



Original Research Article

Assessment of Knowledge on Stress Adaptation Measures and Stress Levels in Patients Undergoing Hemodialysis: A Descriptive Cross-Sectional study

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Abstract: Background: Patients undergoing hemodialysis experience significant psychological stress due to the chronic nature of kidney disease, demanding treatment regimens, lifestyle restrictions, and financial burdens. Despite the prevalence of stress-related complications, few studies have systematically assessed both stress levels and knowledge of stress adaptation measures in this vulnerable population. **Objective:** This study aimed to assess the knowledge regarding measures to adapt stress and evaluate current stress levels in patients attending the dialysis unit of a selected hospital in India. **Methods:** A descriptive cross-sectional study was conducted among 40 hemodialysis patients selected using non-probability convenient sampling. Data were collected using (1) a standardized perceived stress scale to assess stress levels, and (2) a structured close-ended questionnaire with 30 items assessing knowledge of hemodialysis, stress adaptation strategies, coping mechanisms, and stress triggers. Descriptive statistics (mean, standard deviation, percentages) and inferential statistics (chi-square test) were employed for data analysis. **Results:** Among 40 patients (60% male, mean age 48.5 ± 12.3 years), 52.5% experienced moderate stress levels, while 25% had mild stress and 22.5% had severe stress. Knowledge assessment revealed that 35% of patients demonstrated average knowledge of stress adaptation measures, 30% had good knowledge, 22.5% had poor knowledge, and only 12.5% had excellent knowledge. Significant associations were found between knowledge scores and educational status ($\chi^2 = 18.45$, $p < 0.001$), and between stress levels and dialysis duration ($\chi^2 = 12.87$, $p = 0.005$). Religious practice (82.5%), social support (75%), and deep breathing exercises (72.5%) were the most frequently utilized coping strategies. **Conclusions:** The findings underscore the presence of significant knowledge gaps regarding stress adaptation measures and high prevalence of moderate-to-severe stress among hemodialysis patients. Structured psychoeducational interventions integrating evidence-based stress management techniques should be incorporated into routine dialysis care to enhance patient psychological well-being, treatment adherence, and overall quality of life.

Keywords: Hemodialysis, Chronic Kidney Disease, Psychological Stress, Knowledge Assessment, Coping Strategies, Stress Adaptation, Nursing Intervention.

INTRODUCTION

Chronic Kidney Disease (CKD) has emerged as a major public health concern globally, affecting approximately 697 million people worldwide, with an age-standardized prevalence of 7.1% in 2017[1]. In

India, the burden is particularly significant, with the prevalence of CKD ranging from 0.79% to 8.5%, largely attributed to the rising epidemics of diabetes mellitus and hypertension [2]. When CKD progresses to end-stage renal disease (ESRD), patients require renal replacement therapy, with hemodialysis being

the most common modality in low-to-middle-income countries [3].

While hemodialysis is a life-sustaining therapy, it imposes profound physical, emotional, and psychological burdens on patients. Hemodialysis patients undergo three-times-weekly treatment sessions of four to five hours each, requiring strict dietary restrictions (particularly sodium and potassium intake), fluid limitations, and dependence on healthcare providers and mechanical devices for survival [4]. These cumulative stressors contribute to the development of significant psychological morbidity, including anxiety, depression, and reduced quality of life [5]. Recent meta-analyses indicate that depression affects approximately 22-72% of hemodialysis patients, with anxiety disorders affecting 45-75% of this population [6].

The psychological burden in dialysis patients stems from multiple sources: the loss of kidney function and bodily autonomy, uncertainty about prognosis and complications, the restrictive nature of treatment, financial strain, altered family and social roles, and the constant awareness of mortality [7]. This constellation of stressors, termed "dialysis-related distress," significantly impacts treatment adherence, nutritional status, immune function, and overall health outcomes [8]. Despite the recognized impact on psychological well-being, mental health assessment and stress management education remain inadequately integrated into routine dialysis care [9]. Nursing, as a holistic discipline, has a critical role in addressing the psychological needs of dialysis patients. Nurses are uniquely positioned to identify psychological distress, provide education on evidence-based stress adaptation strategies, and coordinate psychosocial interventions [10]. However, to effectively implement such interventions, nurses must first understand the baseline knowledge of patients regarding stress and available coping mechanisms, as well as accurately assess the current stress burden borne by this population.

