

Factors and Interventions Associated with Parental Attachment during Pregnancy in Iran: A Systematic Review

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Abstract

Background: Parents' attachment to the child is an intimate, warm and continuous relationship which is the basis of the natural development of the child. Attachment starts long before birth, and is affected by a variety of factors that are not definitively recognized. Also, several interventions have been proposed for improving it that their effectiveness has not yet been determined. Given the evidence about the role of cultural and national differences, it is necessary to review existing studies in order to identify these factors and interventions in Iran.

Materials and Methods: In this review, Web of Science, Scopus, Proquest, Psycinfo, CINAHL, Embase, and PubMed databases and SID, Magiran, Irondoc, Barakat Knowledge Network System as Iranian databases were searched using English and Persian keywords such as prenatal attachment, relationship, maternal attachment between 2000 and 2017, to find articles related to prenatal attachment. The full text of the articles was studied by two reviewer and their main findings were extracted and categorized.

Results: Factors and interventions associated with parental attachment summarized into 12 themes: parent education, culture, anxiety, family, planning for pregnancy, history of fetal loss, substance abuse, postpartum attachment, fetal anomaly, paternal attachment, attachment measurement tools, and effectiveness of education on prenatal attachment.

Conclusion: The effect of education and counseling on prenatal attachment in Iranian parents suggests the use of these methods in prenatal care. Parent's education, social support and marital satisfaction were significant associated factors with increasing maternal attachment. History of fetal loss, anxiety and smoking was associated with the poor prenatal attachment.

Key Words: Iran, Parental Attachment, Pregnancy, Maternal-Fetal Relationship, Systematic Review.

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1- INTRODUCTION

Most of the richness and beauty of life come from every individual's close relationships with people like mother, father, sister, brother, partner, child and a small group of close friends. Everyone has a special attachment with each member of this group. Mother's attachment to her child is also one of these special cases (1-3). In fact, attachment is the foundation of the natural and healthy development (4). First time in the 1960s, the term attachment was used by John Bowlby in description with the mother-child relationship. He defined attachment as "a series of inner behaviors that would cause the infant to develop an intimate relation with his/her main caregiver" (5), while they both enjoy this relationship (6). Although this concept was first used for postpartum relationship, it is believed that attachment starts long before birth during the pregnancy period (7-9).

Cranelly defined maternal-fetal attachment as the enthusiasm for performing behaviors to interact with her infant (10) and Muller believed it to be beyond behaviors, and has defined attachment as a unique relationship between the mother and the infant (11). This relationship is known as one of the major components of the child's social and emotional development (7, 9); parents who have a high attachment to their infants are often sensitive to their needs, and this sensitivity affects many aspects of the infant's personality such as their sense of curiosity, ability to socialize and trust (12-19). In this relationship, the child would learn the manner of relating to and communicating with others and therefore, it is considered as the foundation for formation of child's future behaviors (20). A child with a more secure relationship with the parents during his/her first year of life, would experience more desirable cognitive outcomes, better social interactions and less behavioral and

educational problems (14). In return, in cases of low attachment, less emotional and mental development, escaping from school, poor social interactions, more aggressive and hostile behaviors in childhood, behavioral disorders in adolescence or adulthood, such as substance abuse would be observed (12, 21). The maternal-fetal attachment is closely related to other important processes. Meleis believes that the attachment and relationship to the fetus and giving of self for the fetus are the duties that the mother must undertake from pregnancy (22). The commitment, attachment and preparation of the mother to care for a child during pregnancy are one of the main components of the process of motherhood and the achievement of maternal identity (23). This process is essential for the sense of competence and eligibility for motherhood in women. In fact, maternal fetal attachment, at the center of the maternity concept, is a unique opportunity for mother and child to form a unique relationship of importance and value (24).

