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Evaluating a brief mindfulness intervention after hysterectomy in young women – A pilot study in Pakistan

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Abstract

Hysterectomy is a common surgical procedure that involves the removal of a woman's uterus. The procedure can produce substantial psychological distress, particularly in young women, which can be long-lasting. The goal of this study was to examine the effectiveness of a 4-week brief mindfulness-based intervention in reducing the symptoms of psychological distress in women who underwent hysterectomy and restoring their positive psychological functioning. The study used a quasi-experimental, open label design. Participants were 16 young women recovering from hysterectomy. 8 of these women underwent the brief-mindfulness based intervention, while the remaining 8 were a control, no treatment group. Results showed that women participating in the study reported mild-to-severe symptoms of psychological distress and very low positive psychological functioning levels in pretest. After the treatment, distress levels of women in the treatment group returned to normal values, while distress levels of women in the control group remained elevated. *(Afr J Reprod Health 2025; 29 [5]: 17-28).*

Keywords: Hysterectomy, Mindfulness-Based Interventions, Positive Psychological Functioning, Mental health

Résumé

L'hystérectomie est une procédure chirurgicale courante qui implique le retrait de l'utérus d'une femme. Cette procédure peut provoquer un stress psychologique substantiel, en particulier chez les jeunes femmes, pouvant être durable. L'objectif de cette étude était d'examiner l'efficacité d'une intervention brève de pleine conscience de 4 semaines pour réduire les symptômes de détresse psychologique chez les femmes ayant subi une hystérectomie et pour restaurer leur fonctionnement psychologique positif. L'étude utilisait un design quasi-expérimental, à étiquette ouverte. Les participantes étaient 16 jeunes femmes en convalescence après une hystérectomie. 8 de ces femmes ont suivi l'intervention brève basée sur la pleine conscience, tandis que les 8 autres formaient un groupe témoin sans traitement. Les résultats ont montré que les femmes participant à l'étude rapportaient des symptômes de détresse psychologique de légers à sévères et des niveaux de fonctionnement psychologique positif très bas au prétest. Après le traitement, les niveaux de détresse des femmes dans le groupe de traitement sont revenus à des valeurs normales, tandis que les niveaux de détresse des femmes dans le groupe témoin sont restés élevés. *(Afr J Reprod Health 2025; 29 [5]: 17-28).*

Mots-clés: : Hystérectomie, Interventions basées sur la pleine conscience, Fonctionnement psychologique positif, Santé mentale.

Introduction

Hysterectomy is a common gynecological surgery worldwide. It is a surgical procedure involving the removal of a woman's uterus, and sometimes additional reproductive organs, depending on the type of hysterectomy performed. The decision to undergo a hysterectomy is typically based on various medical conditions, such as uterine fibroids, endometriosis, gynecological cancers, chronic pelvic pain, or other severe uterine disorders[1]. Three primary forms of hysterectomy surgeries include total hysterectomy, partial hysterectomy, and radical hysterectomy. A total hysterectomy removes the entire uterus and cervix, while a partial hysterectomy removes only the top section of the uterus, leaving the cervix untouched. Radical hysterectomy is a comprehensive surgical treatment that entails the removal of the uterus, cervix, upper part of the vagina, and nearby lymph nodes. Anxiety and stress may be heightened during this decision-making process, and discussions with healthcare providers and support from loved ones are crucial[2].

The impact of a hysterectomy on mental health is a complex and individualized experience that can vary before and after the procedure. The

diagnosis of a condition necessitating a hysterectomy can elicit a range of emotions, including anxiety, fear, and sadness. Women may experience concerns related to fertility, body image, and the potential for changes in sexual function[3]. Therefore, hysterectomy is associated with an increased risk of long-term mental health issues, especially depression and anxiety[4]. A study reported that the commonest clinical indication was a uterine mass (47.7%). The most common surgical procedure was total abdominal hysterectomy (52.4%) and 4.7% of hysterectomies were done for ovarian malignancies[5].

Moreover, the impending loss of the uterus can impact a woman's sense of identity and body image. Fears about femininity, sexuality, and the perception of oneself may contribute to emotional distress[6]. Furthermore, the level of support from family, friends, and healthcare professionals plays a significant role in a woman's mental health before the surgery. Supportive networks can help alleviate anxiety and provide reassurance during this challenging time[7].

