

Original Research Article

Characteristics and Factors Associated with Sleep Disorders in Patients with Chronic Kidney Disease

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Abstract: Background: Chronic Kidney Disease (CKD) is a major public health issue affecting over 8–16% of the global population, with significant health consequences. The incidence and financial burden of managing this condition are substantial, particularly in Sub-Saharan Africa, where it is about 3–4 times more common. An often overlooked but important effect of CKD is the alteration of sleep patterns, which impacts quality of life. **Objective:** This study sought to describe the characteristics and factors associated with sleep disorders among CKD patients at the Yaoundé General Hospital. **Methodology:** This case-control study was conducted at the Dialysis and Nephrology outpatient units of the Yaoundé General Hospital in Cameroon from November 2016 to April 2017. Consenting CKD cases and controls were assessed for sleep quality using the Pittsburgh Sleep Quality Index, a validated clinical tool. Sociodemographic, medical, and other relevant data were obtained from hospital records. Data were analysed using SPSS version 20.0 with a significance level of 0.05. **Results:** A total of 244 participants were included, with 141 CKD cases and 143 controls. Mean age was 48.32 ± 14.66 years for cases and 50 ± 14.19 years for controls. Hypertension/vascular nephropathy was the leading CKD cause (41.2%), and 83% of patients were on dialysis for an average of 36 ± 5 months. Poor sleep affected 60.3% of CKD patients versus 14% of controls, OSA risk was 61% versus 11.5%, RLS occurred in 42.5% versus 16.1%, and EDS in 58.9% versus 20.6%. Poor sleep was associated with anemia, hypertension, sex, diabetes, dialysis, and physical exercise. **Conclusion:** Sleep disorders are more frequent in individuals with CKD than in the general population in our setting, with a negative impact on quality of life.

Keywords: Sleep Disorder, Chronic Kidney Disease, Quality of Life.

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INTRODUCTION

Chronic Kidney Disease (CKD), a condition with a worldwide prevalence of 8–16% [1], represents a major public health issue. The incidence and prevalence of CKD are increasing, and the financial burden associated with the management of the condition is enormous [2]. In sub-Saharan Africa, where the condition is approximately 3–4 times more common, its prevalence is 13.9% [3]. It is estimated that by 2030, 70% of persons with ESRD will be living in Africa due to the relatively late referral of these patients to hospitals, limited human and material resources available for early CKD diagnosis and renal replacement therapy (RRT), and poor awareness of kidney disease in the community

[4]. CKD is associated with an increased risk of cardiovascular morbidity and premature mortality; it also has a significant negative impact on patients' quality of life (QoL) [5]. CKD has also been associated with sleep disorders. These sleep disorders include sleep apnea, insomnia, excessive sleepiness, restless legs syndrome, and periodic limb movement disorder [6]. However, the complex and dynamic relationship between sleep disorders and chronic kidney disease (CKD) remains relatively poorly investigated [7]. Sleep duration and quality have been reported to decline among adults over the past decades, particularly among patients with certain pathologies, including CKD [8]. Among patients with CKD, sleep disorders are reportedly more common in

those with ESRD [9]. According to previous studies, approximately 80% of ESRD patients on dialysis report sleep complaints, with daytime sleepiness being the most commonly reported symptom [10, 11]. Despite the magnitude of the problem posed by sleep disorders among patients with CKD, relatively little attention is given to this aspect of the lives of these patients [12]. In Cameroon, the association between sleep disorders and CKD is relatively underexplored, despite the latter having a prevalence as high as 10–14.2% in the nation's urban areas [13]. Thus, we conducted this study to characterize sleep disorders and the factors associated with them among patients with CKD in Cameroon.

