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ASSESMENT OF HEARING LOSS IN PATIENTS OF CHRONIC RENAL FAILURE

ENT

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ABSTRACT

Objective: To study the incidence and possible role of chronic renal disease in hearing loss. **Methods:** 63 patients with chronic renal disease were studied. Patients were divided into three groups according to their age in order to make a precise comparison between their bone conduction thresholds and the corresponding normal audiograms. The age groups were as follows:
Group A: 25-40 years.
Group B: 41-55years.
Group C: 56-75 years.
The duration of chronic renal disease was taken into consideration and the relation between the duration of the disease and the degree of hearing loss was assessed. Clinical evaluation of all patients was done, followed by pure tone audiometry and analysis was done of bone conduction threshold. **Results:** The incidence and severity of hearing loss increased with the advancing age and duration of chronic renal disease.
Conclusion: Patients with chronic renal disease had sensorineural deafness of greater severity which should be assessed and evaluated to halt its progression.

KEYWORDS

Hearing loss, chronic renal failure, Ageing

INTRODUCTION:

Many similarities anatomical, physiological, pharmacological and pathological exist between nephron and stria vascularis of the cochlea and hearing loss has been reported in patient with renal failure1-3. Although the gross anatomy of kidney and cochlea differ greatly, there are many similarities at the ultrastructural level; both contain epithelial structure in close contact with their vascular supply. Basement membrane is found closely apposed to capillary endothelium in both Bowman's capsule and proximal renal tubule of the kidney and also around the capillaries of stria vascularis.

In both, epithelial cells show feature known to be associated with active transport of fluid and electrolyte mainly microvilli containing numerous mitocondria.Both organs are involved in body fluid homeostasis and therefore have epithelium containing a sodium potassium ion pump using ATPase. Carbonic anhydrase is also present in both stria and nephron[1].

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. Degree of hearing loss may give an indication of the extent of damage to auditory function, whereas the type of hearing loss may distinguish between lesions in the outer and middle ear (conductive hearing loss) or the cochlea and the neural pathways (sensorineural hearing loss). Several etiological factors have been linked to hearing loss in renal failure [4] including use of ototoxic medications, electrolyte disturbances, hypertension [5, 6] and hemodialysis treatment itself [7-9]. Brookes [10] suggested that vitamin D deficiency might be a contributing factor to hearing loss in renal failure. Adler et al. [11] found a significant reduction of Na, K-activated ATPase in the inner ear of uremic guinea pigs. They also reported an inverse correlation between serum creatinine levels and Na, K-activated ATPase. As Na, K-activated ATPase in the cochlea is important for maintaining cationic gradients; they suggested that inhibition of this enzyme system may be a factor in inner ear dysfunction among uremic patients [11]. Di Paolo et al. [12] indicated a very high incidence of nerve conduction dysfunction in groups of CRF patients. They found decreased conduction velocity in sensory and motor units, with the sensory units being more affected than the motor. In agreement with these studies, several ABR studies of CRF indicated dysfunction of the auditory nerve and pathways [8].

The aim of this study is to find out the presence of hearing loss in chronic renal failure pateints if yes then what type of hearing loss.

MATERIALAND METHOD:

From October 2011 to October 2012, a prospective study was performed on 63 patients attending tertiary Hospital in Uttrakhand; all of them were diagnosed as having acquired chronic renal disease The age of patients ranged from 25 to 75 years.

Inclusion criteria - Chronic renal disease patients who were non diabetic without any ear pathology ear and no previous history of ear surgery.

Exclusion criteria -Patients who had one or more of the following were excluded from the study-
1. Local otological disease.
2. Previous otological trauma or surgery.
3. Family history of hearing loss.
4. Definite exposure to ototoxic drugs by careful drug history.
5. Habitual exposure to hazardous noise such as exposure to explosions, those who work in electric generation machines.

After clinical examination, pure tone audiometry was done, and analysis of bone conduction thresholds was done.

Patients were divided into three age groups in order to make a precise comparison between their bone conduction thresholds and the corresponding normal audiograms.

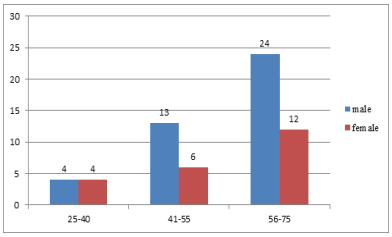
Thus, the age groups were as follows:
Group A: 25-40 years.
Group B: 41-55years.
Group C: 56-75 years.

The duration of chronic renal disease was taken into consideration and the relation between the duration of the disease and the degree of

hearing loss was assessed.
The pure tone audiometry was done in the sound – proof (acoustic) booth in the ENT clinic. The hearing acuity was measured in dB at the frequencies 500 – 8000Hz. The average for the four frequencies 500Hz, 1000Hz, 2000Hz and 4000Hz were recorded. The duration of illness, dosage of diuretic and blood pressure were also taken into account.

RESULTS:
Of the studied 63 cases, 41 are males and 22are female(As shown in in Figure 1) and a(Table 1).

Figure 1



Distribution according to gender- Table 1

Age Group	Male	Female	Total
25-40	4	4	8
41-55	13	6	19
56-75	24	12	36
Total	41	22	63

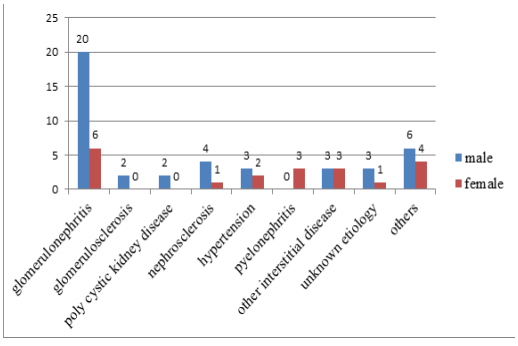
Maximum number of patient were of age group 56-75 years, contributing major portion of the total cases studied. Of the total 63 cases, 65.07% patients were males and 34.92% patients who were affected were females, thus male to female ratio was found to be 1.86:1 (Fig 1).

