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The Prevalence and Severity of Chronic Pain in Patients with End-Stage Kidney Disease (ESKD) on Maintenance Hemodialysis

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ABSTRACT

Background and Aim: Chronic pain is a common yet often underrecognized symptom in patients with end-stage kidney disease (ESKD) receiving maintenance hemodialysis. This study was conducted to determine the prevalence, severity, and associated clinical and biochemical factors of chronic pain in patients undergoing long-term hemodialysis at a tertiary care center in Multan, Pakistan. **Materials and Methods:** A descriptive cross-sectional study was conducted over six months (February 2024 to August 2024) at the dialysis units of Nishtar Hospital, Multan. A total of 150 adult ESKD patients on maintenance hemodialysis were enrolled using non-probability consecutive sampling. Data on demographics, comorbidities, dialysis duration, and laboratory parameters were collected. Chronic pain was defined as pain lasting ≥3 months and graded by the Numerical Rating Scale. Statistical associations were assessed using chi-square and independent sample t-tests. **Results:** Among 150 patients (mean age 52.4 ± 13.2 years; 58% male), 98 (65.3%) reported chronic pain. Of these, 28 (28.6%) had mild, 41 (41.8%) moderate, and 29 (29.6%) severe pain. Common pain sites included the lower back (34.7%) and lower limbs (26.5%). Chronic pain was more prevalent among females (74.6%, $p = 0.034$), diabetics (78.7%, $p < 0.001$), and patients with dialysis duration >24 months (79.8%, $p < 0.001$). Lower hemoglobin ($p = 0.004$), lower ferritin ($p = 0.012$), higher calcium-phosphate product ($p = 0.007$), and elevated iPTH levels ($p = 0.003$) were significantly associated with chronic pain. **Conclusion:** Chronic pain affects two-thirds of hemodialysis patients and is associated with demographic, clinical, and metabolic factors. Regular screening and targeted interventions should be integrated into dialysis care for symptom relief.

INTRODUCTION

Chronic pain is a widespread yet often overlooked issue among patients receiving maintenance hemodialysis for end-stage kidney disease (ESKD). Despite advancements in dialysis delivery and improved biochemical monitoring, pain remains poorly addressed in routine nephrology care. International studies report that nearly 50–66% of hemodialysis patients experience chronic pain, with a significant proportion suffering from moderate to severe intensity [1–3]. The consequences extend beyond physical discomfort, including disturbed sleep, reduced mobility, emotional distress, and poor treatment adherence. Unrelieved pain also contributes to higher healthcare use and reduced quality of life [4]. Despite this, pain in dialysis patients is often normalized or left unreported, particularly in low-resource settings, where symptom control is not a primary focus of renal care.

Pain in dialysis patients stems from multiple causes, including musculoskeletal conditions like osteoarthritis and bone disease, neuropathic pain from diabetic neuropathy or vascular access injury, and dialysis-related discomfort such as needle site pain or muscle cramps [5]. Factors such as older age, female gender, longer dialysis duration, and multiple comorbidities, especially diabetes, are linked to greater pain burden [6]. Biochemical disturbances, including high parathyroid hormone (PTH) levels and elevated calcium-phosphate product, are also associated with pain severity [7]. However, despite known risk factors, pain assessment is not standardized in many centers. Healthcare providers often under-assess pain due to time constraints or clinical prioritization of dialysis adequacy, while concerns about medication side effects limit the use of appropriate treatments. Non-pharmacological options such as physical therapy or behavioral interventions are rarely implemented, and multidisciplinary approaches remain underutilized [3,8].

Pain is often underreported, unrecorded, and insufficiently addressed in standard care practices.

Identifying how common and severe this issue is within the local context is necessary to plan focused interventions and improve patient-centered care. Therefore, this study is designed to determine the prevalence and severity of chronic pain in patients receiving maintenance hemodialysis at this facility. The findings aim to raise awareness, inform clinical practice, and support the introduction of routine pain assessment protocols and effective symptom management strategies in dialysis settings.

