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Sleep Quality and Health-Related Quality of Life in Hemodialysis Patients With and Without Restless Legs Syndrome

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ABSTRACT

Introduction. Restless legs syndrome (RLS) is a frequent complication in people with chronic kidney disease (CKD), especially in maintenance hemodialysis. Its frequency among hemodialysis patients is far above that of the general population, with estimates spanning widely from 5%-70%. For patients on long-term dialysis, RLS can disrupt sleep and lower quality of life. This study aimed to contrast sleep quality and health-related quality of life (HRQOL) between maintenance hemodialysis patients who have RLS and those who do not. **Methods**. A cross-sectional design was applied to patients on maintenance hemodialysis. RLS status was established using the diagnostic criteria of the International Restless Legs Syndrome Study Group (IRLSSG). Sleep quality was measured with the Pittsburgh Sleep Quality Index (PSQI) and health-related quality of life with the Kidney Disease Quality of Life-36 (KDQOL-36). **Results**. Among 61 participants, 31% fulfilled the criteria for RLS. In exploratory unadjusted comparisons, the two groups differed in age, proportion with type 2 diabetes mellitus, and serum potassium. Patients with RLS slept significantly worse, with a median global PSQI score of 9 (IQR 6–10.5) against 4.5 (IQR 2.25–7) in those without RLS ($p<0.001$). KDQOL-36 scores were likewise significantly lower in the RLS group on the symptom/problem list (73.35 vs 84.27; $p=0.011$), effects of kidney disease (61.35 vs 74.70; $p=0.009$), and burden of kidney disease (24.34 vs 41.51; $p=0.002$). **Conclusion**. RLS was frequent in maintenance hemodialysis patients. Those with RLS slept worse and reported lower HRQOL across several kidney disease–specific domains than those without it.

1. Introduction

Chronic kidney disease (CKD) is a leading global public health problem, marked by a gradual decline in kidney function and considerable illness and death. Many patients who reach end-stage renal disease (ESRD) need renal replacement therapy, and maintenance hemodialysis (HD) is the most common form. Although HD sustains life, it places considerable physiological strain on the body and brings numerous complications that erode well-being, among them metabolic disturbances, cardiovascular disease, fatigue, and various sleep and neurological problems.[1,2]

RLS, also known as Willis–Ekbom disease, is a sensorimotor neurological condition defined by an overwhelming need to move the legs, usually with uncomfortable or abnormal sensations. Symptoms characteristically start or intensify at rest, peak in the evening or at night, and ease at least partly with movement.[3,4] The IRLSSG criteria serve as the standard diagnostic approach in both clinical and research practice.[3] RLS occurs in the general population too, but it is considerably more common in CKD, particularly among patients on maintenance hemodialysis. Prevalence figures reported for dialysis populations vary greatly, from roughly 5% to 70%, a spread that probably reflects differences in patient profiles, diagnostic methods, and geographic settings. Newer systematic reviews put the figure at about one quarter to one third of maintenance hemodialysis patients, which confirms that RLS remains a relevant clinical issue in this group.[5,6] An earlier study in the hemodialysis unit of Adam Malik Hospital likewise found that over 30% of dialysis patients met RLS criteria.[7]

The pathophysiology of RLS in CKD is intricate and probably involves several mechanisms acting together. The best-supported ones are low iron availability in the brain, impaired iron transport across the blood–brain barrier, and abnormal dopaminergic signaling in the central nervous system, as shown by neuropathological and neuroimaging work.[8,9] Other possible contributors include accumulation of uremic toxins, ongoing systemic inflammation, disturbed mineral and bone metabolism, electrolyte imbalances, and dialysis-

related changes such as intradialytic hypotension, fluid shifts, and rapid changes in solute concentrations.[10,11] Genetic predisposition and coexisting conditions such as diabetes mellitus and peripheral neuropathy may further shape individual risk.[9]

