



Effect of Mindfulness-Based Stress Reduction Training on Revealing Sexual Function in Iranian Women with Breast Cancer

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Abstract

Most studies on the treatment of sexual problems in women with breast cancer have been conducted based on a quantitative approach. Adding a post-intervention qualitative study can help to clarify the impact of the therapy on sexual function. The present mixed-method study was performed to determine the impact of mindfulness based stress reduction on sexual function in women with breast cancer. This study consisted of two quantitative and qualitative phases. The quantitative phase was a randomized clinical trial, where 52 subjects were randomly assigned to intervention and control groups that completed female sexual function index (FSFI) in pretest, posttest (after the intervention), and follow-up (1 month after the intervention) stages. Intervention was an eight-session group mindfulness-based stress reduction. After analyzing data from 46 subjects, qualitative data were collected using the conventional content analysis method. At the follow-up stage, statistically significant improvements were noted in the intervention group for the sexual desire ($P=0.021$) and arousal ($P=0.021$), but decreases were observed in orgasm scores ($P=0.042$). In the control group, overall FSFI score decreased at follow-up compared to those of the pretest and posttest ($P<0.001$). (There were no differences between the two groups in the three stages. Two main categories of qualitative analysis, i.e. “mindfulness, an attempt for love continuation” and “Sexual Responsiveness scope”, confirmed the results of quantitative phase. Based on the results, mindfulness intervention can impact the aspects of sexual performance that rely on women, which are mostly of psychological origin and may not affect all aspects.

Keywords Breast cancer · Islamic republic of Iran · Mindfulness · Mixed method study · Sexual function

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Introduction

Breast cancer (BC) is the second most common cancer worldwide [1]. BC accounts for 30% of all new cancer diagnoses [2] and the most common malignancy (an incidence rate of 33.2/100,000) in women [3]. In Iran, this kind of cancer is the third cause of death, with a peak age of the fourth and fifth decades of life, which is a decade younger than that of American women [4]. Thus, it can be concluded to have a growing trend in Iranian young women [1].

BC screening and treatment increase survival of patients, thereby creating new demands both for them and health care providers. The effect of BC and its treatments create long-term physical and psychological changes that affect diseased women and relationships with their husbands [5]. They experience a vast range of significant problems in the quality of their sex life, including body image, emotions, psychological issues, sexual desire, intimacy, etc.[6]. At least 40–100% of patients with cancer experience sexual disorder, which can be caused by cancer surgery, radio- or brachytherapy, and hormone therapy [6–8].

In most cases, mastectomy means losing the female identity, negative body image, loss of femininity feeling, lack of sexual attractiveness, and also a change in sexual self-esteem leading to disorders in sexual performance. In addition, most approaches in BC only aim to cure cancer itself ignoring the psychological issues, especially sexual problems. The other issue is that Asian women have a more conservative attitude to sexual issues and deal with it as a private context [9]. It is, therefore, important to investigate effective treatments and interventions for sexual concerns [10, 11].

In spite of many advances in conventional medicine, the use of alternative medicine is very common among such patients. The frequency of using complementary/alternative medicine is reported to be up to 79.8–76.0% [12]. Mindfulness is a complementary treatment that positively affects anxiety, pain, stress, fatigue, and side effects of treatment. Mindfulness-based stress reduction (MBSR) is a standard protocol consisting of different types of mindfulness training plus hatha yoga elements added therein [13]. Various studies reported different results about the effect of mindfulness on sexual function. For example, two studies showed that MBSR could improve sexual self-efficacy and function in women [10, 14]. However, there are studies showing that the MBSR has no impacts on some aspects of the women's sexual functioning [15, 16], or it does not affect sexual dysfunction at all [17]. On the other hand, most studies have been conducted based on a quantitative approach [10, 18–20], whereas some questions cannot be addressed with a quantitative perspective. For instance, how does a therapy impact sexual function? Or why does an intervention not affect the whole or some stages of sexual function? To answer such questions, a study should be designed to not only assess the intervention effect, but also to examine how it makes its influence [21]. A post-intervention qualitative study can help to understand or explain the trial outcomes (e.g., variation in trial results) [22].

