



Original Article

## Effect of intradialytic mindfulness-based meditation on spiritual well-being and anxiety in hemodialysis patients: a randomized controlled trial

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### A B S T R A C T

**Background:** Patients undergoing hemodialysis frequently experience anxiety and reduced spiritual well-being; however, few studies have simultaneously addressed these outcomes using structured mindfulness-based interventions delivered during dialysis sessions.

**Purpose:** To evaluate the effectiveness of intradialytic mindfulness-based meditation in reducing anxiety and improving spiritual well-being among patients undergoing hemodialysis.

**Methods:** A randomized controlled trial was conducted involving 58 patients undergoing routine hemodialysis, randomly assigned to an intervention group (n = 29) or a control group (n = 29). The intervention group received a 2.5-hour mindfulness training session followed by audio-guided mindfulness practice during the first 15 minutes of hemodialysis sessions, twice weekly for four weeks. The control group rested quietly without guided practice. Anxiety was measured using the Zung Self-Rating Anxiety Scale (ZSAS), and spiritual well-being was assessed using the Spiritual Well-Being Scale (SWBS). Data were analyzed using paired and independent t-tests.

**Results:** The intervention group showed a significant increase in spiritual well-being scores (mean change +6.07) compared with the control group (+1.21) (p = 0.021). Anxiety scores significantly decreased in the intervention group (-11.76) compared with minimal change in the control group (+0.69) (p = 0.001). The between-group effect sizes were large (SWB: d = 1.36; anxiety: d = -1.88).

**Conclusion:** Intradialytic mindfulness-based meditation is a feasible and effective complementary intervention that improves spiritual well-being and reduces anxiety among patients undergoing hemodialysis.

### INTRODUCTION

Chronic kidney disease (CKD) affects approximately 673.7 million people worldwide and is projected to become one of the leading causes of death by 2050.<sup>1,2</sup> As the number of patients requiring long-term dialysis continues to increase, attention has gradually shifted from purely biomedical management toward more holistic approaches that also address patients' psychological and spiritual needs.

Patients undergoing hemodialysis often experience substantial emotional burden, including anxiety, spiritual distress, and existential uncertainty related to lifelong treatment dependence, lifestyle restrictions, and loss of autonomy.<sup>3-5</sup> Despite these challenges, dialysis care

remains largely focused on physiological parameters, while psychospiritual needs receive limited attention.<sup>6</sup> Previous studies indicate that nearly half of patients undergoing hemodialysis experience moderate to severe anxiety, which may negatively affect treatment adherence, coping, and quality of life.<sup>7</sup>

Spiritual well-being (SWB) is increasingly recognized as a protective factor that enhances psychological resilience, supports coping with chronic illness, and improves quality of life.<sup>8-10</sup> Mindfulness-based meditation has emerged as a promising non-pharmacological approach to promote emotional regulation and psychological adaptation in patients with chronic conditions. Structured audio-guided mindfulness practices, incorporating breath awareness and acceptance, are particularly advantageous because they

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are low-cost, easily delivered, and adaptable to clinical settings such as dialysis units.<sup>11,12</sup>

However, evidence regarding mindfulness-based interventions in hemodialysis populations remains limited. Existing studies often involve small samples, focus primarily on psychological outcomes, and rarely address spiritual well-being.<sup>13,14</sup> Moreover, randomized controlled trials evaluating interventions that simultaneously target anxiety and spiritual well-being in this population are still scarce.

Therefore, this study aimed to evaluate the effectiveness of intradialytic mindfulness-based meditation in improving spiritual well-being and reducing anxiety among patients undergoing hemodialysis. By addressing this gap, the present randomized controlled trial provides novel evidence on the feasibility and clinical value of a structured mindfulness-based psychospiritual intervention that can be integrated into routine dialysis care.

## METHOD

### Study Design

This study employed a randomized controlled trial (RCT) with two parallel groups (intervention and control) to evaluate the effectiveness of intradialytic mindfulness-based meditation. A pretest–posttest design was used to assess changes before and after the intervention. The study was single-blind, with outcome assessments conducted without knowledge of group allocation. Outcomes were measured using standardized self-reported questionnaires at baseline and post-intervention.<sup>15</sup>

### Settings and Participants

The study was conducted in the Hemodialysis Unit of Universitas Sebelas Maret Hospital, Central Java, Indonesia, between June and July 2025. Participants were adult patients undergoing routine hemodialysis. Randomization was performed using a computer-generated sequence (Microsoft Excel version 16). Allocation concealment was ensured using sequentially numbered, sealed, opaque envelopes prepared by an independent researcher.

