

MAGNITUDE OF IMPACTED EARWAX IN OMAN, ITS IMPACT ON HEARING IMPAIRMENT AND ECONOMIC BURDEN OF EARWAX ON HEALTH SERVICES

MAZIN AL KHABORI, SUBIRENDRA KUMAR, RAJIV KHANDEKAR*

ABSTRACT

BACKGROUND: Wax in ear canal causes a sizeable burden on resources of health services to a country. **AIM:** The magnitude of impacted wax, its effect in a survey and cost of managing this problem were reviewed in 2002. **SETTINGS AND DESIGNS:** A study was conducted during 1996 to estimate the magnitude and causes of hearing impairment and ear diseases in Oman. The authors further reviewed the data of community-based prevalence study to assess the role of impacted wax. **MATERIALS AND METHODS:** Trained physicians used portable audiometers to test the hearing status of each ear. They used otoscopes to examine the ear. Persons suspected to have hearing impairment or ear disease were reexamined by audiologists and otologists to determine the causes of hearing impairment. The resources for managing impacted wax were also calculated. **RESULTS:** In this survey, 11,402 subjects of all ages were examined. Prevalence of impacted wax was 11.7% (CI 95% 11.1-12.2). Impacted wax was significantly higher in females compared to males [RR = 1.22 (CI 95% 1.10-1.35)]. It was more common in residents of regions with humid environment than those of regions with less humidity [RR = 1.91 (CI 95% 1.67-2.18)]. Impacted wax in ear canal was associated with ear diseases. A total of 181,000 Omani people were estimated to have impacted wax in the ear canal. Managing impacted wax could cost 3.6 million US dollars to the ear care services. **CONCLUSIONS:** Impacted wax was a hindrance in the hearing survey, and countries should plan to deal with earwax in such surveys. Its impact on hearing impairment and resource burden should be considered while formulating policies for ear care.

Key words: Deafness survey, hearing impairment, Oman, wax in ear

Wax in the external canal is an innocuous condition, for which a person may not even

Department of Otolaryngology, Head and Neck Surgery and Communication Disorders, Al Nahdha Hospital, Muscat, *Department of Non-communicable Disease, Ministry of Health, Oman

Correspondence:

Dr. Rajiv Khandekar, Eye and Ear Health Care, Non-communicable Disease Control, Directorate General of Health Affairs, Ministry of Health (HQ) POB: 393, Pin: 113, Muscat, Oman. E-mail: rajshpp@omantel.net.om

seek an opinion. Whether a proactive approach should be adopted to manage wax and remove it whenever observed, irrespective of symptoms, is a matter of debate among ENT surgeons. The issue is more complex in a community-based survey as procedures of syringing in the field are with risk as facilities to deal with emergencies are limited; and often, the primary health care staffs are not trained to

manage such emergencies.

In hearing screening, there may be an undesirable delay due to cleaning of impacted wax. There is a small risk of traumatic complications like ruptured tympanic membranes. It can put a population-based study into jeopardy and pose hurdles for the survey staff.

There are many traditional methods to remove impacted wax. The 'street earwax remover' in the Indian subcontinent is well known. Candling was another technique for wax removal.^[1] The availability of many over-the-counter eardrops (wax softeners, dissolvers, removers), as well as various implements for its removal, makes it a popular and lucrative health issue, at least for the manufacturers but not one without morbidity.^[2,3] The art of earwax removal, like many other traditional health occupations, has moved into the realm of medical science in the last century or so. The cost in man hours for removal of impacted wax is worth noting.^[4]

A national survey to determine the causes of 'deafness and common ear diseases' was carried out in 1996 in Oman. Impacted wax was one of the commonest findings. We looked at the potential burden due to impacted wax on health services during this survey and proposed possible solutions.

MATERIALS AND METHODS

A combined blindness and deafness survey was carried out during 1996-97 to delineate the prevalence and causes of blindness, hearing impairment and common ear/eye diseases

in the Omani population. The survey design was a combination of stratified and cluster sampling methods. The detailed methodology is described in earlier publications.^[5,6] The survey was conducted in two phases. In Phase I, trained doctors and nursing staff screened the study population in their houses. To ensure high quality of the survey, ENT specialists reexamined 15% of the people examined in Phase I. The survey had uniform and satisfactory quality in all the regions. (Concordance rates were more than 90% for three parameters.)

In Phase I, all persons suspected to have hearing impairment or ear disease were referred to ENT specialists to delineate the cause of hearing impairment and initiate management. This constituted the Phase II of the survey. Subjects having impacted wax were also referred.