Among hemodialysis patients, RLS typically appears as an uncomfortable urge to move the legs, especially at night or while resting. It can occur together with periodic limb movements in sleep and repeated awakenings. The resulting problems include heavy daytime sleepiness, fatigue, poor concentration, mood changes, and a reduced capacity for everyday activities. In CKD, poor sleep and impaired health-related quality of life (HRQOL) have been linked to adverse outcomes such as cardiovascular events and poorer treatment adherence.[12,13] Earlier research has also shown that hemodialysis patients with RLS report worse HRQOL and a heavier perceived burden of kidney disease than those without RLS.[14,15] Even though RLS is common and can interfere with daily functioning, it is still often overlooked in routine nephrology care. Variable prevalence estimates, scarce epidemiological data from local populations, and the lack of consistent screening practices may all delay recognition and treatment. Validated, standardized instruments can make diagnosis more consistent and allow results to be compared across studies. For this reason, we identified RLS with the IRLSSG criteria, assessed subjective sleep quality with the Pittsburgh Sleep Quality Index (PSQI), and evaluated HRQOL with the Kidney Disease Quality of Life-36 (KDQOL-36) questionnaire.[3,13]

Because RLS may affect sleep and quality of life in maintenance hemodialysis patients, its clinical consequences deserve closer examination. Earlier work at Adam Malik Hospital described how common RLS is among hemodialysis patients, but its link with patient-reported outcomes, especially sleep quality and HRQOL, has not been adequately studied. We therefore conducted this study in the Hemodialysis Unit of Adam Malik Hospital, Medan, to add evidence on these outcomes. Its aims were to establish the prevalence of RLS in maintenance hemodialysis patients, to compare clinical and laboratory characteristics of patients with and without RLS, and to assess group differences in sleep quality and HRQOL using the PSQI and KDQOL-36.

2. Methods

This analytical cross-sectional study took place in the Hemodialysis Unit of Adam Malik Hospital, Medan, Indonesia, from May to June 2025. Adults on maintenance hemodialysis were recruited consecutively over this period. Eligible patients were aged 18 years or older, had a CKD diagnosis, had received maintenance hemodialysis for at least three months, and were willing and able to give written informed consent. Patients were excluded if they had a primary neurological disorder other than RLS (for instance Parkinson's disease), an active psychiatric illness that prevented reliable completion of the questionnaires, an acute severe illness at recruitment, or could not communicate in Indonesian well enough for the instruments to be administered accurately. No formal sample size calculation was done beforehand; the sample consisted of all eligible, consenting patients available during the study period. In total, 61 participants were analyzed.

RLS was diagnosed with the five essential IRLSSG diagnostic criteria as revised in 2014, and all five had to be met.3 Possible RLS mimics, namely peripheral neuropathy, muscle cramps, musculoskeletal disorders, and other causes of leg discomfort, were looked for through clinical history and interview and ruled out before a patient was classified as having RLS.

Sleep quality was measured with the Pittsburgh Sleep Quality Index (PSQI), a validated self-report questionnaire covering seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. These combine into a global score, and a value above 5 denotes poor sleep quality.[13] We used the Indonesian PSQI, which earlier Indonesian research found to have acceptable validity and reliability, with Cronbach's alpha between 0.649 and 0.854 across components and an overall internal consistency of 0.909.[16]

Kidney-specific HRQOL was assessed with the Kidney Disease Quality of Life-36 (KDQOL-36). Besides the generic 12-item Short Form (SF-12) health survey, it contains kidney-specific domains: symptoms/problems, effects of kidney disease, and burden of kidney disease. Domain and composite scores followed the standard scoring guidelines and were transformed to a 0–100 scale, where higher values indicate better HRQOL. The Indonesian KDQOL-36 has been formally translated and validated in maintenance hemodialysis patients, showing good construct validity and internal consistency, with Cronbach's alpha from 0.706 to 0.886 across domains.[17] Demographic and clinical information came from patient interviews and medical records and covered age, sex, duration of dialysis, comorbidities (mainly diabetes mellitus and hypertension), and dialysis prescription (session frequency and length). Laboratory values taken from the latest routine blood tests were hemoglobin, serum ferritin, serum iron, blood urea nitrogen (BUN), creatinine, sodium, potassium, calcium, and phosphate, all recorded within one month of the questionnaire. These tests were part of routine care, and the timing of sampling relative to dialysis sessions and interdialytic periods was not standardized. Laboratory results, serum potassium in particular, were therefore treated as exploratory findings and not as independent determinants of RLS.

Trained investigators conducted face-to-face

interviews to administer the IRLSSG diagnostic questions, the PSQI, and the KDQOL-36 just before the scheduled hemodialysis session. Every participant was assessed in the pre-dialysis period with the same standardized timing, which limited variation from dialysis timing and intradialytic physiological changes. Laboratory data were retrieved from medical records within one month of the interview. Data were anonymized before analysis to protect participants' privacy. The Health Research Ethics Committee of Universitas Sumatera Utara reviewed and approved the protocol (Approval No. 412/KEPK/USU/2025, May 22, 2025). The study followed the ethical principles of the Declaration of Helsinki, and all participants gave written informed consent before enrollment.

