ORIGINAL RESEARCH

Hearing assessment in chronic renal failure patients undergoing hemodialysis

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ABSTRACT

Background: Chronic kidney disease and Acute kidney injury are consuming a huge proportion of health care finances in developed countries. Both chronic kidney disease and acute kidney injury contribute significantly to morbidity, mortality and decreased expectancy of life in the developing world. Sensorineural Hearing Loss (SNHL) has been reported in chronic kidney diseases (CKD) patients, with a prevalence of over 30%. **Objectives:** To assess degree and type of hearing loss in CKD patients undergoing hemodialysis and to compare the hearing threshold before and after hemodialysis procedure. To assess the relation between hearing loss and duration of renal disease, age, gender. **Methodology:** The relevant clinical history was taken as per proforma which mainly included history of ear infection, ear surgery, duration of renal disease, use of ototoxic drugs, duration of illness, dosage of diuretics, history of hypertension and diabetes, occupation to know if there was any exposure to loud sound. **Result:** The severity of hearing loss increased with duration of disease. Most cases where the duration of disease was less than 1 year, had mild hearing loss whereas majority of the cases with moderate or severe hearing loss was suffering from CKD more than 1.5 years. The severity of hearing loss increases with duration of renal illness and it was statistically significant. **Conclusion:** The severity of hearing loss increases with duration of illness. Majority of patients having CKD more than one year showed mild or moderate hearing loss whereas majority of patients having CKD more than one and half year. Haemodialysis causes hearing loss and in every session of dialysis the hearing loss increases. Hence there is definite association between hearing loss and hemodialysis.

INTRODUCTION

Chronic kidney disease and Acute kidney injury are consuming a huge proportion of health care finances in developed countries. Both chronic kidney disease and acute kidney injury contribute significantly to morbidity, mortality and decreased expectancy of life in the developing world. Sensorineural Hearing Loss (SNHL) has been reported in chronic kidney diseases (CKD) patients, with a prevalence of over 30%. Incidence of End stage renal disease (ESRD) in India is 229 per million population. Incidence of AKI in India 33%. The increase in incidence of CKD may be due to by increase in prevalence of precipitating factors like diabetes mellitus, cardiovascular diseases and human immunodeficiency virus (HIV) infection.

Dialysis is a process of removing waste products and excess fluid which build up in the body when the kidneys stop working. The word dialysis comes from the Greek word "dia" – to pass through, and "leuin" meaning to loosen. Dialysis uses a membrane as a filter and a solution called dialysate to regulate the balance of fluid, salts and minerals carried in the bloodstream.

Since the performance of dialysis in medical field, many side effects post dialysis like hypotension, muscle cramp, anaemia, sleep apnea, hyperkalemia has been observed. In 1950s hearing loss was first recognized after dialysis procedure and several investigations were launched. Case reports linking hemodialysis to the occurrence of SNHL in CKD patients have existed for a significant period of time. Since 1973, there has been several published articles that referred to this topic without drawing a conclusion on the specific cause for the hearing loss. The earliest study conducted by Kang (2018), showed that Sensorineural heating loss is more prevalent in CKD patients than non-CKD patients after the performance of hemodialysis. The incidence of SNHL in CKD patients undergoing dialysis is 24%. According to a recent study by Li (2020), approximately 30-40% of patients under regular hemodialysis experienced SNHL. SNHL in CKD after hemodialysis may occurs due to factors such as osmotic alterations caused by

hemodialysis, similarities in antigenicity between the labyrinths and the kidney, uremic neuropathy and ototoxicity. A study conducted by Akeem O et al. (2006) mentioned that the aetiopathogenesis of SNHL in CKD patients may be due to osmotic alteration resulting in loss of hair cells, collapse of the endolymphatic space, oedema and atrophy of specialized auditory cells, Antigenic similarity between basement membranes of glomeruli and striavascularis of the inner ear may explain this association to some extent. The use of ototoxic drugs, electrolyte disturbances, and hypertension have been implicated in various studies. The role of hemodialysis in the causation of sensorineural hearing loss (SNHL) is controversial; some authors have reported a depression in hearing threshold after hemodialysis while others are of the opinion that there was no relation between the two. As the number of CKD patients increasing at an alarming rate, the number of people requiring hemodialysis is bound to increase, this study makes an effort to answer the research question "Does hearing loss occur in CKD patients after hemodialysis?".

