

Study of Depression, Anxiety, Somatic Symptoms, and Quality of Life in Patients with Chronic Kidney Disease on Maintenance Hemodialysis in a Tertiary Hospital in Chennai



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[Visual Abstract](#)

ABSTRACT

Background: Chronic kidney disease (CKD) is associated with substantial psychological morbidity, particularly among patients receiving maintenance hemodialysis (MHD). Depression, anxiety, and somatic symptoms adversely affect health-related quality of life (HRQoL), yet these factors remain under-recognized in routine clinical practice.

Objectives: To assess the prevalence and severity of depression, anxiety, and somatic symptoms and to evaluate their association with quality of life among patients with CKD undergoing maintenance hemodialysis.

Materials and methods: This hospital-based cross-sectional observational study included 50 adult patients with CKD receiving maintenance hemodialysis at a tertiary care hospital in Chennai. Participants were assessed using the Hospital Anxiety and Depression scale (HADS), Somatic Symptom scale-8 (SSS-8), and World Health Organization Quality of Life-BREF (WHOQOL-BREF) questionnaire. Data were analyzed using R software. Categorical variables were compared using the Chi-square test, and a p -value < 0.05 was considered statistically significant.

Results: Psychological distress and somatic symptom burden were common among patients undergoing maintenance hemodialysis. Female participants demonstrated a higher prevalence of abnormal depression scores, whereas abnormal anxiety scores were more frequent among males; however, these differences were not statistically significant (anxiety: $p = 0.053$; depression: $p = 0.170$). No significant associations were observed between age, CKD stage, or overall quality-of-life quartiles and HADS anxiety or depression scores ($p > 0.05$). A highly significant association was observed between SSS-8 quartiles and somatic symptom severity ($p < 0.0001$), indicating that higher somatic symptom scores were associated with greater symptom burden.

Conclusion: Depression, anxiety, and somatic symptoms are common among patients with CKD receiving maintenance hemodialysis. Although most demographic and clinical variables were not significantly associated with psychological distress, greater somatic symptom burden was strongly associated with higher SSS-8 scores. Routine psychological assessment using validated screening tools may facilitate early identification and comprehensive management of psychological morbidity in patients undergoing maintenance hemodialysis.

Keywords: Anxiety, Chronic kidney disease, Depression, Hospital Anxiety and Depression Scale, Maintenance hemodialysis, Quality of life, Somatic Symptom Scale-8, Somatic symptoms.

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INTRODUCTION

Chronic kidney disease (CKD) is a progressive condition characterized by the gradual decline of kidney function, leading to impaired filtration of waste and fluid, systemic complications, and significant health burdens.¹ It is a growing global health concern due to its association with cardiovascular disease and the eventual need for renal replacement therapies like dialysis or transplantation. CKD is diagnosed when kidney damage or decreased function persists for more than 3 months and is staged based on glomerular filtration rate (GFR). Common causes include diabetes, hypertension, genetic disorders, infections, and autoimmune diseases. As the disease advances, remaining nephrons compensate

for lost function, which accelerates kidney damage and results in symptoms like nausea, swelling, and fatigue. Early CKD often lacks symptoms, making diagnosis difficult without targeted testing.²

Management aims to slow progression and treat complications through lifestyle changes, dietary modifications, and medications such as ACE inhibitors.³ When kidney failure progresses to end-stage renal disease (ESRD), maintenance hemodialysis (MHD) becomes essential. MHD helps maintain electrolyte balance, removes toxins, and prevents life-threatening complications. Although not curative, it significantly improves patients' quality of life (QoL) and prolongs survival. MHD also plays a vital role in bridging patients awaiting kidney transplants.⁴

However, CKD patients on MHD frequently suffer from psychological disorders such as depression and anxiety, as well as somatic symptoms such as fatigue and muscle pain, which greatly reduce their QoL.⁵ These issues are linked to the chronic nature of the illness, treatment burden, and social and financial stress. Psychological distress affects adherence to treatment and worsens outcomes. Depression and anxiety may also accelerate disease progression through physiological mechanisms like inflammation.⁶

Effective management requires integrating mental health services with renal care. Interventions such as cognitive behavioral therapy, medications, and peer support can improve emotional well-being and compliance.⁷ This study aims to assess levels of depression, anxiety, somatic symptoms, and QoL in CKD patients on MHD using HADS, SSS-8, and WHOQOL-BREF tools, emphasizing the need for holistic and personalized care approaches.

