

## The Relationship Between Long-Term Haemodialysis and Sleep Quality in Patients with Chronic Kidney Failure

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### ABSTRACT

**Introduction:** The World Health Organization (WHO) states that chronic kidney disease (CKD) worldwide increases by more than 30% each year. The duration of haemodialysis plays a significant role in affecting the sleep quality of chronic kidney disease patients. Patients undergoing haemodialysis therapy experience uncomfortable symptoms such as nausea, vomiting, hypotension, and fatigue. Mental health issues among haemodialysis patients include anxiety and depression. These factors can impact the sleep quality of haemodialysis patients. To determine whether there is a relationship between the duration of haemodialysis and sleep quality in patients with chronic kidney disease.

**Objective:** This study aims to determine the relationship between the duration of hemodialysis and sleep quality in chronic kidney failure patients at Sunan Kudus Islamic Hospital.

**Method:** This study employed a descriptive correlational research method with a cross-sectional design. The sampling method used purposive sampling, with a sample size of 45 respondents. The research instrument used to measure sleep quality was the PSQI questionnaire, which consists of 9 questions. This study used the validity and reliability tests from previous researchers, and data collection was conducted using a questionnaire.

**Results:** The results of this study showed that sleep quality was categorized as good (<5) in 22.2% of cases, while 77.7% were categorized as poor. The Spearman rank test yielded a p-value of 0.013 < 0.05. This indicates a significant association between the duration of haemodialysis and sleep quality at RSI Sunan Kudus.

**Conclusion:** There is a significant association between the duration of haemodialysis and sleep quality in chronic kidney failure patients at the Haemodialysis Unit of Sunan Kudus Islamic Hospital.

**Keywords:** Chronic Kidney Failure, Duration of Hemodialysis, Sleep Quality.

## INTRODUCTION

Chronic kidney disease (CKD) is a condition in which kidney function deteriorates to the point where the kidneys are unable to filter and excrete electrolytes such as sodium and potassium from the blood or produce urine. Chronic kidney disease remains a serious health issue worldwide (Aryzki et al., 2019). The World Health Organisation (WHO) reports that the global prevalence of chronic kidney disease (CKD) increases by more than 30% annually (Riskesdas, 2018). According to the National Chronic Kidney Disease Fact Sheet (NCKDFS 2017), in the United States, 30 million adults (15%) have CKD. In the United States, 200,000 people undergo haemodialysis annually. The prevalence of haemodialysis in Japan is 2.309 million people per year. In Singapore, it is 1.661 per 1 million people (Hermawati, 2017).

In Indonesia, the prevalence of chronic kidney disease patients aged  $\geq 15$  years increased from 2.0% to 3.8% or 713,783 people. Chronic kidney disease patients in North Kalimantan are among the highest in Indonesia at 0.64%, followed by North Maluku with 0.56% of chronic kidney disease patients, North Sulawesi at 0.53%, North Sumatra with 0.33% or 45,782 patients, and Central Java Province ranked sixth out of 34 provinces, with 65,755 patients.

Patients undergoing haemodialysis therapy experience uncomfortable symptoms such as nausea, vomiting, hypotension, and fatigue. Mental health issues among haemodialysis patients include anxiety and depression. These issues can be influenced by environmental comfort factors such as room temperature (Kasar, K. S., Erzincanli, S., & Akbas, 2020). A study by Kamil (2017) noted that one complication for patients undergoing haemodialysis therapy is the risk of poor sleep quality (Kamil, 2017).

Sleep quality disturbances frequently occur in CKD patients undergoing haemodialysis and may persist over time. This can affect the sleep quality of chronic kidney disease patients, whether good or poor, and may impact their daily activities. Sleep disturbances in chronic kidney disease patients undergoing haemodialysis therapy can not only result in poor sleep quality but also have negative effects on mental and physical health, leading to a decline in the condition of chronic kidney disease patients, such as cognitive dysfunction and memory issues, irritability, and reduced concentration. Sleep disorders can increase the risk of developing various chronic diseases, including depression, hypertension, stroke, diabetes, heart disease, and obesity (Safruddin, 2016).

