







The effects of mindfulness-based stress reduction on psychological symptoms, quality of life, and marital satisfaction in infertile women undergoing IVF: A randomized clinical trial

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Abstract

Background: Infertility encompasses complex medical, psychological, social, and cultural challenges, significantly impacting those affected. The process of In Vitro Fertilization (IVF) often adds considerable stress.

Objectives: This study investigated the effects of Mindfulness-Based Stress Reduction (MBSR) on the psychological health, quality of life, and marital satisfaction in infertile women undergoing IVF.

Methods: This randomized controlled trial employed a consecutive sampling to include 44 women with infertility, undergoing IVF from September 2021 to February 2023. Participants were allocated into intervention and control groups, 22 each, through block randomization. The intervention group participated in an 8-week MBSR program, while the control group received education on parenting styles across four sessions. Assessment tools comprised the Brief Symptom Inventory, the brief World Health Quality of Life Questionnaire, and the Enrich Marital Satisfaction Questionnaire Short Form. Assessments were conducted at baseline, after the intervention, and two months after the intervention. Data analysis utilized the chi-square, t-test, and repeated measures analysis of variance.

Results: The mean baseline psychological symptoms, quality of life, and marital satisfaction scores did not significantly differ between the two groups. The mean baseline score for psychological symptoms in the MBSR group was 109.36 ± 19.52 , which decreased to 77.82 ± 19.89 and 58.82 ± 9.26 immediately after and two months after the intervention ($P < 0.001$). The mean baseline quality of life score in the MBRS group was 47.39 ± 3.43 which increased to 54.70 ± 3.90 and 59.71 ± 3.57 in consecutive measurements ($P < 0.001$). The mean score for marital satisfaction in the MBRS group was 123.59 ± 19.44 and increased to 143.45 ± 18.41 and 158 ± 12.44 over time ($P < 0.001$). In the control group, the mean psychological symptoms increased over time, but the quality of life and marital satisfaction did not change significantly.

Conclusion: MBSR could significantly reduce psychological distress and enhance both the quality of life and marital satisfaction in infertile women undergoing IVF.

Keywords: Mindfulness, Quality of life, Marital Status, Infertility.

Introduction

Primary infertility (PI) is defined as the inability to conceive after 12 months of unprotected intercourse. Infertility impacts over 7% of men and 10% of women globally^[1] and its prevalence in Iran is higher than the global average.^[2] It can lead to psychological issues such as stress, anxiety, depression, feelings of helplessness, worthlessness, negative self-perception, impulsive

behaviors, concerns about attractiveness, and strained marital relations,^[1] all of which negatively affect the quality of life (QOL).^[3,4] Limited access to assisted reproductive services and unsuccessful interventions further reduce the QOL of infertile women.^[5] Studies have also found a significant association between infertility and marital satisfaction -partners' perception of fulfilling each other's needs.^[6-11]

Mindfulness-based stress reduction (MBSR), a widely used mindfulness intervention for stress reduction that incorporates mind-body meditation and psychoeducational elements,^[12-14] has been shown to have positive effects on the mental health of people with infertility.^[15] Although MBSR interventions have been shown to improve the QOL of infertile women,^[4] its utility in women undergoing In Vitro Fertilization (IVF) remains under-researched. Some studies have indicated that women undergoing IVF feel anxious about the treatment process^[16] and that MBSR reduces anxiety.^[14, 17-20] A number of studies have also noted increased marital satisfaction following MBSR,^[21] but these findings are mostly from short-term interventions. Furthermore, no studies have simultaneously examined the effects of MBSR on psychological symptoms, QOL, and marital satisfaction of infertile women undergoing IVF. Therefore, further research is needed to understand the long-term effects of MBSR in infertile women undergoing IVF.

Objectives

This study investigated the effects of MBSR on psychological symptoms, QOL, and marital satisfaction of infertile women undergoing IVF.

Methods

Study design and participants

A randomized controlled trial was conducted in women with PI undergoing IVF at Shahid Beheshti Hospital in Kashan, Iran, from September 2021 to February 2023. Inclusion criteria were: Infertility for at least one year, currently pursuing IVF treatment, no prior psychological treatments for IVF, a minimum age of 25 years, literacy, no substance abuse, and no use of antidepressants and anxiolytic medications. Exclusion criteria included missing more than two treatment sessions, becoming pregnant during the study, and inability to perform the exercises involved in the study.

