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Feasibility of Modified Mindfulness Training Program on Antenatal Depression and Perceived Stress Among Expected Mothers with Male Child Preference

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Abstract: Background/Objectives: Antenatal depression and perceived stress are prevalent mental health challenges in pregnant women, associated with male-child preference. The study aimed to assess the feasibility of a modified mindfulness training program on antenatal depression and perceived stress levels among expected mothers with male child preference at a public sector tertiary care hospital in Karachi, Pakistan. **Materials and Methods:** The present feasibility trial was conducted among expected mothers having antenatal depression and perceived stress with a male child's preference by using the ADAPT-ITT framework. Need assessment and experiences of the new target population were carried out through an exploratory, descriptive qualitative study. In-depth interviews were conducted using a semi-structured interview guide and analyzed using a thematic analysis process. A repeated measures MANOVA was employed to investigate the effect of time on antenatal depression and perceived stress scores in the feasibility of the intervention. **Results:** Five major themes emerged from qualitative data. Significant influence of time was established on antenatal depression scores and a perceived score of $F_{(2, 326)} = 21.244$, $p < 0.001$ and $F_{(2, 326)} = 310.748$, $p < 0.001$ respectively. Antenatal depression scores significantly decreased from T1 to T2, mean difference = 4.00, $p < 0.001$, and slightly significant decline from T2 to T3, mean difference = 1.167, $p = 0.001$. Perceived stress scores significantly reduced from T1 to T2, mean difference = 10.214, $p < 0.001$, and a minor but significant decline from T2 to T3, mean difference = 0.333, $p = 0.043$. **Conclusion:** The study concluded the modified mindful training program was a culturally suitable, contextually relevant intervention in Pakistan's context and it significantly reduced antenatal depression and perceived stress in expected mothers with male child preference.

Keywords: Modified mindful training program; antenatal depression; perceived stress; expected mothers; male child preference

1. Introduction

Pregnancy is considered the foremost life event associated with psychological and physiological change, which upsurges the expected mother's vulnerability to mental disorders [1,2]. Antenatal depression (AD) has been identified as the most prevalent psychiatric disorder during pregnancy, which can lead to dire consequences for the mother and infant's health [3]. Expected mothers are more prone to AD than non-pregnant women and have approximately 2-fold more significant risk [4].

Expected mothers with antenatal depression are at the highest risk of preeclampsia, caesarean section, prolonged delivery process, dystocia, postpartum hemorrhage, postpartum depression, maternal suicide [5], and insomnia [6]. Mothers who had once AD, in their children are more likely to have an incidence of low birth weight, delayed fetal growth, and impaired brain development [7].

Furthermore, it may significantly deter their cognitive, behavioral, and emotional development [8]. AD is recognized as a global public health-related issue affecting one in five women globally [9]. Prevalence of AD reported in low and middle-income countries, and high-income countries were 15.6 % and 10%, respectively [10]. Additionally, the prevalence of antenatal depression was reported in South Africa at 31% [11], India at 22% [12], Rwanda at 6% [13], USA (United States of America) at 6.8 % [14]. On the contrary, a recent study accomplished in Pakistan showed the highest prevalence of 82% of AD in pregnant women [15].

Pregnancy has been identified as a stressful event in a woman's life. Moreover, it is proven that perceived stress in pregnancy has been linked with adverse obstetric consequences, including low birth weight, iron deficiency, and preterm birth [16]. The prevalence of perceived stress during pregnancy was 23.6% in Thailand [17], 19% in the USA [18], and 42.2 % in Pakistan [19]. Higher male child preference was documented in India at 61.23% [20] and Pakistan at 37.5% [21].

A suitable intervention could help pregnant women efficiently manage their perceived stress levels and antenatal depression [22]. Mindfulness training program (MTP) intervention can reduce mental health, including stress and anxiety [23]. Even though MTP has considerable efficacy in reducing perceived stress, longer-term follow-up and data from various sociocultural are also lacking [24]. A current systematic review presented MTP's methodological quality and operationalization resilience weakness, including low sample size and short-term measurement [25].

Pakistan is located in South Asia and has a diverse socio-cultural background. There is a dearth of data regarding the feasibility of a mindfulness training program on antenatal depression and perceived stress levels among expected mothers in the Paki-stan context. Therefore, the study aimed to assess the feasibility of a modified mindfulness training program on antenatal depression and perceived stress levels among expected mothers with male child preference at a public sector tertiary care hospital in Karachi, Pakistan.

2. Materials and Methods

2.1. Study Design

The present feasibility trial was conducted among expected mothers having antenatal depression and perceived stress with a male child's preference by using the ADAPT-ITT framework (Table 1). The study was conducted for four months between September to December 2024. On top of that, an exploratory, descriptive qualitative study was conducted to explore the experiences of the new target population for need assessment.

Table 1. ADAPT-ITT Phases Methodology.

