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Clinical and demographic profile of peripheral neuropathy in chronic kidney disease in tertiary hospital in Bundelkhand region, Central India

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ABSTRACT

Background: Peripheral neuropathy is the most common chronic kidney disease (CKD)-related complication, with a prevalence of more than 60%. It is directly proportional to the duration and severity of CKD. **Aims and Objectives:** The study focuses on the prevalence, clinical, and demographic profile of peripheral neuropathy in CKD patients. **Materials and Methods:** The present study was cross-sectional and conducted in a tertiary hospital in Central India from October 2021 to September 2022. Among 100 CKD patients, peripheral neuropathy was assessed clinically and by electrophysiological nerve conduction studies. **Results:** Out of 100 subjects, 66% were male and 34% were female. Males were affected more (66.66%) than females (58.82%). Out of 46 pre-hemodialysis (HD) patients, 25 (54.34%) showed peripheral neuropathy. Out of 54 HD patients, 41 (75.92%) showed peripheral neuropathy, maximum age group with neuropathy >60 years, duration of uremia of 31–36 months, and average creatinine >9 mg/dL. The most common pattern observed was mixed sensory-motor neuropathy (axonal + demyelination) at 86.36%. **Conclusion:** The prevalence of peripheral neuropathy increases with the duration and severity of CKD. The most common pattern is distal symmetrical mixed sensory-motor neuropathy.

Key words: Chronic kidney disease; Peripheral neuropathy; Pre-hemodialysis

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INTRODUCTION

Chronic kidney disease (CKD) encompasses a spectrum of different pathophysiological processes associated with abnormal kidney function and a progressive decline in glomerular filtration rate (GFR).[1] Kidney disease: Improving global outcomes defines CKD as abnormalities of kidney structure or function lasting >3 months with implications for health.[2] CKD has been categorized into five stages based on GFR and three stages based on albuminuria. The most common causes of nephropathy are diabetic nephropathy, hypertensive nephrosclerosis, chronic glomerulonephritis, etc.

The manifestations of uremic peripheral neuropathy range from paresthesia to pain, weakness, atrophy of the lower limbs, muscle cramps, and restless legs. The rate of reversibility depends on various parameters, such as the duration of symptoms, the type of renal replacement therapy, and the frequency of dialysis. Levels of urea, creatinine, parathyroid hormone, middle molecule, and others have been correlated with a reduction in nerve conduction velocity and peripheral manifestations of neuropathy. The study is aimed at estimating the prevalence of peripheral neuropathy in patients with CKD in a tertiary care hospital, including those on hemodialysis (HD). Neuropathy in CKD is a distal, symmetrical, and mixed sensory-motor polyneuropathy affecting the lower limb more than the upper limb. Its prevalence is directly proportional to the duration and severity of CKD.

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Aims and objectives

The objectives of the study are as follows:

- To study the prevalence of peripheral neuropathy in patients with CKD
- The clinical and demographic profile of peripheral neuropathy in CKD patients includes age, sex, duration of uremia, and creatinine stage in CKD on HD and not on HD.

MATERIALS AND METHODS

Patients

A cross-sectional study was conducted in 100 CKD patients attending the HD unit, OPD, or inpatient Department of Medicine at Maharani Laxmi Bai Medical College, Jhansi, between October 2021 and September 2022 and assessed for peripheral neuropathy.

Ethical clearance

The ethics committee's approval was duly obtained and the study was conducted in accordance with the guidelines. Informed consent was obtained from each participant.

Inclusion criteria

The following criteria were included in the study:

- All patients irrespective of age and sex with the CKD
- eGFR <60 mL/min/1.73 m^2 determined by the MDRD formula (186.3* creatinine in mg/dL) – 1.154* (Age)-0.203 * (0.742)(if female)
- Ultrasound abdomen evidence of CKD (increased renal echogenicity, reduced renal cortical thickness, and reduced renal length <9 cm)

Exclusion criteria

The following criteria were excluded from the study:

- Patient denying consent
- Patient who had renal transplant and on peritoneal dialysis. Patient with other known cause of peripheral neuropathy such as hypothyroidism, diabetes mellitus, and tuberculosis
- Hansen's disease: Patients on drug having neuropathy as established toxicity, malignancy, and Vitamin B12 deficiency.

Methodology

Patients who satisfied the inclusion criteria were included in the study and were asked for a detailed history regarding the duration of neurological symptoms, whether the patient is already on any renal replacement therapy, and if the patient is already on HD, then the duration of his HD period was recorded. The patients were asked to answer questions from the MNSI questionnaire. Then, physical assessment according to the MNSI physical assessment chart was carried out and points filled. All the patients were subjected to nerve conduction studies.

