Sana'a University Journal of Medical and Health Sciences

Prevalence and Predictors of Depression among Hemodialysis Patients in Amran City, Yemen

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Abstract

Introduction: Depression negatively affects the quality of life of patients undergoing hemodialysis (HD). Therefore, this study aimed to assess the prevalence of depression and its related factors among HD patients in Amran City, Yemen.

Methods: We conducted a cross-sectional study among 120 HD patients in Amran City between July and August 2024. Depression was measured using the Beck Depression Inventory–II (BDI-II), and associations with depression were examined using the chi-square test. Multivariable binary logistic regression was employed to determine predictors of depression, with a significance threshold of <0.05.

Results: Depression was observed in 60.8% of HD patients in Amran City. Independent predictors included being female (AOR = 2.3, 95% CI: 1.02–5.18, p = 0.043), illiteracy (AOR = 3.6, 95% CI: 1.45–8.91, p = 0.006), urban residence (AOR = 2.7, 95% CI: 1.11–6.52, p = 0.029), and having hypertension (HTN), with AOR = 2.5, 95% CI: 1.01–6.10, p = 0.048.

Conclusion: Depression is prevalent among approximately two-thirds of HD patients in Amran City. Its key predictors include being female, illiteracy, urban residence, and HTN. It is advised to integrate psychological evaluation and support into routine HD care, with collaboration between nephrologists and psychiatrists.

Article Info

Keywords:
depression, hemodialysis, prevalence, predictors, Yemen.

Article History:
Received: 6-March-2026,
Revised: 22-June-2026,
Accepted: 20-August-2026,
Published: 28-October-2026.

1. INTRODUCTION

End-stage renal disease (ESRD) substantially affects patients' daily functioning and mental health [1–3]. Globally, more than 10.9 million individuals with ESRD are estimated to receive renal replacement therapy [4], and hemodialysis (HD) represents the most commonly used treatment [5]. The strict dietary restrictions, fluid limitations, and lifestyle adjustments associated with HD may increase the risk of depression [1, 6, 7]. In Yemen, estimates from 2006 indicated an ESRD incidence of 93 cases per million population, with over 5,000 patients receiving HD [8, 9]. Depression is frequently observed in patients receiving HD [10], but its prevalence rates differ greatly from one country to another. Differences between countries may reflect the characteristics of the studied populations, the instruments used to assess depression, and differences in clinical care structures [11–20]. Routine assessment of depressive symptoms allows earlier psychological referral and monitoring of treatment response. Standardized diagnostic guidance, including criteria from the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) [21], describes major depressive disorder as persistent low mood or loss of interest lasting at least two weeks, accompanied by cognitive and somatic features [21]. However, diagnosis of depression in patients with ESRD can be difficult because many symptoms of CKD, such as fatigue, sleep disturbances and appetite changes, overlap with those of depression [22, 23]. Elevated serum urea levels have also been reported in association with depressive symptoms [24], suggesting a possible role of uremic toxicity in

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the onset of depression in patients with chronic kidney disease (CKD).

The prevalence of depression among patients with HD in Yemen is notably high. In Hodeidah City, 63% of HD patients experienced depression, disproportionately higher among females [25]. However, there is a lack of data on depression among HD patients in many governorates of Yemen, including Amran. This study investigated the prevalence of depression and its associated factors among HD patients in Amran City, north of Yemen.

2. SUBJECTS AND METHODS

2.1. Study design, population and place

A cross-sectional study was carried out among patients with ESRD undergoing HD at the Dialysis Center of Al-Sammad Hospital in Amran City from July to August 2024. Al-Sammad Hospital hosts the only dialysis center that provides services to patients with ESRD in both the city and the surrounding rural districts. The study included all ESRD patients aged >15 years who were undergoing HD at the center for at least three months, had no history of renal transplantation, and provided informed consent to participate. Patients with intellectual disabilities or diagnosed psychiatric conditions, such as dementia, delirium, or psychotic disorders, were excluded.

2.2. Sample size and selection

Using the OpenEpi online software (www.openepi.com) and based on an assumed total dialysis center population of 145 patients, a 50% expected response rate, a 95% confidence level, and a 5% marginal error, a sample size of 106 patients was calculated. However, 120 HD patients were recruited using convenience sampling during the study period.