Preliminary survey results conducted by researchers at Kudus Islamic Hospital revealed 92 cases of CKD patients in December 2023. Based on a preliminary study conducted by researchers in the haemodialysis unit in January 2024 at Kudus Islamic Hospital, data was obtained from 81 patients who regularly undergo haemodialysis, with an average of 2-3 sessions per week, with 35 patients undergoing hemodialysis for 1-12 months, 16 patients for 12-25 months, and 30 patients for 25-40 months. From brief interviews with 4 patients undergoing hemodialysis therapy, it was found that before undergoing hemodialysis therapy, patients felt uncomfortable, short of breath, had cramps throughout their bodies, and experienced difficulty sleeping at night. This study aims to determine the relationship between the duration of hemodialysis and sleep quality in chronic kidney failure patients at Sunan Kudus Islamic Hospital.

## MATERIALS AND METHODS

The type of research used in this study is quantitative research. The design used in this study is a descriptive correlational study, which aims to describe or find the relationship between the independent and dependent variables, namely the duration of haemodialysis, with the dependent variable of sleep quality. Based on its descriptive nature, the researcher uses a cross-sectional approach, also known as a transversal study, where data collection is conducted simultaneously in one day. The population in this study was all patients undergoing haemodialysis therapy at RSI Sunan Kudus, totalling 81 patients. The sample in this study was obtained according to the inclusion criteria, namely patients undergoing haemodialysis twice a week, totalling 45 patients. The characteristics of this study were based on inclusion and exclusion criteria, where the inclusion criteria were patients

undergoing haemodialysis twice a week. The exclusion criteria were patients experiencing complications, patients who withdrew from the study, patients who suddenly experienced emergencies that prevented them from completing the questionnaire, and patients who were unwilling to participate as respondents. The study was conducted on 20–21 March 2024 at the haemodialysis unit of RSI Sunan Kudus. The instrument used in this study was a questionnaire measuring sleep quality in patients undergoing haemodialysis therapy. The instrument was not validated or tested for reliability because it had already been tested by previous researchers. In this study, the variables studied used an ordinal scale for both the dependent and independent variables. Therefore, the statistical test used was the Spearman Rank test, with a significance level of 0.05. If the P value is  $\leq 0.05$ , there is a meaningful relationship between the variables being tested.

## RESULTS

The characteristics of respondents in this study include age, gender, highest level of education, and occupation.

### 1. Respondent Age

Table 1  
Frequency Distribution of Respondents Based on Age in the Haemodialysis Unit of RSI Sunan Kudus

Age	Frequency	Percentage (%)
30-40 years old	20	44,4
41- 50 years old	12	26,7
51- 60 years old	9	20.0
61-70 years old	4	8,9
Total	45	100,0

The results in Table 4.1 show that the largest number of respondents were aged 30–40 years, with 20 people (44.4%), and the smallest number of respondents were aged 61–70 years, with 4 people (8.9%).

### 2. Gender

Table 2  
Frequency Distribution of Respondents by Gender in the Haemodialysis Unit of RSI Sunan Kudus

Gender	Frequency	Percentage (%)
Men	23	51,1
Women	22	48,9
Total	45	100,0

The results in Table 4.2 show that most respondents were male, with 23 respondents (51.1%), while the smallest number were female, with 22 respondents (48.9%).

### 3. Highest Level of Education

Table 3

Frequency Distribution of Respondents Based on the Highest Level of Education of CKD Patients in the Haemodialysis Unit of RSI Sunan Kudus

Highest Level of Education	Frequency	Percentage (%)
SD	10	22,2
SMP	12	26,7
SMA	13	28,9
University	10	22,2
Total	45	100,0

The results of the analysis in Table 4.3 show that the highest level of education was senior high school, with 13 respondents (28.9%), and the lowest was elementary and junior high school, with 10 respondents (22.2%).

### 4. Occupation

Table 4

Frequency Distribution of Respondents Based on Occupation of GSK Patients in the Haemodialysis Unit of RSI Sunan Kudus

Occupation	Frequency	Percentage (%)
PNS	8	17,8
Entrepreneur	7	15,6
Private employee	12	26,7
Farmer	7	15,6
Not working	11	24,4
Total	45	100,0

The results of Table 4.4 show that most respondents were private employees, namely 12 people (26.7%), while the smallest number of respondents were entrepreneurs and farmers, namely 7 people (15.6%).