MATERIALS AND METHODS

To attain our objective, we conducted this hospital-based case-control study from November 2016 to April 2017 at the dialysis and the nephrology outpatient consultation units of the Yaoundé General Hospital. We included patients who were aged at least 18 years, had CKD (estimated glomerular filtration rate (eGFR) < 60ml/min/1.73m, a structural kidney disease, or a spot urine/protein ratio of >200mg/g of creatinine) and were on dialysis, had no history of treatment for sleep with continuous positive airway pressure or tracheotomy, and were not currently on home oxygen therapy. We used consenting individuals with normal renal function as controls, and controls were matched for age and sex. We excluded pregnant women, people who were on medications and stimulants that induce sleep or affect the sleep/wake cycle (such as antiepileptic drugs) in the last three months, people whose sleep/wake cycles had been altered due to the nature of their jobs (night-shift workers), people who were diagnosed with sleep disorders before being diagnosed with CKD, people who were diagnosed with chronic lung diseases before being diagnosed with CKD, people with major neurological and psychiatric disorders, and people with acute complications. Ethical approval was obtained from the institutional review board of the Faculty of Medicine and Biomedical Sciences of the University of Yaoundé I, and administrative authorization was obtained from the Yaoundé General Hospital. The requirement for participants' informed consent was waived due to the retrospective nature of the study. A structured questionnaire was used to obtain the relevant data from the clinical records of patients and their controls. We collected data on variables such as age, sex, highest level

of education, etiology of CKD, comorbidities (such as HIV, diabetes, hepatitis B/C, and hypertension), current treatment, blood pressure, weight, height (each participant's body mass index [BMI] was calculated using the person's weight and height), sleep scale parameters, serum creatinine level (especially for the control group), tobacco consumption, alcohol consumption, and hemoglobin levels (for patients). Our main outcome variable was the presence/absence of sleep disorders assessed using clinical scoring and defined per the International Classification of Diseases (ICD)/American Sleep Medicine Classification [14]. Each patient's sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI) [15]. We entered all relevant data into Microsoft Excel 2016 and then exported it to SPSS 20.0 for analysis. Before analyses, all continuous data were tested for normality using the Shapiro–Wilk test. Normally distributed continuous data were presented using mean values and standard deviations, while continuous data with skewed distributions were presented using medians and interquartile ranges. Categorical data were presented using counts and percentages. We used Student's t-test (for normally distributed variables) or the Mann–Whitney U test (for variables with skewed data distributions) to assess associations between continuous variables. The Chi-square test was used to assess associations between categorical variables. We conducted univariate analyses to identify associations between independent variables and the outcome variable, and then performed a multivariate analysis that included all variables with statistically significant associations in the univariate analyses to control for confounding. P-values less than 0.05 were considered statistically significant.

RESULTS

We included a total of 141 patients with CKD (91 males and 50 females) and 143 healthy controls (92 males and 51 females) in our study. The ages of our participants ranged from 19 years to 81 years, with a mean value of 49.20±14.38 years. The most represented age group was 31–60 years, accounting for 46.48% of participants. Among the 284 participants of this study, 126 (44.37%) had attained just secondary education. The sociodemographic characteristics of our study participants are presented in Table 1 below.

Table 1: Sociodemographic characteristics of our study participants

Variable	CKD patients		Controls	
	Males	Females	Males	Females
Sex	91	50	92	51
Age (years)				
0–30	20	15	22	16
31–60	41	25	41	25
>60	30	10	30	10
Highest level of education				
Primary	23	14	24	15

Variable	CKD patients		Controls	
	Males	Females	Males	Females
Secondary	42	21	42	21
Tertiary	26	15	26	15

Clinical Profiles of Our CKD Patients

Hypertensive/vascular nephropathy was the cause of CKD in 41.2% of our patients. The mean

duration of dialysis was 46±5 months. The clinical profiles of our CKD patients are shown in Table 2.

Table II: Clinical profiles of our CKD patients

Variable	Frequency	Percentage (%)
Cause of CKD		
Hypertension	58	41.2
Diabetes	26	18.4
HIVAN	11	7.8
Chronic Glomerulonephritis	33	23.4
Cortical necrosis	6	4.3
ADPKD	4	2.8
Unknown	3	2.1
CKD stage		
G3	6	4.26
G4	6	4.26
G5	129	91.48
Duration of dialysis (months)		
<36	93	66.1
≥36	48	34.0
Dialysis shift		
Morning	61	43.3
Evening	56	39.7
Anemia		
Present	96	68.1
Absent	45	31.9

HIVAN: HIV-associated nephropathy; **ADPKD:** Autosomal dominant polycystic kidney disease; **G3:** Stage 3 CKD; **G4:** Stage 4 CKD; **G5:** Stage 5 CKD.

