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PREVENTION OF HEARING IMPAIRMENT FROM CHRONIC OTITIS MEDIA

**Report
of a
WHO/CIBA Foundation Workshop**

held at
**The CIBA Foundation, London, U.K.
19-21 November 1996**

**Number Two in the series:
*Strategies for Prevention of Deafness and Hearing Impairment***

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KEY POINTS FROM THE WORKSHOP

- Chronic otitis media (COM) is an **important public health problem** with substantial economic and societal costs.
- COM is a **major global cause of hearing impairment** and this may have serious long-term effects on language, auditory and cognitive development, and educational progress.
- COM is a **continuing problem**, especially in children in disadvantaged communities in developing and developed countries.
- Many countries need to **gather prevalence data** to determine the burden of COM and the priority for its prevention and management.
- **Opportunities for cost-effective prevention** of COM and its sequelae occur particularly in the community and at the primary level of health care, through targeting risk factors and implementing primary ear care.
- **Primary health care workers need to be given training** and equipment for prevention, detection and management of COM
- The **diagnosis of COM needs to be made earlier** in childhood to prevent its long-term effects especially on hearing impairment.
- There is new evidence to show that chronic suppurative otitis media (CSOM) should be treated with **antibiotics** as well as wicking.
- **Ear surgery plays a role** in preventing COM causing further hearing impairment
- There is a **shortage of ear specialists** in many developing countries and new training programmes and career structures need to be developed for secondary and tertiary levels of health services.
- **More research needs to be carried out** into risk factors for otitis media, development of vaccines, evaluating treatment methods, studying effects on auditory development and educational progress, studying community perceptions of hearing impairment, and developing programmes for training and sustainable service delivery.

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SUMMARY

A **workshop** of experts on the Prevention of Hearing Impairment from Chronic Otitis Media was convened jointly by WHO and the CIBA Foundation in November 1996. Its task was to review the epidemiology, pathogenesis and management of COM and to draw up recommendations for prevention and management of chronic otitis media in the context of Primary Health Care, particularly with regard to preventing hearing loss in developing countries.

Chronic otitis media is a **major public health problem** in many populations around the world, and a significant cause of morbidity and mortality. The disease and its sequelae produce substantial economic and societal costs. It is particularly common amongst poor communities in developing countries, and also in certain disadvantaged groups in developed countries. COM is a major global cause of hearing impairment, and this effect is a matter of serious concern, particularly in children, because it may have long-term effects on early communication, language development, auditory processing, psychosocial and cognitive development, and educational progress and achievement.

Chronic otitis media was **defined**, in this workshop, to comprise chronic suppurative otitis media and chronic perforation of the tympanic membrane. *Chronic suppurative otitis media* (CSOM) is a stage of ear disease in which there is chronic infection of the middle ear-cleft, a non-intact tympanic membrane and discharge (otorrhea), for at least the preceding two weeks. *Chronic perforation of the tympanic membrane* may develop after an acute perforation fails to heal, or following resolution of CSOM, or during the course of chronic otitis media with effusion.

The **prevalence of COM** around the world ranges from 1 - 46% in disadvantaged groups in developing and developed countries. A prevalence of >1% of COM in children in a defined community indicates that there is an avoidable burden of the disease, but which can be dealt with in the general health care context. A prevalence of $\geq 4\%$ indicates a massive public health problem of COM which needs urgent attention in targeted populations.

In many countries, accurate **population-based data for COM** is not available. Such data is needed for a country to determine the priority for the prevention and management of COM in the national health programme. Prevalence data should be gathered, using standard methodologies for conducting small-scale surveys incorporating rapid assessment methods.

Risk factors for the development of COM include young age, overcrowding, inadequate housing, poor hygiene, lack of breastfeeding, poor nutrition, exposure to cigarette or wood-burning smoke, high rates of naso-pharyngeal colonization with potentially pathogenic bacteria, eustachian tube dysfunction, and inadequate or unavailable health care. Poverty is a major risk factor in developing countries and in certain neglected populations including ethnic groups such as Inuits, Australian Aboriginals, and Native Americans.

There are **opportunities for prevention** at all levels of health services particularly in the community and at the primary level of health care. Many of these opportunities can be implemented through a programme of **primary ear care** incorporated into primary health care. This can be a highly cost-effective way of reducing or eliminating long-term morbidity and mortality caused by COM. Thus general health promotion measures should be targeted, including breastfeeding, immunisation, *adequate* nutrition, personal hygiene, improved housing, reduced overcrowding, and adequate access to clean water. In addition, primary health care workers should be given appropriate training and basic equipment for detection and management of COM and prevention and care of COM should be integrated into the existing primary health system.

In many countries, the **diagnosis of COM** needs to be made earlier in childhood,

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particularly to prevent its long-term morbidity from chronic discharge and hearing loss, and reduce mortality from complications. Specific questions on ceratin ear disease symptoms and signs should be included in the child's road to health chart and health education messages regarding COM and nasal and ear hygiene should be included in a health education manual for PHC workers to use with school teachers, pupils, and parents.

Current WHO recommendations for treating "chronic ear infection" (pus seen draining from the ear and discharge reported for 14 days or more) are to dry the ear by daily wicking by the parent and follow up in 5 days. Although antibiotics are not currently recommended, there is now evidence that wicking by itself is ineffective and topical and/or systemic antibiotics need to be administered also. However, aminoglycoside-containing topical antimicrobial agents are NOT recommended because of known ototoxicity in animal models.

Ear surgery may have a role in both the primary and secondary prevention of COM and it plays an essential part in the prevention of *further* hearing impairment and, sometimes in the improvement of hearing. Thus human resources and appropriate facilities and equipment should be provided for an essential range of surgical services at the primary, secondary and tertiary levels for proper management of COM.

In many developing countries, there is a lack of **ear specialists** and overburdened hospital facilities. At the secondary (intermediate) level of health care, usually based at district hospitals, otolaryngologists are generally not available, and a programme of additional training in otology for the medical assistant/clinical officer grade, (or for general hospital/clinic doctors in some health systems) may need to be set up. At the tertiary referral level, the number of ear specialists (usually as otolaryngologists) may need to be increased by a programme of regional training with a defined career structure with government commitment.

Although progress has been made in recent years in understanding the epidemiology, pathogenesis and microbiology of otitis media, **further research** needs to be targeted at studying risk factors for otitis media, elucidating microbial interactions in the middle ear, developing and testing vaccines against otitis media, evaluating treatment methods including by clinical and community trials, and studying effects of chronic otitis media on auditory, language, and cognitive development and educational progress in children. There is also a need for research into community perceptions of hearing, hearing impairment and disability and into the development of training programmes and sustainable service delivery especially for remote or disadvantaged communities.

ABBREVIATIONS

COM	chronic otitis media
CSOM	chronic suppurative otitis media
DALY	disability-adjusted life years
ENT	ear, nose and throat
IFOS	International Federation of Oto-Rhino-Laryngological Societies
OME	otitis media with effusion
ORL	oto-rhino-laryngology
PEC	primary ear care
PHC	primary health care
WHO	World Health Organization

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1. INTRODUCTION

A workshop on the prevention of hearing impairment from chronic otitis media was held at The CIBA Foundation¹, London, U.K. from 19 to 21 November 1996.

The meeting, which was jointly organised by the CIBA Foundation and the WHO Programme for the Prevention of Deafness and Hearing Impairment, included 18 participants from 14 countries. Professor Yash Pal Kapur from U.S.A. and Dr Piet van Hasselt from Botswana, were unanimously elected chairman and rapporteur respectively.

The **agenda**, which was adopted without modification, is included in Annex 1; the list of participants in Annex 2.