The sample size was determined based on a recent study investigating the impact of a mindfulness-based intervention on the QOL of women undergoing IVF. The mean posttest QOL scores of the intervention and control groups were 71.72 ± 11.43 and 59.09 ± 12.67 , respectively.^[22] Using the formula for comparing two means, and considering $S_1=11.43$, $S_2=12.67$, $\mu_1=71.72$, $\mu_2=59.09$, $\alpha=0.05$, and $\beta=0.1$ and assuming a potential dropout of 10%, a sample size of 22 was calculated for each group.

Forty-four eligible women undergoing IVF treatment were consecutively recruited and randomly assigned to an intervention group and a control group, 22 each. Random

assignment was performed using a block randomization method with a 1:1 assignment ratio. To this end, we prepared a permuted block randomization schedule using an online number generator (i.e. <https://www.sealedenvelope.com/simple-randomiser/v1/lists>), and the 44 supposed participants were randomly assigned into 11 blocks of 4 to be assigned to the study groups, 22 each [Figure 1].

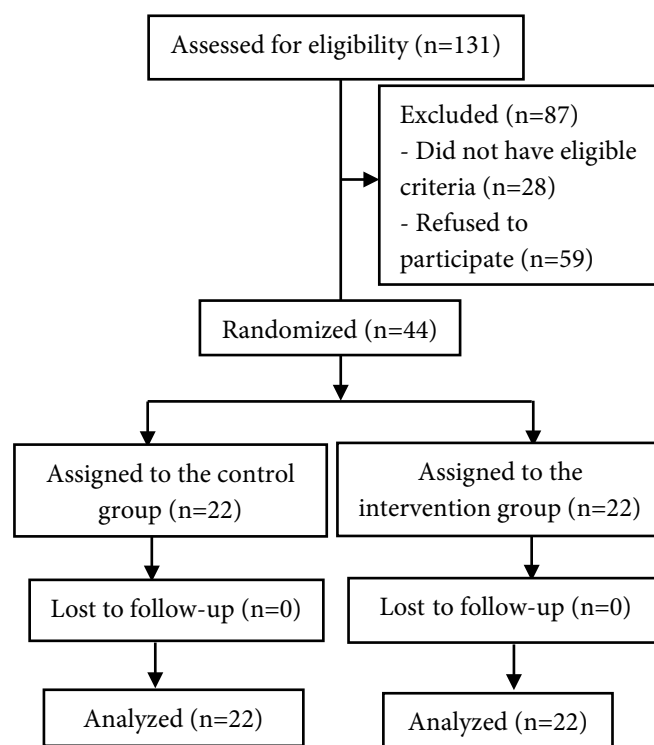


Figure 1. The study flow diagram

Data collection instruments

The study data were collected using a demographic and infertility information form, the Brief Symptom Inventory-53 (BSI-53), the brief World Health Organization Quality of Life Questionnaire (WHOQOL-BREF), and the Enrich Marital Satisfaction Questionnaire Short Form (EMSQ-SF). The demographic and infertility information form included questions on the participants' age, job, education level, monthly income, housing status, marital duration, time since infertility diagnosis, family history of infertility, cause of infertility, time since the last pregnancy, and husband's age, job, and education level. The BSI consists of 53 items derived from the SCL90 questionnaire to assess various psychological symptoms. The items are scored on a 5-point Likert scale ranging from "0: minimal intensity" to "4: maximum intensity". The BSI-53 total score ranges between 0 and 212, with higher scores indicating more severe symptoms. Akhavan Abiri *et al.* assessed the validity and reliability of the

Persian translation of the BSI-53 and reported its Cronbach's alpha to range from 0.62 to 0.85 for different subscales. The reliability of the BSI-53 was also assessed by test-retest, and the correlation coefficient was 0.83.^[23]

The WHOQOL-Breif contains 26 items in four domains namely physical health, mental health, social relationships, and environmental health. The items are rated on a 5-point Likert scale, from "1: completely disagree" to "5: completely agree". The total score of the WHOQOL-Breif ranges between 0 and 100, with higher scores indicating a better QOL. Nazemi et al. examined the validity and reliability of the WHOQOL-Breif, and its Cronbach's alpha was 0.81.^[24]

The EMSQ-SF includes 47 items to assess marital satisfaction. All items are scored on a Likert scale from "1: lowest" to "5: highest". Its total score ranges between 47 and 235. The Persian version of the EMSQ-SF demonstrated good validity and its overall Cronbach's alpha was reported to be 0.92.^[25]

Participants completed the demographic and infertility information form at baseline. But the BSI-53, the WHOQOL-Breif, and the EMSQ-SF were completed at baseline, immediately after, and two months after the intervention.