Father's attachment to the fetus, which is also father's deep love and affection toward his unborn child during pregnancy, plays an important role in accepting the paternal identity, desirable pregnancy outcomes and improvement of maternal-fetal health; meaning that fathers with higher attachment to their fetus are usually more sensitive toward in time start of their wives' prenatal care and health behaviors, and would develop a better relationship with their child after birth (25). The quality and level of attachment during pregnancy could be changed (8), and parents' preparation for developing a joyful relationship with their fetus could be strengthened using various strategies (1, 2). Therefore, different interventions have been suggested for increasing parents' prenatal attachment (2), but the effect of the proposed interventions in his field are

not yet determined (26-29). Since the attitude towards the unborn child is different in various parts of the world (30), and it seems that the quality of paternal-fetal relationship is impacted by different factors such as individual's nationality or cultural status (31), Alhusen et al. (2012) in their review article mentioned that, considering the increasing importance of attachment during pregnancy, researchers and care providers for pregnant women should have a comprehensive understanding of this relationship in their population (32), and comprehensive localized studies should be performed in this field. On the other hand determining these factors is of great importance due to their outcomes (33). Walsh et al. has also stated that predictive factors for maternal-fetal attachment are not definitely specified (34). During the recent years, by clarifying the necessity of evidence-based practice in clinical majors including midwifery, at first the studies that have been conducted in the field of attachment, their results and the necessary studies for future must be determined. So performing review studies is recommended. Review studies which are necessary for guiding the policies and making the decisions, would be helpful in planning for performing new researches (35). Also, given the evidence about the role of cultural and national differences, it is necessary to review existing studies in order to identify these factors and interventions in Iran. Results of the present study could help the providers of prenatal care in making more appropriate evidence-based decisions in the field of prenatal attachment.

2- MATERIALS AND METHODS

2-1. Data sources

This study is a systematic review of the interventions and factors associated with parental attachment during pregnancy in Iran. Web of Science, Scopus, Proquest,

Embase, PsycInfo, CINAHL and PubMed databases, and SID, Magiran, Irondoc, Barakat Knowledge Network System as Iranian databases were systematically searched. To determine the question of the review, Population, Interventions, Comparisons, and the Outcomes related to the objectives and Context of the study were considered (PICOC).

2-2. Search strategy

A comprehensive list of keywords was provided for each part of the PICOC. For example for the population, phrases such as pregnant mother, expectant mother/father, pregnant mother, husband of pregnant women and parents were used. Different combinations of the keywords were used for obtaining the maximum relevant articles (**Table.1**). Also, the archives of all the Persian-language journals in the fields of midwifery, reproductive health, family and psychology were manually searched based on the keywords.

2-3. Study Selection

After completing the search in each section, studies were sorted based on their publication year and the titles of the studies were reviewed to find repetitions. The selected articles were determined. The abstracts of the articles were studied and the inclusion criteria were evaluated. To avoid the selection bias, decisions about including or excluding the studies was made based on previously determined inclusion and exclusion criteria. These criteria were developed based on the objectives of the review and its components: published original articles between January 2000 and September 2017 in Persian or English languages that have been done in Iran among study population including pregnant women, their husbands or both while having a clear indication of measurement attachment during pregnancy, its associated factors, or

evaluated the effects of interventions on prenatal attachment, were selected in order to assess their full texts.

2-4. Data extraction

Full texts of the articles, their goals, used tools, studied variables; interventions and findings of the studies were assessed. Extracted data from each study were reviewed and organized into the form of a table (Table.2).

2-5. Risk of bias within the studies

To increase the reliability of the study's results and to prevent bias in data entrance, searching, study selection, making decision for inclusion or exclusion of the studies and evaluating the full texts were conducted by two independent reviewers (Figure.1 represents the process of the articles). The process was monitored by the supervisor with any disagreements resolved by discussion to reach consensus.

2-6. Study quality assessment

In the step of data management and processing, for assessment of the studies' quality, a standard assessment appropriate for the type of the study was used. The quality of experimental studies was evaluated using Consort 2010 (36), and Study Quality Guide by Cochrane Consumers and Communication Review Group (37), and descriptive studies were evaluated based on Newcastle-Ottawa Scale adapted for none randomizes studies (38).

2-7. Data synthesis

A summary of the main findings of the study was developed. Since the methodology of the reviewed articles was not the same, and in addition to interventional studies, observational studies were also included in the review; therefore, in order to data synthesis, the narrative approach with thematic summaries were used. The similar findings of studies were categorized as themes.