There are few mixed method studies on women with BC. These studies have been evaluated outcomes other than sexual function [23, 24]. Since mixed methods can present more comprehensive evidence for a research subject, the current study aimed to investigate the effect of MBSR on sexual dysfunction in women with BC and to elucidate the reasons and conditions underlying this type of intervention.

Method and Material

The present research is an explanatory mixed-method study consisting of two quantitative and qualitative phases. The overall objective of this approach is that qualitative data help the explanation or elaboration of primary results [21]. The weight of the quantitative phase was more than the qualitative phase according to the research objectives and questions. Integration performed through merging of two databases together for analysis and for comparison [25].

Quantitative Phase

Subjects

Quantitative phase was conducted as a randomized controlled clinical trial, including pretest, posttest, and follow-up on BC patients in during 2018–2019. The study population included BC patients referring to hematology wards of hospitals and hematology clinics in Bushehr city. With a total type I error of 0.05, a power of 80% and effect size 0.85 according to previous study [8], a sample size of 23 subjects was calculated for the intervention and control groups, respectively. After considering the 10% drop-out rate, 52 subjects were included in the study. In the end of study data from 46 subjects were analyzed (See CONSORT diagram: Fig. 1). Inclusion criteria were at least one lobectomy, at least elementary literacy, ordinary marital condition, voluntary participation,

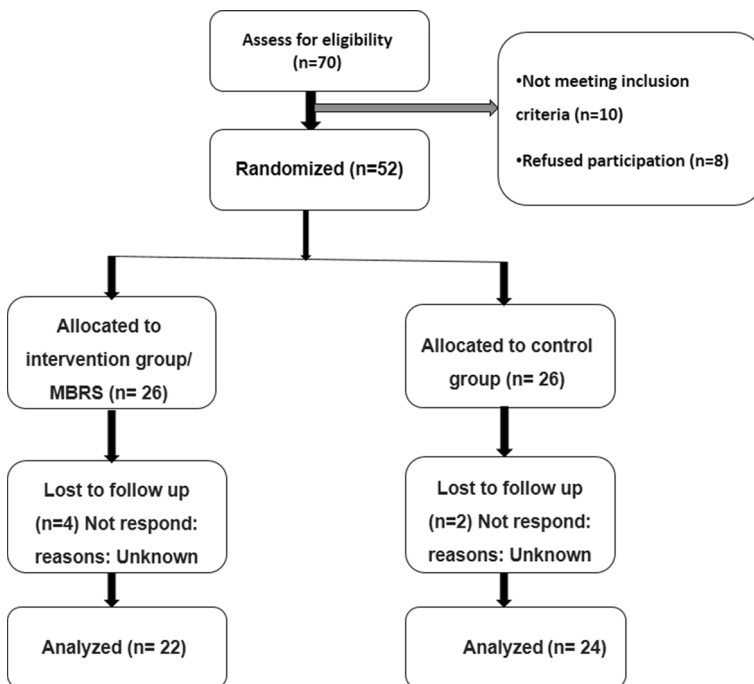


Figure1 CONSORT diagram

no use of drugs affecting sexual activity, and at least 3 months after the last cycle of chemo- or radiotherapy. Exclusion criteria included receiving psychological treatment, disorders interfered with sexual functioning (psychological problems, Alzheimer's, mental retardation, and multiple sclerosis), and recurrence of disease.

Measures

Data gathering tools consisted of a demographic questionnaire and the female sexual function index (FSFI) [26]. The FSFI included 19 items evaluating six domains of female sexual function (desire, arousal, lubrication, orgasm, satisfaction, and pain during intercourse) during 4 weeks. Sexual desire was assessed with two items. Arousal and lubrication were assessed with four items. Orgasm, satisfaction, and pain were assessed with three items. Response ranges were 1–5 for items 1, 2, 15, 16 and 0–5 for other items. The score for domain with two, three and four questions was 0.6, 0.4 and 0.3 respectively. The translations and cultural adaptation of this tool were previously done and its validity was examined using the experts' opinion. Also, its reliability confirmed by a Cronbach's alpha coefficient of 0.85 [27].

