



Effects of mindfulness-based childbirth education on prenatal anxiety: A quasi-experimental study

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ABSTRACT

Pregnancy and childbirth represent a sequence of challenging events, and adaptive coping strategies are necessary to maintain emotional wellbeing. The present study aimed to assess the effectiveness of applying a mindfulness-based intervention (MBI) for pregnant Saudi women with anxiety in the third trimester. A quasi-experimental, within- and between-subject design was used for this study. Data were collected at two points between February and August 2021 from 88 participants using the Pregnancy-Related Anxiety Questionnaire and the Five Facet Mindfulness Questionnaire. A large, statistically significant reduction was observed in the mean scores of participants' anxiety post-intervention. Furthermore, the anxiety level in the intervention group was very low post-intervention compared to that in the control group. *Level of education* and *spontaneous or medically necessary abortion* significantly influenced participants' anxiety. The MBI sessions helped nulliparous women experience less anxiety during pregnancy. Healthcare providers' awareness about the importance of incorporating mindfulness in childbirth education should be increased. Future research should examine the long-term effects of mindfulness-based techniques on maternal health.

1. Introduction

Pregnancy and childbirth are unique experiences for pregnant women, and adaptive coping strategies are necessary to maintain health and wellbeing. Pregnant women are susceptible to psychological ambivalence, frequent mood swings from exhaustion to elation, emotional issues, or anxiety-depressive disorder (Bjelica et al., 2018). Anxiety during pregnancy can be associated with several phenomena, such as generalized anxiety and pregnancy-related anxiety (PRA) (Naja et al., 2020). Pregnancy-related anxiety is a distinct form of anxiety disorder that differs from general anxiety and depression (Anderson et al., 2019; Brunton et al., 2019). It affects expectant mothers and is characterized by excessive worry and fear regarding the health of the fetus, fetal loss, childbirth experience, parenting, and newborn care, as well as pregnancy-related social and financial challenges (Bayrampour et al., 2016).

Pregnancy-related anxiety is a growing problem globally, with a

prevalence rate ranging between 29.2 % and 34.4 % in lower- and middle-income countries (Dennis et al., 2017; Nielsen-Scott et al., 2022) and approximately 19.4 % in high-income countries (Dennis et al., 2017). Studies conducted in Saudi Arabia have revealed that the prevalence of PRA ranges between 34.6 % and 54 % (Alqahtani et al., 2018; Khouj et al., 2022) and has increased to 75.3 % during the coronavirus disease 2019 (COVID-19) pandemic (Abahussain et al., 2022). Pregnant women in the third trimester experience higher PRA compared to those in the first and second trimesters (Saadati et al., 2021), and nulliparous women experience greater PRA than multiparous women (Brunton et al., 2019).

Anxiety experienced by mothers during pregnancy may result in adverse pregnancy outcomes that threaten the physical and mental health of both the mother and child (Kashanian et al., 2021). Negative experiences during childbirth can lead to a state of psychological anxiety (Tani & Castagna, 2017). Pregnancy-induced anxiety increases the likelihood of postpartum depression (Swinson, 2006). In addition, PRA

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has been associated with negative childbirth experiences such as labor induction and the use of labor medication (Hoyer et al., 2020). However, a positive childbirth experience can improve maternal mental health and strengthen mother-infant attachment (Brubaker et al., 2019; Molgora et al., 2020). Therefore, the World Health Organization highlighted the importance of high-quality care and positive childbirth experiences, including complementary care such as mindfulness (World Health Organization, 2018). Thus, adopting preventive measures for PRA is of great importance for pregnant women.

Mindfulness-based interventions (MBIs) geared toward pregnant women or expecting couples gain popularity to alleviate the burden of anxiety during pregnancy. Furthermore, MBIs that employ mindfulness-based cognitive therapy or mindfulness-based stress reduction (MBSR) are effective in reducing anxiety levels and fostering emotional resilience among pregnant women (Callanan et al., 2022; Jenkins et al., 2022; Kvasnak et al., 2021; Shi & MacBeth, 2017). For example, a number of researchers reported that MBSR is appropriate for Chinese pregnant women and is beneficial in reducing PRA (Zhang et al., 2019). Mindfulness-based stress reduction in childbirth classes—developed in the United States by midwife and mindfulness teacher Nancy Bardacke—integrates teachings of mindfulness via formal and informal meditations with the knowledge of the psychobiological process in pregnancy, birth, breastfeeding, postpartum adjustment, and the psychological needs of the infant (Duncan & Bardacke, 2010). It serves to prevent or attenuate the development of PRA symptoms during the perinatal period (Güney et al., 2022; Zhang et al., 2019).

The definition of “mindfulness” has been modified for use in psychotherapy and now comprises a broad range of ideas and practices (Siegel et al., 2009). Mindfulness has been defined as “the awareness that emerges through paying attention, on purpose, in the present moment, and non-judgmentally to the unfolding of experience moment by moment” (Kabat-Zinn, 2003, p.145).

Mindfulness is inspired by Eastern Asian spiritual and religious practices, particularly Buddhism, and considering its cultural associations is important. These issues have led to studies on Muslims' and Christians' cultural acceptance of mindfulness-based interventions (Blignault et al., 2021; Hathaway & Tan, 2009; Trammel, 2015; Vandenberghe & Costa Prado, 2009). These studies have reported the acceptability of mindfulness-based interventions when adapted to account for individuals' cultural and spiritual backgrounds (Vandenberghe & Costa Prado, 2009).

As mindfulness practices such as meditation are consistent with Islamic principles, the influence of Islamic culture and principles on Saudi society facilitates the adaptation of mindfulness practices (Al-atiq, 2016). Previous researchers assessed the frequency of mediation among Saudi and non-Saudi residents of Saudi Arabia aged over 18 years to understand its impact on mental health, such as anxiety; they found that 75 % of the participants engaged in some form of meditation (Alhusseini et al., 2021). The authors (Bahattab & AlHadi, 2021) implemented acceptance and commitment therapy, which included a mindfulness exercise as part of the therapy to reduce the symptoms of anxiety and depression among Saudi Muslim women, and found it to be effective. These studies support the idea that mindfulness is a potential way to reduce anxiety among Saudi women.