Data were entered and analyzed in IBM SPSS Statistics for Windows, version 26 (IBM Corp., Armonk, NY). Baseline characteristics were summarized descriptively. The Shapiro–Wilk test checked the distribution of continuous variables. Normally distributed variables were reported as mean ± standard deviation (SD) and compared with the independent-samples t-test, whereas non-normally distributed variables were reported as median (interquartile range [IQR]) and compared with the Mann–Whitney U test. Categorical variables were compared with the chi-square test or Fisher's exact test, as appropriate.

The primary outcomes were the differences between participants with and without RLS in the global PSQI score (sleep quality) and the KDQOL-36 domain scores (HRQOL). The prespecified primary KDQOL-36 outcomes were the kidney disease–specific domains: symptom/problem list, effects of kidney disease, and burden of kidney disease. The SF-12 physical and mental composite scores were treated as exploratory outcomes, as were all other demographic, clinical, and laboratory comparisons. For continuous outcomes, effect sizes were expressed as mean differences with 95% confidence intervals (CI). A two-sided p-value below 0.05 indicated statistical significance. Since the secondary analyses were exploratory and involved multiple comparisons, their results were interpreted with caution.

3. Results

Sixty-one CKD patients on regular hemodialysis were enrolled, of whom 19 (31%) met the diagnostic criteria for restless legs syndrome (RLS) and 42 (69%) did not. Overall mean age was 51.05 ± 11.6 years, and patients with RLS were significantly older than those without (54.84 ± 8.30 vs 49.33 ± 12.51 years, p = 0.048). Body mass index (BMI) did not differ significantly between groups (22.66 ± 3.98 vs 22.96 ± 3.26; p = 0.754), nor did sex distribution (p = 0.403). Hemodialysis duration, grouped as <12, 12–60, and >60 months, was not significantly associated with RLS (p = 0.707). Type 2 diabetes mellitus (primary diagnosis) was more frequent in the RLS group, and the difference was statistically significant (p = 0.018).

Table 2 shows the routine laboratory results, covering hemoglobin, iron profile, renal function, and electrolytes. Hemoglobin and most iron parameters were similar in both groups. Median (IQR) ferritin tended to be lower in the RLS group than in the non-RLS group (563 [357–874.5] vs 925.5 [484–1315.3] µg/L; p=0.052). Renal function parameters did not differ significantly. BUN was lower in patients with RLS (59.42 ± 12.12 vs 67.66 ± 16.85 mg/dL; p=0.060). Of the electrolytes, serum potassium was higher in the RLS group (4.43 ± 0.48 vs 4.07 ± 0.66 mmol/L; p=0.043), and the others showed no significant differences.

The Pittsburgh Sleep Quality Index (PSQI) showed a significant difference between groups: the global score was higher in RLS patients than in non-RLS patients (median 9 [IQR 6–10.5] vs 4.5 [IQR 2.25–7]; p<0.001), meaning poorer sleep quality with RLS. PSQI component scores were not normally distributed and are therefore given as median (IQR). The groups differed significantly in subjective sleep quality, sleep duration, habitual sleep efficiency, use of sleep medication, and daytime dysfunction, but not in sleep latency or sleep disturbance scores.

Table 1. Demographic and clinical characteristics of the study sample

Variable	Total (n=61)	RLS (n=19)	Non-RLS (n=42)	p-value
Age (years), mean ± SD	51.05 ± 11.6	54.84 ± 8.30	49.33 ± 12.51	0.048
BMI (kg/m^2), mean ± SD	22.87 ± 3.48	22.66 ± 3.98	22.96 ± 3.26	0.754
Sex — male, n (%)	35 (57.4%)	9 (47.4%)	26 (61.9%)	0.403
Hemodialysis duration				0.707
<12 months, n (%)	21 (34.4%)	7 (36.8%)	14 (33.3%)	
12–60 months, n (%)	30 (49.2%)	10 (52.6%)	20 (47.6%)	
>60 months, n (%)	10 (16.4%)	2 (10.5%)	8 (19.0%)	
Type 2 DM, n (%)	21 (34.4%)	11 (57.9%)	10 (23.8%)	0.018
HT, n (%)	42 (68.9%)	11 (57.9%)	31 (73.8%)	0.243
GN, n (%)	1 (1.6%)	1 (5.3%)	0 (0%)	0.311

BMI: body mass index; RLS: restless legs syndrome; DM: diabetes mellitus; HT: hypertension; GN: glomerulonephritis. Categorical variables are shown as number (percentage), calculated within each group; continuous variables are shown as mean ± standard deviation.

