Original Article

DOI: 10.7860/JCDR/2026/84492.23438

Effect of a Mind-Body-Spirit Intervention on Stress and Cardiovascular Parameters among Patients Undergoing Haemodialysis: A Pilot Study

Nursing Section

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ABSTRACT

Introduction: Chronic Kidney Disease (CKD) affects more than 800 million people worldwide. Patients undergoing haemodialysis often experience increased stress and compromised cardiovascular health, which may affect treatment outcomes. Addressing these psychosocial and physiological challenges is therefore essential for improving patient well-being.

Aim: To determine the effect of a Mind-Body-Spirit intervention on stress and cardiovascular parameters among patients undergoing haemodialysis.

Materials and Methods: A quantitative pilot, quasi-experimental non equivalent pre-test–post-test control group design was used in the dialysis units of Yenepoya Medical College Hospital and Father Muller Medical College Hospital, Mangaluru, Karnataka, India, from November 30, 2023, to April 30, 2024. Thirty patients were purposively selected and allocated to an intervention group (n=15) and a control group (n=15). Data were collected using a demographic questionnaire and the Perceived Stress Scale (PSS); Blood Pressure (BP) and heart rate were measured using a calibrated digital BP monitor. The intervention group received the Mind-Body-Spirit intervention three times weekly for 12 weeks, while the control group received standard care. Demographic variables were summarised using frequency and percentage. Changes in stress, Blood Pressure (BP) and heart rate across time and between groups were analysed using two-way repeated measures Analysis of Variance (ANOVA) ($p<0.05$).

Results: The total study sample included 30 participants. Most were aged 35-45 years, comprising 16 (53.3%), male 23 (76.7%), and unemployed 16 (53.3%). Most participants had undergone haemodialysis for 1-5 years 18 (60.0 %) and hypertension was the most common comorbidity 18 (60.0%). Baseline demographic and clinical variables were comparable between groups ($p>0.05$). The intervention group showed significant reductions in stress ($p=0.026$), systolic BP ($p=0.015$), diastolic BP ($p=0.003$), and heart rate ($p=0.028$).

Conclusion: The Mind-Body-Spirit intervention significantly reduced stress and improved cardiovascular parameters among patients undergoing haemodialysis. Integrating such interventions into CKD care may enhance psychological resilience and cardiovascular health.

Keywords: Chronic kidney disease, Mindfulness, Music, Prayer, Relaxation therapy

INTRODUCTION

The CKD is a progressive, life-altering condition affecting more than 800 million people globally, accounting for over 10% of the world's population [1]. CKD is projected to become the fifth leading cause of years of life lost globally by 2040 [2]. In India, the burden is particularly concerning: deaths from CKD nearly doubled from 0.59 million in 1990 to nearly 1.2 million in 2016, and by 2018, an estimated 175,000 individuals were on chronic dialysis, reflecting a prevalence of 129 per million population [3]. Diabetes and hypertension are the leading causes of CKD, with a markedly increased risk; one in three individuals with diabetes and one in five with hypertension develop kidney disease [4]. Other risk factors include cardiovascular disease, smoking, obesity, advancing age, and a family history of kidney failure [5].

The physical toll of CKD is compounded by its psychological, social, and economic consequences. For patients on haemodialysis, the treatment regimen often leads to loss of independence, financial strain, and disruption of employment, social relationships, and overall quality of life. These challenges are associated with increased stress and poorer cardiovascular outcomes, making both stress management and cardiovascular stability crucial components of healthcare management [6].

Complementary and Alternative Medicine (CAM) is gaining attention as a means of addressing chronic illness through a more holistic approach. While CAM use is increasing globally, its integration into biomedical settings remains limited, particularly within India [7]. Existing evidence highlights the benefits of various individual approaches: mindfulness-based interventions can reduce distress and improve psychological well-being in patients undergoing haemodialysis [8]; progressive muscle relaxation and music therapy have shown positive effects on stress and vital signs; and prayer, as a spiritual practice, has been linked to reduced anxiety and enhanced coping among critically ill patients. These modalities share a focus on addressing the mind, body, and spirit together, offering a broader therapeutic scope than conventional treatment alone [9].