Quality of Sleep

The mean PSQI score was approximately 3.5 times higher among patients with CKD than among healthy controls. The proportion of long sleepers among healthy controls was approximately twice that among patients with CKD; conversely, the proportion of short

sleepers among patients with CKD was approximately 3.68 times that among healthy controls. Overall, sleep efficiency and sleep quality were significantly higher in healthy controls than in patients with CKD. Participants' sleep quality parameters are presented in Table 3.

Table III: Participants' sleep quality parameters

Sleep quality assessment	CKD n (%)	Non-CKD n (%)	p-value
Mean PSQI score ± SD	8.395±1.267	2.39±0.183	
Sleep duration			
Long sleepers	22 (15.6)	47 (32.4)	0.001
Typical sleepers	51 (36.2)	42 (29)	
Short sleepers	68 (48.2)	19 (13.1)	
Sleep efficiency			
> 85 %	14 (10)	77 (53.1)	0.017
75–84%	24 (17)	21 (14.5)	
<75 %	103 (73)	46 (31.8)	
Sleep quality			
Good sleep	56 (39.72)	123 (86.0)	<0.001
Poor sleep	85 (60.28)	20 (14.0)	
Sleep latency			
<15	20 (14.2)	90 (62.1)	<0.001

Sleep quality assessment	CKD n (%)	Non-CKD n (%)	p-value
16–30	29 (20.6)	26 (17.9)	
31–60	46 (32.6)	22 (15.2)	
>60	46 (32.6)	7 (4.8)	

The sleep quality was significantly associated with the male sex, dialysis duration, and hypertension. The associations between sleep quality and participants'

comorbidities and clinical parameters are shown in Table 4.

Table IV: Associations between sleep quality and patients' comorbidities and clinical parameters

	Good Sleep n (%)		Poor Sleep n (%)		p-value	OR (95%CI)
Sex						
Male	56 (74.6)		34 (51.5)		0.036	0.366 (0.177–0.754)
Female	19 (25.4)		32 (48.5)			
Hypertension						
Yes	40 (61.5)		54 (71.5)		<0.001	0.210 (0.120–0.369)
No	25 (38.5)		22 (28.5)			
Diabetes						
Yes	19 (25.3)		21 (31.8)		0.346	0.727 (0.349–1.515)
No	56 (74.7)		45 (68.2)			
HIV/AIDS						
Yes	6 (8.0)		12 (18.2)		0.213	1.905 (0.375–5.399)
No	69 (92.0)		64 (81.8)			
Dialysis duration						
<36 months	50 (66.7)		43 (65.2)		0.036	1.650 (0.132–0.549)
≥36 months	25 (33.3)		23 (34.8)			
ANEMIA						
Present	48 (64)	56 (84.8)			0.020	0.145 (0.187–0.748)
Absent	27 (36)	10 (15.2)				
PURITUS						
Present	24 (22.7)	17 (25.8)			0.036	0.489(0.249–0.962)
Absent	51 (77.3)	49 (74.2)				

DISCUSSION

In this study, we sought to determine the prevalence, characterize, and identify the associated factors of sleep disorders among participants with CKD compared with the general population.

We included a total of 284 participants (141 CKD and 143 non-CKD) of the CKD population, 117 had ESRD and were undergoing twice-weekly hemodialysis, with a mean age of 49.21 ± 4.38 years (age range: 19-81 years). This was similar to results reported by Fouda *et al.*, 2017 in Cameroon [16], with a mean age of 44.1 ± 4.8 and to Pai *et al.*, in Korea [17], who had a mean age of 50 years; this reflects the fact that CKD in Cameroon occurs at lower ages; Sub-Saharan Africa and in the world as a whole (14). The male-to-female ratio was 1.8:1, similar to that reported by Adejumo *et al.*, [18], in Nigeria

There were no statistically significant differences in age, sex, or education level between the two participant groups. This indicates that the cases were properly matched by their controls. The cases were more

likely to be unemployed (p=0.003), likely due to an inability to maintain employment due to ill health.