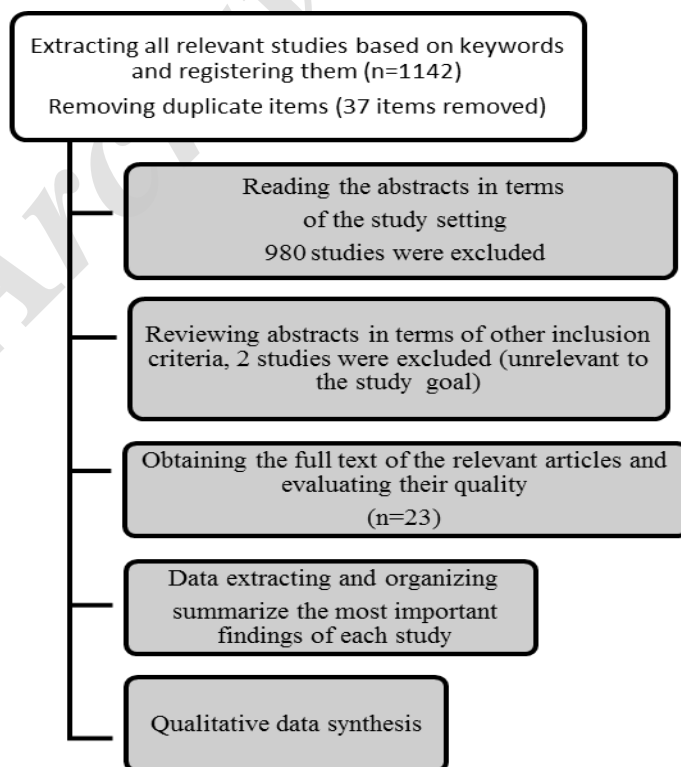


Fig.1: PRISMA flowchart of present study (39).

Table-1: Keywords combinations.

Maternal/Paternal And Attachment AND/OR Fetus,
 Prenatal /Pregnancy AND Attachment,
 Parental/Expectant Mother/Father AND Attachment,
 Paternal/Maternal AND Attachment,
 Maternal/Paternal AND Fetal AND Relation,
 Prenatal/Pregnancy AND Relationship,
 Mother/Fetal AND Fetal AND Relation,
 Mother/Father AND Fetal AND Attachment.

* Similar phrases and Persian synonyms were also used

3- RESULTS

In this review, all published original articles in electronic databases between January 2000 and September 2017 were reviewed. During the first step, 1,142 articles were found related to parental attachment during pregnancy. Subsequently, the titles and authors' names of the articles were sorted based on the year of publication and the articles were checked for duplication. Thirty seven studies were removed. Then, the abstracts were studied and, if it was not carried out in Iran, it was excluded from the study. At this step, 980 papers were excluded. Twenty five abstracts were controlled for other inclusion criteria. Two articles were excluded: one abstract was not relevant to the PICOC, and two articles with the same author while having a different titles, reported the same findings.

At the next step, the full text of the 23 articles was reviewed. A 'star system' has been developed in which a study is judged on three broad perspectives: the selection of the study groups; the comparability of the groups; and the ascertainment of either the exposure or outcome of interest for case-control or cohort studies respectively. The goal of this project is to develop an instrument providing an easy and

convenient tool for quality assessment of non-randomised studies to be used in a systematic review (38). An evaluation of the quality of the articles showed that all of them got the minimum score needed to enter the review (Half of total score). Finally, 23 articles were included the review: 12 Persian articles and 11 articles published in English. Fourteen articles were experimental and 9 articles were descriptive. The characteristics of the articles are shown in **Table.2** (*Please see the table at the end of paper*).

In general, the associated factors and interventions are summarized in 12 themes: parent education, culture, anxiety, and family, planning for pregnancy, and history of fetal loss, substance abuse, postpartum attachment, fetal anomaly, paternal attachment, attachment measurement tools, and the effects of education and counseling on prenatal attachment. The geographic distribution of studies from the East, North, Center, South, and West parts of Iran can represent a picture of the whole country and confirm the external generalizability of the review findings.