MATERIALS & METHODS

Prospective study was conducted on CKD patients undergoing hemodialysis in BMC, Hospital, Sagar. The duration of study was for 1 year from August 2021 to August 2022.

Examination of the patients and audiological assessment was performed in the Department of ENT, BMC, Sagar. A total number of 110 patients were selected for the study. The relevant clinical history was taken as per proforma which mainly included history of ear infection, ear surgery, duration of renal disease, use of ototoxic drugs, duration of illness, dosage of diuretics, history of hypertension and diabetes, occupation to know if there was any exposure to loud sound.

INCLUSION CRITERIA

- Consecutive CRF patients with no previous history of ear surgery, ear discharge (safe/unsafe CSOM), no other otological symptoms.
- The age of patients ranging from 20 to 80 years
- Patient who has given consent.

EXCLUSION CRITERIA

Patients having one or more of the following were excluded from the study:

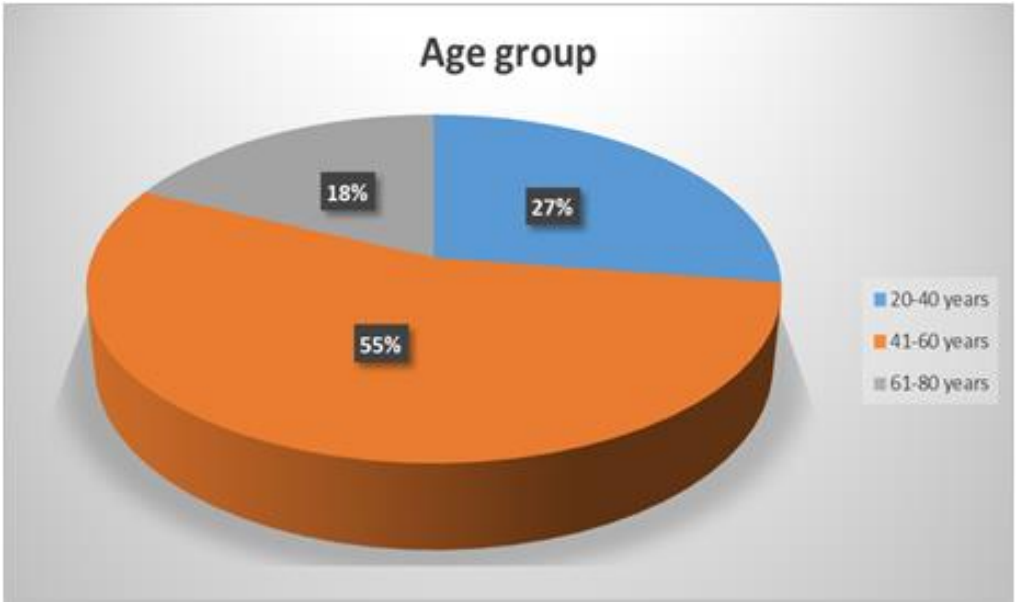
- Local otological disease, congenital hearing loss.
- Previous otological trauma or surgery.
- Family history of hearing loss.
- Definite exposure to ototoxic drugs by careful drug history.
- Habitual exposure to hazardous noise such as exposure to explosions, those who work in electric generation machines
- Patient who has not given consent.

