



The relationship between anemia, depression, duration of hemodialysis, and quality of sleep among end-stage renal disease patients[☆]



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Received 13 November 2018; accepted 17 April 2019

Available online 17 June 2019

KEYWORDS

Anemia;
Depression;
Duration of
hemodialysis;
Sleep quality;
ESRD patients

Abstract

Objective: The present study investigated the prevalence of anemia, depression, and duration of hemodialysis among ESRD patients and its relation with quality of sleep.

Method: A total of 70 ESRD patients undergoing hemodialysis in referral Hospital in Bogor, Indonesia participated in the study. PSQI questionnaire and BDI II questionnaire were used to measure the quality of sleep and status of depression, respectively. The medical record was used to record the value of hemoglobin, and the demographic questionnaire was used to determine the duration of hemodialysis. The gathered data were analyzed using descriptive and chi-square test.

Results: Almost all of the respondents had anemia (98.6%), poor sleep quality (94.3%), with minimal depression (64.3%). There is no relationship either anemia or depression with sleep quality of patient (p anemia = 0.957, p depression = 0.502, $\alpha = 0.05$). And for the duration of hemodialysis showed a significant relationship with the patient's sleep quality ($p = 0.049$, $\alpha = 0.05$).

Conclusions: Physical impact is more common than the psychological impact in this study. Family support and attention of health care providers are very important to improve quality of patient's health. Thus they can live longer.

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[☆] Peer-review under responsibility of the scientific committee of the Second International Nursing Scholar Congress (INSC 2018) of Faculty of Nursing, Universitas Indonesia. Full-text and the content of it is under responsibility of authors of the article.

Introduction

Chronic renal failure is a condition involving kidney damage that impairs kidney function in the elimination system. The fifth stage of chronic renal failure, known as end-stage renal disease (ESRD), is characterized by the worst type of kidney damage, with Glomerular Filtration Rate (GFR) <15 ml/min/1.73 m². The global prevalence of ESRD tends to be high (0.1%)¹ and is even higher in Indonesia (0.2%).²

ESRD affects patients physically and psychologically. Physically associated with various complications, the most common of which is anemia. The prevalence of anemia was 50% in patients with chronic renal failure and 75% among dialysis patients.³ Psychologically, the clinical factors experienced by patients with chronic renal failure can lead to depression.⁴ Globally, the prevalence of depression is 10% higher among patients with chronic renal failure.⁵

Besides physical and psychological burdens, ESRD patients also experience disturbances concerning their basic needs. For instance, the prevalence of sleep disorders among ESRD patients ranges from 45 to 80%.⁶ Sleep deprivation can be detrimental to patients' health and quality of life. In particular, anemia and depression, which are common physical and psychological impacts of ESRD, may decrease the quality of sleep among HD patients.

Previous studies found varying information concerning the relationship between the duration of HD and quality of sleep for ESRD patients undergoing HD. Pai et al.⁷ found that, due to the accumulation of uremic toxins, the longer a person has undergone HD, the lower his or her quality of sleep. Furthermore, Warhamna⁸ revealed that patients who have undergone HD for more than six months are more able to adapt to the conditions and achieve good sleep quality. Based on this prior research, this study aims to determine the relationship between anemia, depression, duration of hemodialysis, and quality of sleep in ESRD patients.

Method

This research has ethical clearance from Faculty of Nursing Universitas Indonesia. It employs a cross-sectional design with a total sampling technique and examines 70 ESRD patients undergoing HD in a hospital in Bogor, Indonesia. Anemia is identified in patients' medical records by investigating patients' hemoglobin values, which are divided into four categories based on the World Health Organization's criteria: non-anemia (male: hemoglobin (Hb) >12.9 g/dl. Female: Hb >11.9 g/dl), mild anemia (male: Hb 11–12.9 g/dl. Female: Hb 11–11.9 g/dl), moderate anemia (male and female: Hb 8–10.9 g/dl), and severe anemia (male and female: Hb <8 g/dl).

Depression is identified using the Indonesian-language version of the Beck Depression Inventory (BDI) II questionnaire divided into the cognitive, affective, and somatic aspects of assessment. Duration of HD is identified using the demographic questionnaire. Sleep quality is identified using the Pittsburgh Sleep Quality Index (PSQI) quality of sleep questionnaire. The questionnaire identified seven factors: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, sleeping pills, and daytime dysfunction. The characteristics of respondents, including

Table 1 Characteristics of ESRD patients in HD unit (N=70).

Variable	Classification	N	%	N total
Age	Early adult (>20–40 years)	10	14.3	70
	Older adult (41–65 years)	43	61.4	
	Elderly (>65 years)	17	24.3	
Gender	Woman	33	47.1	70
	Man	37	52.9	

age and gender, were identified using the demographic questionnaire.

The questionnaires have been tested for validity and reliability. The results of the validity tests for both questionnaires show that their validity is higher than that of the *r* table (0.361); the validity of the PSQI questionnaire ranged from 0.394 to 0.623, while that of the BDI II questionnaire ranged from 0.369 to 0.739. Reliability, which was determined based on Cronbach's alpha, for the PSQI questionnaire was 0.469 and for BDI II was 0.883. These results indicate that the tests are valid and reliable.