4- DISCUSSION

The present study indicates that in Iran, parental attachment during pregnancy has

been associated with what factors and interventions to improve it. Of the 23 papers found, 14 were interventional and 9 were descriptive. More than half of the articles were intervention and can provide the strongest evidence that is the strength of this review. Also, descriptive-analytic articles are important in depicting the existing conditions and can be helpful in identifying factors associated with the attachment of pregnancy. In general, the findings are summarized in 12 themes: parent education, culture, anxiety, family, planning for pregnancy, history of fetal loss, substance abuse, postpartum attachment, fetal anomaly, paternal attachment, attachment measurement tools, and effect of intervention on prenatal attachment.

4-1. Parent education and attachment

Parent's education is one of the factors that are associated with increased attachment (25, 51). Rubin believes that during pregnancy, mother takes four major developmental tasks to achieve maternal identity: safe passage, the acceptance of her child by intimate persons and receiving support, communicating with the child, and giving of self for the baby (58). Although these tasks prepare the mother for postpartum period, it also makes a sense of satisfaction with the fetus (59). In order to ensure safe passage during pregnancy, the mother has to learn about herself and fetal. Perhaps, one of the reasons for the increased attachment with education will be the possibility of obtaining a higher awareness of parents about the fetus and pregnancy.

4-2. Culture and attachment

Culture plays an important role in parenting behaviors and attachment (60). The cultural background of families affects their attitude, behavior, and performance during pregnancy and postpartum. Insufficient attention to culture and cultural values in existing researches in

prenatal attachment issue is one of the findings of this study. Only one study that focuses on the role of language and dialect shows that Persian speaking fathers have had a higher attachment than Lori and Azeri speaking fathers (25).

4-3. Anxiety and Attachment

Findings show that training attachment behaviors through increasing maternal-fetal attachment reduces anxiety and improves mental health. In the study by Rafiee et al. attachment training reduces the anxiety in third trimester of pregnancy in first time pregnant women in Shiraz (61). One of the factors that cause anxiety is concerned with passage the pregnancy safe. When this confidence is obtained through training attachment behaviors, anxiety decreases. On the other hand, it seems that this relationship is mutual, so that anxiety is a factor that can affect maternal-fetal attachment, so this relationship can be improved through ways that reduce the anxiety (46).

4-4. Family and Attachment

Social support, marital satisfaction, and affection to partner are factors associated with attachment in family relationships (24, 25, 51). This relation also applies to pregnant women with a history of fetal death (49). Relationship between marital satisfaction and maternal-fetal attachment has also been reported in some other studies (62). Social support is the amount of respect, affection and love that one receives from others. (63) The study on this case shows that social support increases maternal attachment by reducing depression in pregnancy (64). Relationship between poor attachment and depression disorders during pregnancy is an important issue, because this situation results in a severe reluctance of mother to communicate, and this will result in a weaker attachment in the postpartum period (65). The partner can be a source of support for enhancing maternal and fetal

attachment (66). Family support allows the new member to be accepted, and this is critical in the formation of the relationship between the mother and the fetus (59). The mother tends to place her fetus under the support of father and community and ensure its future. (49). Lack of social support or the instability of family relationships during pregnancy reduces maternal-fetal attachment while increasing women's anxiety and their concerns with the passing the pregnancy safe.

4-5. Planning for pregnancy and Attachment

The relation between planned pregnancy and maternal-fetal attachment is conflict. Some studies report wanted pregnancy, tendency to childbearing and planning for pregnancy as the factors enhancing the maternal-fetal attachment (25, 50), which is also showed in some studies in other parts of the world (21, 62, 67); while another study has not showed any correlation between prenatal attachment and the type of pregnancy (wanted or unwanted) (30). One of the reasons for conflict findings is the various measurement tools for maternal-fetal attachment so that the Muller prenatal attachment inventory (11) measures three attachment subscales that are in the domain of emotional relationships; while Cranley's maternal-fetal attachment scale (10) is more comprehensive, and includes five subscales. Some studies have reported that anxiety is greater especially in the cases of unplanned pregnancies in multiparous women, so it decreases maternal-fetal attachment, and they have reported improvement in anxiety and increased attachment in this group of mothers after their intervention (41).