Methodology

Patients were selected based on medical records. Fifty two participants with dysfunction in at least one domain of sexual function (score below 3.9) were included in the study. Simple randomization was used to assign the subjects to intervention and control groups. All participants completed questionnaires in three stages: before the intervention (pre-test), after the intervention (post-test), and 1 month after the intervention (follow-up). The intervening group in two different groups of 13 subjects underwent mindfulness tutorials and each group received 8 sessions of 90 min (one session per week) based on the MBSR protocol [28]. The cost of transportation was undertaken by the research team. The mindfulness courses were held in a special hall with audiovisuals facilities. Exercises of each session were shared through forming a group in the WhatsApp social network, and mindfulness exercises were also followed through the same channel. The control group received no intervention. Because of ethical considerations at the end of the study, a pamphlet containing the mindfulness teachings, CDs, and the introduction of training classes was presented to those participants willing to get the training program.

Data Analysis

Quantitative data were analyzed by SPSS 19 software. Demographic variable were compared by the Chi square and Independent t test. Based on normal or non-normal distributions, the Friedman nonparametric test (and the Wilcoxon test for paired comparisons) or repeated measures ANOVA with Bonferroni post-hoc test was used for within group comparison. Mean change scores of sexual function and its sub-scales between the two groups were compared by the Independent t test or Mann–Whitney test based on normal or non-normal distributions. A significant level of less than 0.05 was considered in all cases.

Qualitative Phase

Participants and Data Collection

Qualitative data were collected after analyzing quantitative data using conventional content analysis method. Participants were selected from the intervention group by phone calls. Data were collected through semi-structured personal interviews accomplished in a quiet place in favor of the participant. Each interview lasted for 30–45. Interviews were recorded by a MP3 recorder after explaining the objectives for participants and obtaining their permission. Data was focused on the experiences and emotions of the participants regarding cancer diagnosis, the impact of the disease on their sexual life, and the effects of new interventions. Interviewees were asked to define their learning from the program, and feeling of doing the mindfulness and its impact. According to the responses, the interview was then proceeded by enlightening open-ended and deepening questions such as "please explain it more?", "what does that mean?". Sampling was done until data saturation. By analyzing the 17th interview, the researcher felt that it had reached the saturation level. The 18th interview were carried out to confirm the saturation level (Total participants: 18).

Data Analysis

Qualitative data were analyzed by the 5-step qualitative content analysis. After each interview, recorded statements were immediately transcribed verbatim in order to reveal a clear model from thoughts, behaviors, ideas, and experiences of the participants. Each transcribed interview was considered a unit analysis. Before coding, the whole text was read repeatedly so that the researcher became completely familiar with the data, achieve immersion, and obtain a sense of the whole, followed by coding the meaning units. The sub-categories were first coded according to their similarities; depending on the relations between subcategories, the subcategories were then organized into smaller categories of internally homogeneous and externally heterogeneous [29].

Trustworthiness

Multiple strategies were utilized to ensure the trustworthiness of qualitative phase. For member checking, transcribed data with initial codes were returned to each participant to ensure the correct understanding of the participants' statements. The method of agreement was utilized to examine similarities in the data. The primary analyst had the leader role in coding the data. Another researcher was consulted throughout the coding process, then reviewed the coding, and discussed any sites of disagreement with the primary analyst in order to increase the credibility of the analysis. Interview transcripts, coding sheets, and theme interpretations were shared with the peer to peer debriefing. The peer was a faculty member of nursing experienced in research on the topic of sexuality research.

Ethical Considerations

This study was extracted from MS thesis approved and funded by Bushehr University of Medical Sciences, Bushehr, Iran. This study was performed in line with the principles of

the Declaration of Helsinki. This study was conducted after obtaining a permit from the committee of research and ethics of Bushehr University of Medical Sciences, and obtaining the IRCT code)IRCT20090522001930N2(. Study objectives description were considered. Informed consent was obtained from the participants and was assured of data confidentiality.

Findings

Finding of Quantitative Phase

Mean ages and standard deviations of control and intervention groups were 49.00 ± 7.48 and 44.50 ± 7.72 , respectively, with no statistically significant differences between the two groups. The two groups were similar in terms of demographics and disease specifications (Tables 1 and 2).

