



Effectiveness of deep breathing exercises on stress among chronic kidney disease (CKD) clients undergoing hemodialysis

Nilesh Mhaske^{1*}, Heera Jayasheela², Sonali Mhaske³

¹ Smt. Sindhutai Eknathrao Vikhe Patil College of Nursing, Pravara Institute of Medical Sciences (DU), Maharashtra, India

² Dean, Faculty of Nursing, Smt. Sindhutai Eknathrao Vikhe Patil College of Nursing, Pravara Institute of Medical Sciences (DU), Maharashtra, India

³ Assistant Professor, Smt. Sindhutai Eknathrao Vikhe Patil College of Nursing, Pravara Institute of Medical Sciences (DU), Maharashtra, India

Abstract

Background: Chronic Kidney Disease (CKD) patients undergoing hemodialysis often experience high stress levels due to the chronicity of illness, frequent hospital visits, lifestyle changes, and emotional burdens. Deep breathing exercises have been identified as a simple, cost-effective intervention to reduce stress.

Objectives:

1. To assess the level of stress among CKD clients undergoing hemodialysis.
2. To evaluate the effectiveness of deep breathing exercises in reducing stress.
3. To find the association between the level of stress and selected demographic variables.

Materials and Methods: A quasi-experimental one-group pre-test post-test design was used. Thirty CKD clients undergoing hemodialysis were selected using purposive sampling. A standardized perceived stress scale was administered before and after a week-long deep breathing exercise intervention. Data were analyzed using SPSS v25, applying descriptive and inferential statistics.

Results: Pre-test stress levels showed 43.3% of participants with high stress, 40% with moderate, and 16.7% with low stress. Post-intervention, only 13.3% had high stress while 60% showed low stress. Paired t-test revealed a significant reduction in stress levels ($p < 0.01$). Demographic variables such as education ($p = 0.041$) and income ($p = 0.036$) showed significant associations with stress levels.

Conclusion: Deep breathing exercises were effective in reducing stress among CKD clients undergoing hemodialysis. It is recommended as a complementary therapy in nephrology care settings.

Keywords: Chronic kidney disease, hemodialysis, stress, deep breathing exercises, complementary therapy

Introduction

Chronic Kidney Disease (CKD) is a progressive, irreversible loss of renal function that poses a major global public health challenge. The *Global Burden of Disease Study (2023)* ranks CKD among the top 10 causes of mortality worldwide, with an estimated 9.1% global prevalence, equating to nearly 700 million people. In India, the prevalence ranges from 8% to 16%, with a substantial proportion progressing to End-Stage Renal Disease (ESRD) requiring renal replacement therapy such as hemodialysis. The increasing incidence is largely driven by the rising burden of diabetes mellitus, hypertension, obesity, and aging populations.

Hemodialysis, while a life-sustaining treatment for ESRD, imposes significant lifestyle disruptions and psychosocial burdens. Patients often undergo three sessions per week, each lasting 3–5 hours, which can lead to employment loss, altered family roles, reduced mobility, and dependence on caregivers. These challenges, combined with dietary and fluid restrictions, recurrent medical procedures, and fear of disease progression, contribute to heightened stress levels. Studies indicate that 40–50% of hemodialysis patients experience moderate to high stress, which is closely linked to poorer treatment adherence, decreased quality of life, and higher morbidity.

Stress in CKD clients is multidimensional, arising from both physiological and psychosocial sources. Physiological

contributors include fatigue, muscle cramps, hypotension during dialysis, and sleep disturbances. Psychosocial factors encompass financial strain due to treatment costs, uncertainty about prognosis, social isolation, and diminished autonomy. Persistent stress activates the hypothalamic–pituitary–adrenal (HPA) axis and the sympathetic nervous system, resulting in elevated cortisol levels and increased cardiovascular risk—further complicating CKD management.

Mind–body interventions have been increasingly recognized in nephrology care for their ability to promote relaxation and emotional well-being without pharmacological side effects. Deep breathing exercises, also known as diaphragmatic or slow-paced breathing, are a simple, cost-effective technique that involves conscious regulation of breath to stimulate the parasympathetic nervous system. This activation leads to a reduction in heart rate, blood pressure, and cortisol secretion, thereby attenuating the physiological manifestations of stress. Evidence from studies in chronic illness populations, including cardiovascular disease, cancer, and chronic respiratory disorders, suggests that deep breathing can significantly improve mood, reduce anxiety, and enhance overall quality of life.

