Mother-infant bonding and its predictors among pregnant women in Saudi Arabia

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ABSTRACT

The purpose of this study is to identify the predictive factors that encourage mother-infant bonding in pregnant women in the city of Jazan (Saudi Arabia). This is a descriptive cross-section study with 255 pregnant women who filled in the Mother-Infant Bonding Questionnaire, Multidimensional Scale of Perceived Social Support, and Relationship Assessment Scale. Data were analyzed using the t-test, analysis of variance, and regression analysis. The main results showed that pregnant women are generally geared toward a high level of bonding with their infants (3.34±2.080). Regression analysis indicated that a significant portion of the variance in the level of mother-infant bonding among pregnant women was attributed to spousal support, planned pregnancy, and working status. The three variables accounted for 28.6% of the variance in raising mother-infant bonding. This study demonstrated the significance of spousal support and planned pregnancy in the lives of pregnant women. As a result, spousal support during a planned pregnancy may affect feelings and behaviors toward the fetus that are more affectionate, caring, and concerned. Therefore, attention to these factors should be considered in planning to improve mother-infant bonding.

1. Introduction

Bowlby (1982) was the first to propose an attachment theory for a mother and child bond in the 1960s (Ossa et al., 2012). Bowlby (1982) described bounding as a set of inner behaviors that would make the infants closely associated with their primary caregivers, who are typically the mothers. Even though this concept was first developed during the postpartum period, many authors believed that bounding would begin long before childbirth, during pregnancy (Atashi et al., 2018; Güney and Uçar, 2019; Bjelica et al., 2018). It means that bounding begins when the mother knows about her pregnancy, and this is the actual starting point for the relationship between the fetus and the nearby environment (Golmakani et al., 2021). Cranley (1981) articulated the bounding of a mother, as she was eager to connect with her fetus, in addition. Muller and Mercer (1993) claimed it was more than just actions and described her as a special bond between her mother and her fetus. The focus on the value of a mother-infant bond (MIB) is a common feature of all of these concepts (Terada et al., 2022).

The development of MIB is important as it plays a key role in the invention and development of postpartum attachments (Erickson et al., 2019). Cataudella et al. (2016) and Zdolska-Wawrzkiewicz et al. (2020) have revealed that during the prenatal period, MIB will build up and help the mother prepare for the transition to the period of motherhood. The mother-infant bond plays a crucial role in the health status of pregnant mothers and the growth of unborn babies (Atashi et al., 2018). In addition, several studies have shown that there is a significant impact of MIB on predicted postpartum attachment behaviors, such as relationship and communication between mother and child (Oyetunji and Chandra, 2020; Takács et al., 2020). The postpartum attachment was positively correlated with higher MIB (Doster et al., 2018). The mother-infant bond, which is one of the fundamental needs of both the mother and the child, will serve as an imaginary bond and establish a positive relationship between the mother and the child. It would be considered a central component of the child's development and would strengthen a sense of confidence (Joas and Möhler, 2021; Denbow, 2019).

The mother-infant bond has been strongly associated with certain developmental properties, such as problem-solving capabilities, exploration skills, imagination, and control capabilities in early childhood (Lutkiewicz et al., 2020).

On the other hand, the lower MIB predicted poorer postpartum bonding at 3 months (Jussila et al., 2021). Likewise, Smorti et al. (2019) and Yoon and Sung (2021) discovered that women who expressed negative feelings about birth in the early period of the postpartum during their pregnancy also expressed lower levels of MIB. Impeded development of MIB would have a negative impact on children, adolescents, and adults (Nordahl et al., 2019). Children with impaired MIB experience have demonstrated weaker emotional and mental development, poorer social relationships, increased school-leaving behavior, and, in addition, violent and disruptive behavior during childhood, behavioral disorders in teenagers, and increased substance abuse behavior during adulthood (Nordahl et al., 2019; Lutkiewicz et al., 2020). Disturbed MIB may also impede immunity and healing and may contribute to psychosomatic disease caused by the physical manifestations of autonomic dysfunction (Glynn et al., 2018). Children and adults who have an unstable attachment during the prenatal period may learn that their parents are not always present in times of stress and difficulty, leading to an insecure relationship with their parents (Atashi et al., 2018).

