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# Prevalence and Associated Risk Factors of Restless Legs Syndrome in Iraqi Hemodialysis Patients: A Cross-Sectional Study

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**ABSTRACT**

**Background:** In patients receiving hemodialysis, restless legs syndrome (RLS) is an underrecognized comorbidity that significantly reduces sleep quality and treatment compliance. **Objectives:** The purpose of this study was to assess the prevalence of RLS, risk factors, and implications for nursing care among hemodialysis patients in An Nasiriyah, Iraq. **Methods:** A cross-sectional study utilizing the International Restless Legs Syndrome Study Group's (IRLSSG) standardized criteria, involving 199 hemodialysis patients from January 2024 to March 2025. Participants were categorized into an RLS group (n=76) and a control group (n=123) based on the IRLSSG criteria. Demographic and clinical characteristics, along with laboratory data, were acquired via interviews and medical records. Statistical analysis employed SPSS version 26, considering *p*-values under 0.05 as significant. **Results:** RLS prevalence was 38.2% (95% CI: 31.4–45.4%). Multivariate regression identified age, hypertension, smoking (Odds Ratio = 2.98, $p = 0.038$), and longer ESRD duration as independent predictors of RLS. Furthermore, 81.6% of patients with RLS reported significant sleep disturbances, with 31.6% indicating extremely severe disruption. **Conclusion:** The prevalence of RLS among Iraqi hemodialysis patients is significantly high and is associated with poor sleep quality. Nursing-led screening and the application of non-pharmacological interventions may improve symptom management and overall outcomes.

***Keywords: Hemodialysis; Nursing Assessment; Patient-Centered Care; Restless Legs Syndrome; Symptom Management***

## INTRODUCTION

Restless Legs Syndrome (RLS), also known as Willis-Ekbom disease, is a neurological sensorimotor disorder marked by an overwhelming urge to move the limbs, frequently associated with discomfort, especially during periods of rest and in the evening (Alabdulqader *et al*., 2025; Mathur *et al*., 2025; Xu *et al*., 2025). RLS significantly impacts individuals undergoing maintenance hemodialysis, leading to difficulties in sleep, a reduction in quality of life, and challenges in adhering to their dialysis regimens (Giannaki *et al*., 2017; Xu *et al*., 2023). RLS holds significant importance in the medical field, yet it frequently goes unrecognized or is inadequately addressed. This complicates the responsibilities of nurses, as they must address both physical and mental health challenges (Gossard *et al*., 2021).

The prevalence of RLS varies substantially across different populations and geographic regions (Song *et al*., 2024). Studies of the general population from the last three years report a range of 11.2% to 26.6% (Al-Hunaiti *et al*., 2024; AlShareef, 2023). This variation highlights a notable gap in data for Iraq. A study in Mosul found that 28.72% of hemodialysis patients had RLS, which is a high rate (Mahmood *et al*., 2023). However, a nationwide study has not yet followed this finding to assess the prevalence and associated risk factors throughout the entire country. In Iraq, various genetic, nutritional, environmental, and clinical factors could influence the diverse RLS profile among the HD population. Therefore, understanding these local traits is

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crucial for developing nurse-led interventions that achieve patient-centered outcomes.

This cross-sectional study aimed to assess the prevalence of RLS and to identify clinical and demographic risk factors among hemodialysis patients in An Nasiriyah, Iraq. The study offers critical information to guide nurse evaluations, non-pharmacological therapies, and approaches to alleviate patient suffering within this susceptible demographic.

## METHODOLOGY

### Study design and setting

A descriptive cross-sectional study was carried out at the Hemodialysis Center of Al Hussain Teaching Hospital, Iraq, between January 2024 and March 2025. The sample size was calculated for a finite population. With an estimated 400 active hemodialysis patients (N), a 95% confidence level (Z=1.96), a 5% margin of error (e=0.05), and a conservative expected proportion of 0.5 (*p*), the minimum required sample was 197. A consecutive sampling method was employed throughout the study period (Dhand & Khatkar, 2025).

