Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

Original Article

Assessment of Hearing Loss among Diabetic Patients -A Clinical Study

Shiv Nath Singh[1], Arjun Singh[2]

[1]MD (Medicine), Prof.& HOD, Dept. of Medicine, RMRI Bareilly, U.P., India
[2]M.S (E NT.), Asst Prof, Dept. of E.N.T, RMRI Bareilly, U.P., India

ABSTRACT:

Background: The pathologic changes that accompany diabetes could plausibly cause injury to the vasculature or the neural system of the inner ear resulting in sensorineural hearing impairment. Hence; we planned the present study to assess hearing loss among diabetic patients. **Materials & methods:** A total of 50 patients with presence of type 2 diabetes and 50 healthy controls were enrolled in the present study. Recording of pure-tone hearing (in decibels [dB]) and other biochemical values was also done. Value of average pure-tone audiometry threshold of the worse ear more than 25 dB was categorized as presence of hearing impairment. Determination of the pure tone audiogram was done. All the results were recorded and analysed by SPSS software. **Results:** Mean age of the subjects of the diabetic group and the control group was 44.5 and 47.6 years respectively. There were 29 males and 21 females in the diabetic group, and 25 males and 25 females in the control group. Hearing loss was present in 34 diabetic patients and 15 healthy controls. **Conclusion:** Diabetic patients are significantly affected by hearing loss in comparison to the healthy population.

Key words: Diabetic, Hearing loss

Received: 2 May 2018 Revised: 28 June 2018 Accepted: 15 July 2018

Corresponding author: Dr. Arjun Singh, M.S (E NT.), Asst Prof, Dept. of E.N.T, RMRI Bareilly, U.P., India

This article may be cited as: Singh SN, Singh A. Assessment of Hearing Loss among Diabetic Patients -A Clinical Study. J Adv Med Dent Scie Res 2018;6(7):151-153.

INTRODUCTION

Diabetes mellitus (DM) is probably one of the oldest diseases known to man.People living with type 2 DM are more vulnerable to various forms of both short- and long-term complications, which often lead to their premature death. This tendency of increased morbidity and mortality is seen in patients with type 2 DM because of the commonness of this type of DM, its insidious onset and late recognition, especially in resource-poor developing countries.[1- 3]

Risk of developing hearing impairment is associated with male sex, lower education, industrial or military occupation, and leisure time noise exposure, and prevalent hearing impairment has been correlated with smoking.[4, 5]The pathologic changes that accompany diabetes could plausibly cause injury to the vasculature or the neural system of the inner ear resulting in sensorineural hearing impairment. Evidence of such pathology, including sclerosis of the internal auditory artery, thickened capillaries of the stria vascularis, atrophy of the spiral ganglion, and demyelination of the eighth cranial nerve, has been described among autopsied patients with diabetes.[6- 8] Hence; we planned the present study to assess hearing loss among diabetic patients.

MATERIALS & METHODS

The present study was conducted in the department of ENT of the dental institute and it included assessment of hearing loss among diabetic patients. A total of 50 patients with presence of type 2 diabetes and 50 healthy controls were enrolled in the present study. Detailed data of the patients in relation to the audiological, clinical and demographic history was collected. Conductance of audiometry test and logo audiometry tests was done in all the subjects in a sound proof room. Exclusion criteria for the present study included:

- Patients with history of any form of ear infection,
- Patients with history of previous heavy noise exposure,
- Patients with history of positive ototoxic infection,
- Patient with presence of conductive hearing loss

Patients with presence of HbA1c levels of more than 7 mmol/L were included under the diabetic group. Recording of pure-tone hearing (in decibels [dB]) and other biochemical values was also done.

Value of average pure-tone audiometry threshold of the worse ear more than 25 dB was categorized as presence of hearing impairment. Determination of the pure tone audiogram was done. All the results were recorded and analysed by SPSS software. Chi- square test was used for assessment of level of significance. P- value of less than 0.05 was taken as significant.

RESULTS

Total 50 type 2 diabetic and 50 healthy controls were included in the present study. Mean age of the subjects of the diabetic group and the control group was 44.5 and 47.6 years respectively. There were 29 males and 21 females in the diabetic group, and 25 males and 25 females in the control group. Hearing loss was present in 34 diabetic patients and 15 healthy controls. There were 10 subject of the diabetic group and 3 subjects of the control group who had pre tone threshold of more than 2000 Hz.