To the researcher's knowledge, there is a shortage of Saudi Arabian published studies to identify predictors that will develop MIB during pregnancy. Identification of other variables may therefore have a positive effect on MIB that helps healthcare professionals in the development of educational programs based on these predictors. Moreover, the previous studies that looked at MIB and related factors in Saudi Arabia looked at MIB during the postpartum period, such as a study conducted by Abbas et al. (2018) that found that the psychological status of the mother was one of the main factors affecting bonding in the postpartum period. Considering the importance of MIB in the development of children and mothers' health during pregnancy, the researchers carried out this study to assess the level of MIB during pregnancy and examine the predictive factors that may improve MIB among women in Saudi Arabia.

2. Method

This study used a descriptive cross-section design. The study was conducted in the southwest corner of Saudi Arabia among pregnant women who received antenatal care at three antenatal care clinics located in the middle, eastern, and southern parts of the city. The three clinics serving number of women accessing the three antenatal care clinics were 849 in 2018 (Asmri et al., 2020).

The study sample consisted of pregnant adult women (age≥18 years old). The pregnant women were selected with a nonprobability sample method (convenience) in antenatal care clinics. All available women were included in the sample at the time of data collection. The sample size was calculated prior to data collection using the G*Power software. The researcher estimates the sample size based on a desired power of 0.95, $\alpha=0.05$, and a medium effect size of 0.5. The final sample consisted of 240 participants to strengthen the study findings. However, oversampling is intended to gain a more detailed understanding of the phenomena. The final sample size in this study was 255 pregnant women.

The selection and inclusion criteria required that the women be (a) aged 18 years old or more; (b) different parties and levels of education; (c) oriented and mentally competent; (d) free from obstetrical problems such as antepartum hemorrhage, eclampsia, preeclampsia, and medical diseases such as cardiac disease, diabetes mellitus, anemia, or kidney disease; (e) patients who are able to read, write, and communicate in Arabic; and (f) are capable of communicating via the WhatsApp application. The exclusion criteria for subjects are: (a) less than 18 years old; (b) women with obstetrical or medical illnesses; (c) patients who are unable to read, write, or communicate in Arabic; and (d) inability to communicate through WhatsApp.

2.1. Study instruments

The questionnaire consisted of three instruments and a maternal demographic sheet. The maternal demographic sheet was developed by the researcher on the basis of a literature review, taking into account the aim of the study and the data to be collected for this study, including obstetric history (gestational age, intended pregnancy) and maternal demographic data (maternal age, maternal education, and work status). These characteristics were found to have significant relation with MIB in the reviewed studies (McNamara et al., 2019). This study used the Mother-Infant Bonding Questionnaire (MIBQ), the Multidimensional Scale of Perceived Social Support (MSPSS), and the Relationship Assessment Scale (RAS).

2.1.1. Mother-infant bonding questionnaire (MIBQ)

Taylor et al. (2005) used a self-reported scale of nine items to measure maternal bonding toward her fetus and infant. MIBQ includes: "loving," "disappointed," "neutral or felt nothing," "possessive," "resentful," "dislike," "protective," "joyful," and "aggressive" (Taylor et al., 2005). All items on the MIBQ are applicable during the pregnancy and postpartum periods. This instrument uses a 4-point Likert scale ranging from 3 (not at all) to 0 (very much), with the scale of some items reversed. The total scale ranges from 0 to 27, with higher scores indicating worse mother-infant bonding. The Cronbach's alpha value for the total scale was found to be 0.71 (Taylor et al., 2005), and more recently, the Cronbach's alpha reliability

coefficient of MIBQ was found to be 0.84 (Ohara et al., 2016).