In the context of CKD, incorporating deep breathing exercises into routine care offers a practical, low-cost strategy to mitigate stress during and between dialysis

sessions. Despite its potential, limited studies in the Indian setting have explored the effectiveness of this intervention specifically for hemodialysis patients. The present study was therefore undertaken to assess stress levels among CKD clients undergoing hemodialysis, evaluate the impact of a structured deep breathing exercise program, and examine the association between stress levels and selected demographic variables. The findings are expected to contribute to evidence-based recommendations for integrating non-pharmacological stress management strategies into nephrology practice.

Objectives

1. To assess the level of stress among CKD clients undergoing hemodialysis.
2. To evaluate the effectiveness of deep breathing exercises on stress levels.
3. To determine the association between stress levels and selected demographic variables.

Materials and Methods

Research Design and Setting

Quasi-experimental one-group pre-test post-test design. Conducted in a tertiary care hospital dialysis unit, Maharashtra.

Sample and Sampling Technique

- **Sample size:** 30 CKD clients undergoing hemodialysis
- **Sampling technique:** Non-probability purposive sampling

Inclusion Criteria

- Diagnosed with CKD and undergoing hemodialysis for ≥ 3 months

- Aged ≥ 18 years, willing to participate
- Able to understand instructions and participate in the exercise

Exclusion Criteria

- Clients with known psychiatric illness
- On anxiolytic medications or other stress-relieving therapies

Intervention: Deep Breathing Exercise Protocol

Participants were trained in deep breathing (diaphragmatic breathing) — inhale for 4 seconds, hold for 2 seconds, exhale for 6 seconds.

- **Duration:** 10 minutes per session, twice daily for 7 days
- Supervised on Day 1 and Day 4; other sessions were self-practiced

Data Collection Tools

1. Sociodemographic questionnaire
2. Perceived Stress Scale (PSS-10)

Ethical Considerations

Ethical clearance was obtained from the Institutional Ethics Committee. Informed consent was taken from all participants.

Data Analysis

Data analyzed using SPSS v25. Descriptive statistics (frequency, percentage, mean, SD) and inferential statistics (paired t-test, chi-square test). Significance set at $p < 0.05$.

Results

Section 1: Sociodemographic Data (N = 30)

S. N.	Variables	Categories	Frequency (f)	Percentage (%)
1	Age (years)	18 – 27	4	13.3
		28 – 37	6	20.0
		38 – 47	9	30.0
		48 – 57	8	26.7
		Above 58	3	10.0
2	Gender	Male	18	60.0
		Female	12	40.0
3	Religion	Hindu	20	66.7
		Muslim	9	30.0
		Christian	1	3.3
		Illiterate	7	23.3
4	Educational Qualification	Primary & Secondary	9	30.0
		Higher Secondary	8	26.7
		Graduate	6	20.0
		Agriculture	11	36.7
5	Occupation	Daily wages	8	26.7
		Private Employee	7	23.3
		Govt. Employee	4	13.3
		Upper	5	16.7
		Upper Middle	7	23.3
6	Income	Middle	10	33.3
		Lower Middle	7	23.3
		Lower	1	3.3
		Married	19	63.3
		Unmarried	8	26.7
7	Marital Status	Widowed	3	10.0
		Nuclear	20	66.7
		Joint	9	30.0
8	Type of Family	Extended	1	3.3

9	Place of Residence	Rural	22	73.3
		Urban	8	26.7
10	Health Insurance	Govt. Schemes	21	70.0
		Self	9	30.0

Section 2: Stress Levels Before and After Deep Breathing Exercise

Stress Level	Pre-Test (n/%)	Post-Test (n/%)
Low	5 (16.7%)	18 (60.0%)
Moderate	12 (40.0%)	8 (26.7%)
High	13 (43.3%)	4 (13.3%)

