

Hearing loss in patients with chronic kidney disease undergoing haemodialysis

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Abstract: *Background:* Haemodialysis is a treatment for chronic renal failure/chronic kidney disease that significantly reduce the morbidity and postpone the mortality. However, studies have reported that in these patients, hearing loss symptoms were increasing and affecting their quality of life. *Objectives:* To determine the percentage, degree, and type of hearing loss in patients undergoing haemodialysis secondary to chronic renal failure and to determine the relationship between hearing loss and the number of haemodialysis procedures undergone (duration). *Methods:* This was a prospective study; data from patients with renal failure who were undergoing regular haemodialysis at our tertiary care centre hospital were collected. A routine otorhinolaryngological examination was performed, and hearing loss was determined using otoacoustic emission and pure tone audiometric studies. Statistical analysis was performed using Epi-Info software. *Results:* The prevalence of hearing loss among dialysis patients was 79.17%. It is a sensorineural type (SNHL) of deafness. The majority of cases had a mild type of hearing loss. No significant relationship was found between the number of haemodialysis and the degree of hearing loss in CRF patients in our study. *Conclusions:* SNHL is common in patients with chronic renal disorders on haemodialysis. Further study should be conducted with a larger population with follow-up.

Keywords: Hearing Loss, Haemodialysis, Chronic Renal Failure.

Introduction

Chronic renal failure (CRF) is an end-stage kidney disease caused by various conditions such as diabetes mellitus, hypertension, chronic glomerulonephritis, chronic pyelonephritis, renal vascular disease, NSAIDS, and obstructive uropathies. The disease process is due to the direct damage of nephrons or may be due to indirect damage that propagates to end-stage renal failure [1].

CRF has various clinical presentations such as anaemia, uremic pericarditis, encephalopathy, anorexia, nausea, vomiting, dyslipidaemia, muscle cramps, electrolyte imbalance, and acidosis. Once the above clinical features are established, it is mandatory for the clinician to shift from routine management to renal replacement therapy such as haemodialysis or peritoneal dialysis [2]. The life span of patients with severe renal failure can be prolonged by

modern techniques such as haemodialysis and peritoneal dialysis. The above lifesaving methods are not free from complications.

Inner ear dysfunction is one of the common complications noted the following haemodialysis, the exact reasons being poorly understood [3]. Shared antigenicity between labyrinth and renal membranes, osmotic alteration in blood by haemodialysis, accumulation of pink debris in inner ear parenchyma, probably amyloid like material as well as blue material debris deposits, Na⁺-K⁺ ATPase inhibition, aluminum toxicity, contamination of blood by degraded products of old cellulose acetate, nephrotoxic and ototoxic drugs usage, uremic status per se reduces cochlear microphonics and cochlear action potential, loss of outer hair cell count and hyalinization of spiral ganglion following increase number of haemodialysis events edema and atrophy of specialized auditory

cells were some theories have been proposed [4-7]. This study was conducted to investigate the prevalence and pattern of hearing loss in patients undergoing haemodialysis.

Material and Methods

A prospective clinical study involving chronic renal failure patients who were undergoing regular haemodialysis at our tertiary care centre hospital was conducted, and each patient was subjected to haemodialysis twice a week, each session lasting for 4 hrs according to standard protocols of dialysis. Patients with a previous history of hearing loss, consumption of ototoxic drugs, uncontrolled diabetes, and uncontrolled hypothyroidism were excluded from the study and patients undergoing regular haemodialysis at our tertiary care centre hospital due to chronic renal failure were included in the present study

Routine Otorhinolaryngological examination was performed for all the patients. Hearing loss was assessed by OAE (Otoacoustic emission study) and PTA (pure tone audiometry) study, the hearing thresholds were recorded. Using Epi- Info software statistical analysis was done.

Results

In our study, males were more compared to females, the mean of the study population was found to be 40.83± 13.42 years. A high percentage of patients come under within 40 years of age group (Table 1).

The prevalence of hearing loss among dialysis patients is 79.17%. It is the sensorineural type (SNHL) of deafness. Mild type of hearing loss

was more prominent than moderate type hearing loss (Table 1). On OAE evaluation 19 patients were referred. Each patient underwent haemodialysis during the daytime for 4 hours duration and 2 times in a week.