2.1.2. Multidimensional scale of perceived social support (MSPSS)

The MSPSS is a 12-item self-reported scale used to measure an individual's perception of support from three sources: Family, friends, and a significant other (special person) (Zimet et al., 1988). This instrument uses a 7-point Likert scale ranging from 7 (very strongly agree) to 1 (very strongly disagree). Items 1, 2, 5, and 10 indicate "Significant Other" subscale support, items 3, 4, 8, and 11 indicate the "Family Support" subscale, and items 6, 7, 9, and 12 indicate the "Friends Support" subscale. The total scale ranges from 12 to 84, with higher scores indicating high-perceived social support. A mean scale score ranging from 1 to 2.9 could be considered low support; a score of 3 to 5 could be considered moderate support; a score from 5.1 to 7 could be considered high support (Zimet et al., 1988). The subscales' discriminant validity is satisfactory and the instrument has good psychometric properties in terms of validity and reliability index for all three subscales, ranging from 0.85 to 0.92 and 0.87 to 0.93 for the whole scale (Budge et al., 2013; Wang et al., 2021).

2.1.3. Relationship assessment scale (RAS)

RAS is a reliable, brief, and cost-effective measurement of relationship satisfaction (Hendrick, 1988). Relationship satisfaction is one of the main areas of relationship assessment. It is composed of seven items, each scored on a Likert scale of five points. RAS scores range from 7 to 35, with higher scores indicating greater satisfaction with the relationship. It is appropriate for use with any person in an intimate relationship, such as married people, cohabiting couples, engaged couples, or dating couples. The short form of the scale makes it more effective in clinical locations and for online administration (Hendrick, 1988). The RAS was found to have adequate reliability and validity (Hendrick, 1988). The most recent Cronbach's alpha of RAS was 0.82 (Maroufizadeh et al., 2018).

2.2. Data collection process

The researcher first met the party responsible for women's records and prepared a strategy for gathering pregnant women's names who visited the antenatal care clinic. After that, preparations were also made with the charge nurse to arrange a meeting with the participants before leaving the antenatal care clinic. The researcher provided the charge nurse with information on the purpose of the study, the data collection process, and study eligibility criteria to ensure their assistance in the data collection process. The researcher explained the purpose and procedures of the study and invited women to participate in it if they met the inclusion criteria of the study and the women who were willing to participate, including the signing of informed consent with an acknowledgment that the women understood the information contained within the consent form. The researcher then collected the WhatsApp numbers of the women to send a link to the Google form. The researcher told the women to submit the answers when they completed the questionnaire. The Google form link included a questionnaire that is divided into sections. The first section includes a cover letter form and a demographic sheet, while the second section includes the instruments of the study.

2.3. Data analysis

The Statistical Package for Social Science (SPSS) SPSS®-PC version 28 for Windows was used to analyze the data. For all statistical analyses, the level of significance was set at 0.05. Descriptive statistics were used to describe the maternal demographic data as well as the level of MIB, social support, and spousal support. An independent-sample t-test was used to examine the difference in the mean level of the MFA between women who planned to become pregnant and women who did not plan to become pregnant and between working women and not working women. One-way ANOVA was used to examine significant differences in the mean level of the MIB across age groups and levels of education. The Pearson product-moment correlation coefficient was used to identify potentially significant relationships between MIB and social support, spousal support, and maternal demographic characteristics. A stepwise multiple linear regression analysis was used to identify the predictive power of MIB from the following variables: Social support, spousal support, and maternal demographic characteristics.

3. Results

The sample consists of 255 pregnant women in this study. The age ranged from 17 to 44 years, with a mean (SD) of 28.37 (6.68). The gestational week ranged from 9 to 41, with a mean (SD) of 26.96 (7.20). Most of the participants (95.7%) planned for pregnancy in the second trimester (48.2%) and third trimester (47.8%). Most of the participants were in secondary school education (63.9%) and the majority of them were working (86.7%) (Table 1).

