Journal of Renal and Hepatic Disorders
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ORIGINAL RESEARCH

Depression in prevalent maintenance hemodialysis patients

Jawad Iqbal Rather[1,*], Amir Farooq[2], Muzamil Ahmad Wani[2], Nuha Saleem[2], Zeeza Hussain Shah[3], Muzafar Maqsood Wani[2], Imtiyaz Ahmad Wani[2], Imran Khan[2]

[1]Department of Medicine, Government Medical College Anantnag, 192101 Anantnag, India
[2]Department of Nephrology, Sher-I Kashmir Institute of Medical Sciences, 190011 Srinagar, India
[3]Department of Medicine, Sher-I-Kashmir Institute of Medical Sciences, 190011 Srinagar, India

Abstract

Background: Depression is a common mental health issue among patients on maintenance hemodialysis (MHD), significantly impacting their quality of life and overall prognosis. While prior studies have reported variable prevalence rates globally, data specific to MHD patients in our regional tertiary care setting remain limited. This study addresses this gap byevaluating prevalence, severity, and associated factors of depression, thereby supporting evidence-based health strategies in this at-risk population. **Methods**: This cross-sectional study evaluated the prevalence and severity of depression in 74 patients undergoing MHD at a tertiary care center in North India. The Montgomery-Åsberg Depression Rating Scale (MADRS) was used to assess the symptoms of depression. **Results**: The overall prevalence of depression was 59.5%. Among the participants 33.8% had mild depression, 23.0% had moderate depression, and 2.7% had severe depression. Patients dialyzed via tunneled hemodialysis catheters exhibited significantly higher rates of depression compared to those with arteriovenous fistulas ($p < 0.05$). Patients with a transplant prospect had lower rates of depression compared to those without ($p < 0.05$). **Conclusions**: Depression is highly prevalent in patients on MHD. This study highlights the need for routine depression screening and appropriate management in this vulnerable population to improve their overall well-being and treatment outcomes.

Keywords: MHD; Depression; MADRS; AV fistula; Vascular access

Submitted: 11 July, 2025; *Accepted:* 09 January, 2026; *Published:* 20 June, 2026

Author for correspondence: jawadiqbal93@gmail.com (Jawad Iqbal Rather)

How to cite: Jawad Iqbal Rather, Amir Farooq, Muzamil Ahmad Wani, Nuha Saleem, Zeeza Hussain Shah, Muzafar Maqsood Wani, Imtiyaz Ahmad Wani, Imran Khan. Depression in prevalent maintenance hemodialysis patients. Journal of Renal and Hepatic Disorders. 2026; 10(1): 41-46. doi: 10.63268/jrenhp.v10i1.247.

Doi: 10.63268/jrenhp.v10i1.247

Introduction

Kidney diseases have a significant impact on global health. Chronic kidney disease (CKD) represents a significant and escalating global health challenge, with a worldwide prevalence estimated at 850 million individuals, corresponding to 14.2% of the global population [1]. The prevalence of CKD is projected to rise, driven by increasing rates of risk factors such as diabetes, hypertension, and obesity [2]. Major depressive disorder (MDD) is a prevalent mental health condition that affects over 332 million people worldwide. The lifetime prevalence of MDD is estimated at approximately 10.8%, and it contributes to an estimated 1 trillion USD in lost global productivity annually [3].

In patients receiving maintenance hemodialysis (MHD) for end-stage renal disease (ESRD), depression represents the most frequent psychiatric comorbidity, with an estimated prevalence ranging from 20% to 40%. Self- or clinician-administered questionnaires have been shown to detect depression more frequently than structured clinical interviews. A strong link between depression and increased mortality risk has been established among patients undergoing MHD [4]. Although affective and cognitive symptoms of depression may serve as more robust predictors of long-term mortality than somatic symptoms in MHD patients, depressive symptomatology independently contributes to dialysis nonadherence, increased healthcare resource utilization, and a reduced quality of life (QoL) [5].

