

Assessment of Hearing in Subjects with Chronic Renal Failure: A Clinical Study

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ABSTRACT

Background: Presence of hearing loss and estimation of type and degree constitute one of the most common methods used to investigate the effects of renal disease on the auditory system. Hence; we planned the present study to assess hearing loss in subjects with CRF.

Materials & Methods: The present study included assessment of hearing loss among subjects with chronic renal failure (CRF). A total of 40 CRF subjects and 40 healthy controls were included in the present study. Complete blood investigations along with serum renal profile in all the patients was evaluated. Pure tone audiometry was used for assessing the hearing profile in all the patients. Threshold value of more than 26 dB was categorized as abnormal. Classification of hearing loss was done as follows: Mild: 26- 40 dB, Moderate: 41- 55 dB, Severe: 56- 90 dB, and Profound hearing loss: more than 90 dB. All the results were summarized by SPSS software.

Results: Profound hearing loss was seen in 5 subjects of the control group, while they were seen in 12 subjects of the study group. Severe hearing loss was seen in 5 subjects of the control group, while they were seen in 16 subjects of the study

group. Significant results were obtained while comparing the prevalence of severity of hearing loss among the subjects of the study group and control group respectively.

Conclusion: Significant of hearing loss due occur in subjects with CRF.

Key words: Chronic Renal Failure, Hearing Loss, Sensorineural.


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INTRODUCTION

The incidence of sensorineural hearing loss among patients with chronic renal failure (CRF) is considerably higher than in the general population. Presence of hearing loss and estimation of type and degree constitute one of the most common methods used to investigate the effects of renal disease on the auditory system.¹⁻³

The gross anatomy of the kidney and cochlea differs greatly, although there are many similarities at the ultra structural level. Both of them contain epithelial structures in close contact with their vascular supply. Basement membrane is found closely opposed to capillary endothelium in both Bawmans capsule and proximal renal tubule of the kidney and also around the capillaries of the stria vascularis.⁴

Haemodialysis has also been reported to contribute to hearing loss in CKD. Studies on the impact of haemodialysis have produced contradictory results, with a sizeable number reporting that haemodialysis plays no role in hearing loss associated with CKD.^{5,6}

Although chronicity of disease was found to have no association with hearing loss in many studies, a recent study demonstrated that the greater the duration of disease, the greater the hearing loss.⁷⁻⁹ Hence; we planned the present study to assess hearing loss in subjects with CRF.

MATERIALS & METHODS

The present study was conducted in the department of ENT of the medical institute and it included assessment of hearing loss among subjects with chronic renal failure (CRF). A total of 40 CRF subjects and 40 healthy controls were included in the present study. Complete demographic and clinical details of all the subjects were obtained.

Inclusion criteria for the present study included:

- Subjects less than 50 years of age, or more than 20 years of age,
- Subjects with positive history of hearing impairment in correlation with renal failure

Exclusion criteria for the present study included:

- Subjects with positive history of hearing loss due to any other reason,
- Subjects with history of presence of any other co-morbid condition,
- Subjects with positive history of intake of ototoxic drugs

Complete blood investigations along with serum renal profile in all the patients was evaluated. Pure tone audiometry was used for assessing the hearing profile in all the patients. Threshold value of

more than 26 dB was categorized as abnormal. Classification of hearing loss was done as follows:

Mild: 26- 40 dB,

Moderate: 41- 55 dB,

Severe: 56- 90 dB, and

Profound hearing loss: more than 90 dB

All the results were summarized by SPSS software. Chi- square test was used for assessment of level of significance. P- value of less than 0.05 was taken as normal.

Table 1: Demographic details

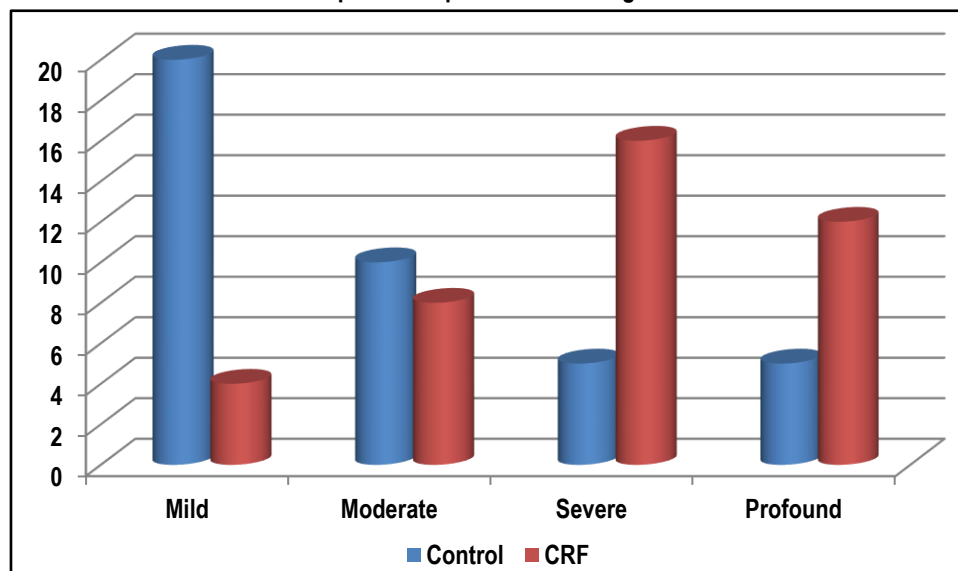
| Parameter | Control | CRF |
|------------------|---------|------|
| Mean age (years) | 44.1 | 45.3 |
| Males | 22 | 23 |
| Females | 18 | 17 |