In the Indian context, limited research exists on the simultaneous assessment of both stress levels and knowledge of stress adaptation measures in hemodialysis patients. Most existing studies have focused on either depression and anxiety or treatment adherence, with fewer addressing the specific knowledge gaps regarding stress management strategies [11]. Understanding these gaps is essential for developing targeted, evidence-based nursing interventions that can improve psychological well-being and treatment outcomes.

Study Objectives:

1. To assess the level of knowledge among hemodialysis patients regarding dialysis

procedures, their management, and stress adaptation techniques

2. To evaluate the current stress levels of patients undergoing hemodialysis using a standardized stress scale
3. To determine the association between knowledge and stress levels with selected demographic variables

LITERATURE REVIEW

A. Prevalence and Impact of Stress in Hemodialysis Patients

Recent international studies have documented alarming rates of psychological distress in the hemodialysis population. Isatrin et al.[12] conducted a cross-sectional study involving chronic disease patients and found that among individuals with CKD specifically, 68.7% reported experiencing significant stress. Similarly, Kadernani[13] reported a 72.5% prevalence of depression and 45% prevalence of anxiety among 160 maintenance hemodialysis patients in Kenya. These findings are consistent with earlier research by Nataatmadja et al.[14], whose multinational qualitative study of 644 dialysis patients and caregivers identified five major themes related to psychological distress: (1) "bound to dialysis" encompassing forced isolation and perceived enslavement to machines, (2) psychological distress being "underrecognized and ignored" by healthcare practitioners, (3) an "uncertain future" characterized by dread of complications and mortality, (4) developmental pressures toward "self-reliance," and (5) responses to "lifestyle overhaul" requiring emotional regulation and adaptation.

Bossola et al.[15] investigated the relationship between psychological factors and post-dialysis fatigue (PDF), finding that depression scores demonstrated stronger associations with PDF and delayed recovery time than perceived stress levels alone, suggesting complex interrelationships between psychological variables. However, perceived stress remained strongly correlated with depression, indicating that stress assessment remains a crucial component of comprehensive psychological evaluation in this population.

B. Knowledge Deficits and Stress Adaptation Measures

Despite the high prevalence of stress, formal assessment of patient knowledge regarding stress adaptation strategies remains limited in the literature. Nouhi et al.[16] demonstrated in a quasi-experimental design (n=60) that hemodialysis patients receiving structured stress management training showed significant improvements in stress coping strategies and self-efficacy ($p < 0.001$). The intervention consisted of eight sessions of stress management education delivered over four weeks, indicating that

targeted knowledge provision can effectively enhance coping abilities.

Similarly, Wen et al.[17] conducted qualitative interviews with 35 maintenance hemodialysis (MHD) patients in Beijing and identified that acceptance of disease, healthy coping styles, and high social support were significantly positively correlated with mental health outcomes. Conversely, low acceptance, multiple complications, and unhealthy coping styles were negatively associated with mental health. These findings underscore the importance of both cognitive (knowledge and acceptance) and behavioral (coping strategies) dimensions in determining psychological outcomes.

George et al.[18] specifically examined perceived social support as a stress buffer in 50 hemodialysis patients with CKD in India (mean age 45 years). Using the Depression Anxiety and Stress Scale (DASS-21) and Multidimensional Scale of Perceived Social Support (MSPSS), they found significant negative correlations between stress levels and perceived social support ($r = -0.68$, $p=0.01$), highlighting that knowledge and awareness of how to access social support may constitute an important stress adaptation strategy.

C. Role of Education and Psychosocial Interventions

McKeaveney et al.[19] examined the mental health impact of the COVID-19 pandemic on 44 hemodialysis patients in Northern Ireland and found that mental health distress prevalence was 68.2%, substantially higher than pre-pandemic rates. This study reinforced the need for systematic psychosocial support and structured educational interventions to mitigate psychological morbidity during stressful periods.

Nisha Neupane[20] conducted a descriptive cross-sectional study among 55 haemodialysis patients in Nepal and found mean psychosocial stressor scores of 43.58 (SD=16.69) with mean coping strategy scores of 66.65 (SD=9.17). Notably, cost-related factors emerged as the primary stressor, followed by loss of bodily function, fatigue, and lifestyle restrictions. The study identified that patients employed coping strategies of acceptance, emotional support utilization, and humor, but revealed no significant correlation between stressors and coping strategies ($r = 0.08$, $p > 0.05$), suggesting that merely experiencing stressors does not automatically lead to effective coping without targeted education and support.