3.1. The results of the participants' maternal-fetal attachment level, social support level, and spouse support level

Analysis of the results revealed that the mean (SD) level of mother-infant bonding was 3.34 (2.080). This indicates that pregnant women are generally geared toward a high level of attachment with their infants in this study. The mean (SD) level

of social support among pregnant women was 6.01 (.714) on the MSPSS. The mean score from 5.1 to 7 could be considered high support (Zimet et al., 1988), indicating higher levels of social support in this study. The mean (SD) level of spouse support among pregnant women was 3.03 (.479), indicating that pregnant women are generally geared toward higher levels of support from their spouses in this study (Table 2).

Table 1: Demographic characteristics of participants (N=255)

Variable	Mean	SD	No. (%)
Age	28.37	6.68	
Gestational week	26.96	7.20	
Age groups			
≤24			95 (37.3)
25-33			85 (33.3)
>34			75 (29.4)
Planned pregnancy			
Yes			244 (95.7)
No			11 (4.3)
Education			
Primary school			11 (4.3)
Secondary school			163 (63.9)
College or university level			81 (31.8)
Working status			
Yes			221 (86.7)
No			34 (13.3)
Gestational age			
≤13 (First trimester)			10 (3.9)
14–26 (Second trimester)			123 (48.2)
>27 (Third trimester)			122(47.8)

SD: Standard deviation

Table 2: Measures of central tendency of study instruments

Variables	Min.	Max.	Mean	SD
Mother-Infant bonding questionnaire (MIBQ)	0	19	3.35	2.071
Multidimensional scale of perceived social support (MSPSS)	4	7	6.01	.714
Relationship assessment scale (RAS)	2	4	3.03	.479

SD: Standard deviation

3.2. The results of the relationship between the level of mother-infant bonding and social support, spouse support, age, and gestational weeks

A Pearson product-moment correlation (Pearson r) coefficient for a 2-tailed test of significance was used to determine the relationship between the independent variables (social support, spouse support, gestational week, and age) and the dependent variable, mother-infant bonding (Table 3). The results of this study revealed that there was a weak, statistically significant positive relationship

between spouse support and the level of mother-infant bonding (r=0.271; n=255; P=.001), with a high level of spouse support associated with a higher level of mother-infant bonding. Additionally, there was a weak, statistically significant positive relationship between social support and the level of mother-infant bonding (r=0.135, n=255, P=.03), with social support associated with a higher level of mother-infant bonding. As well, there was a weak statistically significant positive relationship between age and the level of mother-infant bonding (r=0.271; n=255; P=.001), with an increase in the age of pregnant women associated with a higher level of mother-infant bonding (Table 3).

Table 3: Correlations between selected independent variables and MIB

Variable	r	P-value
Age	.138*	.027
Gestational age	.056	.376
Social support	.135*	.031
Spouse support	.271*	.000

*: Significant at p≤0.05

3.3. Differences in the Level of mother-infant bonding between groups for selected obstetric history (gestational age, intended pregnancy) and maternal demographic (age, education, and work status)

An independent-sample t-test was used to examine the difference in the total level of mother-infant bonding with respect to planned pregnancy. The result of the study showed that there is a statistically significant difference in the mean level of mother-infant bonding in scores between women who planned for pregnancy (M=3.13, SD=1.57) and women who did not plan for pregnancy (M=8.18, SD=4.68, t (253)=9.09, p=0.001) (Table 4). In the Mother-Infant Bonding Questionnaire, higher scores indicate worse mother-infant bonding. This means that women who planned for a pregnancy had a stronger bond with their babies than women who did not plan for a pregnancy.

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Table 4: Differences between groups for selected demographics (intended pregnancy, working status) and level of mother-infant bonding

Variables	Mean	SD	t-Value	df	P-value
Planned pregnancy					
No	8.18	4.687	9.094	253	.000
Yes	3.13	1.574			
Working status					
No	4.50	3.31	3.55	253	.000
Yes	3.17	1.75			

*: Significant at p≤0.05; SD: Standard deviation

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An independent-sample t-test was used to examine the difference in the total level of mother-infant bonding with respect to working status. The result of the study showed that there is a statistically significant difference in the mean level of mother-infant bonding in scores between women who work (M=3.17, SD=1.75) and women who do not work (M=4.50, SD=3.31, t (253)=3.55, p=0.001) (Table 4). In the Mother-Infant Bonding Questionnaire, higher scores indicate worse mother-infant bonding. This means that women who worked had higher bonding with their infants than women who did not.

