

Prevalence and Characteristics of Depression in Chronic Kidney Disease Patients Receiving Hemodialysis: A Cross-Sectional Study

Nadya Fairuz Imsabrina,¹ Rihadini,² Lukman Faishal Fatharani³

¹Faculty of Medicine, Muhammadiyah University Semarang, Indonesia

²Department of Psychiatry, Faculty of Medicine Muhammadiyah University Semarang, Indonesia

³Department of Biomedicine, Faculty of Medicine Muhammadiyah University Semarang, Indonesia

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Correspondence:

Nadya Fairuz Imsabrina,
Faculty of Medicine,
Muhammadiyah University
Semarang, Indonesia,
Email: nadyafairuz1502@gmail.
com

Abstract

Background: Chronic Kidney Disease (CKD) causes decreased kidney function, requiring long-term hemodialysis. This condition is often associated with poor prognosis and increased risk of psychiatric diseases, particularly depression.

Objective: To examines the levels of depression among CKD patients receiving hemodialysis at Roemani Muhammadiyah Hospital, Semarang, Indonesia.

Methods: A descriptive cross-sectional study was conducted on a sample of 80 respondents with CKD undergoing hemodialysis. Samples were selected using purposive sampling based on the inclusion criteria. Data collection was conducted in March 2024 using the Beck Depression Inventory-II (BDI-II) instrument and analyzed with GraphPad 9.5.

Results: The results showed that the prevalence of depression among CKD patients undergoing hemodialysis was 83.8%, 11.9%, and 5.0% for minimal, mild, and moderate depression levels, respectively. Depression was more frequently observed in female patients and those over 50 years old. Significant differences were found in the duration of CKD ($p=0.03$) and hemodialysis ($p=0.02$) across depression levels, with shorter durations observed in patients with mild depression. However, correlation analysis revealed a weak and non-significant negative relationship between depression scores and duration of hemodialysis.

Conclusion: Most CKD patients receiving hemodialysis experienced minimal depression, followed by mild and moderate depression, with higher occurrence in women and patients aged >50 years. Although significant differences in CKD and hemodialysis duration were observed across depression levels, the overall relationship showed a weak and non-significant negative correlation.

Keywords: Beck Depression Inventory-II (BDI-II), chronic kidney disease (CKD), depression, hemodialysis

Introduction

Chronic kidney disease (CKD) refers to sustained impairment of kidney function lasting more than 3 months and remains a significant concern in the field of healthcare.¹ The 2018 data from Basic Health Research (*Riskesdas*) showed that 4 out of 1000 people in Indonesia were diagnosed with CKD. A decrease in prevalence was observed in 2013,

from 0.2% to 0.3%.²

Kidney damage can be acute and chronic, where, in certain stages, it will require dialysis treatment to help remove uremic toxins. Dialysis treatment should be considered when the glomerular filtration rate (GFR) is < 15 mL/minute per 1.73 m² (stadium 5).³ The frequently used kidney replacement therapy is hemodialysis.⁴ According to *Riskesdas* in 2018, the average prevalence of patients with

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CKD receiving hemodialysis in each province of Indonesia was 19.33%.² Patient data, based on the Indonesian Renal Registry, in 2018 increased drastically from the previous year, with 66,433 new patients receiving hemodialysis.⁵

Hemodialysis can be a major stress in patients daily lives because survival continuously depends on dialysis machines, and quality of life is worse compared to other chronic diseases and the general population.⁶ This long-term treatment procedure and worse prognosis results lead to mental diseases, mainly depression, which often occurs in patients with kidney disease.⁷ The prevalence of patients with CKD suffering from depression has increased from 20% to 40%.⁸ A study in *Rumah Sakit Jemursari* Surabaya showed that respondents suffering from depression symptoms were 68.1%.⁹ Another study reported that the percentage of depression in hemodialysis patients was 72.73%, with 59.09% reporting having moderate to severe depression.¹⁰ Additionally, a positive correlation was found between a more prolonged period of hemodialysis and an increased prevalence of depression, as well as a decline in quality of life.^{11,12} The difficulties of self-care, diminished control over health, and dependence on dialysis equipment make hemodialysis patients more vulnerable to depression. Tension is increased by the procedures, which include inserting a needle into an arteriovenous fistula or placing a catheter, as well as by machine alarms. Dependency on medical professionals and family members can also lead to psychological stress and the rise of depressive symptoms.¹³