To our knowledge, this is one of the earliest exploratory studies using an MBI for pregnant women in Saudi Arabia. Therefore, the purpose of this study was to examine the effect of MBI in managing PRA among pregnant women in the Saudi context. We also examined the relationship between pregnant women's sociodemographic characteristics (age, level of education, and prior spontaneous or medically necessary abortion) and level of anxiety.

2. Methods

2.1. Research design

A quasi-experimental, within- and between-subject design was used for this study. Surveys were conducted at two points in time. Data were collected one week before and one month after the intervention. The authors followed the TREND statement checklist for nonrandomized controlled trials to present this study.

2.2. Sampling and data collection procedure

Participants were recruited from a childbirth education clinic through the convenience sampling method. The clinic was chosen as it is part of a main maternity hospital in the Eastern region of Saudi Arabia. Other clinics in Saudi Arabia were not included as they were not accessible to the researchers, especially during the COVID-19 lockdown. The research team distributed a quick response code, which could be used to check the inclusion criteria. Those who met the inclusion criteria and agreed to participate in the study were included in either the control or the intervention group on a non-random basis. Those interested in participating in the educational sessions were sent another online form to check their availability.

The inclusion criteria were as follows: 1) English proficiency, 2) being a nulliparous woman with low-risk, healthy, singleton pregnancies, 3) having an intimate partner, and 4) a 30-week gestation period at the start of the intervention. English proficiency was necessary as the instruments were provided in English. The research team decided not to translate the instruments to avoid affecting their reliability and validity. Furthermore, the aim of the study was not to test the psychometric properties of the instruments; instead, it was to test the effectiveness of the intervention during this preliminary study. The inclusion of nulliparous women, especially those with a lower risk of pregnancy, was necessary owing to the limited literature. Moreover, those with psychiatric illnesses or those without an intimate partner were not eligible to participate in the study as these may be covariates that need to be controlled to not affect the feasibility of the intervention. However, it was not necessary for the participants to include their intimate partner in the study.

All eligibility screening and assessments were conducted through an online survey. The recruitment statement included information regarding the purpose of the study, potential risks and benefits, confidentiality, and the privacy of participants. Participants in the intervention group were informed that they could reschedule their weekly sessions based on their preferences. Data were collected between February and August 2021 using self-report questionnaires.

The G-power was used to determine the minimum sample size required to run the statistical analysis. Under a significance level of 0.05, a power of 0.80, and an effect size of 0.15, a minimum sample of 77 participants was needed to run the multivariate analysis. The total sample size of this study was 88 participants; each group consisted of 44 participants. In the intervention group, participants' age ranged from 26 to 41 years, with an average age of 35.1 years. The majority of participants (54.5 %) had a bachelor's degree or higher and were employed (78 %). Participants who had at least one spontaneous or medically necessary abortion represented 45.5 % of the sample. In the control group, participants' age ranged from 23 to 45 years, with an average age of 30.1 years. Those who had at least one elective abortion represented 11.4 % ($N = 10$). Most participants had either a diploma (30.8 %) or a bachelor's degree (35.9 %) and were employed (60.5 %).

2.3. Intervention

The intervention for expecting mothers and their partners was specifically designed to train them in mindfulness-based childbirth education. Individual classes were conducted for each couple. This

intervention was adapted from MBSR and childbirth education program. The MBSR was originally developed by Kabat-Zinn (2003). The program involved the following: 1) body scan meditation, 2) sitting meditation, 3) awareness of pleasant and unpleasant events, 4) awareness of breathing, and 5) awareness of routine activities and events such as eating and waking, and awareness of interpersonal communications (Table 1). To ensure that mindfulness practices provided in the content are compatible with Saudi culture, pilot testing was conducted on three couples.

The participants were offered structured mindfulness educational sessions with a childbirth education program consisting of approximately 2 h of instruction over eight weeks. The content of the adopted mindfulness-based childbirth educational sessions was delivered using videos, posters, books, and guided meditation. Participants in the intervention group were also provided with weekly assignments relevant to the material presented in class and 20-min guided meditations, which they were encouraged to utilize daily.

To maintain efficacy, the intervention was carried out by professionally certified childbirth educators and meditation teachers. To ensure adherence to the intervention, participants were asked to provide their preferences regarding the day and time of the weekly session. Participants in the control group received only a routine prenatal care service, which included routine prenatal visits with medical checkups. The researchers did not interfere with the control group.

The mindfulness-based childbirth education incorporated two approaches: (1) mindfulness of thoughts and feelings through breath

Table 1
The content of the adopted mindfulness-based childbirth educational sessions.

Content	Duration
Week 1	2.5 h
A clear description of the Mindfulness Triangle of Awareness	
Tips for Mindful Eating (training)	
Tips for the Meditation Journey (training)	
Session 2	2.5 h
Discussion on Home Practice Assignment of the previous week	
Body Scan Meditation	
Three Steps Breathing Space	
The 8 Attitudinal qualities of Mindfulness	
Mindful Movement/Mindful Walking	
The Blob-Pleasant Event	
Session 3	2.5 h
Discussion on Home Practice Assignment of the previous week	
Awareness of Breath and Body Meditation	
Informal Practice S.T.O.P	
Mindful Yoga	
Session 4	2.5 h
Discussion on Home Practice Assignment of the previous week	
Turning Toward the Difficult Meditation	
Responsive/Reactive Modes of minds	
Acceptance precedes Change	
Session 5	2.5 h
Discussion on Home Practice Assignment of the previous week	
Awareness of Thoughts Meditation	
Why are our Negative Thoughts so powerful?	
Session 6	2.5 h
Discussion on Home Practice Assignment of the previous week	
Mindful Communication	
How to label the emotions to calm the Brain	
Session 7	2.5 h
Discussion on Home Practice Assignment of the previous week	
Kindly Body Awareness Meditation	
G.L.A.D finding joy and balance in your life	
GLAD:	
G: Become aware of any Gratitude that you are thankful for today	
L: Bring to mind one new thing you Learned today	
A: Become aware of one small Accomplishment you did today	
D: Delight	
Session 8	2.5 h
Discussion on Home Practice Assignment of the previous week	
A Mindful Life, Tips for Daily Mindfulness	