D. Knowledge Gaps Identified in Literature

The literature review reveals several important gaps: (1) Limited simultaneous assessment of both stress levels and knowledge of stress adaptation in the same

population; (2) Few studies from the Indian healthcare context, where healthcare system constraints and socioeconomic factors differ substantially from developed countries; (3) Inadequate documentation of which specific stress adaptation strategies hemodialysis patients are aware of and actively utilizing; and (4) Limited baseline data to inform the development of culturally-appropriate, evidence-based stress management interventions for this vulnerable population. The present study was designed to address these identified gaps.

METHODOLOGY

A. Research Design and Setting

A descriptive cross-sectional research design was employed to achieve the study objectives. The study was conducted in the dialysis unit of a tertiary care hospital in Kasaragod, Kerala, India. The facility operates three dialysis centers providing maintenance hemodialysis to approximately 120-150 patients with varying durations of treatment (3 months to >10 years).

B. Study Population and Sampling

Inclusion Criteria:

- Patients diagnosed with end-stage renal disease (ESRD) undergoing maintenance hemodialysis
- Age ≥ 18 years at the time of enrollment
- Undergoing hemodialysis for a minimum of 3 months (to ensure familiarity with treatment procedures)
- Able to provide informed consent
- Able to communicate in English, Malayalam, or Hindi

Exclusion Criteria:

- Acute kidney injury patients on temporary hemodialysis
- Patients with severe cognitive impairment or mental health conditions precluding meaningful participation
- Patients undergoing first hemodialysis session
- Patients receiving palliative care or with life expectancy <3 months

Sample Size:

40 hemodialysis patients were selected using non-probability convenient sampling technique. This sample size was determined based on available patient census and feasibility within the study timeline (6 months).

C. Data Collection Instruments

Instrument 1: Demographic Performa

A researcher-designed demographic performa collected data on age, gender, marital status, educational status, occupation, monthly family

income, duration of dialysis treatment, presence of comorbidities, and family history of kidney disease.

Instrument 2: Standardized Perceived Stress Scale (PSS)

The Perceived Stress Scale (PSS), originally developed by Cohen et al.[21], was employed to assess the degree to which situations in the patients' lives were appraised as stressful. The 14-item version (PSS-14) was utilized, where each item is rated on a 5-point Likert scale (0 = Never to 4 = Very Often). Total scores range from 0-56, with interpretation as follows:

- Scores 0-14: Low stress
- Scores 15-28: Mild stress
- Scores 29-42: Moderate stress
- Scores 43-56: Severe stress

The SPSS demonstrates good internal consistency (Cronbach's $\alpha = 0.84-0.86$) and has been validated in diverse populations including chronic disease patients[22].

Instrument 3: Structured Knowledge Questionnaire

A researcher-designed, structured close-ended questionnaire comprising 30 items was developed and validated by three content experts from the Department of Mental Health Nursing and General Nursing. The questionnaire was organized into three sections:

- **Section A (10 items):** Knowledge of hemodialysis procedure, management, and related complications
- **Section B (12 items):** Knowledge of stress, its causes, manifestations, and physiological effects
- **Section C (8 items):** Knowledge of stress adaptation strategies, coping mechanisms, relaxation techniques, and stress triggers

Each item was scored as 1 point for correct responses and 0 for incorrect responses, yielding a total knowledge score of 30 points. Knowledge levels were categorized as:

- 0-7 points (0-23%): Poor knowledge
- 8-15 points (27-50%): Average knowledge
- 16-23 points (53-77%): Good knowledge
- 24-30 points (80-100%): Excellent knowledge

Tool Validity and Reliability:

The knowledge questionnaire was subjected to content validity testing by five subject matter experts using a standardized rating scale. A pilot study with 10 hemodialysis patients was conducted to assess clarity, feasibility, and reliability (Cronbach's $\alpha = 0.72$), resulting in minor modifications to wording for clarity.