### 5. Duration of haemodialysis

Table 5

Frequency distribution of duration of haemodialysis at the haemodialysis unit RSI Sunan Kudus

Duration of haemodialysis	Frequency	Percentage (%)
1-12 months (New)	11	24,4
12-25 months (Medium)	11	24,4
≥25 months (Old)	23	51,1
Total	45	100,0

Tabel 5 menunjukkan lama menjalani hemodialisa di unit hemodialisa di RSI Sunan Kudus dibagi dalam 3 kategori yaitu baru 1-12 bulan sebanyak 11 orang (24,2%), sedang 12-25 bulan sebanyak 11 orang (24,4%), lama ≥25 bulan sebanyak 23 orang (51,1%).

## 6. Sleep Quality

Table 6  
Frequency Distribution of Sleep Quality in the Haemodialysis  
Unit of RSI Sunan Kudus

Sleep Quality	Frequency	Percentage (%)
Good $\leq 5$	10	22,2
Bad $> 5$	35	77,8
Total	45	100,0

Tabel 6 menunjukkan hasil penelitian kualitas tidur baik sebanyak 10 orang (22,2%), kualitas tidur buruk sebanyak 35 orang (77,8%).

## 7. The Relationship Between Long-Term Haemodialysis and Sleep Quality in Chronic Kidney Failure Patients at RSI Sunan Kudus

Table 7  
Cross-tabulation of the Relationship between Length of Time Undergoing Haemodialysis and Sleep  
Quality in Chronic Renal Failure Patients at RSI Sunan Kudus

Quantity in Chronic Renal Failure Patients at RSP Sunan Kudus							P Value
Duration of haemodialysis	Sleep Quality				Total		
	Good		Bad				
	f	%	f	%	f	%	
1-12 months (New)	1	9,1	10	90,9	11	100	0,013
12-25 months (Medium)	0	0,0	11	100,0	11	100	
≥ 25 months (Old)	9	39,1	14	60,9	23	100	
Total	10	22,2	35	77,8	45	100	

Data analysis using Spearman's rank test yielded a p-value of 0.013, which is less than 0.05 ( $0.013 < 0.05$ ), indicating a relationship between the duration of haemodialysis and sleep quality in patients with chronic renal failure at RSI Sunan Kudus.

## DISCUSSION

The duration of haemodialysis treatment at the haemodialysis unit of RSI Sunan Kudus was divided into three categories: new patients (1–12 months) numbered 11 individuals (24.2%), intermediate patients (12–25 months) numbered 11 individuals (24.4%), and long-term patients ( $\geq 25$  months) numbered 23 individuals (51.1%). This aligns with a previous study (Yola Kinanthi et al., 2023), which found that the duration of haemodialysis among chronic kidney failure patients in the haemodialysis unit at Slamet Riyadi Hospital in Surakarta showed that out of 57 respondents (100%) Most patients had undergone haemodialysis for more than 30 months, with 23 respondents (40.4%). Based on research conducted by Maili et al. (2015), most respondents in their study had undergone haemodialysis for more than one year. (Wulandari & Sari 2016) also revealed that 28 respondents (43.6%) in their study had undergone haemodialysis therapy for more than 36 months. The high number of patients undergoing long-term haemodialysis indicates that most haemodialysis patients can survive for a considerable period despite having poorly functioning kidneys and various health issues resulting from kidney damage.

The haemodialysis dose administered to patients is generally twice a week, with each HD session lasting 5 hours, or three times a week with each haemodialysis session lasting 4 hours. The duration of haemodialysis is closely related to its efficiency and adequacy, so the length of time spent on haemodialysis is also influenced by the level of uraemia due to the progression of kidney function deterioration, as well as blood flow rate and dialysate flow rate. The longer the haemodialysis process, the longer the blood remains outside the body. Therefore, more anticoagulants are required, with the consequence of side effects (Sompie et al., 2015).

The longer patients undergo haemodialysis (HD), the more compliant they become in undergoing haemodialysis because the respondents have reached the acceptance stage, and they also receive a lot of health education from nurses and doctors about the disease and the importance of regularly undergoing HD for them. Based on previous research conducted by (Sari 2016), the duration of haemodialysis can cause sleep pattern disturbances in patients with chronic kidney failure. This occurs due to the progression of symptoms and the disease undergoing therapy, as well as complications caused by long-term haemodialysis therapy or other sleep disorders such as increased parathyroid hormone levels, renal osteodystrophy, sleep apnoea, and excessive daytime sleepiness.