ADAPT-ITT Phases	Methodology
1. Assessment	The community advisory board, consisting of six members, was formulated and included two patients, one nurse, one gynaecologist, one psychiatrist, and one nutritionist. Need assessment was conducted through in-depth interviews with stakeholders such as pregnant with antenatal depression and perceived stress.
2. Decision	Decisions related to adapting the intervention were based on the community advisory board's recommendation and the results of in-depth interviews.
3. Adaptation	Theatre testing (Pretesting) of the original intervention was carried out. Furthermore, pretesting the intervention with the target population to determine the thoughts related to the intervention, mobilize feedback on the content, and obtain recommendations for improving acceptability for target populations. Modifications were made according to the recommendations of the community advisory board; it focuses on culture, ethnicity, language, cultural groups, and religions, reinforcing what is necessary to fit the country's sociocultural context. PI demonstrated the intervention to five patients. The provider panel obtained feedback from patients. The feedback was incorporated with the help of the community advisory team.
4. Production	1st draft of the intervention was formulated and presented before the community advisory board for further feedback and approval.

5.Topical experts	Topical experts were identified to review and provide feedback on the 1st draft of the intervention. The content area expert, comprising six members, was identified as two psychiatric nurses, one gynecologist, two psychiatrists, and one nutritionist. Topical experts were identified with the endorsement of the community advisory board team.
6. Integration	Feedback from topical experts was integrated to finalize the intervention.
7. Training	Two graduate female nurses were trained to administer intervention to the new population. The training consisted of three days of four-hour sessions daily.
8. Testing	A feasibility trial was conducted to assess the feasibility of the intervention. It is employed to determine the study's primary outcome by quantitative data on baseline and post-intervention from the study participants.

2.2. Participants and Procedure

Eight in-depth interviews were conducted based on saturation using a semi-structured interview guide and analyzed using a thematic analysis process. To assess the feasibility of a modified mindfulness training program, the calculated sample size was 84 participants with 42 subjects in control and 42 in the treatment group. Pregnant women in their first and second trimesters of pregnancy, carrying single fetuses, having precious pregnancies, and visiting antenatal clinics were included in the study. Expected mothers with antenatal scores ≥10 and perceived stress levels of 1 to 40 were enrolled in the study. Before data collection, the study's objectives and instruments were explicitly explained to all participants. Privacy was guaranteed throughout the research process. The study was conducted following the Declaration of Helsinki of 2008.

2.3. Measures

The feasibility of the intervention was assessed in three phases: baseline assessment, intervention, and follow-up assessment.

2.3.1. Phase-I (Baseline Assessment)

In phase I, participants were screened for antenatal depression and perceived stress due to male-child preference. A convenient, non-probability sampling method was used to approach the subjects. The data was collected using an adapted, validated open-access instrument named the Edinburgh Postnatal Depression Scale (EPDS) and Perceived Stress Scale (PSS-10). The content validity index (CVI) and reliability of EPDS were 0.78 and 0.85 respectively. The reliability of PSS-10 was 0.84. The maximum EPDS score is 30, and a score ≥10 or above is used to consider antenatal depression. A total perceived stress score ranging from 0 to 40 was calculated. Higher scores on this scale indicate a higher level of stress; 0–13 indicates "Mild stress", 14–26 indicates "Moderate stress," and 27–40 indicates "High stress".

2.3.2. Phase-II (Intervention)

In this phase- a modified mindfulness intervention was executed. A simple random sampling method was utilized to recruit 84 study participants for the feasibility of the intervention. Subjects either in control or intervention groups were randomly allocated using computer-generated numbers. The intervention group received MMTP. The control group did not receive MMTP and followed routine hospital standard intervention. Initially, the PI received training on MTP. Then, MTP training was modified using vigorous eight phases of the ADAPT-ITT framework. The PI trained the female trainer, who carried out a plan of intervention.

The ultimate objective of the modified mindfulness training program (MMTP) is to teach people with mental illnesses how to live happier, healthier lives. The six-week training includes patient-centred, evidence-based intervention focused on teaching mindfulness meditation, breath work, basic yoga, spirituality, and eating behaviour. The two-hour intervention section was utilized in presenting lectures (50 minutes), practicing (50 minutes), and summarizing (20 minutes).

The outline of this modified mindfulness training program was as follows:

Week 1: The ABCs model of Mindful stretching and Muscle relaxation drilled in the first week of the MMTP Program.

Week 2: Participants learned about the beginner's mind, deep and attentive breathing, mindful imagery, and a mindfulness theme tune.

Week 3: The participants learned about gratitude workouts (cultivating grateful thinking) and Mindful-S.T.O.P. It is an abbreviation for short casual mindfulness practice (S – Stop, T – Take deep or mindful breaths, O – Observe surrounding sounds, P – Proceed with the activities with a smile).

Week 4: The participants learned about Body Scans, Kindness, and — mindfulness of thinking errors.

Week 5: The participants learned about cultivating mindfulness of spirituality. It was explained using an MP3 to create a Mindfulness Personal Practice Package (Customizing Mindfulness of Spirituality Practice).

Week 6: The participants learned about healthy eating behaviour.

After six weeks of intervention, a posttest was conducted using the same questionnaire.

