SENSORINEURAL HEARING LOSS IN GHANAIANS WITH DIABETES MELLITUS

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SUMMARY

This study was undertaken to find out whether 47 Ghanaian diabetics who receive regular treatment from the Korle Bu Teaching Hospital also have sensorineural hearing impairment and, if so, the extent and degree to which they fit the "typical" pattern of sensorineural hearing loss attributed to diabetes mellitus. Forty-one non-diabetic Ghanaians served as controls. Each subject was given pure tone audiological examination.

Analysis of variance showed that the diabetics had higher threshold of hearing than the controls at all octave frequencies. The female diabetics were deader than their male counterparts. Insulin-dependent diabetics had worse hearing loss than non-insulin-dependent ones.

This study in Ghanaians with diabetes mellitus revealed no deviation from the "classic" picture of a bilaterally symmetrical sensorineural hearing loss.

Key Words: Audiometry; Sensorineural hearing loss; diabetes mellitus; Ghana.

INTRODUCTION

The relationship between sensorineural hearing loss and diabetes mellitus has been studied extensively since the advent of audiometry. There is still debate on diabetes mellitus as a cause of sensorineural hearing impairment¹². The typical pattern of hearing loss described by those who admit a connection be-

between diabetes and hearing loss is a progressive, bilateral, sensorineural deafness of gradual onset which affects predominantly the higher sound frequencies in older patients. There is a decrease in auditory acuity which is similar to that due to presbycusis, except that those affected show a hearing loss greater than could be expected at that age³⁻⁵.

Exceptions to this typical pattern have also been reported. These have included acute onset of hearing loss⁶⁻⁷ which may be associated with Meniere's syndrome⁶ or unilateral impairment⁷, unilateral deafness per se with⁸ or without⁹ vestibular symptoms, and low-frequency involvement⁷⁹.

This study was undertaken to find out whether Ghanaian diabetics, who receive regular treatment from Korle Bu Teaching Hospital also have sensorineural hearing impairment and, if so, the extent and degree to which they fit the typical pattern of sensorineural hearing loss attributed to diabetes mellitus.

SUBJECTS AND METHODS

This study investigated the hearing thresholds of 88 subjects: 41 controls and 47 diabetics. The control group comprised 20 males and 21 females aged between 24 and 50 years. The patients, ranging between 25 and 46 years of age, comprised 26 males (15 insulin dependent and 11 non-insulin dependent) and 21 females (12 insulin dependent and 9 non-insulin dependent). The record cards of all patients due to attend the diabetic outpatients clinic at the Korle Bu Teaching Hospital were used to admit the patients to the survey. All
subjects over 50 years of age were excluded in an attempt to minimize the effects of presbycusis.

**TABLE 1: MEAN HEARING THRESHOLDS OF NORMAL AND DIABETIC SUBJECTS**

<table>
<thead>
<tr>
<th>Frequencies (Hz)</th>
<th>Controls a</th>
<th>Diabetics b</th>
</tr>
</thead>
<tbody>
<tr>
<td>125</td>
<td>6.5 ± 4.9</td>
<td>23.1 ± 5.3</td>
</tr>
<tr>
<td>250</td>
<td>6.9 ± 4.1</td>
<td>22.1 ± 3.9</td>
</tr>
<tr>
<td>500</td>
<td>6.2 ± 5.2</td>
<td>20.9 ± 5.0</td>
</tr>
<tr>
<td>1000</td>
<td>5.5 ± 2.3</td>
<td>22.7 ± 9.0</td>
</tr>
<tr>
<td>2000</td>
<td>5.6 ± 1.7</td>
<td>23.9 ± 4.1</td>
</tr>
<tr>
<td>4000</td>
<td>10.1 ± 2.5</td>
<td>25.5 ± 2.6</td>
</tr>
<tr>
<td>8000</td>
<td>15.7 ± 4.6</td>
<td>22.8 ± 9.8</td>
</tr>
</tbody>
</table>

a - normal (control group) n = 82
b - diabetics; n = 94
P < 0.01 F(82, 94) = 77.59
n refers to number of ears tested

None of the subjects selected for this study gave any history or showed any evidence of noise-induced hearing loss, conductive hearing loss, ototoxic drug ingestion, accident and/or surgery to the middle or internal ear, or any other type of hearing impairment other than that due to age and/or diabetes. No member of the control group gave any family history of either deafness or diabetes nor did clinical oto-scope examination reveal any abnormalities in them.