*Inclusion criteria* were (1) adults aged ≥18 years and (2) on maintenance hemodialysis for >3 months. Exclusion criteria were (1) acute kidney injury, (2) critical illness, or (3) significant cognitive impairment or dementia. Patients who were unwilling to participate were also excluded. A total of 199 patients provided informed consent and were enrolled, meeting the required sample size.

### Data Collection and Procedures

Data collection was incorporated into clinical care to reduce patient burden. Dialysis nurses with specialized training performed face-to-face interviews during standard hemodialysis sessions utilizing a structured questionnaire. RLS was assessed utilizing the 12 diagnostic criteria established by the International Restless Legs Syndrome Study Group (IRLSSG) (Broström *et al*., 2023). Severity items evaluated symptom frequency, intensity, and impact on sleep, daily activities, and mood using a 5-point Likert scale (0 = none to 4 = very severe). Clinical characteristics and paraclinical parameters were gathered using a standardized questionnaire under supervision. This patient-centered approach aligned gathering data with dialysis schedules and standard nursing assessments.

### Statistical Analyses

In this study SPSS software version 26 has been used (IBM Corporation, USA) to do the statistical analysis. Percentages and frequencies were used to show categorical variables. The Kolmogorov-Smirnov test was utilized to evaluate the normality of continuous variables. The independent samples t-test was used to compare variables that were normally distributed (such as age and hemoglobin). The results are shown as the mean ± SD. The Mann-Whitney U test was used to evaluate variables that do not follow a normal distribution (e.g., duration of ESRD). The results are shown as median [IQR]. The authors performed binary logistic regression analysis to look at how the paraclinical features were related to the evaluated patients.

### Ethical Considerations

The study received ethical approval from the Ethics Committee of the Faculty of Nursing at Thi-Qar University, Iraq with reference number 441-3 on 4th January, 2024.

## RESULTS

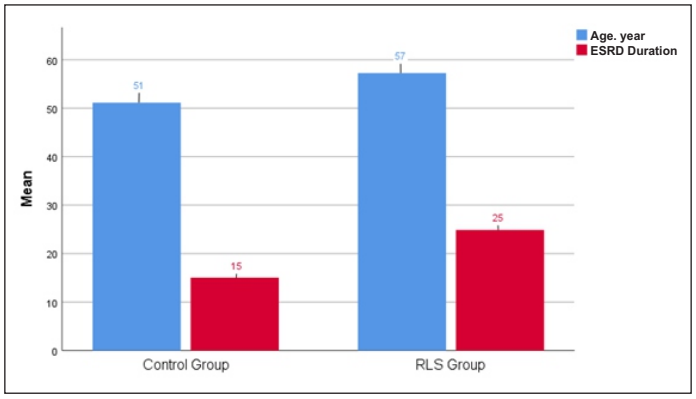
A total of 199 hemodialysis patients were included in the study, with 76 (38.2)%, 95% CI: (31.4% to 45.4%) meeting the diagnostic criteria for RLS. No participants displayed symptoms of RLS before the onset of ESRD or the initiation of hemodialysis.

***Table 1: Clinical and Demographic Characteristics of the Study Participants***

| Variables | RLS Group (n=76) | Control Group (n=123) | P-Value |
|---|---|---|---|
| Age, years, (mean ± SD) | 57.2 ± 14.2 | 51.1 ± 16.6 | 0.009 |
| Duration of ESRD (month), Median [IQR] | 24.0 [12.0, 33.0] | 7.0 [3.0, 12.0] | <0.001 |
| Duration of hemodialysis (month), (mean ± SD) | 8.3 ± 1.8 | 8.5 ± 2.2 | 0.510 |
| Male, n (%) | 43 (56.6) | 80 (65.0) | 0.233 |
| Smoking status, n (%) | 10 (13.2) | 9 (7.3) | 0.173 |
| Hypertension, n (%) | 67 (88.2) | 92 (74.8) | 0.022 |
| Cerebrovascular disease, n (%) | 18 (23.7) | 18 (14.6) | 0.107 |
| Cardiovascular diseases, n (%) | 27 (35.5) | 31 (25.2) | 0.119 |