2.3. Survey instruments and data collection

A structured questionnaire was used to collect demographic data (gender, age, marital status, education, place of residence, and employment status), as well as data about the duration of disease and the presence of comorbidities. Depression was measured using the Beck Depression Inventory-II (BDI-II) [26]. Because several symptoms related to CKD may overlap with depression symptoms, a higher cutoff score has been recommended when applying this tool, according to a Brazilian study [27]. For the present study, the BDI-II was translated into Arabic and printed for use at the dialysis center.

The recruitment of eligible patients occurred during their regular HD sessions. Those participants who were literate completed the questionnaire on their own, whereas those who could not read or write were assisted by researchers. After the survey, the patients were provided with an educational brochure on depression and practical coping strategies.

2.4. Data analysis

Data were summarized and analyzed using IBM SPSS Statistics, version 22 (IBM Corp., Armonk, NY, USA), and statistical significance was defined as p-value <0.05. A threshold score of 15 or higher was employed to identify depression [26]. To study the association between patients' characteristics and depression, a univariate analysis using the chi-square test was performed, calculating the odds ratios (ORs) of associations with their 95% confidence intervals (CIs). Multivariable binary logistic regression was used to examine variables that had a p-value <0.20 in the univariate analysis to account for potential confounders and identify independent predictors of depression, calculating the adjusted ORs (AORs) with 95% CIs.

3. RESULTS

3.1. Demographic characteristics of patients

Table 1 shows that over half of the HD patients in the study were males (55.8%), and their mean age was 47.2±16.1 years, with the majority (67.5%) aged 50 years or younger. Most participants were married and unemployed (81.7% each), uneducated (46.6%), and rural residents (55.8%).

3.2. Prevalence of depression among hemodialysis patients

Among HD patients in Amran City, 60.8% (73/120; 95% CI: 52.1–69.5) had depression.

3.3. Association of demographic factors with depression

Table 2 shows that depression was significantly associated with gender (OR = 2.7, 95% CI: 1.24–5.88; p = 0.011), age (OR = 2.4, 95% CI: 1.05–2.44; p = 0.035), literacy status (OR = 4.4, 95% CI: 1.98–9.91; p <0.001), employment status (OR = 2.7, 95% CI: 1.06–7.00; p = 0.034) and residence (OR = 3.2, 95% CI: 1.44–6.97; p = 0.003), being significantly more frequent among patients who were female, older than 50 years, illiterate, unemployed and urban residents compared to their counterparts. Conversely, depression showed no significant association with marital status.

Table 1. Demographic characteristics of HD patients ($N = 120$).

Characteristics	n (%)
Gender	
Male	67 (55.8)
Female	53 (44.2)
Age (years)	
Mean ± SD: 47.2 ± 16.1	
≤ 50	81 (67.5)
> 50	39 (32.5)
Marital status	
Married	98 (81.7)
Single	12 (10.0)
Widowed / divorced	10 (8.3)
Education level	
Uneducated	56 (46.6)
Primary education	30 (25.0)
Secondary education	26 (21.7)
University education	8 (6.7)
Employment status	
Employed	22 (18.3)
Unemployed	98 (81.7)
Residence	
Rural	67 (55.8)
Urban	53 (44.2)

SD: standard deviation; HD: hemodialysis.

Table 2. Association between demographic characteristics and depression among HD patients at the Dialysis Center of Al-Sammad Hospital, Amran City, Yemen (2024).

Characteristics	*N*	Presence of depression		*p*-value
		n (%)	OR (95% CI)	
Gender				
Male	67	34 (50.7)	Reference	
Female	53	39 (73.6)	2.7 (1.24–5.88)	0.012
Age (years)				
≤ 50	81	44 (54.3)	Reference	
> 50	39	29 (74.4)	2.4 (1.05–5.66)	0.035
Marital status				
Married	98	60 (61.2)	Reference	
Unmarried	22	13 (59.1)	0.9 (0.36–2.35)	0.853
Literacy status				
Literate	64	29 (45.3)	Reference	
Illiterate	56	44 (78.6)	4.4 (1.98–9.91)	< 0.001
Employment status				
Employed	22	9 (40.9)	Reference	
Unemployed	98	64 (65.3)	2.7 (1.06–7.00)	0.034
Residence				
Rural	67	33 (49.3)	Reference	
Urban	53	40 (75.5)	3.2 (1.44–6.97)	0.003

N: number of HD patients; n: number of depressed patients; HD: hemodialysis; OR: odds ratio; CI: confidence interval.

