EAR INFECTIONS IN PATIENTS WITH DIABETES MELLITUS

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SUMMARY
The role of diabetes mellitus in the aetiology of malignant otitis externa (MOE) has been reported though specific predisposition to other ear infections have not been found. The aim of this paper is to report the pattern of ear infections and the management from a one year longitudinal study among the people with diabetes attending the Medical Outpatient Department of the University College Hospital, Ibadan.

All consented people with diabetes who satisfied the inclusion criteria were recruited, full clinical examination and investigations including pure tone audiometry were done. They were followed up at 3 month interval for one year.

The prevalence of ear infection was 22.9%. Malignant Otitis Externa (MOE) and Chronic Suppurative Otitis Media (CSOM) accounted for 19 and 18 respectively. The duration of diabetes mellitus was 10 to 35 years with a mean (SD) of 16 (13) and poor glycaemic control was found in 45 (81.8%). Mixed pattern of hearing loss was found in 38 (69%). The patients had a combination of surgery, antibiotics therapy and medicated ear dressing with one death.

It was thus concluded that ear infections are prevalent among people with diabetes and duration of diabetes and glycaemia control are significant associated factors. However the low mortality in this study proves that a high index of suspicion and prompt management will reduce the need for surgery and the morbidity and mortality.

Keywords: Diabetes mellitus, ear infections, management.

INTRODUCTION
Microbial infections of the ears have many aetiological factors including trauma, allergy, eustachian tube dysfunction and immunosuppression.

Since the report of malignant otitis externa (MOE) by Chandler in 1968 attention has been drawn to the peculiarities of this infection among people with diabetes. The direct relationship between malignant otitis externa and diabetes mellitus has been reported by various authors. Lasisi et al reported 13 cases in a 10 year retrospective study in the University College Hospital, Ibadan. Specific predisposition to otitis media has not been reported. The mortality of MOE reported was high. In the report of Lasisi et al, eight deaths were found out of 13 cases, and persistence of aural granulation despite ear dressing, cranial neuropathy and abscess in the base of the skull were identified as poor prognostic features. Delay in the commencement of management due to advanced presentation and low index of suspicion was identified as a major risk factor for death.

In order to report the pattern of ear infections and the management among people with diabetes attending the Medical Outpatient Department of the Hospital we carried out a survey with a view to early detection of the ear infections and prompt management.

MATERIALS AND METHODS
All patients attending the Endocrinology Unit of the University College Hospital, Ibadan between April 1998 and March 1999 who satisfied the inclusion criteria were recruited in the study. They all had their informed consent taken. The type of diabetes was taken as diagnosed by the managing physician. Type 1 was diagnosed using age less than 35 years, abrupt onset of symptoms within few days to weeks and a fasting blood sugar (FBS) greater than 7 mmol/L and 2 hour postprandial (2HPP) greater than 11.1 mmol/L while the criteria for Type 2 was age greater than 35 years, insidious onset of symptoms or asymptomatic with FBS greater than 7 mmol/L and 2HPP greater than 11.1 mmol/L. A questionnaire was administered to all the patients followed by a full clinical examina-
tion. The ear swab was taken for microscopy, then culture and sensitivity when indicated. Sheep blood agar was used for culture. Blood samples were taken from peripheral veins using a disposable needle and syringe after cleaning the area with spirit swab. These were analysed for fasting and 2 hour postprandial sugar, serum electrolyte, urea and creatinine.

Pure tone audiometry (PTA) was performed using an Audiometer-Amplivox model 2150 in an acoustic booth, ambient noise at <30dB. The air and bone conduction were tested separately at frequencies 500Hz, 1000Hz and 2000Hz in the better ear (in accordance with the World Health Organization) and plotted on an audiograph.

The mean of the 2 hours postprandial blood glucose over five clinic visits (at two weekly intervals) was used to assess the degree of control of diabetes. A mean of less than 8.9mmol/L was termed good control while over 8.9mmol/L was termed poor.