Most of our participants 47.5% had a tertiary level of education.

There was no statistical significance between BP in the cases and the controls, although the cases had higher systolic blood pressure than the controls. This was the case with neck circumference. Hypertension/vascular nephropathy was the most frequent cause of CKD 41.2% this was the same found by Banaga *et al.*, in 2015 in Sudan [19], who stated that hypertension and diabetes constitute the leading cause of ESRD in Africa amongst adults over 40 years of age, similar finding in Nigeria by Oluseyi *et al.*, where hypertension (34.5%) and diabetes (25.7%) were leading aetiologies for CKD [20], and Naicker in 2015 [21], in South Africa. A majority of our cases were on dialysis (80.1%); the mean duration of dialysis was 46 ± 5. A similar pattern was observed by [22]. Anemia was seen in 68.1% of our cases, the mean haemoglobin was 9.292 ± 8. Puritus was common in 53.9% of our cases, compared with 9.7% in our controls; however, this difference was not statistically significant.

This was similar to Ademujo *et al.*, [18], in Nigeria in 2016.

We interviewed 286 participants using 4 sleep questionnaires: PSQI, BQ, RLSSS, and ESS. To minimise misunderstanding, we carefully explained the contents of each questionnaire to each participant in the language he understood best. Sleep patterns were analysed for each questionnaire, which assessed one or more sleep disorders.

We had almost twice the typical sleepers (47.6%) in our participants with normal kidney function as compared to those with CKD (29.7%). Participants with CKD were found to be 3 times shorter sleepers than their controls.

Cases had 6 times as many very inefficient sleepers (32.6%) as controls (4.8%), $p < 0.001$, and 4 times as many poorer sleepers as controls (60.3%), as opposed to 14%, respectively, similar to Fouda *et al.*, in Douala and to Gunet *et al.*, in Turkey. There was no statistically significant difference in snoring prevalence between participants and controls (34.8% vs. 22.1%).

However, these results differed from those obtained by Miskoweic *et al.*, in Poland, who reported 18%. This difference may be partially explained by the use of polysomnography in their study, whereas we used subjective scales [23]. It is worth noting that cases were also at a higher risk of OSA 17.7% than their controls 6.6% $p = 0.024$ and a total of 61% had risk for sleep apnoea compared to 34.2% this was similar to the results obtained by Abuyassin in 2015 Nigeria who had 60% [24], and Adeseun *et al.*, in 2010 Nigeria [25], this could be because of the geographical proximity in the two countries.

The mean ESS was 7.67 ± 2.394 in CKD participants compared to 2.59 ± 1.198 in those with normal kidney function. Its prevalence was 58.9% in the CKD population, compared with 14.9% in the non-CKD population. However, this differed from the results obtained by Musci *et al.*, [22], in Canada, who reported 31% using the same scale. This could be explained by differences in sample size (76 vs. 141). Moreover, our participants with CKD included both patients on hemodialysis and those who were not.

In our cases, we observed 12.6% of participants with moderate-to-severe RLS, compared with 4.2% in controls; however, this association was not statistically significant. The controls had no participants with severe RLS, whereas 7.1% of cases had severe RLS; these results were twice those reported by Onwuchekwa U.N *et al.*, (2011) in Nigeria (5.4%). This could be accounted for by the smaller sample size and the use of different scales; otherwise, it was similar to that reported by Yasmine *et al.*, (2010) in India (14.5%; [26]).

We observed that more participants with hypertension and diabetes had significant RLS. Nilfour *et al.*, in Mashhad reported similar results [27], it was also predominant among females, although not statistically significant. These results were similar to those obtained by Jesús *et al.*, [28], in Iran and by Onwuchekwa *et al.*, [26], in Nigeria, who also found that RLGs was predominant in females. Although some studies showed that anemia and other metabolic factors were associated with RLGs [29], this was not the case in our study, as there was no significant association with anemia.