Table 3. Association between clinical characteristics and depression among HD patients at the Dialysis Center of Al-Sammad Hospital, Amran City, Yemen (2024).

Variable	N	Presence of depression		*p*-value
		n (%)	OR (95% CI)	
Duration of renal disease (years)				
≤ 5	106	64 (60.4)	Reference	
> 5	14	9 (64.3)	1.2 (0.37–3.77)	0.778
HTN				
Yes	89	59 (66.3)	2.4 (1.04–5.49)	0.038
No	31	14 (45.2)	Reference	
Diabetes mellitus				
Yes	15	9 (60.0)	1.0 (0.32–2.90)	0.944
No	105	64 (61.0)	Reference	
Heart disease				
Yes	11	6 (54.5)	0.8 (0.22–2.62)	0.654
No	109	67 (61.5)	Reference	

N: number of HD patients; n: number of depressed patients; HD: hemodialysis; HTN: hypertension; OR: odds ratio; CI: confidence interval.

Table 4. Independent predictors of depression among HD patients at the Dialysis Center of Al-Sammad Hospital, Amran City, Yemen (2024).

Predictor	AOR (95% CI)	p-value
Female gender	2.3 (1.02–5.18)	0.043
Illiteracy	3.6 (1.45–8.91)	0.006
Urban residence	2.7 (1.11–6.52)	0.029
HTN	2.5 (1.01–6.10)	0.048

HTN: hypertension; HD: hemodialysis; AOR: adjusted odds ratio; CI: confidence interval.

3.4. Association between clinical characteristics and depression

Table 3 shows that depression was significantly associated with hypertension (HTN), with 66.3% of hypertensive patients exhibiting depression compared to 45.2% of non-hypertensive patients (p = 0.038). Conversely, no statistically significant association was observed between depression and the duration of renal disease (p = 0.645), diabetes mellitus (p = 0.944), or heart disease (p = 0.750).

3.5. Predictors of depression among hemodialysis patients

Multivariable logistic regression showed that female gender (AOR = 2.3, 95% CI: 1.02–5.18, p = 0.043), illiteracy (AOR = 3.6, 95% CI: 1.45–8.91, p = 0.006), urban residence (AOR = 2.7, 95% CI: 1.11–6.52, p = 0.029), and HTN (AOR = 2.5, 95% CI: 1.01–6.10, p = 0.048) were identified as independent predictors of depression among patients with HD (Table 4).

4. DISCUSSION

This study revealed that approximately two-thirds of HD patients in Amran City were depressed, highlighting the substantial psychological burden in this population. This rate is comparable to the 63% recently observed in Hodeida City [25]. Higher prevalence rates have been reported among HD patients in China (68.9%) [19], Palestine (73.1%) [28] and Egypt (83.2%) [20]. In Saudi Arabia, the reported prevalence was considerably lower (34.5%) [29]. Such variation may relate to differences in measurement approaches, cultural context, quality of dialysis services, and the extent of psychosocial support.

Sex was significantly associated with depression in this study. Similar patterns have been reported in Yemen, Saudi Arabia, and Palestine [25, 28, 29]. However, studies from Egypt, China, and Pakistan have reported different results [19, 20, 30]. Women are usually more vulnerable to depression due to less effective stress management [25, 31], and the added social and domestic duties for housewives can intensify emotional stress during prolonged HD [28]. This finding suggests a need for targeted psychosocial interventions and clinical support for women undergoing HD.

Age was not an independent predictor of depression in the present study, which is consistent with a finding

from Palestine [28]. Older adult patients may be more susceptible to depression due to a higher frequency of comorbidities, age-related physiological changes, and a decline in coping mechanisms. Reports from Hodeida, Yemen, Saudi Arabia, Egypt, and China also found no association between age and depression among HD patients [18–20, 25, 29]. The lack of association between depression and marital status in the present study aligns with findings from Hodeida, Saudi Arabia, Egypt, and Palestine [20, 25, 28, 29]. Variations in patient demographics, sociocultural factors, and healthcare system elements could affect the association between depression and both age and marital status.

Illiteracy was found to be an independent predictor of depression in the present study, which could be explained by the fact that well-educated patients are likely to have better coping mechanisms and a greater capacity to adjust to psychological stressors [19]. Compared to more literate HD patients, less literate patients are generally more likely to suffer from anxiety and depression [32]. In contrast, studies from Hodeida, Egypt, Palestine, and Pakistan did not find an association between depression and educational attainment [20, 25, 28, 30]. The association between literacy and depression appears to vary depending on the context and is likely shaped by wider sociocultural and economic factors.