Sample size was calculated using G\*Power (version 3.1.9) with a medium effect size ( $d = 0.5$ ),  $\alpha = 0.05$ , and 80% power, yielding a minimum of 52 participants. After accounting for 10% attrition, 58 participants were enrolled and randomly assigned to the intervention ( $n = 29$ ) or control group ( $n = 29$ ).

Inclusion criteria were CKD stage V, undergoing hemodialysis for  $\geq 3$  months, age  $\geq 18$  years, ability to communicate, and willingness to provide informed consent. Exclusion criteria included severe cognitive impairment, psychiatric disorders, or conditions interfering with participation.

## The Variable, Instrument, and Measurement

Primary outcomes were spiritual well-being (SWB) and anxiety. Demographic data (age, sex, education, duration of hemodialysis) were collected using a structured questionnaire. SWB was measured using the Indonesian version of the Spiritual Well-Being Scale, which demonstrated good validity (item–total correlation  $> 0.30$ ) and reliability (Cronbach's  $\alpha = 0.89$ ). Scores ranged from low (20–40), moderate (41–99), to high (100–120).<sup>16</sup>

Anxiety was assessed using the Indonesian version of the Zung Self-Rating Anxiety Scale (ZSAS), with acceptable validity ( $\geq 0.30$ ) and reliability (Cronbach's  $\alpha = 0.85$ ). Scores were categorized as normal (20–44), mild–moderate (45–59), severe (60–74), and extreme ( $\geq 75$ ).<sup>17</sup> All participants completed both instruments at baseline and five weeks after the intervention.

## Experimental Procedure

Participants were randomly assigned to intervention or control groups. The intervention group attended a 2.5-hour face-to-face mindfulness training session led by a certified practitioner. Participants then practiced intradialytic mindfulness meditation during the first 15 minutes of hemodialysis sessions, twice weekly for four weeks, using standardized audio guidance. The session included breathing awareness (5 minutes), body scan (7 minutes), and closing reflection (3 minutes). The control group followed the same dialysis schedule but rested quietly without guided mindfulness practice. Adherence was monitored through attendance records.

## Data Analysis

Data were analyzed using SPSS version 27. Normality and homogeneity were assessed using Kolmogorov–Smirnov and Levene's tests. Within-group changes were analyzed using paired t-tests, and between-group differences using independent t-tests. ANCOVA was conducted to compare post-intervention outcomes while controlling for baseline values. Effect sizes were calculated using Cohen's  $d$  and interpreted as small (0.2), medium (0.5), and large (0.8). Statistical significance was set at  $p < 0.05$  with a 95% confidence interval.

## Ethical Consideration

This study was approved by the Research Ethics Committee of Universitas Sebelas Maret Hospital (No. 031/UN27.46/TA.04.19/KEP/EC/2025; Protocol ID 008/03/2025) and registered at ClinicalTrials.gov (Identifier: NCT07378748). Written informed consent was obtained from all participants, and data confidentiality was maintained throughout the study.

## RESULTS

### Participant Characteristics

A total of 58 participants were enrolled and randomly allocated to the intervention ( $n = 29$ ) and control ( $n = 29$ ) groups. All participants completed the study and were

included in the final analysis. Baseline characteristics were comparable between groups (Table 1). No significant differences were observed in gender distribution, age, education level, or duration of hemodialysis ( $p > 0.05$ ), indicating homogeneity between groups at baseline.