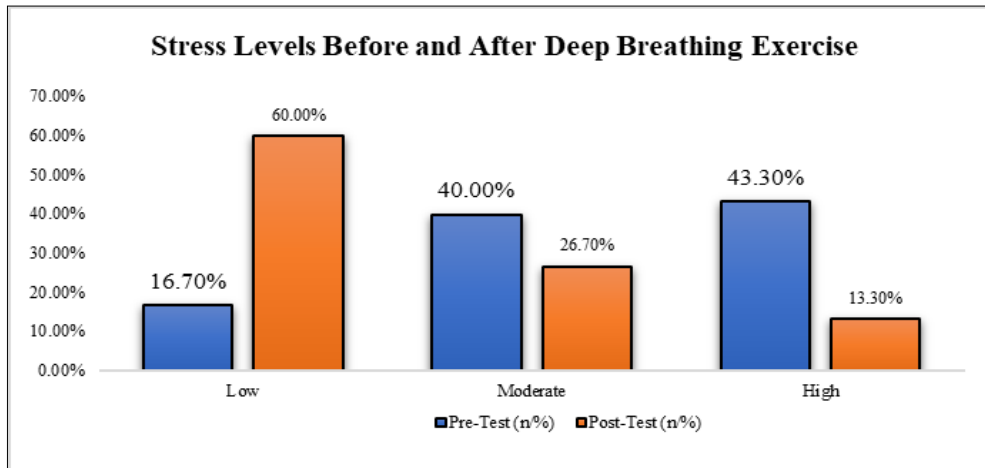


Fig 1: Bar diagram showing percentagewise distribution of respondents according to stress levels before and after deep breathing exercise

Interpretation:

Post-test results show a significant reduction in high stress and a marked increase in participants with low stress.

Paired t-test Result:

- Mean pre-test stress score: 24.13 ± 3.4
- Mean post-test stress score: 16.80 ± 3.1
- t = 9.21, p < 0.01, indicating statistically significant improvement.

Section 3: Association of Stress with Demographic Variables (Pre-Test)

Variable	p-value	Significance
Age	0.072	NS
Gender	0.441	NS
Education	0.041	Significant
Occupation	0.067	NS
Monthly Income	0.036	Significant
Marital Status	0.186	NS

Discussion

The present study revealed that most CKD clients undergoing hemodialysis were experiencing moderate to high levels of stress prior to intervention, a finding consistent with earlier studies by Thomas *et al.* (2018) [1] and Singh *et al.* (2020) [2], who also reported high stress prevalence among dialysis patients due to the chronicity of treatment, lifestyle disruptions, and emotional burden. This underscores that stress is a pervasive and under-recognized complication of CKD, with significant implications for treatment adherence and quality of life.

Following a one-week program of deep breathing exercises, a statistically significant reduction in stress levels was observed, with the proportion of participants reporting high stress decreasing from 43.3% to 13.3%. This supports the

growing body of evidence that mind–body interventions are effective in managing psychological distress in chronic illness populations. Similar outcomes have been reported by Yogendra *et al.* (2021) and Kunikullaya *et al.* (2019), where diaphragmatic breathing was found to reduce anxiety, improve emotional well-being, and stabilize physiological parameters such as heart rate and blood pressure. The mechanism of action likely involves activation of the parasympathetic nervous system, suppression of the hypothalamic–pituitary–adrenal (HPA) axis, and consequent lowering of cortisol levels, resulting in both physical relaxation and mental calmness.

The significant associations between stress levels and education as well as income observed in the present study are noteworthy. Higher education levels may enhance health literacy, enabling patients to better understand their illness, treatment options, and coping strategies, thereby reducing psychological distress. Similarly, greater financial stability can reduce the economic burden of ongoing dialysis, improve access to supportive resources, and alleviate one of the major sources of chronic stress. These findings are in line with Kumar *et al.* (2020), who highlighted that socioeconomic factors play a critical role in determining psychological resilience among CKD patients.

From a clinical practice perspective, the results suggest that deep breathing exercises are a feasible, low-cost, and non-invasive adjunct to standard nephrology care. They can be easily taught by nursing staff, require no special equipment, and can be practiced by patients both during and outside dialysis sessions. Incorporating such interventions into routine care could help address the psychosocial needs of CKD clients, particularly in resource-limited settings where access to formal psychological services may be restricted.

The study also emphasizes the importance of a holistic, biopsychosocial approach in CKD management—where

physical treatment is complemented by interventions targeting mental and emotional well-being. Future research with larger sample sizes, longer follow-up periods, and comparative designs (e.g., with other relaxation techniques) would provide stronger evidence for integrating deep breathing into standardized care protocols for dialysis patients.

Conclusion

Deep breathing exercises were found to be effective in significantly reducing stress levels among CKD clients undergoing hemodialysis. The intervention is simple, non-invasive, and can be incorporated into patient education programs.

Limitations

- Small sample size
- Single-center study
- No control group for comparison

Recommendations

- Incorporate deep breathing exercises into daily routine for CKD patients
- Educate staff and patients on the benefits of relaxation therapies
- Conduct multicentric studies with larger samples and control groups

Conflict of Interest

None declared.

Funding

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