MATERIALS AND METHODS

This was a descriptive cross-sectional study conducted in the dialysis units of Nishtar Hospital, Multan, over a six-month period from February 2024 to August 2024. The primary objective of the study was to determine the prevalence and severity of chronic pain among patients with end-stage kidney disease (ESKD) undergoing maintenance hemodialysis. Ethical approval for the study was obtained from the Institutional Review Board of Nishtar Medical University, Multan. All participants were enrolled after obtaining written informed consent in their native language, ensuring that the study's purpose, confidentiality of information, and voluntary participation were fully understood.

The sample consisted of 150 adult patients selected using non-probability consecutive sampling. Patients were approached during their routine dialysis sessions, and those who fulfilled the eligibility criteria and provided consent were included in the study.

Inclusion criteria for participant selection were as follows: adult patients aged 18 years and above, clinically diagnosed with end-stage kidney disease as confirmed by nephrology records, undergoing maintenance hemodialysis for a minimum duration of three months, and receiving dialysis at a frequency of at least two sessions per week. Patients had to be clinically stable, alert, and capable of verbal communication in order to respond reliably to pain-related questions and complete the assessment.

Exclusion criteria included patients with acute kidney injury or those who had recently initiated dialysis (less than 3 months), those who were admitted for intercurrent illness or medical instability at the time of interview, and individuals with cognitive impairment, psychiatric disorders impairing comprehension, or language barriers that prevented meaningful participation. Patients who declined to participate or were too ill to respond were also excluded.

Demographic and clinical baseline data were collected using a structured interviewer-administered form. Information gathered included age, gender, duration of dialysis (in months), number of dialysis sessions per week, and coexisting medical conditions such as diabetes mellitus, hypertension, ischemic heart disease, and musculoskeletal disorders. Relevant laboratory data including hemoglobin, serum calcium, phosphorus, and intact parathyroid hormone (iPTH) levels were extracted from medical records when available.

The primary outcome measure was the presence of chronic pain and its severity. Chronic pain was defined operationally as pain persisting for at least three months, irrespective of its cause, and not attributable to acute complications such as infection or recent trauma. Pain severity was assessed using the 11-point Numerical Rating Scale (NRS), where patients were asked to rate their pain from 0 (no pain) to 10 (worst possible pain). Pain intensity was categorized as mild (NRS 1–3), moderate (NRS 4–6), or severe (NRS 7–10). Patients were also asked to describe the location of pain, its frequency (intermittent or constant), whether they had reported it to healthcare providers, and whether any pain-relieving interventions were being used.

Data were collected in face-to-face interviews conducted in the local language (Urdu or Saraiki), ensuring patient comfort and privacy. Interviews were carried out during the first hour of dialysis sessions to avoid discomfort or fatigue-related bias. All interviews were conducted by trained staff using a standardized format to maintain uniformity.

Statistical analysis was performed using IBM SPSS version 26. Quantitative variables such as age and duration of dialysis were expressed as mean and standard deviation, while categorical variables including gender, comorbidities, and pain severity categories were presented as frequencies and percentages. Associations between pain presence/severity and variables such as age, gender, duration on dialysis, and presence of comorbidities were evaluated using Chi-square tests for categorical variables and independent sample t-tests for continuous variables. A p-value less than 0.05 was considered statistically significant.

RESULTS

A total of 150 patients undergoing maintenance hemodialysis at the dialysis units of Nishtar Hospital, Multan, were included in the study. The mean age of participants was 52.4 ± 13.2 years, ranging from 21 to 80 years. Of the total, 87 (58%) were male and 63 (42%) were female. The average duration of dialysis was 26.3 ± 15.8 months. Most patients (102, 68%) received dialysis three times per week, while the remaining 48 (32%) underwent two sessions weekly (Table 1).