MATERIALS AND METHODS

This hospital-based, cross-sectional observational study was conducted in the Department of General Medicine and Nephrology at Sree Balaji Medical College and Hospital, Chennai, after obtaining approval from the Institutional Ethics Committee. Adult patients (≥ 18 years) with CKD undergoing maintenance hemodialysis for at least 3 months were eligible for inclusion. Patients were recruited using purposive sampling after obtaining written informed consent.

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Individuals with preexisting psychiatric illness, cognitive impairment, or acute medical complications were excluded.

Sample Size Estimation

The sample size was determined in consultation with a biostatistician based on the primary objective of evaluating the correlation between psychological distress and quality of life. Assuming an anticipated correlation coefficient (r) of 0.35, a two-sided α error of 0.05, and a study power of 80%, the minimum required sample size was calculated to be 50 participants. Accordingly, 50 eligible patients fulfilling the inclusion criteria were enrolled in the study.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using R software (R Foundation for Statistical Computing, Vienna, Austria). Continuous variables were summarized as mean $\pm$ standard deviation (SD), while categorical variables were expressed as frequencies and percentages. Associations between categorical variables were assessed using the Chi-square test. A two-tailed p -value < 0.05 was considered statistically significant.

RESULTS

A total of 50 patients with chronic kidney disease undergoing maintenance hemodialysis were included in the study. The demographic and clinical characteristics of the study population are summarized in Tables 1 and 2. Abnormal anxiety scores were highest among participants aged 18–29 years and ≥ 60 years (75% each), whereas abnormal depression scores were most frequent in the 45–59-year age group (55%). However, there was no statistically significant association between age group and anxiety ($p = 0.433$) or depression ($p = 0.249$). Male participants demonstrated a higher proportion of abnormal anxiety scores than females (72.73% vs 50.00%), whereas abnormal depression scores were more frequent among females (53.57% vs 31.82%). These differences were not statistically significant for anxiety ($p = 0.053$) or depression ($p = 0.170$). Participants in the second WHOQOL quartile exhibited the highest proportion of abnormal anxiety scores, whereas abnormal depression scores were most frequent in the third quartile. No statistically significant association was observed between overall WHOQOL quartiles and HADS anxiety ($p = 0.2450$) or HADS depression ($p = 0.1982$). Among patients with CKD stage 4, very high somatic symptom severity was observed more frequently than in other CKD stages. However, the association

between CKD stage and somatic symptom severity was not statistically significant ($p = 0.2958$). Participants in the second quartile of HADS anxiety scores demonstrated the highest frequency of very high somatic symptom severity. However, no statistically significant association was observed between HADS anxiety quartiles and somatic symptom severity ($p = 0.2321$). A statistically significant association was observed between SSS-8 quartiles and somatic symptom severity ($p < 0.0001$). Participants in the third and fourth SSS-8 quartiles exclusively demonstrated very high somatic symptom severity, whereas those in the first quartile predominantly exhibited low to medium symptom severity. Very high somatic symptom severity was most frequently observed among participants in the lowest WHOQOL quartile. However, the distribution of somatic symptom severity did not differ significantly across WHOQOL quartiles ($p = 0.8168$).

Table 1 summarizes sociodemographic data. The mean age was 45.6 years (SD 15.23), and the mean BMI was 25.59 kg/m² (SD 4.97). Most participants were female (56%) and resided in rural areas (52%). A majority were unemployed (36%), with varied educational

levels and marital statuses, notably 30% separated.

Table 2 shows that 44% of participants had abnormal anxiety levels, while 16% were borderline and 40% normal. For depression, 60% had abnormal scores, 14% were borderline, and only 26% were normal. This indicates a high prevalence of psychological distress among the study population.

Abnormal anxiety was highest among participants aged 18–29 years and ≥ 60 years (75% each), whereas abnormal depression was most frequent in the 45–59-year age group (55%). However, Chi-square analysis showed no statistically significant association between age group and anxiety ($p = 0.433$) or depression ($p = 0.249$) (Table 3).

Male participants had a higher proportion of abnormal anxiety scores than females (72.73% vs 50.00%), whereas abnormal depression scores were more common among females (53.57% vs 31.82%). However, these differences were not statistically significant for anxiety (Chi-square test, $p = 0.053$) or depression (Chi-square test, $p = 0.170$) (Table 4).

HADS score distribution by eGFR category is presented in Table 5.