Depression in CKD patients receiving hemodialysis may accelerate atherosclerosis, inflammation, and the risk of cardiovascular problems. Moreover, depression is correlated with non-compliance to treatment, indiscretions in diet, weight gain when receiving dialysis, and missing schedules. Non-compliance with self-care behavior deteriorates blood pressure, anemia, cholesterol, blood glycemia, bone metabolism, phosphorus, and fluid balance, leading to serious health complications.¹⁴ This causes an increase in mortality rate, longer duration of hospitalization, longer hemodialysis period, and less frequency of transplantation.¹⁵ Currently, there is a lack of studies in Indonesia focusing on depression in CKD patients receiving hemodialysis. Therefore, this study aims to determine the prevalence and features of depression in patients with CKD receiving

hemodialysis.

Methods

A descriptive study with a cross-sectional design was conducted on 80 patients with CKD who were receiving hemodialysis at Roemani Muhammadiyah Semarang Hospital in March 2024. The identified samples were obtained using purposive sampling based on the inclusion criteria, which include CKD patients receiving regular hemodialysis every week. Meanwhile, patients with a history of mental diseases, a family history of mental disease, or communication diseases were excluded. All participants provided written informed consent, and this study was approved by the Health Research Ethics Commission of Roemani Muhammadiyah Hospital (EA-011/KEPK-RSR/III/2024).

Data collection was conducted using the questionnaire of Beck Depression Inventory-II (BDI-II) to measure depression based on what the patients felt in the last 2 weeks. The BDI-II was selected for this study as it is a widely validated instrument designed to assess the cognitive, behavioral, emotional, and somatic components of depression. The questionnaire consists of 21 item groups describing 21 categories of attitudes and depression symptoms with a scale of 4-point, from 0 (no symptoms) to 3 (severe symptoms). The BDI-II scale categorizes depression levels as follows: 0-13 (minor), 14-19 (mild), 20-28 (moderate), and 29-63 (severe). This study showed a good level of internal consistency, as evidenced by a Cronbach's Alpha of 0.90, indicating that the instrument used to measure depression was valid and reliable.¹⁶ Data were analyzed using GraphPad Version 9.5, and ethical approval was obtained.

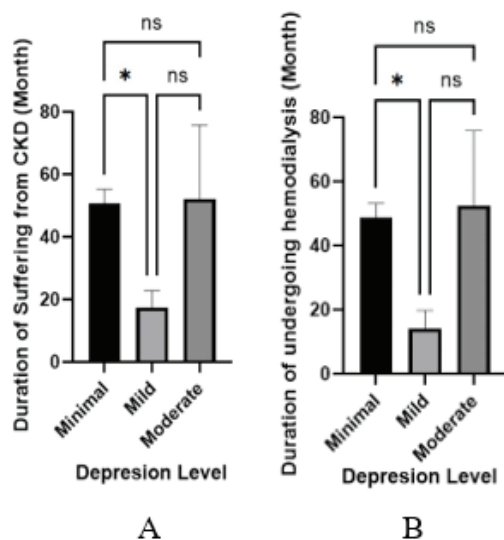
Results

A total of 80 CKD patients were recruited to participate in this study. As shown in Table 1, male patients (55.6%) were higher than females (43.2%), with the average age being 51.43 years old (± 10.850). Most patients had completed Senior High School/Vocational School (38.8%) and worked as private employees (40.0%).

The majority of patients (83.8%) experienced minimal or no depression, while mild depression was observed in 9 patients (11.3%), and moderate depression in 4 patients (5.0%). However, no cases of severe depression were recorded. A statistically

Table 1 Characteristics of the Study Participants (n=80)

Characteristics	n (%)	Mean ($\pm$ SD)
Gender		
Male	45 (55.6)	
Female	35 (43.2)	
Age		51.43($\pm$ 10.850)
Education		
No education	2 (2.5)	
Elementary school	11 (13.8)	
Junior high school	15 (18.8)	
Senior high school/Vocational school	31 (38.8)	
Diploma/Bachelor	21 (26.3)	
Occupation		
Unemployed	12 (15.0)	
Housewife	24 (30.0)	
Private employees	32 (40.0)	
Civil servant	6 (7.5)	
Retired	(7.5)	