2.3.3. Phase-III (Follow-Up Assessment)

In phase -III, follow-up assessment data was collected after one month of intervention with the same participants in both control and intervention groups and the same questionnaire in both groups during visits to antenatal clinics at OPD.

2.4. Data Analysis Procedure

Need assessment for intervention, in-depth interviews were conducted using a semi-structured interview guide by eight pregnant women based on saturation. Braun and Clark's (2006) six-phase thematic analysis process was used to analyze qualitative data. The study ensured credibility, transferability, dependability, and confirmability to attain various aspects of rigour designated by Guba and Lincoln in 1985.

To assess the feasibility of the intervention data was entered and analyzed using IBM SPSS Statistics version 27.0. A repeated measures MANOVA was employed to evaluate the effect of time (Pre-Intervention, Post-Intervention, and follow-up) on antenatal depression and perceived stress scores. The multivariate test Wilks' Lambda was utilized to assess a statistically significant influence of time on the outcome variables (Antenatal depression and perceived stress). A Post hoc investigation using Bonferroni adjustments was conducted to compare depression and stress scores between the three time points (Pre-Intervention, Post-Intervention, and Follow-up). Before conducting the repeated measures MANOVA analysis, the assumptions of multivariate normality and sphericity were evaluated. The assumptions of multivariate normality were assessed using Shapiro-Wilk tests at each time point for antenatal depression and perceived stress scores. Results indicated that both antenatal depression and perceived stress scores met the normality assumption at three points in time ($p > 0.05$). The assumption of sphericity was tested using Mauchly's test for both antenatal depression and perceived stress scores, and it was not violated ($p > 0.05$). A p-value of 0.05 or less was considered as significant.

2.5. Ethical Considerations

The study protocol was approved by the Ethical Review Committee (ERC) of the Institute of Nursing Sciences, Khyber Medical University Peshawar, Khyber Pakhtunkhwa (Ref No. KMU-INS.6885 dated 16 October 2024). Before data collection, written informed consent was obtained from all study participants. Additionally, permission from the study setting for data collection was obtained from the Medical Superintendent, of Sindh Qatar Hospital, Karachi.

2.6. Trial Registration

The trial was registered with Clinical Trials.gov. NIH, USA and Clinical Trial Unit (CTU), Khyber Medical University, Peshawar, Pakistan. NCT06685484 Unique Protocol ID: KMU/DIR/CTU/2024/009.

3. Results

Table 2 explores the themes and sub-themes that emerged from an exploratory, descriptive qualitative study. In-depth interviews were conducted with 08 pregnant mothers. The sample was based on data saturation. Five significant themes and thirteen sub-themes emerged regarding pregnant women's perspectives about experiences of their antenatal depression and perceived stress with male-child preference and the potential acceptability and feasibility of psychological intervention. The major themes and sub-themes including theme-1: Psychosomatic response with sub-themes like symptoms of antennal depression and symptoms of perceived stress, theme-2: Psychosocial determinant of maternal mental health with sub-themes including reproductive factors, family dynamics, financial constraints, and cultural belief and related factor, theme-3: Influence of family dynamics of gender preference with sub-themes such as male gender preferences and roles of in-laws and their family member on gender preference, theme-4: Coping mechanism for managing stress and antenatal depression with sub-themes including faith-based coping, seeking emotional support and relaxation through hobbies, theme:5 Contextualized health interventions in Pakistan context with sub-themes comprising culturally tailored approaches and religious applicable methods.

Table 2. Major themes and sub-themes.

Major themes	Sub-themes
Theme-I: Psychosomatic response	Symptoms of antenatal depression
	Symptoms of perceived stress
Theme 2: Psychosocial determinant of maternal mental health	Reproductive factors
	Family dynamics
	Financial constraints
	Cultural beliefs and related factors
Theme 3: Influence of family dynamics gender preference	Male gender preferences
	Roles of in-laws and their family members on gender preference
Theme 4: Coping mechanism for managing stress and antenatal depression	Faith-based coping
	Seeking emotional support
	Relaxation through hobbies and communication with family members
Theme 5: Contextualized health interventions in Pakistan context	Culturally tailored approaches
	Religious applicable methods

Table 3 demonstrates the respondents' demographic and baseline clinical characteristics in the control and intervention groups regarding the feasibility of intervention. Most participants in both groups were within the age range of 25–31. No statistical significance difference was noticed in age distribution among groups (p-value = 0.468). Education level was also similar between groups; most participants had an intermediate or middle/matric level of education (p-value = 0.638).

Compared to the control group, a larger percentage of participants from the intervention group were working women (control: 23.81% vs intervention: 30.95%). However, the observed difference was statistically insignificant (p = 0.08). In both groups, a higher percentage of husbands had master's level education and above, which was statistically insignificant (p = 0.065). Participants having lower household incomes categorized as "Poor" were more dominant in the intervention group, with near to statistically significant results (p-value = 0.058). Unplanned pregnancies were observed comparatively more often in the intervention group, whereas statistical significance was not observed

(p = 0.08). Similarly, both groups were identical concerning gravity and history of abortions, having statistically insignificant results.