Participants in this study were divided into three groups according to their gestational age, age groups, and education levels. One-way ANOVA was used to examine the difference in the level of mother-infant bonding with respect to gestational age, age groups, and educational levels. The result of the study showed that there is no statistically significant difference in the mean level of mother-infant bonding at p<.05 between different gestational ages, different age groups, and different education levels.

3.4. Factors predicting the mother-infant bonding among studied pregnant women

A stepwise linear multiple regression analysis was conducted to identify predictors of mother-infant bonding. The results of this study revealed that a final model contained three variables (spouse support, intended pregnancy, and working status) (Table 5). The model explained 28.6% of the variance in mother-infant bonding levels (R2=0.286, P.05). When a predictor variable is entered into a prediction equation, it is assigned a weight (β in the column) that corresponds to its ability to influence the level of mother-infant bonding. For each unit change in the independent variables, there is an expected change equal to the size of these values in mother-infant bonding. Intended pregnancy had the greatest impact on mother-infant bonding (β=.44, P=.000), followed by spouse support (β=.137, P=.015) and working status (β=.125, P=.023). The direction of influence for the spouse support predictor was a positive one; that is, as the value of this predictor increased, the level of mother-infant bonding increased. However, the direction of influence for intended pregnancy and working status predictors was a negative one; that is, as the value of these predictors increased, the level of mother-infant bonding decreased.

4. Discussion

The purpose of the study is to identify the predictors that improve the strength of mother-infant bonding among pregnant women in a city in the southwest corner of Saudi Arabia. The results of this study support other studies' findings that pregnant women are generally geared toward a high level of bonding with their expected baby (Souza et al., 2017; Shreffler et al., 2021; Hassan and Hassan, 2017). Mother-infant bonding in pregnant women can be explained within the context of Mercer's (1981) theory. Mercer (1981) has identified MIB as an affection relationship, a desire for protection, building the interaction, and an emotional tie between the mother and her unborn baby during the pregnancy.

Table 5: Significant predictors of level of mother-infant bonding among studied pregnant women, (N=255)

Variables	R^2	R^2 Change	t	β	P-value
Planned pregnancy		.246	-8.056	-.445	.000
Spousal support		.024	2.457	.137	.015
Working status		.015	-2.281	-.125	.023
	.286				

β: Partial correlation; *: Significant at P≤0.05; R: 0.534

This study found that pregnant women who felt supported by their spouses presented more MIB means. In line with the study findings, the literature describes that there is an association between better MBI and feeling socially supported (Da Rosa et al., 2021; Cuijlits et al., 2019; Delavari et al., 2018; Yoon and Sung, 2021). Historically, caring for children was seen as primarily a mother, with the father's role being to financially support the family. Contrary to popular belief, men are now more involved in housework and, in particular, in monitoring the progression of their children (Nomaguchi and Milkie, 2020; Bueno and Vieira, 2014). Furthermore, more recent studies show that the husband's presence, assistance, and support throughout the gestational period are essential elements that might impact the development of the maternal role and, as a result, positively interfere with mother-infant bonding (Cremonese et al., 2017; Mazúchová et al., 2021). In addition, several studies show that women who report feeling supported by their spouse have fewer symptoms of depression, anxiety, and stress (Lebel et al., 2020; Stapleton et al., 2012). As a result, the relationship between mother-infant bonding and feeling supported by the spouse demonstrates the significance of a paternal figure in this crucial period for the woman, as well as the effect on emotions and behaviors of greater affection, care, and concern for the expecting baby.