Prayer and positive affirmations, in particular, play a unique role by fostering spiritual coping, offering hope, and assisting patients in finding meaning beyond their illness journey [10-12]. Spirituality fosters peace of mind, self-fulfilment, and relief from suffering; when integrated into care, it enhances compassion and contributes to a more holistic healthcare setting [13,14].

Despite growing evidence, previous studies [15-18] have largely examined interventions such as music, mindfulness, progressive muscle relaxation, and prayer in isolation. To date, no study has evaluated these modalities as a single integrated intervention among patients undergoing haemodialysis. Therefore, the present study implemented a comprehensive Mind-Body-Spirit intervention combining music therapy, mindfulness, progressive muscle

relaxation, and prayer to evaluate its effects on stress, blood pressure, and heart rate in individuals undergoing haemodialysis. This integrated approach may offer a holistic strategy to improve both psychological well-being and cardiovascular stability among haemodialysis patients.

MATERIALS AND METHODS

A quantitative pilot quasi-experimental study with a non equivalent control group and pre-test-post-test design was conducted in the dialysis units of two tertiary care hospitals in Mangaluru, Karnataka, India, between November 30, 2023, and April 30, 2024. The study participants comprised patients undergoing haemodialysis at Father Muller Medical College Hospital (intervention group) and Yenepoya Medical College Hospital (control group). Ethical approval was sought from the Institutional Research Committee and Institutional Ethics Committees of both institutions. (YEC-1, protocol number YEC-/2023/086 dated 10.06.2023, and FMIEC/CCM/570/2023 dated 10.10.2023).Administrative permission from hospital authorities was also obtained. The purpose of the study was explained and informed consent was obtained from the study participants, who were assured of the confidentiality of their responses

Sample size calculation: The sample size was calculated from a previous study [19] where $X^1 \pm \sigma 1 = 2.41 \pm 3.08$ and $X^2 \pm \sigma 2 = 1.66 \pm 2.1$, using the formula

$n=2(Z\alpha+Z\beta)^2 \sigma 2/(X1-X2)^2$ where $Z\alpha=1.96$ at 95% confidence interval, $Z\beta=0.841$ for 80% power. The calculated sample size was n=9 per group; however, the researcher selected 15 participants per group to increase statistical reliability considering small-sample uncertainty. A purposive sampling technique was employed to recruit participants who met the inclusion criteria.

Inclusion criteria: Adults aged 35-65 years undergoing haemodialysis for at least three months (three sessions per week, each lasting 3-4 hours) were included in the study. Both male and female patients were eligible, with or without co-morbidities such as Diabetes (DM) and Hypertension (HTN).

Exclusion criteria: Patients following alternative therapies or currently engaged in meditation more than twice a week during the past month, those with hearing impairment, those diagnosed with dementia, or other mental disorders, patients who were haemodynamically unstable during dialysis, and those unable to understand Kannada or English.

Study Procedure

Data were collected using the following instruments:

- A demographic proforma that included age, gender, occupation, duration of illness, co-morbidities, and medications. Stress levels were evaluated using the PSS-10.
- Scores were categorised as: 0-13 (low stress), 14-26 (moderate stress), and 27-40 (high stress) [20].
- Physiological measures, such as blood pressure and heart rate, were measured using a calibrated digital blood pressure monitor (Dr. Morepen Equinox EQ 308 CTH).

The data collection procedure began with a pre-test conducted during the last dialysis cycle prior to the intervention for both groups. Stress was assessed using PSS, while blood pressure and heart rate were measured using a digital BP apparatus in the unit waiting area which took approximately 15 minutes to complete. Participants in the intervention group received a 45-minute audio session via headphones, commencing 30 minutes after dialysis initiation, three times weekly for 12 weeks. The audio session included music, mindfulness practices, progressive muscle relaxation, and prayer. Participants were monitored throughout for adverse symptoms such as dizziness, headache, palpitations, nausea, anxiety, or exhaustion. The control group received routine care which included providing comfort, a warm blanket when required, monitoring vital signs and weight, patient education, and psychological support.

Post-tests were conducted at the end of the first, second, and third month of the intervention for both groups.