Table 3. Baseline Demographic and Clinical Characteristics of Participants (n = 84).

Variable	Control n (%)	Intervention n (%)	P-Value
Age Group (Years)			
18–24	13 (31)	9 (11)	0.468
25–31	14 (33)	19 (45)	
≥32	15 (36)	14 (33)	
Education			
Illiterate	1 (2.4)	3 (7.1)	0.638
Primary	5 (11.9)	7 (16.7)	
Middle/Matric	13 (31)	15 (35.7)	
Intermediate	20 (47.6)	14 (33.3)	
Master& above	3 (7.1)	3 (7.1)	
Employment Status			
Housewife	32 (76.19)	29 (69.05)	0.08
working women	10 (23.81)	13 (30.95)	
Husband Education			
Illiterate	1 (3.7)	3 (11.1)	0.065
Primary	5 (18.5)	3 (11.1)	
Middle/Matric	2 (7.4)	6 (22.2)	
Intermediate	3 (11.1)	9 (33.3)	
Master& above	16 (59.3)	15 (55.6)	
Household Income			
Good	30 (71.4)	22 (52.4)	0.058
Poor	12 (28.6)	20 (47.6)	
Un-Planned Pregnancy			
Yes	25 (59.5)	32 (76.2)	0.08
No	17 (40.05)	10 (23.8)	
Gravity			
1–2	12 (28.6)	12 (28.6)	0.497
3–4	10 (23.8)	14 (33.3)	
5–6	20 (47.6%)	16 (38.1)	
History of Abortions			
Yes	11 (26.2)	6 (14.3)	0.175
No	31 (73.8)	36 (85.7)	

Table 4 discloses baseline antenatal depression-related symptoms among the control and intervention groups. Participants in both groups displayed restricted ability to laugh and delight, as more than 70% reported lower or no pleasure (p =0.081). Looking forward to pleasurable activities was equally reduced in both groups (p-value = 0.071). Many participants blamed their selves needlessly for things that went wrong (control: 57.1% vs. intervention: 69.1%). However, the difference was statistically insignificant (p = 0.636).

In the control group, 14.29% stated their incapability to cope at all, in contrast to 19.05% in the intervention group. A higher percentage of the control group (21.43%) reported some difficulty in coping compared to 9.52% in the intervention group. However, statistical significance was not achieved (p = 0.36).)

In the intervention group, more sleeping difficulties due to sadness were reported (42.86%) compared to the control group (33.3%), with no statistical significance (p = 0.144). Crying due to

unhappiness was slightly more frequent in the control group (42.86%) than in the intervention group (33.34%) (p -value = 0.09).

At 19.05% of the intervention participants reported feeling sad "most of the time" compared to 21.43% in the control group (p = 0.69). Additionally, thoughts of self-harm were somewhat more frequent in the control group (45.24), in contrast to 30.95% in the intervention group, while statistical significance was not achieved (p = 0.055).

Table 4. Baseline Depression Symptoms in Control vs Intervention Groups (n = 84).

Question	Control n (%)	Intervention n (%)	P-Value
I have been able to laugh and see the funny side of things			
As much as I always could	9 (21.43)	7 (16.67)	0.081
Not quite so much now	3 (7.14)	4 (9.52)	
Definitely not so much now	18 (42.86)	16 (38.10)	
Not at all	12 (28.57)	15 (35.71)	
I have looked forward with enjoyment to things			
As much as I ever did	5 (11.9)	8 (19.05)	0.071
Rather less than I used to	11 (26.19)	8 (19.05)	
Definitely less than I used to	15 (35.71)	11 (26.19)	
Hardly at all	11 (26.19)	15 (35.71)	
I have blamed myself unnecessarily when things went wrong			
Yes, most of the time	8 (19.05)	8 (19.05)	0.636
Yes, some of the time	16 (38.10)	21 (50)	
Not, very often	14 (33.3)	11 (26.19)	
No, Never	4 (9.52)	2 (4.76)	
I have been anxious or worried for no good reason			
No, not at all	2 (4.76)	1 (2.38)	0.36
Hardly ever	10 (23.81)	7 (16.67)	
Yes, sometimes	22 (52.38)	19 (45.24)	
Yes, very often	8 (19.05)	15 (35.71)	
I have felt scared or panicky for no very good reason			
Yes, most of the time	3 (7.14)	5 (11.9)	0.145
Yes, some of the time	17 (40.48)	10 (23.81)	
Not, very often	15 (35.71)	19 (45.24)	
No, Never	7 (16.67)	8 (19.05)	
Things have been getting on top of me			
Yes, most of the time, I haven't been able to cope at all	6 (14.29)	8 (19.05)	0.221
Yes, sometimes I haven't been coping as well as usual	9 (21.43)	4 (9.52)	
No, most of the time, I have coped quite well	12 (28.57)	9 (21.43)	
No, I have been coping as well as ever	15 (35.71)	11 (26.19)	
I have been so unhappy that I have had difficulty sleeping			
Yes, most of the time	5 (11.9)	13 (21.43)	0.144
Yes, some of the time	13 (30.95)	5 (11.9)	
Not, very often	17 (40.48)	22 (52.38)	
No, Never	7 (16.67)	6 (14.29)	
I have felt sad or miserable			
Yes, most of the time	9 (21.43)	8 (19.05)	0.69
Yes, some of the time	8 (19.05)	7 (16.67)	
Not, very often	17 (40.48)	22 (52.38)	
No, Never	8 (19.05)	5 (11.9)	
I have been so unhappy that I have been crying			
Yes, most of the time	10 (23.81)	6 (14.29)	0.09
Yes, some of the time	8 (19.05)	8 (19.05)	
Not, very often	15 (35.71)	25 (59.52)	
No, Never	9 (21.43)	3 (7.14)	
The thought of harming myself has occurred to me			
Yes, most of the time	8 (19.05)	5 (11.9)	0.055