For many women, a hysterectomy brings relief from the symptoms that led to the surgery, such as chronic pain, heavy bleeding, or other gynecological issues. Relief from these symptoms can positively impact mental health[8]. Some women may experience a sense of grief and loss after a hysterectomy, particularly if the surgery was performed due to cancer or if they had not completed their family planning. Addressing these emotions through counseling or support groups is essential[9].
Depending on the type of hysterectomy, women may experience hormonal changes, including menopause if the ovaries are removed. Hormonal fluctuations can contribute to mood swings, anxiety, and other emotional challenges[10]. Changes in sexual function and intimacy are common concerns after a hysterectomy. Open communication with healthcare providers and one's romantic partner is vital to address these issues, and counseling may be beneficial[11].

Mental health support, including counseling and therapy, can be valuable post-hysterectomy. Addressing emotional concerns, body image issues, and adapting to changes in self-perception may require ongoing support[12]. A longitudinal study following a group of women for over 20 years revealed that removing the uterus increases the risk of developing depression and anxiety, sometimes years after the procedure. This risk was even higher in women who underwent hysterectomy at a younger range. On the overall sample, women who underwent hysterectomy showed an absolute risk increase of 6.6 percent for depression and 4.7 percent for anxiety after hysterectomy. For women who had hysterectomies between ages 18 and 35, the risk of depression was higher, with absolute risk increase of 12 percent[4].
The mental health conditions that increase after hysterectomy may be related to a decrease in ovarian function that occurs from removal of the uterus. There is also a theory that hysterectomies may directly affect cognitive and brain aging. It is concluded that removal of the uterus, even with conservation of the ovaries, may also have long-term effects on physical and mental health[4].

Mindfulness is generally referred to as the ability to become more conscious of one's physiological, emotional, and psychological well-being in the moment, and in the absence of any negative perception as it is associated with the positive outcome of one's psychological functioning.[13]. Brief Mindfulness Based Interventions (BMBIs) durations most often range from two to three-week programs to single laboratory-based experimental sessions. The maximum duration of such interventions is 4 weeks. BMBIs are a unique approach to improve mindfulness and optimism among individuals.

Studies indicated that BMBIs can positively impact numerous health related outcomes, even when they consist solely of a single 5-minute session[14]. They can sometimes be as effective as standard mindfulness-based interventions (MBIs) because both types of programs contribute to enhancing the overall psychological functioning of individuals[14,15]. Literature indicates that BMBIs can improve mental health and positive psychological functioning (PPF).

PPF refers to the level of optimal emotions that can be felt when an individual realizes his/her potential and positive dimensions of mental and emotional well-being, such as autonomy and personal development, vitality, creativity, resilience, etc[16,17]. It mainly emphasizes understanding and enhancing human values such as wisdom, courage, self-control, kindness, and open-mindedness among others along with the self-development that can be

achieved by human actions leading to happiness and optimism[18,19].

MBIs are specifically aimed at relieving symptoms of stress, anxiety, depression, and other chronic issues of mental health and physical pain[20,21]. Further, it helps in reducing reactivity, increases acceptance of self, and others, and enhances creativity in individuals[22]. Implementation of the MBI program can lead to increased self-awareness, better impulse control, and less emotional reactions to stressful situations along with the development of mindful awareness and enhancement of positive psychological functioning[23,24].

MBIs are suggested to be particularly fruitful in helping women cope with the psychological after-effects of hysterectomy and bring improvement in their overall psychological functioning and emotion regulation[25–29].