Table 2. Laboratory indicators in RLS and non-RLS patients

Variable	RLS (n= 19)	Non-RLS (n= 42)	p-value
Hemoglobin (g/dL), mean ± SD	8.21 ± 1.41	8.29 ± 1.42	0.850
Ferritin (µg/L), median (IQR)	563 (357–874.5)	925.5 (484–1315.3)	0.052
Serum iron (µg/dL), median (IQR)	52 (41.5–73)	67.5 (49.8–92.5)	0.193
TIBC (µg/dL), mean ± SD	216.36 ± 37.01	222.33 ± 51.47	0.652
Creatinine (mg/dL), median (IQR)	10.2 (7.1–12.4)	9.8 (8.4–13.0)	0.815
BUN (mg/dL), mean ± SD	59.42 ± 12.12	67.66 ± 16.85	0.060
Sodium (mmol/L), mean ± SD	140.89 ± 4.47	140.35 ± 5.03	0.691
Potassium (mmol/L), mean ± SD	4.43 ± 0.48	4.07 ± 0.66	0.043
Calcium (mg/dL), median (IQR)	9.26 (8.8–9.7)	9.09 (8.7–9.6)	0.586
Phosphate (mg/dL), mean ± SD	6.82 ± 2.55	5.60 ± 1.72	0.156

RLS: restless legs syndrome; TIBC: total iron binding capacity; BUN: blood urea nitrogen. Data distribution was checked with the Shapiro–Wilk test

Table 3. PSQI Component Scores According to RLS Status

PSQI component	RLS Median (IQR)	Non-RLS Median (IQR)	p-value
Subjective sleep quality	2 (1.5–2)	1 (1–1)	0.001
Sleep latency	2 (1–3)	1 (1–2)	0.088
Sleep duration	2 (1–2.5)	1 (1–1)	0.007
Habitual sleep efficiency	1 (0–2)	0 (0–1)	0.005
Sleep disturbance	1 (1–1)	1 (1–1)	1.000
Use of sleep medication	0 (0–0)	0 (0–0)	0.002
Daytime dysfunction	1 (1–2)	0 (0–1)	<0.001
Total PSQI score	9 (6–10.5)	4.5 (2.25–7)	<0.001

PSQI: Pittsburgh sleep quality index; RLS: restless legs syndrome. Data distribution was checked with the Shapiro–Wilk test.

Table 4. KDQOL-36 domain scores by RLS status

KDQOL-36 domain	RLS (n=19) Mean ± SD	Non-RLS (n= 42) Mean ± SD	Mean Difference (95% CI)*	p-value
Symptom/problem list	73.35 ± 16.74	84.27 ± 13.16	-10.92 (-19.82 to -2.03)	0.011
Effect of kidney disease	61.35 ± 18.07	74.70 ± 16.47	-13.35 (-23.26 to -3.45)	0.009
Burden of kidney disease	24.34 ± 21.93	41.51 ± 17.61	-17.18 (-28.88 to -5.48)	0.002
SF-12 Physical Composite	36.65 ± 8.03	37.73 ± 8.45	-1.08 (-5.66 to 3.50)	0.580
SF-12 Mental Composite	49.09 ± 10.99	51.34 ± 10.94	-2.24 (-8.41 to 3.92)	0.459

RLS: Restless legs syndrome; KDQOL-36: Kidney Disease Quality of Life 36-Item Short Form Survey. *Mean difference calculated as RLS minus Non-RLS.

According to the KDQOL-36, health-related quality of life (HRQOL) was significantly worse in patients with RLS compared with those without RLS across several kidney disease–specific domains. Patients with RLS had significantly lower scores in the symptom/problem list domain (73.35 ± 16.74 vs. 84.27 ± 13.16; p = 0.011), effect of kidney disease domain (61.35 ± 18.07 vs. 74.70 ± 16.47; p = 0.009), and burden of kidney disease domain (24.34 ± 21.93 vs. 41.51 ± 17.61; p = 0.002). However, no statistically significant differences were observed between the two groups in the SF-12 physical composite score (36.65 ± 8.03 vs. 37.73 ± 8.45; p = 0.580) or mental composite score (49.09 ± 10.99 vs. 51.34 ± 10.94; p = 0.459).