Within-group comparison showed significant differences in desire, arousal, and orgasm scores in the intervention group, and in the total score of sexual function in both groups (Table 3). In pairwise comparison, the control group had no changes over time in term of FSFI domains, but overall FSFI score decreased at follow-up compared to pre-test ($P < 0.001$, $Z = -4.000$) and post-test ($P < 0.001$, $Z = -4.286$). (Table 4 represents between-group comparison of sexual dysfunction and its sub-scales. 1 month after intervention compared to pre-test, statistically significant improvements were noted in the intervention group for the FSFI domains of desire ($P = 0.021$, $Z = -2.511$) and arousal ($P = 0.021$, $Z = -2.311$), but orgasm score decreased in this group ($P = 0.042$, $Z = -2.038$). The

Table 1 Comparison of baseline characteristics (nominal variables)

	Intervention group Frequency (%)	Control group Frequency (%)	(χ^2 or Fisher* statistics) P value
<i>Education level</i>			
Primary school	3 (13.6)	10 (41.7)	(5.17)* 0.157
Pre high school	3 (13.6)	3 (12.5)	
High school	5 (22.7)	5 (20.8)	
Graduate	11(50.0)	6 (25.0)	
<i>Job</i>			
House wife	15 (68.2)	18 (75)	(0.263) 0.746
Employed	7(31.8)	6 (25.0)	
<i>Breast surgery</i>			
Bilateral mastectomy	10 (45.5)	15 (62.5)	(2.045)* 0.303
Unilateral mastectomy	1(4.5)	0 (0)	
Lumpectomy	11(50.0)	9 (37.5)	
<i>Tomoxifen Use</i>			
No	5 (22.7)	12 (50.0)	(2.694)* 0.069
20 Mg/day	5 (22.7)	3 (12.5)	
40 Mg/day	12 (54.5)	9 (37.5)	

*Statistical analysis is Fisher exact test

Table 2 Comparison of baseline characteristics (ordinal and interval variables)

Variable	Group	Mean (SD)	Mean rank	(Z statistics) P value
Age	Intervention	44.50 (7.72)	19.61	(- 1.884) 0.060
	Control	49.00 (7.48)	27.06	
Marriage	Intervention	22.50 (10.60)	22.59	(- 0.441) 0.659
	Control	24.00 (10.91)	24.33	
Duration of breast cancer diagnosis	Intervention	4.77 (3.87)	22.80	(- .346) 0.730
	Control	4.81 (3.21)	24.15	
Duration of end of chemotherapy	Intervention	38.64 (23.30)	25.43	(- .937) 0.349
	Control	32.00 (19.95)	21.73	
Duration of Tamoxifen use	Intervention	26.00 (21.57)	27.25	(- 1.863) 0.063
	Control	15.00 (20.17)	20.06	
Number of child	Intervention	2.23 (1.41)	22.43	(- .530) 0.596
	Control	2.38 (1.50)	24.48	

SD standard deviation

*Reported Statistic is F

overall FSFI score decreased at follow-up compared with post-test ($P=0.042$, $Z=-2.030$). Mean change scores of sexual function and its sub-scales did not differ between the two groups (Table 4).

Finding of Qualitative Phase

Five categories and 16 subcategories were obtained through analysis of qualitative interviews (Table 5). The results indicated relationship progress from health to post-intervention. Two main categories of “mindfulness, an attempt for love continuation” and “Sexual Responsiveness scope”, which were extracted in line with intervention-pertinent questions, are illustrated here. The findings in qualitative section complemented and almost confirmed those of quantitative section. “Mindfulness, an attempt for love continuation” category elucidated that this intervention could pacify participants during intervention and cultivate a distinct attitude toward life and sexual relationship to realize that they should return to life. One participant explained, “Mindfulness is extraordinary; it is as if they replace you with someone else. Positive-thinking increased my willingness to return to life.” (Diploma, duration of illness: 4 years). After the intervention, they believed that sexual intercourse was part of love and that they had to maintain sex in order to maintain love. One participant commented, “By attending this course, I came to the conclusion that I have to keep my love. If I love my husband, I have to fulfill his needs as much as possible.” (Bachelor degree, duration of illness: 2 years).

