

Ear and hearing disorders in rural grade 2 (Sub B) schoolchildren in the western Cape

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Summary

Four hundred and one children living in rural areas with a high level of poverty were assessed for ear and hearing disorders in their second year of schooling. Overall, only 40,3% of these children had both normal-appearing ear drums and normal hearing thresholds bilaterally; 14% had obstructing wax plugs; 17% had evidence of past acute otitis media with scarring or progression to chronicity — 6% having perforations; 31% had middle-ear effusions and/or their sequelae; and 33% had some impairment of hearing but, if the effect of testing in the classroom environment is considered, there was probably only significant impairment in 9%. It is suggested that the prevalence of chronic ear disorders is a useful marker of the quality of primary care in rural communities.

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One of the most common health problems identified in rural children during visits to community health clinics in the western and north-western Cape is chronic suppurative otitis media. These are predominantly children from underprivileged homes. As an example of the extent of this problem, at one of the clinics visited approximately 10% of the scholars from the local school had frankly suppurating otorrhoea.

This survey was undertaken to gain a better understanding of the extent of ear and hearing disorders in these children since no local data on this subject exist for these areas, and it is important that this information should be available, since acute otitis media is one of the common infections of childhood which, if inadequately treated, carries a strong probability of progression to chronicity. If this occurs the handicap of associated deafness with its deleterious effect on the attainment of full educational potential is allied to the disability of suppurating ear disease.¹

For the survey to be undertaken within the available resources, a representative target group had to be selected. In selecting the sample, the first consideration was that much of the chronic ear disease seen was in subjects from the poorer socio-economic sectors of the community where there is no ease of access to health care. In these rural areas this also included families in which breadwinners were in employment. The second consideration was that studies from different countries indicate that the peak incidence of acute otitis media is in the 1 - 3-year-old age group.^{2,3} By 7 - 9 years there is a steep fall in incidence associated with growth of the Eustachian tube to adult proportions. The 7 - 9-year age group should therefore reflect fairly accurately the incidence of significant

ear disease in the population. This statement can be justified by the following observations of ear disorders:

1. If during the course of acute otitis media the drum perforates but subsequently heals it will be left with a visible scar. Tympanosclerotic plaques often form in tympanic membranes after under-treatment of acute otitis media. Resolution of either the scars or the plaques is unusual.

2. When progression of acute to chronic suppurative otitis media occurs, the resulting perforation usually persists even when the infection is controlled.

3. The presence of a 'glue ear' for any length of time overstretches the tympanic membrane and this laxity can be recognised for a long time after the middle-ear effusion has resolved. Persistent overstretching results in atrophy of the middle fibrous supporting layer of the membrane and this atrophy cannot be reversed.

4. Retraction pockets that form in response to persistent negative middle-ear pressures usually cannot be reversed and some progress to form cholesteatoma.

Therefore since both acute otitis media and 'glue ears' are predominantly disorders of preschool children, the sequelae of significant disease will be seen in children in their early school years. Further, since childhood ear disease is the precursor of much of adult disease, the incidence in childhood should reflect the pattern of ear disease to be expected in the adult population. For these reasons children in their second year of schooling (Sub B or grade 2) from rural areas were selected as the target group for the survey.

Subjects and methods

Children in the selected classes who were present on the day that the school was visited were examined for the presence of any ear abnormality or disease by an otolaryngologist. A Grason Stadler GSI 28 Tympanometer was used to assess tympanic membrane mobility, middle-ear pressures and the threshold loudness level required to elicit a reflex contraction of the stapedius muscle in the middle ear. This latter measurement is a useful method of screening for normal hearing since the 'reflex' threshold occurs at a constant level above the threshold of hearing. Children with an unsatisfactory reflex threshold had pure tone audiometry performed in the classroom environment using a Maico MA21 audiometer with sound excluding cups around the audiometer headphones.

Results

A total of 401 grade 2 (Sub B) schoolchildren were examined from 11 rural schools. Their age distribution is shown in Fig. 1. Only 40,3% of these children had two normal appearing ears with bilateral normal hearing.

The disorders affecting the other children are classified below. Some children had more than one disorder at the time of examination.

Conditions affecting the external canal: 324 children (81%) had bilateral, normal external ear canals.

Otitis externa: 9 children had otitis externa and in all of them it was unilateral.

