



## SIGNIFICANCE OF MICROALBUMINURIA IN HEARING LOSS IN TYPE – 2 DIABETES MELLITUS

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### ABSTRACT

Presence of microalbuminuria in diabetes mellitus is one of the diagnostic indicator of diabetic cochleopathy. The aim of this study is to study the significance of microalbuminuria in deafness in type-2 diabetes mellitus & to correlate between microalbuminuria and cochleopathy in type-2 diabetes mellitus. The study was conducted in a sample of 100 diabetic patients attending diabetic outpatient department of tertiary care center for routine check up. Microalbumin (MAL) in human urine was estimated by turbidimetric immunoassay & Hearing Loss by Pure Tone Audiogram. Out of 100 diabetic patients, 58 had microalbumin in urine & 46 had hearing loss. Out of 46 diabetic patients with hearing loss, 42 had microalbuminuria. In this study, 46% percentage of diabetic people were found to be associated with hearing loss. Microalbuminuria was found in 58% of the diabetics & 91.3% of diabetic cochleopathy had microalbuminuria. Thus, early detection of microalbuminuria in diabetic patients can help in prevention & progression of hearing loss which is irreversible.

**KEYWORDS :** Microalbuminuria, Cochleopathy, Turbidimetry



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## INTRODUCTION

The commonest endocrinological metabolic disorder in the society is diabetes mellitus. It is mainly due to absolute or relative insulin deficiency. Cochleopathy, a late complication of diabetes mellitus leading to sensori-neural hearing loss which is irreversible increasing the morbidity in life. Sensori-neural hearing loss results from lesions of the cochlea, VIII nerve or central auditory pathways. The bony cochlea is a coiled tube making 2.5 to 2.75 turns round a central pyramid of bone called modiolus having sensory end organs. Hearing is very essential for a person to do normal day-today activities. Hearing loss in diabetes is bilateral, irreversible & progressive as shown in many studies<sup>1-5</sup>. Many cause for this hearing loss is due to micro-angiopathy of the inner ear<sup>6</sup>. The aim of this study is to study the significance of microalbuminuria in deafness in type-2 diabetes mellitus and to correlate between microalbuminuria and cochleopathy in type-2 diabetes mellitus. The percentage of cochleopathy is proportionately increased with presence of microalbumin in urine. Strict glycemic control can reduce the occurrence of cochleopathy in diabetes which can be predicted by the presence of microalbumin in urine, to be checked on periodic basis. Pure Tone Audiogram, used here to estimate the hearing threshold for standardized stimuli through bone conduction route. It is an

electronic device that produces pure tones of various frequencies, the intensity of which can be increased or decreased in 5 decibel steps used for quantitative or qualitative analysis of hearing loss.

## MATERIALS & METHODS

100 type-2 diabetic patients with age 35-55 years of a tertiary care center were taken for this study under exclusion & inclusion criteria. Patients with infection in the nose, ear & throat, ear surgeries done previously, those with hypertension, history of consumption of ototoxic drugs, having noise induced sensori-neural hearing loss & family history of deafness were excluded from the study. Institutional ethical committee gave approval to do this study. Samples were collected from patients after getting their consent. The sample for this test is Heparin or EDTA plasma or serum for blood glucose and whole blood for HbA<sub>1c</sub>. Early morning urine sample was collected from the patients for the estimation of microalbumin in urine. Microalbumin was estimated by turbidimetric immunoassay. Pure Tone Audiometry was used to estimate cochlear function. Bone conduction Pure Tone average was taken and compared with microalbumin.

## RESULTS

**Table-1**  
***Number of diabetic subjects with or without microalbumin***

<b>Subjects/Sex</b>	<b>Presence of microalbuminuria</b>	<b>Absence of microalbuminuria</b>
Male	30	14
Female	28	28
Total	58	42

