

**LEAD  
ARTICLE**

# Hearing loss in Rural Population : The Etiology

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## *Abstract*

*Out of the five sensations, hearing is a major one. The gross impairment of hearing especially in the children lead to lack of development of speech and makes the person grossly handicapped. This study consisting of 758 cases from rural area having hearing impairment, was aimed to findout the various aetiological factors resulting in hearing loss. 62.2% of cases belonged to 0-20 years age group. Otitis media (57.25%) was the commonest aetiological factor. Conductive hearing loss was the commonest type of hearing loss in otitis media. 86.17% cases of otitis media were in age group 0-20 years.*

A multi-centre I.C.M.R. study (1983) revealed that 10.7% population of rural area has hearing impairment and 82.1% of these had bilateral hearing loss. In urban areas, the percentage was 6.8%. Infections of the ear constituted nearly half the number. According to 1981 census, severe handicap of deaf mutes was seen in nearly 3 lakh children. Nearly 80 million people suffer from hearing impairment and out of these 35 million are children below the age of 14 years. It is also estimated that nearly 4 million children have very severe handicap. W. H. O. in its 38th world health assembly of 1985 (Agenda item 22.2) has approved that the "attainment of health for all require increased activity for the prevention of hearing, which affects atleast 8% of the population in every country". Recognizing also that in developing countries, most of the hearing impairment, which occurs in excessive prevalence in some communities results from causes that can be prevented at the primary health level, and that much of the deafness is reversible or remediable.

## *Materials and Methods*

This work was carried out in a rural area of Western U.P. in 1992 to find out the various aetiological factors for hearing loss. A total number of 758 cases, where the only complaint was diminished hearing were subjected to detailed history, general physical examination and E.N.T. examination. Cases where detailed history could not be obtained were excluded from the study as also those cases who were not cooperative in hearing assessment. Hearing assessment in 0-5 years age group was done by behavioral observation audiometry (B.O.A.) and cases having age more than 5 years were, subjected to pure tone Audiometry (P.T.A.) using MK 700IV model of Arphi.

## *Results*

1. **Age distribution (Fig 1)** : out of total number of 758 cases, 260 (34.3%) belonged to 0-10 year age group. As age advanced, there was progressive reduction in the number of cases. Youngest case was 3 and half years old and the oldest one being 78 years.