STATISTICAL ANALYSIS

The Statistical Package for the Social Sciences (SPSS) version 27.0 was employed for the analysis of data. Demographic variables were analysed using frequency and percentage. Comparisons of stress, blood pressure and heart rate between groups across repeated time points were analysed using a mixed-design ANOVA {group (between-subjects) × time (within-subjects) repeated-measures ANOVA}.

RESULTS

A total of 30 patients participated in the study (intervention group n=15; control group n=15). Most participants were aged 35-45 years 16 (53.3%), male 23 (76.7%), and unemployed 16 (53.3%). The majority had been undergoing haemodialysis for 1-5 years 18 (60.0 %), and hypertension was the most common comorbidity 18 (60.0%). Baseline demographic and clinical variables were comparable between groups (p>0.05) [Table/Fig-1]. stress scores significantly declined within the intervention group across repeated measurements while stress levels in the control group increased over time are shown in [Table/Fig-2]. The between-group effect size for stress reduction was large ($\eta^2=0.164$). A significant time-related change in Systolic Blood Pressure (SBP) within the intervention group, characterised by an initial increase followed by a sustained reduction across subsequent follow-ups, whereas the control group showed a gradual decrease over time is demonstrated in [Table/Fig-3]. Diastolic Blood Pressure (DBP) decreased slightly but significantly within the intervention group [Table/Fig-4]. Similarly, heart rate demonstrated a significant decline within the intervention group and between groups, whereas the control group showed fluctuations as presented in [Table/Fig-5].

Variables	Intervention group n (%)	Control group n (%)	p-value
Age (years)			
35-45	08 (53.3)	08 (53.3)	1.00
46-55	05 (33.3)	05 (33.3)	
56-65	02 (13.3)	02 (13.3)	
Gender			
Male	11 (73.3)	12 (80.0)	0.66
Female	04 (26.7)	03 (20.0)	
Occupation			
Employed	08 (53.3)	05 (33.3)	0.76
Unemployed	06 (40.0)	10 (66.7)	
Retired	01 (06.7)	00 (0.0)	
Duration of illness (years)			
01-05	08 (53.3)	10 (66.7)	0.86
06-10	05 (33.3)	03 (20.0)	
11-15	01 (06.7)	01 (06.7)	
>15	01 (06.7)	01 (06.7)	
Associated co-morbidities			
None	00 (0.0)	01 (06.7)	0.78
Diabetes mellitus	01 (06.7)	03 (20.0)	
Hypertension	11 (73.3)	07 (46.6)	
Both (DM and HTN)	03 (20.0)	03 (20.0)	
Other (Cardiac)	00 (0.0)	01 (06.7)	

Medications			
None	0	01 (06.7)	0.67
OHA/Insulin	01 (06.7)	03 (20.0)	
Anti-hypertensive	11 (73.3)	07 (46.6)	
Both	03 (20.0)	03 (20.0)	
Any others (Cardiac)	0	01 (06.7)	

[Table/Fig-1]: Distribution of study subjects according to demographic characteristics (N=15+15=30).
Fisher's-exact test was used to compare categorical variables between groups due to small cell frequencies. p>0.05 indicates no statistically significant difference between groups. DM: Diabetes mellitus; HTN: Hypertension; OHA: Oral hypoglycaemic agents.

Study group	Time point	Mean±SD	MD±SD	Within group p-value	Between group p-value
Intervention	Pre-test	22.93±6.9	8.67±4.32	0.004*	0.026*
	Post-test 1	20.13±6.7			
	Post-test 2	17.07±6.5			
	Post-test 3	14.27±5.6			
Control	Pre-test	22.27±7.0	- 3.73±6.03	0.093	
	Post-test 1	22.27±6.7			
	Post-test 2	24.73±5.7			
	Post-test 3	26.00±6.4			

