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Original Research Article

A cross-sectional analysis of clinical, hematological and psychosocial factors associated with alexithymia and somatic symptoms in patients with chronic kidney disease: insights from a South Indian cohort

Krishna Kumar Dhakchinamoorthi[1,2]*, Sanjay Bose[3], Boopathi Raja Dhandapani[4], Lekha Sakthivel[1], Jisha Joe Rajan[1], Hariraj Devarajalu[1], Kamalesh Ramesh[1]

[1]Government Medical College Hospital, Tiruppur, Tamil Nadu, India
[2]SNS College of Pharmacy and Health Sciences, Coimbatore, Tamil Nadu, India
[3]Department of Psychiatry, Government Medical College Hospital, Tiruppur, Tamil Nadu, India
[4]Department of General Medicine, Government Medical College Hospital, Tiruppur, Tamil Nadu, India

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***Correspondence:**
Dr. Krishna Kumar Dhakchinamoorthi,
E-mail: krishnakumarrx@gmail.com

ABSTRACT

Background: Chronic kidney disease (CKD) is increasingly recognized as a biopsychosocial condition, with emotional dysregulation and somatic symptoms representing important yet underexplored dimensions. This study aimed to examine the prevalence and predictors of alexithymia and somatic symptoms in CKD patients, highlighting clinical, laboratory and psychosocial interactions.
Methods: A cross-sectional study was conducted among 130 CKD patients (mean age: 54.9±13.8 years; 58.5% male). Psychometric assessments included the Toronto Alexithymia Scale (TAS-20) and the Patient Health Questionnaire (PHQ-15). Data were analyzed using Kruskal-Wallis, Mann-Whitney *U*, Spearman correlations and univariate and multivariate regression models.
Results: Alexithymia was present in 50.8% of participants, while somatic symptoms were reported in 46.9%. TAS scores were significantly associated with age (p=0.021) and diabetes mellitus (p=0.016). PHQ-15 scores showed limited associations, with significant differences across age groups (p=0.039) and borderline associations with CKD stage (p=0.052). Red blood cell (RBC) count emerged as the strongest predictor of both TAS (β=0.923, p<0.001) and PHQ-15 (β=0.239, p=0.006) scores. The multivariate model explained 85.4% of TAS variance (Adjusted R^2=0.854), whereas PHQ-15 scores were less predictable (Adjusted R^2=0.068). Caregiver burden was significantly higher among patients with alexithymia (p<0.0001).
Conclusions: Alexithymia and somatic symptoms are highly prevalent in CKD and shaped by biological and psychosocial determinants. Incorporating broader psychosocial assessments and caregiver support into CKD management could enhance patient outcomes and alleviate family burden.

Keywords: Alexithymia, Somatic symptom, Chronic kidney disease, Emotional dysregulation, Psychosocial factors, Red blood cell count

INTRODUCTION

Chronic kidney disease (CKD) represents a growing global health burden, with an estimated prevalence of 8–16% worldwide and a rising incidence in low- and middle-income countries such as India.[1] The disease is characterized by progressive deterioration of renal function, often culminating in end-stage renal disease

(ESRD), which requires dialysis or transplantation.[2] While the physiological and biochemical aspects of CKD have been extensively studied, its psychological dimensions remain underexplored, particularly in the Indian context.[3,4] Among the psychological constructs gaining attention in nephrology are alexithymia and Somatic symptoms. Alexithymia, derived from the Greek meaning "no words for emotions," refers to a personality trait marked by difficulty in identifying and describing emotions, externally oriented thinking and limited imagination.[5] Somatic symptom, on the other hand, involves excessive focus on physical symptoms, often without adequate medical explanation, leading to significant distress and functional impairment.[6] Both conditions are increasingly recognized in patients with chronic illnesses, including CKD, owing to the interplay of biological, psychological and social stressors.[7-9]

CKD patients face a unique constellation of challenges frequent hospital visits, dietary restrictions, financial strain and uncertainty about prognosis that may predispose them to emotional dysregulation.[10] Studies have shown that alexithymia is associated with poor coping strategies, reduced treatment adherence and increased healthcare utilization.[11,12] Similarly, somatic symptoms have been linked to increased symptom burden, anxiety and depression in chronic illness populations.[13,14] Despite these associations, few studies have systematically examined the prevalence and correlates of alexithymia and Somatic symptoms in CKD patients, particularly in India, where cultural norms may influence emotional expression and Somatic symptoms.[15]

Biological factors such as anemia, uremia and electrolyte imbalances may also contribute to emotional and cognitive disturbances in CKD patients.[16,17] Anemia, for example, has been implicated in fatigue, cognitive slowing and mood changes, which may exacerbate alexithymic traits.[18,19] Similarly, elevated creatinine and urea levels may affect neurocognitive functioning, further complicating emotional processing.[20] Understanding these associations is crucial for developing holistic care models that integrate psychological screening and intervention into routine nephrology practice. Socioeconomic stressors such as debt, property loss and family disruption are particularly salient in the Indian CKD population. These stressors may amplify emotional distress and somatic preoccupation, especially in patients with limited access to mental health resources.[21,22] Moreover, cultural factors such as stigma, emotional restraint and reliance on somatic idioms may influence the manifestation and reporting of psychological symptoms.[23] Thus, a culturally sensitive approach is essential for accurate assessment and intervention.