The **scope** of the meeting was to address the problem of chronic otitis media (COM) as a significant cause of hearing impairment in all countries of the world, but especially in developing countries. It focussed particularly on chronic suppurative otitis media (CSOM) and chronic perforation of the tympanic membrane but also reviewed the role of some other types of chronic middle ear disease such as chronic otitis media with effusion. COM as a public health problem, and the possibilities for preventing hearing impairment by management of COM in the context of primary health care were also considered.

The **purposes** of the meeting were:-

- To review current knowledge and opinion on the epidemiology, pathogenesis and management of COM.
- To draw up recommendations for the management of COM in the context of Primary Health Care, with particular regard to preventing hearing loss, in the setting of developing countries.
- To consider future research needs.

This report consists of a synthesis of the main findings from the workshop presentations and discussions, followed by its conclusions and recommendations. The executive summary gives the key points of the meeting. Copies of the full texts of the original working papers may be obtained from Prevention of Deafness and Hearing Impairment (PDH), World Health Organization, 1211 Geneva, Switzerland.

NOTE ON DEFINITIONS: In this report, unless the context states otherwise, the term *chronic*

¹ Now called the Novartis Foundation

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otitis media includes both chronic suppurative otitis media or chronic perforation of the tympanic membrane. The term *chronic otitis media with effusion* describes a different disease entity and means the chronic form of otitis media with effusion or secretory otitis media.

2. TERMINOLOGY, DEFINITIONS AND CLASSIFICATION

Chronic otitis media is a term that must be defined and the disease characterized. To many clinicians, this term is synonymous with chronic suppurative otitis media, which does not include a chronic perforation of the tympanic membrane in which the middle ear-mastoid is without infection; a perforation may occur as a complication or sequela of otitis media (or following tympanostomy tube extrusion or removal, or as the result of trauma), and the patient never experiences an episode of otorrhea, or the initial episode of drainage does not become chronic. Chronic suppurative otitis media is a stage of ear disease in which there is chronic infection of the middle ear-cleft, i.e., eustachian tube, middle ear and mastoid, and in which a non-intact tympanic membrane (e.g., perforation or tympanostomy tube) and discharge (otorrhea) are present; mastoiditis is invariably a part of the pathological process.

Despite this strict definition, a review of the literature reveals that many reports that describe the epidemiology of chronic otitis media include in this disease entity chronic perforation, with and without otorrhea. Also, some clinicians consider a chronic perforation that is associated with infection to be "active," and when infection is absent it is "inactive." Chronic oto-mastoiditis is another term used by clinicians, but this term is also synonymous with chronic suppurative otitis media.

Aural cholesteatoma may also be included under the disease entity chronic otitis media, but cholesteatoma may or may not be associated with chronic infection; i.e., cholesteatoma with or without chronic "suppurative" otitis media (and mastoiditis). Most clinicians and investigators today would not include chronic otitis media with effusion (chronic "secretory" otitis media) under the definition of chronic otitis media, since the tympanic membrane is intact in this disease entity. However, chronic otitis media with effusion is a major cause of hearing loss in infants and children, and in many parts of the world—especially in highly-developed countries—more prevalent than chronic suppurative otitis media.

In this report, as already stated and unless the context states otherwise, the term *chronic otitis media* includes both chronic suppurative otitis media and chronic perforation of the tympanic membrane.

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3. EPIDEMIOLOGY

3.1 The Global Burden of COM.

Chronic otitis media is a major health problem in many populations around the world, affecting diverse racial and cultural groups living in climate extremes ranging from the Arctic Circle to the equator. There appear to be four groups of populations based upon the prevalence of the disease (see table 1), with certain disadvantaged ethnic groups having some of the highest prevalences.

However, there is a still shortage of accurate, standardised data with which to compare the size of the problem between different parts of the world. Recent comparisons of the burden of mortality and loss of disability-adjusted life years (DALY's) have been attempted between otitis media (all types grouped together) and other conditions of importance in developing countries. These demonstrate that the burden from otitis media is substantially greater than from trachoma, and comparable with that from polio. The major part of the DALY burden must be due to hearing impairment.

In developed countries, since the advent of antimicrobial therapy, the incidence and prevalence of chronic suppurative otitis media has markedly decreased, and that of otitis media with effusion has increased. This is much less the case in developing countries, although some are now reporting increasing OME.

3.2 Risk Factors

High rates of chronic otitis media have been attributed to overcrowding, inadequate housing, poor hygiene (these factors through transmission of the pathogens by physical contact with a contaminated individual, inhalation of infected droplets, or contact with an infected surface), lack of breastfeeding, poor nutrition, passive smoking, anecdotally to wood-burning smoke, high rates of naso-pharyngeal colonization with potentially pathogenic bacteria, and inadequate or unavailable health care. Poverty is a major risk factor in developing countries and certain neglected populations.

Since Chronic suppurative otitis media begins with an acute onset of otitis media, either acute otitis media or otitis media with effusion, risk factors associated with acute otitis media may also be initially involved (viral and bacterial infection); eustachian tube dysfunction; young age and immature or impaired immunologic status; upper respiratory allergy; familial predisposition; presence of older siblings; male sex; bottle feeding; day-care attendance; passive smoking.

GROUP	POPULATION	PREVALENCE
Highest	Inuits	12-46 %
	Australian Aboriginals	12-25 %
High	Native Americans	4-8 %
	S Pacific Islands	4-6 %
	Africa	3-6 %
Low	Korea	2 %
	India	2 %
	Saudi Arabia	1.4 %
Lowest	USA	<1 %
	UK	<1 %

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EPIDEMIOLOGY

Others may include use of pacifiers and sleeping position. Early onset otitis media may be related to maternal diet, alcohol use in pregnancy and to low levels of cord blood pneumococcal antibodies.

Certain ethnic groups (eg Inuits, Australian Aboriginals, Native Americans) appear to be at particularly high risk of developing COM. There is some evidence that this may be due to their eustachian tubes being semipatulous (of low resistance) or larger in diameter than in other ethnic groups which allow easier reflux of nasopharyngeal secretions into the middle ear. In addition Australian aboriginal neonates have been shown to develop colonisation of the nasopharynx earlier and more rapidly than Caucasian neonates.

Individuals with cleft palate or Down's Syndrome more readily develop otitis media and they have on average shorter eustachian tubes than age-matched individuals without these disorders.

4. NATURAL HISTORY

4.1 Pathogenesis

For acute otitis media, an upper respiratory viral infection results in congestion of the respiratory mucosa of the upper respiratory tract, which results in obstruction of the eustachian tube. Negative middle-ear pressure develops and is followed by *aspiration* of potential pathogens (viruses and bacteria) into the middle ear where a suppurative effusion accumulates. Prolonged negative pressure results in a sterile effusion (OME).

Recurrent episodes of acute otitis media or otitis media with effusion appear to relate to anatomic or physiologic abnormality of the eustachian tube (eg short, floppy eustachian tubes which *reflux* or *insufflate* infected nasopharyngeal secretions into the middle ear following closed-nose swallowing, blowing the nose, or crying).

Chronic OME (persistent middle-ear effusion) occurs with continuing negative pressure within the middle ear: the effusion becomes "trapped" in the middle ear due to the anatomy, and impairment of both the mucociliary system and the pumping action of tubal opening and closing.

Chronic perforation of the tympanic membrane may develop after an acute perforation fails to heal, resolution of active CSOM, or during the course of chronic otitis media with effusion. Such a perforation is usually much larger than an acute perforation and may adequately drain the middle ear and prevent further spread of infection within the temporal bone or, more importantly, into the intracranial cavity. It may close spontaneously.