4-6. History of Fetal loss and Attachment

Studies assessed the relationship between maternal-fetal attachment and the history

of fetal loss indicated that the mean score of attachment or its subscales are lower in these populations (48, 56). Although Armstrong et al. reported different results; they showed that Maternal-fetal attachment is not influenced by the history of fetal loss. It should be noted that when a mother experiences fetal loss, she may feel overwhelmed for many years and, in the next pregnancy, develop severe anxiety and distress that results in poor attachment (32). These mothers need educational, counseling and supportive programs; but this issue hasn't been addressed in Iran. So that has been studied only in one study (43). However, in the case of history of prenatal death, the decision for next pregnancy may lead to a conflict of feelings in the father (68), but in the Iranian studies, the history of stillbirth and abortion was not associated with paternal attachment (25,50).

4-7. Substance Abuse and Attachment

Smoking is associated with poor maternal-fetal attachment (25). It is believed that there is a positive relationship between health promotion behaviors such as cease the smoking and drugs and prenatal attachment (69); as poor attachment shows itself with insufficient health behaviors during pregnancy, such as smoking. The tendency to give up smoking is higher in women who are willing to maintain their health for their fetus (70).

4-8. Prenatal and Postpartum Attachment

Only three studies have assessed these two variables together. It should be noted that the stronger the maternal-fetal attachment is, stronger emotional behaviors the mother will have with the infant after birth (45). Interventions on maternal-fetal attachment affect the mother-infant attachment behaviors during postpartum period (2, 46).

4-9. Paternal Attachment in Comparison with Maternal Attachment

In the limited studies that have examined the paternal-fetal attachment, there is a significant difference between the maternal and paternal attachment (25, 50), which shows fathers are attached to their fetus by a different pattern (62). These results showed that mothers have a stronger relationship with the fetus. One of the reasons is the lack of paternal involvement in prenatal care programs; so that the increase of father's attending in prenatal ultrasound scans was associated with increased paternal attachment to the fetus (25). In Iran, less attention has been paid to the participation of fathers during pregnancy. If the fathers are trained about the attachment concept and know their role in reducing anxiety of wives, they can increase the maternal-fetal attachment (47).

4-10. Fetal Anomaly and Attachment:

Fetal anomaly, smoking, and high risk pregnancies are related to poor attachment behaviors. Although abnormality in the fetus lead to anxiety and adverse psychological effects, the comparative study of the prenatal attachment before and after fetal echocardiography between two groups of pregnant women, showed that maternal attachment in the group of fetus with abnormality was significantly higher than healthy fetus group (4). Emotional attachment before childbirth has two dimensions: qualitative and quantitative. Quantitative dimension or attachment magnitude is time long that mother devoted to behaviors such as acquirement the necessary information, engagement in dreaming and imaging the fetus (71). In fact, the mindfulness of mother is more effective than other factors such as maternal investment for pregnancy on maternal-fetal attachment (72); therefore, if the parents are committed to continuing pregnancy, the diagnosis of fetal anomaly

will not interfere with their attachment (59).

4-11. Prenatal Attachment measurement

In 21 reviewed studies, the Cranley's maternal/paternal-fetal attachment scale has been used to measure attachment (1, 2, 25, 40-57). In a study, the validity and reliability of the Muller prenatal attachment inventory in the Iranian pregnant women population has been verified (30). The Cranley's scale, which has been used in the world more than other scales, has been used in Iran since 2002 after verifying content validity and reliability through a test-retest method and correlation coefficient of 0.85 as a standard questionnaire in studies (53). The similarity of maternal-fetal attachment measurement tool in the studies can affect the results of findings and is one of the strengths of this review.