This study aims to address these gaps by investigating the prevalence of alexithymia and somatic symptoms in CKD patients and exploring their associations with clinical, laboratory and psychosocial variables. Specifically, we examined whether hematological parameters (e.g., RBC count, hemoglobin), renal function markers (e.g., creatinine, urea) and socioeconomic factors (e.g., debt, property loss) predict alexithymic and somatic symptoms severity. By integrating psychological and biomedical data, we seek to advance a biopsychosocial understanding of CKD and inform multidisciplinary care strategies.[24]

To our knowledge, this is one of the first Indian studies to systematically evaluate alexithymia and somatic symptoms in CKD patients via validated scales and multivariate statistical models. These findings may have implications for screening, psychoeducation and tailored interventions in nephrology settings. Furthermore, they contribute to the growing literature on emotional processing and somatic symptoms in chronic illness, highlighting the need for integrated mental health services in medical specialties.

METHODS

Study population

This cross-sectional observational study was conducted over six months (from April to September, 2024) at a tertiary care hospital in Tiruppur, Tamil Nadu, India. The hospital caters to diverse urban and semiurban populations and offers comprehensive nephrology services, including dialysis, outpatient consultations and inpatient management. The study protocol received approval from the Institutional Ethics Committee (IEC No: 1748/ME3/2024) and written informed consent was obtained from all participants in accordance with the Declaration of Helsinki.

Data collection

The participants were adults aged 18–80 years with a diagnosis of CKD (stages 1–5), either on conservative management or undergoing maintenance hemodialysis. Patients were excluded if they had severe cognitive impairment or dementia, active psychosis, recent psychiatric hospitalization, inability to comprehend Tamil or English or refusal to provide consent. Among the 135 patients screened, 130 met the inclusion criteria and completed all the study assessments. The clinical variables recorded included CKD stage, duration of dialysis (where applicable), number of comorbidities (such as diabetes mellitus and hypertension), family history of CKD and socioeconomic stressors, including debt and property loss. Laboratory parameters were obtained from recent medical records and included hemoglobin, RBC count, WBC count, hematocrit, platelet count, serum creatinine, urea, SGOT, SGPT, bilirubin and random blood sugar.

Outcome measurements

The psychological evaluation involved two validated instruments. The Toronto Alexithymia Scale (TAS-20) is a 20-item self-report measure assessing difficulty in

identifying feelings, difficulty in describing feelings and externally oriented thinking. Scores ≥61 indicate alexithymia, whereas scores between 52 and 60 suggest possible alexithymia. The PHQ-15 scale was used to assess Somatic Symptom burden and associated distress, with higher scores indicating greater Somatic Symptom severity. Both scales were administered in either Tamil or English according to participant preference and trained research assistants assisted illiterate participants in completing the assessments.

Statistical analysis

Statistical analyses were performed via GraphPad Prism 8.0 and SPSS version 23. Demographic, clinical and laboratory data were summarized via descriptive statistics. Comparisons between groups were carried out via the Mann-Whitney *U* test and the Kruskal-Wallis test for continuous variables and chi-square tests for categorical variables. Univariate linear regression was used to identify predictors of TAS and PHQ-15 scores and variables with a p value <0.10 were subsequently entered into multivariate regression models via a stepwise selection method. Spearman correlation coefficients were calculated to explore associations between psychological scores and laboratory parameters. Statistical significance was set at $p<0.05$ and adjusted R^2 values were reported to indicate the explanatory power of the regression models.

Sample size/power calculation

To ensure adequate statistical power for detecting meaningful associations between psychological scores (TAS and PHQ-15) and clinical variables, a priori sample size estimation was conducted via G*Power 3.1 software (© 2025 Heinrich-Heine-Universität Düsseldorf, Germany). Assuming a medium effect size ($f^2=0.15$), an alpha level of 0.05 and a power (1–β) of 0.80 for multiple linear regression with up to 10 predictors, the minimum required sample size was calculated to be 118 participants. Our final sample of 130 CKD patients exceeded this threshold, thereby ensuring sufficient power to detect medium-sized effects in multivariate models. Post hoc power analysis for the final multivariate regression model predicting TAS scores (adjusted $R^2=0.854$) revealed a power of greater than 0.99, confirming the robustness of the observed associations. Similarly, the PHQ-15 regression model (adjusted $R^2=0.068$) yielded a post hoc power of 0.81, validating the adequacy of the sample for detecting small-to-moderate effects. These calculations affirm the reliability of our statistical findings and support the validity of inferences drawn from regression analyses.

RESULTS

Demographic and clinical characteristics

The study included 130 participants with CKD, with a mean age of 54.9±13.8 years, 58.5% were male. Table 1 presents the demographic and clinical characteristics in relation to the TAS and Somatic Symptom (PHQ-15) scores. Age was significantly associated with the TAS score (p=0.021). Post hoc analysis revealed that participants aged 31–60 years had significantly higher TAS scores than did those aged <30 years (p=0.028) and those aged >61 years scored higher than did those aged 31–60 years (p=0.046). For PHQ-15, no overall age-group difference was observed (p=0.115), although post hoc comparison indicated a significant difference between the 31–60 and >61 years groups (p=0.039). Among the comorbidities, diabetes mellitus was significantly associated with TAS scores, with higher scores among diabetic participants than among nondiabetic participants (61.46±9.58 vs. 58.20±10.14, p=0.016).