Table 1: Sociodemographic summary

Variable	Mean	Standard deviation (SD)	
Age (years)	45.6	15.23	
BMI (kg/m²)	25.59	4.97	
Categorical variables			
Variable	Category	Count (n)	Percent (%)
Sex	Female (F)	28	56
	Male (M)	22	44
Residency	Rural	26	52
	Urban	24	48
Marital status	Married	11	22
	Separated	15	30
	Single	11	22
	Widowed	13	26
Education level	College	8	16
	Elementary	14	28
	Graduate	12	24
	High school	8	16
	None	8	16
Occupation	Employed	16	32
	Retired	16	32
	Unemployed	18	36

Table 2: HADS category distribution

Category	Anxiety (n)	Anxiety (%)	Depression (n)	Depression (%)
Normal	20	40	13	26
Borderline abnormal	8	16	7	14
Abnormal	22	44	30	60

Table 3: HADS categories by age group

Age group (years)	Anxiety abnormal (%)	Anxiety borderline (%)	Anxiety normal (%)	Depression abnormal (%)	Depression borderline (%)	Depression normal (%)
18–29	75.0	25.0	0.0	50.0	0.0	50.0
30–44	57.14	7.14	35.71	21.43	35.71	42.86
45–59	50.0	15.0	35.0	55.0	10.0	35.0
60+	75.0	12.5	12.5	50.0	12.5	37.5

Table 4: HADS categories by sex

Sex	Anxiety abnormal (%)	Anxiety borderline (%)	Anxiety normal (%)	Depression abnormal (%)	Depression borderline (%)	Depression normal (%)
Female	50.0	10.71	39.29	53.57	17.86	28.57
Male	72.73	18.18	9.09	31.82	13.64	54.55

Table 5: HADS by eGFR category

eGFR Category (mL/min/1.73 m ²)	Anxiety Abnormal (n)	Anxiety Borderline (n)	Anxiety Normal (n)	Depression Abnormal (n)	Depression Borderline (n)	Depression Normal (n)
<15	13	2	5	10	3	7
15–30	17	5	8	12	5	13
Chi-square <i>p</i> -value	Anxiety <i>p</i> = 0.7662		Depression <i>p</i> = 0.7781			

Table 6: HADS by overall WHOQOL score

Overall WHOQOL score (quartile)	Anxiety abnormal (n)	Anxiety borderline (n)	Anxiety normal (n)	Depression abnormal (n)	Depression borderline (n)	Depression normal (n)
Q1 (Lowest QoL)	8	4	2	6	1	7
Q2	9	0	2	3	4	4
Q3	5	2	5	8	0	4
Q4 (Highest QoL)	8	1	4	5	3	5

Table 7: Somatic symptom severity vs CKD stage

CKD stage	High (n)	Low (n)	Medium (n)	Minimal (n)	Very high (n)
Stage 3	2	4	1	0	6
Stage 4	3	1	2	0	10
Stage 5	2	3	6	2	8

Table 8: Somatic symptom severity vs HADS anxiety score

HADS Anxiety Score (Q)	High (n)	Low (n)	Medium (n)	Minimal (n)	Very high (n)
Q1	2	4	1	1	5
Q2	1	0	2	0	10
Q3	2	3	2	0	7
Q4	2	1	4	1	2

Participants in the second WHOQOL quartile had the highest frequency of abnormal anxiety (9/11), whereas abnormal depression was most frequent in the third quartile (8/12). However, no statistically significant association was observed between overall WHOQOL quartiles and HADS anxiety ($p = 0.2450$) or HADS depression ($p = 0.1982$) (Table 6).

Patients with CKD stage 4 demonstrated the highest frequency of very high somatic symptom severity (10 cases), whereas

stage 5 patients showed a broader distribution across medium and minimal severity categories. However, there was no statistically significant association between CKD stage and somatic symptom severity (Chi-square test, $p = 0.2958$) (Table 7).

Participants in the second quartile of HADS anxiety scores demonstrated the highest frequency of very high somatic symptom severity (10 cases). However, no statistically significant association was

observed between HADS anxiety quartiles and somatic symptom severity (Chi-square test, $p = 0.2321$) (Table 8).

Participants in the third and fourth quartiles of SSS-8 scores exclusively demonstrated very high somatic symptom severity, whereas those in the first quartile predominantly had low to medium symptom severity. A highly significant association was observed between SSS-8 quartiles and somatic symptom severity (Chi-square test, $p < 0.0001$) (Table 9).