awareness and (2) mindfulness of the body through guided body awareness meditation and mindful yoga. The intervention contained approximately equal aspects of education, discussion, and exercises. Adaptations of mindfulness-based childbirth education components included (1) awareness of the developing fetus during the body scan meditation and (2) the use of exercises related to pregnancy, such as mindfulness regarding pain and anxiety about labor. Furthermore, the standard childbirth preparation classes provide women with evidence-based information to assist them in making informed decisions (i.e., physiology of pregnancy, mothers' needs in pregnancy, exercise, stages of labor, pregnancy nutrition, stages of labor, the role of hormones, common discomforts during pregnancy, protecting the birth environment, birth team roles, birthing positions, minimizing medical interventions and making the birth plan).

2.4. Measurement

The sociodemographic form included entries for age, gender, occupation, educational attainment, prior elective abortion, and presence of a psychiatric condition or psychological disorder. From the Islamic perspective, "abortion" is defined as "termination of pregnancy before viability" (Iqbal et al., 2019, p. 1). Previous researchers reported that a prior abortion experience is one of the major factors that lead to anxiety among pregnant women (Pershad et al., 2022; Silva et al., 2017). Therefore, abortion, *spontaneous or medically necessary abortion*, was included in this study as a demographic variable. Participants were only asked whether they had an abortion in the past. Furthermore, we aimed to test whether the intervention has a positive impact on ameliorating the effect of factors such as abortion rather than a focused effect on a particular type of abortion (i.e., early abortion, late abortion, threatened abortion, or induced abortion).

Data were collected using the Pregnancy-Related Anxiety Questionnaire (PRAQ-R2) and the Five Facet Mindfulness Questionnaire (FFMQ). The PRAQ-R2 is a self-report measure developed by Huizink et al. (2016) that measures anxiety during pregnancy. It consists of 11 items rated on a five-point Likert scale and three subscales: *fear of delivery*, *anxiety about giving birth to a child with physical or mental disabilities*, and *anxiety about physical changes*. Summing all items produces an overall scale score that reflects the anxiety level of participants (Huizink et al., 2016). A higher score indicates greater anxiety levels. The reliability and validity of the PRAQ-R2 were established and were acceptable. In this study, the Cronbach's α of the subscales ranged from 0.74 to 0.95 (Huizink et al., 2016).

The FFMQ was developed by Baer et al. (2006) to assess mindfulness skills among participants. It comprises 39 items and five subscales: observing, describing, acting with awareness, non-judging of inner experiences, and non-reacting to inner experiences. The reliability of the scale has been established in previous research and has shown acceptable results; Cronbach's α ranged from 0.75 to 0.91 (Duncan et al., 2017). In this study, Cronbach's α of the subscales ranged from 0.71 to 0.92.

2.5. Ethical considerations

The study was performed following the Declaration of Helsinki. The approval of the concerned institutional review board was obtained prior to data collection. The research team informed participants that their participation was completely voluntary and they had the right to withdraw at any time during the study with no consequences. Participants were informed that access to their responses was restricted to the primary investigator and that the data would be destroyed once the study was complete. To maintain participants' confidentiality, responses were reported in aggregate form. Signed informed consent was obtained from all participants. Permission to use the instruments was granted by the original authors (Baer et al., 2006; Huizink et al., 2016).

2.6. Data analysis

The data were analyzed using the software package IBM SPSS Version 27. The descriptive statistics included the central tendency measures (mean), and dispersion measures (standard deviation) were used to perform the analysis of the items and subscales. The dependent sample *t*-test was used to determine the influence of the mindfulness intervention on pregnancy anxiety. Multiple linear regression was used to determine the relationship between the demographic characteristics and anxiety.

3. Results

3.1. Descriptive statistics and subscales of FFMQ

Table 2 presents the descriptive statistics and subscales of FFMQ pre- to post-intervention. In the pretest measures, participants showed a moderate level of mindfulness; the scores of FFMQ subscales ranged from 2.98 to 3.42 but significantly increased after the intervention ($p < .05$). The paired sample *t*-test showed a significant improvement in FFMQ scores ($t = 9.4, df = 87, 95\% \text{ CI } [0.327, 0.502], p < .001$).

3.2. Anxiety level pre- to post-MBI (within-subject design)

Table 3 shows the items and subscales analysis of PRAQ. Cronbach's α of the subscales ranged from 0.74 to 0.95. The average anxiety score for all subscales was moderate; nevertheless, the average score for "fear of giving birth" was the highest ($M = 3.27, SD = 0.88$). The paired sample *t*-test was used to determine whether there was a statistically significant difference in the mean scores of participants' anxiety before and after the MBI. The results indicated that mindfulness was associated with a significant reduction in participants' anxiety scores, $95\% \text{ CI } [0.086, 1.33], t(37) = 2.39, p < .05$ (Table 4).

3.3. Comparison of differences in anxiety level (between-subject design)

The independent sample *t*-test was used to compare the baseline data of anxiety between intervention and control groups. The results indicated that the intervention ($M = 2.82, SD = 0.97$) and control groups ($M = 2.94, SD = 0.82$) were homogenous ($p > .05$). After the mindfulness intervention, the anxiety scores reduced significantly in the intervention group compared to the control group ($95\% \text{ CI } [0.389, 1.04], t(86) = 4.35, p < .001$). Table 4 provides more information.