OBSERVATION & RESULT

Majority of participants were between 41-60 years of age (54.50%) followed by 20-40years (27.30%) and 61-80 years (18.20%)

Age group	Count	Percent
20-40 years	30	27.30 %
41-60 years	60	54.50 %
61-80 years	20	18.20 %
Total	110	100%

Table 1 showing Age Distribution



Majority of the participants were male (61.8 %)

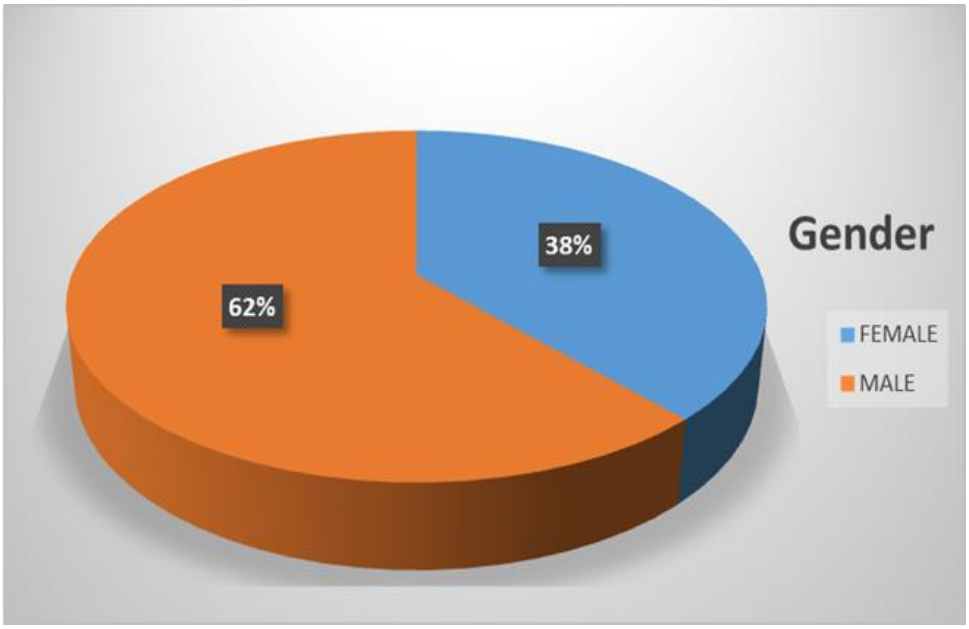


Fig 1 showing Gender Distribution among Participants

Duration of illness were 7-12 months in 58%, > 18 months in 23 %, 0-6 months in 10%, 13-18 months in 8.20% of participants.