Looking at the effect sizes of brief BMBIs, a 2018 meta-analysis evaluated the effects of BMBIs on reducing negative affectivity in student and community samples. They found the overall effect sizes to be low for student samples (g=.14), and moderate for community samples (g=.41). These authors also reported a substantial publication bias, which when account for, significantly reduced the overall effect size (g=.04) [30]. A 2022 study compared the effects of an eight-week BMBI and a Health Enhancement Program (HEP) on depression and/or anxiety of patients receiving dialysis and looked at a six-month follow up. Results showed that, at the six-month follow-up, the reduction in depression of participants who underwent BMBI was of equal magnitude as that of participants who underwent HEP ($\eta_p^2 = 0.27$), but that reduction in anxiety was stronger in the BMBI group (d = 1.07), than in the HEP group (d = 0.85)[31]. A study examining the effects of a seven-week mindfulness-based stress reduction intervention with semiannual 90-minute booster sessions at two- and four-year follow-ups, reported that scores of the mindfulness-based intervention group were better than those of the no-treatment control group at the 4-year follow-up. The magnitude of the difference between groups was low to moderate (d = 0.23–0.42)[32]. Another very recent study looked at the effects of a six-week online MBI on the mental health of Chinese undergraduate nursing students, reported moderate to high reductions of anxiety and stress and improvements in perceived social support and mindfulness in the MBI group compared to control immediately after the intervention (d=0.42-0.78). However, the difference was much lower at the three-month follow-up (d=0.15-0.36)[33].

Several studies focused on the implementation of MBIs to increase distress tolerance, improve psychological functioning, emotion regulation, mental health, and coping with stressful events with optimism and confidence[21,34]. MBIs are a relatively new approach to maintain physical functioning, alleviate pain, reduce depressive symptomatology, and positively influence postoperative (hysterectomy) care outcomes[35].

There is a limited number of published data sets from Pakistan assessing the role of MBIs on the mental health and positive psychological functioning (PPF) of women who underwent hysterectomy. To address this gap, the goal of the present study is to examine the effects of a brief mindfulness-based intervention on overall mental health of women who underwent hysterectomy. Mental health was assessed through symptoms of anxiety, depression, and stress, as well as, through positive psychological functioning. The focus of the intervention was to direct women's attention to the present moment, with acceptance of post-effects of hysterectomy, present life, and their abilities and capabilities to cope with the aftermath of this surgical procedure. Brief mindfulness-based intervention used in this study was a four-week therapeutic intervention designed to help women in Pakistani society to overcome post-hysterectomy psychological challenges. We hypothesized that mental health and positive psychological functioning would improve after the intervention (in the treatment group). In case these indicators improve in the control group as well, the improvement in the treatment group will be stronger.

Methods

Participants

The current study utilized a between-subjects quasi-experimental open label research design, incorporating an experimental group (EG) and a control group (CG) comprising of female participants. Originally, 25 women who underwent hysterectomy were contacted about participating in

the study from 3 hospitals in Rawalpindi and Islamabad, Pakistan, where hysterectomy procedures are being done. Of these, five participants declined to participate, while four participants did not match the inclusion criteria. Consequently, only 16 participants—eight in each group—completed the study. Individual introductory sessions were conducted with each participant, during which they were provided with a comprehensive explanation of the study's particulars and thereafter requested to provide signed informed consent. Participants' average age was around 32-33 years (M=32.37 and SD=2.65).

Inclusion criteria required that participants be women who underwent hysterectomy with ovaries remaining intact within the past 4 weeks, that they were between 25 and 40 years of age, proficient in the Urdu language, and that they provided signed consent to take part in the study. Exclusion criteria stated that women who underwent emergency hysterectomy procedures, had their ovaries removed, had prior mental health issues, the hysterectomy procedure done less than 4 weeks or more than 6 month before the start of the study, and those who were not proficient in Urdu would not be included in the present study.

Medical reasons due to which study participants underwent hysterectomy were varied. They included abnormal and excessive vaginal bleeding, endometriosis, fibroids, intense lower abdominal pain during menstruation, lower back pain, swollen lower abdomen, frequent urination, and severe labor and delivery complications.

All women participating in the study received detailed information regarding potential complications following surgery, such as bleeding, infection-related damage to the ureter, bladder, or bowel, frequent and severe urination, and thrombosis.

Procedure

All the participants were introduced to the BMBI program and offered the option to participate in the intervention. Eight participants consented to participate in the treatment program and additional eight consented to complete the outcome measures, but without participating in the intervention. These participants formed the control group. The fact that the treatment and the control group happened to be the same size was a coincidence and not something planned by the researchers. The aim of the study and intervention were explained to the study participants during an introductory session along with the assurance of confidentiality and anonymity of individual responses. Those who agreed to participate were included in further study procedures.

The study was conducted in three phases - pre-testing (baseline, one week before the intervention), BMBI intervention, and post testing (one week after the BMBI).

