







Maternal-Fetal attachment in unplanned pregnancies following an antenatal training program: A Randomized Clinical Trial

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Abstract

Background: Women have less interaction with the fetus in unplanned pregnancies. This study aimed to determine the effect of an antenatal training program on maternal-fetal attachment in unplanned pregnancies.

Methods: This single-blind clinical trial was performed in the north of Iran in 2019. By simple randomization, 76 mothers with unplanned pregnancies were allocated to the intervention and control groups. Mothers in the intervention group attended three sessions (90 minutes per session) of training based on interaction with the fetus in small groups. The control group only received routine care. Data collection instruments included a demographics checklist, London Measure of Unplanned Pregnancy, and Cranley's Maternal-Fetal Attachment scale. Descriptive statistics, Chi-square, Fisher's Exact test, t-test, analysis of covariance, and multivariate analysis of variance were used for data analysis.

Results: The mean difference of maternal-fetal attachment before and after training was 3.41 ± 2.08 ($P=0.112$) in the intervention group and 3.96 ± 2.17 ($P=0.078$) in the control group. However, the differences between and within groups were not significant. The differences in the subscales of attachment with the fetus were not also significant between the groups after the intervention. Although the post-intervention attachment score for unwanted pregnancy was lower than mistimed pregnancy in the intervention (mean difference: 14 ± 3.61) and control groups (mean difference: 3.70 ± 1.87), it was not significantly different based on the type of pregnancy between the groups.

Conclusion: Maternal-fetal attachment training did not boost interaction with the fetus in mothers with unplanned pregnancies; thus, deeper psychological interventions are needed.

Highlights

What is current knowledge?

Although some studies reported the effect of training on maternal fetal attachment in pregnancy, the effect of a combined behavioral training program has been less considered in unplanned pregnancy.

What is new here?

According to this study, a combined training program could not improve maternal fetal attachment in unplanned pregnancies. Compared to other studies, it seems that due to the mother's specific psychological status in unplanned pregnancy, they are more receptive to simpler behavioral interventions.

Introduction

The concept of unplanned pregnancy refers to a pregnancy that is either mistimed or unwanted. Around 121 million unplanned pregnancies occur each year, representing around 48% of total pregnancies in women aged 15–49 years worldwide (1). According to a meta-analysis in Iran, the rate of unwanted pregnancies was estimated at 52% (2). Unplanned pregnancy is an important maternal-fetal-infant health concern (3).

Maternal-fetal attachment (MFA) is an emotional process experienced by a pregnant woman with her fetus. This experience develops maternal role and identity and is affected by various factors, such as the acceptance of pregnancy and the psychological status of the mother. MFA in unplanned pregnancies is lower than in planned pregnancies. Attachment behaviors provide a basis for promoting healthy practices (4). Cranley classified maternal-fetal interaction behaviors into five groups, including maternal interaction with the fetus, distinction between the mother and the fetus, attributing certain features to the fetus, and sacrificing and accepting the parental role (5). Some studies have reported that training attachment behaviors during pregnancy have a positive effect on maternal-fetal interaction (6–8). However, some others found out single interventions are not effective alone (9,10). The effect of supportive interventions, relaxation with music, and ultrasound on increasing MFA was not confirmed in some studies (11–13). According to a review, there are inadequate findings to conclude the efficacy of various interventions on parental-fetal attachment (10).

Unplanned pregnancy is an important risk factor for low maternal-fetal interaction. Therefore, considering the undesirable outcomes of low attachment

in pregnancy, designing interventions to promote MFA in unplanned pregnancies is necessary. It seems that similar to planned pregnancies, educational interventions may be effective in improving maternal attachment in unplanned pregnancies. Due to the scarcity of studies on this subject and some contradictions between findings, we sought to determine the effect of an antenatal training program on MFA in women with unintended pregnancies.

Methods

Design

This single-blind randomized clinical trial was performed in three cities in the north of Iran from December 2018 to November 2019. The study was approved by the Ethics Committee of Mazandaran University of Medical Sciences.

