A TWO YEAR STUDY OF FACTORS CONTRIBUTING TO HEARING LOSS IN MOZAMBIQUE

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Background to the Present Study

As a developing country recuperating from a lengthy civil war, documenting incidence of hearing loss has remained a low priority in Mozambique. Though an epidemiological study was conducted some thirteen years ago in the capital city of Maputo, the ensuing report provided limited data about factors contributing to hearing loss within the country of Mozambique. Results of hearing evaluation of 1000 primary school-aged children (5 – 16 years old), conducted in 1995 in the capital city of Maputo, were reported. Of the 1000 children evaluated, 18.6% presented with otitis media, and a total of 5% of the children exhibited otitis media accompanied with hearing impairment. Unfortunately, the report fell short of providing more in depth details of any other findings, nor was there any mention regarding excessive cerumen or debris as a contributing factor for hearing loss.

Jackie Clark conditioning a young child who was eventually identified with profound hearing loss

Photo: Jackie Clark

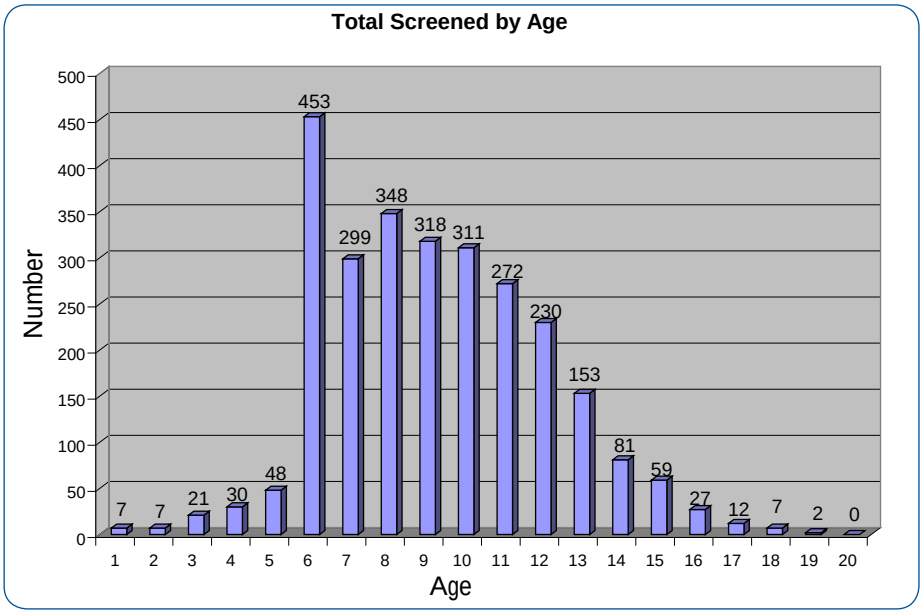

Fig. 1: Total number of students screened by age

It is important to note that, in preparation for a large scale hearing screening program to take place in 2005 and 2006, 1518 primary school students' ears (ages 8-14 years) were viewed otoscopically by trained individuals in 2004. The findings of the initial survey by the author suggested at least 39% of the ears viewed had significant occlusion and, as a consequence, appropriate logistical preparation could be made.

Study

Beginning in 1997, the Mozambique Audiology Philanthropic Program from the University of Texas at Dallas, Callier Center, was created in partnership with the Chicuque Rural Hospital and Maxixe Primary School in Mozambique. The primary purpose was to implement a number of ear and hearing health programs - through free hearing clinics; training local medical technicals; large scale hearing screenings at the primary school; and interacting with the local deaf school program. One of the many results of the program was obtaining much needed and valuable data on incidence and potential causation of hearing loss from conditions, such as ear canal obstruction and restricted tympanic membrane (TM) mobility.