The pretest phase started with an introductory session (one week before the start of the intervention). At this occasion, participants were asked to respond to the informed consent form, demographics sheet, and complete the outcome measures to get the baseline data of the study. All the scales/questionnaires were in the Urdu (Native) language of the participants. All the participants willingly responded in a pre-testing phase and provided the baseline data. However, only 8 participants showed interest to be the part of intervention phase (EG). After the pre-testing phase, intervention group participants were briefed about the intervention phase in detail. The intervention phase included a four-week brief mindfulness-based program. Duration of each weekly session was 90 minutes. The 4-week program used in this study is a condensed version of a traditional 8-week MBI program. The rationale behind the BMBIs was to keep the core content and practices of the program over fewer sessions, which mainly included: mindful eating, mindful breathing, body scan, and walking meditation to help women deal with the post-effects of hysterectomy. The sessions were conducted by the first and the second author, who are certified for mindfulness-based stress reduction therapy, online via Zoom.

The decision was made to make this an online intervention after considering the convenience and availability of participants, as well as scheduling issues. The detailed plan of the intervention is presented in table 1.

In the post testing phase, all participants were asked to respond on PPFS and DASS-21, 1 week after the completion of BMBIs program to evaluate the improvement in mental health and PPF among the study participants.

Table 1: The program of the brief mindfulness-based intervention treatment group participants underwent (n = 8)

Treatment Plan	Techniques	Rationale	Outcome
Initial Phase	Rapport building, goal setting, and acceptance.	To encourage and facilitate participation in the BMBI and improve their overall well-being.	Motivated to participate in the BMBI.
Middle Phase	*S1:* Introduction to mindfulness and Raisin exercise.	To motivate and develop an insight along with improved focus and awareness of the present moment.	Participants started to grasp the focus on present moment.
	S2: Mindful Breathing and practicing mindfulness.	To inculcate the concept of mindfulness with each breath and bodily sensation.	Routine practice of mindfulness and living in the present moment.
	S3: Body Scanning and managing thoughts.	To be aware of the psychological impact on physiological changes.	Realized the influence of thoughts on physical reactions.
	S4: Walking Meditation and Emotion regulation.	To focus on improving PPF and emotion regulation.	Motivated to improve psychological well-being and manage their emotions.
Ending Phase	Termination	End of the BMBI program	

Measures

The study relied on two primary groups of outcome measures to assess the effects of the treatment – symptoms of depression, anxiety and stress, and positive psychological functioning.

Depression, anxiety and stress were measured using the Urdu version Depression, Anxiety, and Stress Scale - DASS-21. The DASS-21 is a collection of three self-report subscales that are used to assess depression, anxiety, and stress[36]. Items are rated on a four-point scale ranging from 0 (doesn't apply to me at all) to 3 (applicable most of time). The correlations between variables were: depression and anxiety r = 0.42, anxiety and stress r = 0.46 and depression and stress r = 0.39. The reliability of DASS-21 showed that it has very good Cronbach's alpha values of 0.81, 0.89 and 0.78 for the subscales of depression, anxiety and stress respectively. The Urdu translated version of DASS-21 showed reliable Cronbach's alpha (0.93), Cronbach's alpha for the subscales was also good; 0.83 for stress, 0.86 for anxiety and 0.84 for depression, and 9.3 for the overall measure of DASS-21[37].

Positive psychological functioning was measured using the Positive Psychological Functioning scale (PPFS)[38]. Autonomy, resilience, self-esteem, purpose in life, enjoyment, optimism, curiosity, creativity, humor, environmental mastery, and vitality are the 11 constructs of Positive Psychological Functioning Scale. They can be summed to create a total positive psychological functioning score. Internal consistency of this score in the original version of the scale was high (Cronbach's alpha .91). The Positive Psychological Functioning scale contains 33 items covering all the aspects mentioned above. It is a 5-point Likert-type scale that includes different levels of agreement (ranging from completely agree to completely disagree). The authors of the scale propose that overall scores of PPFS be divided into three categories - low i.e. 33-77, moderate i.e. 78-121 and high i.e. 122-165.