[Table/Fig-2]: Comparison of perceived stress at different time points within intervention group and between the groups. (n=15+15).
Statistical Test: Two-way repeated measures ANOVA with Bonferroni post-hoc correction. Level of Significance: *p<0.05 statistically significant. η^2 Interpretation: <0.01 = small; 0.01–0.06 = moderate; >0.14 = large effect. MD±SD: Mean difference between Pre-test and Post-test 3. Within-group comparison F (3,81) = 4.875, p=0.004, η^2=0.148, Between-group comparison: F (1,28) = 5.500, p=0.026, η^2=0.164,

Study group	Time point	Mean±SD	MD±SD	Within group p-value	Between group p-value
Intervention	Pre-test	144.67±31.37	15.34±27.17	0.024*	0.015*
	Post-test 1	153.33±27.43			
	Post-test 2	132.00±23.96			
	Post-test 3	129.33±15.80			
Control	Pre-test	167.73±20.17	15.73±26.72	0.971	
	Post-test 1	163.07±24.71			
	Post-test 2	161.33±27.74			
	Post-test 3	152.00±30.28			

[Table/Fig-3]: Comparison of Systolic Blood Pressure (SBP) at different time points within intervention group and between the groups (N=15+15=30).
Statistical Test: Two-way repeated measures ANOVA with Bonferroni post-hoc correction. Level of Significance: *p<0.05 statistically significant. η^2 Interpretation: <0.01 = small; 0.01–0.06 = moderate; >0.14 = large effect. MD±SD: Mean difference between Pre-test and Post-test 3. Within-group comparison F (3,81) =2.368, p=0.024, η^2=0.078, Between-group comparison: F (1,28) = 6.654, p=0.015. η^2=0.192.

Study group	Time point	Mean±SD	MD±SD	Within group p-value	Between group p-value
Intervention	Pre-test	82.00±9.41	2.00±9.34	0.047*	0.003*
	Post-test 1	79.33±9.61			
	Post-test 2	80.67±8.84			
	Post-test 3	80.00±9.26			
Control	Pre-test	97.27±17.49	7.94±15.23	0.782	
	Post-test 1	96.60±17.98			
	Post-test 2	93.33±12.91			
	Post-test 3	89.33±10.33			

[Table/Fig-4]: Comparison of Diastolic Blood Pressure (DBP) at different time points within intervention and between the groups (n=15+15).
Statistical Test: Two-way repeated measures ANOVA with Bonferroni post-hoc correction. Level of Significance: * p<0.05 statistically significant. η^2 Interpretation: <0.01 = small; 0.01–0.06 = moderate; >0.14 = large effect. MD±SD: Mean difference between Pre-test and Post-test 3. Within-group comparison F (3,81) = 2.08, p=0.047, η^2 =0.025 Between-group comparison: F (1,28) = 10.52, p=0.003, η^2 =0.273.

Study Group	Time point	Mean±SD	MD±SD	Within group p-value	Between group p-value
Intervention	Pre-test	77.33±8.87	1.86±7.87	–	–
	Post-test 1	76.67±6.31		0.012*	0.028*
	Post-test 2	73.20±4.39		–	–
	Post-test 3	75.47±6.12		–	–
Control	Pre-test	79.00±7.91	3.80±7.15	–	–
	Post-test 1	78.73±8.22		0.306	–
	Post-test 2	83.47±7.15		–	–
	Post-test 3	75.20±5.99		–	–

[Table/Fig-5]: Comparison of heart rate at different time points within intervention and between the groups (n=15+15).
Statistical Test: Two-way repeated measures ANOVA with Bonferroni post-hoc correction. Level of Significance: * p<0.05 statistically significant. η^2 Interpretation: <0.01 = small; 0.01–0.06 = moderate; >0.14 = large effect. MD±SD: Mean difference between Pre-test and Post-test 3. Within-group comparison F (3,81) = 2.08, p=0.012, η^2 =0.087, Between-group comparison: F (1,28) = 5.39, p=0.028, η^2 =0.161.

DISCUSSION

The present study demonstrated that the Mind-Body-Spirit intervention effectively reduced stress levels and contributed to the stabilisation of blood pressure and heart rate among patients undergoing haemodialysis. A substantial reduction in stress was observed over time between the groups (p=0.026), while systolic (p=0.015) and DBP (p=0.003) showed significant declines. Heart rate also exhibited a modest but statistically significant reduction (p=0.028). These findings indicate that the intervention may serve as an effective non pharmacological strategy for alleviating stress and supporting cardiovascular regulation in patients undergoing haemodialysis.