Chronic suppurative otitis media occurs when acute drainage through a non-intact tympanic membrane persists for 2 weeks to 3 months or longer. (There is no consensus on the duration of otorrhea to be termed chronic.) If there is a chronic perforation, reinfection may occur by reflux through the eustachian tube of nasopharyngeal secretions containing the bacteria seen in acute otitis media (eg *Streptococcus pneumoniae*, and *Hemophilus influenzae*). Organisms such as *Pseudomonas aeruginosa* and *Staphylococcus aureus*, may then enter the middle ear directly from the external ear canal (including through bathing and swimming) which results in secondary infection, chronic otorrhea, and chronic osteitis of the middle-ear cleft

Alaskan Inuit children followed up for 10 years from birth had their first attack of otitis media during the first 2 years of life and an average of 5 attacks during the follow-up. Aboriginal children often have their first of repeated bouts of middle ear infection before their first birthday.

Most cholesteatomas are the final step in a sequence of events that begins with negative middle-ear pressure, progresses to atelectasis of the middle ear, and then leads to a retraction pocket; the development of a cholesteatoma should be rare when a "central" perforation is present, since the middle-ear pressure is ambient. Children and adults who have chronic suppurative otitis media appear to be protected from developing an attic or posterosuperior type of cholesteatoma. This may explain the low incidence of cholesteatoma in racial groups that have a high rate of chronic perforation.

4.2 Effects on Hearing

A conductive hearing loss usually accompanies CSOM; it results from blockage of the external auditory canal by pus and perforation of the tympanic membrane. The average hearing loss is usually worse than that caused by otitis media with effusion. A hearing loss greater than 40dB may indicate fixation or discontinuity of the ossicular chain as well. Sensori-neural hearing loss may also occur, probably due to infiltration of infectious or inflammatory agents through the round window to produce a serous labyrinthitis. The ototoxic effects of some antibiotics used to treat the infection may add to these effects.

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NATURAL HISTORY

A population prevalence study in Swaziland, in 1987 showed chronic otitis media was the commonest cause of any degree of hearing impairment and was found in approximately 30% of those with a hearing impairment. Recent observations of primary schoolchildren in rural Kenya found that 63% of ears with CSOM and 3.4% without outer or middle ear pathology had hearing impairment (>30 dB HL) giving a relative risk of 18.3.

4.3 Effects on Language, Social Development and Educational Progress.

Most observers agree that intermittently attenuated access to auditory stimulation and spoken language in young children, such as brought about by COM during the first 2 or 3 years of life, may have long-term effects on early communication, language, auditory processing, psychosocial and cognitive development, and subsequent educational progress.

Most studies of these effects have been done in developed country children with OME. However, Alaskan Inuit (Eskimo) children with a history of otorrhoea commencing before their second birthday had significantly lower scores in verbal and performance intelligence tests than those with no or a later-commencing history. More than 3 episodes of otitis media also correlated with deficiencies in verbal ability, and delays in school grade attainment and subject achievement. Aboriginal and Torres Strait Islander people in Australia have high rates of otitis media in urban, rural and remote communities. Many infants have their first bout of ear perforation before their first birthday, so their associated hearing loss is prelingual. This contributes to educational difficulties in childhood and training and employment problems in adults.

5. PREVENTIVE MEASURES POSSIBLE WITHIN NATIONAL PROGRAMMES

5.1 General and Public Health Measures

Chronic suppurative otitis media is one of the commonest causes of hearing impairment in developing countries; there are opportunities to prevent it by action in the community and at all levels of national health systems. This should be mainly through primary health care which is very cost-effective for preventive health care in both developing and developed countries. All countries have agreed to the PHC approach and each country must work out its own application of it taking into account variations in disease patterns, access to health services according to population density, and levels and availability of personnel. It would be very useful to carry out studies to show specifically that such a system did reduce COM.

Risk factors that can be targeted should be identified. Overcrowding and exposure to wood and cigarette smoke should be reduced; poor hygiene should be improved, including access to clean water. Health education messages in relation to personal hygiene could be developed to target known risk factors (eg access to hand washing facilities may reduce spread). In addition to health education for positive practices, negative ones such as instilling various substances in the ear (eg oil, milk, leaf extract, cow's urine) should also be targeted. Community leaders, clergy, schoolteachers should help to raise awareness about the dangers of pus draining out of the ear and what to do about it. Highlighting a problem improves compliance to treatment and this can be augmented with techniques to make compliance easier, such as through use of local language on packaging, ease of storage etc. Immunisation against measles (as well as other immunisable diseases) should be encouraged.

Measures that decrease the incidence of acute otitis media will also prevent COM. These include the use of polyvalent human immune globulin, and influenza vaccine which prevents otitis media in a subsequent influenza epidemic. New vaccines (eg polyvalent pneumococcal conjugate vaccines, and against nontypeable *Haemophilus influenzae* and *Moraxella catarrhalis*) are under investigation for their effectiveness against otitis media as well as other diseases.

The prevalence of CSOM in rural Maori children aged 4-13 in New Zealand more than halved between 1978 and 1987. This was attributed to improved housing conditions and better access to health care. Similar changes have been seen amongst Inuit people between 1968 and 1990.

Programmes to change health behaviour targeted at particular groups should be implemented. Eg the Breathing, Blowing and Coughing Program - BBC - for Aboriginal children involves nose blowing, deep breathing and coughing combined with exercise which can be performed daily in the classroom. It does not require screening to impact specifically on at-risk children and it helps to focus the teachers attention on hearing problems in their children.

However, more needs to be done since sustained improvements in hearing health outcomes for example in Aboriginal people have not yet been seen, despite 2 decades of research. This may be because of an overly biomedical focus on the problem. Issues such as community participation, advocacy, healthy public policy, and re-orientation of health services need to be taken into account. Thus access to economic resources, education and improved living conditions must be included in addition to developing medical, educational and audiological programs to assist those with otitis media and associated hearing loss. In some communities, otitis media can be utilised as a tracer disease to measure the success of these

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policies. This assists in "marketing" the issue of otitis media to agencies responsible for environmental or housing policy, when relevant data can be made available.

5.2 Primary Care Level: (health centres and dispensaries)

Prevention at this level is cost-effective. As well as reducing disability and improving patient quality of life, the medical resources that are used to treat the complications of OM could be saved if the disease itself or progression to complications is prevented by effective primary care.

Health Related personnel should have basic knowledge on otitis media and its prevention in order to create awareness through educating the community, especially mothers, concerning early detection of otitis media. For this they should use the **mass media** as much as possible but ensure that the health services can cope with the increased demand.

Primary care level personnel need basic knowledge on otitis media and its prevention, and skills such as ear mopping which can be performed by non-ENT specialists. For example a 1-week course may contain one-third on clinical skills and include emphasis on decision making and communicating the results, which is what health workers need to do. Health workers who are illiterate have good oral memories (learning songs etc) so teaching may be done on an oral basis. Paperwork may be specially designed and simplified for service provision but can also collect epidemiological data. The essence of a programme is

- | |
|--|
| <p>(1) Human Resources Personnel (teachers, community workers, religious and political leaders).</p> <ul style="list-style-type: none">• Health workers.• Nurses.• Clinical officers in some of the countries. <p>(2) Material Resources.</p> <ul style="list-style-type: none">• Health education media.• Diagnostic facilities such as otoscopes.• Drugs - antibiotics (eg penicillin).• Antiseptic ear drops.• Facilities for aural toilet. |
|--|

forming a partnership with the communities so that it can be progressively got right.

Categories of health workers at primary levels vary by country. In East Africa, there are nurses and clinical officers. Training for the latter in Tanzania is described in section 6.

Constraints which must be overcome include ignorance of otitis media, especially that it can be treated, inadequate facilities for diagnosis (eg a non-functioning otoscope), inadequate supply of antibiotics and ear drops. The strategies to overcome these constraints include using the available human resources at *all* levels, educating them for specific tasks (basic and refresher education), and providing the necessary diagnostic and treatment facilities.

5.3 Secondary (Intermediate) Care Level (district and regional hospitals)

Human resources needed include:

- general physicians/surgeons/paediatricians (in some of the hospitals)
- medical/clinical officers
- health officers
- pharmacists
- nursing officers.

Material resources needed include better supply of drugs, equipment and other items compared to the primary level institutions.