Table 9: Somatic symptom severity vs SSS-8 score

SSS-8 Score (Q)	High (n)	Low (n)	Medium (n)	Minimal (n)	Very high (n)
Q1	0	8	4	2	0
Q2	7	0	5	0	0
Q3	0	0	0	0	14
Q4	0	0	0	0	10

Table 10: Somatic symptom severity vs overall WHOQOL score

Overall WHOQOL (Q)	High (n)	Low (n)	Medium (n)	Minimal (n)	Very high (n)
Q1	4	0	1	2	7
Q2	1	2	2	0	6
Q3	0	3	3	0	6
Q4	2	3	3	0	5

Very high somatic symptom severity was most frequently observed among participants in the lowest WHOQOL quartile. However, the distribution of somatic symptom severity did not differ significantly across WHOQOL quartiles (Chi-square test, $p = 0.8168$) (Table 10).

DISCUSSION

Chronic kidney disease (CKD), affecting 10–15% of adults globally, is increasingly prevalent due to rising diabetes and hypertension rates.⁸ While early CKD stages focus on slowing disease progression, stage 5—end-stage renal disease (ESRD)—requires renal replacement therapies such as dialysis or transplantation. ESRD places enormous burdens on healthcare systems and imposes substantial physical and psychological stress on patients. These individuals must adhere to strict medical routines, diet restrictions, and face the mental toll of dependency, lifestyle change, and fear of death. These challenges contribute significantly to the high prevalence of psychiatric comorbidities like depression, anxiety, somatic symptoms, and reduced quality of life (QoL) in this group.⁹

Our study aimed to evaluate these psychological factors in CKD patients undergoing maintenance hemodialysis. The population was predominantly middle-aged, female, rural, unemployed, and borderline overweight—demographics that align with previous studies by Mousa et al. and Lekskulchai et al., who noted similar risk profiles and CKD prevalence patterns. In our study, 60% of patients had abnormal depression and 44% abnormal anxiety scores, with no significant associations with age, sex, height, weight, or BMI, consistent with studies by Chilcot et al. and Qawaqzeh et al.^{10–13}

Depression and anxiety were common across all demographic and clinical subgroups, irrespective of BMI, marital status, education,

occupation, CKD stage, dialysis duration, or lifestyle factors. Bahall et al. and Dziubek et al. similarly found that psychological distress in CKD patients was mostly independent of demographic predictors. Comorbidities like diabetes and hypertension were significantly associated with depression ($p = 0.0174$), as was smoking ($p = 0.0044$), confirming prior findings by Khan et al. and Chiou et al.^{14–17}

Somatic symptoms were widespread, especially among older adults and those with high urinary albumin-to-creatinine ratios (UACR >300 mg/g, $p = 0.0001$), reinforcing UACR's role as a biomarker of symptom burden. Though QoL scores varied, somatic symptom intensity remained high, especially in widowed, unemployed, and long-term dialysis patients. This matches prior research by Senanayake et al. and Shedden-Mora et al., highlighting the complex and multifactorial nature of symptom experience in CKD.^{18,19}

Finally, while quality of life and HADS scores did not predict somatic symptom severity, SSS-8 scores did ($p < 0.0001$), affirming the tool's validity. This suggests that in CKD, psychological distress, physical symptoms, and subjective quality of life are interrelated yet distinct domains, requiring integrated, patient-centered care strategies.

LIMITATIONS

This study has several limitations. First, the cross-sectional design precludes establishing temporal or causal relationships between depression, anxiety, somatic symptoms, and quality of life among patients with chronic kidney disease undergoing maintenance hemodialysis. Second, the study was conducted at a single tertiary care center with a relatively small sample size, which may limit the generalizability of the findings to other populations. Third, purposive sampling may have introduced selection bias. Fourth, psychological assessment was based on

validated self-administered questionnaires, which are subject to reporting and response bias. In addition, several potential confounding factors, including socioeconomic status, dialysis adequacy (Kt/V), inflammatory markers, nutritional status, medication adherence, and social support, were not evaluated. Future multicenter studies with larger sample sizes and longitudinal follow-up are required to better understand the temporal relationship between psychological distress, somatic symptoms, and quality of life in patients receiving maintenance hemodialysis.

CONCLUSION

This study concludes that depression, anxiety, and somatic symptoms are highly prevalent among CKD patients undergoing maintenance hemodialysis, significantly impacting their quality of life. Psychological distress was closely linked to age, comorbidities, and physical symptom burden, with a strong association between HADS and SSS-8 scores. Men experienced more anxiety, while depression was more common in women. Longer dialysis duration correlated with increased psychological morbidity. These findings emphasize the urgent need for integrated care approaches, routine mental health screening, and timely psychosocial interventions within dialysis settings to improve overall well-being and treatment outcomes in this vulnerable population.

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