*Note: RLS: Restless Legs Syndrome; ESRD: End-Stage Renal Disease; IQR: Interquartile Range Data Are Presented As Mean ± SD Median [IQR]: Or N (%).*

The clinical and demographic characteristics of the study participants are presented in Table 1. Patients with RLS demonstrated a significantly older age (57.24 ± 14.29 vs. 51.14 ± 16.61, $p$ = 0.009) and longer duration of ESRD (24.0 [12.0, 33.0] vs. 7.0 [3.0, 12.0], $p$<0.001) compared to controls ($p$< 0.01). Patients with RLS demonstrated a significantly higher prevalence of hypertension (88.2% vs. 74.8%, $p$= 0.022). Although smoking prevalence was higher in the RLS group (13.2% vs. 7.3%), this difference did not reach statistical significance ($p$= 0.173). There were no significant differences observed in sex distribution, cardiovascular comorbidities, or hemodialysis duration between the groups (Table 1, Figure 1).




*Error Bars Represent Standard Deviation (Age) and Interquartile Range (ESRD duration)*

***Figure 1: Comparison of Mean Age and Median ESRD Duration between Control Group and RLS Group***

***Table 2: Severity of RLS Symptoms and Key Patient-Reported Outcomes***

| Variables | Level | RLS Group (n=76) | Control Group (n=123) | *P*-value |
|---|---|---|---|---|
| Overall, how would you rate the RLS discomfort in your legs or arms? | Severe /Very severe | 60 (78.9%) | 5 (4.1%) | <0.001 |
| Overall, how severe is your sleep disturbance from your RLS symptoms? | Severe /Very severe | 62 (81.6%) | 7 (5.7%) | <0.001 |
| How severe is the impact of your RLS symptoms on your ability to carry out daily affairs? | Severe /Very severe | 54 (71.1%) | 9 (7.3%) | <0.001 |
| How severe are your RLS symptoms on mood disturbance? | Severe /Very severe | 47 (61.8%) | 8 (6.5%) | <0.001 |
| How often do you get RLS symptoms? | Severe /Very severe | 57 (75.0%) | 5 (4.1%) | <0.001 |
| How severe is your tiredness or sleepiness from your RLS symptoms? | Severe /Very severe | 63 (82.9%) | 6 (4.9%) | <0.001 |
| Overall, how severe is your RLS as a whole? | Severe /Very severe | 58 (76.4%) | 2 (1.6%) | <0.001 |

*Note: RLS: Restless Leg Syndrome; Severity was rated on a 5-point Likert scale (0 = none, 1 = mild, 2 = moderate, 3 = severe, 4 = very severe). "Severe/Very severe" represents combined scores of 3 and 4. Items were adapted from the IRLSSG severity scale; For this item, "Severe or Very Severe" corresponds to experiencing symptoms for 3 or more hours per 24-hour day.*

Table 2 represents the severity of RLS symptoms and their impact on patient-reported outcomes. A significant proportion of patients diagnosed with RLS displayed moderate to severe symptoms. More than 80% of patients reported significant sleep disturbances, and over 70% indicated that these disturbances affected their daily activities and mood (Table 2 and Figure 2).

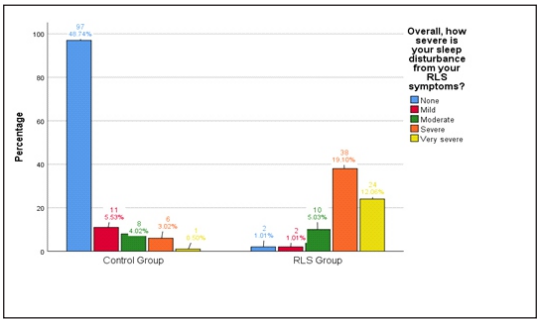



***Figure 2: Distribution of sleep disturbance severity among hemodialysis patients with RLS (n=76)***

Categories: mild (1-2 hours/day), moderate (2-3 hours/day), severe (3-4 hours/day), very severe (>4 hours/day)