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PREVENTIVE MEASURES POSSIBLE WITHIN NATIONAL PROGRAMMES

Basic and continuing education should enable health personnel to:

- diagnose and treat acute otitis media early
- diagnose and treat chronic otitis media devoid of complications
- recognise and refer appropriately cases of otitis media with complications (eg mastoiditis).
- advise the community on preventive measures.

Constraints: Even simple equipment such as otoscopes may be lacking. In most countries in the sub Sahara African Region, otolaryngologists are not generally found at this level. Clinical officers with additional training in O.R.L. will improve on this situation and they are less expensive to train. IFOS² does advocate clinical assistants, including performing surgery, in countries where they would be helpful. Even then, available resources may not allow allocation of the equipment needed. Governments may need to subsidise individual health-care costs.

5.4 Tertiary Care Level (zonal consultant hospitals)

At least one otolaryngologist and appropriate facilities should be in place at each facility at this level to handle cases of otitis media complications through surgical intervention and carry out continuing education at the Intermediate and, to some extent, primary care level. At a recent WHO workshop held in Nairobi, Kenya, it was recommended that a minimum of one otolaryngologist to 500,000 people and one otolaryngologist per tertiary hospital is necessary. This presupposes that the bulk of medical work in the country is performed by lower-level cadres such as clinical officers. Otherwise a minimum of 1:100,000 is required (IFOS has figures for otolaryngologists around the world including Africa).

In some of the developing countries, otolaryngologists are rare and even unavailable. When available, there are insufficient to meet the workload demand (eg in Tanzania, the otolaryngologist: population ratio is 1: 6,000,000 people). This may be improved by collaboration with institutions elsewhere in the region which could provide basic training for ENT specialists in developing countries through a 2-year regional diploma training programme (eg for Africa, 1 in East, 1 in West and 1 in Southern Africa). It should be done regionally since overseas training may be inappropriate for ENT (Only super-specialist training (eg for otology, rhinology etc) should be done overseas). A career structure for personnel taking these diplomas needs to be set up to encourage entrants, including for posting to rural areas; governments will only take this on if personnel so trained will stay where they are posted in rural areas. Professional bodies may resist such a development because they do not want to see new "second-class" specialists emerging. An example of such a training programme is in Saudi Arabia where a 2 year diploma in ENT leads to a position of specialist (but not consultant) with a career & salary structure. Promotion to consultant can occur if the higher degree of fellowship is gained later.

There is also a huge lack of equipment such as operating microscopes and drills for ear surgery in many countries and lack of facilities for their. Specialists hence get very frustrated and stay in the major centres. If specialists are trained the tools must also be made available.

²International Federation of Oto-Rhino-Laryngological Societies

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PREVENTIVE MEASURES POSSIBLE WITHIN NATIONAL PROGRAMMES

6. TRAINING IN PRIMARY EAR CARE for prevention and treatment of COM and hearing loss

The WHO Collaborating Centre, ENT Department in Malmö, has in collaboration with the ENT Departments in Moshi and Dar-es-Salaam run seminars during 5 years in Moshi, Tanzania, to train trainers (This is at a lower grade than the Kenyan clinical officer grade) from district hospitals and dispensaries.

Selection of participants is by the doctor in charge at each district hospital, or mission hospital. The main idea of the seminars is to “train trainers” - the participants are requested to train their colleagues at home. The participant learns to diagnose and treat and when to refer patients with complications (see box 2). The major part of the seminar is devoted to practical training. The participants are equipped with otoscopes, tuning forks, speculae, head mirror, and training material. Training existing personnel to train others with simple equipment and simple treatment which is available, affordable and acceptable = sustainable ear care.

Follow-up visits to former participants have shown that a majority of them are very good at diagnosing and treating AOM and CSOM. Penicillin for 5 days is the most common treatment of AOM. CSOM is treated conservatively with dry-mopping and ear-drops, usually boric-acid in spirit. Compliance is good.

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|---|
| <ul style="list-style-type: none">•diagnose and treat acute otitis media.•diagnose, render primary care and refer appropriately cases of otitis media with complications.•diagnose and treat uncomplicated cases of chronic otitis media.• early detection of hearing loss in children |
|---|

Some of the participants have noticed a decreased number of cases with CSOM and an increase of children with AOM. This may be due to better awareness among the population (eg mothers are informed about “ear care” whilst waiting in the hospital yard). Some participants have found children with deafness after an epidemic of meningitis and referred them to a school for deaf children.

The following constraints have been found in some cases:-

- participants have trained their colleagues at their hospital but fewer have reached the personnel at the dispensaries.
- Many participants want to be “mini-specialists” of ENT, and seem to want to keep their knowledge to themselves.
- rotation of participants to different departments or districts or promotion to District medical officers with mainly administrative work.
- lack of support from the head of the hospital.
- lack of antibiotics and ear drops, no electricity, no source of light.
- difficulties in the detection of hearing loss in noisy surroundings.

Important issues:-

- participants must be chosen according to both cognitive and non-cognitive attributes
- full support and understanding from the head of the district hospital
- Recognition from health authorities of the trained trainers as key persons in the prevention of hearing impairment caused by CSOM is essential.
- allow the participants to stay at a department where he/she is able to see ear patients, at least

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for a minimum of 2 years

- facilitate transport to the different dispensaries or give transport to the personnel from the dispensaries to the district hospital for training.
- good contact with the participants after the seminar, and feed-back regarding the patients who are referred.

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EARLY DETECTION AND MONITORING OF DISEASE AND COMPLICATIONS

7. EARLY DETECTION AND MONITORING OF DISEASE AND COMPLICATIONS

7.1 Early detection

Increased awareness of sequelae of chronic ear disease among physicians, paediatricians and health workers and early proper diagnosis and management of acute otitis media may abort its progression to chronic ear disease.

<p>(1) Questions to be printed on the child's Road to Health Chart (asked together)</p> <p>(2) Does the child have a fever?</p> <p>(3) Does the child have a hearing loss?</p> <p>Visits to Primary Level Health Services: the child should be checked for COM using the Road to Health Chart, as a part of total package for childhood monitoring. Visits may occur:-</p> <ul style="list-style-type: none"> • <i>1st year of life:</i> approximately every 3 months at times of immunisation, or preferably whenever the child attends a PHC centre if more frequent, especially where COM is highly prevalent. • <i>2-5 years of age:</i> periodically or about every 6 months (eg when attending for booster immunisation, other reasons) <p>School Health Services</p> <ul style="list-style-type: none"> • Ages 6-18 years; • same questions as above • On starting school and at regular intervals thereafter • Parents given access to this information <p>Health Education</p> <p>PHC workers give health education messages to teachers, parents, children.</p> <p>Messages :</p> <ul style="list-style-type: none"> • Discharging ears leads to hearing loss which leads to poor education • Early diagnosis avoids complications 	<p>A project in Saudi Arabia successfully taught health workers soft general and otitis media qualified</p> <ol style="list-style-type: none"> 1. The presence of a foreign body (calcium carbonate) 2. The normal appearance of the drum 3. The abnormal appearance of the drum e.g.: <ul style="list-style-type: none"> • disturbance of normal anatomic landmarks • change of colour • congestion • vascularization with or without pulsation • presence of fluid behind the drum or in the canal (discharge - its colour, smell, presence of blood, quantity, etc.) • retraction of drum with prominence of short process of malleus • perforation and its site, central, marginal and attic • healed perforation (scarring) • tympanosclerosis (white patches of calcium carbonate) chalk • presence of tubes <p>Trainees were also instructed in the use of different sizes of otoscope specula and how far to introduce the speculum into the ear canal. The correct way to hold the otoscope and position the patient was explained especially for children.</p>
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Early detection of otitis media (see box 3) is important but difficult for many health workers. Screening of all children by well-trained health workers using otoscopy and tympanometry is the best way to diagnose otitis media in its early stages and then institute treatment. In developing countries this is difficult, but with health development, training of health workers (see Box 4) , establishment of health centres for families, well baby clinics, early immunisation and early treatment, the incidence of otitis media and referral to hospital will be minimised. Nurses or health care workers especially those working with children should be trained and supervised to deal with simple ear problems (eg wax removal), and refer only those who need further management. This will reduce the burden on hospital referral. A proposed algorithm for diagnosis, management and referral of chronic suppurative otitis media is included in Annex 3.