Hearing Screening Program

Beginning in 2005, this portion of the hearing screening program was implemented over a two year period at one of two primary schools for all 1st, 3rd and

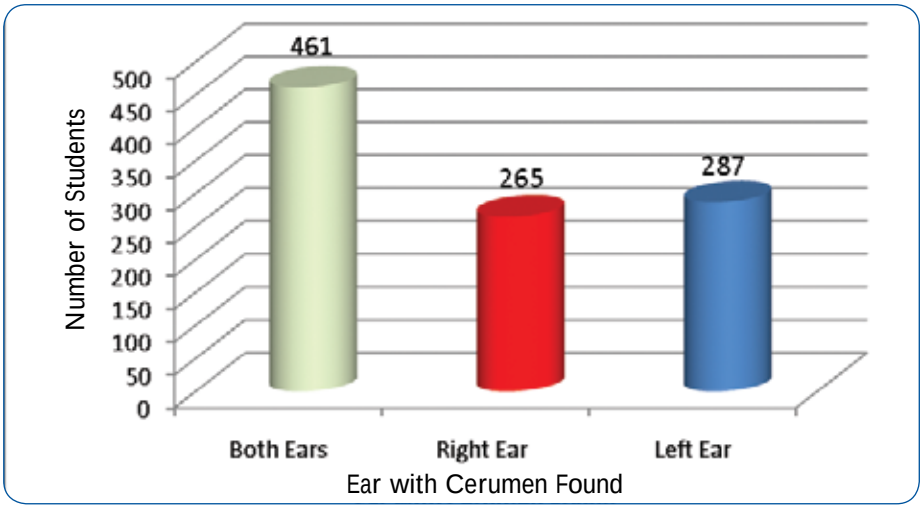

Fig. 2: Number of students with an initial finding of excessive cerumen or debris in external auditory canal via otoscopy

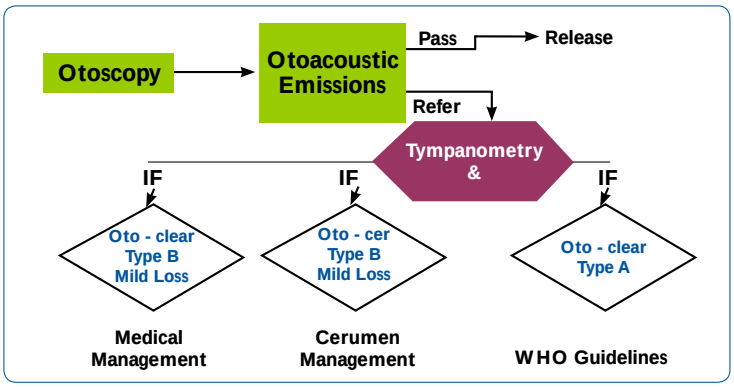

Fig. 3: Program Protocol Workflow

5th grade students (ranging in ages, 6 – 20 years old) in Maxixe, Mozambique and one pre-school (0 – 5 years old) in a neighboring community, Chicuque, Mozambique. Of the total 2685 students screened over the two year period, during an abbreviated time period in the winter season, there were 2384 children, ages 5 through 13 years of age from the primary school (Figure 1). Demographic information (i.e., student name, age, sex and grade) was provided by the classroom teachers, and screening and test results were recorded on the screening forms which the students carried through all required stations. Once concluded, the completed form was turned in by the student for programmatic data management purposes.

Otoscopy

An initial otoscopic inspection was attempted on all students by audiologists and/or trained upper level graduate students, with notation entries made on the screening form. These entries indicated unremarkable external auditory canal (EAC) with no more than 80% occlusion ('Clear'); 80% or greater occlusion with cerumen and/or debris in EAC ('Cerumen'); and any condition that would require medical intervention, such as evidence of active drainage, abnormal EAC or tympanic membrane (TM) discolouration ('Med Tx'). Consistency and agreement of otoscopy findings were confirmed for all of the initial 50 students screened and all of the 10% random checks completed by the author. Otoscopic questions always pertained to the type of debris causing occlusion or type of potential pathology leading to medical referral. These questions had no bearing on the determination of notation category (i.e., 'Clear', 'Cerumen' or 'Med Tx').

At the initial otoscopic inspection, 1013 of the 2685 students (37.7%) were found to have 'Cerumen' (no less than 80% occlusion) in one or both EAC (Figure 2). Almost half of the students had both ears affected with 'Cerumen', and the other half of students had nearly equal right versus left ear affected. A total of 85 students (i.e., 3% of the total number of students screened) had notations 'Med Tx'; this is significantly less than those found with 'Cerumen' at the initial otoscopic inspection.