4. Discussion

This study examined how common restless legs syndrome (RLS) is and how it relates to sleep quality and health-related quality of life (HRQOL) in maintenance hemodialysis patients. Nearly one third of participants had RLS, in line with earlier reports from dialysis populations. Those with RLS slept worse and had lower kidney disease–specific HRQOL than those without. These results underline RLS as a clinically meaningful symptom burden for maintenance hemodialysis patients.

The RLS prevalence in our cohort was similar to earlier hemodialysis studies, which usually report figures of 20% to 45%.[18,19] In the general population it is much lower (2–10%), which shows how heavily dialysis patients are affected.[20] Prevalence varies considerably with diagnostic method, country, sex, age, and comorbidity, making comparisons between studies difficult. Differences in health behaviors, genetic risk, disease awareness, and how the disease is perceived add further variation.[21] Older age and diabetes mellitus were more common in patients

with RLS, matching previous reports.[10,22] Neuropathy and vascular complications from diabetes may increase susceptibility to RLS symptoms; still, because no adjusted analyses were performed, these findings should be regarded as exploratory.

BMI did not differ significantly between groups, which agrees with several Asian studies that likewise found no significant BMI difference.[6,23] The situation in local hemodialysis patients may nevertheless differ because of the epidemiology and nutritional patterns of this population, and a full nutritional assessment with muscle mass measurement would be more informative than BMI alone.

Conventional iron parameters, namely ferritin and serum iron, did not differ significantly between groups here, although ferritin tended to be lower in the RLS group. This does not rule out a role for disturbed iron regulation in RLS, because serum ferritin mainly reflects total body iron stores and can be raised by inflammation in hemodialysis patients. A normal or high ferritin level therefore does not guarantee sufficient functional iron. Moreover, peripheral iron indices may not reflect iron availability in the central nervous system, which has been implicated in the mechanisms of RLS.[3]

Thus, the lack of significant differences in ferritin or serum iron does not exclude iron dysregulation in RLS. Brzuszek et al. and Turk et al. also found no significant differences in conventional iron parameters between patients with and without RLS.[24,25] Together, these findings imply that peripheral iron indices alone may not capture the complex relationship between iron metabolism and RLS in maintenance hemodialysis patients.[22,26] Future studies that include transferrin saturation, inflammatory markers, and treatment-related factors such as intravenous iron and erythropoiesis-stimulating agents could give a fuller picture.

Higher serum potassium was seen more often in patients with RLS in our study, but this should be interpreted with caution. Because of the cross-sectional design, the difference cannot establish a causal link between potassium and RLS symptoms. In addition, potassium values came from previously recorded routine tests and not from standardized measurements at the time of the questionnaires. Information on the timing of blood sampling relative to dialysis sessions and interdialytic intervals was not consistently available, which may have introduced measurement variability and bias. Potassium was also only one of several laboratory parameters in this exploratory analysis, so a chance finding from multiple comparisons is possible. The potassium difference should therefore be seen as hypothesis-generating and requires confirmation in future studies with standardized electrolyte measurement.

Earlier studies have mostly found no significant potassium differences between patients with and without RLS.[19,27,28] The discrepancy with our results may stem from differences in study populations, dialysis characteristics, and laboratory methods. Likewise, sodium, calcium, phosphate, urea, creatinine, and blood urea nitrogen (BUN) did not differ significantly between groups, as in previous studies.[6,19,27,28] These findings suggest that routine biochemical parameters alone are unlikely to explain RLS in maintenance hemodialysis patients.

Studies indicate that 73.5% to 88.5% of hemodialysis patients have sleep disorders, chiefly difficulty falling asleep (84.5%). Patients with RLS face a higher risk of insomnia and excessive daytime sleepiness, and RLS is itself a risk factor for poor sleep quality in kidney disease.[17] In this study, patients with RLS had significantly poorer sleep quality, shown by higher total PSQI scores than those without RLS (Median 9 (IQR 6–10.5) vs 4.5 (IQR 2.25–7), $p < 0.001$), along with worse results in five of the seven PSQI components: subjective sleep quality, sleep duration, habitual sleep efficiency, use of sleep medication, and daytime dysfunction. This agrees with earlier work linking RLS to trouble starting and maintaining sleep in dialysis patients.[13,27] Besides affecting daily life, disturbed sleep in RLS may raise cardiovascular risk, which matters because cardiovascular disease is still a leading cause of death among dialysis patients.[29]

The KDQOL-36 showed marked impairment in the symptom/problem, effects of kidney disease, and burden of kidney disease domains among RLS patients. This matches earlier reports that RLS lowers HRQOL by increasing disease burden, restricting daily activities, and worsening psychological stress.[10,21] Interestingly, the generic SF-12 physical and mental component scores did not differ between groups, which suggests that disease-specific measures detect RLS-related impairment in hemodialysis patients more sensitively.