3.4. Individuals' characteristics and levels of anxiety

Multiple linear regression was used to determine the relationship between participants' characteristics and level of anxiety among participants at the baseline and post-intervention. Prior to intervention, education level and prior spontaneous or medically necessary abortion had a statistically significant influence on participants' anxiety. Participants with a diploma or high school education reported higher anxiety

Table 2
Descriptive Statistics of FFMQ and Its Subscales.

Scale/subscales	Pretest (M \pm SD)	Posttest (M \pm SD)	P-value
FFMQ	3.07 (0.39)	3.49 (0.36)	<.001
Observing	3.42 (0.71)	3.54 (0.68)	.08
Describing	2.73 (0.89)	3.34 (0.95)	<.001
Acting with awareness	3.13 (0.66)	3.81 (0.71)	<.001
Non-judging of inner experiences	3.05 (0.64)	3.62 (0.64)	<.001
Non-reacting to inner experiences	2.98 (0.84)	3.34 (0.69)	.003

Note: M = mean, SD = standard deviation.

Table 3
Descriptive Statistics of Pregnancy-related Anxiety Questionnaire Items/Subscales.

Subscales/item	Pretest (M \pm SD)	Posttest (M \pm SD)	P-value
Fear of Giving Birth	3.27 \pm 0.88	2.33 \pm 0.711	<.001
I am anxious about the delivery	3.28 \pm 0.982	2.47 \pm 1.22	
I am worried about the pain of contractions and the pain during delivery	3.33 \pm 1.0	2.27 \pm 0.75	
I am worried about not being able to control myself during labor and fear that I will scream.	3.20 \pm 1.2	2.25 \pm 0.99	
Worries about bearing a handicapped child	2.62 \pm 1.1	2.02 \pm 0.83	<.01
I sometimes think that our child will be in poor health or will be prone to illnesses.	2.64 \pm 1.1	2.06 \pm 0.92	
I am afraid the baby will be mentally handicapped or will suffer from brain damage.	2.65 \pm 1.3	1.97 \pm 0.89	
I am afraid our baby will be stillborn, or will die during or immediately after delivery	2.57 \pm 1.2	2.0 \pm 1.27	
I am afraid that our baby will suffer from a physical defect or worry that something will be physically wrong with the baby.	2.64 \pm 1.2	2.1 \pm 0.93	
Concern about own appearance	2.84 \pm 0.98	2.34 \pm 0.91	<.05
I am worried about the fact that I shall not regain my figure after delivery.	3.05 \pm 1.1	2.22 \pm 1.0	
I am concerned about my unattractive appearance.	2.74 \pm 1.1	2.54 \pm 1.06	
I am worried about my enormous weight gain.	3.20 \pm 1.2	2.25 \pm 0.99	

Note: M = mean, SD = standard deviation.

Table 4
Comparison of differences in anxiety levels within and between subject designs.

Comparison	Anxiety M \pm SD		t-value	p	95% CI	
	Pretest	Post-test			LLCI	UPCI
Within subject	2.92 \pm 0.96	2.2 \pm 0.73	2.39*	0.02	0.086	1.33
Between subject	Control group 2.95 \pm 0.82	Intervention group 2.22 \pm 0.71	4.35**	<0.001	0.389	1.04

* $P < .05$.

** $P < .001$.

scores, $F(3, 70) = 3.10, \beta = -0.28, p < .05$. Furthermore, participants who had an abortion were more likely to experience anxiety compared to their counterparts; $F(3, 70) = 3.10, \beta = -0.29, p < .05$ (Table 5). After the intervention, participants' characteristics (age, level of education, and abortion) had no statistically significant influence on participants' anxiety scores ($p = .36$).

4. Discussion

Owing to its potential negative effect on the wellbeing and health of pregnant women and children, PRA is a risk factor for adverse pregnancy outcomes. This study assessed the effectiveness of MBI in managing anxiety levels in a sample of pregnant women residing in Saudi Arabia. Following the implementation of the MBI program, the changes in the PRA levels among the participants were greater (levels were reduced further than) for those in the experimental group than among the participants in the control group. This may indicate that MBI was effective in reducing participants' anxiety. A probable reason for lowering PRA may be that MBI helps pregnant women learn new skills to

Table 5
Relationship between participants' characteristics and anxiety pre and post intervention ($N = 88$).

Variables	Age				Level of education				Abortion			
	B	β	t	p	B	β	t	p	B	β	t	p
Anxiety (Pre-test)	0.04	0.21	1.86	.06	-0.41	-0.28	-0.223	0.02*	-0.53	-0.29	-2.25	.02*
Anxiety (Post-test)	0.011	0.09	0.380	.709	-0.049	-0.05	-0.187	0.85	0.745	0.406	1.64	.121
Pre-test	Model Summary ($F = 3.10, R^2 = 0.11, p = .032$)											
Post-test	Model Summary ($F = 1.51, R^2 = 18.7, p = .361$)											

Note: B = unstandardized coefficient; β = standardized coefficient.

* $p < .05$.

reduce anxiety and respond to such feelings in appropriate ways.

Numerous researchers have examined the influence of different MBIs on managing PRA (Güney et al., 2022; Mohamed, 2017; Pan et al., 2019; Yazdanimehr et al., 2016; Zarenejad et al., 2020; Zhang et al., 2019). Regardless of the differences in applying the mindfulness-based interventions and the type of methodology used across these studies, their findings are consistent with those of our study. In a distinct approach to applying MBI, Goetz et al. (2020) investigated the effectiveness of a brief one-week electronic mindfulness on reducing prenatal anxiety among high-risk pregnant women. Participants were able to access the mind-mom app to learn how to reduce pregnancy-related anxiety and increase emotional resilience. This app included specific videos, audio files, and interactive worksheets (Goetz et al., 2020). Their findings revealed that those who have completed at least 50 % of the one-week course had a significant reduction in pregnancy-related anxiety. Previous researchers (Güney et al., 2022) explored the effectiveness of a four-week live online MBSR program in pregnant women diagnosed with COVID-19 in Turkey and showed a significant reduction in levels of distress, anxiety, childbirth fear in experimental in comparison to the control group.