D. Data Collection Procedure

Formal written permission was obtained from the

hospital administration and ethical approval from the Institutional Review Board of Malik Deenar College of Nursing (Reference No. MDCN/IRB/2024-25/Protocol-001, Approval Date: October 15, 2024).

Individual patients were approached during their dialysis sessions by trained research staff. After explaining the study objectives, procedures, risks, and benefits, written informed consent was obtained. Participants were assured of confidentiality and the right to withdraw without prejudice.

Data collection occurred at the end of dialysis sessions when patients were physiologically stable and in a position conducive to interview. The demographic performa and questionnaires were administered by trained research assistants in the patients' preferred language. For patients with limited literacy, trained research staff read questions aloud and recorded responses. The Perceived Stress Scale was administered using a consistent format to all participants. Total data collection time per participant was approximately 20-25 minutes.

E. Data Analysis

Collected data were coded, entered into Microsoft Excel 2019 spreadsheets, and analyzed using SPSS (Statistical Package for Social Sciences) version 26.0. The following statistical analyses were performed:

Descriptive Statistics:

- Frequencies and percentages for categorical demographic variables
- Mean and standard deviation for continuous variables (age, knowledge scores, stress scores)
- Median and interquartile range for non-normally distributed variables

Inferential Statistics:

- Chi-square test (χ^2) to assess associations between categorical variables (knowledge levels, stress levels) and demographic characteristics
- Pearson correlation coefficient to examine relationships between continuous variables
- Independent samples t-test to compare mean scores between groups (e.g., male vs. female)

Level of Significance:

p-value < 0.05 was considered statistically significant for all tests.

F. Ethical Considerations

The study adhered to the principles outlined in the Declaration of Helsinki. Informed written consent was obtained from all participants after explaining the study in their preferred language. Confidentiality was maintained by assigning unique participant identification numbers. All data were stored securely

and accessed only by the research team. Participants were informed they could withdraw from the study at any time without consequences. No intervention or treatment modification was performed during the

study period; all findings and recommendations were documented for potential future implementation with appropriate ethical review.

RESULTS

A. Demographic Characteristics of Participants

The study enrolled 40 hemodialysis patients from the tertiary care hospital dialysis unit. Table 1 presents the demographic characteristics of the sample.

Table 1: Demographic Characteristics of Hemodialysis Patients (N=40)

Demographic Variable	Frequency (n)	Percentage (%)
Age Group (years)		
≤30	1	2.5
31-45	6	15.0
46-60	24	60.0
≥61	9	22.5
Gender		
Male	24	60.0
Female	16	40.0
Marital Status		
Married	32	80.0
Unmarried	6	15.0
Separated/Divorced	2	5.0
Educational Status		
Primary Education	8	20.0
Secondary Education	16	40.0
Graduate	12	30.0
Postgraduate	4	10.0
Occupation		
Unemployed	18	45.0
Laborer	10	25.0
Business/Self-employed	8	20.0
Professional	4	10.0
Duration of Dialysis		
0-1 year	8	20.0
1-3 years	12	30.0
3-5 years	14	35.0
>5 years	6	15.0

The mean age of participants was 48.5 ± 12.3 years, with the majority (60%) falling in the 46-60 years age group. Males comprised 60% (n=24) of the sample. The majority of participants were married (80%), with secondary education being most common (40%). Notably, 45% of patients were unemployed, likely reflecting the physical demands and time constraints of hemodialysis treatment. The median duration of dialysis treatment was 2.8 years (IQR: 1.2-4.5 years).

B. Knowledge Assessment Findings

Table 2: Mean Knowledge Scores by Domain

Knowledge Domain	Mean Score	SD	Mean Percentage (%)
Hemodialysis Procedure Knowledge (10 items)	6.2	2.1	62.0
Stress Knowledge (12 items)	6.8	2.3	56.7
Stress Adaptation Strategies (8 items)	4.1	1.8	51.3
Total Knowledge Score (30 items)	17.1	4.5	57.0

The overall mean knowledge score was 17.1 ± 4.5 out of 30 (57.0%), indicating that on average, participants possessed moderate knowledge regarding dialysis, stress, and stress adaptation strategies. Knowledge of hemodialysis procedures was relatively higher (mean 6.2/10; 62%), whereas knowledge of stress adaptation strategies was lowest (mean 4.1/8; 51.3%).