Table 1. The outline of the MBRS intervention

Session	Components
1	<p>Theoretical Components:</p> <ul style="list-style-type: none"> - An introduction with Mindfulness-Based Stress Reduction (MBSR), its preparations, components, and common effects. <p>Practical Components:</p> <ul style="list-style-type: none"> - Body scanning, sitting meditation, and eating meditation.
2	<p>Theoretical Components:</p> <ul style="list-style-type: none"> - "Awareness and Being Present," mind rumination, transitioning from unawareness to awareness, extending mindfulness to activities of daily living. <p>Practical Components:</p> <ul style="list-style-type: none"> - Body scanning and sitting meditation practices.
3	<p>Theoretical Components:</p> <ul style="list-style-type: none"> - Focusing on "Attention," being non-judgmental, identifying behavioral patterns, self-thinking and self-observation <p>Practical Components:</p> <ul style="list-style-type: none"> - Body scanning, sitting meditation, mindfulness yoga, and expanded awareness.
4	<p>Theoretical Components:</p> <ul style="list-style-type: none"> - "Acceptance," the direct experience of external events, setting goals and objectives, values, overcoming barriers, and fostering commitment. <p>Practical Components:</p> <ul style="list-style-type: none"> - Body scanning, sitting meditation, mindfulness yoga, and expanded awareness practices.
5	<p>Theoretical Components:</p> <ul style="list-style-type: none"> - "Stress," the shift from being stuck in stress reactivity to responding to stress consciously. Working with symptoms, physical and emotional pain, and sleep-related stress. <p>Practical Components:</p> <ul style="list-style-type: none"> - Body scanning, sitting meditation, mindfulness yoga, and walking meditation practices.
6	<p>Theoretical Components:</p> <ul style="list-style-type: none"> - "Non-sexual meditation" (focusing on self-communication, communication with others, and feelings and beliefs about infertility) - "Sexual meditation" (discussing psychological differences between genders and couples' sexual beliefs). <p>Practical Components:</p> <ul style="list-style-type: none"> - Body scanning, mindfulness yoga, sitting meditation, walking meditation.
7	<p>Theoretical Components:</p> <ul style="list-style-type: none"> - "Sexual information," including gynecological anatomy, the sexual reaction cycle, sexual stimulators, differences between genders, intercourse sections and positions, and common sexual problems. <p>Practical Components:</p> <ul style="list-style-type: none"> - Sitting meditation and a practice from previous weeks.
8	<p>Theoretical Components:</p> <ul style="list-style-type: none"> - "Additional meditation information," leading to the ending of the program and a conclusion. <p>Practical Components:</p> <ul style="list-style-type: none"> - Body scanning, sitting meditation, mindfulness yoga, and walking meditation practices.

Intervention

The intervention group received an 8-week MBSR training program that included both individual and group therapy sessions according to the Hosseini et al. protocol.^[5] This program encompassed both theoretical and practical elements, including body scanning, meditation, yoga, and stress management techniques [Table 1]. However, the control group participated in four parenting style workshops during the same period. Since the study coincided with the COVID-19 pandemic, and some participants faced challenges, a number of participants attended the training sessions online. The MBSR sessions were conducted by a clinical psychology master's student trained in MBSR, under biweekly supervision by a supervisor who also had access to the audio recordings of the sessions. The content of the training sessions that each group received was the only aspect blinded to participants. The intervention was carried out at the Department of Medicine, Kashan University of Medical Sciences. Both groups were followed up for two months after completion of the training sessions.

Ethical considerations

This study adhered to ethical principles and commenced after approval from the ethics committee of Kashan University of Medical Sciences (ethics approval code: IR.KAUMS.MEDNT.REC.1400.085). Informed consent was obtained from all participants, with a firm commitment to ensuring confidentiality. The study was also registered at *Iranian* Registry of Clinical Trials under the code: IRCT20210908052417N1.