*Out of 100 diabetic patients, 58 had microalbumin in urine.*

**Table 2**  
**Comparison between microalbuminuria and hearing in the subjects involved Cross tab and chi-square test**

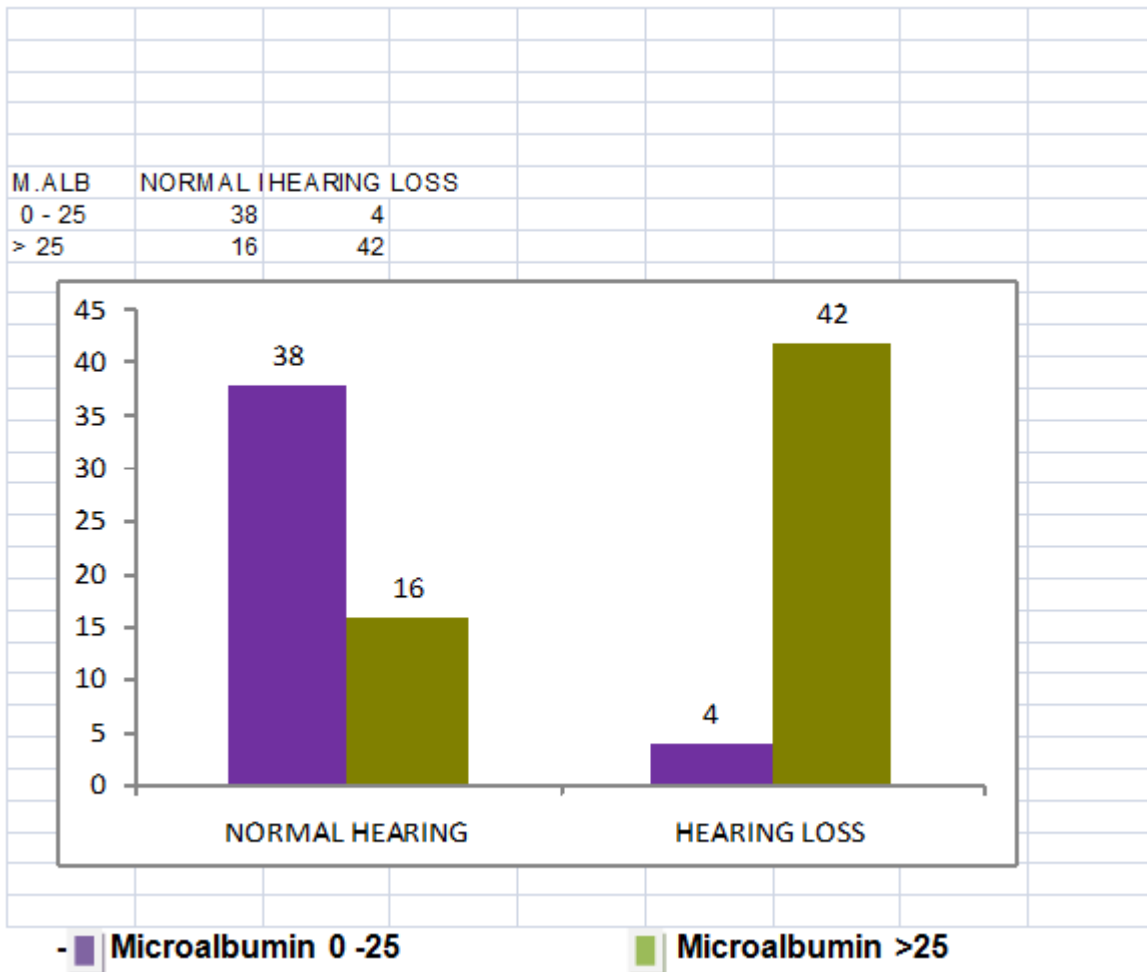
Microalbumin (mg/L)	BC - PTA		Total	Chi-square value	P-value
	Normal hearing	Hearing loss			
0 - 25	38	4	42	} 38.787	0.000 significant
> 25	16	42	58		

BC PTA --- Bone Conduction Pure Tone Average

0-25mg/L ----Normal >25 mg/L --- Microalbuminuria

Out of 100 diabetic patients, 58 had microalbuminuria & 42 out of 58 had hearing loss which is significant.

**Figure 1**  
*shows the bar diagram comparing microalbuminuria with hearing*



## DISCUSSION

This cross sectional study was done in Chennai tertiary care center implicating the importance of microalbuminuria in diabetic cochleopathy diagnosed using a pure tone audiometer. This study was done in hundred diabetic patients of age group between 35 to 55 years. There is no significant sexual difference in having microalbuminuria in this study. Likewise, this study could not make significant differences in both sexes in terms of hearing loss diagnosed by pure tone audiogram. Particular age group (35 - 55years) was selected for the study because sensori-neural hearing loss is common in presbycusis i.e. after the age of 55years. The same concept was there in many studies which used diabetic patients of age group between 20 and 45 years for assessment of hearing using pure tone audiogram.<sup>[7,8,9]</sup> This correlation of hearing loss in diabetics in aged persons by Taylor and Irwin in their study was due to age only<sup>2</sup>. Axelson<sup>3</sup> also accepted the same conclusion in his study but Kakarlapudi<sup>[4]</sup> and Dalton<sup>[10]</sup> told in their study that the hearing loss in diabetics due to age was irrelevant clinically as well as statistically.

It was found to be unclear previously in the pathophysiology of diabetic cochleopathy. But many studies related hearing loss and diabetes which also agreed by this study<sup>8,10</sup>. Increased percentage of hearing loss was shown in this study in poorly controlled diabetics diagnosed by pure tone audiogram in all frequencies tested. Similar finding was told by Kurien<sup>[8]</sup> and Lasisi<sup>[1]</sup> in their study. The cause

is in the inner ear which may be damaged by the deposition of glycated end products. This was showed in the animal studies as outer hair cell damage caused by hyperglycemia.<sup>[6]</sup> Wackym in his study explained that hearing loss in diabetics could be due to micro-angiopathy of inner ear vessels<sup>11</sup>. Our study agrees the same pathophysiology in diabetic cochleopathy diagnosed by the presence of microalbuminuria..

## CONCLUSION

This study concluded the diagnostic importance of microalbuminuria in diabetic cochleopathy, Most of the type 2 diabetic patients having hearing loss showed the presence of microalbumin in the urine samples. They had increased auditory thresholds diagnosed by pure tone audiogram. In this study 58% of diabetics had microalbuminuria, 46% of patients having diabetes had hearing loss considerably. and 91.3% of diabetics with significant hearing loss had considerable microalbuminuria. So it is advisable to screen the diabetes periodically by estimating microalbumin in the urine to rule out significant microalbuminuria (>25mg/L) to prevent microvascular complications including hearing loss & its progression. It is also advisable for all diabetic patients to do pure tone audiogram to diagnose the hearing loss as well as to prevent its progression by estimating the auditory thresholds.

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