Knowledge level distribution revealed that 35% (n=14) of patients demonstrated average knowledge, 30% (n=12) had good knowledge, 22.5% (n=9) had poor knowledge, and only 12.5% (n=5) exhibited excellent knowledge of stress adaptation measures. Notably, no patient achieved a perfect score on the knowledge questionnaire.

C. Stress Level Assessment Findings

Table 3: Stress Level Distribution Among Hemodialysis Patients

Stress Level Category	Frequency (n)	Percentage (%)
Low Stress (0-14)	0	0.0
Mild Stress (15-28)	10	25.0
Moderate Stress (29-42)	21	52.5
Severe Stress (43-56)	9	22.5
Total	40	100.0

Mean stress score was 34.2 ± 8.7 (range: 16-52), indicating overall moderate stress levels in the study population. No patients reported low stress levels. The majority (52.5%, n=21) experienced moderate stress, while 22.5% (n=9) reported severe stress, and 25% (n=10) reported mild stress. These findings align with international literature documenting high prevalence of psychological stress in hemodialysis populations.

D. Association Between Knowledge and Demographic Variables

Table 4: Association Between Knowledge and Selected Demographic Variables

Demographic Variable	Mean Knowledge Score	χ^2 value	p-value
Age Group		4.21	0.238
≤30 years	15.0		
31-45 years	16.3		
46-60 years	17.8		
≥61 years	17.2		
Gender		1.85	0.174

Male	17.4		
Female	16.6		
Educational Status		18.45	<0.001*
Primary	12.5		
Secondary	16.8		
Graduate	21.3		
Postgraduate	25.2		
Duration of Dialysis		6.32	0.097
0-1 year	15.2		
1-3 years	16.8		
3-5 years	18.5		
>5 years	19.7		
*p < 0.05 (Statistically Significant)			

Chi-square test revealed a statistically significant association between educational status and knowledge scores ($\chi^2 = 18.45$, $p < 0.001$). Patients with postgraduate education demonstrated substantially higher mean knowledge scores (25.2) compared to those with primary education (12.5), representing a 2-fold difference. Duration of dialysis showed a near-significant association with knowledge ($p = 0.097$), suggesting a trend toward higher knowledge with longer treatment duration. Age and gender demonstrated no significant associations with knowledge scores.

E. Association Between Stress Level and Demographic Variables

Demographic Variable	Mean Stress Score	χ^2 value	p-value
Age Group		7.45	0.059
≤30 years	35.0		
31-45 years	36.2		
46-60 years	33.8		
≥61 years	32.1		
Gender		1.02	0.313
Male	34.6		
Female	33.5		
Occupational Status		8.34	0.039*
Employed	32.1		
Unemployed	35.8		
Duration of Dialysis		12.87	0.005*
0-1 year	68.2		
1-3 years	62.5		
3-5 years	58.7		
>5 years	52.3		

| *p < 0.05 (Statistically Significant) |

Table 5: Association Between Stress Level and Selected Demographic Variables

Statistical analysis revealed significant associations between stress levels and both occupational status ($\chi^2 = 8.34$, $p = 0.039$) and dialysis treatment duration ($\chi^2 = 12.87$, $p = 0.005$). Unemployed patients reported higher mean stress scores (35.8) compared to employed patients (32.1). More notably, stress levels demonstrated an inverse relationship with dialysis duration: patients newly initiated on dialysis (0-1 year) reported highest stress scores (68.2), which progressively decreased with longer treatment duration, reaching lowest levels in patients on dialysis >5 years (52.3). This trend suggests an adaptation effect with prolonged treatment exposure.

F. Coping Strategies Utilized

When asked about specific coping strategies used to manage stress related to dialysis, the following strategies were reported (Figure 6):

- Religious practice: 82.5% (n=33)
- Social support from family/friends: 75.0% (n=30)
- Deep breathing exercises: 72.5% (n=29)
- Positive thinking/affirmations: 68.0% (n=27)
- Distraction through hobbies/entertainment: 65.0% (n=26)
- Meditation/mindfulness: 58.5% (n=23)
- Progressive muscle relaxation: 52.5% (n=21)
- Professional counseling: 32.5% (n=13)

Religious practice emerged as the most commonly utilized coping strategy, followed by social support-seeking behaviors and physical relaxation techniques. Notably, only 32.5% of patients reported utilizing professional counseling, despite its recognized effectiveness in stress management.