Table 2: Comparison of hearing loss

| Hearing loss | Control | CRF | P- value |
|--------------|---------|-----|----------|
| Mild | 20 | 4 | 0.02* |
| Moderate | 10 | 8 | |
| Severe | 5 | 16 | |
| Profound | 5 | 12 | |

*: significant

Graph 2: Comparison of hearing loss



RESULTS

In the present study, a total of 80 subjects were evaluated, out of which, 40 were subjects with CRF, while the remaining 40 were subjects that were taken as controls. Mean age of the subjects of the study group and the control group was 45.3 years and 44.1 years respectively. There were 22 males in the control group and 23 males in the study group. Profound hearing loss was seen in 5 subjects of the control group, while they were seen in 12 subjects of the study group. Severe hearing loss was seen in 5 subjects of the control group, while they were seen in 16 subjects of the study group. Significant results were obtained while comparing the prevalence of severity of hearing loss among the subjects of the study group and control group respectively.

DISCUSSION

In the present study, profound hearing loss was seen in 5 subjects of the control group, while they were seen in 12 subjects of the study group. Severe hearing loss was seen in 5 subjects of the control group, while they were seen in 16 subjects of the study group. Significant results were obtained while comparing the prevalence of severity of hearing loss among the subjects of the study group and control group respectively. Jamaldeen J et al compared CKD patients with and without hearing loss for association of hearing loss with disease duration, number of haemodialysis, and blood parameters. Hearing loss was present in 41.7 per cent of CKD patients, significantly higher than controls (p=0.001), and was mild in the majority of patients. Impairment

was noted across high and low frequencies of audiometric testing. Median duration of disease was the same (18 months) among CKD patients with and without hearing loss ($p=0.62$). CKD patients with hearing loss received 72 haemodialysis compared to 122 sessions by those without hearing loss ($p=0.04$). Mild sensorineural hearing loss is common in CKD. Hearing loss has no specific pattern as it prevails at high and low frequencies. Hearing loss may be inversely associated with the number of haemodialysis sessions but not with duration of disease.¹⁰

Vilayur E et al presented the first community-based study to show an association between nonsyndromal CKD and hearing loss. Moderate CKD, defined as estimated glomerular filtration rate (eGFR) <60 mL/min/1.73 m². Baseline biochemistry tests, including serum creatinine, were performed. Pure-tone audiometry was performed in sound-treated booths. Moderate CKD was present in 513 of 2,564 participants. Of persons with moderate CKD, 279 (54.4%) had measured hearing loss compared with 581 (28.3%) with eGFR ≥ 60 mL/min/1.73 m². Moderate CKD was independently associated with hearing loss after adjusting for age; sex; noise exposure; education; diabetes, hypertension, and stroke histories; and smoking. Moderate CKD per se was associated independently with hearing loss. Recognizing this link could lead to earlier hearing assessment with appropriate interventions to preserve the hearing of patients with CKD.¹¹ Renda R et al determined the relationship between cochlear sensitivity and hemodialysis in dialytic and non-dialytic chronic kidney disease patients. The study included children aged 6-18 years that were divided into 3 groups: 36 non-dialytic patients with chronic kidney disease, 16 end-stage renal disease patients undergoing hemodialysis, and 30 healthy controls. Blood urea nitrogen, serum cystatin C levels, duration of chronic kidney disease, and the duration of hemodialysis were compared between the chronic kidney disease patients and end-stage renal disease patients undergoing hemodialysis. Hearing health was measured via tympanometry, pure-tone audiometry and distortion product otoacoustic emissions testing. Distortion product otoacoustic emission amplitudes and signal-to-noise ratios were significantly lower at all frequencies tested in the non-dialytic and dialytic groups than in the control group ($p<0.05$). Patients with normal hearing had significantly lower distortion product otoacoustic emission amplitudes and signal-to-noise ratios than the healthy controls ($p<0.05$). The duration of CKD, the cystatin C level, and the blood urea level were not associated with hearing loss. The findings suggested that there was a significant association between the duration of HD and hearing loss. The findings showed that there was impaired cochlear function in the dialytic and non-dialytic patient groups, regardless of hearing loss, as compared to the control group.¹²

CONCLUSION

Under the light of above obtained results, the authors conclude that significant of hearing loss due occur in subjects with CRF. However; further studies are recommended.

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