

# The Prevalence of Hearing Loss in Chronic Kidney Disease Bangladeshi Patients Undergoing Dialysis

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## Abstract

**Objectives:** End stage renal failure patients, face multiple complications. One of them is the involvement of auditory system. The aim of this study was to determine the prevalence and degree of hearing loss in CKD patients on haemodialysis. **Methods and Results:** This cross sectional study was conducted from July 2014 to June 2015. The subjects consist of 50 CKD patients on haemodialysis. The patients were from a tertiary care teaching hospital. The baseline characteristics and risk factors such as age, sex, exposure to ototoxic drugs, diabetes, hypertension, renal functions, electrolytes and duration of dialysis were recorded for all patients. The patients were evaluated for their hearing function using pure tone audiometry. Association of CKD patients with haemodialysis for hearing loss was compared with duration of dialysis. The prevalence of hearing loss in CKD patients on dialysis was found to be 42

**Index terms**— CKD, hearing loss, haemodialysis.

## 1 I. Introduction

The kidney and the Cochlea are closely linked together. Antigenic similarity between basement membranes of glomeruli and stria vascularis of the inner ear may explain this association to some extent. ?? It has been suggested that common physiologic mechanisms involving fluid and electrolyte shifts in stria vascularis of cochlea and glomerulus might explain the association between hearing loss and CKD. 2 The aetiopathogenetic mechanisms reported included osmotic alteration resulting in loss of hair cells, collapse of the endolymphatic space, oedema and atrophy of specialized auditory cells in some, complications of haemodialysis have been hypothesized. 3 The prevalence of end-stage renal disease is increasing worldwide. Several small studies have indicated an increased prevalence of high-frequency hearing loss in patients with CKD or those with end-stage kidney disease who are on dialysis Therapy. 4,5,6 As the disease progresses, hemodialysis and renal transplants are almost always required, both of which induce electrolytic, osmotic and immunological alterations at the inner ear level, resulting in tinnitus, vertigo and hearing loss. 7 Effect of duration of dialysis and type of dialysate used, on hearing impairment is still under debate. Sensorineural hearing impairment following single session of dialysis has been reported . 8

## 2 II. Methods

This was a cross sectional study conducted in Department of Nephrology, Bangabandhu Sheikh Mujib Medical University, Dhaka. The participants comprised of 50 hemodialysis CKD patients. Subjects with audiometric evidence of conductive hearing loss & past medical or surgical treatment of otologic conditions were excluded from the study. Detailed general and systemic examinations as age, gender, and risk factors, such as diabetes, hypertension, and history of ototoxic drug use were assessed. Blood parameters haemoglobin, serum creatinine, calcium & phosphate were also obtained. A prescribed data collection sheet was used for this purpose. Duration of haemodialysis was documented. All CKD patients were evaluated for their hearing function using standard pure tone audiometry. Prevalence and degree of hearing loss was determined in CKD patients undergoing

haemodialysis. Sensorineural hearing impairment were also compared with regard to duration of haemodialysis. Written informed consent was obtained from CKD patients. Permission was taken from the departments concerned for this study. The study was conducted after due ethical approval which was subjected to the hospital administrations. Figure 2 shows prevalence of hearing loss based on duration of dialysis. Total 21 patients on haemodialysis had sensorineural hearing loss. Among those 11 patients (52%) were getting dialysis for less than 1 month, 5 (24%) patients were getting dialysis for 1-6 months and another 5 (24%) patients were getting dialysis for more than 6 months.

### 3 IV. Discussion

This study was conducted to evaluate the prevalence of hearing loss in patients undergoing haemodialysis.

Many similarities, anatomical, physiological, pharmacological and pathological, exist between the nephron and the stria vascularis of the cochlea, and hearing loss has been reported in patients with renal failure. 9,10,11 The fact that the cochlea is susceptible to a wide variety of metabolic, hydroelectrolytic and hormonal imbalances is already widely known and these imbalances are systemic alterations usually found in patients who have compromised renal function. Therefore, it is expected that subjects with CRF develop cochlear dysfunction, clinically manifested by sensorineural hearing loss. 12,13,14,15 This study found that 42 per cent of CKD patients on haemodialysis had hearing loss. Our study result almost matches with Jishana et al. (2015). 16 Effects of both a single session of hemodialysis 17 and long-term hemodialysis 18 therapy have been studied in several small studies. Bazzi et al. (1995) performed an audiometric evaluation of 91 patients on hemodialysis therapy and found a very high prevalence (77%) of slight to moderate sensorineural hearing loss. Ozturan and Lam (1998) found a moderate to severe hearing loss in 46% of the tested patients. 19 Result of prevalence of hearing loss in dialysis patient in our study is more consistent with Ozturan and Lam (1998). 19 Bergstrom suggested that before the advent of haemodialysis and renal transplantation uraemic patients had no higher incidence of hearing loss than the general population. 10 A possible explanation of this statistic may be that the demise of the patient occurred before they developed a hearing loss. Mathog and Johnson described fluctuation of hearing in patients undergoing haemodialysis. 20 Impairment of hearing with haemodialysis has been reported by Rizvil and Mitschke. 21,22 We found that hearing loss is more prevalent in patients who are getting haemodialysis for < 1 months (52%) compared to those who are getting haemodialysis between 1-6 months (24%) and > 6months (24%).