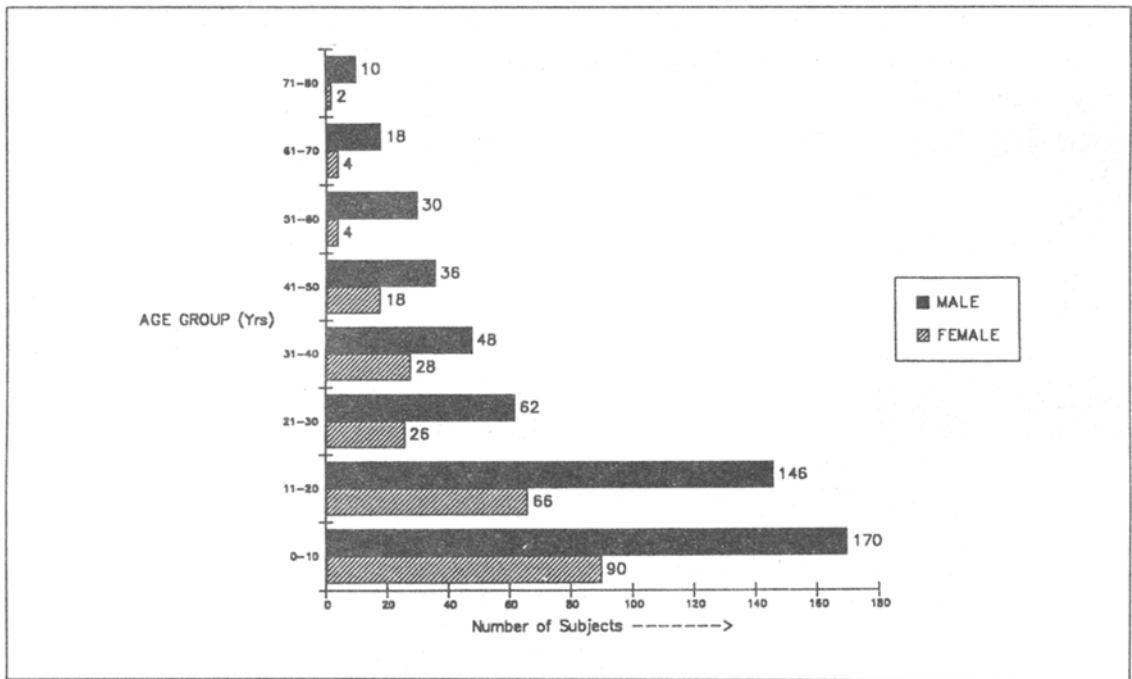


Fig.1 : Age Distribution

- Aetiological Factors (Table 1) :** C.S.O.M. (54.61%) was the most common aetiological factor resulting in hearing loss and presbycusis (8.97%) was the second commonest cause. Sensorineural hearing loss was associated with all aetiological factors except A.S.O.M.. Most common degree of hearing loss seen in our cases was of "Mild" type whereas severe degree of hearing loss was noticed only in cases of meningitis.
- Type of hearing loss in otitis Media (Table II) :** Out of 434 cases, 414 belonged to C.S.O.M. category. A.S.O.M. cases showed only conductive type of hearing loss which was the commonest type of hearing loss found in C.S.O.M. cases.
- Age related Prevalence of Otitis Media (Fig 2) :** The single largest group of cases (46.08%) was in 0-10 year age category. 0-20 year age group included 86.17% of otitis media cases. There was steep fall in the number of cases after 20 years age.
- Prevalence of C.S.O.M. (Fig 3) :** Both safe CSOM & unsafe C.S.O.M. were involving maximum number of cases from 0-10 years & 11-20 year (35.74%) age category.
- Degree of Hearing loss in Otitis Media (Table III) :** Mild degree of hearing loss was most common in A.S.O.M. (80%) as well as C.S.O.M. (65.70%) cases. No case of A.S.O.M. showed severe degree of hearing loss.
- Ear Findings in C.S.O.M. (Table IV) :** Medium sized central perforation (52.77%) was the commonest finding in safe C.S.O.M. and Cholesteatoma (55.55%) being the commonest in unsafe C.S.O.M.

### Discussion

Hearing is necessary to learn language and speech and to develop skills. Because hearing is so important for normal educational and social development, hearing loss can be

**Table - I**  
**Aetiological Factors**

( N = 758)

<b>Aetiological Factor</b>	<b>No. of Cases with H. L.</b>	<b>%</b>	<b>Type of H.L</b>	<b>Degree of H. L. Commonest</b>
* Idiopathic	60	7.91	S. N/Mix	Mild
* Familial H. L.	22	2.90	S. N.	Mod
* Birth Asphyxia	48	6.33	S. N.	Mod
* Presbycusis	68	8.97	S. N.	Mod
* Ototoxicity	42	5.54	S. N.	Mild
* Meningitis	30	3.59	S. N.	Sev
* C. S. O. M.				
-Safe	360	47.49	COND/ MIX/SN	Mild
- Unsafe	54	7.12	COND /MIX/ S. N	Mild
* A. S. O. M.	20	2.63	COND	Mild
* Enteric fever	18	2.37	S. N.	Mod.
* Measles	20	2.63	S. N.	Mod.
* Head Injury	20	1.31	S. N./Mix	Mod.
* Mumps	6	0.79	S. N.	Mild

CON = Conductive S. N. = Sensorineural, Mix= Mixed, H. L. = Hearings Loss.