Further Procedures

As shown in the protocol flow chart (Figure 3), after visual otoscopy, the number of procedures each participant would undergo was dependent upon results beginning with otoacoustic emission testing, tympanometry measures, pure tone 4 frequency air conduction hearing screening and, potentially, a diagnostic pure tone air and bone conduction threshold test.

Of interest are those students whose otoscopic evaluation notations indicated 'Med Tx'. Almost half of those students whose otoscopic evaluation resulted in 'Med Tx' were affected in the right ear only, while the other half of students had nearly equal distribution between left ear and both ears affected.

Otoacoustic Emission (OAE) 4 Frequency Screening

Regardless of the otoscopic findings, all participants then underwent otoacoustic emission (OAE) 4 frequency screening. All participants that passed OAE for both ears handed in their screening forms and were dismissed with a clear 'pass' for the hearing screening. Those participants who twice failed the OAE screen in either ear were re-screened by a different examiner and instrument to achieve confirmation of OAE status. If a failed OAE screen ultimately occurred in either ear, a tympanogram was obtained, followed by a subsequent behavioural pure tone 4 frequency audiometric screening for both ears. Those who passed the behavioural audiometric screening at 25 dB or 40 dB HL, in at least 3 out of 4 frequencies, were dismissed and the screening form handed in with a recommendation to have their hearing checked in one year. Those who did not pass pure tone behavioural screening at 40 dB underwent a diagnostic pure tone audiological air and bone conduction threshold evaluation.

When comparing the number of students who initially failed the screening with those whose hearing loss was validated through behavioural pure tone diagnostic audiometry, it is not surprising that there was a significant decrease in numbers from the initial to the eventual final 'fail' figure (Figure 4). In fact, a total of 432 (16%) of the 2685 students failed the initial first stage OAE screening. There were 232 students who had some condition that could be attributed to their initial screening failure (Figure 5).

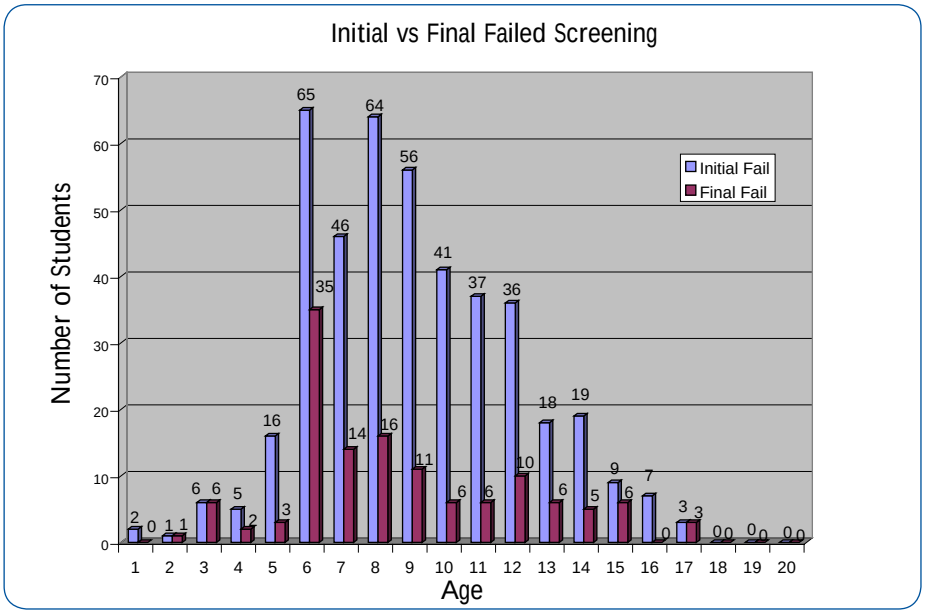

Fig. 4: Number of students with initial hearing screening failure compared to those with identified hearing loss during final testing

The most prevalent condition reported, regardless of age, was excessive cerumen, found in 154 students. A distant second was the severely restricted TM (i.e., flat tympanogram), in the absence of EAC obstruction, found in 61 students - followed by the other less prevalent active drainage condition in 23 students.