The exclusion criteria are lack of consent, use of topical antibiotic ear drops within the previous 3 months and the presence of chronic medical illnesses such as hypertension, chronic renal failure, sickle cell disease, tuberculosis and cancers.

Simple and standard definitions were used as the criteria for clinical diagnosis as follows:

Acute Otitis Media: Presence of otorrhoea or hyperaemic tympanic membrane (not more than 2 week duration).

Chronic Suppurative Otitis Media: Presence of perforated tympanic membrane (more than 2 week duration) with or without otorrhoea, fever or otalgia.

Malignant Otitis Externa: Persistent, severe otalgia with localised tender swelling in the external auditory canal with or without fever or facial nerve palsy.

Otomycosis: itching with or without otalgia and debris in the external auditory canal with or without a culture of fungus or fungal hyphae.

The subjects were treated in the Otorhinolaryngology Out-patient Department with a combination of systemic antibiotics and daily ear dressing or admitted into the ward and treated with a combination of systemic antibiotics, surgery and daily ear dressing until the ear became dry. The systemic antibiotics used were amoxycillin, Ceftriaxone, Cefuroxime, Ciproflaxacin and Metronidazole. The ear dressing was done using antibiotic eardrop impregnated wick. The surgical procedures included cortical mastoidectomy, modified radical mastoidectomy (canal wall down) and extended radical mastoidectomy.

The subjects with ear infections were followed up monthly and those without ear infections were seen every 3 months till the end of the study on March 31st, 1999.

The data was presented in contingency table and analysed using simple frequency distribution, student t-test and chi-square. The significance of the association between the variables was found using the chi square statistic on an appropriate degree of freedom. All test were at 5% level of statistical significance.

RESULT

The study comprised 240 subjects (137 females and 103 males). One hundred and eighty seven (77.5%) were Type 2 diabetic while 54 (22.5%) were Type 1 diabetic. Out of these, 55 had ear infections giving a prevalence of 22.9%. Malignant otitis externa (MOE) and CSOM accounted for 19(34.6%) and 18 (32.7%) respectively (Table 1).

Table 1 Frequency of organisms cultured in the ear of subjects with infections.

<table>
<thead>
<tr>
<th>Infection</th>
<th>Total No. (%)</th>
<th>Organism cultured</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malignant otitis externa</td>
<td>19(34.6)</td>
<td>Pseudomonas aeruginosa</td>
<td>19</td>
</tr>
<tr>
<td>Chronic supplicative otitis media</td>
<td>18(32.7)</td>
<td>Pseudomonas spp.</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bacteroides spp.</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mixed organism</td>
<td>4</td>
</tr>
<tr>
<td>Acute suppurative otitis media</td>
<td>8(14.5)</td>
<td>Staphylococcus aureus</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Streptococcus Spp.</td>
<td>2</td>
</tr>
<tr>
<td>Otomycosis</td>
<td>10(18.2)</td>
<td>Candida species</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fungal hyphae</td>
<td>2</td>
</tr>
</tbody>
</table>

The age range was between 23 and 86 years with a mean (SD) of 59 (16). The duration of diabetes mellitus was 10 to 55 years with a mean (SD) of 16(13).
The main clinical presentations were otalgia (95%), tinnitus and purulent otorrhoea (80%), fever (75%), hearing loss (60%) and itching of the ear (56%). Facial nerve palsy was found in 16 out of 19 cases of MOE. At presentation, 39 (71%) were found to be uncontrolled while 6 became uncontrolled after presentation (during treatment). Mixed hearing loss was found in 38 (69%); 9 (16%) had conductive hearing loss and 8 (15%) had normal hearing pattern. The mean pure tone audiogram for air conduction was 50dB while bone conduction was 45dB.

Systemic antibiotics and medicated ear dressing was common to the management of all the subjects, 17 subjects with MOE and 2 CSOM had modified radical mastoidectomy procedure. The duration of treatment was between 2 weeks to 6 months, Table 2.

