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Effectiveness of a Mindfulness-Based Stress Reduction Program on Quality of Life among Hemodialysis Patients: A Preliminary Study

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Abstract Individuals receiving maintenance hemodialysis for Chronic Kidney Disease (CKD) frequently encounter complex physical, emotional and social challenges that substantially diminish their Quality of Life (QoL). Mindfulness-Based Stress Reduction (MBSR) has increasingly been recognized as a supportive, non-pharmacological strategy for enhancing well-being in populations with chronic illness. This pilot investigation examined the potential influence of an MBSR program on QoL outcomes among patients undergoing hemodialysis. A quasi-experimental pretest–posttest framework was applied with ten participants recruited from a dialysis unit. The intervention cohort engaged in an eight-week structured MBSR program involving weekly one-hour sessions incorporating focused breathing, mindfulness meditation and body-scan practices, while the control cohort continued with standard clinical care. QoL was assessed before and after the intervention using the Kidney Disease Quality of Life Short Form (KDQOL-SF v1.3). Analytical procedures included paired and independent t-tests, in addition to correlational analyses exploring associations with demographic and treatment-related parameters. Notable improvements were observed in the intervention group across multiple domains Symptoms and Problems ($p = 0.0018$), Effects of Kidney Disease ($p = 0.0284$), Sleep ($p = 0.0468$), Physical Functioning ($p = 0.0265$) and Role Limitations due to Physical Health ($p = 0.0211$). Post-intervention patterns indicated that demographic attributes and dialysis-related variables influenced specific QoL dimensions. These preliminary findings suggest that MBSR may offer meaningful benefits for both physical and psychological dimensions of QoL among hemodialysis patients and merits further evaluation in larger controlled studies.

Key Words Mindfulness-Based Stress Reduction, Hemodialysis, Health, Wellbeing, Quality of Life, Non-Pharmacological Interventions

INTRODUCTION

Chronic Kidney Disease (CKD) is characterized by a sustained reduction in glomerular filtration rate below 60 mL/min/1.73 m², often accompanied by albuminuria or structural abnormalities of the kidneys [1]. It is frequently referred to as a silent disease, as individuals may lose up to ninety percent of kidney function without indications [2]. Treatment typically consists of renal replacement therapy and conservative management, with continuous ambulatory peritoneal dialysis being the second most common form of kidney replacement after hemodialysis [3]. Hemodialysis involves extracting blood to filter out waste and correct imbalances before returning it to the body. Research indicates it can improve symptoms and patients' quality of life within six weeks [4,5], but recurring circumstances and long-term treatment can lead to discomfort and fear [6,7]. The dialysis process is seen as troublesome, significantly impacting health-related QoL, with patients requiring frequent hospital visits that restrict their social and professional activities [8]. QoL is a significant concern for individuals with stage V and their caregivers post-dialysis initiation [9]. It encompasses an individual's perception influenced by personal values, cultural context and social standards. Recognized as a vital metric in evaluating Chronic Kidney Disease (CKD) patients on hemodialysis [10], QoL is affected by factors such as age, dialysis duration, comorbidities, anemia and polypharmacy [11]. ESRD and its treatments disrupt various daily life aspects, including occupational functioning, dietary habits, recreation and interpersonal relationships, owing to a combination of physical, psychological, social and environmental stressors [12].

Complementary therapies, such as Mindfulness-Based Interventions (MBIs), provide alternatives to conventional therapies by enhancing health, reducing side effects and lowering costs [13]. A notable MBI is Mindfulness-Based Stress Reduction (MBSR), developed by Jon Kabat-Zinn in 1979 [14], which incorporates meditation and breathing trainings to promote relaxation [15]. Increasing evidence supports nonpharmacological approaches for improving health in Chronic Kidney Disease (CKD) patients. Given the growing interest in integrating holistic approaches within renal care, this study seeks to evaluate the preliminary impact of an MBSR program on QoL domains among patients receiving hemodialysis in the comprehensive management of CKD.