The data was evaluated with the help of the Statistical Package for Social Studies (SPSS 9). Univariate analysis by parametric method was carried out. Frequencies, percentage proportions and age- and sex-adjusted prevalence rates were estimated. To compare the subgroups, we calculated relative risks and 95% confidence intervals.

To estimate the cost of treating impacted wax, we collected information on the routine expenditures at primary, secondary and tertiary level institutions in the Ministry of Health, Oman. The unit salary of manpower for the procedure of removing wax, the cost of disposables and wax softeners and the printing and distribution of health education material for counseling the patient were included.

We obtained ethical clearance from the research and ethical committee of the Ministry of Health, Oman. The identity of the participants was kept confidential. All the cases with ear problem were given treatment free of cost. The results of the study were used to improve the ear care program in Oman.

RESULTS

Of the 11,402 people surveyed, 5,397 were males and 6,005 were females. The participation rates in Phase I and Phase II were 91.8 and 95.8% respectively. Since working males were not available at home during survey, the participation was better amongst females (97%) compared to the males (86.6%). Regional variation in participation was less [Table 1].

The national prevalence of impacted earwax was 11.7% (95% CI 11.1-12.2). Nearly 181,000 subjects in Oman were estimated to have impacted wax in the ear canal of at least one ear.

The trends among subgroups [Table 2] suggested that impacted wax was more common in females than in males (RR = 1.22). It was the least in the age group of '20-29 years.' The elderly (over 60 years of age) had the highest rate of impacted wax (23.9%).

The magnitude of the middle ear diseases and hearing impairment was estimated among those with and without impacted wax [Table 3]. Presence of impacted wax in the ear canal seems to be significantly associated to the middle ear diseases like dry eardrum perforation, Otitis Media with Effusion (OME) and Chronic Suppurative Otitis Media (CSOM). The subjects with impacted wax had significantly higher risk of hearing impairment

Among 1,329 subjects with impacted wax, the ENT surgeon removed impacted wax and found that 23 subjects had eardrum perforation, 14 had OME and 22 had CSOM. Thus if impacted

Table 2: Magnitude of impacted wax in Oman

| Variant | Examined | wax in ear canal # | % | Validation |
|-----------------|----------|--------------------|------|---|
| Male | 5,398 | 564 | 10.5 | RR= 1.22 (CI 95% 1.10 - 1.35) |
| Female | 6,005 | 765 | 12.7 | |
| Group A regions | 7,944 | 1082 | 13.6 | RR= 1.91 (CI 95% 1.67 - 2.18) |
| Group B regions | 3,459 | 247 | 7.2 | |
| Age group | | | | |
| <5 yrs | 1,760 | 155 | 11.7 | X ² = 130.5 Degree of freedom = 4 P=0.00001 |
| 5-18 yrs | 5,830 | 747 | 56.2 | |
| 19-45 | 2,605 | 218 | 16.4 | |
| 46-60 | 902 | 124 | 9.3 | |
| 60- + | 305 | 85 | 6.4 | |
| Total | 11,402 | 1,329 | 11.7 | (CI 95% 11.1 - 12.2) |

Group A comprises of interior areas of N. Sharqiya, Dhakhiliya, Wousta and Dhahira regions - all with dry climate.

Group B comprises of costal areas of Muscat, Dhofar, S. Sharqiya, North Batinah, South Batinah and Musundam regions - all with humid climate.

Table 1: Profile of the Omani population and the examined survey sample

| | Male | | Age group | Female | |
|----------------|------------------|----------------|----------------|------------------|----------------|
| | Population # (%) | Examined # (%) | | Population # (%) | Examined # (%) |
| 125,690 (15.0) | 915 | (17.0) | <5 years | 120,940 (15.0) | 845 (14.1) |
| 360,220 (43.1) | 2926 | (54.3) | 6 to 18 years | 347,358 (43.0) | 2,904 (48.4) |
| 249,140 (29.8) | 950 | (17.6) | 19 to 45 years | 244,322 (30.3) | 1,655 (27.6) |
| 61,650 (7.4) | 455 | (8.4) | 46 to 60 years | 59,340 (7.4) | 447 (7.5) |
| 38,500 (4.6) | 150 | (2.8) | 61 and more | 34,960 (4.3) | 155 (2.6) |

Table 3: Impacted wax in ear canal and middle ear diseases in Oman

| | Ear wax present | Ear wax absent | Validation |
|----------------------------------|-----------------|----------------|--------------------|
| Dry perforation of ear drum | | | |
| Yes | 23 | 53 | RR = 2.62 |
| No | 1,306 | 10,021 | (CI 95% 1.86 3.71) |
| Otitis media with effusion | | | |
| Yes | 14 | 23 | RR = 3.27 |
| No | 1,315 | 10,051 | (CI 95% 2.16 4.96) |
| Chronic suppurative Otitis media | | | |
| Yes | 22 | 70 | RR = 2.07 |
| No | 1307 | 10004 | (CI 95% 1.43 2.99) |
| Hearing impairment | | | |
| Yes | 197 | 314 | RR = 3.71 |
| No | 1,132 | 9,760 | (CI 95% 3.28 4.19) |

wax had not been managed during Phase I, we would have missed diagnosis of these cases with middle ear diseases.