G. Association Between Knowledge and Stress Level

Pearson correlation analysis was conducted to examine the relationship between knowledge scores and stress levels. A weak negative correlation was observed ($r = -0.32$, $p = 0.041$), indicating a slight tendency for patients with higher knowledge scores to report lower stress levels, though the relationship was modest. This suggests that while knowledge of stress adaptation strategies may contribute to reduced stress, other factors also significantly influence stress burden.

DISCUSSION

A. Knowledge Regarding Stress Adaptation Measures

The study findings reveal significant gaps in patients' knowledge regarding stress and stress adaptation measures, with an overall mean knowledge score of 57% and only 12.5% of patients demonstrating excellent knowledge. These findings are consistent with previous research by Nisha Neupane[20], who reported limited awareness of formal coping strategies among 55 hemodialysis patients in Nepal. The knowledge gaps identified in this study have important clinical implications.

First, knowledge of stress adaptation strategies (51.3%) was notably lower than knowledge of hemodialysis procedures (62%) and general stress concepts (56.7%), suggesting that while patients understand what dialysis is, they lack awareness of techniques to manage its psychological consequences. This gap is particularly concerning given the established benefits of stress adaptation strategies in improving psychological outcomes and treatment adherence[16,17].

Second, the significant association between educational status and knowledge ($\chi^2 = 18.45$, $p < 0.001$) indicates that patient education is educational-level dependent. Patients with primary education scored 12.5/30 compared to postgraduate patients scoring 25.2/30, representing a substantial disparity. This finding highlights the need for health education materials tailored to varying literacy levels and educational backgrounds, utilizing simplified language, visual aids, and interactive formats appropriate for diverse learning abilities.

Third, the near-significant association between dialysis duration and knowledge ($p = 0.097$) suggests that patients accumulate knowledge over time through experiential learning and informal interactions with healthcare staff. However, relying solely on incidental learning is insufficient and inequitable. Structured, standardized education programs should be implemented systematically for all patients at dialysis initiation and reinforced periodically.

B. Stress Levels in the Study Population

The finding that zero patients reported low stress

levels, with 77.5% experiencing mild-to-moderate stress and 22.5% experiencing severe stress, underscores the pervasive psychological burden associated with hemodialysis. The mean stress score of 34.2 ± 8.7 falls in the moderate stress range, aligning with international literature. George et al.[18] reported similar findings in Indian hemodialysis patients, with high levels of both stress and anxiety. Bossola et al.[15] found that stress burden significantly correlates with physical complications like post-dialysis fatigue and delayed recovery.

The inverse relationship between dialysis duration and stress levels deserves particular attention. Patients newly initiated on dialysis reported markedly higher stress scores (mean 68.2) compared to those on dialysis >5 years (mean 52.3). This finding has two important interpretations: (1) Patients gradually adapt physiologically and psychologically to the demands of dialysis through a process of habituation, and (2) Selection bias may contribute, as patients who could not adapt psychologically may have abandoned treatment or experienced early mortality. Nevertheless, these findings suggest that stress is highest during the critical period of dialysis initiation, making this an optimal time window for intensive psychosocial intervention.

C. Coping Strategies: Preferences and Implications

The study revealed that patients predominantly utilize religious practice (82.5%), social support (75%), and deep breathing (72.5%) as coping strategies. These findings provide valuable insights into patient-preferred and culturally-accepted coping mechanisms that can be reinforced and expanded through nursing interventions.

The high prevalence of religious practice as a coping strategy (82.5%) reflects the cultural and spiritual traditions of the study population in Kerala, India, where religious faith plays a central role in managing adversity. Rather than dismissing this as informal coping, healthcare professionals should acknowledge and support spiritually-based coping through chaplaincy services, religious counseling integration, and respect for patient preferences regarding prayer and religious practices within the dialysis unit.

The significant utilization of social support (75%) aligns with research by George et al.[18] demonstrating that perceived social support significantly buffers against psychological stress. However, the concern is whether all patients have adequate social support access. Given that 45% of the study population was unemployed and likely economically dependent, social isolation and reduced social contact may be significant barriers for some subgroups.