The present study explored the influence of demographic characteristics (age, level of education, and abortion) on anxiety levels among pregnant women. We found no significant difference between younger and older pregnant women regarding the levels of anxiety during pregnancy. This result is not consistent with previous research 7/2/2023 5:51:00 AM, which reported a positive and significant association between age and anxiety among pregnant women. The difference between our findings and previous findings can be related to the average age of our sample; the majority of our participants were older than 30 years ($M = 35.1, SD \pm 4.55$).

The present study shows that a history of abortion significantly influences participants' anxiety. Those who had spontaneous or medically necessary an abortion were more likely to experience anxiety. In line with this study, researchers (Cena et al., 2020; Marcinko et al., 2011) demonstrated that women with a history of abortion had higher anxiety scores compared to pregnant women without a history of abortion. Similarly, previous researchers (Srinivasan et al., 2020) found that women with pregnancy complications had greater anxiety levels compared to women without serious complications during pregnancy. Many studies (Al-Aithan et al., 2021; Foster et al., 2015; Ghezi et al., 2021; Silva et al., 2017) reported that the number of miscarriages is significantly associated with anxiety during pregnancy.

Our findings also show that participants with a diploma or high school education have higher anxiety. This result is congruent with a previous study (Rubertsson et al., 2014), which found that participants whose highest education was a high school degree were at an increased risk of heightened anxiety symptoms during early pregnancy. In addition, it was found that a low education level reinforces the symptoms of anxiety during pregnancy (Deklava et al., 2015). However, demographic characteristics had no influence on participants' anxiety after the intervention, indicating that the intervention was effective in controlling the variability in participants' levels of PRA regardless of their individual characteristics. Other demographic factors, such as the number of miscarriages, self-efficacy, and attending training courses, were not examined in this study. These factors may provide in-depth details about

the nature of the PRA among pregnant women, thereby requiring further studies.

Although the empirical findings from the present and previous studies demonstrate that mindfulness helps reduce anxiety levels during pregnancy, several researchers have reported a lack of favorable outcomes following the implementation of an MBI. This could be due to methodological issues in the implementation of the mindfulness-based intervention programs in those studies, the positive effects of MBI on PRA cannot be disputed based on their results. For instance, Zarenejad et al. (2020) conducted a randomized controlled trial and reported reductions in anxiety among the experimental group—pregnant mothers who participated in mindfulness sessions; however, they also reported reduced anxiety among those in the control group. Their findings may be attributable to the Hawthorne effect (i.e., mothers' awareness of their condition), as those in the control group may have had access to information from other sources that effectively reduced their anxiety. Moreover, Woolhouse et al. (2014) found no significant difference between the intervention and control groups in their anxiety; however, their results could have been influenced by the study's internal validity and the vast differences in their sample sizes. These methodological issues can be addressed in future studies.

4.1. Implications

To the best of our knowledge, this is the first study in Saudi Arabia that aims to implement a mindfulness-based childbirth education program for pregnant women. The findings of the present study can be applied and may have a considerable impact on mental health issues that affect women and their partners. Currently, childbirth education classes in Saudi Arabia are offered at no cost in primary healthcare centers (Otaibi, 2017). If midwives were trained to teach an MBSR, pregnant women, their infants, and partners may experience multiple benefits from learning mindfulness, compassion skills, and practices. Utilizing a mindfulness-based childbirth program may help prevent PRA and improve pregnancy outcomes.

4.2. Study strengths and limitations

To our knowledge, this is the first study to assess the effectiveness of implementing MBIs during pregnancy in Saudi Arabia. However, this study has several limitations. Participants were mainly recruited from a childbirth education clinic in Saudi Arabia using the convenience sampling method. Therefore, other pregnant women in different countries may not share similar characteristics. In addition, the sample was limited to nulliparous women. Therefore, the results cannot be generalized to multiparous women. Furthermore, the use of a self-report measure may have caused social desirability bias. To minimize this effect, participants were informed that their personal identifiers would not be collected. Anxiety was measured using a self-reported questionnaire, which may not reflect actual anxiety levels. Future researchers are recommended to use objective measures for anxiety. Finally, the inclusion of participants who are proficient in English may have negatively affected the representativeness of the sample. Future research should translate the tools and include non-English speakers to enhance the

generalizability of the findings.

4.3. Recommendations

Based on the findings of the present study, mindfulness-based childbirth education has a positive impact on reducing PRA levels among pregnant women. Therefore, it is essential to increase healthcare providers' awareness of the importance of mindfulness-based childbirth education. Given the limitations of this study, future studies should be conducted for multiparous women to examine the effect of mindfulness-based childbirth education on their anxiety levels and pregnancy outcomes. Future research should examine the long-term effects of mindfulness-based childbirth techniques on maternal health. Large-scale randomized control trials are thus required to obtain definitive evidence.

4.4. Conclusion

Based on the findings, providing mindfulness-based childbirth educational sessions that incorporate mindfulness training skills helps pregnant women learn how to respond to and reduce anxiety more effectively throughout their prenatal care and the last weeks of pregnancy. Furthermore, spontaneous or medically necessary abortion experience and education level influence the level of anxiety among pregnant women. Finally, all presented findings are particularly essential for countries where mindfulness training skills are not applied as a component of prenatal education sessions. Future studies with a robust design (e.g., randomized controlled trials) are recommended to determine the causal relationship between mindfulness and anxiety among pregnant women throughout the prenatal routine care period.