Table 1

Baseline Characteristics and Chronic Pain Prevalence

Variable	Total (n=150)	Chronic Pain Present (n=98)	No Chronic Pain (n=52)	p-value
Age (mean ± SD)	52.4 ± 13.2	55.1 ± 12.4	47.3 ± 12.4	0.002
Gender (Male/Female)	87/63	51/47	36/16	0.034
Duration on dialysis (months)	26.3 ± 15.8	31.2 ± 14.6	18.7 ± 13.9	<0.001
Diabetes Mellitus (%)	80 (53.3%)	63 (64.3%)	17 (32.7%)	<0.001
Hypertension (%)	97 (64.7%)	67 (68.4%)	30 (57.6%)	0.184

Out of 150 patients, 98 (65.3%) reported experiencing chronic pain lasting more than three months. Among them, pain severity based on the Numerical Rating Scale (NRS) was classified as mild in 28 (28.6%), moderate in 41 (41.8%), and severe in 29 (29.6%) patients. Thus, 47.9% of patients with chronic pain experienced moderate to

severe pain. The most commonly reported pain sites were lower back (34.7%), lower limbs (26.5%), and generalized musculoskeletal pain (18.4%) (Table 2).

Table 2

Pain Severity Distribution Among Patients with Chronic Pain (n = 98)

Pain Severity (NRS Score)	Frequency	Percentage
Mild (1–3)	28	28.6%
Moderate (4–6)	41	41.8%
Severe (7–10)	29	29.6%

Among patients with chronic pain, the lower back and lower limbs were the most frequently reported pain sites. Over half described the pain as constant, while the rest experienced intermittent symptoms. Despite the high burden, less than 40% had reported their pain to healthcare providers, and only a small proportion were receiving regular treatment. Most relied on irregular or self-initiated use of over-the-counter analgesics. Detailed results presented in Table 3.

Table 3

Pain Location, Pattern, and Treatment (n = 98)

Variable	Frequency	Percentage
Pain Location		
Lower back	34	34.7%
Lower limbs	26	26.5%
Generalized body pain	18	18.4%
Upper limbs	12	12.2%
Shoulder/neck	8	8.2%
Pain Pattern		
Constant	54	55.1%
Intermittent	44	44.9%
Pain Reported to Provider		
Yes	36	36.7%
No	62	63.3%
Currently Using Analgesia		
Yes	37	37.8%
No	61	62.2%

Chronic pain was more frequently reported among females, diabetics, and those with musculoskeletal comorbidities. It was present in 47 (74.6%) females and 63 (78.7%) diabetic patients. Patients with longer dialysis duration (>24 months) and those with osteoarthritis, 17 (85.0%), also showed higher pain prevalence. Mean hemoglobin and ferritin levels were lower in the pain group, while the calcium-phosphate product and iPTH levels were notably higher, suggesting a link with metabolic bone disease. No significant difference was observed with hypertension or magnesium levels. Complete associations and laboratory comparisons are detailed in Table 4.

Table 4

Association of Chronic Pain with Demographics, Comorbidities, and Lab Parameters

Variable	Chronic Pain (n=98)	No Pain (n=52)	p-value
Age (mean ± SD)	55.1 ± 12.4 years	47.3 ± 12.4	0.002
Female gender	47 (74.6%)	16 (25.4%)	0.034
Duration on dialysis >24 months	71 (79.8%)	18 (20.2%)	<0.001
Diabetes mellitus	63 (78.7%)	17 (21.3%)	<0.001
Hypertension	67 (69.1%)	30 (57.6%)	0.184
Musculoskeletal disorder	17 (85.0%)	3 (15.0%)	0.01
Hemoglobin (g/dL)	9.6 ± 1.4	10.4 ± 1.3	0.004
Ferritin (ng/mL)	312 ± 85	370 ± 92	0.012
Serum calcium (mg/dL)	8.5 ± 0.6	8.6 ± 0.5	0.291
Serum phosphate	5.7 ± 0.9	5.3 ± 1.0	0.041
Calcium-phosphate product	52.6 ± 8.1	48.2 ± 7.6	0.007
Magnesium (mg/dL)	2.1 ± 0.3	2.0 ± 0.2	0.154
Intact PTH (pg/mL)	586 ± 210	453 ± 182	0.003