No significant difference in SSD scores was found based on diabetes status (p=0.574). Socioeconomic stressors are also linked to alexithymia. The participants reporting property loss had significantly higher TAS scores than did those without property loss (61.63±8.58 vs. 57.43±11.47, p=0.033). Similarly, those with debt had markedly higher TAS scores (62.24±8.66 vs. 55.61±10.86, p=0.001). Neither property loss nor debt status was significantly related to PHQ-15 scores.

No statistically significant associations were detected between the TAS or PHQ-15 score and sex, income level, education level, CKD stage, dialysis status, hypertension, coronary artery disease, family history, surgical history, alcohol consumption or smoking status. However, borderline differences in PHQ-15 scores were noted between patients with CKD stage 2 and stage 5 (p=0.052) and between those with and without a family history of CKD (p=0.058).

Alexithymia and somatic symptom severity

The participants were categorized into three alexithymia groups: alexithymia (A), possible alexithymia (B) and non-alexithymia (C). The TAS scores differed significantly across these groups (p<0.0001), with Group A having the highest scores (67.87±4.77). SSD scores were stratified into four severity levels: minimal, low, medium and high. A significant gradient was observed across PHQ-15 categories (p<0.0001), with the highest SSD scores in the high group (18.33±3.04) (Table 2).

Caregiver burden

Caregiver burden, assessed via the family burden interview schedule (FBIS), was significantly greater among caregivers of patients with alexithymia (31.68±5.11) than among those without alexithymia (15.64±4.99; p<0.0001) (Table 2).

Laboratory parameters and psychometric scores

Among the laboratory parameters, hemoglobin and RBC levels showed notable associations. Participants with

normal hemoglobin levels had significantly higher TAS scores (p=0.036). The RBC count was strongly associated with both the TAS and SSD (p<0.0001 and p=0.008, respectively). No significant associations were found between TAS or SSD scores and urea, creatinine, SGOT, SGPT, bilirubin, hematocrit, platelet count, WBC or random blood sugar levels (p>0.05) (Table 3).

Regression analyses

Univariate linear regression analysis revealed several significant predictors of alexithymia, as measured by TAS scores. These included the number of comorbidities (β=0.230, p=0.008), history of property loss (β=0.204, p=0.020), debt status (β=0.313, p<0.001), red blood cell (RBC) count (β=0.918, p<0.001) and random blood sugar levels (β=0.200, p=0.022) (Table 4). These findings suggest that both clinical and socioeconomic factors contribute meaningfully to emotional dysregulation in CKD patients. Subsequent multivariate regression analysis revealed that the RBC count remained the strongest independent predictor of the TAS score (β=0.923, p<0.001), followed by the number of comorbidities (β=0.143, p<0.001), diabetes status (β=–0.096, p=0.018) and serum creatinine level (β=0.069, p=0.045).

Together, these variables accounted for a substantial proportion of the variance in alexithymia severity, with the final model yielding an adjusted R^2 of 0.854 (Table 5). This high explanatory power underscores the robust association between biomedical and psychosocial factors in shaping emotional processing deficits among CKD patients. In contrast, predictors of somatic symptom severity, as measured by SSD scores, are more limited. Univariate analysis revealed RBC count as the only statistically significant variable (β=0.232, p=0.008), whereas family history of CKD approached significance (β=–0.158, p=0.073) (Table 6). The multivariate model retained both RBC count (β=0.239, p=0.006) as a predictor, although the overall explanatory power was modest, with an adjusted R^2 of 0.068 (Table 7). These results suggest that while somatic symptom may be influenced by selected biological and familial factors, its variance is less readily captured by the measured clinical parameters than is alexithymia.

TAS scores across somatic symptom severity subgroups

When comparing the TAS subscale scores between the minimal and severe Somatic Symptom groups (Figure 1), a statistically significant difference was observed for difficulty identifying feelings (DIF), with the severe Somatic Symptom group demonstrating higher median scores (~27) than the minimal Somatic Symptom group (~20; p=0.018), indicating greater impairment in emotional awareness. Difficulty describing feelings (DDF) scores did not differ significantly between groups (median ~14 in both; p=0.386), although the severe group presented wider score dispersion and more extreme values. Externally oriented thinking (EOT) scores were also comparable between groups (median ~24 in both, p=0.135), suggesting that Somatic Symptom severity does not substantially influence this cognitive style. These findings highlight that greater Somatic Symptom is specifically associated with increased difficulty in identifying feelings, whereas descriptive and externally oriented cognitive aspects remain relatively unaffected.

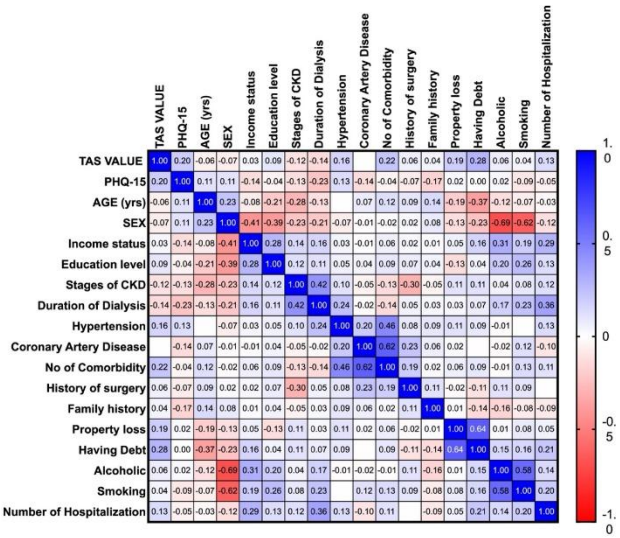

Figure 1: Spearman's rank correlation of all demographic factors (n=130).