**Table - II**  
**Type of Hearing Loss in Otitis Media**

<b>Type of Hearing loss</b>	<b>Otitis Media</b>	
	<b>( N = 434)</b>	
	<b>A. S. O. M ( n = 20)</b>	<b>C. S. O. M.</b> <b>Safe ( n= 360) Unsafe</b> <b>( n<sup>11</sup> = 54)</b>
Conductive	20 (100 %)	327 (90.83%) 26 (48.14%)
Mixed	-	23 (6.38%) 16 (29.62%)
Sensorineural	-	10 (2.77%) 12 (22.22 %)

devastating. Hearing loss is a very important problem of public health in all countries of the world. Because of Socio-economic problems, developing or third world countries tend not to make hearing loss a high priority. An estimated 450 million persons world wide are hearing disabled (Wilson, 1990). The number of disabled persons will grow dramatically

unless decisive actions are taken, as population continue to grow in developing countries and persons in industrialized countries become older.

Recent studies using better controls and prospective designs demonstrate accumulating evidence that frequent middle ear disease in childhood, with its concomitant hearing loss,

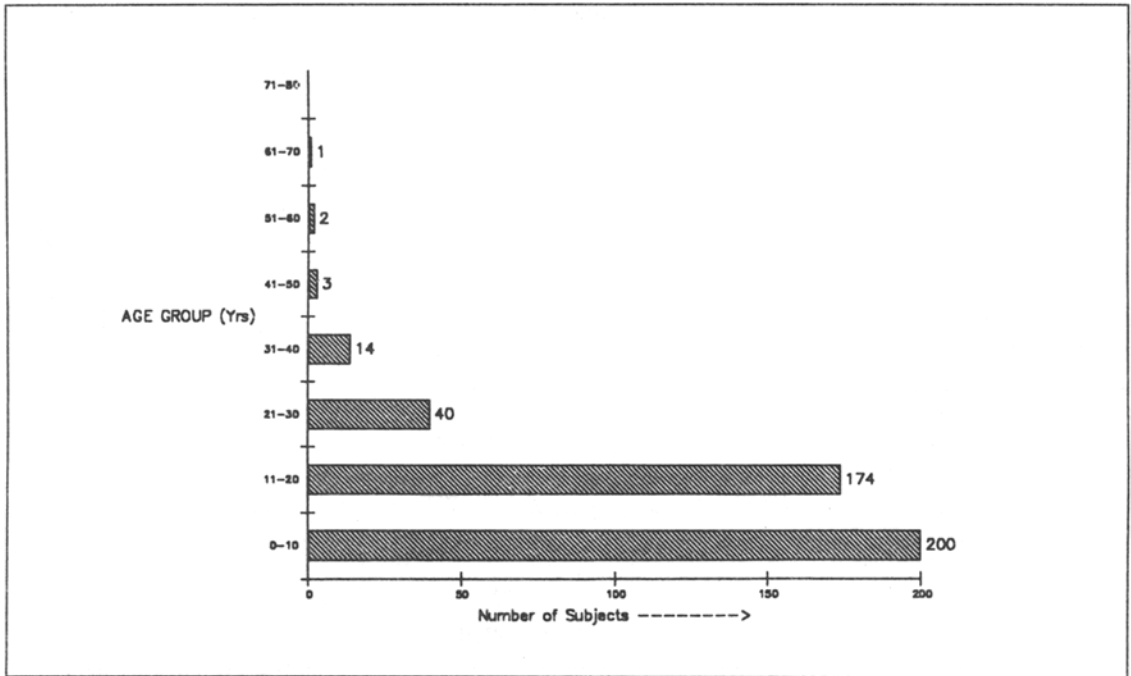


Fig. 2 : Age Related Prevalence of Otitis media.