There is probably no diagnostic marker available yet that enables exact identification of

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middle ear effusion. Clinical examination, for secretory otitis media even if performed by experienced individuals using a pneumatic otoscope, is a subjective manoeuvre with substantial inter-observer difference and has low sensitivity and low specificity. On the other hand, tympanometry is objective and reliable, with a high degree of sensitivity and specificity. A type B tympanogram may be taken to indicate the presence of secretory otitis media. Tympanometry may be too sensitive to use as a screening tool unless subjects are tested twice over 6 weeks. It may also be too expensive to implement in some developing countries, although in the Australian Aboriginal programme it has been shown to reduce the numbers needing otoscopy and hence lessens the training requirement for otoscopy. Otoacoustic emissions can supplement tympanometry to evaluate auditory recovery from a middle-ear disease.

7.2 Possible methods of monitoring (with their main advantages and drawbacks):-

(1) Contact the entire population

- examination not feasible except perhaps for some highly developed countries.

• questions could be included in the national census:-

(1) Do you have or have you had a discharge from your ears?

(2) Do you have any difficulty understanding what people say when they talk to you?

(2) Undertake representative sample surveys.

- valuable, accurate but expensive in cost and specialist manpower
- may actually be difficult to get a representative sample (eg in a school survey, deaf children may not get enrolled, boys are more likely to attend than girls)

(3) Extrapolate from specialist clinics

- under-representative of some conditions.

(4) Extrapolate from "Ear Camps"

- valuable but probably unrepresentative of the population

(5) Extrapolate from school audiometry services

- not universally available
- target population is unrepresentative.

(6) Train Primary Care Health workers to diagnose ear disease and to keep records

- feasible when such services develop
- potentially more representative of the total population.
- in many countries the Primary Health Care worker is the only source of contact with medical services for the majority of the population

EITHER

- **Active chronic otitis media** - a chronically discharging ear, or an ear that has discharged in the past, dried up for a time, and is now discharging again.

OR

- **Inactive chronic otitis media** - an ear that is abnormal but is not currently discharging. This may be a visible abnormality of the drum (perforation, scarring) or some degree of hearing impairment (testing - see box 6).

Advantages:

- require minimal skill to diagnose and can be taught to primary health care workers
- can provide the basis for surveillance records

• **Normal hearing** = response to whispered voice

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- a simple classification of ear disease (see box 5) and testing for hearing impairment and other complications (see box 6) is needed

- questions that should be asked (especially for checking hearing impairment)

(1) How severe is the problem?

(2) What caused the problem?

(3) When did it begin? (this would indicate whether congenital, acquired or degenerative)

(4) What drugs have been taken?

(5) History of noise exposure?

(6) Any family history?

(7) What type of treatment has been given (eg medical, surgical, hearing aids)

(8) Examination of auricle, ear canal, presence of discharge, whether eardrum normal or not. (would depends on skill level of examiner, and whether otoscope available):

(9) Hearing test: See box 6 for a simple hearing screen. If basic audiometric equipment is available, screen for hearing at 25 dB threshold level at 0.5 - 4 kHz (if possible indicate background noise level or at least whether test performed in quiet room; use 1- 4 kHz with high background noise). Improving hearing testing facilities in Health Centres with even simple measures to reduce background noise will reduce false positive tests and improve detection rates.

- **Moderate hearing impairment** = response only to a normal voice.

- **Severe deafness** = response only to a loud voice.

A category of total deafness could be added if felt necessary.

This test should be done by all primary health care workers when examining the ear. The information should be available in the records for monitoring purposes (separate records should be kept of discharging ears and of hearing impairment).

7.3 Monitoring of complications

The main complications are:-

- hearing impairment
- mastoiditis
- intracranial complications (meningitis, brain abscess)
- facial nerve palsy
- labyrinthitis manifesting as acute hearing loss and/or balance upset.

Where ENT specialist services are severely overstretched the occurrence of these complications will be under-reported. However it is feasible to incorporate diagnosis of these complications into primary ear care since the symptoms and signs are fairly obvious and it should therefore be possible to incorporate them into primary ear care records.

In a national programme for the prevention of hearing impairment from chronic otitis media a primary ear care programme is a fundamental requirement and should include record keeping which can be used for monitoring. Data from all levels should be sent to a central collection point for analysis (and feedback of the results to health workers in the field).

8. PRESENT VIEWS ON MANAGEMENT

8.1 Primary Ear care

Primary ear care and case management programmes for CSOM in high-risk populations in developed countries have been shown to be associated with a reduction in frequency of CSOM and mastoiditis. Further intervention studies are needed in developing countries to assess the effectiveness of different interventions and case management.

8.2 WHO recommendations for management of AOM and COM³.

COM can be prevented by treating AOM well. The current WHO treatment recommendations for a 2 month to 5 year old child with an "acute ear infection" (ear pain and/or pus draining from the ear for less than 14 days) are to give an appropriate antibiotic for 5 days, paracetamol for pain, dry the ear by wicking, and follow-up in 5 days. Parents should be instructed about proper dosage and duration of treatment. Although not specifically recommended by these WHO 1995 guidelines, some countries may also recommend myringotomy before rupture of the ear-drum and use of a nasal decongestant. This would depend on the availability of resources including skilled personnel.

For "chronic ear infection" (pus seen draining from the ear and discharge reported for 14 days or more) the recommendations are to dry the ear by wicking and follow up in 5 days. Wicking in the 1995 guidelines is recommended to be done by placing a clean absorbent cloth or soft, strong tissue paper, rolled into a wick in the child's ear, remove when wet, continue to replace with a clean wick until dry 3 times a day, every day until no more pus discharges. Nothing else should be put in the ears. The child should not swim or dive.

However, in a recent field trial in Kenya⁴, where primary schoolchildren administered interventions to their colleagues with CSOM, dry mopping alone made no difference to resolution and healing compared to untreated controls, but antibiotics did produce improvement (see next section).

A proposed algorithm for diagnosis, management and referral of chronic suppurative otitis media is included in Annex 3.

8.3 Ear toilet

In a tertiary level ear clinic in Botswana, a continuously discharging ear is treated with dry mopping and, if possible, with syringing or suction cleaning as well. Dry mopping, even when done by nurses, may not be effective by itself at removing all or most of the pus. In Northern Australia, ear syringing for children with draining ears is carried out daily in schools by "ear workers". This keeps ears clear of debris and pus and reduces conductive deafness but does not lead to healing of tympanic membrane.

³ Management of Childhood Illnesses, WHO & UNICEF; WHO/CDR/95.14; Geneva 1995.

⁴ *Lancet*, 348, 26 October 1996, p1128-1133.

8.4 Role of antiseptics and antibiotics

In the Botswana clinic, antiseptic ear drops (2% acetic acid with 0.5% prednisolone) have been found to be effective against pseudomonas and fungi and less painful than 50% spirit drops. With ear toilet and antiseptic drops, given by trained nurses, approximately 80% of the runny ears become dry. Of the remainder, 15% become dry if given antibiotic ear drops as well. Drops containing neomycin, polymyxin b and a steroid are often available but may not be effective. The newer 4-quinolone antibiotics (ofloxacin, norfloxacin, or ciprofloxacin) are likely to become the most effective topical antibiotics, but are expensive and not yet generally available as otological preparations (some clinicians use the ophthalmic formulations).