Yes, some of the time	11 (26.19)	8 (19.05)
Not, very often	9 (21.43)	21 (50)
No, Never	14 (33.3)	8 (19.05)

Table 5 compares the percentage of responses to perceived stress in the past month between the control and intervention groups. A considerable percentage of participants from the intervention group (54.76%) demonstrated upset feelings "fairly Often" due to unanticipated events compared to the control group (38.1%) in the control group. However, statistically significant was not observed (p = 0.07). At the same time, 54.76% of the intervention group participants established incapability to control essential things of their life "fairly often" compared to 38.1% in the control group (p-value = 0.061).

Participants belonging to the intervention group were more vulnerable to exhibiting feelings of nervousness "very often" (33.33%) in opposition to the control group (23.81%), whereas the result was statistically insignificant (p = 0.144). In the intervention group, 57.14% reported a "rarely" feeling of confidence compared to 28.57% in the control group; however, this difference was not enough to reach significance (p = 0.064).

While evaluating whether things were going their way, 54.76% of the participants from the intervention indicated "almost never" compared to 38.1% from the control group (p = 0.088). Likewise, 64.29% of participants belonging to the intervention group indicated their incapability to cope with things "fairly often," while it was 40.48% in the control group. No statistical significance was achieved (p = 0.144).

A major proportion of participants in the intervention group (30.95%) stated "never" being able to overcome irritations, compared to the control group (11.9%) (p = 0.154). Feeling "almost never" on top of things was more frequent in the intervention group (52.38%) compared to the control group (38.1%) (p = 0.144).

At 52.38% of participants belonging to the intervention group designated anger because of things outside of control "fairly often" compared to 38.1% in the control group (p = 0.254). Finally, feeling overloaded with difficulties was noted "very often" in 50% of the intervention group and 45.24% of the control group (p = 0.479).

Table 5. Comparison of perceived stress between the control and intervention groups (n = 84).

Question	Control n (%)	Intervention n (%)	P-Value
In the last month, how often have you been upset because of something that happened unexpectedly?			
Almost Never	0 (0)	1 (2.38)	0.07
Sometimes	13 (30.95)	9.52)	
Fairly Often	16 (38.1)	23 (54.76)	
Very Often	13 (30.95)	14 (33.3)	
In the last month, how often have you felt that you were unable to control the important things in your life?			
Almost Never	0 (0)	1 (2.38)	0.061
Sometimes	13 (30.95)	4 (9.52)	
Fairly Often	16 (38.1)	23 (54.76)	
Very Often	13 (30.95)	14 (33.33)	
In the last month, how often have you felt nervous and "stressed"?			
Almost Never	1 (2.38)	1 (2.38)	0.144
Sometimes	8 (19.05)	6 (14.29)	
Fairly Often	23 (54.76)	21 (50)	
Very Often	10 (23.81)	14 (33.3)	
In the last month, how often have you felt confident			

about your ability to handle your problems?			
Never	14 (33.33)	9 (21.43)	
Almost Never	12 (28.57)	24 (57.14)	0.064
Sometimes	13 (30.95)	8 (19.05)	
Fairly Often	3 (7.14)	1 (2.38)	
Very Often	0 (0)	0(0)	
In the last month, how often have you felt that things were going your way			
Never	4 (9.52)	9 (21.43)	0.088
Almost Never	16 (38.10)	23 (54.76)	
Sometimes	15 (35.71)	7 (16.67)	
Fairly Often	6 (14.29)	3 (7.14)	
Very Often	1 (2.38)	0 (0)	
In the last month, how often have you found that you could not cope with all the things that you had to do?			
Almost Never	1 (2.38)	0 (0)	0.144
Sometimes	15 (35.71)	10 (23.81)	
Fairly Often	17 (40.48)	27 (64.29)	
Very Often	9 (21.43)	5 (11.9)	
In the last month, how often have you been able to control irritations in your life?			
Never	5 (11.9)	13 (30.95)	
Almost Never	17 (40.48)	16 (38.1)	0.154
Sometimes	14 (14.29)	10 (7.14)	
Fairly Often	6 (14.29)	3 (0)	
Very Often	0 (0)	0 (0)	
How often have you felt that you were on top of things in the last month?			
Never	15 (35.71)	13 (30.95)	
Almost Never	16 (38.1)	22 (52.38)	
Sometimes	11 (26.19)	5 (11.9)	
Fairly Often	0 (0)	1 (2.38)	
Very Often	0 (0)	1 (2.38)	
In the last month, how often have you been angered Because of things that were outside of your control?			
Almost Never	1 (2.38)	2 (4.76)	0.254
Sometimes	20 (7.62)	8 (19.05)	
Fairly Often	16 (38.1)	22 (52.38)	
Very Often	5 (11.9)	10 (23.81)	
In the last month, how often have you felt difficulties We're piling up so high that you could not overcome them?			
Almost Never	1 (2.38)	1 (2.38)	0.479
Sometimes	0 (0)	1 (2.38)	
Fairly Often	12 (28.57)	6 (14.29)	
Very Often	19 (45.24)	21 (50)	