The results of the sleep quality study showed that 10 people (22.2%) had good sleep quality, while 35 people (77.8%) had poor sleep quality. This aligns with the study conducted by Sidqon Mustofa et al. (2022) on sleep quality in haemodialysis patients. The results of this study indicate that sleep quality in haemodialysis patients in this study was good in only 13.3% of cases, while poor sleep quality accounted for 86.7%. This is not only related to the characteristics of the respondents but also to the dimensions of subjective sleep quality, sleep latency, sleep duration, daily sleep efficiency, sleep disturbances, and daytime activity dysfunction. Sleep disturbances had the highest percentage at 18.8%.

Sleep quality is an individual's satisfaction with sleep, so that the person does not exhibit feelings of fatigue, lethargy, apathy, dark circles around the eyes, swollen eyelids, red conjunctiva, sore eyes, headaches, and frequent yawning or drowsiness (Wahab 2017). Poor sleep quality leads to its own set of physical and psychological issues. Poor sleep can be identified by both physical and psychological signs. Psychological signs of poor sleep quality can result in emotional instability, withdrawal, reduced responsiveness, feeling unwell, impaired memory, auditory hallucinations, and diminished decision-making ability. Physical signs of sleep deprivation include puffy facial expressions around the eyes, sunken eyes, red conjunctiva, inability to concentrate, and signs of fatigue such as blurred vision, nausea, and dizziness (N.S. Foundation 2015).

In the study by Nurhayati et al. (2021), CKD patients undergoing haemodialysis experienced sleep disturbances due to the shift and duration of haemodialysis. In addition, factors such as pain and discomfort caused by the disease, anxiety leading to insomnia, and a noisy environment contribute to haemodialysis patients waking up in the middle of the night or early in the morning. Sleep disorders can affect the endocrine, immune, nervous, and cardiovascular systems, one of which is hypertension.

Data analysis using the Spearman's rank test yielded a p-value of 0.013, which is less than 0.05 ( $0.013 < 0.05$ ), indicating a significant association between the duration of haemodialysis and sleep quality in patients with chronic kidney disease at RSI Sunan Kudus.

The duration of haemodialysis refers to the amount of time patients spend undergoing haemodialysis due to their chronic kidney disease (Wahyuni et al., 2018). Patients who have been undergoing regular haemodialysis for more than three months tend to have poor sleep quality, which is caused by several factors, one of which is an increase in inflammatory cytokine levels, leading to changes in sleep quality and duration.

The results of the study in Table 4.7 show that 23 respondents (51.1%) had been undergoing haemodialysis for  $\geq 25$  months (long duration), with 14 respondents (60.9%) having poor sleep quality, 9 respondents having good sleep quality, and 11 respondents (24.4%) having undergone haemodialysis for 12–25 months (moderate), with 11 respondents (100.0%) experiencing poor sleep quality, and 11 respondents (24.4%) undergoing haemodialysis for 1–12 months (new), with 10 respondents (90.9%) experiencing poor sleep quality and 1 respondent (9.1%) experiencing good sleep quality.

The results of the above study indicate that the causes of poor sleep quality among respondents include muscle pain, itchy skin, difficulty breathing comfortably during sleep, anxiety about the incurable nature of their illness and associated conditions such as hypertension, family issues, and these factors make it difficult for patients to sleep comfortably. Meanwhile, patients with good sleep quality had accepted their condition, although new patients undergoing haemodialysis therapy with



good sleep quality complained of pain and itching on the skin but could still cope, and their families were always present and supportive during haemodialysis therapy. From the above research results, it can be concluded that the longer the haemodialysis therapy, the worse the sleep quality of the patients. The study conducted by Dedy Frianti et al. identified the causes of poor sleep quality in chronic kidney failure patients undergoing haemodialysis therapy, including fatigue, comorbidities, psychological factors, difficulty breathing during sleep, and the duration of therapy.

The study conducted by Sakinah, Kosasih, and Sari (2018), which aligns with this research, found that 94.6% of hypertensive patients experience poor sleep quality. The researchers also concluded that comorbidities may influence an individual's sleep quality, which can be linked to psychological factors such as anxiety and the number of treatments undergone, thereby worsening the patient's sleep quality. Sleep is a normal change in a person's consciousness characterised by a decrease in their response to their environment. Sleep can be influenced by various factors (Fitri, Amalia, and Juanita, 2022).