The Kenya study showed that the intervention group of children receiving dry mopping with oral antibiotics and topical antibiotics and steroids had significantly improved rates of resolution of otorrhoea compared to dry mopping alone or no treatment. Another, similar trial could compare the effectiveness of topical antiseptics with topical antibiotics. The Kenyan study also demonstrated that the children who developed resolution or healing of their CSOM had significant improvement in hearing thresholds, compared to those who did not.

There remains controversy and uncertainty about the possible ototoxic potential of otological antiseptics or antibiotics. The FDA (Food and Drug regulatory Agency in the USA) does not approve the topical use of any agent where there is a non-intact tympanic membrane. However many clinicians in different parts of the world prescribe such preparations for CSOM since the risk of damage from CSOM may be considered greater than the risk from ototoxicity. There is a need to show clearly which agents are non-toxic and do not cause hair-cell damage.

8.5 Availability of essential drugs

Only in the developed countries and a few of the more advanced developing countries does greater than 95% of the population have regular access to essential drugs⁵. Many of the poorer developing countries have regular access for fewer than 50% of the population. Often appropriate treatment is not available in places where the disease is commonest. In addition, there is no ear drop (antibiotic or antiseptic) listed in the WHO Essential Drugs List which means that in some developing countries they are even less readily available than other types of drugs.

8.6 Surgical Interventions

See section 9 for details of the role of tympanoplasty for chronic dry perforation.

8.7 Educational & audiological interventions.

Secondary as well as primary prevention of hearing disability will help minimise the educational, social and occupational impact. In the educational setting, classroom acoustics can be improved by simple measures to reduce noise (eg cleaning fans, panelling of inter-classroom walls to roof), sound field amplification can be provided for all children in a classroom, also conventional hearing aids, and FM equipment.

⁵Fighting Disease, fostering development: The World Health report 1996. WHO: Geneva. Page 84.

9. SURGICAL INTERVENTIONS

The following provides an overview of the main types of surgical interventions for COM and their basic requirements at primary, secondary and tertiary levels of a health service. Every country needs to balance health care costs in relation to availability of resources, and this will determine to some extent the levels of training, technology and services that can be afforded.

9.1 OPERATIONS

Minor Operations:

- Myringotomy
- Insertion of grommets

Major Operations:

- Simple mastoidectomy
- Modified radical mastoidectomy
- Radical mastoidectomy
- Mastoid obliteration operation
- Tympanoplasty
- Combined approach tympanoplasty

9.2 MYRINGOTOMY:

Definition: 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

Remarks:

Simple procedure, simple equipment, operating microscope not absolutely necessary.

9.3 GROMMETS

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

Indications:

- Chronic otitis media with effusion for 3 months and if >20 dB hearing impairment (both ears)
- Acute otitis media with complications (eg meningitis), Recurrent acute otitis media
- Mostly for children, and HIV-positive adults.

Remarks:

- Simple procedure; operating microscope needed, placed anteriorly. Grommets can be easily and cheaply made from Poly-Ethylene tubing.
- May be combined with adenoidectomy

9.4 SIMPLE MASTOIDECTOMY

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

Indications:

AIMS

- Prevention and treatment of disabling and fatal complications.

- Halting the ear disease and preventing further deterioration of hearing.
- Improvement of hearing.

STANDARDS

Essential requirements:

- proper training in ear surgery
- proper facilities (operating theatres, general anaesthesia using the laryngeal mask)
- adequate equipment (operating microscope, high-speed drill)
- regular follow-up (eg is there a re-perforation, wet or dry?, hearing test)

Other requirements:

- Two levels of training:
 - (1) For minor ear operations (by clinical officers)
 - (2) For major operations (by specialist surgeons)
 - Major ear operations should be done at a tertiary centre with at least screening audiometry.
 - closure rate for tympanoplasty should be at least 80%
 - results should be evaluated in a standard way
- Problems to avoid:*
- incomplete eradication of the disease
 - iatrogenic complications (eg causing deafness, severing facial nerve).

SURGICAL INTERVENTIONS

- Acute mastoiditis with impending or existing complications which do not resolve after antibiotics and myringotomy.
- Chronic suppurative otitis media (CSOM), not responding to intensive, conservative treatment.

Remarks:

- Expensive equipment and a high level of training required.
- a full mastoidectomy is not always required for acute mastoiditis; incision and drainage with curettage and antibiotics may be sufficient whilst patient is awaiting referral.

9.5 MODIFIED RADICAL MASTOIDECTOMY

Definition: Eradicates disease of middle ear and mastoid; mastoid and epitympanic spaces are converted into an accessible common cavity by removing the posterior and superior external canal walls. Tympanic membrane remnant and functioning ossicles are left intact; usually combined with a tympanoplasty and always with a meatoplasty.

Indications:

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

Remarks:

As for simple mastoidectomy. Long post-operative care needed to ensure good healing of the cavity and maintain a "dry" ear. Sometimes the operation can be restricted to an attico-antrotomy.

Primary level:

drainage of sub-periosteal mastoid abscess, antibiotics, referral

Note: mastoid surgery should not be attempted at primary level

Secondary (intermediate) level:

- adenoidectomy
- myringotomy
- myringotomies with ventilation tube insertion

Needs at secondary level:-

- general surgeon with ENT skills
- clinical microscope for ventilation tube insertion (some surgeons can insert a ventilation tube using a loup and headlight)
- myringotome
- suction tubes, ventilation tubes
- adenoidectomy set

Tertiary Level:

- mastoidectomy
- modified radical mastoidectomy
- tympanoplasty

Needs at tertiary level:-

- referral hospital with specialist qualified ENT surgeons and supporting staff
- operating microscope, mastoid drill/burrs, surgical ear instruments
- audiometer, tympanometer

9.6 RADICAL MASTOIDECTOMY:

Definition: Eradication of disease of middle ear and mastoid; mastoid, antrum and middle ear are exteriorised to form a common cavity with the external ear canal; the tympanic membrane (remnant), malleus, incus, chorda tympani and the mucoperiosteal lining are all removed. The stapes is left in place, if present. The Eustachian tube orifice is occluded. No further grafting is done.

Remarks:

Now rarely indicated, except for tumours.

9.7 MASTOID OBLITERATION OPERATION

Definition: Obliteration of the mastoidectomy cavity after a radical or modified radical mastoidectomy, using a pedicled tissue graft.

Indication:

- In order to avoid frequent after-care, especially in "wet" mastoidectomy cavities.

Remarks:

May be done in one stage with the (modified) radical mastoidectomy. Many techniques.

9.8 TYMPANOPLASTY (MYRINGOPLASTY AND OSSICULOPLASTY):

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SURGICAL INTERVENTIONS

Definition: Tympanic membrane repair (myringoplasty or tympanoplasty type 1) and/or the repair of the ossicular chain (ossiculoplasty) utilising tissue graft in order to improve hearing; with or without mastoidectomy.

Indications:

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

Remarks:

- Elective operation, expensive equipment, high level of training required.
- Autologous tissue is the best grafting material; preserved, homologous tissue is not advisable (risk of transmission of diseases such as Creutzfeld-Jacob); artificial material (hydroxyl-appatite) is very expensive, alternative is cartilage/bone graft.
- In children the results are better after age of 7, and after adenoidectomy.
- Pre-operative HIV screening should be done in adults (no major, elective ear surgery should be done in HIV-positive patients)
- The combined approach tympanoplasty may not be feasible because of the difficulty in getting patients to return for a second-look operation.
- There are advocates in some developing countries of a simple, quick tympanoplasty using a plug for the perforation from ear lobe fat or a small piece of fascia which could be done by the clinical officer or medical assistant grade. Even though the take-rate is lower it would still substantially reduce the numbers who remain hearing-impaired (utilising this technique may have a parallel in the eye field in Africa where carefully-selected medical assistants or clinical officers have been trained to do successful cataract surgery). However in other countries it has been found that at least medically qualified ENT residents are needed to do tympanoplasties and training medical assistants or clinical officers to do them was not satisfactory.