Depression screening and management remain suboptimal within the dialysis population, despite its high prevalence and well-established impact on clinical outcomes [6]. Addressing this disparity is crucial for improving the overall well-being and survival outcomes of patients undergoing MHD.

The prevalence of depression and its associated factors may

vary across the MHD population due to ethnic, socioeconomic, and clinical determinants. Evaluating these variables is essential to informing targeted interventions aimed at improving clinical outcomes and quality of life. Given the prevalence of depression remains largely uncharacterized in our specific MHD cohort, this study was conducted to assess the prevalence of depression in patients receiving MHD.

Materials and methods

This cross-sectional study was conducted between September 2024 and March 2025 at the Department of Nephrology, Sher-I-Kashmir Institute of Medical Sciences, Srinagar, India.

Patients aged ≥18 years who had been on maintenance hemodialysis for at least six months were included in the study. Patients with a pre-existing diagnosis of depression or any other psychiatric disorder, as well as those patients with hospitalization less than 2 months ago, were excluded.

A total of 74 patients were enrolled in the study. The sample size was determined using the formula for estimating a single population proportion: $n = [Z^2 \times p(1 - p)]/d^2$, where $Z = 1.96$ (95% Confidence interval, CI), $p = 0.5$ (conservative estimate due to limited prior regional data), and $d = 0.10$, yielding an estimated sample size of approximately 96. The final sample size of 74, achieved through consecutive eligible enrollment over the study period, provided sufficient power for the primary prevalence endpoint (observed prevalence 59.5%).

A detailed history was taken, and a comprehensive general and systemic examination was performed. Patients were interviewed regarding various demographic related-factors, including rural versus urban dwelling, distance of hemodialysis center from the place of residence, number of medications per day, and whether accompanied by a caregiver to the hemodialysis center.

Assessment of the severity of depressive symptoms was performed using the Montgomery-Asberg Depression Rating Scale (MADRS), which is a 10-item rating scale where each item is scored from 0 to 6, resulting in a total score ranging from 0 to 60 [6]. The total MADRS score was obtained by summing the scores of all 10 items, with maximum possible score is 60. Higher scores indicate more severe depressive symptoms. Scors were interpreted as follows: 0 to 6—no depression, 7 to 19—mild depression, 20 to 34—moderate depression, 35 to 60—severe depression.

The primary aim of the study was to evaluate the prevalence and severity of depression in the study population.

Statistical methods

The data obtained was saved in Microsoft Excel 2024 (Microsoft, Redmond, WA, USA) and exported to the data editor of Statistical Package for Social Sciences (SPSS23, IBM, Armonk, NY, USA). Continuous variables were expressed as mean ± Standard deviation (SD), and categorical variables were expressed as frequencies and percentages. Data was presented in tabulated form. Fisher's exact test was applied to compare categorical variables. A two-tailed p-value was used for calculating statistical significance, and $p < 0.05$ was considered statistically significant.

Results

A total of 74 patients were included in the study. The mean age of the patients was 52 (±14.2) years. Out of the 74 participants, 47 (63.5%) were males, and 27 (36.5%) were females. 40 (54.1%) patients belonged to the age group of 40–60 years. 66 (89.2%) had hypertension and 28 (37.8%) had a history of diabetes mellitus. The mean hemoglobin level was 7.9 (±1.3) g/dL. 52 (70.3%) patients were from a rural background. 56 (75.7%) patients had an arteriovenous fistula (AVF) as vascular access, while 18 (24.3%) had a tunneled hemodialysis catheter (HDC). The mean dialysis vintage was 20.8 (±15.0) months. The baseline parameters of the study population are presented in Table 1.

In terms of underlying kidney disease, 28 (37.8%) had diabetic kidney disease, followed by unknown etiology in 25 (33.8%), Fig. 1.

Depression was identified in 44 (59.5%) patients based on MADRS score. Among these patients, 25 (33.8%) had mild depression, 17 (23.0%) had moderate depression, and 2 (2.7%) had severe depression, as shown in Table 2.