Participants

Seventy-six women with unintended pregnancies were recruited from health centers and family physicians' offices. Considering the mean difference of attachment score following training in Kordi's study (5.86 ± 7.2 and 1.72 ± 3.2 in the intervention and control groups, respectively) (7), $\alpha=95\%$, $1-\beta=0.80$, and 30% dropout, using the formula with rounding the decimal numbers, 38 participants were recruited for each group (Figure 1).

$$n = \frac{(S_1^2 + S_2^2) \times (Z_{1-\alpha/2} + Z_{1-\beta})^2}{(\mu_2 - \mu_1)^2}$$

The inclusion criteria entailed being 15–49 years old, having a London Measure of Unplanned Pregnancy (LMUP) score of 0–3 (14), single pregnancy of 20–32 weeks, having at least elementary school education, not having medical or obstetrics problems and addiction, and not have lost relatives over the past six months. We excluded those who withdrew from the study, lost follow-up, did not follow more than 50% of the recommendations, did not attend the childbirth preparation classes, had medical or obstetrics problems, or had lost a relative during the study.

Data collection tools

Three questionnaires were used for data collection. The demographics-reproductive characteristics questionnaire included some items on age, age at marriage, gestational age, age of marriage, level of education, occupation, income status, gravidity, parity, contraceptive method, satisfaction with fetus' gender, and type of unplanned pregnancy (unwanted or mistimed) and its cause.

The LMUP was used to assess the unplanned pregnancy. It comprises six questions about the use of contraceptive methods, the right time of pregnancy,

intention to become pregnant, intention to have a baby, partner agreement with pregnancy, and attention to health status before pregnancy. Each item takes a score of 0-2; thus, the total score can range between 0 and 12. A score of 0-3 is considered an unplanned pregnancy (14). Content and structural validity and reliability ($\alpha=0.87$) were confirmed for the Persian version of LMUP (15).

Cranley's MFA Questionnaire includes 24 items and five sub-scales in three dimensions: A) cognitive dimension: the distinction between self and fetus, attributing specific characteristics to the fetus; B) emotional dimension: sacrifice; and C) behavioral dimension: interaction with the fetus and acceptance of the maternal role. The items were rated using a 5-point Likert scale (1-5) and the total score spanned from 24 to 120, with a higher score indicating more attachment (5). In addition to the content and face validity, reliability was determined by $\alpha=0.83$ in the Persian version (16).

Procedure

First, LMUP was given to the eligible mothers. If they met the necessary criteria for this measure, the demographic checklist would be completed by them. Then, Cranley's questionnaire was given to them to fill out at the onset and four weeks later. All mothers were explained about the study objectives and signed written consent. Blinding was performed only for the data analyzer because it was not possible for the participants and trainer.

The intervention group included mothers who received MFA behavior training in addition to routine prenatal care. In-person training was provided in small groups (3-5 mothers) during three 90-minute sessions every 3-4 days in the prenatal care clinics by a midwife. Table 1 shows the training content of the sessions (Table 1). This content was provided based on Cranley's theory (5) and previous investigations (6,7,17-19), and its validity was confirmed by seven experts in midwifery and reproductive health. Then, a handbook for teaching attachment behaviors was given to the mothers with a CD containing recorded fetal heart sounds, animation on fetal development stages, and a relaxation exercise guide. At the request of the mothers, the files were stored on the mothers' cell phones, as well. Moreover, a checklist to follow attachment behaviors was given to the mothers and they were asked to do the trained behaviors for four weeks after the last training session (Table 1). During this time, we called mothers weekly and reminded them to practice the exercises. The control group only received routine prenatal care, and at the end of the study, due to ethical considerations, verbal education with a handbook for teaching MFA behaviors was given to them.

Data analysis

The effect of training on MFA and its sub-scales was assessed as the primary outcome. Change of MFA based on unplanned pregnancy was considered as the secondary outcome. SPSS version 16 was used for data analysis. The normal distribution of the variables was assessed by the Kolmogorov-Smirnov test. Mean, standard deviation and frequency were used to describe the variables. Demographic and reproductive variables were compared between the groups by independent t-test, Chi-square, and Fisher's exact test. Attachment scores were compared by the analysis of covariance (ANCOVA) and multivariate analysis of variance (MANOVA) through per-protocol analysis. A P-value less than 0.05 was considered significant.

Table 1. Content of maternal-fetal attachment behaviors training

Sessions	Training content
1	Anatomical and physiological changes in pregnancy and effects of changes, the concept of attachment to the fetus and its advantages, the concept of relaxation and its benefits, and relaxation training (breathing pattern)
2	Stages of fetal development, the process of labor, performing attachment behaviors, including listening to the sound of the fetal heart, talking to the fetus, calling the fetus by a name, looking at the abdomen and paying attention to fetal movements, drawing the fetus, and preliminary relaxation training
3	Principles of nutrition in pregnancy, performing attachment behaviors, including touching the fetus and caressing it from the abdomen, counting fetal movements, looking at the fetus in the sonographic photo, imagining hugging and breastfeeding the baby, and advanced relaxation training

Results

Out of 76 mothers, nine in the intervention group and six mothers in the control group were excluded from the study. Finally, data was analyzed for 29 mothers in the intervention group and 32 mothers in the control group (Figure 1). All the variables, except gestational age and LMUP, had normal distributions (Table 2).