“Sexual responsiveness scope” category revealed various alterations in sexual intercourse during and after intervention. Participants generally reported that their sexual intercourse improved moderately after the intervention. They cited an increase in the frequency of having sex, and dubbed it as a result of a change in attitude toward life. According to the participants, this increase was partly due to elevated sexual desire and partially as a response to their spouse’s need and request. One participant commented, “I responded more positively to my husband’s request for sex” (Diploma, duration of illness: 4 years). The participants’ experiences reflected failure to reach the peak of sexual

Table 3 Within group comparison of total sexual function and its domain

Domain	Time		Group		P value	X ²	Mean rank	P value
	Intervention		Control					
	Mean(SD)	Mean rank	X ² or F* (Mean squares)	Mean				
Desire	Pre-test	2.59 (1.23)	1.64	8.042	0.018	4.204	1.81	0.122
	Post-test	2.97 (1.18)	2.20				2.23	
	Follow-up	2.97 (1.25)	2.16				1.96	
Arousal	Pre-test	2.55 (1.68)	–	3.820* (0.970)	0.030	0.646	1.90	0.724
	Post-test	2.84 (1.74)	–				2.02	
	Follow-up	2.96 (1.63)	–				2.08	
Lubrication	Pre-test	3.08 (1.88)	2.00	0.286	0.867	3.569	1.77	0.168
	Post-test	3.23 (2.01)	2.06				2.20	
	Follow-up	3.10 (1.87)	1.94				2.02	
Orgasm	Pre-test	2.45 (1.49)	2.34	6.873	.032	0.327	2.00	0.849
	Post-test	2.26 (1.41)	1.73				1.94	
	Follow-up	2.35 (1.39)	1.93				2.06	
Satisfaction	Pre-test	2.63 (1.26)		1.780 (0.267)	.181	1.921	2.19	0.383
	Post-test	2.55 (1.16)					1.98	
	Follow-up	2.77 (1.20)					1.83	
Pain	Pre-test	2.47 (1.55)	2.02	0.118	0.943	1.130	2.15	0.568
	Post-test	2.55 (1.34)	1.95				1.90	
	Follow-up	2.84 (1.30)	2.02				1.96	
Total score of FSFI	Pre-test	15.78 (8.37)	2.02	7.057	0.029	29.871	2.42	<0.001
	Post-test	16.40 (7.87)	2.39				2.48	
	Follow-up	13.69 (10.55)	1.59				1.10	

FSFI female sexual function index, SD standard deviation

*Reported Statistic is t

Table 4 Mean changes comparisons of total sexual function and its domain between intervention and control groups

Variable changes	Intervention		Control		Z or t*	P value
	Mean(SD)	Mean rank	Mean(SD)	Mean rank		
Desire: post-test–pre-test	.38 (.92)	24.86	.20 (.46)	22.25	-.701	.484
Desire: follow-up—pre-test	.38 (.66)	26.18	.15 (.67)	21.04	-1.411	.158
Desire: follow-up—post-test	.00 (.96)	24.50	-.05 (.47)	22.58	-.563	.574
Arousal: post-test–pre-test	.29 (.74)	27.30	.07 (.40)	20.02	-1.878	.060
Arousal: follow-up—pre-test	.41 (.79)	26.41	.11 (.42)	20.83	-1.433	.152
Arousal: follow-up—post-test	.12 (.59)	24.82	.04 (.26)	22.29	-.679	.497
Lubrication: post-test–pre-test	.15 (.43)	26.52	-.03 (.43)	20.73	-1.497	.134
Lubrication: follow-up—pre-test	.01 (.77)	25.36	-.06 (.49)	21.79	-.924	.355
Lubrication: follow-up—post-test	-.14 (.76)	24.34	-.04 (.22)	22.73	-.449	.653
Orgasm: post-test–pre-test	-.19 (.35)	19.73	.00 (.35)	26.96	-1.881	.060
Orgasm: follow-up—pre-test	-.11 (.41)	21.11	.02 (.43)	25.69	-1.181	.238
Orgasm: follow-up—post-test	.08 (.36)	23.55	.02 (.18)	23.46	-.025	.980
Satisfaction: post-test–pre-test	-.08 (.53)	23.64	-.02 (.53)	23.38	-.068	.946
Satisfaction: follow-up—pre-test	.14 (.47)	26.70	-.10 (.53)	20.56	-.068	.946
Satisfaction: follow-up—post-test	.22 (.64)	26.43	-.08 (.35)	20.81	-1.577	.115
Pain: post-test–pre-test	.08 (.92)	25.09	-.07 (.37)	22.04	-1.482	.138
Pain: follow-up—pre-test	.37 (1.20)	25.09	-.06 (.41)	22.04	-.798	.425
Pain: follow-up—post-test	.29 (1.02)	24.48	.01 (.38)	22.60	-.785	.433
Total FSFI: post-test–pre-test	.63 (2.17)	–	.15 (1.69)	–	.834*	.409
Total FSFI: follow-up—pre-test	2.09 (6.41)	–	-4.18 (3.16)	–	1.382*	.177
Total FSFI: follow-up—post-test	-2.72 (7.18)	–	-4.33 (2.47)	–	.999*	.327