Saudi Arabia, as one of the Middle Eastern countries, has its own social structures, social roles, and relationships, which may differ from those of Western cultures' norms. Within the Saudi culture, the spouse provides support to the wife regardless of

how many hours per week are spent providing support. Islam also emphasizes the importance of a woman's support system. It is a religious recommendation in the Islamic culture that women be cared for, as Prophet Mohammad (peace be upon him) said, "Take my advice with regard to women: Act kindly towards women, for they were created from a rib, and the most crooked part of a rib is it's uppermost. If you attempt to straighten it, you will break it, and if you leave it alone it will remain crooked; so act kindly toward women.

This study found that pregnant women who planned pregnancy presented more MIB means. Corroborating with the study findings, the literature describes that there is an association between better mother-infant bonding and planned pregnancy (Kordi et al., 2016; Schmidt et al., 2016; Pakseresht et al., 2018). Most of the study samples planned for pregnancy. This may indicate that the study samples had proper use of contraceptive methods, were ready for childcare, were concerned about their health status and their coming baby, and they had a relationship with their spouse. On the other hand, an unplanned pregnancy has negative impacts on women's health. It increases the risk of physical problems and reduces positive behaviors, such as seeking medical care during pregnancy (Pakseresht et al., 2018; Jangjoo et al., 2021).

Pregnant women who work showed more MIB means. This is in accordance with the literature (Giardinelli et al., 2012; Abbas et al., 2018). According to the author, the conflicting results could be due to the high percentage of working women in this study, which has resulted in biased results.

The result of the study showed that there is no statistically significant difference in the mean level of mother-infant bonding among different age groups. This result is consistent with the findings of a previous study (Karakoça and Ozkanb, 2017; Zolfaghari et al., 2019). The author believes that no matter what the age of a pregnant woman, MIB is still present because it is an emotional tie between the mother and her baby. Furthermore, consistent with other studies, the current study revealed that there are no significant statistical differences in the mean level of MIB among gestational ages (Tsao et al., 2019; Zolfaghari et al., 2019). The author believes that as fetal growth occurs, pregnant women can feel the new movements of the baby, which makes the experience more physical for them and may lead them to interact more adequately with the fetus, thus increasing MIB. However, the majority of study samples were in their second and third trimesters, and they already felt the new movements of the baby, so there were no significant statistical differences in the mean level of MIB.

5. Study limitations

This study used a convenience sample method, and the generalizability of the study results may be limited in a targeted setting. This study was conducted on antenatal care clinics in a particular setting in Saudi Arabia. Thus, the results can be generalized to other settings and clinics with caution because of the existing differences. As a result, more comprehensive studies are expected to be conducted to determine the validity of results in the various regions of Saudi Arabia. Another limitation of this study was the number of variables not addressed in this study, such as parity, fetal movement, fetal gender, and stress. Hence, the researcher suggested that future studies should be included. In addition, the collection of data focused on the subjective views of mothers. As a result, bias in response may have occurred, as mothers would have wanted to provide positive answers to make them perceived as good mothers.

6. Implication for practice

The findings of this study have implications for nursing practice in Saudi Arabia to improve MIB strength among pregnant women. Spousal support, planned pregnancy, and working motherhood were the predictors of improving the mother-infant bonding level, and these predictors may be the focus of nursing education. The creation of a clinical assessment method to assess the level of spousal support is likely to improve the strength of MIB. Depending on this assessment, nurses should adopt educational plans to increase spousal support in the prenatal period, and the creation of training programs should include seminars to teach women about the importance of pregnancy planning in enhancing the level of MIB. Integration of spousal support and pregnancy planning into the nursing care plan may be a successful approach to supporting MIB in pregnant women.

7. Conclusion

Mother-infant bonding is positively linked to spousal support, planned pregnancy, and working women. According to Mercer (1981), spousal support is part of the environmental factors that affect mother-infant bonding during pregnancy. Mother-infant bonding may be improved by encouraging spousal support and planning pregnancy. Healthcare professionals should recognize mothers who need additional support in health clinics and enhance MIB activities during prenatal care. Spousal support emerges as a significant predictor variable in this study. Maternal demographic variables such as planned pregnancy and work status can also be considered significant predictors for pregnant women. Based on these findings, proactive intervention by healthcare professionals is based on these predictors to increase the level of MIB among pregnant women in Saudi Arabia, and, as a result, MIB increases a mother's healthy behavior with regard to nutrition, appropriate maternal care, and a desire to know about the fetus (Baghdari et al., 2016).