Statistical analysis

Statistical analysis was done using SPSS v16 software. The prevalence is expressed in percentages (%). Quantitative data were expressed in mean, minimum, maximum, and standard deviation. The qualitative data are expressed on an ordinal scale and compared by the Chi-square test. The difference was considered statistically significant if the P≤0.05.

RESULTS

Out of 100 subjects, 66 were male and 34 were female. Males were affected more (66.66%) than females (58.82%). Out of 54 HD patients, 41 (75.92%) showed peripheral neuropathy. Out of 46 pre-HD patients, 25 (54.34%) showed peripheral neuropathy. The age group with maximum peripheral neuropathy is >60 years (94.11%), followed by 30–60 years (68.57%), and absent in <30 years. Neuropathy is maximal when the duration of uremia is between 2 and 3 years (84.61%), followed by >3 years (78.57%) and 1–2 years (42.85%) (Table 1). Neuropathy is maximal with a creatinine value >9.1 mg/dL (100%). The prevalence of subclinical neuropathy (66%) is higher than that of overt neuropathy (64%). The most common sign observed is an absent ankle reflex (39.06%), followed by an abnormal monofilament test (34.37%), absent vibration perception (20.31%), and ulcerations (4.68%) (Table 2). The most common pattern of neuropathy is mixed sensory-motor (axonal+demyelination) in pre-HD patients (33.33%) and HD patients (70.17%). Pure axonal sensory-motor patterns are seen in pre-HD patients (66.66%) and HD patients (11.11%) (Table 3).

It is observed in our study that with increasing creatinine level, the percentage of neuropathy increases. As seen in table, the group with above 5 mg creatinine has the highest

Table 1: Duration of uremia

Duration of uremia	Neuropathy present (%)	Total
<1 year	1 (8.3)	12
1–3 years	15 (42.85)	35
2–3 years	33 (84.61)	39
>3 years	11 (78.57)	14

Table 2: Abnormal MNSI sign

S. No.	Abnormal MNSI sign	Percentage
1	Appearance of feet	0
2	Ulceration	4.68
3	Absent ankle reflex	39.06
4	Absent vibration perception	20.31
5	Abnormal monofilament test	34.37

percentage of neuropathy and the association is statistically significant (P<0.05) (Table 4).

DISCUSSION

Peripheral neuropathy is the most common neurological complication, resulting in significant morbidity and impairing the patient's quality of life. In this study, 45 males (66.66%) and more than 21 females (58.82%) were affected (Figure 1). In a study by Jedras et al.,[3] conducted on 51 patients on chronic HD, more males were found to have sensory-motor neuropathy when compared to women. Deniz et al.,[4] studied 23 (60.52%) males and 40 (36.4%) females. In this study, maximum neuropathy was seen in the age group >60 years (94.11%), followed by 30–60 years (68.57%) and absent in <30 years. Alagesan and Mohan[5] study showed maximum neuropathy in the 35–44 age groups (27.8%). Sultan[6] study showed maximum neuropathy in the >50-year-old age group (84.62%). In this study, neuropathy is maximal when the duration of uremia is between 2 and 3 years (84.61%), followed by >3 years (78.57%), and 1–2 years (42.85%). Alagesan and Mohan[5] study showed 19.8% of neuropathy in <3 years, and 45.41% had neuropathy >3 years of uremia. Babu et al.,[7] found in their study that prevalence increases with the duration of symptoms. In this study, peripheral neuropathy was found in the pre-HD group in 25 (54.34%) out of 46 patients, and in HD patients in 41 (74.92%) out of 54 (Figure 2). The prevalence of peripheral neuropathy is 60–100% in patients on dialysis. Aggarwal et al., found that in their study of 100 non-HD patients, the prevalence was 70%.

Table 3: Pattern of neuropathy

Pattern of neuropathy	Pre-HD (n=25) (%)	HD (n=41) (%)	Total (n=66)
Pure axonal sensory-motor	6 (66.66)	1 (11.11)	7
Mixed sensory-motor (axonal+demyelinating)	19 (33.33)	40 (70.17)	59

Table 4: Serum creatinine (mg/dL)

Serum creatinine (mg/dL)	Number of patients	Patients with peripheral neuropathy	Percentage
0–3.4	17	7	41.2
3.5–4.9	30	17	56.6
>5	53	40	75.5