Figure 1 presents a correlation heatmap illustrating the interrelationships among clinical and socio-economic variables in the study cohort. Spearman correlation coefficients range from -1.0 (strong negative correlation) to +1.0 (strong positive correlation), with blue hues denoting positive associations and red hues indicating negative ones. Variables include TAS and PHQ 15-scores, demographic factors (age, sex, income, education), clinical parameters (CKD stage, dialysis duration, hypertension, coronary artery disease, comorbidities, surgical history), psychosocial stressors (property loss, debt), lifestyle factors (alcohol use, smoking), and hospitalization frequency. This visualization helps identify potential multicollinearity and clustering patterns relevant to health outcomes.

Figure 2 displays a correlation matrix illustrating the pairwise relationships among key hematological and biochemical parameters in the study cohort. Spearman correlation coefficients range from -1.0 to +1.0, with blue shades denoting positive associations and red shades indicating negative ones. Strong positive correlations were observed between TAS score and RBC count (r=0.98), while haemoglobin and creatinine showed a moderate inverse relationship (r=-0.42). This visualization facilitates the identification of clinically relevant interdependencies and potential confounding variables in the dataset.

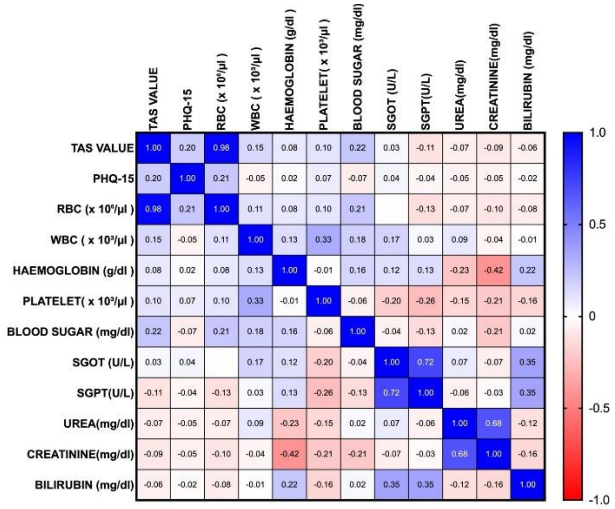

Figure 2: Spearman's rank correlation of all laboratory parameters (n=130).

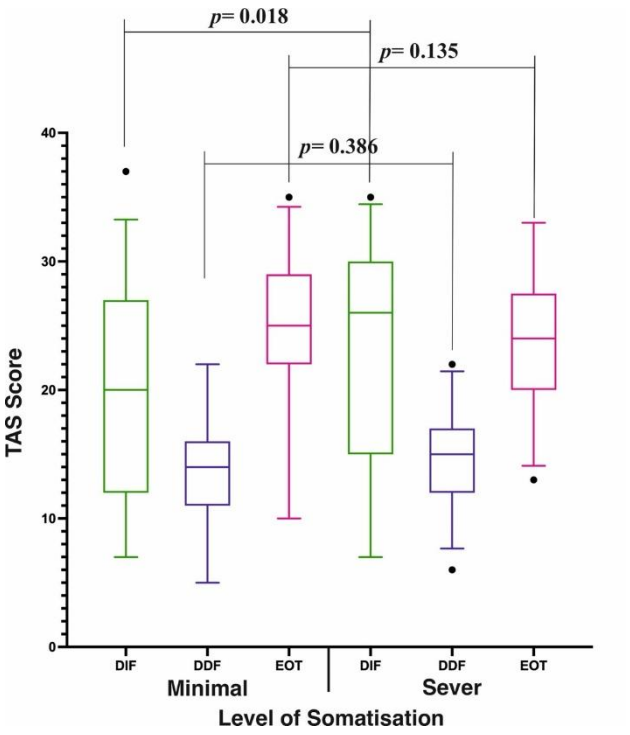

Figure 3: TASs at various levels of somatic symptom (n=130).

Figure 3 presents box plots of TAS (Toronto Alexithymia Scale) subscale scores—DIF (Difficulty Identifying Feelings), DDF (Difficulty Describing Feelings), and EOT (Externally-Oriented Thinking)—stratified by somatic symptom severity (Minimal vs. Severe). TAS scores range from 0 to 40. Each box plot depicts the median, interquartile range, and score distribution. Notable comparisons include: Minimal DIF vs. Minimal EOT (p=0.018), Minimal EOT vs. Severe EOT (p=0.135), and Severe DIF vs. Severe EOT (p=0.386). These findings highlight differential alexithymic profiles across somatic symptom levels.

