slip by AWW/ANM**  
**National Programme for Prevention and Control of Deafness**  
**Ministry of Health & Family Welfare,**  
**Govt. of India**

**Name of Patient:**

**Age:**

**Sex:**

**Address:** \_\_\_\_\_

**History:**

Hearing loss

Ear discharge

Pain in the ear

Itching in the ear

Non development of speech

Unclear speech

Any other:

# NATIONAL PROGRAMME FOR PREVENTION & CONTROL OF DEAFNESS

## To be submitted by the Anganwadi workers

Report to be submitted for the month of \_\_\_\_\_ 2007/2008

Name of Anganwadi Worker: \_\_\_\_\_

Name of the Village: \_\_\_\_\_

Name of the District/ State: \_\_\_\_\_

Population covered in the area: \_\_\_\_\_

Number of children suffering from ear Morbidities: \_\_\_\_\_

Morbidities	0-5 years
Hearing Loss	
Ear Discharge	
Pain in Ear	
Speech Problem	

Number of children referred: \_\_\_\_\_

Report to be submitted monthly to ANM / Multi Purpose Worker.

Signature \_\_\_\_\_

Name of AWW \_\_\_\_\_

# NATIONAL PROGRAMME FOR PREVENTION & CONTROL OF DEAFNESS

**To be submitted by the Multi purpose workers**  
Report to be submitted for the month of \_\_\_\_\_ 2007/2008

Name of MPWF / ANM \_\_\_\_\_

Name of the Subcentre: \_\_\_\_\_

Name of the District/ State: \_\_\_\_\_

Population covered: \_\_\_\_\_

Number of awareness programme organized regarding deafness in the community:  
\_\_\_\_\_

Number of persons sensitized regarding prevention of deafness during the awareness programme \_\_\_\_\_

Number of persons suffering form ear Morbidities:

Morbidities	<15 years	>15 years
Hearing Loss		
Ear Discharge		
Pain in Ear		
Speech Problem		
Ear Trauma		

Number of persons treated: \_\_\_\_\_

Number of persons referred: \_\_\_\_\_

Report to be submitted monthly to PHC M. O. Incharge during monthly RCH meeting.

**Signature** \_\_\_\_\_

Name of MPW:- \_\_\_\_\_

# NATIONAL PROGRAMME FOR PREVENTION & CONTROL OF DEAFNESS

## Report from PHC / CHC

Report to be submitted for the month of \_\_\_\_\_ 2007/2008

Name of PHC/CHC: \_\_\_\_\_

District/ State: \_\_\_\_\_

Number of persons attending the Awareness programme \_\_\_\_\_

Number of cases examined with	<15years	>15 years
Hearing Loss		
Ear Discharge		
Pain in Ear		
Speech Problem		
Wax		
Ear Trauma		

No. of cases of Hearing loss detected	
---------------------------------------	--

Number of awareness programme regarding deafness in the community: \_\_\_\_\_

    â Number of Persons treated: \_\_\_\_\_

    â Number of Person referred: \_\_\_\_\_

        o For Hearing Aid: \_\_\_\_\_

        o For further Treatment: \_\_\_\_\_

**Report to be submitted to Distt. CMO by 7<sup>th</sup> of every month**

Signature \_\_\_\_\_

Name: - \_\_\_\_\_

# NATIONAL PROGRAMME FOR PREVENTION & CONTROL OF DEAFNESS

## Report from School

To be filled by Coordinator Teacher

Name of the School: \_\_\_\_\_

Village / City: \_\_\_\_\_

District /State: \_\_\_\_\_

Whether services of doctors available for screening of children: -

<b>In Govt. Sector</b>	<b>YES / NO</b>
<b>In Pvt. Sector</b>	<b>YES / NO</b>

Age group	Number of the Children in the school		Number of children surveyed	
	M	F	M	F
5-10years				
> 10 years				

**Morbidities:**

Suffering from	Age group 5-10 years	Age group >10
Ear Discharge		
Pain in Ear		
Difficulty in hearing		
Speech Problem		

### School Doctors report:

Number of children screened: \_\_\_\_\_

**Morbidities: -**

Suffering from	Total No.
Wax	
Chronic Suppurative Otitis Media	
Secretory Otitis media	
Acute Suppurative Otitis media	
Hearing loss	
Ear Trauma	
Any other	

Number of Children referred:

Place where referred: \_\_\_\_\_

Report to be collected by MPW's of the area by the end of every month.