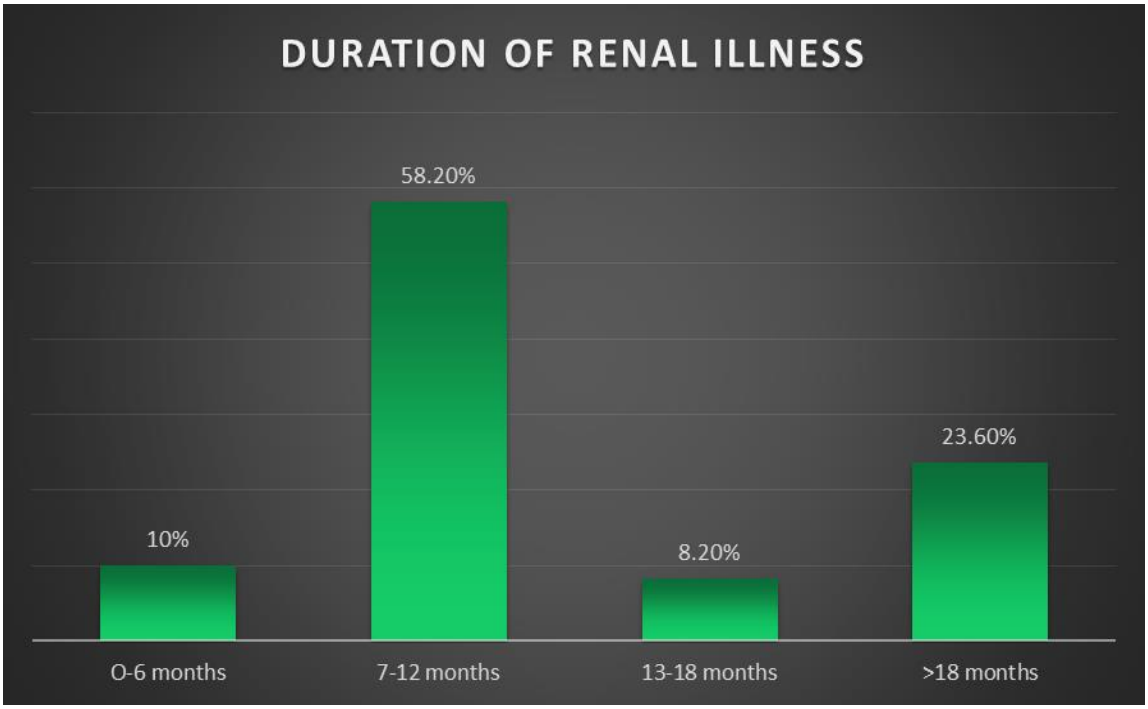


Fig 2 showing Duration of Renal Illness

51.8 % had mild SNHL, 30% moderate and only 1.8 % had severe SNHL while 16.40% have Normal Hearing.

Hearing Loss	Frequency	Percent
MILD SNHL	57	51.80 %
MODERATE SNHL	33	30.00 %
NORMAL	18	16.40 %
SEVERE SNHL	2	1.80 %
Total	110	

Table 2 showing Severity of Hearng Loss

In this study mean hearing threshold was significantly increased after dialysis from 21.5 db to 25.23 db after first Session of dialysis.

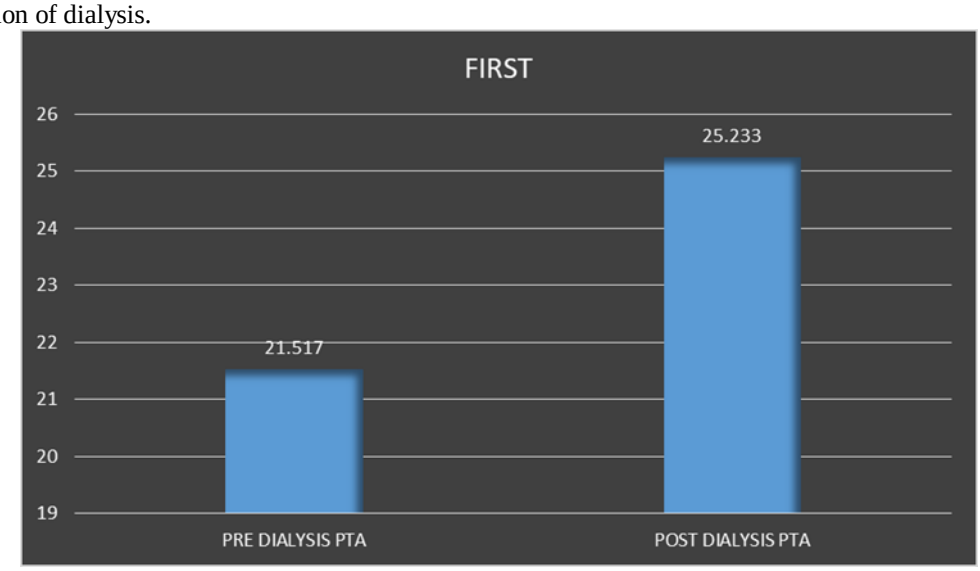


Fig 3 showing mean hearing threshold after first session of dialysis

The mean hearing threshold db was significantly increase after tenth dialysis from 29.23 db to 37.54 db

