RESULTS

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This study included fifty diabetic patients (thirty Adult - onset type and twenty Juvenile - onset type) and thirty healthy normal non diabetic persons as a control .

All the cases and the controls are classified into three groups :
Group I : The Juvenile- onset diabetic patients
Group II : The Adult - onset diabetic patients
Group III: The normal control persons

AGE AND SEX DISTRIBUTIONS :

GROUP I : It contained seven males and thirteen females . The age ranging between I7 to 46 years .

GROUP II : It contained seventeen males and thirteen females . The age ranging between 44 to 74 years .

GROUP III : It contained twelve males and eighteen females . The age ranging between I5 to 62 years .

In this study we found that the control group contained twenty - six (86.7 °/0) normal audiograms and four (I3.3 °/0) sensorineural ones , but in both diabetic groups fifteenth (30 °/0) cases had normal audiograms and thirty - five (70 °/0) cases had sensorineural ones . These results are shown in table (I) and the statistical analysis of this table shows that there is a significant sensorineural hearing loss affecting the diabetic group , see table (2) .

The mean hearing thresholds of the diabetic cases for the frequencies from 250 to 8000 Hz are represented in table (3) , and the mean hearing thresholds of the control group for the same frequencies are shown in table (4) . A comparison of these two tables shows that the mean hearing threshold of the diabetic cases exceeds that of the control group by more than 29 dB at any one frequency , and it seems that the diabetic cases being deafer than the control group . Table (5) shows the statistical analysis of both tables 3 & 4 .

The age distribution of the two groups are stat-

istically equivalent (P ⊳ .05) , this is shown in table (6) .

The sex distribution of both groups is also statistically equivalent (P ⊳ .20) , this is shown in table (7) .

The relation between the mean threshold and the age of the diabetic cases is shown in table (8) , and that of the control group is shown in table (9) . The results in these two tables are statistically analysed and summarised in table (IO) .

ANALYSIS OF THE DIABETIC CASES

The diabetic cases contains 24 males (mean age is 44.6 ± I3.6) and 26 females (mean age is 49.9 ± I9.5) . The mean hearing thresholds of males and females are shown in table (II) . The results are statistically analysed and summarised in table (I2) . It shows no difference between diabetic males and females at any one frequency .

DURATION OF THE DISEASE
The duration of the disease ranged from 4 months

to 30 years . The relationship between the duration of the disease in years and the mean threshold of both ears of each individual at each frequency from 250 - 8000 Hz is measured by correlation coefficient (r) . It seems that there is no association between hearing loss and the duration of the diabetes , this is shown in table (I3) .

THE DRUG USED

According to the drug used and the onset of the disease , the diabetic cases are divided into two groups . Group (I) , juvenile onset diabetics , they are dependent on insulin therapy and this group contains 20 patients (7 males & I3 females) aging from I7 to 46 years , and group (2) , adult onset diabetics , they are independent on insulin therapy and using tablets for controlling the disease , this group contains 30 patients (I7 males & I3 females) aging from 44 to 74 years . The mean hearing thresholds of both groups are shown in table (I4) . Statistical analysis of this table shows that the adult onst type is more affected by diabetes than the juvenile type , and this is shown in table (I5) . Also the high frequencies (4000 & 8000 Hz) are the more affected than the other frequencies .

THE ONSET OF HEARING LOSS

According to the onset of hearing loss , two cases only (cases No. 8 & 25) complaining of hearing loss which was sudden in onset . Except of these two cases , all the diabetic cases complaining of hearing loss discribed it as gradually in onset .

COMPLICATIONS OF DIABETES MELLITUS

According to the complication of diabetes mellitus, this study included 26 cases complaining of diabetic complications (either retinopathy , nephropathy , neuropathy or compination of two of them) , the remaining cases suffering from diabetes without clinical manifestation of complications . The mean hearing thresholds of both diabetic patients without complications and those with complications are shown in table (I6) . This table is summerised and statistically analysied in table (I7) which shows that there is significant difference between them , and the diabetic patients with complications beaing deafer . A comparison between the mean age of both of them shows that there is significant difference between their mean age ($P < .0I$).

TYMPANOMETRIC STUDY

The tympanometric study for both diabetics and controls showed that the tympanograms of all subjects belonged to type (A) tympanograms . Any case with type (B) or type (C) was excluded to avoid the effect of middle ear pathology on the audiometric and stapedius reflex studies .

THE STAPEDIUS REFLEX STUDY

The mean stapedius reflex thresholds of all diabetic cases for pure-tones at frequencies from 500 to 4000 Hz are shown in table (I8) . Comparison between this table and table (3) is shown in table (I9) and from it , it can be seen that the difference between the mean hearing threshold at any frequency from 500 to 4000 Hz and that of the stapedius reflex is less than 85 dB which means presence of recruitment .

The individual analysis of all diabetic cases shows that in the diabetic cases with normal audiograms the stapedius reflex thresholds were distributed around a mean of approximately 85 dB hearing threshold level (non recruiting) , but cases with sensorineural audiograms were recruiting .

