

Musculoskeletal (MSK) Pain and Relationship to Sleep Quality and Depression in Patients with End-Stage Kidney Disease (ESKD)

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ABSTRACT

Musculoskeletal (MSK) pain, sleep disturbance, and depressed mood are prevalent in patients with end-stage kidney disease (ESKD). Between June 2024 and October 2024, a cross-sectional observational survey was conducted using a convenience sample of 22 patients receiving outpatient hemodialysis and 24 patients with kidney transplants at a large academic center. Participants completed the Musculoskeletal Health Questionnaire (MSK-HQ) and the SF-12 Health Survey to assess musculoskeletal pain, sleep disturbance, physical function, and depressed mood. Descriptive statistics and Pearson correlation coefficients were used to examine relationships between MSK pain, sleep quality, physical function, and mood. Moderate-to-severe MSK pain was reported by 41% ($n = 19$) daily and 57% ($n = 26$) at night. A majority 76% ($n = 35$) of participants reported that pain interfered with sleep, with 59% ($n = 27$) experiencing nightly disruption. Patients with daytime pain had more nighttime pain ($r = .81, p < 0.001$), poor sleep ($r = .59, p < 0.001$), physical impairment ($r = .68, p < 0.001$), reduced mobility ($r = .67, p < 0.001$), and feelings of depression ($r = .36, p = 0.02$). Nighttime pain was strongly negatively correlated with reduced ability to perform daytime work or usual daily activities ($r = -.72, p < 0.001$). No significant correlations were observed between pain and type of kidney replacement therapy (dialysis vs. transplant). Recognition of pain and implementation of comprehensive, multidisciplinary management strategies across the continuum of ESKD is important for improvement in overall quality of life (QOL).

INTRODUCTION

Patients with end-stage kidney disease (ESKD) endure a wide array of symptoms that extend beyond uremia, including chronic fatigue, cognitive impairment, musculoskeletal (MSK) pain, and psychological distress (Chu et al., 2025). MSK pain, ranging from joint discomfort and stiffness to disabling myopathies, has been consistently underrecognized despite its substantial impact on functionality and well-being (Coluzzi, 2018; Lockwood et al., 2021). While nephrology care often focuses on traditional markers, such as glomerular filtration rate (GFR), electrolytes, and dialysis adequacy, patient-centered symptoms such as pain and sleep disturbances frequently remain untreated (Coluzzi, 2018; Lockwood et al., 2021).

Sleep disorders are highly prevalent among people with ESKD, affecting up to 80% of patients receiving dialysis in some studies (Chu et al., 2025; Fonseca et al., 2016;). Factors contributing to poor sleep include volume overload, metabolic imbalances, anxiety, and notably, chronic pain (Huang et al., 2023). MSK pain, particularly at night, is a well-documented

contributor to both sleep initiation and maintenance insomnia (Lindner et al., 2015). Sleep deprivation can, in turn, exacerbate inflammation, worsen blood pressure control, impair glucose metabolism, and increase susceptibility to depression (Huang et al., 2023; Lindner et al., 2015; Lyons, 2024). Thus, pain and sleep quality are closely intertwined, and their impact may be magnified in low-income, urban populations who may experience barriers to accessing supportive care services, despite being treated at academic medical centers (Coluzzi, 2018; Lockwood et al., 2021).

Mental health concerns, such as depression and feelings of hopelessness, are also common with ESKD, particularly in patients facing socioeconomic instability, functional decline, or disability (Jhamb et al., 2019; Lambourg et al., 2021). Depression has been shown to predict poorer adherence to dialysis schedules and transplant regimens, higher hospitalization rates, and reduced survival (Jhamb et al., 2019; Pan et al., 2019). Importantly, chronic MSK pain has been directly linked to depressive symptoms, establishing a multidirectional feedback loop between physical pain, sleep, and mood (Lindner et al., 2015; Lyons, 2024).

Despite these associations, few studies have examined how MSK pain affects sleep and depression in underserved populations with ESKD. Even fewer have looked at whether these associations persist in kidney transplant recipients (Lockwood et al., 2021). In dialysis and transplant settings, nephrology social workers play a central role in psychosocial assessment and intervention and are uniquely positioned to identify and address pain, sleep disturbance, and mood symptoms as part of routine care. In this study, we conducted a cross-sectional survey among an urban patient population at a large academic center to assess the frequency and severity of MSK pain and its relationship to sleep quality and mood. We hypothesized that pain would be commonly reported in both dialysis and transplant groups, and that higher pain levels, particularly at night, would be correlated with poorer sleep and increased depressive symptoms, based on clinical observations that transplant recipients often report persistent pain similar to dialysis patients.