Longer dialysis duration was associated with lower RLGs; however, the association was not statistically significant. This was similar to Nilfour *et al.*, who didn't find any significant relationship between dialysis duration and RLGs.

In our study males were significantly poor sleepers this was not the case with Rahele *et al.*, in Iran 2012 who had significantly more females [30], and to Fouda *et al.*, in Douala 2016 while Elder *et al.*, [31], this could be accounted for by the male dominance of our study participant moreover RLS has been associated to females [32], SAS to females [33], and these two are seen to be common in persons with CKD, thus gender and sleep quality could be influenced by the presence of other sleep disorders.

Anemia was significantly associated with poor sleep quality in CKD, consistent with findings from Fouda *et al.*, (2016), Douala, and Iliesco *et al.*, (Canada, 2003) [34]. A similar finding was also found in Ethiopia, where anemic CKD patients had 2.7 times the odds of poor sleep quality compared with non-anemic patients. Again, similar to Oluseyi *et al.*, in Nigeria 2022 where anemia was significantly associated with poor quality of sleep [35], however, the association of anemia to poor sleep has a lot of controversy, in a large survey of insomnia using a different score in 684 dialytic patients, no association was found between Hemoglobin levels and sleep quality/disorders [36].

Comorbidities like hypertension and diabetes were significantly associated with poor sleep. This could be explained by the close association between OSA and Hypertension. These results were consistent with Guney *et al.*, in Turkey 2010), who found the same association with hypertension [37].

Participants on dialysis were significantly poorer sleepers than those who weren't; this was similar to the results obtained by Masoumi *et al.*, in 2013 [38], who compared sleep quality in hemodialysis and peritoneal dialysis patients and found hemodialysis treatment to be a risk factor for poor sleep quality. However, dialysis vintage was not significantly associated with sleep quality, consistent with Fouda *et al.*, in Douala; however, Pai *et al.*, in Korea in 2007

reported that dialysis vintage was inversely related to sleep quality, with sleep quality poorer as dialysis duration increased [17].

Although there was no significant relationship between gender and EDS, we noted that females had more sleep debt compared to their male counterparts. Participants on dialysis were significantly associated with EDS, as well as dialysis duration, and patients who had been on dialysis for less than 36 months had significant sleep debt. This may be because patients become accustomed to their condition over time and adapt to it.

CONCLUSION

- Sleep disorders are more common in persons with CKD than in the general population in our setting.
- The prevalence of CKD in our study was 67%, compared with 14% in the general population.
- The frequencies of the various sleep disorders are OSA (61%), RLGS (14.1%), poor sleep quality (60.3%), and EDS (58.9%).
- Associated factors of these SD included anaemia, pruritus, hypertension, and dialysis treatment.

DECLARATION BY THE AUTHORS

Conflicts of Interest: We have no conflicts of interest to declare

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Data Availability: The data presented in this article have safely stored and can be made available by the authors upon reasonable request.

