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ORIGINAL RESEARCH

Prevalence of Depression and Its Associated Factors Among Hemodialysis Patients in Hodeida City, Yemen

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Background: Depression has a negative impact on the health outcomes of hemodialysis (HD) patients, including decreased quality of life and increased morbidity and mortality rates. Therefore, this study aimed to determine the prevalence of depression and its associated factors among HD patients in Hodeida city, Yemen.

Methods: A cross-sectional study involving 200 HD patients at the Dialysis Center in Hodeida was conducted from February to May 2022. Data on depression were collected using the 9-item Patient Health Questionnaire (PHQ-9). Association of sociodemographic characteristics of patients with depression were assessed using chi-square, subsequently by multivariable logistic regression. Statistical significance was set at P-values <0.05.

Results: The response rate was 98% (200/204). Depression was prevalent among 63% of HD patients at the Dialysis Center in Hodeida city. Sex was significantly associated with depression, where female patients were more frequently depressed than males (82.4% vs 56.4%, $P < 0.001$). In addition, employment status and medical insurance were significantly associated with depression, where unemployed patients were more frequently depressed than employed patients (67.6% vs 52.5%, $P = 0.041$) and patients with medical insurance were less frequently depressed than their counterparts (47.1% vs 66.3%, $P = 0.035$).

Conclusion: Depression is highly prevalent among HD patients in Hodeida city. Female sex, unemployment and lack of medical insurance are predictors of depression among HD patients. These findings emphasize the urgent need for targeted interventions.

Implications for practice: Depression is common among HD patients, so that, psychiatric physicians and nurses are increasingly needed in HD centers to implement mental health assessment of patients for depression signs and symptoms to help in early diagnosis and management of depression in order to improve patients' quality of life and preventing negative outcomes.

Keywords: depression, end-stage renal disease, hemodialysis, patient health questionnaire, PHQ-9, Yemen

Introduction

End-stage renal disease (ESRD) pose substantial public health challenges, affecting a populations in both developed and developing countries worldwide.[1] Globally, more than 1.9 million ESRD patients are undergoing renal replacement therapy.[2] Hemodialysis (HD) patients encounter various health-related challenges, them more susceptible to depression, including physical health deterioration, loss of familial and occupational roles, and diminished capacity for daily activities.[3]

Depression is the most common psychiatric health problem in CKD patients, particularly those with ESRD undergoing HD.[4] Previous studies have reported variable depression proportions among HD patients, ranging from 24% and

85%.[3,5,6] Depression negatively impacts the health outcomes of HD patients, leading to reduced quality of life, medication non-compliance with, recurrent hospitalizations, and increased suicide and mortality rates.[7–9] These complications are linked to depression-induced physiological changes, including markedly elevated inflammatory mediators, such as of C-reactive protein levels, and pro-inflammatory cytokines, particularly, tumor necrosis factor alpha and interleukin-6.[10]

A prospective cohort study involving 462,293 Taiwanese adults revealed that patients with CKD had 83% a higher mortality rate for all causes and 100% higher rate for cardiovascular disease.[11] The diagnose of depression in ESRD patients is challenging due to the overlap of the main somatic symptoms of the depression, such as anorexia, fatigue and sleep disturbances, with those of ESRD,[12,13] leading to delays in diagnosis and treatment.[14] Early and appropriate diagnosis of depression in ESRD patients is crucial for improving treatment adherence and quality of life.[14,15] Therefore, health care professional caring for HD patients should be qualified to regularly assess and investigate depression, facilitating promptly referral to psychologists for early treatment.[3,5] Recent studies highlight the positive impact of early nursing screening, psychological support, and nursing intervention in the treatment compliance, quality of life, and the reduction of anxiety, depression and risk of complications.[15,16]

Yemen, a developing country in the Middle East, reported a high ESRD incidence, estimated at 93 patients per million people in 2006.[17] In Hodeidah governorate, the fourth largest-city in Yemen in terms of population, the prevalence of depression may increase due to ongoing political conflict, low income, and the high prevalence of some neglected diseases, such as malaria and schistosomiasis, or kidney stones.[18–20] According to the annual statistical report in 2019, it revealed that the total number of patients undergoing maintenance dialysis in Yemen reached 5234.[21] In Hodeidah, the capacity of the dialysis center is up to 400 patients.[22]

Therefore, its crucial to assess depression status among HD patients, as no previous study has reported on the depression status among them. This study aimed to determine the prevalence of depression among HD patients in Hodeida city, Yemen, and to identify its associated factors. The findings of this study may serve as a foundation database, reflecting the magnitude of this problem in Yemeni HD patients. Furthermore, the findings can guide healthcare leaders and policymakers in developing and implementing plans to provide psychological support, ultimately improving the quality of life and mental health of HD patients and preventing depression-related complications.