Ethics statement

The Institutional Review Board approvals were obtained from King Saud University (Ref No: KSU-HE-21-111) and Qatif Central Hospital (SREC0258/2021). The study was performed following the Declaration of Helsinki.

Consent

Signed informed consent was obtained from all participants.

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Declaration of competing interest

None.

Data availability

Data will be made available on request.

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References

Abahussain, E., Al-Otaibi, M., Al-Humaidi, K., Al-Mutairi, S., Al-Khatir, A., Abualnaja, A., & Al-Mazidi, S. (2022). Pregnancy complications in pandemics: Is pregnancy-related anxiety a possible physiological risk factor? *International Journal of Environmental*

Research and Public Health, 19(19), 12119. <https://doi.org/10.3390/ijerph191912119>

- Al-Aithan, S. M., Al-Ghaffi, L. A., Al-Shehri, S. Z., & Al-Umran, A. K. (2021). Anxiety among multiparous women in the Al-Qatif sector of KSA: A mixed-method study. *Journal of Taibah University Medical Sciences*, 16(6), 826–834. <https://doi.org/10.1016/j.jtumed.2021.05.011>
- Al-atiq, Y. (2016). Stress, depressive symptoms, well-being and mindfulness in a sample of Saudi medical residents. *The Arab Journal of Psychiatry*, 27(2), 144–150. <https://se.arch.emarefa.net/en/detail/BIM-720133-stress-depressive-symptoms-well-being-and-mindfulness-in-a-s>
- Alhuseini, N., Almustanyir, S., No author, N. author, Hamdan, D., Ijazi, R., Aldhalaan, R., Alfattan, A., & Omair, D. (2021). Meditation and mental health (depression, anxiety, and stress) in Saudi Arabia. *Journal of Complementary Medicine Research*, 12(2), 189. <https://doi.org/10.5455/jcmr.2021.12.02.21>
- Alqahtani, A. H., Al Khedair, K., Al-Jeheiman, R., Al-Turki, H. A., & Al Qahtani, N. H. (2018). Anxiety and depression during pregnancy in women attending clinics in a University Hospital in Eastern province of Saudi Arabia: Prevalence and associated factors. *International Journal of Women's Health*, 10, 101–108. <https://doi.org/10.2147/IJWH.S153273>
- Anderson, C. M., Brunton, R. J., & Dryer, R. (2019). Pregnancy-related anxiety: Re-examining its distinctiveness. *Australian Psychologist*, 54, 132–142. <https://doi.org/10.1111/ap.12365>
- Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, 13(1), 27–45. <https://doi.org/10.1177/1073191105283504>
- Bahattab, M., & AlHadi, A. N. (2021). Acceptance and commitment group therapy among Saudi Muslim females with mental health disorders. *Journal of Contextual Behavioral Science*, 19, 86–91. <https://doi.org/10.1016/j.jcbs.2021.01.005>
- Bayrampour, H., Ali, E., McNeil, D. A., Benzies, K., MacQueen, G., & Tough, S. (2016). Pregnancy-related anxiety: A concept analysis. *International Journal of Nursing Studies*, 55, 115–130. <https://doi.org/10.1016/j.ijnurstu.2015.10.023>
- Bjelica, A., Cetkovic, N., Trninic-Pjevic, A., & Mladenovic-Segeci, L. (2018). The phenomenon of pregnancy—A psychological view. *Ginekologia Polska*, 89(2), 102–106. <https://doi.org/10.5603/GP.a2018.0017>
- Blignault, I., Saab, H., Woodland, L., & O'Callaghan, C. (2021). Cultivating mindfulness: Evaluation of a community-based mindfulness program for Arabic-speaking women in Australia. *Current Psychology*. <https://doi.org/10.1007/s12144-021-02146-z>
- Brubaker, L. H., Paul, I. M., Repke, J. T., & Kjerulf, K. H. (2019). Early maternal-newborn contact and positive birth experience. *Birth (Berkeley, Calif.)*, 46(1), 42–50. <https://doi.org/10.1111/birt.12378>
- Brunton, R., Dryer, R., Saliba, A., & Kohlhoff, J. (2019). Re-examining pregnancy-related anxiety: A replication study. *Women and Birth*, 32(1), e131–e137. <https://doi.org/10.1016/j.wombi.2018.04.013>
- Callanan, F., Tuohy, T., Bright, A.-M., & Grealish, A. (2022). The effectiveness of psychological interventions for pregnant women with anxiety in the antenatal period: A systematic review. *Midwifery*, 104, Article 103169. <https://doi.org/10.1016/j.midw.2021.103169>
- Cena, L., Mirabella, F., Palumbo, G., Gigantesco, A., Trainini, A., & Stefana, A. (2020). Prevalence of maternal antenatal anxiety and its association with demographic and socioeconomic factors: A multicentre study in Italy. *European Psychiatry: The Journal of the Association of European Psychiatrists*, 63(1), Article e84. <https://doi.org/10.1192/j.eurpsy.2020.82>
- Deklava, L., Lubina, K., Circenis, K., Sudraba, V., & Millere, I. (2015). Causes of anxiety during pregnancy. *Procedia - Social and Behavioral Sciences*, 205, 623–626. <https://doi.org/10.1016/j.sbspro.2015.09.097>
- Dennis, C.-L., Falah-Hassani, K., & Shiri, R. (2017). Prevalence of antenatal and postnatal anxiety: Systematic review and meta-analysis. *The British Journal of Psychiatry: the Journal of Mental Science*, 210(5), 315–323. <https://doi.org/10.1192/bjpp.116.187179>
- Duncan, L. G., & Bardacke, N. (2010). Mindfulness-based childbirth and parenting education: Promoting family mindfulness during the perinatal period. *Journal of Child and Family Studies*, 19(2), 190–202. <https://doi.org/10.1007/s10826-009-9313-7>
- Duncan, L. G., Cohn, M. A., Chao, M. T., Cook, J. G., Riccobono, J., & Bardacke, N. (2017). Benefits of preparing for childbirth with mindfulness training: A randomized controlled trial with active comparison. *BMC Pregnancy and Childbirth*, 17(1), 140. <https://doi.org/10.1186/s12884-017-1319-3>
- Foster, D. G., Steinberg, J. R., Roberts, S. C. M., Neuhaus, J., & Biggs, M. A. (2015). A comparison of depression and anxiety symptom trajectories between women who had an abortion and women denied one. *Psychological Medicine*, 45(10), 2073–2082. <https://doi.org/10.1017/S0033291714003213>
- Ghezi, S., Eftekhariyazdi, M., & Mortazavi, F. (2021). Pregnancy anxiety and associated factors in pregnant women. *Zahedan Journal of Research in Medical Sciences*, 23(1), Article e99953. <https://doi.org/10.5812/zjrms.99953>
- Goetz, M., Schiele, C., Müller, M., Matthies, L. M., Deutsch, T. M., Spano, C., ... Wallwiener, S. (2020). Effects of a brief electronic mindfulness-based intervention on relieving prenatal depression and anxiety in hospitalized high-risk pregnant women: Exploratory pilot study. *Journal of Medical Internet Research*, 22(8), Article e17593. <https://doi.org/10.2196/17593>
- Güney, E., Cengizhan, S.Ö., Karataş Okyay, E., Bal, Z., & Uçar, T. (2022). Effect of the mindfulness-based stress reduction program on stress, anxiety, and childbirth fear in pregnant women diagnosed with COVID-19. *Complementary Therapies in Clinical Practice*, 47, Article 101566. <https://doi.org/10.1016/j.ctcp.2022.101566>
- Hathaway, W., & Tan, E. (2009). Religiously oriented mindfulness-based cognitive therapy. *Journal of Clinical Psychology*, 65(2), 158–171. <https://doi.org/10.1002/jclp.20569>