MATERIALS AND METHODS

A quasi-experimental design employing a pretest–posttest approach was utilized to determine the effectiveness of a Mindfulness-Based Stress Reduction (MBSR) program in improving the quality of life (QoL) of adults undergoing maintenance hemodialysis in the dialysis unit of a large tertiary-level teaching hospital, SMCH, where approximately 80–100 patients receive hemodialysis daily. A main study sample of 100 was initially planned; however, for this preliminary pilot investigation, 10 participants (representing 10% of the projected sample) were recruited to evaluate the feasibility of the intervention protocol. Convenience sampling was employed to identify and select participants who met the study criteria and were willing to participate. The sample was subsequently divided into two groups of equal size: Intervention group (n = 5) received MBSR in addition to routine clinical care and Control group (n = 5) continued with standard hemodialysis care alone. Participants were eligible for enrollment if they were adults aged 18–70 years, Had been undergoing hemodialysis for at least three months, Were medically stable and able to participate in mindfulness sessions and Provided informed consent prior to participation. Patients with psychiatric illness, cognitive deficits, or concurrent psychological therapy were excluded. Ethical approval for the study was granted by the Institutional Ethics Committee of the host institution (Ref. No: 001/10/2024/IEC/SMCH). Written informed consent was obtained from each participant. Confidentiality of personal and clinical data was ensured throughout the research process. Participants retained the right to withdraw from the study at any point without any impact on their routine treatment. The intervention followed the standardized MBSR framework developed by Jon Kabat-Zinn. The program spanned eight weeks, during which the intervention group attended weekly 60-minute sessions conducted within the dialysis unit premises with mindfulness meditation, breathing exercises and body scans, supplemented by 20-minute daily home practice. Data collection was carried out using a structured questionnaire that captured two major components: Demographic and Clinical Profile. Data were collected using a structured questionnaire for demographic and clinical characteristics and QoL was measured using the Kidney Disease Quality of Life Short Form (KDQOL-SF™ v1.3), translated into Tamil. Data analysis using SPSS 25 involved descriptive statistics and inferential tests (paired and t-tests). Correlation analysis to examine relationships between QoL domains and selected demographic and clinical characteristics.

RESULTS

Demographic Characteristics

Three patients (60%) in the experimental group (n = 5) were 50 years of age or older and two patients (40%) were younger than 50. Similar trends were seen in the control group (n = 5), where two patients (40%) were under 50 and three patients (60%) were 50 years of age or older. Distribution of genders showed that control group consisted of four males (80%) and one female (20%), while the experimental group had three males (60%) and two females (40%).

In terms of residence, two patients (40%) and three patients (60%) in the experimental group were urban dwellers. In contrast, two patients (40%) from rural areas, two (40%) from semi-urban areas and one (20%) from an urban setting made up the control group.

One patient (20%) was unmarried, while four patients (80%) in the experimental group were married. All five patients (100%) were wedded in control group.

In the experimental group, 40% of patients are illiterate, 40% completed elementary school and 20% held a degree. In the control group, 60% finished primary school, 40% were illiterate and no further education was reported. Regarding occupational status, 40% of the experimental group were housewives, while 60% were retired or working informally; while the control group reflected similar statistics.

Clinical Characteristics.

Family history of renal disease was present in two participants (40%) in the intervention group and one participant (20%) in the control group. Hypertension emerged as the predominant underlying cause of CKD in both groups. Overall, one patient (20%) had diabetes mellitus, three (60%) had hypertension and one (20%) had other etiologies.

The duration of CKD showed parallel patterns across groups: 40% had lived with CKD for less than one year, 40% for one to three years and 20% for more than five years.

Two patients (40%) in the experimental group had received Hemodialysis (HD) for less than a year, two (40%) for one to three years and one (20%) for more than three years. One patient (20%) had been receiving dialysis for one to three years, one patient (20%) for more than three years and three patients (60%) had been receiving it for less than a year. However, people frequently struggle with a loss of independence and feel inferior after two years of hemodialysis. They struggle to maintain their standard of living as they grow reliant on the machines. Patients also experience fatigue, financial difficulties and stringent dietary and fluid restrictions [16].

The number of dialysis sessions varied from group to group. In the experimental group, three patients (60%) participated in dialysis sessions biweekly, while two patients (40%) attended triweekly sessions. In the control group, three (60%) went to sessions twice a week and two (40%) went to sessions three times a week.

Table 1 recapitulates the pre and posttest KDQOL-SF™ scores of hemodialysis patients who received the MBSR intervention. Paired t-test analysis demonstrated significant post-intervention advances in several QoL domains. The Symptoms and Problems domain increased from 41.20 (±8.10) to 48.10 (±7.90) ($t = 4.352$, $p = 0.0018$), while Effects of Kidney Disease on Daily Life improved from 42.50 (±9.00) to 47.80 (±8.60) ($t = 2.607$, $p = 0.0284$). Sleep scores rose from 55.00 (±8.50) to 60.40 (±7.60) ($t = 2.303$, $p = 0.0468$) and Physical Functioning improved from 40.80 (±8.50) to 45.90 (±7.90) ($t = 2.649$, $p = 0.0265$). Likewise, Role Limitation due to Physical Health increased from 22.50 (±17.80) to 30.20 (±15.00) ($t = 2.790$, $p = 0.0211$). Although higher mean scores were also observed for Burden of Kidney Disease, Work Status, Cognitive Function, Social Support and Emotional Well-being, these changes were not statistically significant ($p>0.05$). The total KDQOL score improved modestly from 48.20 (±14.80) to 54.30 (±13.10) ($t = 1.453$, $p = 0.1802$), possibly due to sample size ($n = 10$). Overall, MBSR demonstrated beneficial effects on physical and psychological QoL domains, particularly symptom relief, functional capacity and sleep quality among hemodialysis patients.