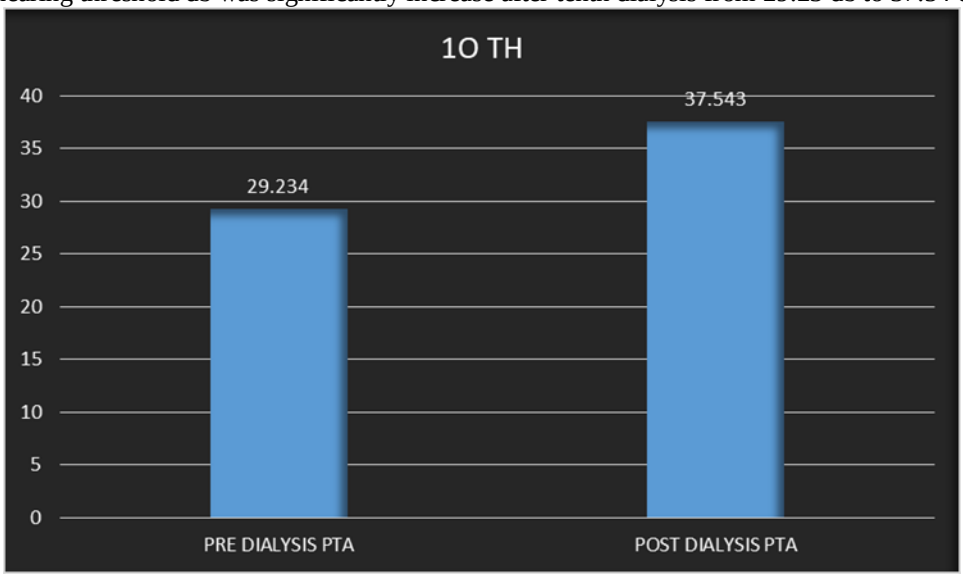


Fig 5 showing mean hearingthreshold after tenth session of dialysis

DISCUSSION

Sensorineural hearing loss is considerably more prevalent in patients suffering from CKD than in general population. It ranges from 28- 77 % worldwide. In India, it is reported in 63.5%. Moreover, in patients undergoing hemodialysis, the chances of SNHL is more. Out of 110 patients in our study, 68 were male and 42 were female. The male to female ratio is 1.6:1, the higher incidence in males compared to females could be due to protective effect of oestrogen and potential deleterious effect of testosterone in non diabetic CKD. In our study majority of participants were in age group between 41 to 60 years (54.50%) followed by the age group of 20–40 years (27.30%) and least among the age group 61 – 80 years (18.20%). Hill et al. assessed the impact of age on CKD prevalence and reported a higher prevalence of CKD of stages 1 to 5 associated with advancing age. Higher age results in lower eGFR independent of other components. In our study we found that the severity of hearing loss increased with duration of disease. Most cases where the duration of disease was less than 1 year, had mild hearing loss whereas majority of the cases with moderate or severe hearing loss was suffering from CKD more than 1.5 years. The severity of hearing loss increases with duration of renal illness and it was statistically significant. Similar to our study, Peyvandi et al. proposed in a recent study that the prevalence and severity of hearing loss increase with the duration of CKD. Similar findings were also reported by Saeed, et al. and Lasisi et al. Our study findings showed that the effect of consecutive dialysis on hearing loss. Hearing before hemodialysis was decreased after the first session of dialysis and it was further decreased after the 10th session of dialysis.Saeed et al. and Lasisi et al.

also reported a similar effect of haemodialysis in hearing loss. The role of hemodialysis in the occurrence of hearing loss among patients with CRF could be due to either changes in the fluid and electrolyte composition of endolymph or the accumulation of amyloid materials in inner ear tissues. Ozen et al reported audiometric improvement of 20 decibel of hearing perception of chronic kidney disease patients following haemodialysis. They hypothesized that haemodialysis causes change in serum osmolarity, BUN and fluid retention which may reverse the hearing impairment in post dialysis period.

CONCLUSION

- No significant association could be found between the gender and degree of hearing loss in CKD patients undergoing hemodialysis.
- There was significant association between duration of CKD and hearing loss , We have found that severity of hearing loss increases with duration of illness .Majority of patients having CKD more than one year showed mild or moderate hearing loss whereas majority of patients having CKD more than one and half year.
- Hemodialysis causes hearing loss and in every session of dialysis the hearing loss increases. Hence there is definite association between hearing loss and hemodialysis.

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