Signature of Principal / co- coordinator Teacher \_\_\_\_\_

Name: - \_\_\_\_\_

# NATIONAL PROGRAMME FOR PREVENTION & CONTROL OF DEAFNESS

## DISTRICT LEVEL PROFORMA

Report to be submitted for the month of \_\_\_\_\_ 2007/2008

Name of the Hospital / District: \_\_\_\_\_

Population of district: \_\_\_\_\_

Number of persons examined: \_\_\_\_\_

Morbidities detected: -

Morbidities	0-5years	5-15years	15-50years	> 50 years
Hearing Loss				
Mild (20- 40 dB)				
Moderate (40- 60 dB)				
Severe (60- 80 dB)				
Profound (>80 dB)				

Referred for	0-5years	5-15 years	15- 50 years	>50years
Number of hearing aids fitted				
No. of persons referred for rehabilitation				

CSOM	0-15years	>15 years
ASOM		
Secretory OM		
Wax		
Ear Trauma		
Speech Problems		
Any other		

Investigations performed:

Age Group	Total No. of investigations
Sex	
Pure tone Audiometry	
<b>Impedance Audiometry</b>	
<b>OAE</b>	



## NATIONAL PROGRAMME FOR PREVENTION & CONTROL OF DEAFNESS

Number of surgeries performed:

Surgery	Total No. of Surgeries
Myringoplasty	
Tympanoplasty	
Myringotomy	
Grommet insertion	
Stapedectomy	
Mastoidectomy	

Ø No. of IEC Sessions  
conducted: \_\_\_\_\_

Report to be submitted by 15<sup>th</sup> of every month to state Nodal officer with copy to Room No. 352 (A), Central Cell, National Programme for Prevention & Control of Deafness in Directorate General of Health Services, Nirman Bhawan, New Delhi.

Signature \_\_\_\_\_

Name:- \_\_\_\_\_

# NATIONAL PROGRAMME FOR PREVENTION & CONTROL OF DEAFNESS

## DISTRICT LEVEL PROFORMA

Report to be submitted for the month of \_\_\_\_\_ 2007/2008

### SCREENING CAMPS

Number of screening camps organized:

\_\_\_\_\_

Number of patients screened in the camps:

\_\_\_\_\_

Morbidities:

Morbidities	0-5years	5-15years	15-50 years	>50 years
Hearing Loss				
Mild				
Moderate				
Severe				
Profound				

Morbidities	0-5years	>15years
CSOM		
ASOM		
Secretory OM		
Wax		
Ear Trauma		
Speech Problems		
Any other		

## NATIONAL PROGRAMME FOR PREVENTION & CONTROL OF DEAFNESS

### Performa to be sent by HOD ENT officers at Medical College level

Report to be submitted for the month of \_\_\_\_\_ 2007/2008

Name of the State Medical College: \_\_\_\_\_

Number of persons attended National Consultation on Prevention of deafness: -

Name: \_\_\_\_\_

Designation: \_\_\_\_\_

Morbidities detected:-

Morbidities	0-5years	5-15years	15-50years	> 50 years
Hearing Loss				
Mild				
Moderate				
Severe				
Profound				

Morbidities	0-15 years	> 15 years
CSOM		
ASOM		
Secretory OM		
Wax		
Ear Trauma		
Speech Problems		
Any other		

Investigations performed:

	Total No. of Investigations
<b>Pure tone Audiometry</b>	
<b>Impedance Audiometry</b>	
<b>OAE</b>	
<b>ABR</b>	

## NATIONAL PROGRAMME FOR PREVENTION & CONTROL OF DEAFNESS

Number of surgeries performed:

Surgery	Total No. of Surgeries
Myringoplasty	
Tympanoplasty	
Myringotomy	
Grommet insertion	
Stapedectomy	
Mastoidectomy	

∅

	0-5years	5-15years	15-50years	> 50 years
Number of hearing aids fitted				
No. of persons rehabilitated with speech therapy				

No. of IEC Sessions conducted in Hospital \_\_\_\_\_

Report to be submitted BY 15<sup>th</sup> of every month to programme Nodal officer in community health secretary with copy to Room No. 352 (A), Central Cell, National Programme for Prevention & Control of Deafness in Directorate General of Health Services, Nirman Bhawan, New Delhi.

Signature \_\_\_\_\_

Name:- \_\_\_\_\_