Statistical analysis

In the scope of the analysis, positive psychological functioning was treated as a single score. DASS-21 scores were treated as they are, as three separate scores. To test the effects of mindfulness-based psychotherapy, pretest-posttest comparisons were done for both groups and effect sizes compared. Comparison of the two groups in the pretest and in the posttest, as well as the comparison of mean individual pre-post differences in the outcome measures were presented. Because the sample size was very small, Wilcoxon's signed rank test and Mann-Whitney U test were conducted for within-group pre-post comparisons and between-group comparisons, respectively. Rank-biserial correlation coefficients and Cohen's d values were used as effect size measures.

Given the quasiexperimental nature of the study, inverse propensity weighting was used to balance baseline covariates and approximate the

conditions of a randomized controlled trial. Inverse propensity weights were created from probabilities of group membership (trial or control) obtained from a binary logistic regression model used to predict group membership from baseline values of outcome variables.

For the treatment group, the weights were inverses of group membership probability (weight = 1 / probability), while for the control group weights were the inverse of 1-probability of treatment group membership (weight = 1 / (1-probability)). The weights were than transformed in order to make their sum equal the number of participants in each group, and these transformed weights were used in the weighted analyses.

For interpreting DASS-21 scores specific cutoff points for Urdu-language respondents were not available. Due to this participants' scores were interpreted by: comparing them to the recommended cutoff points for Australian (or English-speaking) respondents[39].

- converting them to z scores using means and standard deviations for Pakistani women reported in the study by Aslam & Kamal[37]. These z scores were then converted to percentiles based on the assumption that the responses of the sample of this study approximate the theoretical normal distribution sufficiently well. This was done by converting z scores to proportions of cases on a theoretical normal distribution that lie below the stated z score PPFS score elevation was interpreted by converting them to z scores using means and standard deviations for Pakistani women reported in a study by Salam *et al* [40]

Results

Symptom severity and positive psychological functioning level

First, depression, anxiety, and stress symptom severity were examined by comparing the scores of the study sample with recommended cutoff points and Pakistani samples for the general population. Results of these comparisons are presented in table 2. Results from pretests indicate that, at the start of the study, both groups showed elevated levels of anxiety, stress, and depression. Classified based on the recommended cutoff points, participants from both groups most often showed mild or moderate depression symptoms and moderate symptoms of anxiety. Relative to stress, normal levels were the most common in the treatment group, while mild were the most common in the frequent group, but mean percentiles put the averages of both groups in the highest quartile on stress. At the start of the study, comparison with values reported by Salam et al. indicates that both groups have very low levels of positive psychological functioning, likely lower than anyone in the reference sample.[40] In the posttest, levels of depression, anxiety, and stress symptoms remained similar to the pretest, but expressed as percentiles they were a few percentiles higher on average. On the other hand, symptom levels of all treatment group participants returned to normal score ranges. Expressed as percentiles, their symptoms were low.

On unweighted data, results (table 3) show that none of the differences between the treatment and the control group on the pretest reached the conventional statistical significance threshold of 0.05. However, this is largely due to the sample size being very small, as differences between the two groups on Depression and Stress are quite substantial. On the other hand, because the sample size is very small, it is comparatively easier to obtain samples with pronounced differences. In both cases, the control group had more pronounced symptoms. Looking at table 3, it can be seen that this is because the treatment group had more participants in the normal category in both cases. Mean PPFS scores of the two groups were practically identical, while the difference in anxiety symptoms were very small in size.

The situation changed drastically after the treatment. In the post-test the treatment group had drastically lower mean scores on the DASS-21 scales and much better positive psychological functioning. The effect sizes are all extreme, with the highest difference being in positive psychological functioning, where Cohen's d value is above 16. Inspection of table 3 indicates that while mean scores in the control group stayed essentially the same and even worsened somewhat, the stress, anxiety, and depression symptoms in the treatment group all returned to normal. Moreover, while positive psychological functioning in both group was lower than that found in the general population in both groups, it remained so in the control group, while in the treatment group it jumped to the 90th percentile of the reference sample from the general population [40].