Methods
Design, Population and Setting
A cross-sectional study was conducted among HD patients at the Dialysis Center in Hodeida city, Yemen, from February to May 2022. The selected center is the only dialysis center serves patients with ESRD from the city, rural districts of the governorate, and neighboring governorates such as Hajjah and Al Mahwit.

Inclusion and Exclusion Criteria
All patients with ESRD and aged over 18 years in the center were included in the study if they had been receiving HD for more than three months and gave informed consent to participate. Patients with chronic conditions, such as cancer and dementia, or with psychiatric illnesses were excluded. Overall, 204 ESRD patients on maintenance HD were invited to participate, but 200 of them accepted to participate in this study with a response rate of 98%.

Sample Size Calculation and Sampling Method
According to a WHO report, the dialysis center's capacity in Hodeidah governorate is approximately 400.[22] To determine the sample size for our study, we utilized the OpenEpi website formula available at (http://www.openepi.com/Menu/OE_Menu.htm). Considering a 95% confidence interval, 5% precision, and assuming a 50% response distribution, the calculated sample size was 197. Here in, we recruited a sample of 200 dialysis patients. Patients were recruited based on a convenience sampling technique.

Study Tool and Data Collection

Data about depression were collected using the Patient Health Questionnaire (PHQ-9), a widely used 9-item self-report scale assessing depressive symptoms experienced in the preceding two weeks.[8,23] It is one of the most commonly used clinical tools for assessing depression in primary care settings.[24] This tool was derived from the Primary Care Evaluation of Mental Disorders Patient Questionnaire (PRIME-MD PQ).[25] Its items are consistent with the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) for the diagnosis of major depressive disorders, making it a thorough depression screening tool.[23] This tool is brief, easy for patients to complete, and easy scored and interpreted, making it efficient depression screening tool.[26]

Using PHQ-9, patients were asked to rate how frequently they were bothered by specific problems in the preceding two weeks. Four alternative responses were assigned per question and scored from 0 to 3 (0 = not at all; 1 = several days; 2 = more than half the days; and 3 = nearly every day). Accordingly, the total score ranged from 0 to 27, with higher scores representing more severe depression. The severity of depression was categorized based on the total score as none (0–4), mild (5–9), moderate (10–14), moderately severe (15–19), and severe (20–27).[13,27] In this study, the cutoff score of PHQ-9 was set at a total score of 10 and higher to identify patients with moderate or severe depression because its sensitivity and specificity were best balanced at this cutoff point, as revealed in previous studies.[23,28]

An Arabic translation of the PHQ-9 has demonstrated validity and reliability among HD patients in Saudi Arabia[24] and outpatients in Lebanon,[23] with a Cronbach's alpha of 0.86 and 0.88, respectively. Sociodemographic and occupational, including sex, age, level of education, marital status, smoking, chronic illness history, family history of renal failure and psychological disorders, as well as information related to HD were collected using a pre-designed questionnaire. Data from HD patients were obtained through structured interview conducted by the researcher shortly after HD sessions, a time when uremic symptoms are at their lowest. This timing is crucial because many depression symptoms, such as anorexia, sleeplessness, and fatigue, overlap with uremic symptoms.[29] A pilot study with 20 patients was conducted to assess the design feasibility, item readability, and questionnaire reliability. The results of the pilot study showed that the questionnaire was easy to understand and read, and it took 10–15 minutes to complete for each patient, with a Cronbach's alpha of 0.82.

Ethical Considerations

Ethical approval was obtained from the Research Ethics Committee at Hodeida University (Ethical Approval Number; 121/2021). Permission to conduct the study was also obtained from the managers of the Dialysis Center. Informed consent was obtained from participants after explaining the study's objectives, voluntary of participation. Participants were assured of the voluntary nature of their participation and the protection of their anonymity. This study complies with the Declaration of Helsinki.

Data Analysis

Data were analyzed using the IBM SPSS Statistics software version 27.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including frequencies, percentages, means and standard deviations (SD), were used to present participants' characteristics and responses. The chi-square or Fisher's exact test was used where appropriate to assess the association between categorical variables. All significant factors in chi-square test were further analyzed using multivariate binary logistic regression to identify independent predictors of depression. Odd ratios were used to quantify the association at 95% Confidence interval for each predictor. Statistical significance was set at $P < 0.05$.