The mean scores for five domains are shown in Figure 1. When compared to the control group, the intervention group steadily developed mean scores in each domain, indicating better mental and physical health as well as a lower burden of disease after the intervention.

The post-test correlations between several clinical and demographic characteristics and different aspects of the 10 hemodialysis patients who took part in the study are shown in Table 2. Physical and mental health were the two main categories into which the QoL domains were divided. To ascertain associations with variables like age, education, gender, comorbid conditions, dialysate duration and frequency of sessions, the corresponding p-values for each domain were examined.

Revenue and the regularity of dialysis were the two physical health components that showed the strongest relationships with bodily functioning. Diabetes mellitus and educational attainment were significantly linked to role limitations brought on by physical health. Age and the frequency of dialysis were significantly correlated with pain scores. Furthermore, there were significant correlations between general health and diabetes mellitus, age and the frequency of dialysis. The length of dialysis, education and frequency of dialysis sessions were all associated with fatigue. These results imply that clinical and sociodemographic factors significantly impact the psychological and bodily aspects of QoL in HD patients.

For the mental health components, none of the variables showed strong significance, though some patterns were noted. Social function was potentially related to Dialysis frequency appeared to have a minor impact on mental health, age and diabetes mellitus, but this relationship was not statistically significant.

Table 1: Comparison of Pretest and Posttest KDQOL-SF™ Scores on QOL among Patients Undergoing HD of Intervention Group

Item	Pretest Mean±SD	Posttest Mean±SD	t-value	p-value
Symptoms and problems	41.20±8.10	48.10±7.90	4.352	0.0018*
Effects of kidney disease on daily life	42.50±9.00	47.80±8.60	2.607	0.0284*
Burden of kidney disease	38.90±12.50	45.20±11.70	1.562	0.1526
Work status	48.00±23.00	55.50±21.80	1.604	0.1432
Cognitive function	48.90±11.00	52.60±10.30	1.605	0.1429
Quality of social interaction	54.00±9.00	58.30±8.20	0.941	0.3714
Sleep	55.00±8.50	60.40±7.60	2.303	0.0468*
Social support	78.50±20.00	85.90±18.40	0.807	0.4407
Dialysis staff encouragement	83.00±15.00	88.50±13.90	0.413	0.6893
PS	54.10±41.80	60.50±39.20	-0.232	0.8221
Physical functioning	40.80±8.50	45.90±7.90	2.649	0.0265*
Role limitation caused by PH problems	22.50±17.80	30.20±15.00	2.790	0.0211*
Pain	53.00±11.00	58.00±10.40	1.565	0.1521
Social functioning	45.50±12.80	52.70±11.60	0.196	0.8490
Emotional wellbeing	47.00±15.10	53.10±14.30	1.000	0.3434
Role limitation caused by emotional health	26.40±23.90	33.50±22.60	0.036	0.9723
Energy/fatigue	42.00±10.00	48.20±9.40	0.806	0.4411
General health	50.50±8.00	55.60±7.10	0.790	0.4501
Total score	48.20±14.80	54.30±13.10	1.453	0.1802

*$p<0.05$ was considered statistically significant

Table 2: Association between KDQOL Components with Selected Demographic and Clinical Variables of Experimental Group

Physical/Mental Component	Age	Education	Gender	Comorbidties-Hypertension	Duration of dialysis	Frequency of dialysis
Physical functioning	0.05	0.8	0.04	0.83	0.45	0.03
Role physical	0.7	0.01	0.54	0.04	0.25	0.29
Pain	0.03	0.91	0.82	0.51	0.37	0.05
General health	0.01	0.83	0.33	0.02	0.67	0.03
Fatigue	0.05	0.03	0.34	0.67	0.04	0.64
Role-emotional	0.4	0.65	0.63	0.93	0.49	0.36
Emotional well	0.82	0.72	0.63	0.34	0.83	0.59
Social function	0.04	0.45	0.43	0.67	0.24	0.21
Vitality	0.26	0.85	0.36	0.21	0.75	0.38
Mental health	0.67	0.46	0.56	0.45	0.34	0.13