### Table 2 Summary of the management

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Antibiotic</th>
<th>Ear dressing</th>
<th>Surgery</th>
<th>Duration of treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malignant otitis externa (n=19)</td>
<td>19</td>
<td>19</td>
<td>17</td>
<td>6-18weeks (Average = 11)</td>
</tr>
<tr>
<td>Chronic supplicative otitis media (n=18)</td>
<td>18</td>
<td>18</td>
<td>2</td>
<td>3-10 weeks (Average = 5)</td>
</tr>
<tr>
<td>Acute supplicative otitis media (n=8)</td>
<td>8</td>
<td>8</td>
<td>0</td>
<td>2-5 weeks (Average =3)</td>
</tr>
<tr>
<td>Otomycosis (n=10)</td>
<td>10</td>
<td>10</td>
<td>0</td>
<td>4-6 weeks (Average =4)</td>
</tr>
</tbody>
</table>

There was one death while the rest were discharged home.

**DISCUSSION**

Comparing the prevalence of ear infection of 22.9% among people with diabetes with reports of 3.6% and 7.2% among normal population in Lagos and Benin respectively, this study confirms that ear infections are common among people with diabetes. This may be due to numerous immunologic derangements caused by hyperglycaemia, ageing and microangiopathy. The occurrence of only one death in this study is contrary to that of Rubin et al and Lasisi et al who reported mortality of 25% and 61% respectively in their retrospective studies. This could be due to high index of suspicion which is afforded in a prospective study allowing for early detection and consequently reduce the mortality. The death was probably due to late presentation and advanced CNS complication similar to the report of Doroghazi et al.

There is no doubt that infections in diabetics predispose to poor glycaemic control as most subjects were found to be poorly controlled at presentation and many were noticed to have deteriorating glycaemic control after the onset of the infection.

Mixed hearing loss was predominant though conductive hearing pattern would have been expected. This shows that there was a concomitant sensorineural hearing loss. This is most likely due to the contribution from presbyacausis, inner ear microangiopathy or labyrinthitis. The prevalence of MOE and CSOM are about equal. Previous studies have reported on MOE but silent on CSOM. Albert et al. actually reported that there was no particular predisposition to CSOM. This new finding in our report may need further research. The duration of diabetes appears to increase the risk of ear infections as most of the subjects with ear infections had had diabetes for more than 10 years. This is similar to the report of Doroghazi et al who found a correlation between MOE and prolonged diabetes mellitus. They suggested that microangiopathy of the skin of the temporal bone due to longstanding diabetes mellitus results in poor local perfusion and creates an environment well suited for invasion by microorganisms. This was suggested for MOE but we feel a similar pathogenetic factor may be responsible for CSOM though this was not assessed in this study. Only five of the 54 Type 1 patients (9.3%) had ear infection compared with 50 of 187 Type 2 patients (26.7%). This difference is significant and it shows that the Type 2 is more susceptible to ear infections. This may be explained by the pro-
longed duration of the disease and elderly age with consequent further immunodepression in the Type 2 subject.

The choice of conservative treatment was formulated based on our earlier report on the behavioural pattern of malignant otitis externa. Conservative treatment was offered to all the patients in the outpatient clinic except there was persistence of granulation tissue in the external auditory meatus, multiple cranial neuropathy or abscess in the base of the skull. Modified radical mastoidectomy was offered to 19 subjects as the surgical treatment of choice. This was because the disease was advanced due to late presentation. The availability of new radiologic modalities such as transmission radiography, technetium and gallium bone scanning also improves the detection of early disease thus minimising the role of surgery. These facilities were not available in our practice. However, a high index of suspicion, conscious search for the poor prognostic factors, early identification and prompt institution of therapy has helped in reducing the mortality.

We conclude that ear infections are more prevalent among subjects with diabetes and the duration of the diabetes and glycaemic control are important factors. However early detection aided by the availability of sophisticated radiodiagnostic techniques may obviate the need for surgery and still reduce the mortality.

REFERENCES