Table 1: Demographic details

Parameter	Diabetic group	Control group
Number of subjects	50	50
Mean age (years)	44.5	47.6
Males	29	25
Females	21	25

Table 2: Comparison of prevalence of hearing loss

Parameter	Diabetic group	Control group	P- value
Presence of hearing loss (n)	34	15	0.02*

*: Significant

Graph 1: Prevalence of hearing loss

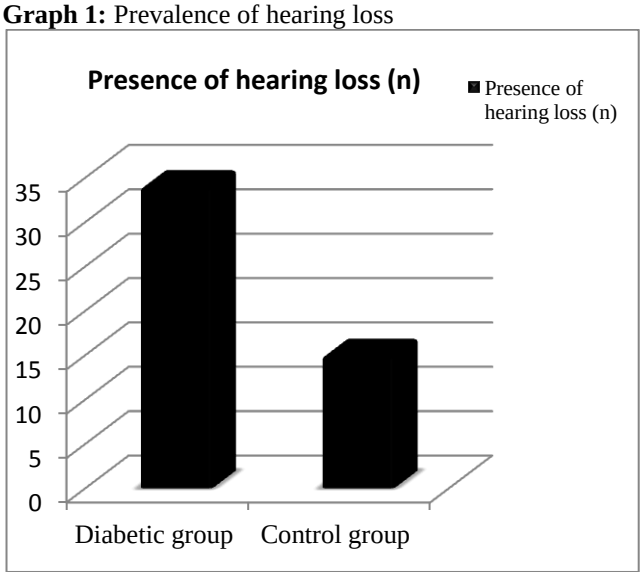

Table 3: Mean pure tone thresholds

Pure tone threshold	Diabetic group (n)	Control group (n)
Less than 1000	20	42
1000- 2000	20	5
More than 2000	10	3

DISCUSSION

In the present study, there were 29 males and 21 females in the diabetic group, and 25 males and 25 females in the control group. Hearing loss was present in 34 diabetic patients and 15 healthy controls. There were 10 subject of the diabetic group and 3 subjects of the control group who had pre tone threshold of more than 2000 Hz. Konrad-Martin D et al identified, and quantify with effect sizes, differences in hearing, speech recognition, and hearing-related quality of life (QOL) measures associated with diabetes and to determine whether well-controlled diabetes diminishes the differences. The authors examined selected cross-sectional data from the baseline (initial) visit of a longitudinal study of Veterans with and without type 2 diabetes designed to assess the possible differences in age-related trajectories of peripheral and central auditory function between the two groups. Results are generally comparable with the literature with regard to the magnitude of threshold differences and the prevalence of hearing impairment but extend prior work by providing threshold difference and hearing loss prevalence effect sizes by category of diabetes control and by including additional functional measures. In a cohort of Veterans with type 2 diabetes and relatively good hearing, significant effects of disease severity were found for hearing thresholds at a subset of frequencies and for one of the three QOL subscales. Significant differences were concentrated among those with poorly controlled diabetes based on current HbA1c.[9]

Oh I-H et al assessed the contributions of diabetes mellitus (DM) and hypertension, both chronic diseases associated with aging, as well as aging itself, to hearing loss in health screening examinees. The prevalence of hearing loss increased with age, being 1.6%, 1.8%, 4.6%, 14.0%, 30.8%, and 49.2% in subjects in their twenties, thirties, forties, fifties, sixties, and seventies, respectively. Hearing value per frequency showed aging-based changes, in the order of 6000, 4000, 2000, 1000 and 500 Hz, indicating greater hearing losses at high frequencies. The degree of hearing loss ranged from mild to severe. Aging and DM were correlated with the prevalence of hearing loss. There was no statistically significant association between hearing loss and hypertension after adjusting for age and DM. The prevalence of hearing loss increases with age and the presence of DM. Hearing loss was greatest at high frequencies.[10] Austin DF et al conducted a cross-sectional study among Veterans to investigate the relationship of diabetes severity and hearing in randomly selected subjects with (165) and without (137) DM and who had no more than a moderate hearing loss. Subjects were classified by three age tertiles (<50, 50-56, and 57+ years). Diabetes severity was classified as insulin-dependent (IDDM), noninsulin-dependent (NIDDM), or no DM. Other DM measures included concurrent serum glucose, serum HbA(1c), duration of disease, and several measures of DM-related complications. There was greater hearing loss in younger tertile DM subjects compared to those without DM. Significant hearing differences were at all frequencies for NIDDM subjects, but for IDDM subjects, differences

