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Original Research Article

Peripheral neuropathy in Chronic Kidney Diseases: prevalence and its correlates

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ABSTRACT

Background: Peripheral polyneuropathy is most common Chronic Kidney Diseases (CKD) related complication with prevalence of more than 60%. The prevalence of peripheral neuropathy is directly proportional to duration and severity of CKD. Objective of the study was to study and assess the prevalence of peripheral neuritis and its correlates in patients with chronic kidney diseases.
Methods: The present study was a cross sectional; descriptive study was conducted in October 2016 to October 2018. Data analysed by using SPSS 23.0 version.
Results: Out of 90 subjects, majority were from 45-54 years age group (26). 70% were male and 30% were females. Out of 60 pre-HD patients, 33(55%) showed peripheral neuropathy. Out of 30 HD patients, 24(80%) showed peripheral neuropathy. Maximum percentage of PN seen in 45-54 age group (76.92%) amongst the 60 males 39 (65%) and amongst 30 females 18(60%) showed peripheral neuropathy. Maximum percentage of PN seen in >5 years age group (79.31%). Pure axonal sensory motor neuropathy (28.88%) was most common pattern.
Conclusions: Peripheral neuropathy is very common in CKD, more common in dialysis patients as compared to predialysis patients.

Keywords: Chronic kidney diseases, Haemodialysis, Peripheral neuropathy, Prevalence

INTRODUCTION

Chronic Kidney Disease (CKD) encompasses a spectrum of different pathophysiological processes associated with abnormal kidney function and progressive decline in Glomerular Filtration Rate (GFR).[1] CKD has become a major cause of morbidity and mortality. In the 2015 Global Burden of Disease Study, kidney disease was the 12th most common cause of death and CKD ranked as the 17th leading cause of morbidity worldwide.[2] The mean (95% confidence interval) global prevalence of CKD is 13.4% and between the stages of 3-5 is 10.6% (9.2-12.2%).[3] In India, the prevalence of CKD is 17.2% and for individual stage 1, 2, 3, 4, 5, as 7%, 4.3%, 4.3%, 0.8% and 0.8% respectively.[4] In India, it has been recently estimated that the age-adjusted incidence rate of End Stage Renal Disease (ESRD) to be 229 per million population (pmp), and >100,000 new patients enter renal replacement programs annually.[5]

The Kidney Disease: Improving Global Outcomes (KDIGO) defines CKD as abnormalities of kidney structure or function, present for >3 months, with implications for health.[6] CKD has been categorized into 5 stages based on Glomerular Filtration Rate (GFR) and into 3 categories based on albuminuria. CKD is of diverse etiology like diabetic nephropathy, hypertensive nephrosclerosis, glomerulonephritis, chronic interstitial

nephritis, obstructive uropathy, renovascular, genetically mediated. In western countries, diabetes and hypertension account for over 2/3rd of the cases of CKD.[7] Diabetes and hypertension are also gaining status of potential epidemic in India.[8,9] These two diseases account for 40-60% cases of CKD in India.[10]

Neuropathy in CKD is distal, symmetrical, mixed sensory motor polyneuropathy affecting lower limbs greater than upper limbs. The prevalence of peripheral neuropathy is directly proportional to duration and severity of CKD.

So, the present study was conducted to find out the prevalence of peripheral neuritis in CKD patients and their correlates in rural tertiary care centre in Maharashtra.

Objective of the study was to study and assess the prevalence of peripheral neuritis and its correlates in patients with chronic kidney diseases.

METHODS

The present study was a cross sectional, descriptive study undertaken to study the peripheral neuropathy and its profile in CKD patients. The study was conducted in October 2016 to October 2018.

All the patients visiting to tertiary health care centre in OPD, wards, HD centre, during the time frame of study and fulfilling the following study criteria of CKD were included in this study. During the study period this study included total 90 cases of which 60 patients who were receiving conservative management without HD included in pre-HD group and 30 patients who were on HD included in HD group.

Inclusion criteria

- All the diagnosed CKD patients (according to KDIGO guidelines) and willing to give informed consent were included as Cases.
- Serum creatinine more than 2 mg %.
- eGFR <45 ml/min/1.73m^2 (stage G3b, G4, G5 of CKD) which is calculated by MDRD (Modification of Diet in Renal Disease) formula1 as:
- GFR (mL/min/1.73 m2) = 1.86 × (S. Creatinine)-1.154 × (Age)-0.203 × (0.742 if female)
- Abnormalities on renal imaging (e.g. Ultrasound abdomen-kidney size <9 cm with loss of corticomedullary differentiation.)