DISCUSSION

The present study found that 98 out of 150 patients (65.3%) on maintenance hemodialysis reported chronic pain lasting more than three months. This prevalence falls within the upper range reported in prior literature. A systematic review by Jaber et al. (2023) noted that chronic pain affects approximately 60.5% of hemodialysis patients, while some studies report any pain—acute or chronic—in up to 89% of patients [9,10]. Rathwell et al. (2021) highlighted a slightly lower prevalence of chronic pain at 31% in some regions, likely due to differences in methodology and patient reporting practices [6]. Compared with these studies, the findings of the current study align more closely with higher-end estimates and confirm that chronic pain remains a widespread concern among patients undergoing long-term dialysis.

Among those experiencing chronic pain in the present study, moderate to severe intensity was noted in 47.9% of patients, based on the Numerical Rating Scale (NRS). This is consistent with earlier findings. Zeng et al. (2022) reported that over 40% of patients with chronic pain described their symptoms as moderate or severe, with mean pain scores often reaching 3.7 out of 10 [11]. Similarly, Iderdar et al. (2025) reported severe pain in 13–22% of dialysis patients at the time of treatment, with pain levels typically escalating during and after sessions [8]. In our study, 29.6% of patients had severe pain, which is slightly higher than some global estimates, indicating a possibly under-addressed symptom burden in the local population.

The most frequently reported pain site in this study was the lower back (34.7%), followed by the lower limbs (26.5%) and generalized musculoskeletal pain (18.4%). This pattern echoes the findings by Hernandes et al. (2021), who identified low back pain in approximately 30% of hemodialysis patients [5,12]. Musculoskeletal pain, especially in weight-bearing areas, remains the most commonly reported pain category across studies [13]. Other studies, including those by Al-Jabi et al. (2021) and Iderdar et al. (2025), similarly list upper and lower limb pain, head, and shoulder as frequent complaints [14].

Only 36.7% of patients in our study had reported their pain to dialysis staff, and just 37.8% were receiving any form of analgesia. These findings are particularly concerning but not unexpected. Prior literature widely reports underreporting and undertreatment of pain in dialysis populations. Al-Jabi et al. (2021) noted that up to 77% of patients are undertreated, and less than 25% use non-drug pain management strategies [14]. Fleishman et al. (2018) similarly documented that although pain is common, only about one-third of patients are appropriately treated. In our study, only 9.2% were on regular analgesic treatment, with most relying on self-medication using over-the-counter painkillers [15]. These

findings point toward a critical gap in routine pain screening and management in dialysis units.

Female patients in this study had a significantly higher prevalence of chronic pain (74.6%) compared to males (58.6%), consistent with the literature. Gheita et al. (2016) and Bouchachi et al. (2025) report that female gender is consistently associated with higher pain sensitivity, greater pain reporting, and more interference in daily functioning. However, some studies also suggest that males may report more musculoskeletal pain specifically (Zeng et al., 2022), though overall burden tends to be higher in women [11,16,17]. With regard to age, the average age of patients with pain was 55.1 years, which was significantly higher than those without pain. Similar findings have been reported across various settings. Older patients are more likely to experience chronic musculoskeletal pain, often due to degenerative changes, decreased mobility, and comorbid illnesses [16,17]. These findings support the inclusion of age-specific pain assessments in routine dialysis care.