Table 6 shows baseline composite mean scores for antenatal depression and perceived stress were evaluated for both control and intervention groups. The composite mean EPDS scores in the control and intervention groups were 26.73 ± 6.42 and 28.54 ± 5.24, respectively, demonstrating a marginally higher score in the intervention group. However, the difference was statistically insignificant (p = 0.161). In contrast, the mean PSS scores in the control and intervention groups were 22.33 ± 2.39 and 22.85 ± 1.88, respectively, with insignificant differences (p = 0.268).

Table 6. Baseline composite mean Antenatal Depression and Perceived Stress scores in Control vs. Intervention Groups.

Scale	Group	Mean± SD	P-Value
EPDS	Control	26.73 ± 6.42	0.161
	Intervention	28.54 ± 5.24	
PSS	Control	22.33 ± 2.39	0.268
	Intervention	22.85 ± 1.88	

Legends: EPDS = Edinberg postnatal depression scale, PSS = Perceived stress scale, SD = Standard deviation.

Table 7 unveils the comparison of antenatal depression and perceived stress scores among participants with female and male child preferences. The mean EPDS scores were lower for participants having male child preference (24.71 ± 3.89) in contrast to female child preference (27.17 ± 6.85) with no statistical difference among groups (p = 0.171). The mean PSS scores were similar in both groups, with male preference = 22.58 ± 2.03 vs. female preference = 22.64 ± 2.66. (p = 0.92)

Table 7. Antenatal Depression and Perceived Stress Scores based on gender preference (n=84).

Scale	Gender Preference	Mean ± SD	P-Value
EPDS Score	Female	27.17 ± 6.85	0.171
	Male	24.71 ± 3.89	
PSS Score	Female	22.64 ± 2.66	0.92
	Male	22.58 ± 2.03	

Legends: EPDS = Edinberg postnatal depression scale, PSS = Perceived stress scale, SD = Standard deviation.

3.1. Post-intervention and Follow-up Results

A repeated measures MANOVA was employed to investigate the effect of time (Pre-Intervention, Post-Intervention, and follow-up) on antenatal depression and perceived stress scores. This approach was preferred as it considers the interrelated nature of the repeated observations and supports the concurrent analysis of both dependent variables (depression and stress).

Before employing repeated measures of MANOVA, the assumptions of both multivariate normality and sphericity were evaluated. The assumptions of multivariate normality were assessed using Shapiro-Wilk tests at each time point for both antenatal depression and perceived stress scores. Results indicated that both antenatal depression, as well as perceived stress scores, met the normality assumption at three points of time (p >.05). The assumption of sphericity was verified by employing Mauchly's test for both antenatal depression and perceived stress scores, and it was not violated (p >0.05).

3.2. Multivariate Test

The multivariate test Wilks' Lambda demonstrated a statistically significant influence of time on the variables (Antenatal depression and Perceived stress) = 0.201, $F_{(4, 326)}$ = 100.452, p < 0.001, specifying that antenatal depression and perceived stress scores significantly changed across the three-time point.

The multivariate interaction between time and group (Intervention and Control) was significant, Wilks' Lambda = 0.742, $F_{(4, 326)}$ = 77.527, p < 0.001, revealing that the trend of changes over time among the groups differs significantly.

3.3. Univariate Test

Table 8 presented the influence of time on antenatal depression scores and perceived stress scores. The univariate test indicated a statistically significant influence of time on antenatal depression scores, $F_{(2, 326)}$ = 21.244, p < 0.001. Likewise, a significant effect of time on perceived stress scores, $F_{(2, 326)}$ = 310.748, p < 0.001, was witnessed.

Table 8. Influence of time on antenatal depression scores and perceived stress scores, Univariate Tests (n = 84).

Measure	Source	Sum of Squares	df	Mean Square	F	p-value
Antenatal Depression	Time	434.738	2	217.369	21.244	<0.001
Perceived Stress	Time	1771.665	2	885.837	310.748	< 0.001

Legends: df = Degree of freedom, F-test.