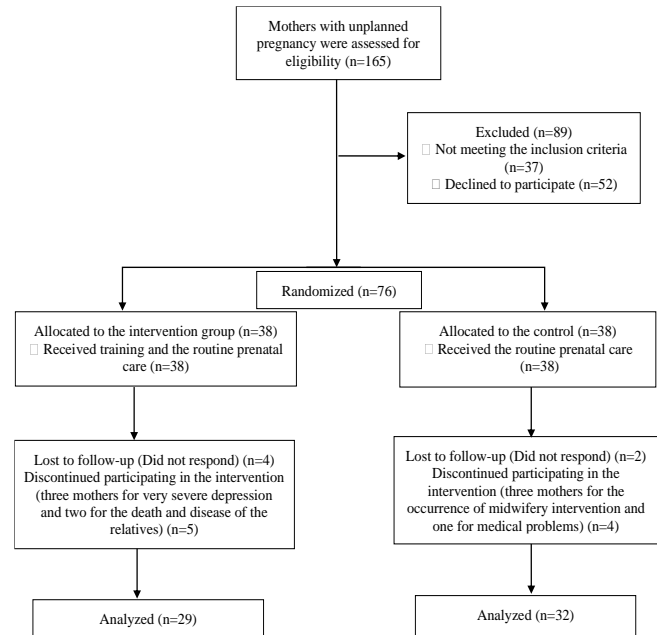


Figure 1. Enrollment of the participants in the study

Table 2. Comparison of the demographic and reproductive variables between the intervention and control groups

Demographic & reproductive variables		Intervention group	Control group	P-value
		M (SD)	M (SD)	
Mother's age (year)		30.20 (5.67)	31.06 (5.81)	P ^a =0.56
Fetal age (week)		25.4 (4.0)	26.46 (4.15)	P ^b = 0.49
London measure of unplanned pregnancy		2.31(0.71)	2.15 (0.67)	P ^b = 0.35
		N (%)	N (%)	
Mother's education	Elementary	6 (20.7)	14 (43.8)	P ^c = 0.15
	High school	12 (41.4)	9 (28.1)	
	University	11 (37.9)	9 (28.1)	
Mother's job	Housewife	25 (86.2)	31 (96.9)	P ^d =0.18
	Occupied	4 (13.8)	1 (3.1)	
Income	Low	8 (27.6)	10 (31.3)	P ^c =0.86
	Moderate	12 (44.4)	14 (43.8)	
	Good	9 (31)	8 (25)	
Habitat	City	20 (69)	18 (59.3)	P ^c =0.30
	Village	9 (31)	14 (43.8)	
Type of unplanned pregnancy	Mistimed	20 (69)	23 (71.9)	P ^c = 0.80
	Unwanted	9 (31)	9 (28.1)	
Gravid	1	4 (13.8)	3 (9.4)	P ^d =0.24
	≥2	25 (86.2)	29 (90.6)	
Para	0	4 (13.8)	3 (9.4)	P ^c =0.69
	1	16 (55.2)	16 (50)	
	≥2	9 (31)	13 (40.6)	

a P-value based on t-test; b P-value based on Mann-whitney-Test; c P-value based on Chi-Square-Test; d P-value based on Fisher's Exact Test

Demographic and obstetric characteristics

Most mothers were gravid two, primipara, housewives with an education level lower than university, and lived in an urban area. Most unplanned pregnancies were mistimed. The two groups were homogeneous in terms of demographic and obstetric characteristics (Table 2). Most of the mothers used a contraceptive method, but not a reliable one (withdrawal method: 25 and 23 women, condom: 2 and 1 women, and oral contraceptive pills: 1 and 4 women in the intervention and control groups, respectively) and 1 in the intervention and 4 in the control groups did not use any methods. The most common reason for unplanned pregnancy was financial problems. Some participants mentioned multiple reasons (Table 3).