Table 2: Symptom severity and level of psychological functioning of study participants (n = 16)

Before treatment						
		Normal	Mild	Moderate	Severe	Mean percentile
Treatment group	Depression	2	4	2	0	81%
	Anxiety	0	3	5	0	86%
	Stress	6	2	0	0	81%
	PPFS	x	x	x	x	0%
Control group	Depression	0	5	3	0	88%
	Anxiety	0	0	6	2	89%
	Stress	3	5	0	0	92%
	PPFS	x	x	x	x	0%
After treatment						
		Normal	Mild	Moderate	Severe	Mean percentile
Treatment group	Depression	8	0	0	0	19%
	Anxiety	8	0	0	0	8%
	Stress	8	0	0	0	9%
	PPFS	x	x	x	x	90%
Control group	Depression	0	3	5	0	93%
	Anxiety	0	0	5	3	95%
	Stress	2	6	0	0	94%
	PPFS	x	x	x	x	0%

Note. Categories of DASS-21 scales were based on recommended cutoff points for Australian respondents[39], while DASS-21 mean percentiles are calculated by comparing to a large sample of Pakistani women[37]. PPFS percentiles are calculated by comparing with the sample of Pakistani women from a study that used PPFS[40]. Higher percentiles on Depression, Anxiety, and Stress indicate higher symptoms severity i.e., worse functioning. Higher percentiles on PPFS indicate more positive psychological functioning i.e., a better situation.

Table 3: Comparison between mean scores of the two groups, and of the size of differences between groups, Mann-Whitney U test statistical significance and effect size measures

Unweighted values		Treatment group		Control group				
		Mean	SD	Mean	SD	Statistical significance	Rank-biserial correlation	Cohen's d
Pretest	PPFS	66.88	6.56	67.00	2.93	1.00	.00	-0.02
	Depression	11.75	2.49	12.88	1.89	.43	-.25	-0.51
	Anxiety	11.63	2.33	12.25	1.98	.71	-.13	-0.29
	Stress	13.13	2.42	15.13	1.25	.09	-.52	-1.04
Posttest	PPFS	131.63	4.34	65.50	3.74	p<.01	1.00	16.32
	Depression	2.88	1.36	14.00	0.93	p<.01	-1.00	-9.58
	Anxiety	2.13	1.46	13.88	1.13	p<.01	-1.00	-9.02
	Stress	3.88	1.13	15.88	1.46	p<.01	-1.00	-9.20
Difference pre-post	PPFS	64.75	6.96	-1.50	2.14	p<.01	1.00	12.86
	Depression	-8.88	2.53	1.13	1.64	p<.01	-1.00	-4.69
	Anxiety	-9.50	1.77	1.63	1.92	p<.01	-1.00	-6.01
	Stress	-9.25	2.92	0.75	1.16	p<.01	-1.00	-4.50
Inverse propensity weighted values		Treatment group		Control group				
		Mean	SD	Mean	SD	Statistical significance	Rank-biserial correlation	Cohen's d
Pretest	PPFS	65.57	5.50	67.30	3.01	.45	.44	-0.42
	Depression	12.63	2.29	12.59	1.94	.98	.27	0.02
	Anxiety	12.52	2.30	12.06	2.06	.68	.25	0.22
	Stress	14.80	2.76	14.96	1.29	.88	.44	-0.08

Posttest	PPFS	132.99	3.38	65.77	3.83	p<.01	1.00	19.90
	Depression	1.99	1.39	13.99	0.91	p<.01	1.00	-10.96
	Anxiety	2.48	1.18	13.75	1.13	p<.01	1.00	-10.44
	Stress	3.40	0.96	15.83	1.50	p<.01	1.00	-10.56
Difference pre-post	PPFS	67.41	6.00	-1.53	2.01	p<.01	1.00	16.47
	Depression	-10.64	2.94	1.40	1.71	p<.01	1.00	-5.35
	Anxiety	-10.05	1.64	1.69	2.03	p<.01	1.00	-6.80
	Stress	-11.40	3.28	0.87	1.07	p<.01	1.00	-5.38

Note. Statistical significance presented in the table is the statistical significance of the Mann-Whitney U test comparing the treatment and the control group on the variable in the given row.