Chronic pain was significantly more common in diabetic patients in our study (78.7%) compared to non-diabetics (50.0%). This finding is consistent with multiple studies that have identified diabetes, particularly with neuropathy or vascular complications, as a significant contributor to pain [14,18]. Neuropathic and ischemic pain are common in diabetics and often involve the lower limbs and feet. In addition, 85% of patients with documented musculoskeletal conditions such as osteoarthritis in our sample reported chronic pain. This confirms earlier observations that chronic pain in hemodialysis patients often arises from multiple overlapping causes, particularly musculoskeletal and metabolic disorders [16]. This study found that 79.8% of patients on dialysis for more than 24 months reported chronic pain, compared to 44.3% of those with shorter dialysis durations. Dialysis vintage has been recognized in previous studies as a key risk factor for chronic pain [19,20]. Over time, patients accumulate musculoskeletal stress, complications from mineral bone disease, and needle-related trauma, all contributing to pain.

Laboratory analysis in our study revealed several notable associations. Patients with chronic pain had significantly lower hemoglobin levels (9.6 g/dL vs. 10.4 g/dL, $p = 0.004$). While anemia is not a direct cause of pain, it contributes to fatigue and overall poor physical function, which may intensify the perception of discomfort [21]. Ferritin levels were also lower in the pain group (312 vs. 370 ng/mL, $p = 0.012$), indirectly pointing to iron deficiency, which is commonly observed in hemodialysis and may affect recovery and physical stamina [22]. However, no direct causative link between ferritin and pain has been firmly established. One of the most significant findings was the elevated calcium-phosphate product in patients with chronic pain (52.6 vs. 48.2 mg^2/dL^2, $p = 0.007$). High calcium-phosphate product is associated with vascular and soft tissue calcification, which can lead to pain in joints and muscles [7]. Moreover, the mean intact parathyroid hormone (iPTH) was considerably higher in the pain group (586 vs. 453 pg/mL, $p = 0.003$), suggesting the presence of secondary hyperparathyroidism, a known contributor to bone pain [23,24]. While magnesium levels were not significantly different between groups in our study, previous reports suggest that serum magnesium may modulate PTH levels and influence bone metabolism [25]. The absence of a clear trend in our sample may reflect variability in dietary intake and magnesium-containing medications.

Self-treatment was the most common approach among our patients, with 28.6% using pain medications irregularly and only 9.2% receiving consistent treatment. These figures mirror international trends. Lockwood et al. (2021) and Dreiher et al. (2021) describe high levels of self-medication, often due to fear of side effects, lack of physician inquiry, and the normalization of pain [26,27]. While some patients adopt positive thinking or rely on social support, such non-pharmacological methods are rarely sufficient, particularly in moderate to severe pain cases.

The findings of this study reaffirm that chronic pain is a major but underrecognized concern in dialysis care. Its burden is highest among women, older patients, those with diabetes and musculoskeletal disease, and individuals with long dialysis duration. Elevated iPTH and calcium-phosphate product indicate a metabolic component that needs to be addressed. Importantly, many patients do not report their pain, and even fewer receive structured management. These findings emphasize the urgent need to integrate pain screening tools into dialysis sessions, address modifiable biochemical abnormalities, and train staff to provide holistic, compassionate pain care.

CONCLUSION

This study shows that many patients on regular hemodialysis quietly live with ongoing pain that often goes unreported and untreated. It tends to affect those with other health problems and those on dialysis for a longer time. Despite being a major part of their daily struggle, pain is not always given attention in routine care. These findings suggest that asking about pain regularly and offering simple, appropriate support should become a normal part of looking after people on dialysis.

Authors' Contribution

Y.A.A. conceived and designed the study, collected the data, and prepared the initial draft of the manuscript. M.R. supervised the research and critically reviewed the manuscript. Z.S. contributed to data analysis and interpretation of results. M.I.J. performed the statistical analysis. I.N. assisted with data collection and literature review. G.A. contributed to manuscript editing and final approval. All authors revised the manuscript for important intellectual content and approved the final version for submission.

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