In subgroup analyses, age less than or more than 30 years of age was not associated with depression. Similarly, gender, marital status, urban *vs.* rural dwelling, or diabetes mellitus were not significantly associated with depression. Use of tunneled HDC was significantly associated with a higher rate of depression as compared with AVF as vascular access. On the other hand, patients who had a transplant prospect had lower rates of depression as compared to those without a transplant prospect, as shown in Table 3.

Discussion

Depression is one of the most common mental disorders in patients on MHD and is a frequently overlooked [7]. In the current study, 74 patients on MHD with a dialysis vintage of at least 6 months were evaluated for depression using the MADRS questionnaire.

The mean age of our study population was 52 (±14.2) years, which is consistent with other studies from India. Hockham *et al.* [8] conducted a multilevel analysis of the Nephroplus dialysis network across India and reported a median age of 53 years in the dialysis population. In our study, 47 (63.5%) participants were men, which aligns with other studies from India showing a gender disparity in access to hemodialysis [9, 10]. This contrast with studies from developed countries, where a higher percentage of women undergoing hemodialysis. In the Dialysis Outcomes and Practice Patterns Study (DOPPS), 41% of the study population were women [11]. The primary reason for this discrepancy may be explained by various sociocultural factors leading to decreased access to healthcare for women in India.

Twenty-eight patients (37.8%) of our study population had underlying diabetes mellitus, comparable to the study by Vijayan *et al.* [12], which included 897 hemodialysis patients, 335 (37.3%) had underlying diabetic kidney disease.

The mean hemoglobin concentration in our study was 7.9 (±1.3) g/dL. Modi *et al.* [13], reported that in the incident hemodialysis population, the mean hemoglobin concentration

Table 1. Baseline characteristics of the study population.

Parameter		Value
Mean age (±SD) in years		52 (±14.2)
Gender, n (%)		
	Male	47 (63.5%)
	Female	27 (36.5%)
Marital status, n (%)	Married	58 (78.4%)
Comorbidities, n (%)		
	Hypertension	66 (89.2%)
	Diabetes Mellitus	28 (37.8%)
	Cardiovascular Disease	7 (9.5%)
	Mean Hemoglobin g/dL (±SD)	7.9 (±1.3)
Residence, n (%)		
	Rural	52 (70.3%)
	Urban	22 (29.7%)
Lifestyle factor n (%)	Active Smoker	6 (8.1%)
Vascular access, n (%)		
	AVF	56 (75.7%)
	Tunneled HDC (N (%))	18 (24.3%)
	Transplant Prospect (N (%))	15 (20.3%)
	Mean dialysis vintage (mon) (±SD)	20.8 (±15.0)
	Mean distance of HD center from residence in kilometers (±SD)	17.2 (±14.3)
	Accompanied by someone to Hemodialysis center (N (%))	72 (97.3%)
	Mean number of medications per day (±SD)	7.7 (±2.3)

SD: standard deviation; AVF: arteriovenous fistula; HDC: hemodialysis catheter; HD: hemodialysis.