***Table 3: Paraclinical Characteristics of the Study Participants***

| Variables | RLS Group (n=76) | Control Group (n=123) | *P*-value |
|---|---|---|---|
| | Mean ± SD | Mean ± SD | |
| Hemoglobin (g/dL) | 8.5 ± 1.2 | 8.7 ± 1.3 | 0.360 |
| Calcium (mg/dL) | 7.6 ± 1.8 | 8.2 ± 1.4 | 0.132 |
| Potassium (mmol/L) | 5.4 ± 1.1 | 5.3 ± 1.0 | 0.746 |
| Sodium (mEq/L) | 140.1 ± 6.64 | 139.3 ± 6.5 | 0.713 |
| Serum creatinine (mg/dL) | 7.5 ± 3.2 | 6.6± 3.0 | 0.115 |
| Blood urea nitrogen (mg/dL) | 121.3 ± 41.7 | 114.1 ± 36.2 | 0.292 |

*Note: RLS: Restless Legs Syndrome; SD: Standard Deviation; G/Dl: Grams Per Deciliter; Mg/Dl: Milligrams Per Deciliter; Meq/L: Milliequivalents Per Liter; Mmol/L: Millimoles Per Liter.*

Paraclinical findings revealed no significant differences in hemoglobin, calcium, sodium, creatinine, or urea levels among the groups (Table 3).

***Table 4: Binary Logistic Regression analysis of Comorbidities Predictors for RLS***

| Predictor | B (Coefficient) | S.E. | *P*-value | Adjusted OR (Exp(B)) | 95% CI for OR |
|---|---|---|---|---|---|
| Age, years | 0.028 | 0.010 | 0.009 | 1.028 | 1.007–1.049 |
| Gender | 0.472 | 0.326 | 0.147 | 1.604 | 0.847–3.037 |
| Hypertension | 0.990 | 0.447 | 0.027 | 2.691 | 1.121–6.464 |
| Smoking status | 1.091 | 0.526 | 0.038 | 2.979 | 1.063–8.347 |
| Duration of ESRD | 0.019 | 0.007 | 0.007 | 1.019 | 1.005–1.034 |

Note: *RLS: Restless Legs Syndrome; ESRD: End-Stage Renal Disease; B: Regression Coefficient; S.E: Standard Error; OR: Odds Ratio; CI: Confidence Interval.*

Multivariate Logistic regression analysis demonstrated that age (OR = 1.028, 95% CI: 1.007–1.049, $p$ = 0.009), hypertension (OR = 2.691, 95% CI: 1.121–6.464, $p$ = 0.027), smoking (OR = 2.979, 95% CI: 1.063–8.347, $p$ = 0.038), and longer duration of ESRD (OR = 1.019, 95% CI: 1.005–1.034, $p$= 0.007) were independent predictors of RLS (Table 4). The model explained 16.6% of the variance in RLS status (Nagelkerke $R^2$ = 0.166). The Hosmer–Leme show goodness-of-fit test yielded significant results ($\chi^2$ = 20.803, $df$ = 8, $p$ = 0.008), suggesting a suboptimal fit of the model. The chosen variables may not fully capture the factors affecting the RLS group, or the relationships may be more intricate than the model suggests.

In contrast, the paraclinical model including hemoglobin, calcium, potassium, and sodium showed no significant predictors of RLS (all $p > 0.05$), though the model demonstrated good fit (Hosmer–Lemeshow: $\chi^2$ = 4.809, $df$ = 7, $p$ = 0.683) and explained 57.3% of the variance (Nagelkerke $R^2$ = 0.573) (Table 5).