REFERENCES

1. Jha V, Garcia-Garcia G, Iseki K, Li Z, Naicker S, Plattner B, et al. Chronic kidney disease: global dimension and perspectives. *Lancet Lond Engl*. 2013 Jul 20;382(9888):260–72.
2. Kerr M, Bray B, Medcalf J, O'Donoghue DJ, Matthews B. Estimating the financial cost of chronic kidney disease to the NHS in England. *Nephrol Dial Transplant Off Publ Eur Dial Transpl Assoc - Eur Ren Assoc*. 2012 Oct;27 Suppl 3:iii73–80.
3. Stanifer JW, Jing B, Tolan S, Helmke N, Mukerjee R, Naicker S, et al. The epidemiology of chronic kidney disease in sub-Saharan Africa: a systematic review and meta-analysis. *Lancet Glob Health*. 2014 Mar 1;2(3):e174–81.
4. Tannor EK, Archer E, Kapembwa K, van Schalkwyk SC, Davids MR. Quality of life in patients on chronic dialysis in South Africa: a comparative mixed methods study. *BMC Nephrol* [Internet]. 2017 Jan 5 [cited 2017 Apr 26];18. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC5217650/>
5. Kefale B, Alebachew M, Tadesse Y, Engidawork E. Quality of life and its predictors among patients with chronic kidney disease: A hospital-based cross-sectional study. *PLoS ONE*. 2019 Feb 27;14(2):e0212184.
6. Pierratos A, Hanly PJ. Sleep disorders over the full range of chronic kidney disease. *Blood Purif*. 2011;31(1–3):146–50.
7. Maung SC, El Sara A, Chapman C, Cohen D, Cukor D. Sleep disorders and chronic kidney disease. *World J Nephrol*. 2016 May 6;5(3):224–32.
8. Muller ME, Heinzer R, Pruijm M, Wuerzner G, Burnier M. [Sleep disorders in patients with chronic renal insufficiency]. *Rev Med Suisse*. 2012 Feb 29;8(330):458–61.
9. Harris TJ, Nazir R, Khetspal P, Peterson RA, Chava P, Patel SS, et al. Pain, sleep disturbance and survival in hemodialysis patients. *Nephrol Dial Transplant*. 2012 Feb;27(2):758–65.
10. Hui DS, Wong TY, Ko FW, Li TS, Choy DK, Wong KK, et al. Prevalence of sleep disturbances in chinese patients with end-stage renal failure on continuous ambulatory peritoneal dialysis. *Am J Kidney Dis Off J Natl Kidney Found*. 2000 Oct;36(4):783–8.
11. Walker S, Fine A, Kryger MH. Sleep complaints are common in a dialysis unit. *Am J Kidney Dis Off J Natl Kidney Found*. 1995 Nov;26(5):751–6.
12. Muller ME, Heinzer R, Pruijm M, Wuerzner G, Burnier M. [Sleep disorders in patients with chronic renal insufficiency]. *Rev Med Suisse*. 2012 Feb 29;8(330):458–61.
13. Aseneh JB, Kemah BLA, Mabouna S, Njang ME, Ekane DSM, Agbor VN. Chronic kidney disease in Cameroon: a scoping review. *BMC Nephrol*. 2020 Sep 23;21(1):409.