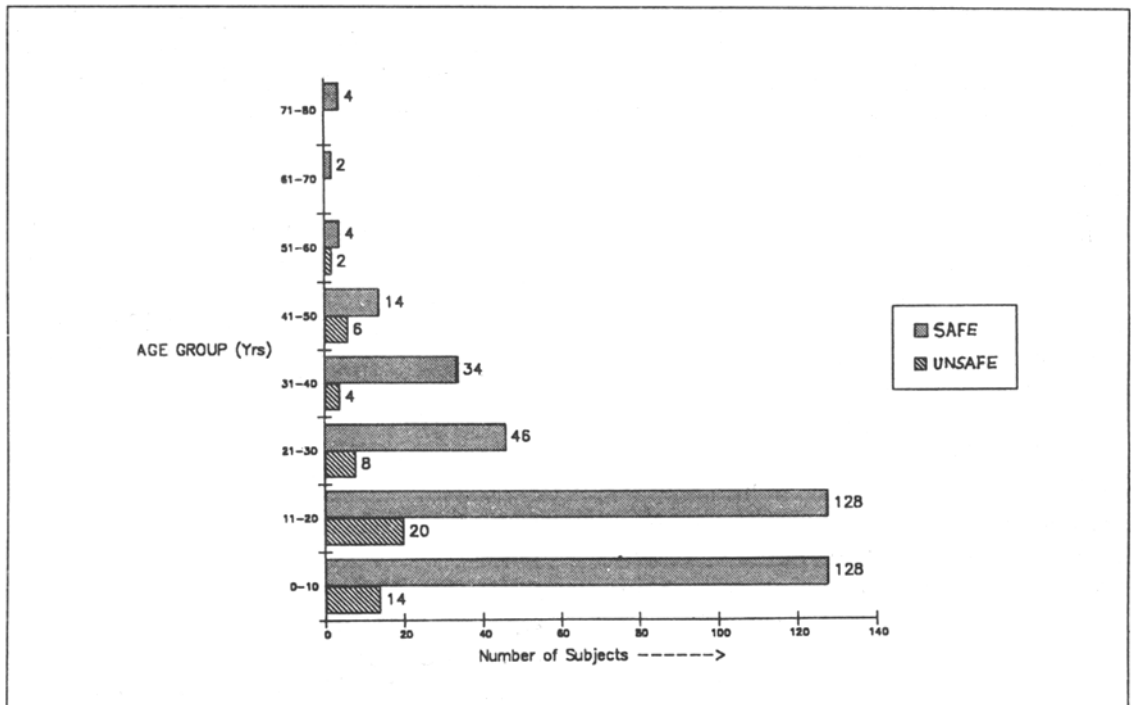


Fig 3 : Prevalence of C. S. O. M

**Table - III**  
**Degree of Hearing Loss in Otitis Media**

Degree of H. L.	A. S.O. M. ( n = 20)		C.S.O. M. ( n = 414)			
	N. O. C.	Degree of H. L.	Safe ( n' = 36)		Unsafe ( n = 54)	
			N. O. C.	Degree of H. L.	N. O. C.	Degree of H. L.
Mild	16 (80%)	Mild	240 (66.66%)	Mild	32 (59.25%)	
Moderate	4 (20%)	Moderate	110 (30.55%)	Moderate	14 ( 25.92%)	
Severe	0 (0%)	Severe	10(2.77%)	Severe	8 (14.8%)	

H.L. = Hearing loss, N. O. C. = Number of case. )

**Table - IV**  
**Ear Findings in C. S. O. M.**

C. S. O. M.							
Safe ( n = 360)							
(n= 414)							
Unsafe ( n' = 54)							
S. C. P.	M. C. P.	L. C. P.	S. T. P.	Chol.	Granl	R. P.	
70	190	80	20	30	10	14	
(19. 44%)	(52, 77%)	(22. 22%)	(5.55%)	(55.55%)	(18. 51%)	(25.92%)	

S. C. P. - Small Sized Central Perforation  
 M.C.P. - Medium Sized Central Perforation  
 L.C.P. - Large Sized Central Perforation  
 S.T.P. - Subtotal Perforation  
 Chol - Cholesteatoma  
 Granl - Granulations  
 R.P. - Retraction Pocket.

reported to be 16%-44% (Dugdate et al, 1978; Dever et al, 1985). Greater O.M. prevalence in whites than in blacks (Griffith, 1979) and greater prevalence of middle ear disease among Indians and Eskimos than among whites (Ratnesar, 1976) are interesting findings. O.M. is more common among males than among females (Casselbrant et al, 1985; Teele et al, 1989). Studies have reported increased prevalence of O.M. in lower socioeconomic classes (stahlberg et al, 1986). Family size has also been reported to increase the risk of O.M. presumably by increasing the potential exposure to infectious agents (zinkus and Gottlieb, 1980).