In a study conducted by Johana Marthrianes Sinay & Mevi Lilipory (2019), respondents who had undergone haemodialysis for more than six months had poor sleep quality (17 respondents, 85.0%), while those who had undergone haemodialysis for less than six months had good sleep quality (8 respondents, 34.8%). The results indicated that respondents with poor sleep quality experienced sleep-related issues such as difficulty falling asleep, waking up easily at night, and difficulty continuing sleep. These issues were also attributed to factors such as age, stress, low haemoglobin levels, and anxiety. The researcher used the Chi-Square test, yielding a p-value of 0.003 or <0.05. Therefore, the alternative hypothesis ( $H_a$ ) was accepted, and the null hypothesis ( $H_o$ ) was rejected, indicating a significant association between sleep quality and the duration of haemodialysis. The dependence of chronic kidney disease patients on haemodialysis throughout their lives has physical, psychosocial, and economic impacts on patients. Anxiety about their health issues can affect patients' sleep quality (Potter & Perry, 2015).

The duration of haemodialysis can cause sleep pattern disturbances in CKD patients. This occurs due to the progressive nature of symptoms and diseases undergoing therapy, complications caused by long-term haemodialysis therapy, or other sleep disorders such as increased parathyroid hormone levels, renal osteodystrophy, sleep apnoea, and daytime sleepiness (Joes Michael Korin et al.,).

Supported by research conducted by (Agusdiman Saputra & Oscar Ari Wirmansyah, 2022), titled 'The Relationship Between the Duration of Haemodialysis and the Quality of Life of Chronic Kidney Disease Patients,' which states that certain neurological and cardiovascular conditions may arise in patients undergoing haemodialysis for an extended period. The emergence of other diseases that can cause symptoms such as bone pain, pruritus, coughing, etc., can disrupt and reduce the quality of sleep in patients. Research by Yola Kinanti Wening Utami et al., (2023) titled "The Relationship Between the Duration of Haemodialysis and Stress Levels and Sleep Quality in Chronic Kidney Failure Patients in the Haemodialysis Room at TK. III Slamet Riyadi Semarang, with 19 respondents (33.3%) having undergone hemodialysis therapy for less than 12 months (new category), 15 respondents having undergone hemodialysis for 12–26 months, and 23 respondents (40.4%) having undergone hemodialysis for more than 36 months. The sample in this study consisted of the total sample of 57 chronic kidney disease patients, using a descriptive analytical study design with a cross-sectional approach. The study results were based on the gamma correlation statistical test. The statistical test results yielded a p-value of 0.006. This means that the p-value is less than 0.05. Therefore, it can be concluded that there is a relationship between the duration of haemodialysis and sleep quality.

The study results indicate a relationship between the duration of haemodialysis and sleep quality in chronic kidney disease patients at Kudus Islamic Hospital, showing that the longer a patient undergoes HD, the worse their sleep quality becomes. The duration of haemodialysis therapy can lead to poor sleep quality in patients. Patients who have undergone haemodialysis experience fatigue,

cramps, bone pain, breathing difficulties while sleeping, and difficulty urinating. The duration of haemodialysis experienced by patients can affect sleep quality because poor sleep quality has negative impacts on physical and mental health and can lead to a decline in patient performance, such as irritability, confusion, anxiety, and decreased concentration. Therefore, adequate sleep quality is something that must be adhered to by patients undergoing haemodialysis (Laurensia Kusuma Dewi & Yovita Hindrati).

## CONCLUSIONS

The study on the relationship between the duration of haemodialysis and sleep quality in chronic kidney failure patients at RSI Sunan Kudus concluded that the duration of haemodialysis at RSI Sunan Kudus was mostly  $\geq 25$  months, with 23 respondents (51.1%). There is a significant association between the duration of haemodialysis and sleep quality in chronic kidney disease patients at RSI Sunan Kudus, as evidenced by a statistical test with a p-value of 0.013 and a positive direction of association. This is demonstrated by the higher number of respondents in the poor sleep quality category (35 respondents, 77.8%) compared to other categories.

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## Availability of Data and Materials

The datasets generated and analyzed during this study are available from the corresponding author upon reasonable request.

## Authors' Contributions

N.P.P, A.A, and A. conceptualized the study and designed the methodology. N.P.W and F.Z analyzed the data. N.P.P, A.A, and A. wrote the original draft, and all authors contributed to reviewing and editing the manuscript. All authors have read and approved the final version of the manuscript.

## Conflict of Interest

There is no conflict of interest in this researches.

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