All students who failed the initial screen, in conjunction with 'Cerumen' otoscopy notation and tympanometry findings consistent with occlusion, underwent cerumen management followed by an OAE re-screening. If they passed the second screening, following cerumen management, they were dismissed. Confidence in program findings of type and degree of hearing loss increased, because the protocol allowed the pairing of otoscopic notations with tympanometric results for all students who failed the diagnostic hearing. Ultimately, 131 (5%) of the students were found to have greater than 40 dB in the better ear with varying degrees and types of hearing loss.

Discussion

These findings are not in complete agreement with the data reported in the 1995 (WHO) report by Mozambique Health Representatives - which stated that the two most prominent causes of hearing loss in Maputo were otitis media and ototoxicity. Nor are the data in agreement with what one would find in developed countries.[1,2] Clearly, the most prominent factors leading to hearing loss in this current program were:

- Excessive cerumen - *followed distantly by*
- Severely restricted TM mobility in the absence of ear canal obstructions - *and lastly*
- Aural drainage.

Not only is there disparity in reports between the 1995 WHO report and this program regarding those prominent causes of hearing loss, the incidence data are likewise conflicted. The 1995 Mozambique report detailed 18.6% incidence of otitis media and 0.9% otitis media with hearing loss in a group of 1000 (5 – 16 year olds) primary school students in the capital of Mozambique (Maputo). Yet, our findings which defined middle ear deficits (i.e., restricted TM mobility or drainage) would suggest that 61 (2%) of all students exhibited hearing loss due to restricted TM mobility and 23 (0.8%) of all students exhibited active aural drainage. When combined, 84 (3%) of all students had either active aural drainage or restricted TM mobility; these particular students were initially identified as 'Med Tx' via initial otoscopic inspection. Unfortunately, the 1995 WHO data[3] was not accompanied with methodological procedures and details. Nor is there any indication of whether 1995 WHO Mozambique data had any seasonal or geographic influences on student screening outcomes.

Excessive cerumen was not reported in the 1995 WHO report, however, our initial otoscopic findings of 38% 'Cerumen' in students is significantly greater than the 10% expected in a developed country paediatric context. Yet, in this program, 154 students ultimately experienced a negative impact on hearing status from the cerumen. Countless other students underwent cerumen management procedures and quite often their hearing was easily improved. Regardless of the disparity in findings in Mozambique, there is a real need to identify if there are any regional differences within the country.

As mentioned earlier, one of the Mozambique Audiology Program components aims to provide hearing and ear health care. Consequently, the necessary medical follow-up, hearing aid recommendations, and cerumen management procedures were conducted within stringent adherence to the WHO guidelines.[3] In fact, hearing aids were dispensed according to the WHO guidelines as well, and the information providing the incidence of hearing loss (by degree and type) in Mozambique is detailed in an earlier report.[4]

Summary

WHO guidelines[3] suggest that one of the purposes of any hearing health project should be to increase community awareness about hearing loss and hearing health. Some of the benefits of conducting prevalence studies include raising awareness within the community so that they seek ear and hearing health assistance. Hearing screenings can be viewed as an initial process by which groups of people are separated into those who manifest some defined trait, or those who do not. The key to prevention of hearing loss is knowledge of accurate epidemiological information on prevalence, risk factors and costs of hearing loss in the population. When launching any initiative, it is wise not only to understand the local culture but, also, become acquainted with local resource limitations and strengths. Further, any aetiologies which may be prominent contributing factors for hearing loss, such as genetic traits, otitis media, excessive cerumen, exostoses, ototoxicity, etc., should be recognised. In fact, some programs will implement an initial survey visit for logistical planning in the community, to see first-hand those challenges or resources immediately available. This means that proper equipment, personnel and instruments are brought for the actual 'identification and remediation' program which may ensue, weeks or months later, with the needs of the region incorporated.