14. Sateia MJ. International classification of sleep disorders-third edition: highlights and modifications. *Chest*. 2014 Nov;146(5):1387–94.
15. Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Res*. 1989 May;28(2):193–213.
16. Fouda H, Halle M-P, MAHAMAT M, MBAMBAP A, Kaze FF, Ashuntang G. sleep quality on maintenance hemodialysis [patients in Douala GENERAL HOSPITAL IN CAMEROON. 2017 Mar;
17. Pai M-F, Hsu S-P, Yang S-Y, Ho T-I, Lai C-F, Peng Y-S. Sleep disturbance in chronic hemodialysis patients: the impact of depression and anemia. *Ren Fail*. 2007;29(6):673–7.
18. Adejumo O, Akinbodewa A, Alli O, Olatunji A, Ibukun I. Prevalence, Pattern and Association of Pruritus with Quality of Life in Chronic Kidney Disease Patients Attending Kidney Care Centre, Ondo City, Southwest Nigeria. *Ethiop J Health Sci*. 2016 Nov;26(6):549–54.
19. Banaga ASI, Mohammed EB, Siddig RM, Salama DE, Elbashir SB, Khojali MO, et al. Causes of end stage renal failure among haemodialysis patients in Khartoum State/Sudan. *BMC Res Notes [Internet]*. 2015 Sep 29 [cited 2017 Jun 2];8. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4589074/>
20. Yibelttal YG, Liknaw WL, Wudneh S, Wondim A, Gashaw SC ,et al poor sleep quality and associated factors among adult chronic kidney disease patients in Gondar comprehensive specialized and Felege HHiwot referral Hospitals, 2020.
21. Naicker S. End-stage renal disease in Sub-Saharan Africa. *Kidney Int Suppl*. 2013 May 1;3(2):161–3.
22. Mucsi I, Molnar MZ, Rethelyi J, Vamos E, Csepanyi G, Tompa G, et al. Sleep disorders and illness intrusiveness in patients on chronic dialysis. *Nephrol Dial Transplant*. 2004 Jul 1;19(7):1815–22.
23. Miskowicz, JJ Klawe. PREVALENCE OF SLEEP APNEA SYNDROME IN HEMODIALYZED PATIENTS WITH END-STAGE RENAL DISEASE. 2006;4:207–11.
24. Abuyassin B, Sharma K, Ayas NT, Laher I. Obstructive Sleep Apnea and Kidney Disease: A Potential Bidirectional Relationship? *J Clin Sleep Med JCSM Off Publ Am Acad Sleep Med*. 2015 Aug 15;11(8):915–24.
25. Adeseun GA, Rosas SE. The Impact of Obstructive Sleep Apnea on Chronic Kidney Disease. *Curr sHypertens Rep*. 2010 Oct;12(5):378–8.
26. Onwuchekwa UN, Efosa O, Ojugwu LI. RESTLESS LEG SYNDROME IN ESRD PATIENTS IN BENIN CITY NIGERIA. *TJN*. 2011 Dec;6:107–13.
27. Niloufar ZS, hami M, Boostani R. Restless leg syndrome in chronic hemodialysis patients in Mashhad hemodialysis centers. *JRIP*. 2017;6(2):137–41.
28. Jesus C, Cigarran S, M.Lopez L. Restless Legs Syndrome in Non-Dialysis Renal Patients: Is It Really That Common? *J Clin Sleep Med*. 2015 Jan 15;11(1):57–60.
29. Quinn C, Uzbebeck M, Sale A. Iron Status and Chronic Kidney Disease predicts Restless Leg Syndrome in Older Hospital Population. *Sleep Med*. 2011;12:295–301.
30. Rahele S, Mehdi Naghizadeh MM. Quality of sleep in dialysis patients Rahele Sabet, MSc,1 Mohammad Mehdi Naghizadeh, MSc,1 and Sousan Azari, MSc2 Author information ► Copyright and License information ►. *Iran J Nurs Midwifery Res*. 2012 Jun;17(4).
31. Elder SJ, Pisoni RL, Akizawa T, Fissell R, Andreucci VE, Fukuhara S, et al. Sleep quality predicts quality of life and mortality risk in haemodialysis patients: Results from the Dialysis Outcomes and Practice Patterns Study (DOPPS). *Nephrol Dial Transplant*. 2008 Mar 1;23(3):998–1004.
32. Araujo SM, de Bruin VM, Nepomuceno LA. Restless legs syndrome in end-stage renal disease: Clinical characteristics and associated comorbidities. *Sleep Med*. 2010;11:785–90.
33. Argekar P, Griffin V, Litaker D. Sleep apnea in hemodialysis patients: Risk factors and effect on survival. *Hemodial Int*. 2007;11:435–41.
34. Iliescu EA, Coo H, McMurray MH, Meers CL, Quinn MM, Singer MA, et al. Quality of sleep and health-related quality of life in haemodialysis patients. *Nephrol Dial Transplant*. 2003 Jan 1;18(1):126–32.
35. Oluseyi AA, Imuetinyan RE, Manmak M, OLawale SO, Ogochukwu CO, et al. Sleep quality and associated factors among patients with chronic kidney disease in Nigeria, 2022
36. Holley JL, Nespors S, Rault R. A comparison of reported sleep disorders in patients on chronic hemodialysis and continuous peritoneal dialysis. *Am J Kidney Dis Off J Natl Kidney Found*. 1992 Feb;19(2):156–61.
37. Guney I, Huseyin A, Yacin S, Lutfullah A. Predictors of sleep quality in hemodialysis patients Ibrahim Guney 1 , Huseyin Atalay 2 , Yalcin Solak 2 , Lutfullah Altintepe 1, Hasan Toy 3 , H. Zeki Tonbu. *Int J Artif Organs*. 2010;33(3):154–60.
38. Masoumi M, Afsoon EN, Aghaghazvini R. Sleep Quality in Patients on Maintenance Hemodialysis and Peritoneal Dialysis. *Int J Prev Med*. 2013 Feb;165–75.

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