The evidence of sensorineural hearing loss (S.N.H.L.) in C. S.O.M. is much more recent. Paparella et al (1970) reporting on the decade audiogram in 279 ears out of more than 500 studied from patients with C.S.O.M., observed significant S.N.H.L. particularly at higher frequencies both in unilateral and bilateral disease. Cochlear losses were found to be associated with C.S.O.M. also by English et al (1973) & Dumich & Harner (1983).

slows the normal developmental processes for atleast some subgroups of children. Effects can include delays in language and phonologic development (Teele et al, 1984), control of the diseases and careful monitoring of hearing not only have medical implications but also are important for normal development.

Otitis media is a common health problem among infants and children throughout the world. It is responsible for great morbidity. Children who experience these conditions are at high risk for developing sequelae, including hearing loss and middle ear pathology (Holm & Kunze, 1969,). Otitis media (O.M.) prevalence in age group 5-16 years has been

The pathology of sensorineural hearing loss resulting from otitis media was assessed by Paparella et al (1972), Goycoolea et al (1980) and Walby et al (1983). The round window membrane was a site of pathological involvement, especially in C.S.O.M. characterized by inflammatory changes, diapedesis of leukocytes, passage of large molecules of albumin and localized inflammatory changes (serous labyrinthitis) in the adjacent basal turn (Paparella et al, 1970). Round window membrane has been found to be twice its normal thickness due to an accumulation of collagen in the subepithelial space (Sahni, R. and Paparella, M.M.—Unpublished observations). Round window membrane may provide a more protective barrier in cases of C.S.O.M. than in cases of A.S.O.M. where the labyrinth may be more vulnerable because of a thinner membrane. Although spotty lesions were seen, in general, hair cells losses in the regional basal turn were not seen (Paparella et al, 1972) Walby et al, 1993).

The incidence of S.N.H.L. as a sequelae of bacterial meningitis ranges from 5-35% of survivors (Trolle, 1950. Sell et al, 1972). Nadol (1978) reported hearing loss to be bilateral in 70% and unilateral in 23% patients with cochlea being the site of lesion in all cases while fungal meningitis cases have shown evidence of neural involvement.

Tinnitus, hearing loss and vertigo are the cardinal symptoms of ototoxicity. Tinnitus is typically intense, high pitched and usually accompanies or frequently precede and supersedes the S.N.H.L.. Aminoglycoside group of antibiotics cause ototoxic side effects (Lerner et al, 1981). Bilateral hearing loss predominates but unilateral loss is not rare. Ototoxic antibiotics typically produces audiometric evidence of steeply sloping loss in high frequencies, whereas diuretic-induced ototoxicity usually results in a flat or slightly sloping audiometric pattern (stringer et al, 1991). Audiologic studies have revealed sensorineural hearing loss as great as 30-40dB at all frequencies, with return to normal hearing after withdrawal of salicylates (Mc

Cabe and Dey, 1965). "Salicylate deafness" characteristically produces flattish hearing curve accompanied by good speech discrimination and reversal on withdrawal of the drug (Byrne and Kerr, 1987). Welsh and Colleagues (1985) indicated progressive loss of central auditory competence in presbycusis. Subjects with presbycusis perform poorly in audiometric tests. The results of SISI test are entirely unpredictable in presbycusis (Jerger et al, 1959). Auditory recruitment may be present or absent; when present, it is assumed that the lesion includes hair cell damage; when absent, lesion is assumed to be retrocochlear (Dix et al, 1948). In all probability, if the two types of lesion coexist, tests will indicate the presence of auditory recruitment rather than its absence (shapiro, 1969).