Table 4: Comparison between pretest and posttest values of the two groups, statistical significance of the Wilcoxon's signed rank test and effect size measures

		Unweighted posttest-pretest comparisons			Inverse propensity weighted posttest-pretest comparisons		
Unweighted posttest-pretest comparisons		Statistical significance	Rank-biserial correlation	Cohen's d	Statistical significance	Rank-biserial correlation	Cohen's d
Treatment group	PPFS	.01	-1.00	-9.30	.02	-.80	-8.63
	Depression	.01	1.00	3.51	.02	.80	2.30
	Anxiety	.01	1.00	5.36	.02	.80	8.38
	Stress	.01	1.00	3.17	.02	.80	2.07
Control group	PPFS	.10	.67	0.70	.09	.61	1.41
	Depression	.10	-.67	-0.69	.08	-.61	-0.80
	Anxiety	.07	-.79	-0.85	.06	-.66	-0.70
	Stress	.12	-.61	-0.64	.11	-.57	-1.07

Note. Statistical significance presented in the table is the statistical significance of the Wilcoxon's signed rank test comparing the posttest and pretest values.

Inspection of the pretest-posttest differences (table 4) in the two groups confirms these findings. The differences in pre-post differences between the treatment and the control group are statistically significant and of extreme size in all cases. They are the most pronounced in positive psychological functioning.

Conclusions are the same when looking at inverse propensity weighted data. The main difference is that now the moderate difference in the pretest is on Positive Psychological Functioning, while the difference of Depression disappeared. The conclusions are the same.

Comparison of the pretest and posttest values in the two groups indicates that the treatment group has shown a statistically significant improvement of extreme size on all 4 outcome measures. On the other hand, the differences in pretest-posttest mean values in the control group are not statistically significant. Effect size measures indicate that they are moderately worse. The conclusions are the same both when looking at unweighted and when looking at inverse propensity weighted data.

Discussion

After a hysterectomy, a woman is no longer able to carry a pregnancy because the uterus has been removed. Therefore, biological pregnancy is not possible following this procedure. Patients are typically discharged from the hospital five days post-hysterectomy. The period of physical recovery from hysterectomy typically lasts between 6 and 8 weeks. Studies indicate that when this procedure is conducted on women past reproductive age, it may not result in adverse mental health consequences. In fact, in this population, adverse mental health issues are often caused by the gynecological disorder (cancer, bleeding…) hysterectomy procedure was conducted to resolve. Because of this, the mental health of these women can show improvement after a surgery that afforded them relief from those disorders[41,42]. However, the situation is different in younger women, women still in their reproductive prime. In this group, the removal of the uterus can bring about adverse mental health changes that can take a lot longer to diminish. The removal of the

uterus can lead to feelings of sadness and anxiety, even when the ovaries are preserved. This may particularly be the case in Pakistani society, in which there is a strong emphasis on female reproductive health. That is why providing adequate mental health support to this group is of particular importance.

The current study sought to examine the effectiveness of a 4-week brief mindfulness-based intervention in reducing symptoms of psychological distress in a group of women of reproductive age who underwent hysterectomy up to a month before the study. Results showed that their symptoms of psychological distress were elevated at the start of the study, and the level of positive psychological functioning was extremely low. Compared to results of a large sample of Pakistani women affected by floods, a very stressful event, pretreatment levels of psychological distress (anxiety, stress, depression), are substantially higher on average in the sample of this study compared to that sample, with the mean value of participants in the current study corresponding to 81-92 percentile of women as reported in that study[37]. Pretreatment level of positive psychological functioning of participants of this study was compared to the sample of Pakistani adult women reported in a 2020 study. The positive psychological functioning levels of participants of the current study was lower than the level reported by any of the participants of that study, corresponding to their 0 percentile[40]. These confirm the expectation that quality of psychological functioning after hysterectomy in these young women was greatly diminished, with heightened psychological distress (substantially higher than that of people who survived floods), and greatly diminished positive psychological functioning.

However, after 4-weeks of intervention, the indicators of psychological distress (anxiety, stress, depression) returned to normal in all participants, while the level of psychological functioning became high compared to a reference sample of Pakistani women. In contrast to that, there were no changes in the control group and it even showed the worsening of the symptoms. Expressed in terms of statistical effect sizes, the observed changes in the treatment group were of extreme size.