Exclusion criteria

- Patients with preexisting peripheral neuropathy before the diagnosis of CKD or with other recognizable risk factors for peripheral neuropathy were excluded from the study (e.g. Diabetes mellitus, Alcoholism, Drug induced peripheral neuropathy, Hansen's disease).
- Patients with collagen vascular disorders, amyloidosis, or any primary neurologic disorder.
- Patients on peritoneal dialysis and kidney transplant recipients.
- Patients on immunosuppressants and steroids.

Statistical analysis

Data was collected by using a structure proforma. Data entered in MS excel sheet and analyzed by using SPSS 23.0 version IBM USA. Qualitative data was expressed in terms of proportions. Quantitative data was expressed in terms of Mean and Standard deviation. Association between two qualitative variables was seen by using Chi square. Comparison of mean and SD between two groups was done by using unpaired t test to assess whether the mean difference between groups is significant or not. Descriptive statistics of each variable was presented in terms of Mean, standard deviation, standard error of mean. A p value of <0.05 was considered as statistically significant whereas a p value <0.001 was considered as highly significant.

RESULTS

Out of 90 subjects, majority were from 45-54 years age group i.e. 26 followed by 16 each from 25-34- and 35-44-years age group. Thirteen patients were from 55-64 years age group. Least number i.e. 9 were from 65-74 years age group (Figure 1).

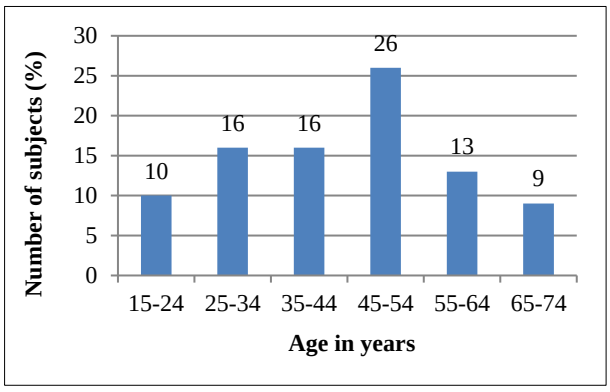

Figure 1: Distribution according to age group.

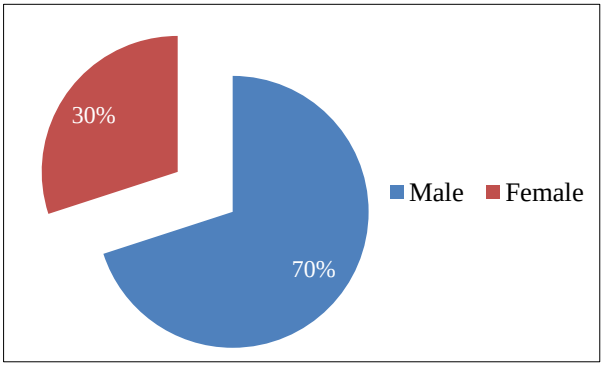

Figure 2: Distribution according to gender.

In this study, 70% were male and 30% were females. Male predominance was observed with male to female ratio as 2.33:1. (Figure 2).

In this study there were total 90 CKD patients, of which 60 patients were not on HD and 30 were on HD. Out of 60 pre-HD patients, 33(55%) showed peripheral neuropathy. Out of 30 HD patients, 24(80%) showed peripheral neuropathy. Out of total 90 patients, 57(63.33%) showed peripheral neuropathy.

The difference in pre-HD and HD was statistically significant ($p<0.05$) (Table 1).

In this study maximum percentage of PN seen in 45-54 age group (76.92%) followed by 35-44 (68.75%), 65-74 (66.66%), 55-64 (61.53%), 25-34 (56.25%) and 15-24 (30%) age groups. In pre-HD group, majority were having neuropathy from 35-44 years age group i.e. 7(70%). This is followed by 64.7% from 45-54 years age group and 50% each from 25-34, 55-64- and 65-74-years age group. In HD group, all nine i.e. 100% each were having neuropathy from 45-54 years and age. This is followed by 80% from 54-64 years age group and 50% each from 25-34, 55-64- and 65-74-years age group. (Table 2).