Correlations between psychosocial scores, demographic factors, clinical characteristics and laboratory parameters

Spearman's rank correlation analysis was conducted to explore the relationships between psychosocial scores (Toronto Alexithymia Scale (TAS) and Somatic Symptom (PHQ-15) scale), demographic attributes, clinical characteristics and laboratory parameters. Correlation analysis revealed several noteworthy associations between psychosocial scores, demographic variables and clinical characteristics. Alexithymia scores (TAS value) showed a moderate positive correlation with somatic symptom severity (PHQ-15) (r=0.195) and number of comorbidities (r=0.220), suggesting that emotional dysregulation may be linked to both somatic distress and clinical complexity. TAS scores also correlated positively with having debt (r=0.284) and property loss (r=0.188), indicating a relationship between financial stressors and emotional processing difficulties. The number of comorbidities was strongly correlated with coronary artery disease (r=0.617) and hypertension (r=0.456), reflecting expected clinical clustering. Duration of dialysis showed a moderate positive correlation with the number of hospitalizations (r=0.356), while stages of CKD were moderately associated with dialysis duration (r=0.420). Among lifestyle factors, alcohol use and smoking were positively correlated (r=0.578) and both showed modest associations with income status (r=0.312 and r=0.193, respectively). Education level correlated positively with income status (r=0.278) and smoking (r=0.258), but negatively with age (r=–0.205) and sex (r=–0.393). These findings underscore the multifactorial interplay between psychosocial burden, socioeconomic adversity and clinical severity in the studied population.

Correlation analysis revealed meaningful associations between psychosocial scores and hematological, biochemical and clinical variables. TAS VALUE showed a strong positive correlation with red blood cell count (RBC) (r=0.976), suggesting a potential physiological link between emotional dysregulation and erythropoietic activity. It also correlated moderately with blood sugar levels (r=0.216) and white blood cell count (WBC) (r=0.147), indicating possible associations with metabolic and inflammatory status. PHQ-15 scores were modestly correlated with RBC (r=0.215), while showing weak or negligible associations with other biochemical markers. Among liver enzymes, SGOT and SGPT were strongly interrelated (r=0.722) and both showed moderate positive correlations with bilirubin (r=0.354 and r=0.353, respectively), reflecting hepatic function clustering. Urea and creatinine were positively correlated (r=0.678), consistent with renal impairment patterns. Hemoglobin levels were negatively associated with urea (r=–0.226) and creatinine (r=–0.422), while platelet count showed inverse correlations with SGOT (r=–0.195), SGPT (r=–0.258) and creatinine (r=–0.213). These findings suggest that psychosocial distress, particularly alexithymia, may be subtly linked to hematological and metabolic alterations, warranting further investigation into psychophysiological interactions in clinical populations.

Table 1: Demographic characteristics of patients with TAS and PHQ-15 scores (n=130).

Category type	Category code	TAS value	P value	PHQ-15 value	P value
Age (in years)	≤30 (3) a	49.33±7.23	0.021* A vs b (0.028) B vs c (0.046)	14.33±4.93	0.115* B vs c (0.039)
	31-60 (68)b	62.01±9.63		12.90±4.96	
	≥61 (59)c	58.54±9.73		14.83±5.48	
Sex	Male (76)	60.54±9.74	0.439	13.37±5.34	0.23
	Female (54)	59.59±10.11		14.43±5.12	
Income category	No (32)	60.19±9.23	0.901*	15.59±4.63	0.382*
	Low (65)	59.88±10.59		12.91±5.09	
	Middle (16)	59.69±11.37		14.69±5.16	
	High (17)	61.53±6.90		13.06±6.46	
Education level	No (72)	59.24±10.03	0.206*	13.89±5.42	0.739*
	Middle (52)	61.87±8.70		13.88±5.02	
	Higher (6)	56.17±15.82		12.17±5.91	
CKD stage	Stage 1 (3)	63.33±4.16	0.395* Stage 2 vs stage 5 (0.052)	18.33±3.79	0.307*
	Stage 2 (9)	66.00±7.21		16.33±4.58	
	Stage 3 (16)	58.44±14.31		13.44±6.20	
	Stage 4 (30)	60.07±9.56		13.80±4.38	
	Stage 5 (72)	59.69±9.18		13.39±5.44	
Dialysis	No	60.64±10.71	0.358	14.70±4.81	0.072
	Yes	59.81±9.30		13.19±5.49	
Hypertension status	No (34)	57.38±9.85	0.064	12.53±4.79	0.143
	Yes (96)	61.13±9.73		14.26±5.36	
Diabetes status	No (51)	58.20±10.14	0.016	14.08±5.59	0.574
	Yes (78)	61.46±9.58		13.59±5.08	
CAD status	No (86)	59.95±9.68	0.965	14.21±4.87	0.125
	Yes (44)	60.52±10.32		13.02±5.93	
Family history	No (121)	60.02±9.98	0.633	14.03±5.25	0.058
	Yes (9)	61.78±8.51		10.78±4.55	
Surgical history	No (95)	59.76±9.39	0.505	14.05±4.99	0.402
	Yes (35)	61.20±11.12		13.14±5.94	
Property loss	No (46)	57.43±11.47	0.033	13.52±5.07	0.8
	Yes (84)	61.63±8.58		13.96±5.38	
Debt status	No (41)	55.61±10.86	0.001	13.71±5.59	>0.05
	Yes (89)	62.24±8.66		13.85±5.13	
Alcohol consumption	No (78)	59.64±10.38	0.473	13.77±5.46	0.819
	Yes (52)	60.90±9.08		13.87±4.99	
Smoking status	No (84)	59.74±10.50	0.67	14.21±5.26	0.285
	Yes (45)	60.89±8.64		13.07±5.23	

*Kruskal–Wallis test used to compare the statistical significance, remaining all comparisons made by using the Mann-Whitney *U* test.