**Fig. 1 Comparison of CKD and Hemodialysis Durations According to Depression Level Among Patients Receiving Hemodialysis (n=80)**

(A) Duration of CKD and (B) duration of hemodialysis. The x-axis shows depression levels (minimal, mild, and moderate), and the y-axis shows duration in months. * indicates a statistically significant difference; ns indicates a non-significant difference

significant difference was found between depression levels and the duration of CKD ($p=0.03$) as well as hemodialysis ($p=0.02$). These results suggest that while depression is present in some patients, severe cases are uncommon, and longer disease duration may be associated with higher depression scores (Table 2, Fig. 1).

The results showed variations in the duration of CKD and hemodialysis across different depression levels in CKD patients receiving hemodialysis. As illustrated in Figure 1, patients with mild depression exhibited shorter durations of both CKD and hemodialysis compared to those with minimal and moderate depression. A statistically significant difference was observed between the minimal and mild depression levels, whereas other comparisons were not statistically significant.

Further analysis showed correlations between depression scores and both the duration of CKD and the duration of hemodialysis in CKD patients receiving hemodialysis. However, these correlations were not statistically significant ($p=0.12$ and $p=0.16$) and showed low R^2 values (0.03 and 0.02), indicating weak associations. These findings suggest that the duration of disease

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Table 2 Level of Depression Based on the Duration of Suffering from CKD and the Duration of Undergoing Hemodialysis (HD)

	Depression level				p-value
	Minimal (%)	Mild (%)	Moderate (%)	Severe (%)	
Duration of suffering from CKD	67(83.8)	9(11.3)	4 (5.0)	0 (0.0)	0,03*
Duration of undergoing HD	67(83.8)	9(11.3)	4 (5.0)	0 (0.0)	0,02*

*= p-value ≤0,05

Table 3 Correlation Between Depression Scores and Duration of CKD and Hemodialysis in CKD Patients Receiving Hemodialysis

	p-value	R ² value
Duration of suffering from CKD	0.12	0.03
Duration of undergoing HD	0.16	0.02

and treatment is not strongly related to depression scores.

Discussion

An epidemiological study on CKD reported a higher incidence and prevalence in men than women. However, depression is less common

in men, while women are twice as likely to be diagnosed with depression.¹⁷ In this study, more women experienced mild depression and moderate depression (17.2%), while most men had mild depression (13.3%). Women tend to recognize subtle emotional changes or have experienced more emotional symptoms than men. In contrast, men often adopt coping mechanisms that comprise emotional suppression and reluctance to seek help. Consequently, men typically require more severe symptoms before acknowledging or reporting depression, which increases the possibility of underdiagnosis and undertreatment.¹⁸

The mean age was 51.43 years, with a range of 23 to 71 years. In Indonesia, most hemodialysis patients are 45 - 64 years old. Depression also increases significantly with the increase in age. The mean age of patients in this study suffering from mild depression was

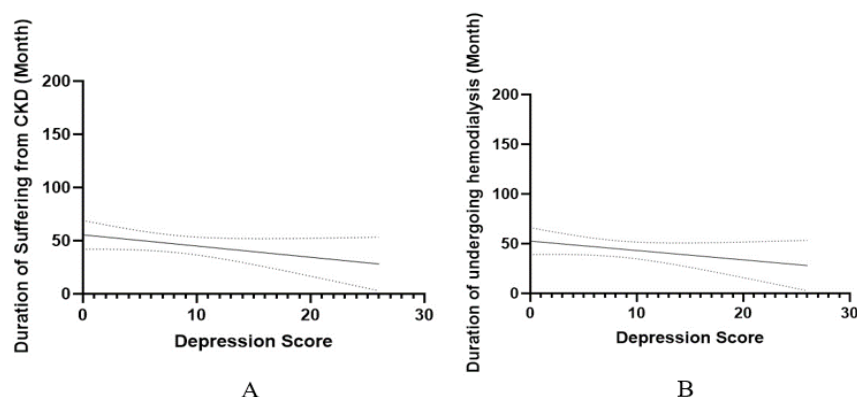


Fig. 2 Correlation Between Depression Scores and the Duration of CKD and Hemodialysis Among Patients Receiving Hemodialysis