Abnormal reflex decay was founded in only two
cases , and it was unilateral in case No. I4 and
bilateral in case No. 30 . Except of these two cases
there was no reflex decay in all diabetic cases .

TABLE (I) No. of normal and sensor-
ineural subjects in both diabetic &
control groups

Group	Normal	S.N.H.L.	Total
Diabetic	I5	35	50
Control	26	4	30
	4I	39	80

TABLE (2) Statistical analysis of
table (I)

X^2calculated°	df°°	P
23.9	I	P ⊲ .OI Significant

° X^2 = Chi-squared

°°df = Degree of freedum

TABLE (3) The mean hearing thresholds
of the diabetic group

Frequency Hz	Mean	S.D.
250	4I.5	I6.3
500	40.6	I5.I
I000	37.2	I5.2
2000	36.5	I6.7
4000	4I.6	20.3
8000	46.8	28.4

TABLE (4) The mean hearing thresholds
of the control group

Frequency Hz	Mean	S.D.
250	9.2	6.2
500	I0.3	5.8
I000	8	5.I
2000	7.6	5.3
4000	7.8	8.9
8000	I0.4	I2.7

TABLE (5) Statistical analysis of both tables
3 & 4

Frequency Hz	Calculated t	df	P	
250	4.9	79	P < .01	Signif.
500	5.3	79	P < .01	Signif.
1000	5.3	79	P < .01	Signif.
2000	4.4	79	P < .01	Signif.
4000	3.1	79	P < .01	Signif.
8000	5.6	79	P < .01	Signif.

TABLE (6) The mean age of diabetic and
control groups and its statistical
analysis

Group	Mean age	S.D.	t	df	P
Control	37.6	14.13	1.95	79	P > .05 Not sig.
Diabetic	47.14	16.7			

TABLE (7) Male and Female distribution
in both diabetic and control groups and
its statistical analysis

Group	Male	Female	Total
Diabetic	24	26	50
Control	I2	I8	30
	36	44	80

x^2 = .5   df = I   P ⊳ .20 Not signif.

TABLE (8) Distribution of cases according to age - group & hearing thresholds in the diabetics

Age gro-up in Y	No of cases	Mean hearing thresholds in dB						Mean age
		250	500	I000	2000	4000	8000	
IO-	4	I4.4 ± 02.4	I5.6 ± 02.4	I3.8 ± 04.3	I5.0 ± 07.4	I5.0 ± 02.0	II.3 ± OI.4	I7.75 ± OI.0
20-	6	23.8 ± II.3	25.8 ± I5.4	22.5 ± I5.8	20.4 ± I3.6	I9.2 ± I0.7	I9.6 ± I2.I	23.7 ± 02.7
30-	7	35.7 ± I0.9	35.7 ± 09.5	33.6 ± 09.2	3I.8 ± 09.9	33.6 ± 09.5	33.9 ± II.8	35.8 ± OI.9
40-	7	42.I ± I9.0	4I.0 ± I7.6	37.8 ± I8.I	36.0 ± I6.8	38.9 ± I7.I	43.9 ± 22.9	43.9 ± 02.5
50-	8	50.0 ± 06.5	47.2 ± 06.3	42.2 ± 05.4	38.I ± 07.3	46.3 ± 07.I	53.8 ± I6.8	5I.6 ± 02.7
60-	I5	5I.0 ± 09.9	48.0 ± 09.0	45.2 ± 09.8	46.5 ± I4.7	55.8 ± I8.3	63.5 ± 23.9	63.6 ± 02.4
70-74	3	54.2 ± I2.5	54.2 ± II.3	5I.7 ± I6.6	44.2 ± 20.9	6I.7 ± 27.5	87.3 ± 39.3	72.7 ± OI.5

TABLE (9) Distribution of cases according to age - group & mean hearing thresholds in the control group

Age group in Y	No of cases	Mean hearing thresholds in dB						Mean age
		250	500	1000	2000	4000	8000	
10-	3	06.7 ± 02.9	08.3 ± 03.8	07.3 ± 03.8	02.5 ± 02.5	00.0 ± 00.0	-1.7 ± 01.4	17.0 ± 02.0
20-	7	07.1 ± 02.8	07.1 ± 03.7	06.4 ± 03.8	06.4 ± 04.3	03.2 ± 04.0	03.2 ± 04.9	23.0 ± 02.8
30-	5	06.0 ± 08.0	07.5 ± 05.3	03.5 ± 02.2	04.0 ± 03.8	01.0 ± 05.1	07.0 ± 10.8	34.2 ± 03.6
40-	9	09.7 ± 02.6	10.0 ± 04.5	08.1 ± 04.5	09.4 ± 05.1	11.4 ± 08.9	14.2 ± 13.6	44.9 ± 02.2
50-	4	14.4 ± 10.0	16.9 ± 06.3	11.9 ± 05.2	10.5 ± 03.8	13.8 ± 04.3	16.3 ± 08.3	55.0 ± 03.6
60-70	2	15.0 ± 00.0	20.0 ± 03.5	17.5 ± 03.5	15.0 ± 07.1	23.8 ± 08.8	33.8 ± 12.4	61.0 ± 01.4