The data were analyzed using descriptive and bivariate analysis (chi-square test) to examine the prevalence of an association between anemia, depression, and duration of hemodialysis with the quality of sleep among ESRD patients undergoing HD.

Results

Discussion

Characteristics of respondents

The participants' characteristics are summarized in Table 1. Respondents' mean age was 53.76 years old. Of the respondents, 85.7% were adults, and older adults comprised 61.4% of the sample. Thus, ESRD occurs mostly in adulthood, primarily among older adults (41–65 years). According to the Ministry of Health of Indonesia, ESRD is found primarily among people aged 35–44 years (older early adults and younger older adults).⁹ Older people are also more at risk of kidney disease; after one is 40 years old, the kidneys' filtration ability begins to decrease by 1% every year.¹⁰

There are fewer elderly respondents because old age associated with morbidity and mortality, and mortality is higher among older ESRD patients because it is associated with progressive kidney function decline.¹¹ Weakness and decreased activity among elderly patients are also associated with mortality.¹²

There was a greater proportion of male respondents (52.9%) than female respondents (47.1%) in this study. Similarly, Armezya et al.¹³ reported that 68% of their respondents were male. Additionally, a prior study reported that 57.8% of patients with new-onset ESRD were male.¹⁴ This is because the dominant hormone in men is testosterone, and it affects various mechanisms, such as apoptosis of podocyte cells, that play an important role in the development of glomerulosclerosis and chronic kidney disease.

Table 2 Prevalence of anemia, depression, duration of hemodialysis, and quality of sleep among ESRD patients in HD unit ($N = 70$).

Variable	Classification	<i>N</i>	%	<i>N</i> total
Anemia	Non-anemia	1	1.4	70
	Mild anemia	2	2.9	
	Moderate anemia	45	64.3	
	Severe anemia	22	31.4	
Depression	Minimal depression	45	64.3	70
	Mild depression	11	15.7	
	Moderate depression	13	18.6	
	Severe depression	1	1.4	
Quality of Sleep	Good	4	5.7	70
	Poor	66	94.3	
Duration of HD	<1 month	2	2.9	70
	1–3 months	9	12.9	
	3–6 months	8	11.4	
	6–12 months	14	20	
	12–36 months	14	20	
	≥36 month	23	32.9	

Table 3 Association between anemia, depression, duration of hemodialysis, characteristics of respondents, and quality of sleep of ESRD patients in HD unit ($N = 70$).

		Quality of sleep				<i>p</i> value
		Good		Poor		
		<i>N</i>	%	<i>N</i>	%	
Anemia	Non-anemia	0	0	1	1.5	0.957
	Mild anemia	0	0	2	3.03	
	Moderate anemia	3	75	42	63.64	
	Severe anemia	1	25	21	31.8	
Depression	Minimal depression	4	100	41	62.7	0.502
	Mild depression	0	0	13	19.69	
	Moderate depression	0	0	11	16.67	
	Severe depression	0	0	1	1.5	
Duration of HD (months)	<1	1	25	1	1.5	0.049
	1–3	0	0	9	13.64	
	3–6	0	0	8	12.12	
	6–12	2	50	12	18.18	
	12–36	0	0	14	21.21	
	≥36	1	25	22	33.33	
Age	Early adult	1	25	9	13.64	0.806
	Older adult	2	50	41	62.12	
	Elderly	1	25	16	24.24	
Gender	Woman	1	25	32	48.48	0.616
	Man	3	75	34	51.52	

Given the differences from previous studies, it can be argued that the results of this study are influenced by patients' socioeconomic factors, response, tolerance, and adaptability to the therapy.¹⁵

Anemia

As shown in [Table 2](#), almost all of the respondents (98.6%) experienced anemia, which manifests in 80–90% of ESRD

patients.¹⁶ This result aligns with previous research conducted by Hidayat et al.,¹⁷ who found an anemia prevalence of 98.5% among their respondents. In this study, anemia is defined according to WHO guidelines: males and females are diagnosed with anemia when their hemoglobin levels are less than 13 g/dl and 12 g/dl, respectively, and are not anemic when their hemoglobin levels are greater than 12.9 g/dl and 11.9 g/dl, respectively.

The high prevalence of anemia in ESRD patients in various studies indicates that anemia is a common physical

effect of ESRD. It occurs because of tubular atrophy resulting in tubulointerstitial fibrosis, which affects the capacity for erythropoietin formation.³

Depression

Depression was categorized into four categories ranging from minimal (which includes people who are not depressed) to severe. Most respondents (64.3%) had minimal depression, while only a few (1.4%) had severe depression. These percentages are lower than those reported in some previous studies. For instance, Bautovich et al.¹⁸ found that 20% of ESRD patients had depression; Palmer et al.⁵ found a prevalence of 20.3%, which is 10% more common among patients with serious illness around the world; and Shirazian et al.¹⁹ mentioned that 20% of ESRD patients with diverse demographic, socioeconomic, and clinical factors had depression.