FSFI female sexual function index, SD standard deviation

pleasure, for which the underlying reason was reported to be pain during intimacy. Some participants stated that their pain alleviated slightly or perhaps they thought about it less often following the intervention; however, all participants declared that pain during intercourse was an irritating issue even after the intervention. According to the participants, the side effects of the medication and the thought of having a defective organ (mastectomy or lumpectomy) hampered them from experiencing orgasm. One participant explained that she went under hysterectomy following tamoxifen side effects, and this defect prevented her from reaching orgasm. She said: “After attending classes, happiness enhanced my sexual desire; however, these medications and not having a uterus hindered me from having orgasm” (Bachelor degree, duration of disease: 6 years). Another participant blamed her husband’s nervousness for lack of sexual pleasure: “I’d gotten better, even my sexual desire increased and my pain alleviated slightly. I got wet but I didn’t reach orgasm. Maybe it had something to do with my husband. He became really stressful and completely changed after my sickness.” (Middle school degree, duration of illness: 1.5 years).

Table 5 Main category, subcategory and quotations of participants extracted from qualitative phase

Category	Subcategory	Statement excerpts
The spectrum of sex regarding health	Sex based on mutual interaction and harmony	Our relationship was good. My husband and I were always in love with each other. My husband was very considerate
	Traditional and norm-based sex	It was always my husband who asked for it which is a common thing to do. Sometimes I wanted it too and sometimes I didn't, but I never said n
	Sex based on forced compromise	The biggest problem was when I didn't feel like it but he insisted. He beat me for the first time in my life because of sex
	Ignoring sex	We didn't even have a good life let alone having sex. I didn't even think about it
	Avoiding sex	It was very difficult. I got used to my illness but not that. It was really hard to have sex so I tried to avoid it
The effects and complications of treatment on sex	A decrease in the quality and quantity of sex	The quality of the relationship had changed. I was not satisfied I think my husband was not satisfied either. We barely had sex
	Surgical implications	I had a thickening of uterus due to medication, I had to surgically remove it. The sex got worse and I felt like I was depressed
	Hormone therapy	It was painful and that's what made things worse. I think it was because of the tamoxifen I was taking
	Chemotherapy	I used to undergo chemotherapy and I didn't get my period. It's an awful feeling that affects sexual relations
Mindfulness striving to continue love	Changing attitudes towards life and sex	Going to these classes taught me that life goes on. I was encouraged to change my perspective. After studying and thinking, I came to the conclusion that the length of life doesn't matter. I have to live well. I should be with my husband and pay attentions to his needs more than before
	Sex as a part of love	Sex between husband and wife is a part of love

Table 5 (continued)

Category	Subcategory	Statement excerpts
The effectiveness scope of intervention	Relative improvement in sex in terms of desire, motivation and frequency	I was happy and this happiness made me want to have sex more frequently
	Failure at the peak of pleasure	It was painful and that's what made things worse. I didn't let me reach the peak of pleasure
	Conflict in perceived satisfaction	Sex is very complicated. There were many times that I wasn't satisfied but I was happy I made my husband happy. This is a very good feeling, but it does not mean satisfaction with sex

Most of the Participants stated that, in spite of their enhanced sexual desire and increased sexual intercourse frequency, they were not satisfied with sex because they did not reach orgasm. However, they fulfilled an inner satisfaction due to their more consideration toward their spouse's needs and his satisfaction of the intercourse. One participant said: "I was satisfied that my husband was pleased, but I never had orgasm even once" (Diploma, duration of illness: 4 years).