4-12. Interventions on prenatal Attachment

Except for one study, interventions were done to improve maternal-fetal attachment with theoretical and practical training sessions that emphasized behaviors such as touching the fetus on the abdomen, imagining the position of the fetus in the womb, explain the physiological changes in pregnancy, and fetal development in different gestational ages. Duration of these interventions vary from two weeks to one month that was mainly done in mothers without a child (first pregnant women or mothers with the history of fetal or neonatal loss) in third trimester of pregnancy and increased maternal-fetal attachment. The common parts of these interventions is touching the fetus and counting the movements. It seems that this simple, inexpensive and effective intervention can be suggested as a common intervention to increase maternal-fetal attachment. Encouraging women to focus on fetal movements has a beneficial effect on prenatal attachment. Even

attention to the magnitude and frequency of fetal movements during the 24-hour period have also increased the maternal-fetal attachment (33), so that women who felt more frequency movements of fetus during 24 hours, had higher score in all subscales of prenatal attachment. Focus on the fetal movements reinforces the presence of fetus to the mother and causes stronger sense of attachment. In a model presented by Cranley the differentiation of fetus from herself is one of the parts of maternal attachment during pregnancy (10). Also, hearing the fetus's heartbeat and touching various parts of the fetus's body from the abdomen also help strengthen this relationship. According to Kaplan's theory, feeling the movement of the fetus helps the mother to accept the fetus as an independent entity (73). A feeling of movement is a sign of the presence of fetus. According to Rubin, the starting point of attachment is feeling the fetal movement (59).

4-1. Suggestion

This study shows a comprehensive image of the prenatal attachment in Iranian parents. By analyzing the existing situation, it is possible to design appropriate interventions according to the characteristics of Iranian parents based on the facilities. Findings can be used to improve this relation. Despite the importance of prenatal attachment, and the considerable number of related documents found in the world, it seems it has not been addressed well in Iran. Regarding to the effectiveness of interventions on paternal attachment during pregnancy among Iranian parents, the use of these methods is recommended to prenatal care. Since there is no definitive evidence of the relationship between some factors and the prenatal attachment and studies have been done among low-risk pregnant women and the father's role wasn't studied, more studies are needed on these issues. Comprehensive studies are suggested

among populations with various cultural and social backgrounds with different reproductive characteristics. Also, due to the lack of qualitative studies about prenatal attachment in Iran, research with qualitative methodology is suggested.

5- CONCLUSIONS

Findings shows parent's education is one of the factors that are associated with increased attachment. Anxiety is a factor that can affect maternal-fetal attachment, so this relationship can be improved through ways that reduce the anxiety. Lack of social support or the instability of family relationships during pregnancy reduces maternal-fetal attachment. In the Iranian studies, the history of stillbirth and abortion was not associated with paternal attachment but it has decreased maternal attachment. Fetal anomaly and smoking are related to poor attachment behaviors. The relation between planned pregnancy and maternal-fetal attachment is conflict and it needs further studies. Theoretical and practical training sessions has improved maternal-fetal attachment. The common parts of these interventions is touching the fetus and counting the movements. Interventions on maternal-fetal attachment affect the mother-infant attachment behaviors during postpartum period.

6- CONFLICT OF INTEREST: None.

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Table-2: General Characteristics of studies								
Authors , Year of publication, References	Study Focus	Study design	Study population	Sample size	Study setting	Instrument for Measuring the Attachment	Methods	Main results
Salehi et al. 2017 (40)	The Effect of Education of Fetal Movement Counting on MFA*	Randomized Controlled Clinical Trial	Pregnant women	52	Isfahan	CMFAS**	The subjects were randomly assigned into two groups. The intervention group was trained, in addition to routine prenatal care, with counting and recording fetal movements, for one month.	A significant increase in MFA was observed in comparison with the control group.
Kordi et al. 2016 (41)	The Effect of guide imagery on MFA	Clinical Trial	Nuliparous women with unplanned pregnancy	67	Mashhad	CMFAS	The subjects were randomly assigned into two groups. The intervention group was given a training session on guided imagery of maternal roles.	Guided imagery significantly increased the MFA.
Mohammadi Rizi and Kordi, 2016 (6)	The relationship between multi- dimensional self- compassion and MFA	Cross sectional	First time Pregnant women	394	Mashhad	Prenatal attachment inventory	Questionnaires were completed by subjects.	There was a significant correlation between the total self-compassion, its dimensions and MFA.