Each subject was tested on a diagnostic audiometer MA 21 (VEB Pracitronic, Dresden, GDR) in a soundproof room. Measurements of pure tone hearing threshold were made at octave intervals, from 125 Hz to 8000 Hz inclusively, by both air and bone conduction. Narrow band masking was used where necessary. The resulting data for each ear were subjected to statistical analysis. Analysis of variance (ANOVA) was chosen as the method to show whether or not the diabetic group had significantly higher threshold than the control group.

**RESULTS AND DISCUSSIONS**

Table 1 shows the mean hearing thresholds of the control and diabetic groups. ANOVA showed that the two groups were drawn from significantly different populations, the diabetics having a significantly higher threshold of hearing (P < 0.01, F(82,94) = 77.59) than the controls at all frequencies. This difference between the two groups cannot be attributed to age as the age distributions of the two groups were not statistically different.

Table 2 shows the mean hearing thresholds of the diabetic group alone. The female diabetics showed significantly greater hearing losses than their male counterparts (P < 0.01, F(52,42) = 38.80). This finding contrasts with that of Axclsson and Fagerberg [10] who could find no difference between the sexes but agrees with Camisaca [9] who found a sex difference. The mean hearing levels of males and females in the control group showed no significant differences.

Non-insulin dependent diabetics had significantly better hearing threshold than the insulin dependent ones (P < 0.01, F(40,54) = 15.72). It may not be possible to comment on this observation as no comparable results could be found in the literature. However, further research is required to elaborate the relation between hearing levels of insulin-dependent diabetics and duration and/or dosage of insulin therapy although a study by Taylor and Irwin [11] showed that diabetic hearing impairment was unrelated to dosage and/or duration of insulin therapy. The following is a description of the pattern of hearing loss in diabetics. Initially, there is impairment in the low frequency range. Then, as the patient ages, the high frequencies become involved leading to a flat audiogram. This high frequency involvement could be due to age alone or to a combination of age and diabetes. As presbycusis advances the patient may suffer from a predominantly high frequency deafness. We, however, cannot be definitive about this until a longitudinal study of diabetics has been conducted to study the progression of hearing loss since in any one group, young or old, long-term or short-lived diabetes can produce hearing impairment and thereby make it impossible to observe any progression of deafness.
TABLE 2: MEAN HEARING THRESHOLDS OF DIABETICS
ACCORDING TO GENDER AND TYPE OF DIABETES

<table>
<thead>
<tr>
<th>Frequencies (Hz)</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>125</td>
<td>22.7 + 7.2</td>
<td>25.1 + 5.1</td>
<td>20.6 + 6.0</td>
<td>20.6 + 6.0</td>
</tr>
<tr>
<td>250</td>
<td>20.2 + 7.0</td>
<td>24.4 + 6.8</td>
<td>20.9 + 7.2</td>
<td>20.9 + 7.2</td>
</tr>
<tr>
<td>500</td>
<td>18.8 + 8.0</td>
<td>22.3 + 7.7</td>
<td>19.3 + 6.7</td>
<td>19.3 + 6.7</td>
</tr>
<tr>
<td>1000</td>
<td>20.7 + 9.1</td>
<td>24.1 + 4.8</td>
<td>21.1 + 7.9</td>
<td>21.1 + 7.9</td>
</tr>
<tr>
<td>2000</td>
<td>21.1 + 7.3</td>
<td>25.9 + 4.1</td>
<td>20.8 + 8.0</td>
<td>20.8 + 8.0</td>
</tr>
<tr>
<td>4000</td>
<td>22.2 + 8.9</td>
<td>27.5 + 8.6</td>
<td>23.5 + 9.2</td>
<td>23.5 + 9.2</td>
</tr>
<tr>
<td>8000</td>
<td>21.0 + 4.0</td>
<td>24.0 + 7.9</td>
<td>20.8 + 8.7</td>
<td>20.8 + 8.7</td>
</tr>
</tbody>
</table>

I - Male diabetics; mean age = 35 years; n = 52
II - Female diabetics; mean age = 30 years; n = 42
III - Non-insulin dependent diabetes mellitus; n = 40
IV - Insulin dependent diabetes mellitus; n = 54

P* < 0.01, F(52,42) = 38.8. P** < 0.01, F(40,54) = 15.72
n refers to number of ears tested
P* refers to comparison between I and II
P** refers to comparison between III and IV

Finally, this study in Ghanaians with diabetes mellitus reveals no deviation from the "classic" picture of a bilaterally symmetrical sensorineural hearing loss associated with diabetes mellitus.

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REFERENCES