***Table 5: Binary Logistic Regression Analysis of Paraclinical Characteristics Predictors for RLS***

| Predictor | B (Coefficient) | S.E. | *P*-value | Adjusted OR Exp (B) | 95% CI for OR |
|---|---|---|---|---|---|
| Hemoglobin (g/dL) | -1.308 | 0.963 | 0.174 | 0.270 | 0.041–1.783 |
| Calcium (mg/dL) | -2.167 | 1.360 | 0.111 | 0.115 | 0.008–1.645 |
| Potassium (mmol/L) | 0.403 | 0.898 | 0.654 | 1.496 | 0.257–8.694 |
| Sodium (mEq/L) | -0.191 | 0.183 | 0.296 | 0.826 | 0.578–1.182 |

*Note: None of the predictors reached statistical significance (p > 0.05) ;* RLS: *Restless Legs Syndrome; B: Regression Coefficient; S.E.: Standard Error; OR: Odds Ratio; CI: Confidence Interval; Meq/L: Milliequivalents Per Liter; Mmol/L: Millimoles Per Liter; Mg/Dl: Milligrams Per Deciliter; G/Dl: Grams Per Deciliter.*

## DISCUSSION

This study found a 38.2% prevalence of RLS among Iraqi hemodialysis patients, aligning with the 20–60% range reported in prior studies (Song *et al*., 2024; Zadeh Saraji *et al*., 2016) but exceeding the local rate of 17.3%. Global prevalence estimates vary, likely due to differences in RLS diagnostic criteria (Castillo-Torres *et al*., 2018). The 38.2% RLS prevalence—double Iraq's MS-patient rate (Al-Hussainy & Hatem, 2018)—reveals critical underscreening by dialysis teams. Nurse-administered tools (e.g., IRLSSG criteria) could improve detection.

The findings of the current study indicated that increasing age was a significant independent predictor of RLS (OR = 1.028, 95% CI: 1.007–1.049, $p$ = 0.009). This observation aligns with previous findings that suggest a higher prevalence of RLS in older populations (Özkök *et al*., 2022; Szklarek *et al*., 2024). While the findings support the established pattern (Gossard *et al*., 2021), the significant strength of the association observed in the Iraqi cohort suggests that the interplay of aging and the difficulties related to ESRD creates a notably vulnerable demographic. This highlights an important factor for nursing practice in the local setting. Therefore, the authors firmly support the need for prioritizing RLS screening among older patients by nurses in Iraqi dialysis units, particularly for those experiencing insomnia, as they constitute a high-risk subgroup that has been overlooked in the past.

The results of this investigation revealed that hypertension was a notably prevalent (88.2%) and significant independent risk factor for RLS, with an odds ratio (OR = 2.69, 95% CI: 1.121–6.464, $p$ = 0.027); this association was significantly higher than what is typically reported (OR = 1.60–2.27) (Guo *et al*., 2022; Hein *et al*., 2019; Sunwoo *et al*., 2019). This increased risk highlights a significant comorbidity in Iraq, where effectively managing hypertension presents a considerable challenge. According to literature, fundamental pathophysiology likely involves shared autonomic dysfunction and elevations in nocturnal blood pressure resulting from periodic limb movements (Cassel *et al*., 2016; Mansukhani *et al*., 2019). Consequently, it is recommended for the adoption of a combination nursing approach: (1) Performing routine RLS screenings for hypertensive dialysis patients and (2) Enhancing the frequency of blood pressure monitoring—particularly during nighttime and throughout dialysis sessions—for patients diagnosed with RLS.

The findings from the study reveal a significant impact of sleep disruption linked to RLS, with 81.6% of participants experiencing severe disturbances and almost one-third (31.6%) reporting very severe symptoms. This strengthens the recognized connection between RLS and impaired sleep (Cederberg *et al*., 2020; Chenini *et al*., 2025). The significant prevalence and severity observed in the cohort, highlight a critical, unmet need in hemodialysis care in Iraq, which directly impacts dialysis tolerance and overall quality of life (Xu *et al*., 2022). Consequently, it is essential for the management of RLS to highlight the importance of ensuring quality sleep (Kubasch *et al*., 2025). In settings with limited resources like ours, it is essential to incorporate practical, nurse-led non-pharmacological interventions—such as guided leg massage and sleep hygiene education—as a core element of standard care (Angelina *et al*., 2024; Cho *et al*., 2022).