Effectiveness of MBS intervention on stress: The MBS intervention group demonstrated a sustained and statistically significant reduction in perceived stress scores across all post-intervention assessments, decreasing from 20.13±6.7 at post-test 1 to 17.07±6.5 at post-test 2 and further to 14.27±5.6 at post-test 3, as confirmed by repeated measures ANOVA (p<0.05). Similar findings were reported by Ba X et al., that music therapy has positive impact on psychological health in heamodialysis patients, particularly stress reduction [21]. Nguyen KT et al., found passive music listening combined with progressive muscle relaxation lowered stress, anxiety, and depression while enhancing quality of life in women undergoing chemotherapy for breast and gynaecological cancers [22]. Hudiyawati D et al., observed significant pre-post reductions in depression, anxiety, and stress scores within intervention groups [23], and Alhawatmeh H et al., reported that mindfulness meditation effectively reduces perceived stress [24]. Similarly, a meta-analysis by Scott-Sheldon et al., confirmed that mindfulness-based interventions significantly reduce stress, anxiety, depression, and blood pressure [25]. Muhammad Khir S et al., documented reductions in depression, anxiety, and stress with progressive muscle relaxation [26]. The present study's integration of prayer, music, and progressive relaxation in a combined format has produced synergistic benefits.

Effectiveness of MBS Interventions on cardiovascular parameters: MBS sessions yielded statistically significant reductions in SBP, DBP, and heart rate between the groups across all post-test assessments (p<0.05). Within-group repeated-measures ANOVA demonstrated a progressive decline across haemodialysis cycles. These physiological improvements suggest the effectiveness of MBS. Wu Y et al., reported a significant decline in SBP, DBP, mean arterial pressure, and pulse rate in HD patients receiving mindfulness interventions [27]. These findings are consistent with previous evidence, including Darki C et al., who demonstrated improvements in cardiovascular parameters with classical music exposure [28] and the meta-analysis by Loomba RS et al., which reported significant reductions in SBP, DBP, and heart rate following music interventions [29]. Razzera BN et al., reported improvements

in physical measures - including blood pressure and heart rate - and psychological symptoms, including anxiety, in individuals undergoing mindfulness-based interventions [30]. Kusnanto K et al., extended this to HD, showing reduced anxiety, blood pressure, and pulse rate [31]. Mind-Body-Spirit intervention may serve as a non pharmacological complement to standard haemodialysis care.

Limitation(s)

The sample size in the present study was relatively small, given it was designed as a pilot investigation. External factors such as dietary habits, home medication regimens, life stressors, and the external support systems available to participants during the study period were beyond the investigator's control and may have influenced the outcomes. Furthermore, cultural beliefs and spiritual practices might have contributed to variations in the study results. These factors highlight the need for larger-scale studies to better control for potential confounding variables and to further validate the findings.

CONCLUSION(S)

The present study demonstrates that a structured Mind–Body–Spirit intervention can significantly improve psychological well-being and promote cardiovascular stability among patients undergoing haemodialysis. Sustained reductions in stress, systolic and DBP, and heart rate across follow-up assessments indicate meaningful clinical benefits. The integration of multiple non pharmacological modalities within a structured framework offers a feasible, low-cost, and culturally adaptable approach that may be incorporated into routine haemodialysis care to support holistic patient outcomes.

Conflict of Interest: The authors declare that this study received an institutional research grant from Father Muller Charitable institutions. There is no financial or personal conflict of interest.

Acknowledgement

We acknowledge hospital authorities, staff of dialysis units, and all the participants of the study for the cooperation extended throughout the data collection period.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Oct 09, 2025
- Manual Googling: Mar 14, 2026
- iThenticate Software: Mar 17, 2026 (4%)

ETYMOLOGY: Author Origin

EMENDATIONS: 7

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Sep 20, 2025**
Date of Peer Review: **Jan 15, 2026**
Date of Acceptance: **Mar 19, 2026**
Date of Publishing: **May 01, 2026**