Hall (1964) showed hemorrhage into inner ear in birth asphyxia cases while pape and wigglesworth (1985) reported necrosis of nuclei in brainstem and thalamic region. Fisch (1976) reported 13.6% incidence of S.N.H.L.. Alberiti et al, (1985) reported 5.55% incidence of S.N.H.L.

In familial hearing loss cases, Fisch (1976) reported 26.1% incidence of hearing loss. Taylor et al, (1975) found 24% incidence of hearing loss.

Before the introduction of vaccine, 3-10% of acquired deafness in children was secondary to measles but with introduction of vaccine incidence has gone down to 1 per 1000 cases. The characteristic audiogram is an asymmetric, bilateral hearing loss affecting hearing at higher more than lower frequencies which is usually permanent (Booth, 1987). Tinnitus and vertigo may accompany the hearing loss and upto 72% of patients have absent or diminished Caloric response in one or both ears (Davis & Johnsson, 1983). Adolescent and adults are more likely to be affected by hearing loss in mumps ( Davis and Johnsson, 1983). In a series of 53 cases, hearing loss was exclusively unilateral, profound or total, permanent and more than 45% patients developing dysequilibrium of vestibular origin (Murakami and Muzushima, 1985).

Escajadillo et al. (1982) reported 6 cases of pathologically confirmed cochleovestibular lesions due to typhoid fever. The lesions occurred between the 2nd & 3rd week of disease, and more often in females. In all but one, hearing loss was bilateral and slight to moderate in intensity.

Hearing loss following head injury is generally secondary to temporal bone fracture. Longitudinal fractures (80%), Transverse fractures (20%) result in conductive and sensorineural hearing loss respectively. Not all skull fractures are evident radiologically and Browning et al (1982) have rightly emphasized the importance of otoscopic examination in all cases of minor head injury.

### **Recommendation**

1. Preventive programme in developing countries should focus on primary health care. Effective action against otitis media is possible. Acute purulent otitis media which

is common in children, is usually treated by physicians, Audiological assessment is usually not done in such patients to assess either middle ear or cochlear dysfunction, since the primary attention is towards clinical management of the infection. We recommend repeated hearing assessment in patients with Acute purulent O. M. and C. S. O. M. during treatment.

2. Avoid ototoxic drugs for systemic and local use.
3. Avoid exposure to loud noise.
4. To avoid hearing loss due to birth asphyxia, deliveries should not be conducted at home.
5. All babies with a history of birth asphyxia should be subjected to audiological assessment by 6 months of age and rehabilitation should be started at the earliest to avoid subsequent handicaps.

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## Course News

### Temporal Bone Surgical Dissection Courses Organised by Skull Base Group Dr. B. Nanavati Hospital, Mumbai

Dr. K. P. Morwani, Head Neurotology Department , Nanavati Hospital , announces five temporal bone dissection courses in the year 1998 to be held at Nanavati Hospital. The courses are divided into level-(basic) and level-II (advance). The dates for the courses and delegate fees are as follows :-

Course	Date & Month	Delegates fees	Level
2nd	27, 28 & 29th March 1998	Rs 1000/-	Level I
3rd	28, 30 & 31st May 1998	Rs 2000/-	Level II
4th	24, 25 & 26th July 1998	Rs 1000/-	Level I
5th	25, 26 & 27th September 1998	Rs 2000/-	Level II
8th	20, 21 & 22nd November 1998	Rs 1000/-	Level I

### Course Highlights

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  - Fees Includes Breakfast, Lunches and evening Tea during the course
- Please send your registration fees specifying the level of course and your participation as delegate / observer by demand draft to be drawn in favour of "National Update O. S. B" Mumbai ; to :-  
Dr. K. P. Morwani , 7, Ambe Bhuvan, Jn 24th and linking road , Khar , Mumbai-400 052. Fax :- 022-6458020 / 6119923 / 6118872