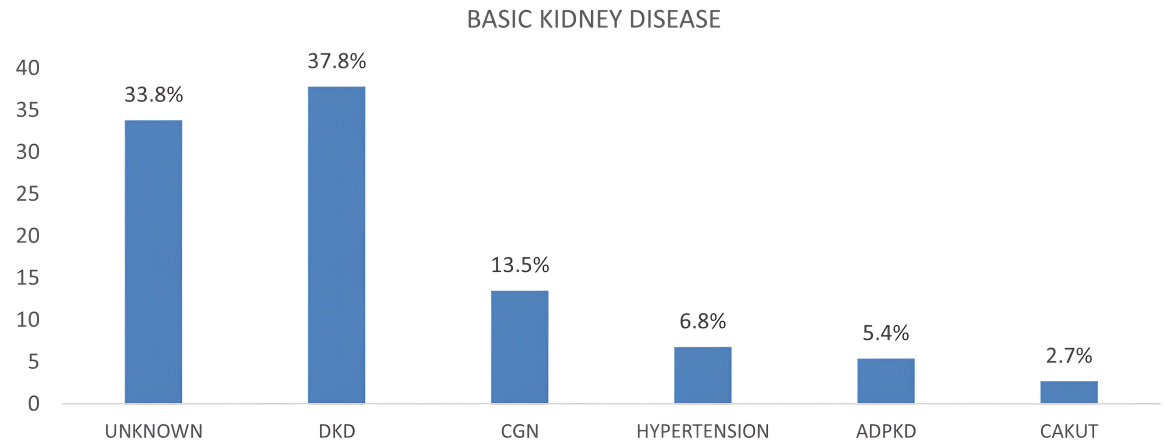

Figure 1. Etiology of kidney disease. DKD: diabetic kidney disease; CGN: chronic glomerulonephritis; ADPKD: adult dominant polycystic kidney disease; CAKUT: congenital abnormalities of the kidney and urinary tract.

Table 2. Number of patients with and without depression (N = 74).

Depression Severity	Frequency (n)	Percentage
No depression	30	40.5
Mild Depression	25	33.8
Moderate Depression	17	23.0
Severe Depression	2	2.7

Table 3. Association of depression rates in various subgroups.

	Depression Present	No Depression	Fisher's exact Test, *p*-Value
Age (yr)			
Age <30	4	4	0.707
Age ≥30	40	26	
Gender			
Male	28	19	>0.999
Female	16	11	
Married			
Yes	34	24	>0.999
No	10	6	
Dwelling			
Rural	31	21	>0.999
Urban	13	9	
Diabetes Mellitus			
Yes	19	9	0.331
No	25	21	
Vascular access			
AVF	27	29	0.001
Tunneled HDC	17	1	
Transplant Prospect			
Yes	5	10	0.037
No	39	20	
Distance from home in Kilometers			
<20	23	10	0.153
≥20	21	20	

p-value of < 0.05 was taken as significant (Fisher's Exact Test). AVF: arteriovenous fistula; HDC: hemodialysis catheter.

increased from 8.2 (±1.7) g/dL in 2002 to 9.1 (±1.7) g/dL in 2005. Since our study included a prevalent hemodialysis population with a minimum vintage of six months, these findings highlight the needs for better management of anemia. The mean dialysis vintage was 20.8 (±15) months.

Fifty-six patients (75.7%) had an AVF, which is comparable with other Indian studies Bansal D *et al.* [14] reported an AVF prevalence of 79% in the prevalent hemodialysis population. Fifty-two patients 52 (70.3%) were from a rural background. As per the Indian Chronic Kidney Disease (ICKD) study, two-thirds of the CKD patients in India reside in rural areas [15].

The mean distance of the hemodialysis center from the place of residence was 17.2 (±14.3) kilometers. In India, the distance is variable, ranging from >50 km in about 60% population [16] to around 5 km in other states [17].

The mean number of medications per day was 7.7 (±2.3). Julie *et al.* [18], in a study, including 176, 133 hemodialysis patients, reported a medication burden of 7.4 (±3.8) in 2013, which decreased to 6.8 (±3.6) in 2017. The appropriateness of medication prescription should be regularly assessed. This is necessary to prevent harm, futility, and unnecessary cost incursion due to inappropriate medication prescription.

The overall prevalence of depression in our study population, as measured by the MADRS questionnaire, was 59.5%. Reported prevalence of depression among patients on hemodialysis (HD) varies widely, ranging from 8% to 71% [19]. The varied prevalence of depression in this patient population may be attributed to differing patient demographics and different diagnostic criteria used for diagnosing depression. Using the MADRS scale in our study, 25 patients (33.8%) had mild depression, whereas 17 (23%) and 2 (2.7%) had moderate and severe depression, respectively.