Results

Sociodemographic Data of the Participants

Table 1 shows that the mean age of HD patients was 41.74±12.9 years, with more than half of patients were aged 31–50 years. The majority of patients were males (74.5%), married (75.5%), uneducated (43.5%), and unemployed (69.5%). In

Table 1 Sociodemographic Characteristics of HD Patients (n=200)

Characteristic	N (%)
Sex	
Male	149 (74.5)
Female	51 (25.5)
Age (years)	
Mean ± SD: 41.7±12.9	
<31	52 (26)
31–50	104 (52)
≥51	44 (22)
Marital status	
Married	151 (75.5)
Single	40 (20.0)
Divorced	9 (4.5)
Education level	
Uneducated	87 (43.5)
Primary	55 (27.5)
Secondary	36 (18.0)
Diploma	13 (6.5)
Bachelor	9 (4.5)
Employment status	
Employee	61 (30.5)
Unemployed	139 (69.5)
Medical insurance	
Yes	34 (17.0)
No	166 (83.0)
Smoking	
Yes	32 (16.0)
No	168 (84.0)
Living status	
Alone	15 (7.5)
With family	185 (92.5)
Family history of renal failure	
Yes	40 (20.0)
No	160 (80.0)

(*Continued*)

Table 1 (Continued).

Characteristic	N (%)
Family history of psychological disorders	
Yes	32 (16.0)
No	168 (84.0)

Abbreviation: SD, standard deviation.

addition, most of them had no medical insurance (83%) and were non-smokers (84%). Most of patients were living with their families (92.5%) and had no family history of either renal failure (80%) or psychological disorders (84%).

Prevalence of Depression Among HD Patients

Depression was prevalent among 63% (126/200) of patients undergoing HD as shown in Figure 1.

Factors Associated with Depression

Table 2 shows that sex was significantly associated with depression, where female patients demonstrated a higher prevalence of depression than males (82.4% vs 56.4%, $P = 0.001$). In addition, employment status and medical insurance were significantly associated with depression, where unemployed patients exhibited a higher frequency of depression than employed patients (67.6% vs 52.5%, $P = 0.041$), while patients with medical insurance showed a lower prevalence of depression than their counterparts (47.1% vs 66.3%, $P = 0.035$). In contrast, no significant associations were found between depression and age, marital status, education level, smoking status, living status, family history of renal failure, family history of psychological disorders, Hypertension, diabetes mellitus, dyslipidemia, angina, or cerebrovascular accident.

Table 3 illustrates the results of the binary logistic regression analysis results in which cutoff of 10 as a dependent variable, and sex, employment status, and medical assurance as independent variables. The results showed that only female (odds ratio (OR) = 0.298; 95% confidence interval (CI) = 0.132–0.674; p = 0.004), remained significantly associated with higher depression score.
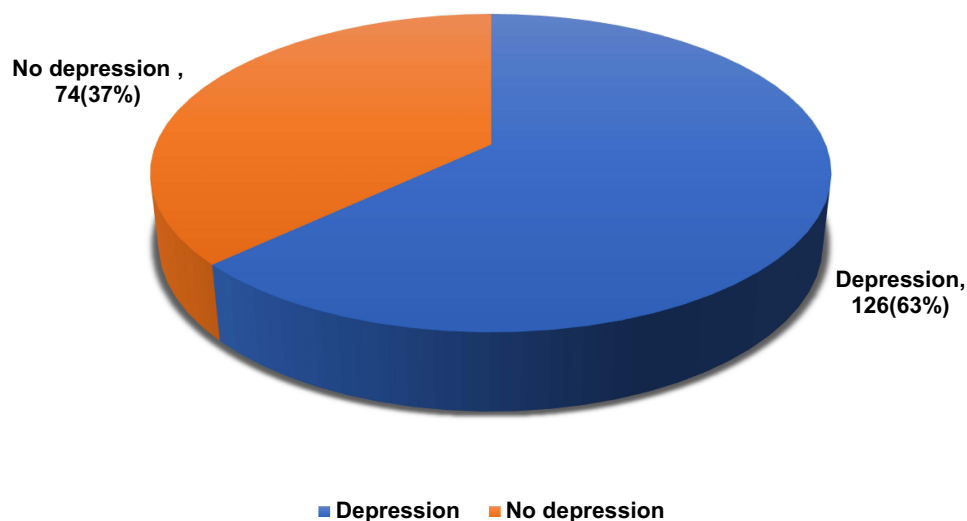

Figure 1 Prevalence of depression among adult hemodialysis patients.