Sajjadi et al. 2016, (42)	Efficacy of MFA Techniques on Enhancing Mother's Attachment to the Fetus	interventional	Pregnant women	30	Tehran	CMFAS	Subjects were randomly assigned into two groups. The intervention group received 8 hours of weekly training sessions on attachment skills.	Pre-natal attachment training increases MFA.
Baghdari et al. 2016 (43)	The Effects of Pregnancy-Adaptation Training on MFA and Adaptation	quasi-experimental	Pregnant Women With a History of Baby Loss	60	Mashhad	CMFAS	Subjects were randomly assigned into two groups. The intervention group received routine prenatal education in addition to four sessions of a pregnancy adaption training package.	The pregnancy adaptation training package increased the adaptation and MFA.
Omani samani et al. 2016 (30)	Psychometric properties of the Persian version of prenatal attachment inventory	Cross sectional	Primi-gravida women	322	Tehran	Prenatal Attachment Inventory	Subjects completed the questionnaire. After two weeks, participants were re-tested. Confirmatory factor analyzing was done.	The unplanned and planned pregnancies were not significantly different in term of MFA.
Parsa et al. 2016 (44)	The effect of training on MFA	Randomized clinical trial	nulliparous women	110	Hamedan	CMFAS	Subjects were randomly assigned into two groups. In the intervention group, four 45-minute group counseling sessions were held on MFA concept and its behaviors on a weekly basis.	Counseling increased MFA in the intervention group compared to the control group.

Tafazoli et al. 2015 (45)	The Relationship between MFA and Mother-Infant Attachment Behaviors	Descriptive correlational	Primiparous women	100	Mashhad	CMFAS, Avant's mother-infant attachment checklist	Subjects completed Questionnaires. Four and eight weeks after delivery, mothers' behaviors toward their neonates were observed while breast feeding.	There was a direct positive relationship between MFA and mothers' emotional behaviors toward infants four and eight weeks after delivery.
Toosi et al. 2014 (46)	The effect of relaxation on anxiety and MFA	Clinical trial	Primi-gravida women	84	Tehran	CMFAS, Avant's mother-infant attachment checklist	Subjects were randomly assigned into two groups. In the intervention group, in addition to routine prenatal care, weekly sessions with relaxation were done for one month. At the first breast feeding after birth mother attachment behaviors were observed.	The maternal- fetal/neonate attachment in the intervention group increased significantly. Anxiety was also improved.
Akbarzadeh et al. 2014 (47)	The effect of father's training regarding attachment skills on MFA	Randomized controlled trial	Expectant fathers	150	Shiraz	CMFAS	The subjects were randomly assigned into two groups. In the intervention group, four 90-minute training sessions were performed on MFA for one month. The fathers were responsible for transmitting the training to pregnant mothers.	After intervention, MFA was significantly different between two groups.

Mehran et al. 2013 (48)	History of perinatal loss and MFA behaviors	Comparative	Pregnant women with and without a history of perinatal loss	100	Tehran	CMFAS	Subjects in the 3 rd trimester of pregnancy completed the questionnaires. The two groups of women were matched for health and literacy.	History of pregnancy loss was found to be associated with disturbances in MFA behaviors related to 'differentiation of self from fetus' in a subsequent pregnancy
Astaraki et al. 2014 (25)	Paternal-Fetal Attachment Behaviors and Associated Factors	Cross-sectional	Expectant fathers who had wives in their 20-40 th weeks of pregnancy	400	Tehran	Cranley' Paternal Fetal Attachment Scale	Subjects completed the questionnaires.	Factors such as ethnic groups, higher education, gestational age, planned pregnancy, baby's gender, and attending ultrasound scans had significant effects on paternal-fetal attachment. Previous marriage, fetal anomaly, tobacco use, multiparty and high risk pregnancy resulted in lower paternal attachment.
Sadeghi et al. 2014 (49)	The association between marital satisfaction, social support and MFA	Correlation	Pregnant women with a prior history of fetal or neonatal death	180	Mashhad	CMFAS	Questionnaires were completed by the subjects between 14 th and 28 th weeks of pregnancy.	The MFA was correlated to marital satisfaction and social support.