Table 3. Reasons for unplanned pregnancy

Reasons for unplanned pregnancy	Number	Percent
Financial problems	44	67.21
Family issues	8	13.33
Fear of fetal anomaly and disability	30	49.18
The young age of the previous child	15	24.59
Sufficient number of children	13	21.31
Recent marriage	4	6.55
Concern about the baby's gender	13	21.31
Spouse's disagreement with current pregnancy	19	31.14
Inappropriate age of the mother	17	27.86
Pregnancy before marriage	1	1.63
Spouse's sickness	1	1.63
Fear of pregnancy	1	1.63

Effect of training on maternal-fetal attachment and its sub-scales

The MFA and its sub-scales scores are reported in Table 4. The highest score in the intervention group was related to interaction with the fetus, and in the control group, it was related to the mother's sacrifice. The efficacy of the training protocol on MFA was assessed by ANCOVA. Equality of the variance of attachment scores was accepted by Levene's test. The attachment score before training was entered in the model as a covariate, and it was not effective in improving the attachment score after the intervention due to $F=40.16$ and $P>0.05$. Group variables (i.e., intervention and control) were entered into the model as a fixed factor, and results showed no significant difference in attachment scores after the intervention between the two groups (Table 4). The mean difference of MFA before and after training was 3.41 ± 2.08 ($P=0.112$) in the intervention group and 3.96 ± 2.17 ($P=0.078$) in the control group.

The efficacy of the training protocol on the attachment sub-scales was analyzed by MANOVA. Box's test of equality of covariance matrices was not significant. Levene's test showed equality of variances for the acceptance of the maternal role, interaction with the fetus, distinction between self and fetus, attributing specific characteristics to the fetus, and sacrifice ($P>0.05$). After adjusting the effect of the binding sub-scale scores pre-intervention as covariates in the model, no significant differences were seen in the sub-scale scores post-intervention between the two groups. Moreover, there was no significant difference between the groups on the combined attachment dimensions after controlling for their basic scores (Table 4).

Effect of training on maternal-fetal attachment regarding the type of unplanned pregnancy

Post-intervention attachment scores for unwanted pregnancy in the intervention and control group were 80.55 ± 13.69 and 81.77 ± 10.74 , respectively, and were lower than mistimed pregnancy in both groups (94.55 ± 10.08 and 85.47 ± 12.61 , respectively). To compare the attachment scores between the groups regarding the type of unplanned pregnancy, MANOVA was applied. Based on Levene's test, equality of the variance of attachment score was accepted. Attachment scores were not significantly different based on the type of unplanned pregnancy between the intervention and control groups ($F=0.638$, $P=0.428$).

Discussion

In this study, the effect of training on MFA in women with unplanned pregnancies was assessed. The results showed that attachment increased in both the intervention and control groups, but the intra- and inter-group differences were not significant. Moreover, the training program was not significantly effective in the attachment sub-scales (Table 4), as well as the total score of attachment based on the type of unplanned pregnancy.

Interventional studies also showed the rise of total attachment scores or sub-scales in the control group over time (20). The rise in the attachment scores in both groups may result from increased gestational age and enhancement of adaptation to pregnancy. Consistent with this study, some researchers reported counting fetal movements, looking at the fetus in ultrasound, relaxation, and music therapy (13), and supportive intervention (12) did not improve MFA. Although some studies reported that ultrasound (21) and addressing infant attachment needs (22) had a positive effect on attachment with the fetus, they were not designed as a clinical trial. However, others reported the significant effects of single training on fetal movement counting (23) and combined training on MFA. Combined training encompassed counting fetus movements, speaking to the fetus, fetal parts palpation and positive imagination of fetus appearance, writing a letter to the fetus, touching the fetus from the abdomen and guessing

the placement of its limbs, and imagining hugging and breastfeeding the infant (24,25). It is worth mentioning that in contrast to our study, these investigations did not assess unintended pregnancies and evaluated primipara mothers. On the other hand, our results were inconsistent with the findings of other studies that reported increased attachment following one session of guided imagery training about maternal role with two weeks of follow-up in women with unplanned pregnancies (7,26). The discrepancy in results may be related to differences in the applied protocols. Therefore, mothers with unplanned pregnancies may be more willing to adopt a simple short-term behavior due to the lack of motivation. In addition, mothers were nullipara and close to the time of delivery. As a result, they might be more patient and interested to do any kind of care. In our study, mothers were mostly multipara with many problems and were asked to perform a combination of behaviors, which might have affected their willingness to comply with the instructions. MFA was affected by some factors, such as the mother's age, gestational age, level of education, parity, planned pregnancy, social support, and economic and marital status (4,24,26). Therefore, it seems that the difference in results may be attributed to these factors. In the current study, the participants were women with unplanned pregnancies who had inappropriate socio-economic and marital status, no social support, and low acceptance of pregnancy. According to Bowlby's theory, MFA is affected by the pregnant mother's attachment to her mother (27). This factor was beyond the scope of the present study. It may be under the influence of this factor that the educational program could not increase attachment; thus, deeper interventions are required. In this regard, some studies have shown that counseling and cognitive therapy can be effective in improving MFA in unplanned pregnancies (28,29).