METHOD

A cross-sectional, observational study involving adult patients with ESKD receiving care at SUNY Downstate Health Sciences University in Brooklyn, New York, from June 2024 to October 2024, was performed using a convenience sample of 46 patients recruited from outpatient hemodialysis ($n = 22$) and kidney transplant ($n = 24$) clinics. Inclusion criteria included age ≥ 18 years, established diagnosis of ESKD, and the ability to complete the questionnaire in English. Participants were recruited consecutively during the study period. Given the exploratory nature of the study, the sample size was determined pragmatically, based on feasibility and clinic volume rather than formal power calculations.

A face-to-face survey was administered using a modified version of the Musculoskeletal Health Questionnaire (MSK-HQ), designed to assess pain location, intensity, interference with daily function, and night symptoms (Hill et al., 2016). Surveys were administered in person by a member of the research team. Participants completed the questionnaire themselves, with the researcher present to provide clarification as needed. Dialysis clinic staff were not involved in survey administration. To assess sleep quality and psychological wellbeing, we used the SF-12 Health Survey, which includes validated components on mental health, energy, fatigue, and social functioning (Ware et al., 1996). Questions specific to sleep included frequency of difficulty falling asleep, staying asleep, and waking due to pain (Table 1).

Demographic information, including age, gender, race, income level, and employment status, was collected. Outpatient participants were classified as either patients receiving dialysis or kidney transplant recipients (KTRs).

The study was approved by the SUNY Downstate IRB committee, no financial incentives were offered, and responses were anonymized.

Statistical analyses included descriptive statistics for demographic variables and symptom frequencies. Pearson correlation coefficients were used to examine the relationship between MSK pain (both daytime and nighttime) and sleep quality, physical function, and mood. A significance threshold of $p < 0.05$ was applied. Analyses were conducted using IBM SPSS Statistics for Windows (Version 27.0; IBM Corp.).

RESULTS

The mean age was 61.3 ($SD = 10.0$). Women made up 56.5% ($n = 26$) of the sample, and 73.9% ($n = 34$) of participants self-identified as Black/African American. More than half (54.3%, $n = 25$) had an annual income under \$20,000, and 71.7% ($n = 33$) were unemployed or receiving disability benefits.

In terms of MSK pain, 41% reported experiencing moderate-to-severe daytime pain, and 57% reported moderate-to-severe pain during the night. Only 14% of patients described little or no pain. Notably, 76% reported that pain interfered with sleep, and 59% said pain disrupted sleep every night. Pain also limited physical function, including walking, climbing stairs, and performing routine self-care.

Statistical analysis showed a strong positive correlation between daytime pain and nighttime pain ($r = .81$, $p < .001$). Daytime pain was also correlated with difficulty falling or staying asleep ($r = .59$, $p < .001$), reduced ability to engage in physical activity ($r = .68$, $p < .001$), difficulty walking ($r = .67$, $p < .001$), and feeling downhearted ($r = .36$, $p = .02$). Nighttime pain was associated with an inability to work or complete tasks ($r = -.72$, $p < .001$) and with depressive symptoms ($r = .36$, $p = .22$). No statistically significant associations were observed between pain severity and transplant status, sex, age, income, or employment.

DISCUSSION

As has been previously reported, MSK pain is a significant and persistent issue among patients with ESKD, regardless of whether they are receiving dialysis or have undergone kidney transplantation (Chu et al., 2025; Fonseca et al., 2016;). Our findings suggest that MSK pain may be a common occurrence and is also strongly associated with poor sleep quality and impaired physical and emotional wellbeing (Jhamb et al., 2019; Lyons, 2024). These results are particularly important given our focus on an urban, predominantly Black/African American population with high levels of adverse social determinants of health (SDOH), including unemployment and socioeconomic disparities (Coluzzi, 2018).

The strong correlation between daytime and nighttime pain, while not unexpected, is clinically meaningful and suggests that pain in this population often persists across the 24-hour cycle. This pattern indicates that MSK pain in patients with ESKD is often persistent rather than temporally limited, extending into the night when it can disrupt sleep initiation and maintenance. This finding underscores the importance of assessing sleep quality in patients who report pain during routine clinical encounters. Even when pain is initially identified as a daytime symptom, its presence may signal an increased risk for nocturnal pain and sleep disturbance, with downstream effects on physical function, mood, and quality of life.

One of the most notable findings is the persistence of pain among transplant recipients, which challenges the common assumption that pain improves significantly after transplantation and suggests that longstanding MSK issues may not resolve even with improved kidney function (Chu et al., 2025; Huang et al., 2023; Lindner et al., 2015). Pain at night appears to have a disproportionate impact, contributing not only to sleep disruption but also to difficulty with daytime work and increased depressive symptoms (Jhamb et al., 2019; Lyons, 2024).