10. RESEARCH OPPORTUNITIES IN OTITIS MEDIA

The following are the main subject areas where research needs to be conducted:-

10.1 Risk factors

- epidemiologic studies of the contribution of genes, environment, prenatal and perinatal risk factors, and socio-economic factors

10.2 Pathogenesis

- comparative anatomy of the middle-ear space among different age groups.
- middle-ear pressure regulation and gas exchange
- the role of middle-ear lymphatics in middle-ear clearance functions.
- how inflammatory responses lead to the chronic changes of middle ear infections.
- roles of adenoids/tonsils and cytokines in mucosal immunity and inflammatory responses;
- host and environmental factors that affect colonization and microbial ecology in the nasopharynx.
- microbial and host factors that contribute to otitis media susceptibility, especially in developing countries
- role of maternal antibodies against relevant bacterial and viral antigens
 - causes of eustachian tube dysfunction, and its role in the pathogenesis of COM
- natural history of otitis media caused by *Moraxella catarrhalis*.

- | |
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| <ul style="list-style-type: none"> • key risk factors for acute and chronic otitis media • key factors in microbial virulence and interactions in the middle ear, and the mechanisms by which infection and eustachian tube dysfunction leads to middle-ear damage • development and testing of bacterial and viral vaccines against otitis media. • diagnostic methods for earlier screening • better treatment methods and testing their efficacy by clinical trials • sequelae of COM especially effects on auditory, language, cognitive, and educational development • community perceptions of hearing, hearing impairment and disability • training programmes and service delivery especially for remote communities |
|--|

10.3 Sequelae

- pathogenesis of tympanosclerosis, granulation tissue and cholesteatoma.
- effects of otitis media on middle-ear and inner ear function
- effect of early conductive hearing loss on speech, language, auditory and cognitive development, behaviour and subsequent academic performance⁶.

10.4 Immunisation

⁶ A US study is currently underway looking at effects of otitis media, speech/language acquisition and cognitive ability in a large cohort of babies being followed through childhood.

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- Develop and test new vaccines for the prevention of bacterial infections that cause otitis media (especially *Streptococcus pneumoniae*, nontypeable *Haemophilus influenzae* (NTHi), and *M. catarrhalis* and *Pseudomonas*).
- further clinical trials to evaluate pneumococcal conjugate vaccines; It is anticipated that a pneumococcal vaccine should be available by the year 2000 (stage 2 trials to demonstrate the effectiveness of this vaccine are currently underway) . A vaccine against non-typeable Hemophilus should be available soon after the pneumococcal one.
- Test other viral vaccines (e.g., influenza and respiratory syncytial virus) for their ability to reduce the incidence of otitis media
- production of protective IgG antibodies against pneumococci and NTHi by maternal vaccination.
- Development of hyperimmune globulins against otitis media pathogens in children
- data, especially for developing countries, to demonstrate effectiveness and cost-effectiveness to persuade governments that such new vaccines are necessary.

10.5 Diagnosis

- Develop improved diagnostic measures for screening otitis media.
- identify measures to detect otitis media and hearing loss in infants of less than six months of age and children in the primary care setting.
- Investigate the use of multifrequency tympanometry and wideband reflectance measurements, and the quantitative analysis of tympanometric data .

10.6 Treatment

- change in nasopharyngeal microflora during antimicrobial prophylaxis and treatment
- investigate and monitor patterns of antibiotic susceptibility and resistance to major middle-ear pathogens worldwide
- effect of antiviral drugs on respiratory viral infection and the contribution of respiratory viruses to otitis media pathogenesis.
- benefits and complications of tympanostomy tubes
- role of adenoidectomy in children under four years of age;
- Investigate the effects of amplification and speech-language therapy alone and in combination with antibiotic therapy and tympanostomy tube insertion.
- multicenter, cooperative clinical trials to study new treatments
- meta-analyses of completed trials of medical and surgical treatments of otitis media.

10.7 Research into community aspects and programme development

In addition to biomedical research, action-based research is needed that can ensure that services are based on the expressed needs of the community, and developed in partnership with the community; and ensure evidence-based programme development.

- ethnographic research into community perceptions of hearing, hearing impairment and disability associated with hearing impairment;
- development of community needs assessment techniques relating to hearing health;
- development and evaluation of models of service delivery for remote rural and urban communities;
- development and evaluation of training methods and programmes for all cadres of hearing health providers;
- development and evaluation of appropriate health education/promotion materials;
- development of methods for program evaluation and monitoring.

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RESEARCH OPPORTUNITIES

11. CONCLUSIONS AND RECOMMENDATIONS

INTRODUCTION

According to recent information, chronic suppurative otitis media (COM) is still very common in many developing countries, particularly amongst poor populations, and also in certain populations in developed countries. COM is, therefore, giving rise to an important need for ear care, to manage the condition and to prevent hearing impairment. COM is a major global cause of hearing impairment, and its effect in terms of moderate hearing impairment is a matter of concern, particularly in children because of the developmental and educational implications.

A workshop on the Prevention of Hearing Impairment from Chronic Otitis Media was therefore convened on a joint basis by WHO and the CIBA Foundation, with support from Hearing International, in London, from 19 to 21 November 1996. On this occasion, the participants, representing expertise from 12 countries and 5 organizations in the field of ear care, made the following conclusions and recommendations:-

1 MEASURE OF MAGNITUDE

The prevalence of COM in a defined child population is a useful measure to estimate the magnitude of the problem of the disease. From a public health perspective **the following criteria are recommended:-**

1.1 a prevalence of >1% of COM in children in a defined community indicates that there is an avoidable burden of the disease, which should be considered within the general health care context in terms of timely diagnosis and appropriate management.

1.2 a prevalence of $\geq 4\%$ indicates a massive public health problem of COM which needs urgent attention in targeted populations.

2 GATHERING OF DATA

In many countries, accurate population-based data for COM is not available. Such data is needed for a country to determine whether the prevention and management of COM should be included as a priority in the national health programme. **It is recommended that:-**

2.1 in countries where COM is known to be a problem but no satisfactory information is available, prevalence data should be gathered, where feasible.

2.2 standard methodologies for conducting small-scale surveys using rapid assessment methods should be developed.

3 BEHAVIOURAL AND ENVIRONMENTAL FACTORS

Certain behavioural and environmental factors are known to be associated with increased risk of COM. **It is therefore strongly recommended that** general health promotion measures eg breastfeeding, immunisation, adequate nutrition and hygiene are systematically encouraged and strengthened in the communities concerned, to reduce the incidence of COM. Furthermore, possibilities for improved housing, reduced overcrowding, and adequate access to clean water should be considered wherever possible. Particular health education messages in schools on nasal and ear hygiene

should be developed.

4 EARLY DIAGNOSIS

In many countries, the diagnosis of COM needs to be made earlier in childhood, in order to prevent its long-term morbidity from chronic discharge and hearing loss, and reduce mortality from complications. **It is recommended that:-**

4.1 questions, based on ear discharge, ear pain/ear tugging/irritability with fever be included in the child's health chart.

4.2 messages regarding COM should be included in a health education manual for PHC workers to use with school teachers, pupils, and parents.

5 TREATMENT CHOICES

Very few countries at present have instruction or training for primary ear care (PEC) as part of primary health care (PHC). **It is recommended** that the decision algorithm and treatment choices (see annex) be included as part of a comprehensive and integrated PEC component for children in a PHC programme.