3.4. Post-Hoc Comparisons

A Post Hoc investigation using Bonferroni adjustments was carried out to compare antenatal depression and perceived stress scores for both intervention and control groups between the three time points (T1 = Pre-Intervention, T2 = Post- Post-Intervention, T3 = Follow-up).

Antenatal depression scores significantly decreased from T1 to T2, Mean Difference = 4.00, p = 0.001, and from T1 to T3, Mean Difference = 5.167, p = 0.001. Similarly, a significant decrease was observed from T2 to T3, Mean Difference = 1.167, p = 0.001. Perceived stress scores significantly reduced from T1 to T2, Mean Difference = 10.214, p = 0.001, and from T1 to T3, Mean Difference = 10.548, p = 0.001. A minor but significant reduction was observed from Time 2 to Time 3, Mean Difference = 0.333, p = 0.043 (Table 9). The results indicated no significant changes in depression and stress scores over the three time points (p-value greater than 0.05 for all pairwise comparisons) in the control group.

Table 9. Pairwise Comparisons of Antenatal Depression and Perceived Stress Scores Across Time Points in Intervention and Control Group (n = 84).

Group	Variable	Time (I)	Mean (I)	Mean (J)	Mean Difference (I-J)	p-value
Intervention	**Depression**	T(1 vs 2)	28.548	24.548	4	<0.001
		T(1 vs 3)	28.548	23.381	5.167	<0.001
		T(2 vs 3)	24.548	23.381	1.167	0.001
	Stress	T(1 vs 2)	22.857	12.643	10.214	<0.001
		T(1 vs 3)	22.857	12.31	10.548	<0.001
		T(2 vs 3)	12.643	12.31	0.333	0.043
Control	**Depression**	T(1 vs 2)	26.734	26.332	0.402	0.514
		T(1 vs 3)	26.734	26.231	0.503	0.472
		T(2 vs 3)	26.332	26.231	0.101	0.765
	Stress	T(1 vs 2)	22.333	21.992	0.341	0.626
		T(1 vs 3)	22.333	21.872	0.461	0.489
		T(2 vs 3)	21.992	21.872	0.12	0.758

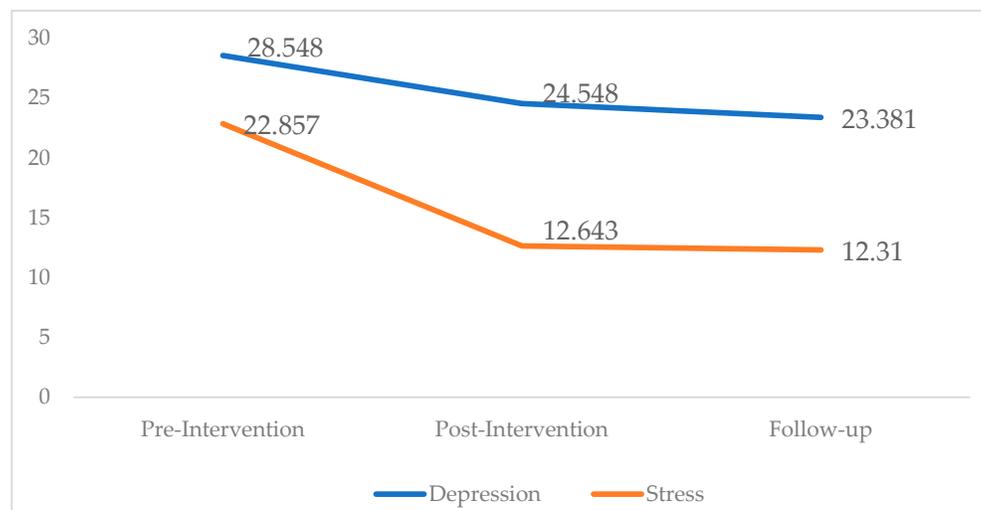Legends: T1 = Time 1, T2 = Time 2, T3 = Time 3.

Figure 1. Scatter plot of Mean of Antenatal depression and perceived stress in the Intervention Group attire-Intervention, Post-Intervention and Follow-up (n-84).

Figure1 illustrates the mean of antenatal depression and perceived stress in the intervention group at pre-intervention, post-intervention, and follow-up.

The scatter plots indicate a significant reduction in average scores for both antenatal depression and perceived stress over time in the intervention group. Before the intervention, participants demonstrated higher mean scores for depression, notably inflated compared to perceived stress. After the intervention, a significant reduction in antenatal depression scores was detected (28.548 to 24.548), whereas stress scores also reduced (22.857 to 12.643). At the follow-up, both antenatal depression and perceived stress scores indicated a slight reduction.

4. Discussion

The objective of this study was to assess the feasibility of a modified mindfulness training program on antenatal depression and perceived stress levels among expected mothers with male child preference at a public sector tertiary care hospital in Karachi, Pakistan. The feasibility trial was conducted using the ADAPT-ITT framework. According to the ADAPT-IIT framework, an exploratory, descriptive qualitative study was conducted initially to explore the need assessment and experiences of the new target population.