(A) Correlation between depression scores and the duration of chronic kidney disease (CKD). (B) Correlation between depression scores and the duration of hemodialysis. The x-axis represents depression scores, whereas the y-axis represents duration in months. Both plots show weak, non-significant negative correlations

51.89 years old, and moderate depression was 52.25 years old. Chronic disease in the middle age, such as CKD and receiving hemodialysis, causes physical inactivity, limited mobility, and social isolation, which ultimately lead to depression.¹⁹

Educational level is correlated with literacy, as individuals with lower education tend to have limited disease knowledge and awareness of impact.²⁰ In this study, mild depression was more common among those with higher education (25.6%), while moderate depression was more prevalent in those with lower education (29.1%). Psychologically and interpersonally, higher education is associated with better coping mechanisms, problem-solving skills, and cognitive abilities, which help mitigate negative health outcomes.²¹

With respect to employment status, the majority of patients experiencing mild and moderate depression were private employees, accounting for six cases (18.8%) and one case (3.1%), respectively. Meanwhile, the lowest proportion of mild depression was found in 2 unemployed patients (16.7%). This is consistent with the fact that individuals with chronic diseases may struggle to secure employment or face reduced working hours compared to those without chronic disease, resulting in a diminished quality of life. Individuals suffering from end-stage CKD, for example, experience a significant decline in employment rates, with approximately half of patients becoming unemployed due to the burden of the disease. This leads to a decrease in the ability to perform tasks and endure physical activities, resulting in limitations in daily routines as well as a decline in both mental and physical well-being.²²

There was a weak negative correlation between depression scores and the duration of CKD and hemodialysis. The results indicated that depression scores tended to decrease as the duration of CKD and hemodialysis increased, although this trend was not statistically significant ($p > 0.05$). Figure 1 shows that the level of minimal and moderate depression was not significant because 1 of 4 patients who experienced moderate depression had suffered from CKD and received hemodialysis for ± 120 months. The average duration of suffering from CKD and receiving hemodialysis was 47.07 months (± 36.415) and 56 months (± 36.483), respectively. Munisi *et al.* stated that disease diagnosis increases the risk of developing depression. However, patients diagnosed with CKD for a period of 4 years or more (53–96 months) are 0.2 times less likely to experience depression. This result is

consistent with studies conducted in India and China, also suggesting that over time, patients with CKD tend to have a better quality of life.²³ Another study by Elkheir *et al.* reported that the duration of dialysis has a significant correlation to depression, with a p-value of 0.000, where patients who have just received hemodialysis have a higher opportunity to experience depression compared to those with long-term dialysis. Patients who spent >1 year receiving hemodialysis feel more adapted to the situation, hence, depression score tends to be lower than those who started dialysis <1 year.²⁴ Various factors, such as coping methods, affect the level of depression in patients with CKD. Patients with longer duration of hemodialysis have lower levels of depression due to various stresses and the development of adaptive coping strategies. More importantly, patients who have received hemodialysis for more than one year show improvement in sexual, mental, as well as physical characteristics compared to less than one year.²⁵

This study found that patients with a prolonged hemodialysis duration tend to have lower depression levels based on the score of the BDI-II. As stated by Deswima *et al.*, patients with a duration of hemodialysis ≤ 36 months experienced more mild (9.6%) and moderate (3.8%) depression compared to those with a duration of ≥ 37 months, with more minimal depression (52%) and a mean BDI-II score of 7.13 ± 5.3 .²⁵ Another study reported that BDI-II score is higher in patients with a shorter duration of hemodialysis as evidenced by a mean score of $17.07 (\pm 12.7)$.¹³ According to the theory proposed by Kubler-Ross, E. & Kessler, D., there are five stages in coping with sadness, namely denial, anger, bargaining, depression, and acceptance. The low score in depression is most possibly due to being in the acceptance stage.²⁵ The limitation of this study is that other factors influencing depression, such as comorbid disease, drug-induced depression, and menopause, are not well documented.

In conclusion, the level of depression in CKD patients receiving hemodialysis includes minimal (83.8%), mild (11.9%), and moderate (5.0%). Women appeared to suffer more from depression (17.2%) at the age of >50 years. In addition, while significant differences in the duration of CKD and hemodialysis were observed across depression levels, the overall relationship showed a weak and non-significant negative trend, suggesting that longer hemodialysis duration may be associated with lower depression scores.

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