The results of this study suggest that the psychological impact of depression in ESRD patients undergoing HD is generally minimal in the sense that it is still controllable. Most of the respondents (72.9%) underwent HD for more than six years, and thus they might have accepted the conditions of the disease since rejection usually occurs when one first finds out that he is suffering from kidney disease and must undergo HD. In addition, family support can reduce the psychological impact of the illness,²⁰ minimizing depression.

Duration of hemodialysis

On average, patients underwent HD for 25.07 months. Of the six categories of duration of HD, most respondents (32.9%) underwent HD for ≥ 36 months. These results are different from those of the Indonesian Renal Registry,²¹ which reported that the most common duration of HD among ESRD patients in Indonesia is 6–12 months.

Both this study and prior research have found that the majority of ESRD patients undergo HD for a long duration. Rahman et al.,²² showed that more patients underwent HD for >6 months (22 people) than <6 months (12 people). Also, Hadi²³ mentioned that the most common length of HD duration was ≥ 24 months (70.4%).

Indonesia is known for its caring, sense of belonging, harmony, and emphasis on family responsibilities.²⁴ This strengthens patients' will to survive. Several studies have shown that family support is related to patients' quality of life. In addition, family support is significantly correlated with quality of life ($p = 0.002$) and moral and material support.²⁰

Quality of sleep

The prevalence of poor sleep quality in this study was very high (94.3%); only four people (5.7%) reported good sleep quality. This result is in line with previous studies on sleep quality among patients with kidney disease. Natale et al.⁶ mentioned that the prevalence of sleep disorders ranged from 45 to 80% and Roumelioti et al.²⁵ mentioned that ESRD patients with dialysis dependence were associated with sleep quality.

Further review of each component in the PSQI questionnaire revealed that the score most contributing to the high PSQI score were that of the third component—sleep duration—followed by sleep latency, daytime dysfunction, subjective sleep quality, sleep disturbances, sleep efficiency, and use of sleeping pills. Respondents' sleep duration was shown to be generally low, which resulted in poor sleep latency and was perceived by respondents to produce low-quality sleep. This was certainly influenced by sleep disturbances, which include pain, overheating, cold, coughing, and waking up in the middle of the night. Various external factors can also affect patients' quality of sleep, including physical condition, pain, diet, and environment (lighting, temperature, and noise).²⁶ The use of sleeping pills had a minimal impact compared to other components due to fear of drug dependence.

Relationship between anemia and quality of sleep

The prevalence of anemia (98.6%) and poor sleep quality (94.3%) was high in this study, in line with previous research by Iliescu et al.,²⁷ who found that 71% of ESRD respondents with HD and low hemoglobin levels experienced poor sleep quality. However, as shown in Table 3, the bivariate analysis performed in this study showed that anemia did not have a significant correlation with sleep quality ($p = 0.957$). In line with the Palawe et al.,²⁸ no association was found between hemoglobin and sleep quality ($p = 0.754$) due to stress factors, poor diet, and lack of exercise. This result differs from those obtained by Rompas et al.,²⁹ which showed a significant relationship ($p = 0.003$) between the hemoglobin level and sleep quality of ESRD patients.

Pai et al.,⁷ who did not know the quality of sleep of the respondents before performing their study, found no relationship between hemoglobin level and PSQI score. This result is consistent with this study, which did not only include respondents who were known to have poor sleep quality and found no association between hemoglobin level and PSQI score.

Relationship between depression and quality of sleep

The results of this study's bivariate analysis showed that there was no significant relationship between depression and sleep quality ($p = 0.502$) (Table 3). Almost all the respondents in this study had minimal depression, yet the majority exhibited poor sleep quality. After further examination of the respondents' answers on the questionnaire, it was determined that the high percentage of poor sleep quality was due to frequent waking up in the middle of the night, pain, itching, coughing, or environmental factors.²⁶ This finding is in contrast to the results of Iliescu,³⁰ which showed that depression was the only independent factor causing 53% of patients' poor sleep quality.

Relationship between duration of HD and quality of sleep

The duration of HD is the only variable that has a significant relationship with the sleep quality of ESRD patients in this study ($p=0.049$) (Table 3). In total, 22 of the 70 respondents (31.4%) who had undergone HD for more than or equal to 36 months experienced poor sleep quality. This is in line with previous research conducted by Pai et al.,⁷ which showed that the longer a person has undergone HD, the lower the quality of sleep they experience due to the accumulation of uremic toxins. However, this study's results are in contrast to the research of Warhamna,⁸ which showed that patients who underwent HD for >6 months were more able to adapt to their conditions and had good sleep quality, while patients who underwent HD for ≤ 6 months experienced poor sleep quality due to psychological factors. In this study, psychological factors did not influence sleep quality. Rather, the significant relationship between the duration of HD and quality of sleep was due to the accumulation of toxins.

Conflict of interests

The authors declare no conflict of interest.

Acknowledgements

This work is supported by Hibah PITTA 2018 funded by DRPM Universitas Indonesia No. 1833/UN2.R3.1/HKP.05.00/2018.

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