The prevalence of depression was significantly higher in patients being dialyzed via tunneled HDC as compared with via AVF (*p*-value 0.001). Ahmet *et al.* [20], in their survey of 180 patients who were on hemodialysis, reported that the Beck Depression Inventory score of more than 14 (signifying the diagnosis of depression) was significantly higher in patients being dialyzed via tunneled cuffed HDC as compared to those being dialyzed via AVF. Patients who are being dialyzed via tunneled HDC have a lower quality of life, more frequent access dysfunction, increased need for vascular access interventions, and lower solute clearance than patients with a functional AVF. These factors may explain the increased prevalence of depression in patients on tunneled HDC [21].

Patients who were enrolled in the kidney transplant program had a significantly lower prevalence of depression compared with those who without a transplant prospect (p-value 0.03). Previous studies have reported that patients who have depressive symptoms have a lower chance of transplant listing [22].

Stratification as per age (less than or more than 30 years), gender, marital status, urban versus rural residence, diabetes status, or distance from home (more than or less than 20 kilometers) did not reveal a statistically significant difference in the prevalence of depression.

The pathophysiological mechanisms contributing to depression in patients on MHD are multifactorial. Biologically, progression of CKD is associated with accumulation of uremic toxins as well as inflammatory markers, such as interleukin-6 and tumor necrosis factor-alpha, which alter the neurotransmitter system and exert neurotoxic effects, contributing to depressive symptomatology. Additionally, dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis in ESRD leads to subclinical hypercortisolemia, further exacerbating mood disorders. Nutritional deficiencies, anemia, and altered body composition are frequently observed in MHD patients, may also contribute to depressive symptoms and reduced quality of life. Psychologically, the chronic stress of living with a life-altering condition, frequent dialysis sessions, physical limitations, and altered social roles contribute to emotional distress and depression [23].

This study highlights that depressive symptoms are highly prevalent in patients on MHD. These patients should be regularly screened for the symptoms of depression and actively managed. Depression in dialysis patients is associated with an increased risk of hospitalizations [24], withdrawal from dialysis [25], and all-cause mortality [4]. Hence, depression should be addressed in these patients to improve patient outcomes.

The limitations of our study include a small sample size, which may limit generalizability. Larger studies are needed from our patient population to confirm these findings. In addition, educational background and socioeconomic status were not assessed. Future studies should be done to assess the treatment outcome and efficacy of various therapies for depression in this patient population.

Conclusions

This study underscores the significant prevalence of depression among patients undergoing maintenance hemodialysis (MHD), with nearly 60% exhibiting depressive symptoms as measured by the MADRS questionnaire. Notably, the study identified a strong association between the use of tunneled hemodialysis catheters and higher rates of depression, as well as a protective effect linked to enrollment in kidney transplant programs. These findings highlight the critical need for routine depression screening and active management in MHD patients, given the known negative impacts of depression on hospitalization rates, dialysis withdrawal, and overall mortality. Although the study is limited by its small sample size and the lack of assessment of socioeconomic factors, necessitate further investigation through larger, more comprehensive studies, it provides valuable insight into the mental health challenges faced by this vulnerable population. Future research should evaluate the effectiveness of various therapeutic interventions for depression in MHD patients, with the ultimate goal of improving patient outcomes and quality of life.

Availability of data and materials

The data is available and can be assessed on a reasonable request.

Author contributions

JIR—designed the concept, collected data, and wrote the manuscript. AF and MAW—helped in data collection and analysis. NS and ZHS—helped in data collection. MMW, IAW and IK—critically reviewed the manuscript. All authors read and approved the final manuscript.

Ethics approval and consent to participate

This study was approved by the institutional ethics committee SKIMS. The protocol number is 123/2024. Written informed consent was taken from the study participants.

Acknowledgment

We acknowledge the contribution of patients, residents, and the dialysis staff who made this study possible.

Funding

This research received no external funding.

Conflict of interest

The authors declare no conflict of interest.

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