Data analysis

Data analysis was conducted using SPSS version 16 (SPSS Inc., Chicago, IL, USA). The study employed descriptive statistics, including frequency and measures of central tendency. We used the Shapiro-Wilk test to examine if the quantitative data were normally distributed. Then, the chi-

square and student's t-test were used to compare the two groups in terms of their demographic characteristics. We also used the Greenhouse-Geisser test for repeated measures analysis to compare the outcome variables between the intervention and control groups through the three measurement time points. Student's t-test was also utilized for pairwise comparison. Significance level was set at < 0.05 .

Results

The average ages in the intervention and control groups were 29.36 ± 3.67 and 29.73 ± 2.16 years, respectively. Demographic and baseline characteristics showed no significant differences between the two groups ($P < 0.05$), [Table 2].

Table 3 presents the means and standard deviations for psychological symptoms, QOL, and marital satisfaction at the beginning of the study, after the intervention, and at follow-up for both groups. The mean baseline psychological symptoms, quality of life, and marital satisfaction scores did not significantly differ between the two groups. In repeated measures analysis, a significant interaction was noted between the intervention and the measurement time ($P < 0.001$), leading to the application of t-tests for pairwise comparisons. Initially, the mean scores for psychological symptoms were similar between the groups ($P = 0.47$). However, post-intervention and at follow-up, the intervention group showed significantly lower psychological symptom scores compared to the control group. Similarly, while initial scores for QOL and marital satisfaction did not differ significantly between the groups ($P = 0.65$ for both), the intervention group demonstrated significantly higher scores in these areas post-intervention and at follow-up. Overall, repeated measures analysis showed that MBSR was effective in improving psychological symptoms, QOL, and marital satisfaction over time.

Table 2. Between-group comparisons respecting participant's characteristics

Variable	Group ^a		P value
	MBSR ^b	Control	
Age (years)	29.36±3.67	29.73±2.16	0.691 ^c
Husband's age (years)	33.86±4.63	32.59±3.92	0.331 ^c
Duration of marriage (years)	7±1.27	6.91±1.19	0.808 ^c
Duration of infertility diagnosis (years)	3±1.31	2.73±1.08	0.455 ^c
Elapsed time since infertility (years)	4.14±1.08	3.82±1.01	0.318 ^c
Level of education			0.803 ^d
Diploma and sub-diploma	5 (22.7)	7 (31.8)	
Associate degree	6 (27.3)	4 (18.2)	
Bachelor's degree	8 (36.4)	9 (40.9)	
Masters and Ph.D.	3 (13.6)	2 (9.1)	

			0.886 ^d
Husband's education level			
Diploma and sub-diploma	5 (22.7)	4 (18.2)	
Associate degree	5 (22.7)	7 (31.8)	
Bachelor's degree	9 (40.9)	9 (40.9)	
Masters and Ph.D.	3 (13.9)	2 (9.1)	
Job			
Housewife	11 (50)	12 (54.5)	0.781 ^d
Employee	9 (40.9)	7 (31.8)	
Freelance job	2 (9.1)	3 (13.6)	
Wife's job			
Housewife	6 (31.8)	7 (31.8)	0.911 ^d
Employee	11 (50)	12 (54.5)	
Freelance job	4 (18.2)	3 (13.6)	
Monthly income			
< 60 million Iranian Rial	10 (45.5)	10 (45.5)	0.99 ^d
60 to 120 million Iranian Rial	10 (45.5)	10 (45.5)	
> 120 million Iranian Rial	2 (9.1)	2 (9.1)	
Housing situation			
The owner	10 (45.5)	9 (40.9)	0.761 ^d
Mortgage or lease	12 (54.5)	13 (59.1)	
Cause of infertility			
The problem is from male	6 (27.3)	5 (22.7)	0.924 ^d
The problem is from the female	7 (31.8)	8 (36.4)	
Both	9 (40.9)	9 (40.9)	
Family history of infertility			
Yes	6 (27.3)	6 (27.3)	0.99 ^d
No	16 (72.7)	16 (72.7)	

^a Data presented as Mean±SD or n (%), ^b Mindfulness-Based Stress Reduction, ^c t-test, ^d chi-square

Table 3. The results of repeated measures analysis for total scores of psychological symptoms, quality of life and marital satisfaction ^a