Table 1: Prevalence of peripheral neuropathy in pre haemodialysis and haemodialysis group.

Line of management	Number of patients examined	Patients with peripheral neuropathy	p
Pre-Hemodialysis	60	33(55%)	Chi sq-5.38, p-0.02, Significant
On hemodialysis	30	24 (80%)	
Total	90	57(63.33%)	

Table 2: Distribution of peripheral neuropathy cases according to age group.

Age group	Pre HD		HD		Number of patients with CKD
	(n=60)	Pts with PN	(n=30)	Pts with PN	
15-24	7	2(28.57%)	3	1(33.33%)	3/10(30%)
25-34	12	6(50%)	4	3(75%)	9/16(56.25%)
35-44	10	7(70%)	6	4(66.66%)	11/16(68.75%)
45-54	17	11(64.70%)	9	9(100%)	20/26(76.92%)
55-64	8	4(50%)	5	4(80%)	8/13(61.53%)
65-74	6	6(50%)	3	3(100%)	6/9 (66.66%)
Total	60	33	30	24	57/90 (63.33%)

Table 3: Comparison between male and female CKD pts. with peripheral neuropathy.

		Males				Females			
		Pre hemodialysis		Hemodialysis		Pre hemodialysis		Hemodialysis	
		No	%	No	%	No	%	No	%
Peripheral neuropathy	Present	21	53.8	18	85.7	12	57.1	6	66.7
	Absent	18	46.2	3	14.3	8	38.1	3	33.3
	Total	39	100.0	21	100.0	21	100.0	9	100.0

In this study out of 60 males, 39 were in pre-HD group and 21 were in HD group. Out of 39 males in pre-HD group 21(53.84%) showed peripheral neuropathy and out of 21 males in HD group 18(85.71%) showed peripheral neuropathy. Out of 30 females in this study, 21 were in pre-HD group and 9 were in HD group.

Out of 21 females in pre-HD group 12(57.14%) showed peripheral neuropathy and out of 9 females in HD group 6(66.66%) showed peripheral neuropathy.

In this study amongst the 60 males 39 (65%) and amongst 30 females 18 (60%) showed peripheral neuropathy (Table 3).

The duration of renal failure varies from 6 months to 7 years. Total 4 groups were made <1-year, 1-3-year, 3-5 year, >5 years for comparison. In <1-year group, out of 11 patients in pre-HD group 4(36.36%) showed PN, 2 patients in HD group 2(100%) showed PN. Out of total 13 patients 6(46.15%) showed PN. In 1-3-year, group, out of 22 patients in pre-HD group 10(45.45%) showed PN, 2 patients in HD group 2(100%) showed PN. Out of total 24 patients 12(50%) showed PN. In 3-5-year, group, out of 14 patients in pre-HD group 9(64.28%) showed PN, 10 patients in HD group 7(70%) showed PN. Out of total 24 patients 16(66.66%) showed PN. In >5 years group, out of 13 patients in pre-HD group 10(76.92%)

showed PN, 16 patients in HD group 13(81.25%) showed PN. Out of total 29 patients 23(79.31%) showed PN.

In this study maximum percentage of PN seen in >5 years age group (79.31%) followed by 3-5-year group (66.66%), 1-3-year group (50%), <1-year group (46.15%). The difference is statistically significant ($p<0.05$) (Table 4).

Table 4: Comparison in pre-HD and HD group with peripheral neuropathy with reference to duration since detection of CKD.

Duration since detection of disease	Pre hemodialysis		Hemodialysis		Total no. of patients	
	Total	Patients with PN	Total	Patients with PN	No	%
< 1 year	11	4(36.36%)	2	2(100%)	6	46.15
1-3 years	22	10(45.45%)	2	2(100%)	12	50
3-5 years	14	9(64.28%)	10	7(70%)	16	66.66
> 5 years	13	10(76.92%)	16	13(81.25%)	23	79.31
Total	60	33(55%)	30	24(80%)	57	63.33

Pure axonal sensory motor pattern of PN found in 15(25%) patients in pre-HD group, 11(36.66%) patients in HD group. Total 26(28.88%) patients showed pure axonal sensory motor PN. Mixed (axonal + demyelinating) sensory motor pattern of PN found in 12 (20%) patients in pre-HD group, 9(30%) patients in HD group. Total 21(23.33%) patients showed mixed sensory motor PN. In this study pure axonal sensory motor neuropathy (28.88%) was most common pattern followed by mixed (axonal + demyelinating) sensory motor (23.33%) (Table 5).