Table 2: Classification of scores for alexithymia (TAS), Somatic Symptom (PHQ-15) and care giver burden (FBIS) (n=130).

Category	Sub group	n	Mean±SD	P value
Alexithymia	Definite (A)	66	67.87±4.77	p<0.0001(A vs B vs C)* p<0.0001(A vs B), p<0.0001(A vs C) p<0.0001(B vs C)
	Possible alexithymia (B)	40	56.35±2.58	
	Non–alexithymia (C)	24	45.21±6.23	
Somatic symptom	Minimal (D)	4	3.25±1.5	p<0.0001(D vs E vs F vs G)* p<0.0001(D vs E), p<0.0001(D vs F), p<0.0001(D vs G), p<0.0001(E vs F), p<0.0001(E vs G), p<0.0001(F vs G)
	Low (E)	25	7.44±1.29	
	Medium (F)	40	11.98±1.54	
	High (G)	61	18.33±3.04	
Care giver burden	Yes (H)	82	31.68±5.11	p <0.0001(H vs I)
	No (I)	48	15.64±4.98	

*Kruskal–Wallis test used to compare the statistical significance, remaining all comparisons made by using the Mann-Whitney *U* test.

Table 3: Analysis of laboratory parameters associated with alexithymia and Somatic Symptom (n=130).

Parameter	Mean± SD	Category	Mean± SD	P value	TAS	P value	PHQ-15	P value
Urea	82.38±44.81	Normal (29)	38.08±10.55	<0.0001	61.10±9.98	0.419	14.00±4.67	0.691
		High (101)	95.11±42.74		59.87±9.86		13.75±5.43	
Creatinine	4.24±3.20	Normal (5)	1.18±0.11	<0.0001	66.40±8.65		16.00±2.74	0.275
		High (125)	4.46±3.5		59.90±9.86	0.189	13.72±5.32	
Hemoglobin*	8.97±2.43	Low (115)	8.39±1.83	<0.0001	60.16±9.81	0.362	13.94±5.21	0.446
		Normal (13)	12.9±0.66	<0.0001	62.23±9.39	0.036	12.92±6.07	0.571
		High (2)	17.25±0.21	0.019	46.0±7.07	0.076	12±0	0.933
SGOT	39.78±64.86	Normal (102)	25.44±7.18	<0.0001	60.07±10.25	0.818	13.75±5.18	0.816
		High (28)	92.04±128.2		60.43±8.46		14.00±5.64	
SGPT	28.52±36.42	Normal (120)	23±5.91	<0.0001	60.20±9.84	0.927	14.03±5.27	0.074
		High (10)	94.8±115.79		59.50±10.69		11.10±4.48	
Total bilirubin	0.67±0.63	Normal (126)	0.58±0.17	<0.0001	60.13±9.81		13.82±5.30	0.850
		High (4)	3.55±2.15		60.50±13.23	0.706	13.50±4.20	
Hematocrit*	31.40±0.10	Low (97)	27.03±5.18	<0.0001	60.15±10.28	0.685	13.98±5.21	0.532
		Normal (30)	40.73±4.13	<0.0001	60.93±8.24	0.207	13.40±5.70	0.525
		High (3)	79.3±19.6	<0.0001	52.00±10.54	0.115	12.33±1.53	0.701
Platelet*	270.51±133.74	Low (19)	102.59±36.72	<0.0001	57.79±9.16	0.199	14.84±5.41	0.406
		Normal (96)	259.81±71.53	<0.0001	60.31±9.78	0.157	13.42±5.24	0.918
		High (15)	551.67±76.84	<0.0001	62.07±11.29	0.314	15.00±5.20	0.236
RBC	8.577±40.29	Low (109)	3.03±0.61		57.91±9.16	P<0.0001	13.47±5.28	P=0.075
		Normal (21)	4.58±0.44	<0.0001	71.6±2.36		15.57±4.83	
WBC*	10.94±7.68	Low (3)	3.47±0.06	<0.0001	57±2.64	0.514	12.33±4.5	0.720
		Normal (77)	7.63±1.82	<0.0001	59.04±10.02	0.287	13.74±5.69	0.596
		High (50)	16.5±9.96	<0.0001	62.04±9.68	0.174	14±4.62	0.812
RBS*	164.18±112.25	Low (11)	8.39±1.83	<0.0001	55.91±11.07	0.398	14.09±3.73	0.886
		Normal (42)	12.9±0.66	<0.0001	59.07±10.19	0.163	13.88±5.94	0.752
		High (77)	17.25±0.21	<0.0001	61.34±9.40	0.250	13.73±5.10	0.962

*Kruskal–Wallis test used to compare the statistical significance, remaining all comparisons made by using the Mann-Whitney *U* test.

Table 4: Univariate regression summary table for the TAS score (n=130).