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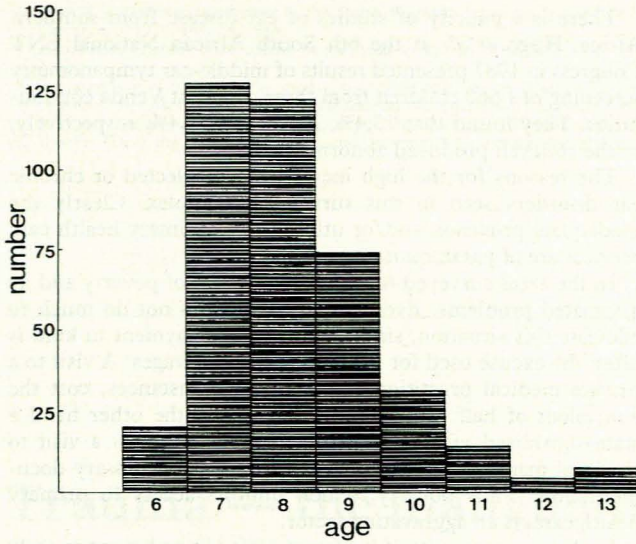


Fig. 1. Age distribution.

Wax: 35 children had a significant unilateral obstructing plug of wax and a further 23 children had obstructing plugs of wax bilaterally, i.e. 14% of the children examined had wax plugs. These were all syringed out before testing the hearing so that any deafness they may have been causing was not assessed.

Conditions affecting the tympanic membrane: 293 children (73%) had bilateral, normal, tympanic membranes.

Scarred tympanic membranes: Scarring of the tympanic membrane represents one of the sequelae of under-treated acute otitis media; 42 children (10%) had such scars. In 7 children both ears were affected. In approximately half of these ears the mobility of the drum was normal and in the remainder mobility was impaired.

Atrophic tympanic membranes: Atrophy of the tympanic membrane represents one of the sequelae of the overstretching of the retracted drum that occurs in 'glue ears'; 46 children (11%) had such atrophy. In 15 of these children both ears were affected. In approximately half of these ears the mobility of the drum was normal, 4 drums had impaired mobility, suggesting associated middle-ear adhesions, and the remainder were hypermobile.

Perforations of the tympanic membrane: 26 children (6%) had perforations and in 6 children they were bilateral.

Myringitis: 4 children had an infected unilateral 'granular myringitis'.

Conditions affecting the middle ear: 341 children (85%) were assessed as having normal middle ears.

'Glue ears' (middle-ear effusions): 50 children (12%) had current middle-ear effusions. In 16 this was bilateral. (This survey was undertaken at the end of summer.) A further 27 children (7%) were assessed as having had recent effusions, 10 of them bilaterally.

Chronic suppurative otitis media: (i) Tubo-tympanic disease: 26 children (6%) had perforations and in 20 the perforation was unilateral, 3 had current infection; in 6 children the perforations were bilateral and 4 of them had both ears currently infected; and (ii) attico-antral disease: 2 children had cholesteatoma and in 1 of them it was bilateral.

Disorders of hearing

Children were assumed to have normal hearing if, in the classroom environment, they produced a stapedius reflex response to a sound stimulus of 105 decibels (dB) or less, or if they had a threshold for pure tone stimulus of 20 dB or less.

Using these criteria 228 children (57%) produced bilateral normal reflexes and were not tested further. A further 41 children (10%) who failed to produce bilateral normal reflexes had normal hearing on pure tone testing. The numbers of children with degrees of hearing loss are listed in Table I.

TABLE I. NUMBERS OF CHILDREN WITH DEGREES OF HEARING LOSS

Hearing loss threshold (dB)	Unilateral loss		Bilateral loss	
	No.	%	No.	%
20-30	40	10	57	14
30-40	16	4	6	1.5
40-50	3		2	
> 50	8		0	

When ear disease was correlated with hearing losses (Table II) the following relationships were established:

Normal-appearing tympanic membranes. A large number of children with normal-appearing tympanic membranes had hearing losses. The majority of these were of a minor degree and probably reflect the difficulty of obtaining threshold responses from young children in an environment where the background noise level may rise to 50 dB at times.

TABLE II. CORRELATION OF ABNORMAL HEARING THRESHOLDS WITH DISEASE PROCESSES

	Recent middle-ear effusion	Middle-ear effusion	Cholesteatoma	Infected perforation	Dry perforation	Atrophic tympanic membranes	Scarred tympanic membranes	Normal appearing tympanic membranes	Hearing threshold (dB)
Right ear	2	14	0	1	6	2	6	48	20-30
	1	2	1	0	1	1	0	6	30-40
	0	0	1	1	0	0	0	2	40-50
	1	0	0	1	0	0	0	4	> 50
Left ear	3	14	0	4	1	3	3	47	20-30
	0	5	1	0	5	0	1	5	30-40
	0	0	0	0	0	0	0	2	40-50
	0	0	0	0	1	0	0	1	> 50

None the less in 20 ears there were significant losses. These children were all referred for specialist audiological evaluation.

Scarred and atrophic tympanic membranes. There was surprisingly little hearing deficit found among the 42 children with scarred or the 46 children with atrophic tympanic membranes. In only 16 ears was the threshold elevated.