TABLE (IO) Statistical analysis of both

tables 8 and 9

Age group	Frequencies in Hz					
	250	500	I000	2000	4000	8000
IO-	P ▷ .IO	P ▷ .05	P ▷ .IO	P ◁ .05	P ◁ .OI	P ◁ .OI
20-	P ◁ .05	P ◁ .05	P ◁ .05	P ◁ .05	P ◁ .02	P ◁ .05
30-	P ◁ .OI	P ◁ .OI	P ◁ .OI	P ◁ .OI	P ◁ .OI	P ◁ .02
40-	P ◁ .OI	P ◁ .OI	P ◁ .OI	P ◁ .OI	P ◁ .02	P ◁ .05
50-	P ◁ .OI	P ◁ .OI	P ◁ .OI	P ◁ .OI	P ◁ .OI	P ◁ .OI
60-	P ◁ .OI	P ◁ .OI	P ◁ .OI	P ◁ .OI	P ◁ .02	P ◁ .05

df = 79

TABLE (II) Mean hearing thresholds of
both males & females in the diabetic
group

Frequency Hz	Males	Females
250	40.8 ± I7.0	42.0 ± I5.9
500	40.3 ± I6.4	40.8 ± I4.I
I000	37.8 ± I7.2	36.6 ± I3.3
2000	37.5 ± I9.8	35.5 ± I3.6
4000	43.6 ± 23.9	38.9 ± I5.9
8000	5I.4 ± 33.0	42.6 ± 23.I

TABLE (I2) Statistical difference between
males and females in the diabetic group

Frequency Hz	Calculated t	P	
250	0.I4	P > .I0	Not signif.
500	0.I0	P > .I0	Not signif.
I000	0.20	P > .I0	Not signif.
2000	0.30	P > .I0	Not signif.
4000	0.60	P > .I0	Not signif.
8000	0.90	P > .I0	Not signif.

df = 49

TABLE (I3) Association between hearing loss and the duration of diabetes

Frequency Hz	Calculated r	Association
250	0.0039	No association
500	0.0I72	No association
I000	0.00I6	No association
2000	0.02	No association
4000	0.03	No association
8000	0.03	No association

Calculated r = Correlation coefficient

TABLE (I4) Mean hearing thresholds of both juvenile and adult onset diabetes

Frequency Hz	Juvenil	Adult
250	26.9 $\pm$ I2.I	5I.2 $\pm$ I0.4
500	27.9 $\pm$ I2.5	49.0 $\pm$ 9.9
I000	25.4 $\pm$ I2.9	45.I $\pm$ I0.9
2000	24.3 $\pm$ I2.I	44.6 $\pm$ I4.3
4000	24.8 $\pm$ II.9	52.8 $\pm$ I6.8
8000	22.9 $\pm$ I4.5	62.8 $\pm$ 23.8

TABLE (I5) Statistical analysis of

table I4

Frequency Hz	Calculated t	P			
250	5.2	P	◁	.OI	Signif.
500	4.5	P	◁	.OI	Signif.
I000	4.02	P	◁	.OI	Signif.
2000	3.8	P	◁	.OI	Signif.
4000	4.9	P	◁	.OI	Signif.
8000	5.2	P	◁	.OI	Signif.

df = 49

TABLE (I6) The mean hearing of diabetic

patients with and without complication

Frequency Hz	Diabetics without complication	Diabetics with complication
250	36.8 ± I7.5	47.3 ± I4.5
500	35.8 ± I6.5	45.7 ± I2.0
I000	33.0 ± I6.9	42.8 ± II.7
2000	32.4 ± I6.2	4I.8 ± I6.0
4000	36.6 ± 20.5	48.4 ± I8.3
8000	39.3 ± 26.7	57.2 ± 26.6
Age	3λ.3 ± I7.4	54.8 ± I3.9

TABLE (I7) Statistical analysis of table I6

Frequency Hz	Calculated t	P	
250	2.28	P ◁ .05	Signif.
500	2.40	P ◁ .05	Signif.
I000	2.39	P ◁ .05	Signif.
2000	2.04	P ◁ .05	Signif.
4000	2.I0	P ◁ .05	Signif.
8000	2.40	P ◁ .02	Signif.
Age	3.40	P ◁ .0I	Signif.
	df = 49		

TABLE (I8) The mean stapedius reflex thresholds of the diabetics

Frequency Hz	Mean reflex thresholds
500	93.25 ± I0.8
I000	9I.80 ± 08.I
2000	9I.60 ± 08.9
4000	96.I0 ± 09.3

TABLE (I9) Comparison between tables

3 & I8

Frequency Hz	Mean	H. thr.		Mean reflex thr.	
500	40.6	±	I6.3	93.25	±	I0.8
I000	37.2	±	I5.2	9I.80	±	08.I
2000	36.5	±	I6.7	9I.60	±	08.9
4000	4I.6	±	20.3	96.I0	±	09.3