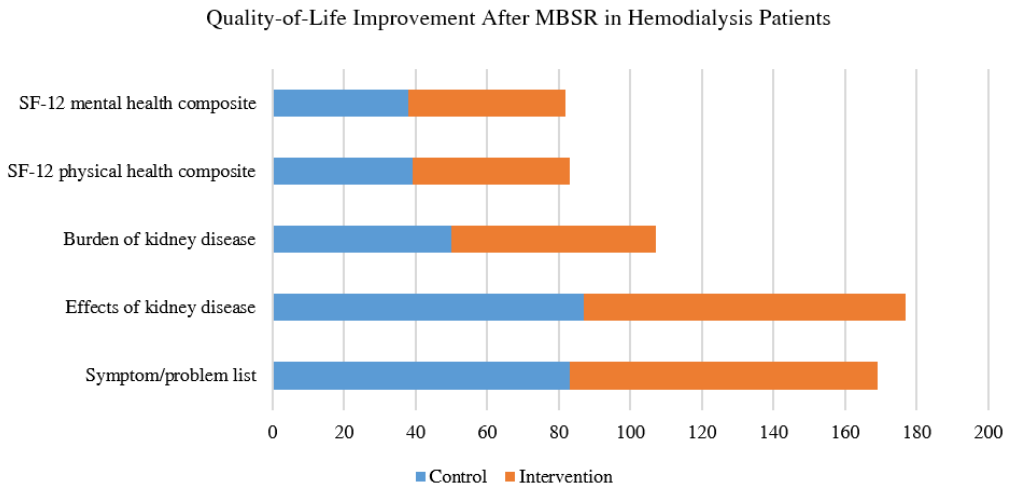

Figure 1: Quality-of-Life Scores in Experimental and Control Groups Following MBSR Intervention

DISCUSSION

Patients undergoing hemodialysis experience continuous physical, emotional and social stressors that adversely affect their overall QoL. The present pilot study findings provide preliminary evidence that structured mindfulness practice can positively influence several QoL dimensions among individuals with Chronic Kidney Disease (CKD) on maintenance hemodialysis. Participants who received the MBSR intervention demonstrated notable improvements in symptom burden, physical functioning, sleep quality and role performance related to physical health. These outcomes are consistent with a growing body of literature supporting the therapeutic potential of mindfulness-based approaches for chronic illness management

Li *et al.* [17] reported significant improvements in SF-36 scores and overall QoL following MBSR among CKD patients. Similarly, Alhawatmeh *et al.* [18] found that mindfulness practices improved emotional regulation, reduced perceived stress and enhanced QoL in hemodialysis patients. Systematic reviews further corroborate these findings. Syamsiah *et al.* [19] also confirmed that mindfulness-based interventions positively influence both psychological and physiological health outcomes among dialysis populations.

Razzera *et al.* [20] highlighted that mindfulness programs are safe and effective for improving the well-being of hemodialysis patients, while Al-Ghabeesh *et al.* [21] demonstrated mindfulness training significantly reduced mental distress in similar groups. Garel *et al.* [22] and Hernández *et al.* [23] further noted improvements in mental health, symptom perception and coping ability after mindfulness interventions, supporting the discoveries of the current study.

In this pilot study, correlations identified between demographic/clinical variables and QoL components i.e., Age, educational status, comorbidities and dialysis frequency have been repeatedly shown to influence functional capacity and perceived health in hemodialysis populations. These results are consistent with the work of El Kass *et al.* [24], who found that sociodemographic and treatment-related factors significantly influenced QoL in hemodialysis patients.

In General, the findings highlight the multidimensional benefits of integrating MBSR into routine dialysis care. Regular mindfulness practice may help patients adapt to treatment demands, alleviate psychological distress and enhance their capacity to maintain physical and emotional balance, ultimately leading to improved quality of life.

CONCLUSION

In comparison to standard care, this pilot study showed that MBSR program yielded measurable improvements in several domains of QoL among patients receiving maintenance hemodialysis. These findings highlight the value of incorporating structured mindfulness practices as a supportive, non-pharmacological strategy within dialysis care. Large-scale randomized controlled trials are required in the future to authenticate these findings and evaluate the longstanding health effects on individuals with chronic kidney disease.

Conflicts of Interest

The authors declare that there are no conflicts of interest associated with this research.

Statement of Funding

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Contributions of the Authors

C.C. was responsible for conceptualization, data collection, statistical analysis, interpretation of findings and preparation of the initial manuscript draft. P.T. and N.S. contributed to project supervision, critical review and manuscript refinement.

Data Availability Statement

The datasets generated and analysed in this study are available from the corresponding author upon reasonable request. Data cannot be made publicly accessible at this time due to ongoing related research activities but may be shared for academic purposes with appropriate institutional approval.

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