Discussion

This study aimed to investigate the effect of MBSR training on sexual function in women with BC. The results revealed that the intervention led to an increase in overall sexual function immediately after intervention and a decrease in overall FSFI score at follow-up stage. On the other hand, the results declared that the total score of sexual performance in the follow-up stage significantly decreased in the control group compared to the pretest. The subcategory of improved sexual intercourse quality resulted from the qualitative part of the study confirms the results of the quantitative part in term of the comparison over time. The results of this study are consistent with Bober et al. (2018) in term of within group comparison in the intervention group [16]. Other studies indicated that mindfulness was effective on women's sexual performance and sexual self-efficacy [10, 30].

Our within group comparison and qualitative results indicates that sexual performance of BC patients will deteriorate if they do not undergo effective psychological interventions. Findings about total FSFI may be the result of changes in different areas of sexual function. For example, mild decline, though insignificant, in most areas of sexual function of control groups 1 month after intervention caused a significant reduction in total score of the control group, or significant and insignificant increases in sexual function domain in intervention groups.

The analysis outcome indicated that the scores of desire and arousal domains enhanced over time in the intervention group. Nevertheless, between group comparisons displayed no significant differences between the experimental and control groups in term of these two domains. According to the participants in qualitative section of the study, mindfulness-derived happiness and composure led to an increase in sexual desire. This finding is consistent with that of Berroto et al. (2012) in term of within subject effect in intervention and control groups and of Bober et al. (2018) in intervention group [16, 18].

Shayan et al. (2017) showed within and between subject effects of stress management intervention on all domain of sexual function, which is inconsistent with present study in term of between group differences [8]. Taken together, the quantitative and qualitative results indicate the impact of the intervention on two areas of sexual desire and sexual motivation.

Stephenson and Kerth (2017) realized that mindfulness exerted their highest impacts on the mental aspects of sexual performance including sexual desire and arousal [31].

Cognitive-behavioral interventions consist of two main mechanisms. First, they enhance one's cognitive skills by raising awareness of sensory or motivational concentration and sexual arousal. Second, they eliminate negative attitudes or thoughts that interfere with sexual performance, and replace them with better and more productive attitudes and thoughts [15]. In a study conducted by Van Driel et al., (2019) intervention did not influence desire and motivation domains [17] which is in contradiction with the present study, probably due to the target population of the aforementioned study comprising women

with salpingo-oophorectomy suffering from moderate- to-severe menopausal symptoms. Another reason underlying this difference may be the cultural context of the research units. Iranian women training and the culture they live in imply that most people are on the conviction that sexual request should be expressed by men and it is considered a taboo if women declare it. Thus it has made women reluctant to talk about sexual issues hindering them from expressing their sexual needs and desires [27]. Being in the intervention group has changed their perspective in a way that their sexual desire increased to some extent on the one hand; they would not consider expressing their desire to have sexual intercourse an embarrassing issue on the other hand, resulting in a significant variation in the desire domain.