- Hoyer, J., Wieder, G., Höfler, M., Krause, L., Wittchen, H.-U., & Martini, J. (2020). Do lifetime anxiety disorders (anxiety liability) and pregnancy-related anxiety predict complications during pregnancy and delivery? *Early Human Development*, *144*, Article 105022. <https://doi.org/10.1016/j.earlhumdev.2020.105022>
- Huizink, A. C., Delforterie, M. J., Scheinin, N. M., Tolvanen, M., Karlsson, L., & Karlsson, H. (2016). Adaption of pregnancy anxiety questionnaire—revised for all pregnant women regardless of parity: PRAQ-R2. *Archives of Women's Mental Health*, *19*(1), 125–132. <https://doi.org/10.1007/s00737-015-0531-2>
- Iqbal, H., Habib, A., & Amer, S. (2019). Abortion – An Islamic perspective. *Journal of the British Islamic Medical Association*, *2*(1). https://www.jbima.com/wp-content/uploads/2019/08/E01_0819_Ethics_Abortion-an_islamic_perspective.pdf
- Jenkins, A., Kearney, L., Kendall, G., & Kannis-Dymand, L. (2022). Mindfulness-based group therapy as support for mental health concerns in pregnancy: A systematic review [Preprint]. In *In Review*. <https://doi.org/10.21203/rs.3.rs-1037571/v1>
- Kabat-Zinn, J. (2003). Mindfulness-based interventions in context: Past, present, and future. *Clinical Psychology: Science and Practice*, *10*(2), 144–156. <https://doi.org/10.1093/clipsy.bpg016>
- Kashanian, M., Faghankhani, M., YousefzadehRoshan, M., EhsaniPour, M., & Sheikhansari, N. (2021). Woman's perceived stress during pregnancy; stressors and pregnancy adverse outcomes. *The Journal of Maternal-Fetal & Neonatal Medicine*, *34*(2), 207–215. <https://doi.org/10.1080/14767058.2019.1602600>
- Khouj, M. A., Albasri, S., Albishri, A. A., Softa, S. M., Almaslamani, A. S., & Ahmad, H. M. (2022). Prevalence of stress, anxiety, and depression among pregnant women in Jeddah. *Cureus*, *14*(7), Article e27174. <https://doi.org/10.7759/cureus.27174>
- Kvasnak, K., Brunton, G., Lemonde, M., Chyzy, B., & Abbass-Dick, J. (2021). Considerations for the design of a perinatal mindfulness intervention for adolescents based on a systematic review of the literature. *International Health Trends and Perspectives*, *1*(2). <https://doi.org/10.32920/ihtp.v1i2.1438>
- Marcinko, V. M., Marcinko, D., Dordević, V., & Oresković, S. (2011). Anxiety and depression in pregnant women with previous history of spontaneous abortion. *Collegium Antropologicum*, *35*(Suppl. 1), 225–228.
- Mohamed, S. (2017). Mindfulness based intervention program on anxiety and depressive symptoms among pregnant women. *American Journal of Nursing Science*, *6*, 232. <https://doi.org/10.11648/j.ajns.20170603.21>
- Molgora, S., Fenaroli, V., & Saita, E. (2020). The association between childbirth experience and mother's parenting stress: The mediating role of anxiety and depressive symptoms. *Women & Health*, *60*(3), 341–351. <https://doi.org/10.1080/03630242.2019.1635563>
- Naja, S., Al Kubaisi, N., Singh, R., & Bougmiza, I. (2020). Generalized and pregnancy-related anxiety prevalence and predictors among pregnant women attending primary health care in Qatar, 2018–2019. *Heliyon*, *6*(10), Article e05264. <https://doi.org/10.1016/j.heliyon.2020.e05264>
- Nielsen-Scott, M., Fellmeth, G., Opondo, C., & Alderdice, F. (2022). Prevalence of perinatal anxiety in low- and middle-income countries: A systematic review and meta-analysis. *Journal of Affective Disorders*, *306*, 71–79. <https://doi.org/10.1016/j.jad.2022.03.032>
- Otaibi, A. S. A. (2017). *An Overview of Health Care System in Saudi Arabia*. 4 p. 12) (12).
- Pan, W.-L., Chang, C.-W., Chen, S.-M., & Gau, M.-L. (2019). Assessing the effectiveness of mindfulness-based programs on mental health during pregnancy and early motherhood—A randomized control trial. *BMC Pregnancy and Childbirth*, *19*(1), 346. <https://doi.org/10.1186/s12884-019-2503-4>
- Pershad, J., Mugerwa, K. Y., Filippi, V., Mehrtash, H., Adu-Bonsaffoh, K., Bello, F. A., ... Calvert, C. (2022). Prevalence and determinants of self-reported anxiety and stress among women with abortion-related complications admitted to health facilities in Eastern and Southern Africa: A cross-sectional survey. *International Journal of Gynaecology and Obstetrics: The Official Organ of the International Federation of Gynaecology and Obstetrics*, *156*(Suppl. 1), 53–62. <https://doi.org/10.1002/ijgo.14042>