Overall, in contrast to this study, some researchers found that interventions based on fetal awareness (8,23), educational programs (25,30), ultrasound (31), relaxation (26), and support techniques (32) can improve MFA. However, there are many differences regarding the studied population, intervention protocols, and design. Most studies did not consider unplanned pregnancy and did not perform a blended intervention. Some of them did not have a control group and included both fathers and mothers in the study (33). Therefore, comparing the results may not be relevant and more studies with the same design are needed.

This study has some limitations which need to be addressed. First, the majority of mothers were involved in many problems that could not be controlled, and they often did not have enough motivation to attend the training sessions because they had unplanned pregnancies. Second, due to the self-report design of the questionnaires, participants' reports may be somewhat different from reality. Third, the small sample size and short duration of the intervention might affect the results. Finally, it was not possible to do the homework under the supervision of the researcher because the trained behaviors had to be practiced daily. To control the limitation due to the psychological situations, in case of major stressful events, they were excluded from the study.

Conclusion

This study showed that maternal fetal attachment training alone cannot promote attachment in unplanned pregnancies. Given that various socio-economic and cultural factors affect unwanted and mistimed pregnancies, interventions affecting the mother's attachment in planned pregnancies may not be effective in unplanned pregnancies. Therefore, adopting specialized measures and adding psychological content to training protocols are suggested to improve attachment in women with unplanned pregnancies. Strengthening paternal-fetal attachment may make the intervention more effective in women with unplanned pregnancies. Therefore, considering the role of fathers in future studies is suggested.

Table4. Maternal-fetal attachment and its sub-scales scores before and after the intervention in the intervention and control groups

Maternal-fetal attachment and its sub-scales		Intervention group Mean (SD)		P-value	Control group Mean (SD)		P-value	P-value between groups	
		Before	After		Before	After		Before	After
Maternal-fetal attachment (total)		86.79 (14.80)	90.20 (12.88)	0.112 ^a	80.46 (14.90)	84.43 (12.06)	0.078 ^a	0.102 ^b	0.076 ^c
Behavioral dimension	Acceptance of the maternal role	15.34 (2.84)	16.06 (2.12)	0.092 ^a	13.96 (3.22)	15.46 (3.10)	0.015 ^a	0.084 ^b	0.378 ^d
	Interaction with the fetus	18.03 (3.98)	19.34 (3.90)	0.099 ^a	16.62 (3.57)	17.68 (3.50)	0.094 ^a	0.151 ^b	0.860 ^d
Cognitive dimension	Distinction between self and fetus	15.55 (3.10)	15.51 (2.69)	0.247 ^a	14.21 (3.57)	14.65 (3.24)	0.499 ^a	0.127 ^b	0.267 ^d
	Attributing specific characteristics to the fetus	20.65 (2.93)	19.44 (4.64)	0.103 ^a	18.40 (5.30)	19.34 (4.68)	0.159 ^a	0.067 ^b	0.931 ^d
Emotional dimension	Sacrifice	18.86 (3.70)	19.34 (3.19)	0.469 ^a	19.50 (3.91)	19.78 (3.05)	0.584 ^a	0.516 ^b	0.588 ^d

a P-value based on paired t-test; b P-value based on t-Test; c P-value based on ANCOVA; d p-value based on MANOVA

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Ethical statement

The study was approved by the Ethics Committee of Mazandaran University of Medical Sciences (Code of ethics: IR.MAZUMS.REC.1397.3029) and was registered at the Iran Registry of Clinical Trials (IRCT20091130002792N3).

Conflicts of interest

There is no conflict of interest for the authors.

Author contributions

"PM" designed the study, collected the data, and was a major contributor to writing the manuscript. "MAS" designed the study, interpreted the data, developed the first draft of the manuscript, and was responsible for the integrity and accuracy of the data. "FE" contributed to the designing of the study and interpretation of the data, and "AN" analyzed and interpreted the data. All authors read and approved the final manuscript.

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