In the study, smoking emerged as a significant independent predictor of RLS, with an odds ratio of (OR = 2.98, 95% CI: 1.063–8.347, $p$= 0.038). This observation aligns with the current body of literature that illustrates a connection between smoking and the severity of RLS, even among patients with ESRD (Güler *et al*., 2021). Identifying smoking as a modifiable risk factor in Iraqi dialysis patients transforms it from a general health concern to a specific, actionable target for RLS management. The mechanisms may include the impact of

nicotine on dopaminergic pathways and peripheral circulation. The author support the integration of structured, nurse-led smoking cessation programs into dialysis care protocols in Iraq, especially as a strategy to reduce RLS symptoms and improve sleep quality, which may encourage increased patient engagement.

The results of the cohort study demonstrate that a prolonged duration of ESRD serves as a notable predictor of RLS (OR = 1.019, 95% CI: 1.005–1.034, $p = 0.007$). This supports the notion that RLS is a common neurological complication associated with chronic kidney disease (Hadia *et al*., 2024; Hamed *et al*., 2023). This connection indicates that continuous exposure to uremic toxins, sustained inflammation, and the progression of neuropathy may contribute to the development or exacerbation of RLS symptoms over time. Consequently, RLS should be regarded not as a static comorbidity but as a condition whose risk increases with the duration of renal failure. This holds considerable importance for nursing surveillance: the authors propose incorporating RLS screening as a routine, continuous assessment—such as every 6 months—throughout a patient's dialysis experience, rather than conducting a one-time evaluation at the initiation of dialysis.

The regression model for comorbidities demonstrated inadequate fit (Hosmer–Lemeshow $p = 0.008$), suggesting that these variables only partially clarify the prevalence of RLS. Unmeasured variables, like iron deficiency, neuropathy, and substance use, may also influence the outcomes.

Given the significant prevalence, the considerable impact on sleep, and the presence of modifiable risk factors highlighted in the research, the authors strongly recommend incorporating evidence-based RLS screening and nurse-led non-pharmacological interventions into routine hemodialysis care in Iraq. This approach should commence with standard admission screening utilizing IRLSSG criteria, succeeded by continuous evaluation and the application of practical interventions, including therapeutic leg massage, guided exercises, and sleep hygiene education. Furthermore, nursing documentation systems should be modified to encompass RLS status, and staff should undergo competency-based training in symptom management.

### Limitations

It is essential to acknowledge several limitations. The sample size (N=199) may limit statistical power for subgroup analyses. The cross-sectional design restricts the ability to establish causal relationships. Important variables such as iron/ferritin levels, dialysis adequacy (Kt/V), neuropathy, and medication use were not examined due to the inaccessibility of the data. Their absence may have negatively impacted the model's fit. Finally, the single-center design limits its applicability to other contexts.

## CONCLUSION

This study found a notable prevalence of RLS in Iraqi hemodialysis patients, emphasizing its insufficient recognition in conventional nursing practice. Advanced age, hypertension, smoking, and extended duration of ESRD emerged as significant predictors. Nurse-led screening and non-pharmacological interventions, including leg massage, stretching, and sleep hygiene education, may represent effective strategies for improving patient comfort and treatment adherence in resource-limited settings. Therefore, future interventional and longitudinal studies are necessary to investigate causal relationships and assess the effectiveness of structured nurse-led strategies in enhancing sleep quality and quality of life in hemodialysis patients. Future studies should focus on longitudinal and interventional approaches to determine causal relationships and evaluate the impact of nurse-led protocols on patient-centered outcomes, including sleep quality, dialysis adherence, and quality of life, particularly in resource-limited settings. To improve generalizability and confirm prevalence rates, it is crucial to conduct multicenter studies across different regions of Iraq.

### Conflict of Interest

The authors declare that they have no competing interests.

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