Predictor variable	B (Unstandardized)	Std. error	Beta (Standardized)	t value	P value
Age (in years)	-0.031	0.073	-0.037	-0.420	0.676
Sex	-0.947	1.760	-0.047	-0.538	0.592
Income category	0.338	0.929	0.032	0.364	0.717
Education	0.936	1.482	0.056	0.631	0.529
Stages of CKD	-0.963	0.819	-0.103	-1.176	0.242
Duration of dialysis (in years)	-0.074	0.062	-0.105	-1.192	0.235
Hypertension	3.743	1.948	0.167	1.921	0.057
Diabetes mellitus	3.265	1.766	0.162	1.849	0.067
Coronary artery disease	0.569	1.835	0.027	0.310	0.757
Number of comorbidities	1.955	0.731	0.230	2.673	0.008
Family history	1.753	3.418	0.045	0.513	0.609
Surgical history	1.442	1.954	0.065	0.738	0.462
History of property loss	4.196	1.778	0.204	2.360	0.020
Presence of debt	6.626	1.775	0.313	3.733	0.000
Alcoholic	1.263	1.769	0.063	0.714	0.477
Smoking	1.153	1.814	0.056	0.636	0.526
No. of hospitalization	-0.051	0.332	-0.019	-0.154	0.878
RBC (X 10^6/µl)	10.976	0.420	0.918	26.139	0.000
WBC (×10^3/µl)	0.099	0.113	0.077	0.879	0.381
Hemoglobin (gm/dl)	0.120	0.357	0.030	0.335	0.738
Hematocrit (%)	0.023	0.080	0.025	0.288	0.774
Platelet (×10^3/µl)	0.007	0.006	0.097	1.107	0.270
Blood sugar (mg/dl)	0.018	0.008	0.200	2.310	0.022
SGOT (U/l)	0.001	0.013	0.010	0.110	0.912
SGPT (U/l)	-0.006	0.024	-0.023	-0.264	0.792
Urea (mg/dl)	0.000	0.019	0.002	0.020	0.984
Creatinine (mg/dl)	-0.080	0.250	-0.028	-0.319	0.108
Bilirubin (mg/dl)	0.572	1.376	0.037	0.416	0.678

Table 5: Multivariate regression analysis of the TAS score (n=130).

Predictor Variable	B (Unstandardized)	Std. Error	Beta (Standardized)	R^2	Adjusted R^2	P value
(Constant)	21.501	1.545				
RBC (×10^6/µl)	11.047	0.410	0.923	0.842	0.841	0.000
Number of comorbidity	1.218	0.333	0.143	0.850	0.847	0.000
Diabetes	-1.934	0.808	-0.096	0.858	0.854	0.018
Creatinine (mg/dl)	0.196	0.097	0.069	0.862	0.858	0.045

Dependent Variable: TAS score, Predictors: (Constant), RBC (x 10^6/µl), Number of co-morbidity, Diabetes, Creatinine(mg/dl).

Table 6: Univariate regression summary table PHQ 15-score (n=130).

Predictor variable	B (Unstandardized)	Std. Error	Beta (Standardized)	t value	P value
Age (in years)	0.033	0.039	0.076	0.857	0.393
Sex	1.058	0.935	0.100	1.132	0.260
Income category	-0.604	0.492	-0.108	-1.226	0.222
Education	-0.353	0.790	-0.039	-0.446	0.656
Stages of CKD	-0.764	0.434	-0.154	-1.762	0.081
Duration of dialysis (in years)	-0.065	0.033	-0.173	-1.986	0.049
Hypertension	1.731	1.042	0.145	1.661	0.099
Diabetes mellitus	-0.489	0.952	-0.046	-0.514	0.608

Continued.

Predictor variable	B (Unstandardized)	Std. Error	Beta (Standardized)	t value	P value
Coronary artery disease	-1.187	0.972	-0.107	-1.220	0.225
Number of comorbidities	-0.023	0.400	-0.005	-0.058	0.954
Family history	-3.255	1.800	-0.158	-1.808	0.073
Surgical history	-0.910	1.040	-0.077	-0.875	0.383
History of property loss	0.443	0.967	0.040	0.458	0.648
Presence of debt	0.147	0.996	0.013	0.147	0.883
Alcoholic	0.096	0.945	0.009	0.102	0.919
Smoking	-1.149	0.963	-0.105	-1.194	0.235
No. of hospitalization	-0.055	0.156	-0.042	-0.351	0.726
RBC (×10⁶/µl)	1.478	0.548	0.232	2.697	0.008
WBC (×10³/µl)	0.031	0.060	0.045	0.513	0.609
Hemoglobin (gm/dl)	0.023	0.190	0.011	0.121	0.904
Hematocrit (%)	0.006	0.043	0.012	0.134	0.894
Platelet (×10³/µl)	0.003	0.003	0.074	0.844	0.400
Blood Sugar (mg/dl)	-0.004	0.004	-0.079	-0.897	0.371
SGOT (U/l)	-0.004	0.007	-0.048	-0.538	0.591
SGPT (U/l)	-0.019	0.013	-0.131	-1.495	0.137
Urea (mg/dl)	-0.006	0.010	-0.052	-0.589	0.557
Creatinine (mg/dl)	-0.206	0.132	-0.136	-1.559	0.122
Bilirubin (mg/dl)	-0.068	0.734	-0.008	-0.093	0.926

Table 7: Multivariate regression PHQ 15-score (n=130).

Predictor Variable	B (Unstandardized)	Std. Error	Beta (Standardized)	R2	Adjusted R2	P value
(Constant)	9.045	1.832				
RBC (×10⁶/µl)	1.526	0.542	0.239	0.054	0.046	0.006

Dependent Variable: PHQ-15 score, Predictors: (Constant), RBC (×10⁶/µl).