Our finding that hearing loss is more prevalent in patients who are getting haemodialysis for < 1 months (52%) is interesting as it suggests a possible beneficial association between increasing number of dialysis sessions and hearing loss. Gartland et al.(1991) recorded pure tone thresholds on 31 patients before and after a session of haemodialysis and documented a low frequency hearing loss, which improved significantly on one-third of the patients after dialysis. 23

### 4 V. Conclusion

Sensorineural hearing loss was seen to develop in CKD patients undergoing haemodialysis. However, there may be an ameliorative effect of haemodialysis on hearing loss in CKD, an association that needs to be tested further. So, we recommend closely monitoring of hearing levels in dialysis patients.

Haemodialysis may have an important role in occurrence of hearing loss in CRF.

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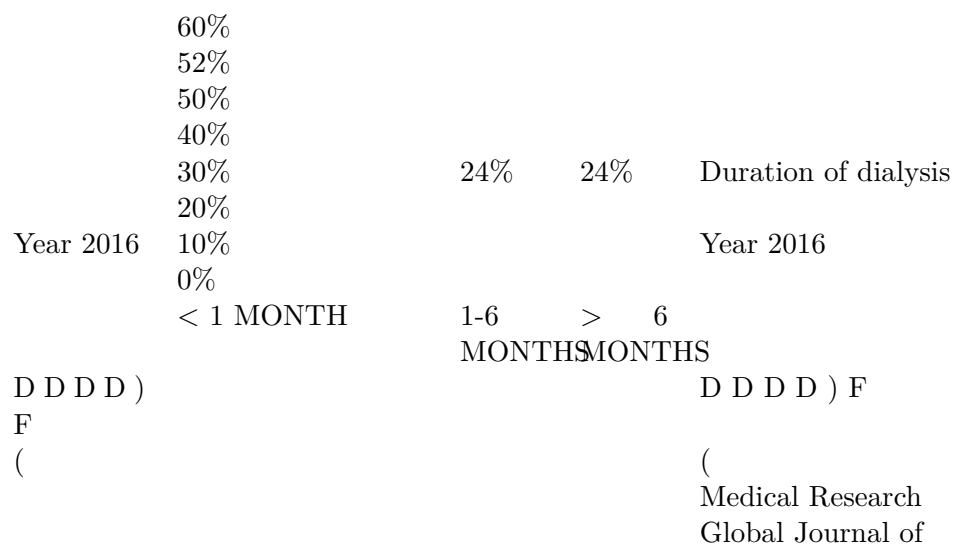


Figure 1: T

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Baseline characteristics	CKD group (n=50)
Age,y Mean+ SD	39.4±12.5
Sex(male/female)	30/20
Diabetes mellitus	16
Hypertension	34
Duration of CKD (in Months) Mean+ SD	18.7+17.1
BMI (kg/m <sup>2</sup> ) Mean+ SD	19.6+3.83
Systolic BP(mm Hg) Mean+ SD	149+18
Diastolic BP(mm Hg) Mean+ SD	85.3+7.6
Hb % (gm/dl) Mean+ SD	8.5+1.75
Serum creatinine(mg/dl) Mean+ SD	6.1+3.8
Serum Calcium (mmol/l) Mean+ SD	1.72+0.12
Serum Phosphate (mmol/l) Mean+ SD	1.93+0.2

Figure 2: Table I :



[Note: 1. Cosgrove D, Samuelson G, Meehan DT, Miller C, McGee J, Walsh EJ. et al. Ultrastructural, physiological, and molecular defects in the inner ear of a gene-knockout mouse model for autosomal Alport syndrome. *Hear Res.* 1998 Jul; 121, (1-2): 84-98. 21 Volume XVI Issue IV Version I © 2016 Global Journals Inc. (US)]

Figure 3:

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