6 OTOTOPICAL ANTIMICROBIALS

These may be indicated to treat some types of CSOM. It is recognised that there remains uncertainty and disagreement about whether to use such antimicrobials and which to use in the presence of a perforated ear drum because of the risk that some antimicrobials are ototoxic. In the absence of any effective optional oral antibiotic treatment for children for the known organisms responsible for CSOM - in particular *Pseudomonas* spp. - and the known ineffectiveness of dry mopping on its own, use of topical antimicrobial agents, universally practised by most ENT specialists, **is recommended** in addition to dry mopping. Aminoglycoside-containing topical antimicrobial agents are NOT recommended because of known ototoxicity in animal models.

7 COMPLICATIONS.

COM is a significant cause of mortality and morbidity in developing countries. **It is therefore recommended** that information concerning complications can be obtained by recovering data from primary health facilities and from hospital records where feasible.

8 SURGERY.

Ear surgery may have a role in both the primary and secondary prevention of COM where other, non-surgical measures (eg oral or parenteral antimicrobial therapy) have failed. It plays an essential part in the prevention of further hearing impairment and, in certain cases, improvement of hearing can be accomplished by ear surgery. **It is recommended** that human resources and appropriate facilities be developed to provide for an essential range of surgical services at the primary, secondary and tertiary levels for the proper management of COM.

9 EQUIPMENT AND TRAINING FOR PRIMARY HEALTH WORKERS

There is a need for the integration of the prevention and care of COM into the existing primary health system in developing countries because of the lack of ear specialists and overburdened hospital facilities. In order to make this care available **it is recommended** that primary health care workers should be given appropriate training and basic

CONCLUSIONS AND RECOMMENDATIONS

equipment for detection and management of COM.

10 APPROPRIATE TECHNOLOGY

The affordability of ear care equipment and instruments is a limiting factor for the implementation of an ear care programmes and services. **It is recommended** that affordable, robust otoscopes, audiometric equipment, hearing aids, operating microscopes and microsurgical drills be developed; furthermore, the standardisation of ear-instrument sets should be promoted in order to reduce purchase costs.

11 RESEARCH NEEDS

In the last several years, important progress has been made in understanding the epidemiology, pathogenesis and microbiology of otitis media. **It is recommended** that future research emphasis should be on studying risk factors for otitis media, elucidating viral and bacterial interactions in the middle ear, developing and testing bacterial and viral vaccines against otitis media, evaluating treatment methods, and studying effects of chronic otitis media on auditory, language, and cognitive development and educational progress.

There is a need for action-research to facilitate the development or enhancement of effective, efficient and sustainable hearing health programmes. This includes medical, educational and audiological interventions. In addition to improved individual case management, action research (through qualitative and quantitative methodologies) can ensure services are based on the expressed needs of the community; that services are developed in partnership with the community; and can ensure evidence based programme development. **It is recommended** that the following research areas be considered:-(1)ethnographic research into community perceptions of hearing, hearing impairment and disability associated with hearing impairment; (2) Development of community needs assessment techniques relating to hearing health; (3) Development and evaluation of models of service delivery for remote rural and urban communities; (4) development and evaluation of training methods and programmes for all cadres of hearing health providers; (5) development and evaluation of appropriate health education/promotion materials; (6) Development of methods for program evaluation and monitoring.

ANNEX 1: AGENDA

Opening of the meeting

Election of officers

Adoption of the Agenda

1. **Otitis media as a global cause of hearing impairment, and its social and educational implications.** [*presentation by Dr A.W. Smith, WHO*]

2. **Pathogenesis and epidemiology** [*presentation by Professor C. Bluestone, USA*]

3. **Present views on management** [*presentation by Professor P. Alberti, Canada*]

4. **Preventive measures possible within national programmes** [*presentation by Professor B. Minja, Tanzania*].
 - **Behavioural and environmental aspects** [*presentation by Mr G. Preston, Australia*]

 - **Early detection and treatment** [*presentation by Professor S. Zakzouk, Saudi Arabia*]

 - **Monitoring of disease and complications** [*presentation by Dr C. Prescott, South Africa*]

 - **Surgical interventions** [*presentation by Dr P Van Hasselt, Botswana*]

5. **Integration into Primary Health Care** [*presentation by Dr I. Bastos, Sweden*]

6. **Research needs** [*presentation by Dr J. Snow, USA*]

Conclusions and recommendations

ANNEX 2: LIST OF PARTICIPANTS

Professor P. W. Alberti

General Secretary, International Federation of Oto-Rhino-Laryngological Societies, Department of Otolaryngology, The Toronto Hospital, University of Toronto, 7-221 Eaton North, 200 Elizabeth Street, Toronto, Ontario M5G 2C4, Canada

Dr Inga Bastos

Director, WHO Collaborating Centre ENT-Clinic, General Hospital, S-21401 Malmö, Sweden

Professor C. D. Bluestone

Professor of Otolaryngology, Department of Pediatric Otolaryngology, Children's Hospital of Pittsburgh, 3705 Fifth Avenue at DeSoto Street, Pittsburgh, Pennsylvania 15213-2583, USA

Professor G. Brobby

Dean, Professor of Otorhinolaryngology, Chair of Department of EENT, School of Medical Sciences, University of Science and Technology, Kumasi, Ghana.

Professor H. Hendarmin

ENT Specialist, Faculty of Medicine, University of Indonesia, 6 Salemba, Jakarta, Indonesia

Professor S. K. Kacker

Head, Department of Oto-Rhino-Laryngology; Director, All India Institute of Medical Sciences, C-1/9, Ansari Nagar, New Delhi 110 029, India

Professor Yash Pal Kapur

President, Hearing International, Department of Surgery and Audiology, Michigan State University, 115 Wilson Road,

East Lansing, Michigan 48824-1220, USA

Dr I.J. Mackenzie

Hearing Impairment Research Group
International Health Division
Pembroke Place
Liverpool School of Tropical Medicine
Liverpool L3 5QA, UK

Professor B. M. Minja

Department of Otolaryngology, Muhimbili Medical Centre, P.O. Box 65000, Dar es-Salaam, United Republic of Tanzania

Dr H. Nabulsi

Coordinator, IMPACT, c/o World Health Organization, avenue Appia, 1211 Geneva 27, Switzerland

Dr Suchitra Prasansuk

Director, Otological Center, Bangkok Unit, Department of Otolaryngology, Faculty of Medicine, Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand

Dr C. A. J. Prescott

ENT Specialist, The Red Cross War Memorial Children's Hospital, Klipfontein Road, Rondebosch 7700, Cape Town, South Africa

Mr G. Preston

National Manager, AHS Programs for Indigenous Australians, Australian Hearing Services, Darwin Hearing Centre, P.O. Box 9848, Darwin, NT 0801, Australia

Dr J. B. Snow

Director, National Institute on Deafness and Other Communication

PREVENTION OF HEARING IMPAIRMENT FROM CHRONIC OTITIS MEDIA

Report of a WHO/CIBA Foundation Workshop, London: 19-21 November 1996

Disorders, 9000 Rockville Pike,
Bethesda, Maryland 20892, USA

Dr P. van Hasselt

ENT Surgeon, Bamalete Lutheran
Mission Hospital, PO Box V6,
Ramotswa, Botswana (representing
Christoffelblindenmission)

Professor S. M. Zakzouk

Senior Consultant, Department of
Otorhinolaryngology, King Abdul
Aziz University Hospital,
P.O. Box 245, Riyadh 11411,
Saudi Arabia

SECRETARIAT

Dr G. R. Bock,

Deputy Director, The CIBA
Foundation, 41 Portland Place,
London W1N 4BN, UK

Dr B. Thylefors

Director, Programme for the
Prevention of Blindness and
Deafness, World Health
Organization, avenue Appia,
1211 Geneva 27, Switzerland

Dr A. W. Smith

Medical Officer, Prevention of
Deafness and Hearing Impairment,
World Health Organization, avenue
Appia, 1211 Geneva 27, Switzerland

**ANNEX 3: PROPOSED ALGORITHM FOR CHRONIC SUPPURATIVE
OTITIS MEDIA (CSOM)**

SEE FILE IN POWERPOINT

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