Maximum number of patient were of glomerulonephritis leading to chronic renal disease contributing to 26 (41.2%) of total patient of which 20 were male and 6 were female (table 2, Fig 2).

Table 2: Etiological factors of chronic renal disease in the studied group

Diagnosis	male	female	total	Percentage
Glomerulonephritis	20	6	26	41.2
Glomerulosclerosis	2	0	2	3.17
Poly cystic kidney disease	2	0	2	3.17
Nephrosclerosis	4	1	5	7.9
Hypertension	3	2	5	7.9
Pyelonephritis	0	3	3	4.7
Others interstitial nephritis	3	3	6	9.5
Unknown etiology	3	1	4	6.3
Others	6	4	10	15.8
Total	43	20	63	

Figure 2

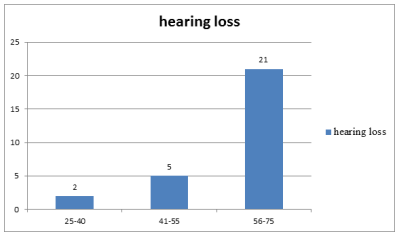


The incidence of sensorineural deafness was found to increase with advancing age in patients with CKD. Maximum hearing loss was found in age group of patients between 56 –75.(Tab 3, Fig 3)

TABLE: 3 Hearing status with age

Group	Age (yr.)	Patient	Hearing loss	%
A	25 - 40	8	2	25
B	41 - 55	19	5	26.36
C	56 - 75	36	21	58.33
Total	25 - 75	63	28	44.44%

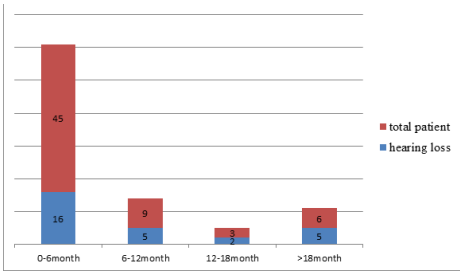
Figure 3



It was observed that the incidence of sensorineural hearing loss increased significantly with increase in duration of the disease.(Tab 4& Fig 4)

TABLE: 4 Hearing status with duration of disease

Duration of disease (month)	Number of patients	Hearing loss	Percentage %
0- 6 month	45	16	33.33
6-12 month	9	5	55.55
12-18 month	3	2	66.66
>18 month	6	5	83.33
Total	63	28	44.44

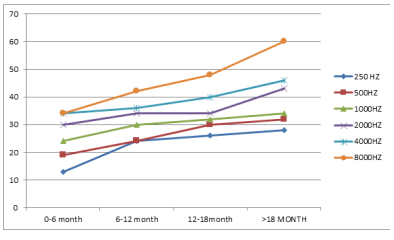


The average bone conduction thresholds were estimated according to the duration of chronic renal disease. The hearing loss increased with increase in duration of disease and mostly in higher frequency(Table 5 & Fig 5).

Table 5-The average bone conduction loss was estimated according to the duration of disease

Duration/Frequency	250 HZ	500HZ	1000HZ	2000HZ	4000HZ	8000HZ
0- 6 month	13	19	24	30	34	34
6-12 month	24	24	30	34	36	42
12-18 month	26	30	32	34	40	48
>18 month	28	32	34	43	46	60

Figure 5



DISCUSSION;
Sensorineural hearing loss among patients with chronic renal disease has been a common finding in studies investigating the effects of renal failure on auditory function. Despite differences in methodologies and indices of auditory function, existence of hearing loss has been a common threat. The higher incidence of hearing loss among patient

with chronic renal disease has long been established and is constantly being verified by many studies.

Bergstrom Land Thompson (13) reported that 47% of 151 pediatric end stage renal patients had hearing loss. Hearing loss is a more commonly reported finding than vestibular dysfunction. Kusakari et al. (14) studied inner ear function of 229 patients with chronic haemodialysis. They found that 60% had hearing loss, 36% had vestibular dysfunction and 26% had a combination of bothL.

Charachonet al. (15) reported that 75% of 54 patients with chronic renal disease had hearing loss. Zeigelboim et al. (16) measured thresholds between 9 and 18 kHz in 37 patients with chronic renal disease undergoing conservative treatment and a control group with normal hearing function. Age ranges in both groups were 30–59 years. They found a more severe high-frequency hearing loss in the group with chronic renal disease. Hearing loss among patients with chronic renal disease seemed to deteriorate further a year after the first evaluation. Kochhar et al. (17) reported an association between hearing loss and chronic renal disease in 27.5% of patients. Henrichet al. (18) found that 75% of the patients showed no deterioration of hearing during the 4-year time of follow-up. They concluded that hearing loss is common in renal failure, but it does not worsen with duration of treatment. Kusakariet al. (19) reported that inner ear dysfunction (including hearing loss and vestibular dysfunction or a combination) was not correlated with urea and serum creatinine levels or with duration of treatment.

CONCLUSION:

In our present study it is concluded that there is significant increase in the high frequency hearing threshold of patients with chronic renal disease. This was directly related to the duration and severity of disease. However, there was no correlation with blood pressure and dosage of diuretics to hearing loss. The Hearing threshold must have increased with time due to vascular aging, but should not have reached pathological level. The most probable explanation is that hearing loss in chronic renal failure patients is possibly the early and accelerated vascular aging and also by some other factors which might have aggravated with the duration of disease.

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