Yaseen et al. found RLS to be associated with impairment in several HRQOL domains, but not in the physical component.[30] A possible explanation is that physical functioning is already reduced in patients with advanced CKD on maintenance hemodialysis, so physical component scores discriminate poorly between those with and without RLS. Our results are similar: SF-12 physical composite scores did not differ, whereas kidney disease–specific KDQOL-36 domains were significantly lower in RLS patients. Yilmaz et al. confirmed that depression and anxiety commonly accompany RLS in CKD patients.[31] Such variation across studies may arise from socio-cultural factors that influence mood and cause anxiety and depression in RLS patients, while CKD patients also tend to rely on coping strategies and social support that preserve their mental health.[32,33]

These results highlight the value of systematic RLS screening in maintenance hemodialysis patients, given its association in this study with poorer sleep quality and disease-specific quality of life. Identifying RLS can help clinicians find patients who need further assessment and individualized management. Possible approaches include correcting reversible contributors such as iron deficiency and other metabolic abnormalities, and using pharmacological RLS treatment when clinically appropriate. Which specific interventions actually improve sleep quality and HRQOL in RLS patients remains to be determined. Dialysis-related factors might also contribute to RLS symptoms, yet dialysis adequacy measures such as Kt/V and urea reduction ratio (URR) were not assessed here and should be included in future research.[34] Prospective studies are also needed to test whether targeted RLS treatment improves longer-term outcomes, including cardiovascular morbidity and survival.

This study adds to the evidence that RLS matters clinically in maintenance hemodialysis patients. Those with RLS slept worse and scored lower in several kidney disease–specific quality-of-life domains than those without. These PSQI and KDQOL-36 differences suggest that RLS may add substantially to the symptom burden in this group. Even so, the findings must be read with caution given several methodological limitations.

First, the sample was relatively small and from a single center, and no formal sample size calculation was done, so the study may have lacked power to detect smaller differences and its generalizability may be limited. Second, the cross-sectional design precludes causal inference. Multivariable adjustment was also not carried out, so residual confounding from comorbidities, medication use, dialysis characteristics, symptom burden, and unmeasured psychosocial factors cannot be excluded. Third, sleep quality was based on validated self-report questionnaires and not on objective measures such as polysomnography. Finally, laboratory data came from routine clinical records without standardization to dialysis timing, which may also have affected the exploratory laboratory comparisons.

Despite these limitations, the study used validated tools (the IRLSSG criteria, PSQI, and KDQOL-36), enabling a systematic assessment of RLS, sleep quality, and HRQOL. It also contributes data from an Indonesian hemodialysis population, where evidence on the clinical consequences of RLS is still limited. Lastly, because laboratory values came from routine records, data on transferrin saturation, intravenous iron, erythropoiesis-stimulating agent use, and standardized sampling time relative to dialysis were not consistently available, which limits a fuller evaluation of iron status and laboratory correlates of RLS.

5. Conclusion

Among CKD patients on maintenance hemodialysis at Adam Malik Hospital, Medan, RLS was common. Patients with RLS slept worse and had lower kidney disease–specific quality-of-life scores than those without, especially in the symptom, effects, and burden domains. Exploratory comparisons showed differences in age and type 2 diabetes prevalence between the groups, but these should be interpreted cautiously because no adjusted analyses were done. Further prospective and interventional studies are needed to establish whether targeted identification and treatment of RLS improves sleep quality and HRQOL in hemodialysis patients.

6. Author Contribution

J.B.R.H.S. contributed to the conceptualization of the study, data collection, data analysis, drafting of the manuscript, and critical revision and editing of the manuscript. M.F.G. contributed to the methodology development and supervision of the study. S.R. contributed to the methodology development and supervision of the study. All authors have read and approved the final version of the manuscript.

7. Acknowledgements

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8. References

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