Table 5: Pattern of peripheral neuropathy in pre-HD and HD patients.

Pattern of peripheral neuropathy	Pre HD (n=60)	HD (n=30)	Total (n=90)
Pure axonal sensory motor	15 (25%)	11 (36.66%)	26 (28.88%)
Mixed sensory motor (axonal + demyelinating)	12 (20%)	9(30%)	21 (23.33%)

DISCUSSION

CKD is becoming epidemic in developed and developing countries. CKD is a complex comorbid condition with multiple complications. Neurological complications occur in all levels of the nervous system. Peripheral neuropathy is most common neurological complication, resulting in significant morbidity and impairs patient's quality of life.

In this study the pre-HD group out of 60 there were 39(65%) males and 21(35%) females. In the HD group out of 30there were 21(70%) males and 9(30%) females (Table 3). Sultan LI et al, studied 20 patients in pre HD group, 10(50%) males and 10(50%) females and 20 patients in HD group, 11(55%) males and 9(45%) females.[11] Jasti DB et al, studied 135(67.5%) males and 65(32.5%) females.[12] Deniz et al, studied 23(60.52%) males and 15(39.47%) females.[13] Alagesan et al, studied 71(63.96%) males and 40(36.04%) females.[14] Ogura T et al, studied 31(44.28%) males and 39(55.71%) females.[15] Janda K et al, studied 46(67.64%) males and 22 (32.35%) females. Aggarwal HK et al17 studied 62% males and 38% females.[16] Sex predilection in this study was almost similar to that of Jasti DB et al, Deniz et al, Alagesan et al, Janda K et al, i.e. no. of male patients were more than female patients.[12-14,16]

In this study, maximum percentage of PN was seen in 45-54 age group (76.92%) followed by 35-44(68.75%), 65-74(66.66%), 55-64(61.53%), 25-34(56.25%) and 15-24(30%) age groups (Table 2). Alagesan et al, study showed maximum PN in 35-44 age group (27.8%).[14] Sultan LI et al, study showed maximum PN in >50 years age group (84.62%) followed by 35-49 age group (55.55%) and 20-34 age group (44.44%).[11] In this study maximum percentage of PN were found in 45-54 age group, which were almost similar to Alagesan et al, and Sultan et al, study results.[11,14]

In this study, amongst the 60 males 39(65%) and amongst 30 females 18(60%) showed peripheral neuropathy (Table 3). Alagesan et al, study showed 48.6% males and 16.3% females had PN. Sultan LI et al, study showed 42.5% males and 20% females had PN. The difference between in PN was significant.[11,14] In this study, no significant difference was present in view of PN between both the sexes. However, Alagesan et al, and Sultan et al, showed significant difference of PN involving more no. of males than females.[11,14]

In this study, maximum percentage of PN seen in >5 years age group (79.31%) followed by 3-5-year group (66.66%), 1-3-year group (50%), <1-year group (46.15%) (Table 4). This shows that PN increases as the duration of

disease increases. Alagesan et al, study showed 19.8% PN in <3 years of disease detection and 45.1% of patients had PN after >3 years of disease detection.[14] The incidence of PN was significantly correlated with duration of CKD (p<0.001). Sultan LI et al, study showed high significant difference in PN between the kidney disease duration <5 years (15.39), 5-10 years (77.77%) and >10 years (100%).[11] As the duration of disease increased, incidence of PN increased in this study and similar conclusion was made by Alagesan et al, and Sultan et al, in their study.[11,14]

CONCLUSION

Peripheral neuropathy is very common in CKD, more common in dialysis patients as compared to predialysis patients. It's frequency and severity increase as the duration of disease and stage of CKD increases.

Sensory motor type of neuropathy is more common than pure sensory type of neuropathy. Distal symmetrical sensory motor neuropathy is common type of neuropathy, which is more in lower limbs than upper limbs.

Pure axonal sensory motor and mixed (axonal + demyelinating) sensory motor neuropathy are common patterns of PN in CKD.

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