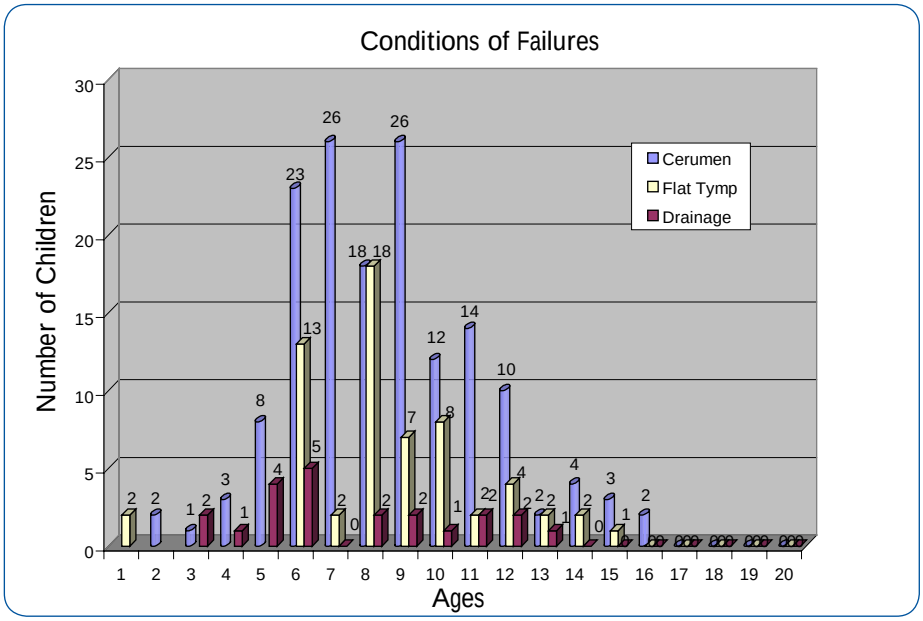

Fig. 5: Conditions affecting the hearing screening failures

Hearing Loss in Mozambique

Results from this project confirm an ongoing need for establishing National Hearing Healthcare Programs which integrate cerumen management procedures and promote good hearing health practices – to educate individuals on the potential complications which can occur from otitis media. As discovered, the greatest contribution to hearing loss in the specific region of Maxixe Mozambique is obstruction in the external auditory canal, followed, a distant second, with medical pathology and, lastly, with sensorineural hearing loss. Knowledge of which aetiologies are particularly prevalent in a specific region or country can only be beneficial to national administrators in their plans to identify, prioritise health programs and select/monitor preventive strategies.

Acknowledgments

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Screening for Hearing Impairment: Oman

SCREENING FOR HEARING IMPAIRMENT IN OMAN

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Oman is a country with a population of 2.44 million of which 1.77 million are Omani and the rest are people from other countries.[1] Oman is situated in the southern part of the Gulf peninsula and has an area of 309,500 square kilometres. It is a member country of the Eastern Mediterranean Region of the World Health Organization.

Rapid socio-economic developments from 1970 placed Oman among group 'B' countries in the WHO classification, based on mortality data.[2] Health strategies, such as an emphasis on the primary health care approach, optimum utilisation of health services, community participation, easy access to health services, etc., placed Oman among the top five countries of the WHO member countries for health service utilisation.[3]

Health Care of Children

High coverage of immunisation of children, antenatal care and a special emphasis on an organised approach to the control of diseases have resulted in a marked decline in communicable diseases in Oman.[4] Health information regarding the newborn is compiled and recorded in the child health register. The reporting of childbirth is mandatory in Oman. More than 95% of the births take place in hospitals. To achieve the objective of improving quality of life, the national health program stressed early detection and care of children with special needs.

ENT examination in the deafness clinic
Photo: Mazin Jawad J Al Khabori

Hearing loss is one of the priority health problems in Oman since 1995.[5] This health care emphasis was justified in 2000, when hearing impairment was found to be one of the leading causes of disease burden in Oman.[6] A community based prevalence study on blindness and deafness, conducted in 1996, suggested that the national prevalence of hearing impairment was 5.5%, of which 2% was of a disabling grade.[7] Unfortunately, information regarding hearing impairment among less than one year old children was not possible in the survey. Since 1995, the ear health care program introduced standard procedures for common diseases causing deafness.[8]

In 2001, the ear health care program in Oman introduced hearing screening for the newborn,[9] as a policy in the sixth Five Year Health Plan.

The Ministry of Health is divided administratively into nine regions. Al-Nahdha Hospital is the only tertiary centre with advanced diagnostic audiology services. Health staff in the maternity or paediatric wards, and the ENT department of the Ministry of Health, are trained in screening. Further periodic training is carried out by the ENT specialists of the regional hospitals. A protocol outlining the screening, referring and defaulter retrieval procedures is prepared and distributed to all regions. The regional ear care health managers