Poor sleep, often unrecognized in routine nephrology care, has serious health consequences. It exacerbates inflammation, impairs glucose metabolism, and contributes to hypertension—all risk factors already elevated with ESKD (Lindner et al., 2015; Turek et al., 2012). Moreover, sleep disturbance reduces patients' ability to cope with the rigors of treatment, worsens depression, and diminishes quality of life (Lindner et al., 2015; Pan et al., 2019). Symptom management in patients receiving dialysis should include targeted approaches for insomnia and pain, given their impact on patient outcomes (Natale et al., 2019).

This study reinforces the need for a multidisciplinary approach to care management for patients with ESKD. Incorporating pain assessments, sleep evaluations, and mental health screenings into routine care, particularly for underserved populations, could substantially improve patient outcomes with referral to appropriate services (Gela et al., 2024; Pan et al., 2019). Within dialysis and transplant centers, nephrology social workers (NSWs) are well positioned to conduct mental health screening and psychosocial assessments and could incorporate brief, standardized screening tools for sleep quality and pain into routine evaluations; licensed clinical social workers (LCSWs) may also be trained to deliver psychotherapeutic interventions targeting pain coping and sleep disturbance. Physical therapy, behavioral sleep interventions, and access to psychological support

services should be considered integral parts of dialysis and kidney transplant follow-up (Diaz et al., 2021; Gela et al., 2024; Natale et al., 2019).

Our study is limited by its small sample size and cross-sectional design. While the correlations identified are statistically significant, causality cannot be established and the findings should be interpreted as hypothesis-generating. Larger, longitudinal, and interventional studies are needed to evaluate these associations over time and determine whether targeted interventions can improve pain, sleep quality, and related psychological outcomes in this population. In addition, the lack of observed associations between pain severity and socioeconomic variables, such as income and employment may reflect limited variability in these factors within our cohort, reducing statistical power to detect such relationships.

CONCLUSION

Musculoskeletal (MSK) pain remains a significant, underappreciated burden in patients with ESKD, regardless of whether they remain on dialysis or had kidney transplants. In our urban population, pain was closely associated with poor sleep, impaired physical function, and symptoms of depression. These findings underscore the need for comprehensive, integrated approaches that address chronic pain, sleep disturbances, and mental health concurrently. Routine screening for MSK pain and sleep quality may help identify patients at risk. Our findings suggest potential multidisciplinary implications for dialysis and transplant care teams, including collaboration with physical therapy, behavioral health, and other supportive services, to address pain and sleep disturbances.

For social workers in nephrology settings (NSWs), these findings highlight the importance of holistic care. Beyond managing access to dialysis and transplant resources, nephrology social workers can advocate for pain management resources, coordinate behavioral health referrals, and help patients navigate sleep hygiene education or therapy. Addressing these often-overlooked symptoms may meaningfully enhance quality of life and promote better long-term outcomes for people living with ESKD. Structural demands that prioritize administrative responsibilities over direct patient care may limit social workers' ability to engage fully in pain and sleep-related screenings and interventions, highlighting a broader opportunity within dialysis and transplant systems to support more patient-centered psychosocial care.

Author Note: *Tasneem Ibrahim and Sarah Elhage contributed equally to this work and share first authorship.*

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Table 1. Survey Item Components

Domain	Survey Item (occurred past 2 weeks unless stated)
Daytime pain	Severity of joint/muscle pain or stiffness during the day
Nighttime pain	Severity of joint/muscle pain or stiffness during the night
Walking	Interference with ability to walk
Self-care	Interference with washing or dressing
Physical activity	Difficulty doing desired activities (e.g., walking, jogging)
Work/routine	Interference with work or daily household tasks
Social/hobbies	Interference with social activities or hobbies
Help from others	Frequency of needing help from family, friends, or carers
Sleep	Trouble falling or staying asleep due to symptoms
Fatigue	Level of fatigue or low energy
Mood	Feeling anxious or low in mood due to symptoms
Understanding	Understanding of condition and treatments
Self-management	Confidence in managing symptoms independently
Overall bother	Overall bother from joint or muscle symptoms
Physical activity (past week)	Number of days with ≥ 30 minutes of heart-raising activity (e.g., sport, brisk walking, cycling; not housework/job tasks)

Adapted from Ware et al 1996

Table 2.

Table 2. Sociodemographic and Clinical Characteristics of Study Participants (N = 46)	n (%) or mean $\pm$ SD
Age, years	61.3 $\pm$ 10.0
Female sex	26 (56.5)
Male sex	20 (43.5)
Kidney replacement therapy	
• Hemodialysis	22 (47.8)
• Kidney transplant recipient (KTR)	24 (52.2)
Race/Ethnicity	
• Black/African American	34 (73.9)
• Other race/ethnicity*	12 (26.1)
Annual household income	
• < \$20,000	25 (54.3)
• $\geq$ \$20,000	21 (45.7)
Employment status	
• Unemployed/disability benefits	33 (71.7)
• Employed/other	13 (28.3)

*Includes all participants who did not self-identify as Black/African American.