- Robertsson, C., Hellström, J., Cross, M., & Sydsjö, G. (2014). Anxiety in early pregnancy: Prevalence and contributing factors. *Archives of Women's Mental Health*, *17*(3), 221–228. <https://doi.org/10.1007/s00737-013-0409-0>
- Saadati, N., Afshari, P., Boostani, H., Beheshtinasab, M., Abedi, P., & Maraghi, E. (2021). Health anxiety and related factors among pregnant women during the COVID-19 pandemic: A cross-sectional study from Iran. *BMC Psychiatry*, *21*(1), 95. <https://doi.org/10.1186/s12888-021-03092-7>
- Shi, Z., & MacBeth, A. (2017). The effectiveness of mindfulness-based interventions on maternal perinatal mental health outcomes: A systematic review. *Mindfulness*, *8*(4), 823–847. <https://doi.org/10.1007/s12671-016-0673-y>
- Siegel, R. D., Germer, C. K., & Olendzki, A. (2009). Mindfulness: What is it? Where did it come from? In F. Didonna (Ed.), *Clinical handbook of mindfulness* (pp. 17–35). Springer. https://doi.org/10.1007/978-0-387-09593-6_2
- Silva, M. M.d. J., Nogueira, D. A., Clapis, M. J., & Leite, E. P. R. C. (2017). Anxiety in pregnancy: Prevalence and associated factors. *Revista Da Escola de Enfermagem Da USP*, *51*. <https://doi.org/10.1590/S1980-220X2016048003253>
- Srinivasan, A. S., Thambi, S. S., Krishnarajan, D. K., & Prakasam, K. C. A. (2020). Incidence and impact of various complications on pregnancy related anxiety in women attending an obstetrics clinic in a tertiary care hospital. *Indian Journal of Pharmacy Practice*, *13*(4), 317–325. <https://doi.org/10.5530/ijopp.13.4.54>
- Swinson, R. P. (2006). The GAD-7 scale was accurate for diagnosing generalised anxiety disorder. *Evidence-Based Medicine*, *11*(6), 184. <https://doi.org/10.1136/ebm.11.6.184>
- Tani, F., & Castagna, V. (2017). Maternal social support, quality of birth experience, and post-partum depression in primiparous women. *The Journal of Maternal-Fetal & Neonatal Medicine*, *30*(6), 689–692. <https://doi.org/10.1080/14767058.2016.1182980>
- Trammel, R. (2015). Mindfulness as enhancing ethical decision-making and the Christian integration of mindful practice. *Social Work and Christianity*, *42*(2), 165–177. <http://www.proquest.com/docview/1736913746>
- Vandenbergh, L., & Costa Prado, F. (2009). Law and grace in Saint Augustine: A fresh perspective on mindfulness and spirituality in behaviour therapy. *Mental Health, Religion and Culture*, *12*(6), 587–600. <https://doi.org/10.1080/13674670902911872>
- Woolhouse, H., Mercuri, K., Judd, F., & Brown, S. J. (2014). Antenatal mindfulness intervention to reduce depression, anxiety and stress: A pilot randomised controlled trial of the MindBabyBody program in an Australian tertiary maternity hospital. *BMC Pregnancy and Childbirth*, *14*(1), 369. <https://doi.org/10.1186/s12884-014-0369-z>
- World Health Organization. (2018). WHO recommendations on intrapartum care for a positive childbirth experience. World Health Organization. <https://apps.who.int/iris/bitstream/handle/10665/260178/9789241550215-eng.pdf>
- Yazdanimehr, R., Omid, A., Sadat, Z., & Akbari, H. (2016). The Effect of mindfulness-integrated cognitive behavior therapy on depression and anxiety among pregnant women: A randomized clinical trial. *Journal of Caring Sciences*, *5*(3), 195–204. <https://doi.org/10.15171/jcs.2016.021>
- Zarenejad, M., Yazdkhasti, M., Rahimzadeh, M., Mehdizadeh Tourzani, Z., & Esmaelzadeh-Saeieh, S. (2020). The effect of mindfulness-based stress reduction on maternal anxiety and self-efficacy: A randomized controlled trial. *Brain and Behavior: A Cognitive Neuroscience Perspective*, *10*(4), Article e01561. <https://doi.org/10.1002/brb3.1561>
- Zhang, J.-Y., Cui, Y.-X., Zhou, Y.-Q., & Li, Y.-L. (2019). Effects of mindfulness-based stress reduction on prenatal stress, anxiety and depression. *Psychology, Health & Medicine*, *24*(1), 51–58. <https://doi.org/10.1080/13548506.2018.1468028>