**Table 1.** Baseline Characteristics of Participants ( $n = 58$ )

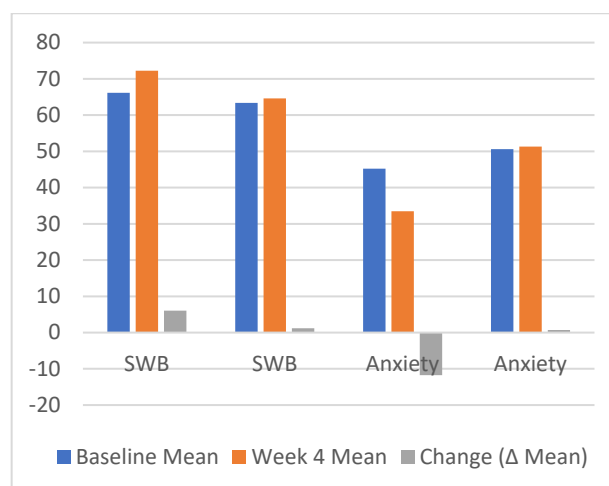
Characteristic	Intervention	Control	<i>p</i> -value
<b>Gender</b>			0.559 <sup>a</sup>
Male	13 (44.8%)	16 (55.2%)	
Female	16 (55.2%)	13 (44.8%)	
<b>Age (years)</b>			0.321 <sup>b</sup>
26–35	4 (13.8%)	1 (3.4%)	
36–45	5 (17.2%)	3 (10.3%)	
46–55	10 (34.5%)	9 (31.0%)	
56–65	9 (31.0%)	11 (37.9%)	
>65	1 (3.4%)	5 (17.2%)	
<b>Education Level</b>			0.605 <sup>b</sup>
Elementary school	6 (20.7%)	5 (17.2%)	
Junior high school	5 (17.2%)	3 (10.3%)	
Senior high school	12 (41.4%)	13 (44.8%)	
Diploma/Bachelor	5 (17.2%)	8 (27.6%)	
Master's degree	1 (3.4%)	0 (0.0%)	
<b>Duration of Hemodialysis</b>			0.669 <sup>b</sup>
<1 year	1 (3.4%)	3 (10.3%)	
1–2 years	16 (55.2%)	15 (51.7%)	
3–4 years	6 (20.7%)	4 (13.8%)	
>5 years	6 (20.7%)	7 (24.1%)	

Note: <sup>a</sup>Chi-square continuity correction; <sup>b</sup> Likelihood ratio

### Effects of the Intervention on Spiritual Well-Being and Anxiety

Changes in spiritual well-being (SWB) and anxiety scores from baseline to week 4 are presented in Table 2 and Figure 1. In the intervention group, SWB scores increased significantly from  $66.17 \pm 8.42$  at baseline to  $72.24 \pm 7.95$  after the intervention (mean change  $+6.07$ ;  $p = 0.003$ ). In contrast, the control group showed only a minimal increase (from  $65.86 \pm 7.91$  to  $67.07 \pm 7.88$ ; mean change  $+1.21$ ). Between-group comparison showed a significant difference favoring the intervention group ( $p = 0.021$ ), with a large effect size (Cohen's  $d = 1.36$ ).

Anxiety scores in the intervention group decreased significantly from  $49.83 \pm 6.15$  at baseline to  $38.07 \pm 5.92$  after the intervention (mean change  $-11.76$ ;  $p < 0.001$ ). In the control group, anxiety scores showed minimal change (from  $48.90 \pm 5.88$  to  $49.59 \pm 5.76$ ; mean change  $+0.69$ ). Between-group analysis confirmed a significantly greater reduction in anxiety in the intervention group ( $p = 0.001$ ), with a very large effect size (Cohen's  $d = -1.88$ ). Figure 1 illustrates these changes, showing a clear increase in SWB and a marked reduction in anxiety in the intervention group compared with minimal changes in the control group.



**Figure 1.** Changes in SWB and Anxiety Scores between Intervention and Control Groups.

## DISCUSSION

This randomized controlled trial demonstrated that intradialytic mindfulness-based meditation significantly improved spiritual well-being among patients undergoing hemodialysis. Participants receiving the intervention showed greater improvements compared with the control group, with a large effect size (Cohen's  $d = 1.36$ ), indicating clinically meaningful psychospiritual benefits.

Comparison with previous randomized controlled trials highlights the magnitude of these effects. Rej et al. (2017) reported negligible effects on anxiety (GAD-7;  $d = 0.03$ ) and small effects on depressive symptoms (PHQ-9;  $d = 0.23$ ) following chairside mindfulness practice in hemodialysis patients.<sup>18</sup> In contrast, the present study demonstrated substantial improvements in spiritual well-being and anxiety. These differences may be attributed to variations in intervention structure, duration, and contextual integration. Delivering mindfulness practice directly during dialysis sessions may enhance engagement and enable patients to apply coping strategies in real time.