DISCUSSION

This study offers novel insights into the psychological burden associated with CKD in an Indian tertiary care setting, revealing a notably high prevalence of alexithymia (50.8%) and somatic symptom disorder (SSD) (46.9%) among patients. These findings reinforce the evolving understanding that CKD is not merely a physiological condition but also deeply intertwined with psychological and psychosomatic dimensions. Our results are consistent with previous research documenting elevated rates of emotional processing difficulties and somatic preoccupation in chronic medical illnesses, including CKD.[25,26]

The prevalence of alexithymia in our cohort mirrors findings from international studies, including those conducted in Turkey and other regions, suggesting that emotional dysregulation may be a universal feature of CKD across cultural and geographic boundaries.[27,28] Prior research has linked alexithymia in CKD patients to depression, reduced quality of life, poor treatment adherence and increased symptom burden.[29,30] Similarly, our observed somatic symptom prevalence of 46.9% aligns with reports indicating that up to 70% of non-dialysis CKD patients experience persistent and distressing somatic symptoms.[13]

Multivariate analysis revealed that the red blood cell (RBC) count was the strongest predictor of both the TAS and PHQ-15 scores. This finding is consistent with the literature suggesting that anemia in CKD patients is associated with cognitive impairment, fatigue and mood disturbances.[31,32] Reduced RBC levels may impair oxygen delivery to brain regions involved in emotional regulation, thereby contributing to alexithymic traits. The link between low RBC count and somatic symptoms may reflect heightened bodily vigilance and fatigue-related distress.[33] Additionally, elevated creatinine levels are predictive of TAS scores, indicating that declining renal function and the accumulation of uremic toxins may disrupt neurocognitive and emotional processing.[34]

An unexpected finding was the negative association between diabetes mellitus and PHQ-15 scores. This may suggest that diabetic patients, owing to greater illness awareness and more frequent healthcare engagement, possess better emotional insight. Alternatively, CKD patients without diabetes may experience more rapid disease onset, leading to greater emotional disruption. Socioeconomic adversity particularly debt and property loss was also significantly associated with higher TAS scores, echoing prior studies linking financial hardship to reduced quality of life and increased symptom burden in CKD patients.[2,35] In India's predominantly out-of-pocket

healthcare system, economic stressors may intensify emotional suppression and somatic symptoms.

Another noteworthy observation was the inverse relationship between a family history of CKD and PHQ-15 scores. Familiarity with the illness may offer psychological buffering, reducing somatic distress. This aligns with evidence that social support can mitigate the psychological burden on dialysis patients.[36] The co-occurrence of alexithymia and somatic symptoms in CKD may be driven by overlapping biological and psychosocial mechanisms. CKD-related metabolic disturbances, anemia and microvascular brain injury are known to affect neural circuits involved in emotional regulation and interoception.[37,38] These findings have important clinical implications. Patients with alexithymia may struggle to articulate symptoms, adhere to treatment plans or participate in shared decision-making. Routine psychological screening via brief, validated tools such as the TAS-20 and PHQ-15 scales is both feasible and potentially transformative in CKD care. Addressing anemia and optimizing renal function may not only improve physical health but also alleviate psychological distress. A multidisciplinary approach involving nephrologists, psychiatrists and psychologists is essential to implement a truly biopsychosocial model of care.[24]

In the Indian cultural context, emotional restraint, stigma surrounding mental health and reliance on somatic idioms often obscure underlying psychological distress. Many patients express emotional suffering through physical complaints, a pattern shaped by cultural norms.[15,23] Moreover, caregiver burden which is evident in our dataset may indirectly affect patients' emotional health by reducing available support and increasing isolation. The high caregiver burden observed among alexithymic patients, coupled with the protective effect of family history against somatic symptoms, underscores the importance of family dynamics and social support systems in CKD care.

These findings suggest that psychological interventions must be culturally sensitive and family-centered to be effective in the Indian setting. This study's strengths include its integration of psychological, laboratory and sociodemographic data, the use of validated assessment instruments and the application of multivariate statistical modelling. However, limitations must be acknowledged. The single-center design and modest sample size may limit generalizability and the cross-sectional methodology precludes causal inference. In addition to creatinine levels, red blood cell count suggests that the severity of renal dysfunction directly influences emotional processing. Socioeconomic predictors particularly debt and property loss further emphasize the role of financial stress in exacerbating emotional dysregulation among Indian CKD patients. From a clinical standpoint, this research supports the routine implementation of psychological screening in nephrology practice.

The strong associations between biological markers and psychological symptoms suggest that managing anemia and optimizing renal function may concurrently improve emotional well-being. These findings advocate for integrated care models that address the multifaceted nature of CKD through a biopsychosocial lens. While the study's limitations underscore the need for additional research, they also help identify specific areas that warrant deeper exploration in future studies. Future research should systematically examine the longitudinal associations among chronic kidney disease progression, alexithymia and somatic symptom disorder and rigorously evaluate the efficacy of tailored psychosocial interventions designed to mitigate associated psychological distress and improve patient outcomes.

CONCLUSION

In conclusion, this study contributes meaningfully to the growing recognition that chronic kidney disease demands comprehensive care that addresses not only physiological needs but also the profound psychological and social challenges faced by patients and their families. The high prevalence of alexithymia and Somatic Symptom driven by biological factors such as RBC count and creatinine and compounded by socioeconomic stressors underscores the urgency of adopting a holistic, biopsychosocial approach to CKD management. Integrating routine psychological screening, targeted anemia treatment and culturally adapted mental health support into standard nephrology practice may enable early identification of vulnerable patients, increase emotional well-being and improve long-term treatment outcomes.

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