Groups Variables	Pretest		Posttest		Follow-up		P value ^b		
	Intervention	Control	Intervention	Control	Intervention	Control	Group	Time	Time-Group
Psychological symptoms	109.36±19.5	113.18±15.4	77.82±19.9	133.32±16.3	58.82±9.3	126.04±15.9	<0.001	<0.001	<0.001
Effect size	0.21		3.05		5.17				
P value (t test)	0.47		<0.001		<0.001				
Quality of Life	47.39±3.4	47.92±4.1	54.70±3.9	47.26±4.1	59.71±3.6	44.98±3.3	<0.001	<0.001	<0.001
Effect size	0.14		1.86		4.26				
P value (t test)	0.65		<0.001		<0.001				
Marital Satisfaction	123.59±19.4	128.41±19.1	143.45±18.4	127.54±17.7	158±12.4	126.77±13.8	<0.001	<0.001	<0.001
Effect size	0.25		0.88		0.22				
P value ^c	0.41		<0.001		<0.001				

^a Data presented as mean±SD, SD: Standard deviation, ^b Repeated measures analysis, ^c t-test

Discussion

This study underscores the effectiveness of MBSR in diminishing psychological symptoms in infertile women undergoing IVF. This aligns with the findings of an earlier

study, where mindfulness-based cognitive therapy significantly reduced stress and irrational cognitions related to childbearing in women undergoing IVF.^[26] Additionally, it resonates with a study highlighting the

benefits of a 6-week yoga program, a component of mindfulness-based therapy, in alleviating anxiety, depression, and enhancing QOL in infertile women.^[27] These collective findings highlight the considerable potential of mindfulness-based methods in improving psychological well-being in infertile women.

MBSR and its components such as body scanning, mindful sitting, and focused breathing have been shown to bolster self-awareness, enhance mind-body communication, and reduce anxiety in women with infertility.^[5] Our study goes further, indicating the positive impacts of MBSR on QOL and marital satisfaction in women undergoing IVF. These outcomes are in line with previous studies investigating the effects of mindfulness-based interventions on QOL, mental well-being,^[28,29] and marital satisfaction in couples and infertile women.^[30,31]

In exploring how MBSR enhances marital satisfaction, it appears that regular practice of techniques like loving-kindness, self-communication, and body scans, coupled with meditation, fosters empathy and compassion. This, in turn, improves communication skills and reduces emotional reactivity, positively influencing marital satisfaction.^[29]

This study had certain limitations. The challenges posed by the sensitive nature of infertility reduced the willingness of some individuals to participate in the study, resulting in a longer sampling period. Additionally, some participants attended some training sessions online as it was difficult for them to attend training sessions regularly. Future research should aim to overcome these limitations and further investigate the long-term effects of mindfulness-based interventions on infertile women undergoing IVF.

Conclusions

The implementation of MBSR not only reduced the psychological distress of infertile women, but also improved their family relationships, marital satisfaction, and QOL. Therefore, nurses and midwives at infertility centers are suggested to implement similar mindfulness-based programs for infertile women to decrease their psychological symptoms and improve their marital satisfaction and QOL. It is advisable to conduct further research with longer follow-up to thoroughly assess the long-term efficacy of MBSR in the context of infertility treatment.

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Competing interests

The authors declare that they have no competing interests.

Abbreviations

Mindfulness-based stress reduction: MBSR;
In Vitro Fertilization: IVF;
Enrich Marital Satisfaction Questionnaire Short Form: EMSQ-SF;
Brief Symptom Inventory-53: BSI-53;
Brief World Health Organization Quality of Life: WHOQOL-BREF.

Authors' contributions

SAT, ZZ, and AO designed the study. SAT collected data, analyzed data, and wrote the manuscript. All authors read and approved the final manuscript. All authors take responsibility for the integrity of the data and the accuracy of the data analysis.

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Availability of data and materials

The data used in this study are available from the corresponding author on request.

Ethics approval and consent to participate

The study was conducted in accordance with the Declaration of Helsinki. This study ethical approved at Research Ethics Committee of Kashan, Iran (Ethics code: IR.KAUMS.MEDNT.REC.1400.085).

Consent for publication

By submitting this document, the authors declare their consent for the final accepted version of the manuscript to be considered for publication.

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