Contemplating how these changes came to be it comes to mind that the BMBI the treatment group underwent may have given them a renewed sense of purpose, leading to an increase in their overall well-being. Qualitative review of the treatment experience indicates that many treatment group participants exhibited increased mindfulness and acceptance of their current selves. Participants may have gained a deeper understanding of the intricate relationship between thoughts, emotions, and mental well-being. During the treatment, some participants expressed a lack of optimism and sought guidance on managing their thoughts and emotions after undergoing a hysterectomy, despite having sufficient family support.

Other participants displayed a positive attitude from the start, leading to notable improvements in their mental health and PPF. Having a clear grasp of mindfulness and how it can be applied in everyday life may have contributed to enhancing positive psychological functioning. After the study, some participants noted that they have become more mindful of their actions, even in simple tasks like using the restroom. They pay close attention to each step involved in completing the task. Others reported an increased awareness of their thoughts and emotions and are actively working on regulating and managing their emotional responses.

Strengths and limitations of the study

The current study has several strengths, but also multiple limitations that need to be mentioned. Looking at strengths, this is one of the first studies examining the effects of a mindfulness-based intervention on a sample of women of reproductive age who underwent the hysterectomy procedure and results strongly supported the effectiveness of the treatment. Such women are comparatively rare as hysterectomy is primarily conducted on women after menopause. A study on a large sample in Germany reported that only 10% of hysterectomy patients are below the age of 39[43]. Therefore, the sample of this study comes from a very small subsegment of hysterectomy patients whose psychological reactions to the procedure are also most often different from those of older women.

Another important strength of this study is that it was conducted, and the intervention delivered, very soon after the hysterectomy procedure, while study participants were still physically recovering from it. The study used a well-established and tested measure of psychological distress, but it also included a measure of positive psychological

functioning. Positive psychological functioning is an aspect of overall mental health and well-being that is often neglected by researchers in clinical settings who primarily focus on the so-called negative psychological symptoms. Finally, the study was conducted on women in Pakistan, a sample from a population that is comparatively very much underrepresented in psychological research, particularly in research published in international journals.

That said, the study also has a number of limitations that need mentioning. Most notably, it was not possible to make this study a randomized controlled trial. Due to the nature of postoperative recovery of participating women (which did not allow a waitlist control group) and study authors' position, to be able to conduct the study at all, it was necessary to allow women to select whether they are willing to be a part of the treatment group or not. Second, due to the nature of the mindfulness-based interventions (and psychotherapeutic interventions in general), it was not possible to conceal the group assignment from the participating women. It is obvious when one is undergoing a mindfulness-based treatment, and it would be ethically problematic to have women still physically recovering from a serious surgical intervention undergo a sham treatment, while keeping them in false belief that it is a therapeutic intervention. Due to this, it was decided to have a no treatment control group and this was an open label study.
However, an open label approach combined with the fact that all outcome variables were assessed through self-reports opens door for reporting bias in the form of Hawthorne effect. On the other hand, this is a limitation often found in published studies testing the effectiveness of psychotherapeutic treatment. Third, the other side of the fact that the study was examining a very rare segment of hysterectomy patients is that the sample was very small. As already mentioned, women of reproductive age undergoing hysterectomy are a very small part of the total number of hysterectomy patients. Combined with the fact that the need to find include women soon after the study procedure further limited the number of women that could be recruited for participation. Finally, the study did not have a follow-up. All the measurements presented here come from within two months after the operation

Conclusions

In summary, the study showed that a brief 4-week mindfulness-based intervention might be an effective way to help young women / women of reproductive age who underwent hysterectomy cope with adverse mental health consequences associated with the procedure and gynecological issues due to which it was conducted. At the start of the study i.e., within 4 weeks of the surgery, most study participants showed mild or moderate levels of psychological distress indicators (depression, anxiety, stress), and very low positive psychological functioning.
However, after the intervention, values of distress indicators in the group that underwent the treatment returned to the normal range and positive psychological functioning greatly improved. In contrast, values of the outcome variables in the control group stayed the same or even worsened somewhat. While definite conclusions would require further research, these results very strongly indicate that brief mindfulness-based interventions might be a very useful tool for providing support to young women who underwent hysterectomy in the postoperative period.

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Data availability

The study dataset can be downloaded from OSF using the link - https://osf.io/hdv8c/?view_only=01efc5554dbd4913b35acce30a429afb.

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