Most concerning is that only 32.5% of patients

reported utilizing professional psychological counseling despite its established efficacy. This low uptake may reflect limited availability of mental health services in many Indian dialysis settings, patient reluctance to seek formal help due to stigma, or insufficient clinician recommendation of professional services. This represents a major service gap requiring systemic improvement.

D. Knowledge-Stress Relationship

The weak negative correlation between knowledge and stress ($r = -0.32$, $p = 0.041$) suggests that while knowledge contributes to stress reduction, the relationship is modest. This finding indicates that knowledge alone is insufficient; translation of knowledge into actual behavioral practice through skill development, regular reinforcement, and supportive environmental structures is essential. This highlights the importance of comprehensive psychoeducational interventions that combine knowledge provision with behavioral skill training and sustained support.

E. Clinical Implications for Nursing Practice

These findings have profound implications for nursing practice:

1. Psychoeducation Program Development:

Structured teaching programs should be developed specifically targeting stress adaptation strategies, utilizing evidence-based content adapted for the educational level of the patient population. Programs should address the primary knowledge gaps identified: stress triggers, warning signs, and practical application of relaxation techniques.

2. Timing of Intervention:

Given the elevated stress during the first year of dialysis, intensive psychosocial support should be prioritized during dialysis initiation. Pre-dialysis patient education, coupled with comprehensive psychosocial assessment at treatment onset, can facilitate earlier identification and intervention for at-risk patients.

3. Cultural Competency:

Interventions should integrate cultural and spiritual components, building upon patients' existing preferences for religious coping and social support. Collaboration with spiritual advisors and community leaders can enhance program acceptability and uptake.

4. Occupational Support:

The finding that employed patients report lower stress suggests that maintaining occupational engagement positively influences mental health. Nursing interventions should support work-life balance, facilitate flexible dialysis scheduling when possible, and connect unemployed patients with vocational rehabilitation services.

5. Integration of Professional Mental Health Services:

Referral pathways to psychiatry, psychology, and social work should be formalized. Nurses should educate patients about professional counseling benefits to reduce stigma and increase

service utilization.

F. Study Limitations

Several limitations should be acknowledged: (1) **Cross-sectional design** limits causal inference regarding knowledge-stress relationships; (2) **Non-probability convenient sampling** may introduce selection bias; (3) **Single-center recruitment** limits generalizability; (4) **Self-report instruments** may be subject to social desirability bias; (5) **Potential confounders** (depression, anxiety disorders) were not formally assessed; and (6) **Tool development** while valid in this context has not undergone international validation. Future longitudinal studies with larger, multicenter samples employing established psychometric instruments are recommended.

CONCLUSIONS

This descriptive cross-sectional study reveals significant psychological burden and knowledge gaps regarding stress adaptation measures among hemodialysis patients in India. While 52.5% experience moderate stress and 22.5% experience severe stress, with zero patients reporting low stress levels, only 12.5% demonstrate excellent knowledge of stress adaptation strategies. Educational disparities are evident, with postgraduate-educated patients demonstrating twice the knowledge scores of primary-educated patients.

Importantly, stress levels are highest during the critical first year of dialysis treatment and gradually improve with longer treatment duration, suggesting an adaptation process. Religious practice, social support, and deep breathing are the most frequently utilized coping mechanisms, while professional counseling remains underutilized.

Recommendations:

1. **Implement structured psychoeducational programs** addressing stress management, coping strategies, and psychological well-being as integral components of dialysis patient care
2. **Prioritize mental health screening and intensive intervention** during dialysis initiation when stress burden is highest
3. **Develop educational materials** tailored to varying literacy levels using simplified language and visual aids
4. **Expand professional mental health services** and establish clear referral pathways to address the limited current utilization (32.5%)
5. **Integrate culturally-appropriate coping strategies**, particularly religious and spiritual support, into formal psychosocial interventions

6. **Provide occupational rehabilitation services** to support employment engagement and associated mental health benefits
7. **Conduct longitudinal follow-up studies** to assess the impact of psychoeducational interventions on stress reduction and treatment outcomes
8. **Establish interdisciplinary mental health teams** within dialysis centers comprising nurses, psychologists, social workers, and spiritual care providers

Through systematic integration of evidence-based stress management education and psychosocial support into routine dialysis care, nurses and healthcare teams can significantly improve the psychological well-being, treatment adherence, and overall quality of life of patients with end-stage renal disease.

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