In this study, depression was significantly associated with unemployment, although not independently. Unemployment may place patients under considerable financial strain and limit access to practical and emotional coping resources, thereby increasing vulnerability to depressive symptoms. Comparable associations have been reported in studies from Yemen and other countries [20, 25, 28, 30]. In addition, the demanding nature of hemodialysis—particularly the fatigue and time commitment required for regular sessions—can contribute to social withdrawal among individuals with CKD [33]. Many patients also encounter limited job opportunities and workplace discrimination [34], further compounding their psychological burden.

Urban residence was significantly associated with depression. This association may be related to stressors that are more prevalent in urban settings, such as financial strain and overcrowding, higher living costs, and greater socioeconomic pressure. In the Yemeni context, this association may also reflect easier access to healthcare services and screening in urban areas, which could increase the likelihood of detecting depression symptoms among urban patients. In addition, the ongoing crisis and economic hardship in Yemen may have intensified economic disparities in urban settings, thereby exposing patients to additional psychological stressors. However, a study from Palestine found higher depression levels among patients living in rural areas [28]. Such variations suggest that the relationship between place of residence and psychological well-being is shaped by local social and economic conditions.

The lack of association between depression and the duration of HD in this study might suggest that patients undergoing prolonged dialysis gradually acquire coping strategies and psychological adaptation. Factors such as religious beliefs and acceptance of the situation may improve emotional resilience [16]. Similar observations have been reported in studies conducted in Palestine and India [28, 35]. However, this finding contradicts a study in Egypt [20], in which patients who underwent HD for a long period had higher anxiety and depression levels. These conflicting results imply that the mental health of patients undergoing long-term HD is influenced by a variety of factors, including the disease itself, as well as more general cultural, social, and individual resources.

In terms of chronic comorbidities, this study found that among HD patients, HTN and depression were significantly and independently associated, but not with diabetes or heart failure. Vascular dysfunction and neuroendocrine stress pathways may allow HTN to exacerbate depression, and depression may exacerbate blood pressure regulation, resulting in a reciprocal relationship [36]. HTN has been found to be a possible indicator of depression vulnerability in patients with ESRD [37]. Notably, HD patients who suffer from depression frequently have high blood pressure. For instance, a study conducted in India found that all patients with depression had HTN, whereas only 38% had diabetes mellitus [38]. Therefore, it is important to address the mental health of HD patients in relation to their cardiovascular health. The small number of patients with either diabetes mellitus or heart failure in this study may have limited the statistical power to identify significant associations.

This study advances knowledge about depression burden among patients with HD in Amran City. However, some limitations should be addressed. The cross-sectional design of this study could not establish causal relationships between depression and the independent variables. Conducting the study at a single center with a small convenience sample limited the generalizability of its findings. Furthermore, the lack of formal psychiatric confirmation of depression might lead to a misclassification because of the overlapping between the symptoms of depression and physical problems of ESRD. It is recommended that future prospective cohort studies and multi-center studies be conducted to better understand depression in patients with HD.

5. CONCLUSION

Depression is prevalent among approximately two-thirds of HD patients in Amran City. Its key predictors include being female, illiteracy, urban residence, and high blood pressure. It is advised to integrate psychological evaluation and support into routine HD care, with collaboration between nephrologists and psychiatrists.

ACKNOWLEDGEMENTS

The authors thank the participants at the Dialysis Center of Al-Sammad Hospital in Amran City. They also acknowledge the support in data collection by Najeeb S. Al-Wesabi, Wafa'a A. Amer, Hamid A. Hamid, Ammar A. Abdullah, Khaled A. Al-Shargi, Salah A. Abdulwahid, Mohammed M. Hageb, Haitham Q. Abdulrahman, Raoof A. Ghaleb, Amani B. Y. Al-Hawmi, Thekra K. Al-Hawmi, Mohammed A. Al-Hashedi, and Aseel A. Aljaofy from the Faculty of Medicine and Health Sciences, Amran University.

ETHICAL APPROVAL

The Research Ethics Committee of Amran University (Amran, Yemen) approved the study. Permission was also granted by the dialysis center administration. Patients were informed about the study procedures before enrollment and provided written consent. Participation was voluntary, and confidentiality of all collected data was maintained throughout.

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