Table 2 Factors Associated with Depression Among HD Patients (n=200)

Variable	N	PHQ-9 Depression Score n (%)		Chi-square	P-value
		<10	≥ 10		
Sex					
Male	149	65 (43.6)	84 (56.4)	10.99	**<0.001***
Female	52	9 (17.6)	42 (82.4)		
Age (years)					
<31	52	19 (36.5)	33 (63.5)	0.26	0.878
31–50	104	40 (38.5)	64 (61.5)		
≥51	44	15 (34.1)	29 (65.9)		
Marital status					
Married	151	56 (37.1)	95 (62.9)	6.384	0.094[b]
Single	40	18 (45.0)	22 (55.0)		
Divorced	9	0 (0.0)	9 (100.0)		
Education level					
Uneducated	87	28 (32.2)	59 (67.8)	4.776	0.311[b]
Primary school	55	21 (38.2)	34 (61.8)		
Secondary school	36	13 (36.1)	23 (63.9)		
Diploma	13	6 (46.2)	7 (53.8)		
Bachelor	9	6 (66.7)	3 (33.3)		
Employment status					
Employee	61	29 (47.5)	32 (52.5)	4.184	**0.041***
Unemployed	139	45 (32.4)	94 (67.6)		
Medical insurance					
Yes	34	18 (52.9)	16 (47.1)	4.466	**0.035***
No	166	56 (33.7)	110 (66.3)		
Smoking					
Yes	32	14 (37.5)	18 (62.5)	0.004	0.949
No	168	65 (82.3)	103 (63.1)		
Living status					
Alone	15	3 (20.0)	12 (80.0)	2.011	0.125
Family	185	71 (38.4)	114 (61.6)		
Family history of renal failure					
Yes	40	15 (37.5)	25 (62.5)	0.005	0.924
No	160	59 (36.9)	101 (63.1)		

(*Continued*)

Table 2 (Continued).

Variable	N	PHQ-9 Depression Score n (%)		Chi-square	P-value
		<10	≥ 10		
Family history of psychological disorders					
Yes	32	10 (31.2)	22 (68.8)	0.540	0.462
No	168	64 (38.1)	104 (61.9)		
Hypertension					
Yes	150	57 (38.0)	93 (62.0)	0.257	0.612
No	50	17 (34.0)	33 (66.0)		
DM					
Yes	37	10 (27.0)	27 (73.0)	1.937	0.164
No	163	64 (39.3)	99 (60.7)		
Dyslipidemia					
Yes	32	8 (25.0)	24 (75.0)	2.353	0.125
No	168	66 (39.3)	102 (60.7)		
Angina					
Yes	55	22 (40.0)	33 (60.0)	0.293	0.588
No	145	52 (35.9)	93 (64.1)		
Cerebral vascular accident					
Yes	13	6 (46.2)	7 (53.8)	0.500	0.556[a]
No	187	68 (36.4)	119 (63.6)		

Notes: Star sign (*) and bold text indicate significant results. [a]Fisher's exact test was conducted. [b]Fisher's exact test was conducted.
Abbreviation: PHQ-9, 9-item Patient Health Questionnaire.

Table 3 Predictors of Depression Among HD Patients (n=200)

Characteristic	B	S.E.	Wald	AOR	95% CI	P value
Sex						
Male	Reference					
Female	1.209	0.416	8.465	3.352	1.484–7.570	**0.004***
Employment						
Yes	Reference					
No	0.017	0.444	0.001	0.970	0.426–2.428	0.970
Medical insurance						
Yes	Reference					
No	0.628	0.527	1.422	0.233	0.668–5.259	0.233

Notes: Star sign (*) and bold text indicate significant results.
Abbreviations: B, coefficient of predictor variables; CI, confidence interval; AOR, adjusted odd ratio; S.E, standard error.

Discussion

Depression in ESRD patients undergoing HD poses significant challenges, particularly in Yemen, where cultural norms contribute to underdiagnosis and undertreatment. In Yemen, like other conservative Arab countries, people do not accept referrals to psychologists. Furthermore, they do not adhere to treatment or follow-up if diagnosed because they believe that depression is a mental problem and consider it a stigma in society.[30] Depression can adversely affect HD patients, leading to reduced quality of life, non-adherence to medications, recurrent hospitalizations, and increased suicide and mortality rates.[31] Consequently, continuous assessment and psychological support are needed, especially for Yemeni HD patients who are facing multiple war-related crises.