Parental Attachment during Pregnancy

Abasi et al. 2013 (50)	The comparing of fetal attachment between couples	Comparative	pregnant women and their husbands	386	Sari	CMFAS	The questionnaires were completed by participants.	The prenatal attachment was different between expectant mothers and fathers, and it was higher in mothers. The marital satisfaction and planning for pregnancy are factors influencing attachment. There was a significant relationship between social support, mother's education, fetal gender prediction and MFA.
Torshizi, 2013 (51)	Different Dimensions of MFA Behaviors and Associated Factors	Descriptive-analytical	Pregnant women	241	Birjand	CMFAS	Questionnaires were completed by subjects.	MFA was significantly correlated with education level of expectant mothers and fathers, satisfaction with life and social support.
Jamshidi Manesh et al. 2013 (52)	MFA and its Associated Factors	Cross sectional	Pregnant women	400	Tehran	CMFAS	Subjects completed the questionnaires.	Age and high education, high gestational age, wanted pregnancy and satisfaction with the fetus gender, being housewife, speaking Persian language, performing fetal health screening were the factors associated with attachment.

Akbarzadeh et al. 2013 (53)	Effect of learning attachment behaviors on anxiety and MFA	Randomized control trial	First pregnant women	84	Shiraz	CMFAS	The subjects were randomly assigned into two intervention and control groups. Experimental group received routine pregnancy care in addition to four 90-minutes' sessions on the MFA behaviors.	Women in the case group experienced significantly less anxiety and more MFA after learning attachment behaviors.
Toosi et al. 2011 (1)	Effect of Attachment Training on Anxiety and Attachment Behaviors	Clinical trial	First-time Mothers.	84	Shiraz	CMFAS, Avant's mother-infant attachment checklist	Subjects were randomly assigned to intervention and control groups. In addition to routine prenatal care, the intervention group received 4 sessions of 90 minutes during one month. At the first day after the delivery, the researchers observed mothers attachment behavior.	After the intervention, MFA increased significantly in the intervention group compared to the control group.
Abasi et al. 2010 (54)	The Effect of Foetal Movement Counting on Primipara MFA.	Interventional	First time pregnant women	83	Sari	CMFAS	Subjects were randomly assigned into two groups. The intervention group counted their fetal movements for half an hour each morning.	Regular counts of fetal movements can significantly increase the MFA.
Abasi and Tafazzoli 2009 (55)	Effect of attachment behaviours education on Primipara Maternal Foetal Attachment	Interventional	First time pregnant women	83	Sari	CMFAS	Subjects were randomly assigned into two groups. The intervention group received four two-hour weekly sessions training for attachment behaviors.	The training of attachment behaviors increases MFA.

Taavoni et al. 2008 (56)	Comparison of Maternal Fetal Attachment between Primgravidas and Multigravidas Women	Comparative	Pregnant women with Past History of Fetal or Neonatal Death	120	Mashhad	CMFAS	Forty subjects (with no living child) and 80 Subjects (primi-gravida) were completed the questionnaires.	A statistically significant difference was found in total score of MFA and its subscales between two groups.
Abasi et al. 2008 (57)	The effect of MFA educatin on maternal mental health	Intervention	First time pregnant women	83	Sari	CMFAS	The subjects were randomly assigned into two groups. In the intervention group, the training classes of MFA behaviors were held weekly and the subjects recorded their attachment behaviors.	The mean score of mental health and MFA increased significantly at the end of the study in the intervention group.
Davachi et al. 2001 (2)	The effect of fetal touching on MFA or meternal newborn attachment	Randomized controlled clinical trial	First time pregnant women	100	Boushehr	CMFAS, Avant's Mother Infant attachment checklist	The subjects were randomly assigned into two groups. In the intervention group, mothers touched the fetus daily for two weeks and recorded the fetal movements. Then, on the first day after childbirth, the two groups were observed at the first breastfeeding.	There was no significant difference in the MFA and its dimensions between the two groups, but after delivery, the self-directed behaviors, mother's attention to the infant and the maternal-infant attachment behaviors were significantly different in the two groups.