were at 1,000 Hz and below, and 10,000 Hz and above. Over age 50 years, there were significant associations between hearing at low frequencies and IDDM only. Self-report of prior noise exposure did not explain observed differences. Diabetes is associated with an increased risk of hearing loss, and this difference is manifest particularly in adults <50 years old.[11]Konrad-Martin D et al investigated DM severity and auditory brainstem response (ABR) in military Veteran subjects with (166) and without (138) DM and with no more than moderate hearing loss. Subjects were classified by three age tertiles. DM severity was classified as insulin-dependent (IDDM), non-insulin-dependent (NIDDM), or no DM. Other DM measures included serum glucose, HbA1c, and several DM-related complications. ABR measures included wave I, III, and V latencies; I-III, III-V, and I-V latency intervals; and wave V amplitude; for each ear at three repetition rates (11, 51, and 71 clicks/second), and both polarities. Outcomes were stratified by age tertile and adjusted for pure tone threshold at 3 kHz. Repeated measures multivariate analysis of covariance modeled the ABR response at each repetition rate for DM severity (main effect) and hearing at 3 kHz (covariate). Modeled contrasts between ABR variables in subjects with and without DM were examined. Significant differences existed between no DM and IDDM groups in the younger tertile only. Adjusting for threshold at 3 kHz had minimal effect. Self-reported noise exposure was not related to ABR differences, but HbA1c and poor circulation were. IDDM is associated with an increased wave V latency, wave I-V interval, and reduced wave V amplitude among Veterans under 50 years.[12]

CONCLUSION

From the above results, the authors concluded that diabetic patients are significantly affected by hearing loss in comparison to the healthy population. However; further studies are recommended.

REFERENCES

1. Willi C, Bodenmann P, Ghali WA, Faris PD, Cornuz J. Active smoking and the risk of type 2 diabetes: a systematic review and meta-analysis. JAMA 2007. Dec;298(22):2654-2664
2. Rother KI. Diabetes treatment–bridging the divide. N Engl J Med 2007. Apr;356(15):1499-1501.
3. Yoon KH, Lee JH, Kim JW, Cho JH, Choi YH, Ko SH, et al. Epidemic obesity and type 2 diabetes in Asia. Lancet 2006. Nov;368(9548):1681-1688
4. Cowie CC, Rust KF, Byrd-Holt DD, et al. Prevalence of diabetes and impaired fasting glucose in adults in the U.S. population: National Health And Nutrition Examination Survey 1999–2002. Diabetes Care. 2006;29(6):1263–1268.
5. McCarthy MI. Genomics, type 2 diabetes, and obesity. N Engl J Med 2010. Dec;363(24):2339-2350 .
6. Jorgensen MB. The inner ear in diabetes mellitus. Histological studies. Arch Otolaryngol. 1961;74:373–381.
7. Makishima K, Tanaka K. Pathological changes of the inner ear and central auditory pathway in diabetics. Ann Otol Rhinol Laryngol. 1971;80(2):218–228.
8. Friedman SA, Schulman RH, Weiss S. Hearing and diabetic neuropathy. Arch Intern Med. 1975;135(4):573–576.
9. Konrad-Martin D, Reavis KM, Austin D, et al. Hearing Impairment in Relation to Severity of Diabetes in a Veteran Cohort. Ear and hearing. 2015;36(4):381-394.
10. Oh I-H, Lee JH, Park DC, et al. Hearing Loss as a Function of Aging and Diabetes Mellitus: A Cross Sectional Study. Liu H, ed. PLoS ONE. 2014;9(12):e116161.
11. Austin DF1, Konrad-Martin D, Griest S, McMillan GP, McDermott D, Fausti S. Diabetes-related changes in hearing. Laryngoscope. 2009 Sep;119(9):1788-96. doi: 10.1002/lary.20570.
12. Konrad-Martin D1, Austin DF, Griest S, McMillan GP, McDermott D, Fausti S. Diabetes-related changes in auditory brainstem responses. Laryngoscope. 2010 Jan;120(1):150-8. doi: 10.1002/lary.20636.

Source of support: Nil **Conflict of interest:** None declared