This is the first study to determine the prevalence of depression and its associated factors among HD patients in Yemen. The findings reveal a notable depression prevalence of 63% among HD patients in Hodeida city, as determined by the PHQ-9 scale. While this prevalence is lower than the prevalence reported in China (73.8%)[32] but higher than that reported in Jordan (48.5%),[13] where both studies utilized the same scale. Other smaller-scale studies in Saudi Arabia and Lebanon reported lower prevalence rates of 24.6% and 40.8%, respectively, using the Hospital Anxiety and Depression Scale.[3,6] Using the same tool, Khan et al[5] reported higher prevalence rates of depression among HD patients in Malaysia during three visits (71.3, 78.2 and 84.9%). In comparison to our study, a higher prevalence of depression (73.1%) was found among ESRD patients undergoing HD in Palestine.[33] The high prevalence rates of depression among HD patients in Yemen and Palestine could be explained by several common factors, including the impact of conflicts, limited social and psychological support, and inadequate dialysis facilities.[33]

The finding that female patients were more frequently depressed than males in the present study is consistent with other studies.[6,33,34] In contrast, no significant association between sex and depression was found for Lebanese patients.[3] One explanation for sex differences in depression could be attributed to the fact that females have less adaptation and coping mechanisms to stressors than males.[35,36] In addition, females in Yemen, like other Arab countries, are more susceptible to depression due to their lack of social authority and their feeling of inability to control their life. On the other hand, the absence of an association between depression and the age in the present study is consistent with findings reported for HD patients from Lebanon and Malaysia.[3,5] In contrast, a recent study showed that older Palestinian patients undergoing HD were found to be more susceptible to depression than younger ones, which may be attributed to their exposure to chronic diseases and physiological alteration.[33]

The lack of association between depression and the marital status of HD patients in the present study is in line with the findings reported in other Arab countries.[3,33] In contrast, unmarried CKD patients in China were found to be more frequently depressed than married ones, which was explained by the social support received by married patients from their partners as opposed to their counterparts.[37] However, further studies are needed to investigate this issue. The lack of association between depression and the education level of HD patients in this study is in line with that reported in other studies.[33,38] In contrast, it was found that highly educated CKD patients in Lebanon had lower levels of depression that may be related to their ability to have more resources to adapt and cope with depression.[3]

In the present study, unemployed patients were more frequently depressed than employed ones, which is consistent with other studies.[3,33] Employment conditions may play an important role in depression as a result of poor economic conditions. People who spend longer periods unemployed are exposed to more stressful conditions than those who are working.[39] Unemployment could expose the person to social isolation, deprivation of social relationships, and an increased susceptibility to depression. In addition to economic status and its effect on the occurrence of depression, the present study revealed that patients without medical insurance were more frequently depressed. The high cost of medications and medical care expenses are top concerns for patients in Yemen due to their low incomes. The war conflict in Yemen contributes to the deteriorating economic conditions and is a source of stress and depression for HD patients and the general population as a whole. Therefore, special attention should be given to these patients by health administrators in Yemen and by national and international health organizations to provide them with medical insurance and free healthcare services.

Limitations

This study is limited by being limited to a single center, despite having an adequate sample size and including all patients in this only center in Hodeida governorate. Therefore, its conclusions may not be generalizable to HD patients in the country. Nevertheless, these findings are considered the basis for future larger-scale studies in HD centers nationwide. Moreover, this study was conducted during two main stressors, war conflict in the country and the COVID-19 pandemic, which were not taken into account in the questionnaire. Therefore, the impact of these stressors on the study findings cannot be ruled out.

Relevance to Clinical Practice

The present study provides insight into the high prevalence of depression among Yemeni HD patients who have been overlooked, remain undiagnosed and receive no care. Its findings reinforce the appeal to health administrators in the country in addition to local and international organizations to provide the required medications and healthcare services for all patients with HD. Nurses and physicians in HD centers have to pay more attention to the assessment of depression among HD patients for early diagnosis and referral to a psychologist. This study highlights the need for nurses and physicians to provide such patients with all necessary psychological support and care.

Conclusion

Depression emerges as a pervasive issue among Hemodialysis (HD) patients in Hodeida, Yemen, underscoring the critical need for immediate intervention. Sex female, unemployment and lack of medical insurance are predictors of depression among HD patients. Therefore, urgent integration of psychiatric professionals in HD centers is crucial for routine mental health assessments and early intervention. Bridging diagnostic and treatment gaps is imperative, not only to enhance the quality of life for HD patients but also to prevent adverse outcomes associated with untreated depression. Future research should focus on targeted interventions and assess the effectiveness of mental health programs tailored to this specific patient population.

Acknowledgments

Disclosure

The authors declare that they have no conflicts of interest.

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