Quantitative results revealed no impacts of intervention on pain, lubrication, and sexual satisfaction domains. The results of the qualitative part indicated persistent post-intervention pain, which confirms the outcome of quantitative section. However, satisfaction in women was due to the satisfaction of their spouse, not to sex, which is in line with Van Drile et al. (2018) [17]. Although some studies reported that psychological interventions could improve these domains of sexual performance [11, 14], most studies reported different results about the effect of cognitive intervention in different domains of sexual function. For example, Berotto et al. (2012) and Bober et al. (2018) showed that the intervention had no effect on the pain domain but improved other domains of sexual function [16, 18]. This discrepancy in results may be due to differences in the study population or the type and length of intervention. Since all research units underwent chemotherapy, major risks of this adjuvant therapy are ovarian failure, leading to atrophy and vaginal dryness, which in turn can cause painful intercourse. In fact, it can be claimed that pain and lubrication disorders are not merely affected by psychological disorders [31]; hence, pain management requires more extensive interventions [32]. One reason underlying the ineffectiveness of intervention on pain domain can be the limitation of research tools [16]. The FSFI measures the presence of pain, not the extent and severity of it; perhaps using a tool to measure the severity of pain can show the effect of mindfulness on pain management during sexual intercourse. In general, the FSFI only deals with sexual performance without addressing such issues as body image, mental health, and lust; hence this tool may not be suitable for the group whose body image and mental health are altered by cancer treatment [32]. Regarding satisfaction domain insignificance, it should be noted that sexual satisfaction is the product of optimal performance in other areas, especially orgasm. On the other hand, sexual satisfaction itself can affect the ability to manage pain and discomfort during intimacy [16]. In other words, sexual performance problems, which are a combination of psychological and physiological sources, are highly interactive, thus requiring extensive and comprehensive interventions [32]. On the other hand, the results in the qualitative part reflect the fact that assessing the extent of sexual intercourse is not complete without considering the sexual partner. Participants' allegations indicated increased satisfaction of their husbands with sexual intercourse after the intervention, which in turn elevated their inner satisfaction. A remarkable finding is related to a significant difference in orgasm domain before, during and after the follow up in the intervention group in spite of decreased orgasm scores. Qualitative findings indicated no effect of intervention on orgasm. Some studies showed that mindfulness increased the orgasm score [8, 16]. Contrarily, other studies showed that mindfulness had no effect on orgasm [14, 17, 33]. No study could be found to be consistent with this finding. One reason might be negative or non-significant findings no published by others [31]. On the other hand, it can be interpreted that the experience and thoughts about orgasm as the sexual climax is a function of sexual intercourse.

Increased desire might have led to increased frequency of sexual intercourse, which in turn directed one's attention toward orgasm more frequently. As noted in the qualitative part of the study, the frequency of sexual intercourse was mentioned by some participants. In future studies, it is recommended to include sexual intercourse frequency in research units before and after the intervention.

It should be noted that the increased tendency to have sexual intercourse in this study is mainly due to elevated motivation that roots in women themselves. However, aspects such as orgasm, sexual satisfaction, and even pain during sexual intercourse are issues that mostly depend on the performance of both partners. Due to cultural considerations and lack of husbands' cooperation, there were no interventions of husbands in the current study, which might affect the results.

This study suffers from some constraints. One of the major limitations is the small number of samples and thus the limited statistical power. Other limitations of this study include non-participation of husbands in research units. Since most dimensions of sexual performance depend on the performance of both partners, studies that provide interventions for both partners can yield better results. Inability to evaluate ovarian function by rigorous tests, such as FSH measurement, was another restriction of this study, which is recommended to be considered in future studies.

Conclusion

Based on the results of this study, mindfulness intervention in women with BC can impact the aspects of sexual performance that rely on women, are more of psychological origin, such as sexual desire and arousal and may not affect all aspects. Since, sexual dysfunction in women with BC is a complex and multidimensional concept consisting of psychological, communicational, and physical problems. Thus, development of a comprehensive program that includes a set of cognitive, physical, and behavioral training and interventions can promote sexual performance of BC patients. In addition, sexual function is issue that mostly depends on the performance of both partners. Thus, investigations on the impact of interventions considering both sexual partners can allow for more comprehensive results as well. Due to the effectiveness of the MBSR training on some domains of sexual function, this intervention can be provided as a recommended treatment in addition to medical treatments in oncology centers and hospitals.

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Compliance with ethical standards

Conflicts of interest The authors declare that they have no conflict of interest.

Ethics Approval This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of Bushehr University of Medical Sciences (Date: 2018/2/19. IR.BPUMS.REC.1396.1396.218), and obtaining the IRCT code for quantitative phase of study (Date: 2018/8/8. NO: IRCT20090522001930N2).

Consent to Participate Study objectives description and were considered. Informed consent was obtained from the participants and was assured of data confidentiality.

Consent to Publish Not applicable. Objective of study was described for subject. Including publication of results

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