Several mechanisms may explain the observed improvements in spiritual well-being. Mindfulness practice encourages non-judgmental awareness of thoughts, emotions, and bodily sensations, fostering cognitive clarity, emotional balance, and adaptive meaning-making.<sup>8,19</sup> In chronic conditions such as end-stage kidney disease, patients often experience ongoing discomfort, treatment dependence, and existential concerns. Mindfulness may help shift patients from passive endurance toward active acceptance of internal experiences, thereby strengthening spiritual resilience.<sup>22</sup>

Mindfulness may also facilitate a deeper sense of inner connectedness, which is closely associated with spiritual well-being. Through sustained attention to breathing and bodily sensations, mindfulness practice can cultivate a reflective mental state that promotes acceptance and inner peace. For some individuals, this process may -

**Table 2.** Effects of Intradialytic Mindfulness-Based Meditation on Spiritual Well-Being and Anxiety

Variable	Group	Baseline Mean ± SD	Week 4 Mean ± SD	Mean Change (95% CI)	p-value <sup>a</sup> (within)	p-value <sup>b</sup> (between)	Cohen's d
Spiritual Well-Being	Intervention	66.17 ± 7.58	72.24 ± 5.88	6.07 (2.15 – 9.30)	0.003	0.021	1.36
	Control	63.38 ± 5.35	64.59 ± 5.40	1.21 (0.70 – 1.72)	—		
Anxiety	Intervention	45.21 ± 8.89	33.45 ± 7.25	-11.76 (-15.31 – -8.21)	<0.001	0.001	-1.88
	Control	50.62 ± 7.01	51.31 ± 6.51	0.69 (0.32 – 1.06)	—		

Note: <sup>a</sup> Paired sample t-test; <sup>b</sup> Independent samples t-test; Cohen's d represents the between-group effect size

reinforce a sense of connection with God or a higher power, an important dimension of spiritual well-being.<sup>8,23</sup>

These findings are consistent with the spiritual coping framework proposed by Najafi, which highlights spirituality as a protective factor in coping with existential stress and chronic illness.<sup>20,21</sup> Compared with earlier studies focusing primarily on psychological outcomes, this study provides additional evidence that mindfulness interventions may also enhance spiritual dimensions of well-being, particularly when integrated into clinical settings such as hemodialysis.<sup>8,22,23</sup>

From a clinical perspective, integrating mindfulness practice into routine hemodialysis sessions may represent a feasible and resource-efficient strategy for delivering holistic care. The intervention required minimal resources, involved short practice duration, and could potentially be facilitated by trained nursing staff, supporting patient-centered care that addresses both physiological and psychospiritual needs.

This study also demonstrated that intradialytic mindfulness practice significantly reduced anxiety levels among patients undergoing hemodialysis, with a very large effect size (Cohen's d = -1.88). These findings indicate that mindfulness may serve as an effective non-pharmacological approach for managing emotional distress in this population.

The anxiety-reducing effects of mindfulness can be explained through several mechanisms. Mindfulness promotes present-moment awareness and reduces maladaptive cognitive processes such as rumination, anticipatory worry, and catastrophic thinking.<sup>24,25</sup> By encouraging emotional acceptance and cognitive distancing from distressing thoughts, mindfulness enhances emotional regulation and psychological resilience.

In addition, mindfulness has been associated with activation of the parasympathetic nervous system, promoting relaxation and reducing physiological stress responses.<sup>26</sup> For hemodialysis patients, who frequently experience anxiety related to treatment dependence and disease uncertainty, mindfulness may provide a structured strategy for regulating stress during dialysis sessions.

These findings are consistent with previous meta-analyses demonstrating the effectiveness of mindfulness-based interventions in reducing psychological distress among individuals with chronic illness.<sup>27-29</sup> Integrating mindfulness

into dialysis sessions may further enhance its effectiveness by embedding psychological support within routine medical care.

Several limitations should be considered. The relatively small sample size and single-center design may limit generalizability. In addition, the use of self-reported measures introduces potential reporting bias. The short follow-up period also limits conclusions regarding the long-term sustainability of the intervention effects. Despite these limitations, the findings suggest that intradialytic mindfulness-based meditation is a safe, simple, and feasible intervention for improving psychospiritual well-being in hemodialysis patients. Integrating mindfulness into routine dialysis care may support the development of holistic, patient-centered approaches that address both psychological and spiritual dimensions of health

## CONCLUSIONS AND RECOMMENDATION

This randomized controlled trial demonstrates that intradialytic mindfulness-based meditation improves spiritual well-being and reduces anxiety among patients undergoing hemodialysis. The intervention was feasible to implement during routine dialysis sessions without disrupting clinical procedures. These findings support the use of brief guided mindfulness practice as a practical complementary approach to enhance psychospiritual well-being in hemodialysis care. However, the results should be interpreted cautiously due to the relatively small sample size and single-center design.

Future multicenter studies with longer follow-up periods are needed to confirm the sustainability of these effects. Incorporating physiological stress markers, such as heart rate variability or cortisol levels, and qualitative patient experiences may further clarify the underlying mechanisms and clinical relevance of mindfulness-based interventions.

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