The existing ear care services had 40 ENT surgeons in the MOH. The average time taken for removal of impacted wax was 15 min. One may have to use wax softeners and then do ear syringing, and hence it was time consuming also. A qualified nurse assisted the doctor during the entire procedure. To manage impacted wax in the survey, we calculated the cost. We included direct costs covering the salary of the skilled manpower of ENT department, who spent at least 30 min in ear examination, counseling, performing interventions and following the patient. The cost of instruments, medications that were used before and after the management were also included. The unit cost to manage one patient with impacted earwax would be US \$20. Thus total cost of managing all subjects with impacted earwax in Oman would be around US \$3.6 million [Table 4].

Table 4: Cost of diagnosing and managing impacted wax in Oman

| Item | Total cost (US \$) | Time required | Unit cost (US \$) |
|---------------------------------------|--------------------|---------------|-------------------|
| Human resource | | | |
| ENT doctor | 2,000 | 20 minutes | 5 |
| Nursing staff | 1,000 | 20 minutes | 2.5 |
| Medical orderly | 600 | | 1.5 |
| Consumables | | | |
| Saline | 2 | 15 minutes | 2 |
| Disposable gloves | 2 | | 2 |
| Syringe (50 ml) | 2 | | 2 |
| Ear drops | | | |
| Wax softeners | 5 | Few drops | 1 |
| Health education material (brochure) | | | |
| Printing distribution and display | | | 1 |
| Case record and Follow up examination | | | 2 |

DISCUSSION

The sample was large enough to give national prevalence. However, dataset of subgroups would offer trends only. During otoscopy in the villages, small amount of wax could have been dislodged by the tip of otoscope and thus presence of impacted wax in the ear canal could have been an underestimate to some extent.

Nearly one among eight Omani subjects had impacted wax. In the literature, we could not get rates of impacted wax in the population of all ages to compare our results. Wax in the ear has become one of the commonest ear complaints presenting in the general practice population, as shown in studies in the United Kingdom, the United States of America^[7] and Arhus in Denmark.^[8] In Denmark, the incidence of complaints due to earwax was 39.3 per 1,000 population.^[9] It was the second most common complaint presented by adults at the ear, nose and throat (ENT) casualty service at Dublin.^[10] The picture in the developing countries also

showed similar trends. Impacted earwax was a predictor of hearing impairment in children of Lagos.^[11] Impacted wax was observed in 38.4% in black and 49.9% in Indian preschool children of various ethnic groups in Durban Central Region.^[12] A study in Malaysia also suggested significant association of impacted wax with hearing loss in children.^[13]

Fairey *et al.* noted that 25% of children aged 3-10 years had appreciable amounts of wax, and there was a gradual decline in prevalence with age.^[14]

The coastal regions, which have high humidity, show trends of higher prevalence than the regions in the interior (Dhahirah and Dakhaliya), which have a dry desert climate. Thus wax production seems to be related to humidity and temperatures. Further studies are needed to support this hypothesis.

The cost burden of wax has been a hidden drain on the resources of health authorities that provide service to its people. Even though the problems associated with non-impacted wax, like reversible mild hearing loss and irritation, are minimal, the morbidity associated with its removal cannot be ignored.^[15,16] Tympanic membrane perforations and otitis externa can occur in 1 out of 1,000 cases of ears syringed.^[17] In a study, 25% of the total claims received for compensation were related to syringing for impacted wax.^[18]

The tendency for ENT practitioners to remove wax that is obstructing the view of the eardrum is very common, if not universal. The impacted earwax has also been shown to cause noticeable hearing problems in school children, a common finding in

health surveys.^[6,19-21] Sharp *et al.* observed that removal of occlusive wax improved hearing by a mean of 5 dB.^[15] It raises the question whether an asymptomatic wax, which is not occluding the canal completely, should warrant a proactive approach and undergo syringing. Though a small but a definite risk of complications exists following ear syringing, is it justified to subject the patient to the risk of complications of syringing, especially if the patient has no hearing impairment? If left unattended, some of them may remain asymptomatic. Others may become symptomatic; and at that time, intervention is justified. Fairey *et al.*^[14] did not support removing wax when assessing children in general practice.