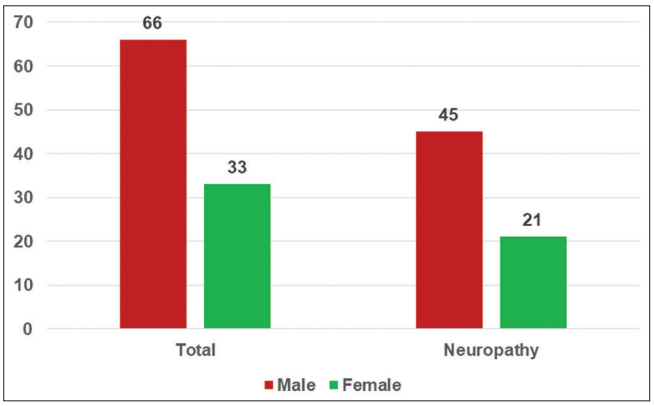

Figure 1: Sex distribution of peripheral neuropathy

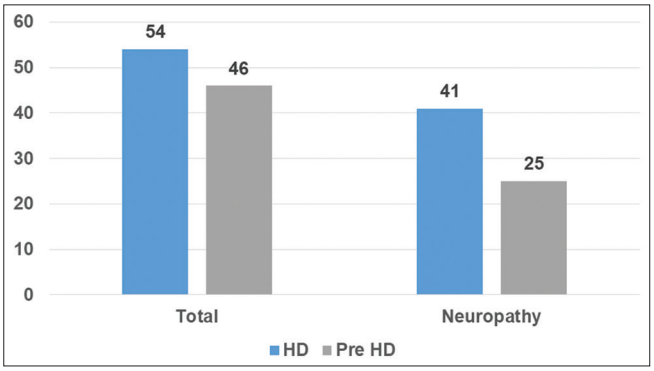

Figure 2: Distribution of peripheral neuropathy among Hemodialysis and non hemodialysis

Limitations of the study

This was a single-centered study.

CONCLUSION

Peripheral neuropathy is common in CKD patients and is more common in dialysis patients as compared to pre-dialysis patients. It increases with the duration and severity of CKD. Distal symmetrical mixed sensory-motor polyneuropathy is more common in the lower limb than the upper limb. Measures need to be taken for the early detection and treatment of neuropathy. The problem is known for long but still unaddressed.

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REFERENCES

1. Bargman JM and Skorecki K. Chronic kidney disease. In: Loscalzo J, Fauci A, Kasper D, Hauser S, Longo D and Jameson J, editors. Harrison's Principles of Internal Medicine. 21th ed. United States: McGraw Hill; 2022. Available from: https://accesspharmacy.mhmedical.com/content.aspx?bookid=3095&sectionid=265425997 [Last accessed on 2023 May 24].
2. Bagga A and Srivastava RN. Pediatric Nephrology. India: Jaypee Brothers Medical Publishers Pvt Ltd.; 2016. Available from: https://www.google.co.in/books/edition/pediatric_nephrology/-06jdaaaqbaj?hl=en&gbpv=0 [Last accessed on 2022 Jan 15].

3. Jedras M, Zakrzewska-Pniewska B, Wardyn K and Switalski M. Uremic neuropathy--II. Is pruritus in dialyzed patients related to neuropathy? Pol Arch Med Wewn. 1998;99(6):462-469.
4. Deniz E, Aynur O, Gültekin G, Mehmet H, Bahar T, Ahmet K, et al. Clinical and electrophysiological correlation of patients with chronic renal failure: The contribution of quantitative neurological scores. Int J Med Med Sci. 2012;4:192-199.
https://doi.org/10.5897/IJMMS12.093
5. Alagesan S and Mohan AP. A study on peripheral nerve dysfunction in chronic kidney disease. IOSR J Dent Med Sci. 2016;15(5):22-26.
https://doi.org/10.9790/0853-1505022226
6. Sultan LI. Evaluation of the clinical and neurophysiologic parameters of peripheral nerve functions in uremic Egyptian patients. Egypt J Neurol Psychiatr Neurosurg. 2007;44(2):473-487.
7. Babu MM, Kiran MR, Ravindra K, Srinivas V, Kandregula P, Vardhan RV, et al. Clinical manifestation and prevalence of peripheral neuropathy and nerve dysfunction in patients with chronic kidney disease. Int J Res Med Sci. 2015;3(2):451-455.
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Authors' Contributions:
SNS, AK, and NA- Definition of intellectual content, literature survey, prepared first draft of manuscript, implementation of study protocol, data collection, data analysis, manuscript preparation, and submission of article and **SS-** Concept, design, clinical protocol, manuscript preparation, editing, and manuscript revision, design of study, statistical analysis and interpretation, review manuscript, review manuscript, literature survey, coordination, and manuscript revision.

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