In the present study, individuals highlighted the need for contextualized health interventions in Pakistan, which must suit religion, society, and culture. Individuals also underlined that the intervention must be user-friendly and have no side effects on their pregnancy. These findings are congruent with another qualitative study's results, underscoring the need for evidence-based health intervention acceptable in the local context and religion [26].

In the present study results for the feasibility of the intervention, in the baseline assessment, the respondents' demographic and clinical characteristics, including age, education, employment status, household income, unplanned pregnancy, gravidity, and history of abortion, were compared in both control and intervention groups. No significant difference in demographic and clinical characteristics was exhibited in the baseline assessment. Hence, both groups (Control and Intervention) were comparable. These findings are aligned with the study in China by Leng et al. which found no significant difference in baseline assessment in control and treatment groups [27].

In the current study, findings concerning gender preferences showed that most participants reported a strong desire for male-child preference. However, no significant difference was observed in the control and intervention groups (p = 0.1). Thus, both groups are identical. These results are congruent with the study in Nepal by Chaudhary et al., which found that male child preference is considerable in pregnant women. However, no statistical significance was established (p = 0.193) [28]. The recent research study in Zambia by Tempo et al. highlighted the reasons behind male child desire, including support in old age, family security, food security, provision of financial support, and social support [29].

In the present study, regarding baseline antenatal depression-related symptoms, the overwhelming majority (100%) of study participants reported higher levels of mean EPDS score in the control (26.73) and treatment group (28.54), even though the difference was statistically insignificant (p = 0.161). These study findings are parallel with a study in China by Leng et al., which disclosed higher mean EPDS scores (10.5) in pregnant women, whereas statistical significance was not established, and respondents in a trial, the control and treatment groups exhibited comparable antenatal depression symptoms at baseline assessment [27].

Regarding perceived stress in pregnant women, the present study depicted greater mean PSS scores in the control group (22.33) and intervention group (22.85), and both groups, including control and intervention were comparable in terms of PSS scores as statistically insignificant differences were computed (p=0.268). These results align with the study in Denmark by Jensen et al. unveiled that the

mean score on the PSS was (20) in the intervention group and the control group, with statistically insignificant differences in both groups at baseline (p = 0.968) [30].

The present study found that the participants who were allocated to the intervention group of the modified mindful training program disclosed a significantly larger reduction in antenatal depression and perceived stress in pregnant women. These study findings are congruent with a study in Sweden by Lonnberg et al. which established that mindful-based training had a significant effect on the reduction of antenatal depression and perceived stress in pregnant women [31].

In the present study results, the antenatal depression scores significantly decreased from T1 (Time 1 = Pre-Intervention) to T2 (Time 2 = Post-Intervention), with a mean difference = 4.00, p < 0.001. Furthermore, a slight significant decrease was observed from T2 and T3 (Time 3 = Follow-up). These study results are nearly congruent with a study in Taiwan by Pan et al. to assess the effect of mindfulness programs on the psychological health of pregnant women, which found a lower EPDS mean score from T1 to T2 at 2.53 points lower at p = 0.007. Moreover, a significant lessening of the mean score in EPDS between T1 and T2 was observed in intervention groups [32]. Comparable results were established in another study in Australia carried out by Sansone et al., which indicated significant differences in EPDS mean scores in T1 and T2. In contrast, follow-up results from T2 and T3 showed no significant differences in the mean score of EPDS (p = 0.130) [33]. However, meta-analysis indicated inconsistent findings that the mindful-based interventions do not significantly reduce the antenatal depressive symptoms in pregnant women [34].

In the present study results, perceived stress scores significantly reduced from T1 to T2 with a mean difference = 10.214, p < 0.001. Similarly, a slight significant decline in perceived stress scores was observed in T2 and T3 (p = 0.043). This result contrasts with a study in Australia conducted by Sansone et al., which did not reveal significant differences in perceived stress scores in T1 and T2 (p = 0.092) and T2 and T3 (p = 0.052) [32]. The variation in perceived scores may be documented using a different measurement tool, as the present study utilized the PSS-10 instrument; however, the contrast study used the DASS-21 questionnaire.

The present study results indicated no significant changes in depression and perceived stress scores over the three time points (p-value greater than 0.05 for all pairwise comparisons) in the control group. These findings are congruent with those of a study in Iran by Nejad et al., who found no statistically significant result in antenatal depression and perceived scores among expected mothers in the control group [35].

5. Conclusions

In conclusion, the modified mindfulness training program is a feasible, adaptable, contextually relevant, and culturally suitable intervention in Pakistan context. The study also established that a modified mindfulness training program significantly reduces antenatal depression and perceived stress in pregnant women with male-child preferences in the Pakistan context. The study explored pregnant mothers' experience of antenatal depression and perceived stress, its determinants, and expression of contextually relevant and culturally defined construction underscoring the need for the development of culturally suitable intervention in Pakistan's context to improve the pregnant mother's mental health.

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Conflicts of Interest: The authors declare no conflict of interest.

Abbreviations

The following abbreviations are used in this manuscript:

EPDS   Edinburg postnatal depression scale
PSS   Perceived stress scale

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