Dry and infected perforations. A large proportion of these children had hearing losses. In 12 of the ears the loss was mild, in 6 it was significant and in 2 there were severe sensorineural losses.

Cholesteatoma. This disease, in keeping with its destructive nature, had a marked effect on hearing. Both children affected had significant conductive losses.

Middle-ear effusions. Most of the children with 'glue ears' had either a mild or a moderate conductive hearing loss. In those ears in which there had been a recent effusion that had now resolved the hearing had, by and large, returned to normal.

Discussion

A rather worrying statistic has emerged from this survey: that only 40% of the 401 children examined had two normal appearing ears with normal hearing. In 17% of the children there was residual evidence that episodes of acute otitis media had been under-treated, and then either resolved with scarring or progressed to chronicity; 42 such children had scarred eardrums and 26 had perforations. Only 1 in 5 of these children had hearing impairment, generally a conductive hearing loss of mild degree.

In 31% of the children there was evidence of middle-ear effusions and their sequelae. Of these children, 50 had a current effusion. It should be borne in mind that this survey was conducted at the end of summer when it would be expected that the incidence of this type of middle-ear disorder would be at its lowest. There were signs of a recent effusion in 27 children and 46 children had atrophic eardrums. In 2 children retraction pockets had already progressed to cholesteatoma with marked deafness.

If, considering the circumstances, the threshold of normal hearing was taken to be at 20 dB, then only 67% of the children had normal hearing. If, however, the normal threshold was considered to be at 30 dB, then 91% of the children had normal hearing. But even with the threshold for normal hearing taken at this latter level, approximately 1 in 10 of the children had hearing impairment that would interfere with achievement of their full educational potential.

When these results are compared with those reported from other countries, a wide spectrum of ear disease is found. Van Cauwenberge⁴ examined 2065 Belgian children and found that 0.5% had perforations but none were actively infected. Mawson and Ludman⁵ quote a figure of 9:1000 as the incidence of chronic otitis media with perforation in the population of the UK. Bordley *et al.*⁶ from the USA averaged figures for the incidence of acute otitis in childhood in that country and found that 50% of children have one episode before 1 year of age and 75% by 2 years. They calculated that 33% of children would have three or more episodes and 15% would be 'otitis prone'. Wiet⁷ maintained that chronic otitis media was 15 times more common among the Indian than the non-Indian North American population. Among Apaches perforations are found in 8 - 10% of the population in Arizona.⁸ Tschopp⁹ reported a 30% incidence of chronic otitis media in native Alaskan children. Baxter and Ling¹⁰ found that 50% of Eskimos in the Baffin Zone had evidence of current or past middle-ear disease, with nearly 9% having chronic otitis media with perforation. McCafferty *et al.*¹¹ reported an incidence of chronic otitis media of 12% among Australian Aboriginal schoolchildren.

There is a paucity of studies of ear disease from southern Africa. Hugo *et al.* at the 6th South African National ENT Congress in 1987 presented results of middle-ear tympanometry screening of 1660 children from three different Venda communities. They found that 13.4%, 27.4% and 51.4%, respectively, of the children produced abnormal results.

The reasons for the high incidence of neglected or chronic ear disorders seen in this survey are complex. Clearly the inadequate provision and/or utilisation of primary health care services are of paramount importance.

In the areas surveyed there are high levels of poverty and its associated problems. Even employment does not do much to alleviate this situation, since in rural areas payment in kind is often the excuse used for paying inadequate wages. A visit to a private medical practitioner can, in some instances, cost the equivalent of half of a month's wages. On the other hand a state-subsidised visit to a district surgeon requires a visit to the local magistrate's court first to obtain the necessary documentation. Thus poverty, which inhibits access to primary health care, is an aggravating factor.

Lack of transport itself is often a major impediment to early primary care.

Poor housing and overcrowding are potent factors in the spread of respiratory tract infections, which are associated with otitis media.

There is often a great deal of ignorance about the causes and significance of middle-ear disease, related perhaps to its high prevalence in some communities.

In the present circumstances of most rural districts the nurses in the community clinics are crucial to any attempts to lessen the extent of the problem of chronic ear disorders.^{12,13} They are more accessible to rural working-class families than are medical practitioners. Based on this observation we would suggest the following strategies to improve rural health care for ear disorders: (i) health education programmes should be introduced to inform the public about the importance of early treatment of ear disorders; and (ii) a better quality of 'available' primary health care is needed to alleviate the situation until such time as there is an upliftment of rural social circumstances: (a) nursing staff in rural clinics should receive adequate training in the management of ear disorders and have available simple equipment to deal with them, and (b) community clinics should have available for dispensing by such adequately trained nursing staff antibiotics effective against the organisms of acute ear infections.

We suggest that the prevalence of chronic ear disorders is a sensitive marker of the quality of primary health care in a community.

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