Table-1: Socio-demographic, hearing loss and haemodialysis details of study subjects

	No. of Patients	%
Gender		
Male	32	66.67
Female	16	33.33
Age Group		
<30	14	29.17
30-40	14	29.17
40-50	10	20.83
50-60	6	12.50
>60	4	8.33
Degree of Hearing Loss		
<25 dB	10	20.83
Mild (26-40 dB)	20	41.67
Moderate (41-55 dB)	13	27.08
Moderately Severe (56-70 dB)	1	2.08
Severe (71-90 dB)	4	8.34
No. of haemodialysis underwent		
<200	8	16.67
200-400	18	37.5
400-600	10	20.83
>600	12	25

Table-2: Relationship between the hearing loss and number of haemodialysis procedures

Hearing loss	Normal	Mild	Moderate	Moderately Severe	Severe
Haemodialysis					
<200	0	5	2	0	1
200-400	4	6	4	1	3
400-600	2	5	3	0	0
>600	4	4	4	0	0

The number of mild types of hearing loss was found to be higher and followed by moderate, severe, and moderately severe. In account of the

number of dialysis, 200-400 times dialyzed patients have shown the highest hearing loss compared to others (Table 2).

Table-3: Details of Pure tone audiometry reports of right ear

No. of Haemodialysis	No. of patients	Mean PTA value	Standard deviation
<200	8	37.18	16.53
200-400	18	39.51	21.17
400-600	10	33.87	13.23
>600	12	31.25	11.12

As the dialysis number increases, the mean PTA was reduced, however on applying the ANOVA test, the p-value is found to be 0.59005. Hence, the result is not statistically significant (Table 3).

Table-4: Details of Pure tone audiometry reports of left ear

No. of Haemodialysis	No. of patients	Mean PTA value	Standard deviation
<200	8	38.12	17.08
200-400	18	37.63	17.37
400-600	10	33.35	12.95
>600	12	33.85	10.67

As the dialysis number increased, the mean PTA was reduced, however on applying the ANOVA test, a p-value is found to be 0.81889. Hence, the result is not significant (Table 4). Thus, there is no significant difference in the PTA values among different groups. This means that number of haemodialysis does not affect the degree of hearing loss.

Discussion

Chronic kidney disease is an end-stage kidney disease where patients are on haemodialysis, which has a known complication of hearing loss. SNHL is more prevalent in CKD than in the general population. It ranges from 28% -77% [8].

In our study, hearing loss showed in 79.17% of cases. Patients who underwent 200-400 cycles of haemodialysis had the maximum number of hearing loss complications. However, statistically significant results were not obtained from this study this may be due to the small sample size and multifactorial aetiology. According to Henrich et al study, chronic renal failure patients on chronic dialysis were tested for hearing loss at

the beginning of the study and were followed up for 1-4 years, it was seen that 70% of the patients had some measurable hearing loss at the beginning of the study, 75% of the patients showed no deterioration of hearing loss in the follow-up period. They concluded that hearing loss in chronic renal failure had multifactorial aetiology and chronic dialysis did not cause further deterioration of hearing acuity [9].

Oda et al in their study of 290 patients on haemodialysis, reported that 43 patients (15%) showed hearing loss [10]. Haider et al found a point prevalence rate of 72.9 % of sensorineural hearing loss among haemodialysis patients. [11]. Bergstrom et al in their study of haemodialysis on 224 chronic kidney disease patients showed 91 patients (41%) had sensory neural hearing loss [12]. In our study, the prevalence of sensorineural hearing loss among patients undergoing haemodialysis was found to be around 79%.

D Gatland et al studied the hearing threshold changes following haemodialysis in patients with chronic renal failure. They concluded that there was a high incidence of both high and low-frequency hearing losses in chronic renal failure patients and fluctuation in low frequencies with dialysis was common [13]. According to Jamaldeen et al study, although all frequencies were found to be affected by chronic renal failure, hearing impairment at higher frequencies was more common [14] and in Kligerman et al study, 28 patients receiving haemodialysis, found a high incidence of high-frequency impairment among the patients [15]. This pattern of high-frequency hearing loss was seen in the present study as well.

Uremic deafness showed improvement in hearing in 13 patients before and after renal transplantation at 2k-8k Hz by Mitscheke et al [5]. Raise in creatinine level showed increased hearing thresholds and was reversible. According to Pevyandi et al study, the prevalence and severity of deafness increased with chronicity of renal failure and haemodialysis [4]. In the present study, however, the duration of dialysis and the number of sessions of haemodialysis did not seem to worsen the degree of hearing loss.

Conclusion

Sensorineural hearing loss has a considerable prevalence in chronic renal failure patients undergoing haemodialysis. This loss involves higher frequencies more commonly. Hearing loss is a considerable aspect of the care of patients with renal failure and they must undergo routine audiological assessment.

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Limitations: The sample size is less and follow-up cases were not done.

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