In population-based hearing surveys, generally hearing screening is withheld if there is impacted wax in the ear, even if the patient is asymptomatic. This amounts to multiple visits of the same patients, and the screening gets delayed. Majority of these cases are expected to pass the screening test. Some subjects even drop out of the survey, thus affecting the sample and the validity of the results. Thus cleaning asymptomatic wax cases does not seem to be justified. Based on the experience of the population survey conducted in Oman, it was felt that the incidental wax with no symptoms should not prevent the health personnel from performing the screening. If the person fails screening, intervention should be considered. A small number of cases with shallow retraction pockets and minor dry perforations may be missed because they may not have significant hearing impairment. These two situations may be interfered separately as those with and without symptoms. Their numbers are likely to be very small.

In our survey, occluding amount of earwax was prevalent at a rate of 11.7%. Nearly 181,000 subjects with earwax will need care if one believes in removing wax in all cases irrespective of symptoms. It is the ENT surgeon who primarily is responsible for removal of impacted earwax in Oman so far. Earwax removal can be very simple, taking a few minutes, to a time consuming procedure requiring instillation of softeners and re-appointment for ear syringing, which can take up to half an hour. An estimated 15 min per ear is a reasonable time, and it should also include the time taken for setting up of instruments, towels, etc. The cost of around US \$3.6 million to the Ministry of Health is of staggering proportion. If indirect cost of patients' loss of job hours to attend the clinic is accounted for, the cost of managing impacted wax would further escalate. Hence the policy of removal of earwax should be carefully prepared, with due attention paid to the cost implications.

ENT surgeon is too expensive a health person to be utilized for procedures like removal of wax on routine basis. In order to reduce the cost of the specialist clinics, primary health care doctors and some nursing staff who are directly involved in the ear care are trained in these procedures in Oman.^[22,23] Syringing by nursing staff is not a uniform practice all over the world. A study indicated that primarily general practitioners undertake syringing; but among them, only 19% themselves performed syringing and for the rest, this task was assigned to the nursing staff.^[15] Fox and Bartlett reported that the patients had better satisfaction rate when the nursing staff provided the ear care.^[24] The author is of the opinion that after training in syringing, the general practitioner

or the nursing staff may be able to handle the responsibility. Wilson and Roeser suggested that cerumen management can be within the scope of practice for audiologists.^[25] The danger of perforating a normal eardrum is the worry of many who do not advocate delegating the syringing of ears to nonmedical personnel. However, the risk of perforation by syringing is minimal.^[15,26] Training the health staff in proper procedures could further reduce the risk of perforation.

Other major cause for concern is the use of wax softeners. Earwax, as the name suggests, contains lipids;^[27] it also contains a lot of keratin.^[28] The usual practice of asking patients to use oil (olive, almond, etc.) few days prior to syringing has been proven to be not very effective.^[29] Many proprietary wax 'removers' and 'softeners' are oil based and contain keratolytic chemicals and have similar results to each other.^[30-32] Their use can also cause problems.^[33] Besides, oil-based eardrops are nonproprietary solutions. The water-based eardrops are effective.^[29,32] The dangers of using softeners with karyolytic agents are rare but real, especially with unsuspected perforations.^[2] Water seems to be an effective softener^[9,33] and is inexpensive (the cost being in ensuring its cleanliness, e.g., boiling or bottling).

Referrals to remove impacted wax can increase the waiting list in any outpatient departments. Morbidity statistics in our primary walk-in clinics showed that a lot of time was used in syringing of ears for wax.^[34] In order to reduce the initial patient load, patients were routed through an experienced nurse. All those who had earwax-related problems as their main

complaint were dispensed Glycerol eardrops (Glycerol U.S.P. 99%^[35]) at the first visit, and an appointment was fixed for a date after 3 to 5 days of syringing. This has reduced the patient visits to the specialty clinics. Our aim is to reduce this further by delegating the syringing to primary health doctors/nursing staffs that have received training as part of the National Ear Care Programme.

CONCLUSIONS

Impacted earwax is a sizeable problem in our community, and they utilize health resources. This has to be tackled in a cost-effective manner without adding to the morbidity, which ironically is not experienced in 'leaving it there,' but it is in 'trying to remove it.' Removing impacted wax in all the cases would be very costly, with some possible complications. Asymptomatic cases need not receive a proactive intervention. By triaging the genuine cases of symptomatic earwax and dispensing inexpensive nonproprietary water-based neutral eardrops, the costs can be further reduced. Trained general doctors and nursing staffs can undertake syringing. Only a small percentage ought to be referred to specialty clinics. The incidental wax noticed during hearing survey should not delay the process of screening. The intervention should be undertaken only if the screening fails.

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