Acknowledgment

Compliance with ethical standards

Ethical considerations

The institutional review board (IRB) of the antenatal care clinics involved in this study was obtained (Ref. No. 2219). When a researcher met the participants, they were given a chance to leave the study at any time without interfering with their normal treatment. The researcher gave the women who agreed to participate in the study ample time to review the consent form before signing it. The consent form assured that all the information obtained from participants would be strictly confidential and anonymous and used for study purposes only and that their participation was voluntary. The researcher also coded the answers of the participants, so that it is difficult to recognize them.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

Abbas SI, Turkistani MH, Al-Gamdi AA, Alzahrani SA, Alzahrani AA, and Helmy FF (2018). Factors associated with postnatally maternal-infant attachment in Taif, Saudi Arabia. Saudi Journal for Health Sciences, 7(2): 127-131. https://doi.org/10.4103/sjhs.sjhs_50_18

Asmri MA, Almalki MJ, Fitzgerald G, and Clark M (2020). The public health care system and primary care services in Saudi Arabia: A system in transition. Eastern Mediterranean Health Journal, 26(4): 468-476. https://doi.org/10.26719/emhj.19.049 **PMid:32338366**

Atashi V, Kohan S, Salehi Z, and Salehi K (2018). Maternal-fetal emotional relationship during pregnancy, its related factors and outcomes in Iranian pregnant women: A panel study protocol. Reproductive Health, 15: 176. https://doi.org/10.1186/s12978-018-0620-6 **PMid:30333017 PMCid:PMC6192301**

Baghdari N, Sahebzad ES, Kheirkhah M, and Azmoude E (2016). The effects of pregnancy-adaptation training on maternal-fetal attachment and adaptation in pregnant women with a history of baby loss. Nursing and Midwifery Studies, 5(2): e28949. https://doi.org/10.17795/nmsjournal28949 **PMid:27556052 PMCid:PMC4993030**

Bjelica A, Cetkovic N, Trninic-Pjevic A, and Mladenovic-Segedi L (2018). The phenomenon of pregnancy-A psychological view. Ginekologia Polska, 89(2): 102-106. https://doi.org/10.5603/GP.a2018.0017 **PMid:29512815**

Bowlby J (1982). Attachment and loss: Retrospect and prospect. American Journal of Orthopsychiatry, 52(4): 664-678. https://doi.org/10.1111/j.1939-0025.1982.tb01456.x **PMid:7148988**

Budge SL, Adelson JL, and Howard KA (2013). Anxiety and depression in transgender individuals: The roles of transition status, loss, social support, and coping. Journal of Consulting and Clinical Psychology, 81(3): 545-557. https://doi.org/10.1037/a0031774 **PMid:23398495**

Bueno RK and Vieira ML (2014). Análise de estudos brasileiros sobre o pai e o desenvolvimento infantil. Psicologia Argumento, 32(76): 151-159.

Cataudella S, Lampis J, Busonera A, Marino L, and Zavattini GC (2016). From parental-fetal attachment to a parent-infant relationship: A systematic review about prenatal protective and risk factors. Life Span and Disability, 19(2): 185–219.

Cranley MS (1981). Development of a tool for the measurement of maternal attachment during pregnancy. Nursing Research, 30(5): 281-284. https://doi.org/10.1097/00006199-198109000-00008 **PMid:6912989**

Cremonese L, Wilhelm LA, Prates LA, Paula CCD, Sehnem GD, and Ressel LB (2017). Apoio social na perspectiva da puérpera adolescente. Escola Anna Nery, 21(4): e20170088. https://doi.org/10.1590/2177-9465-ean-2017-0088

Cuijlits I, Van De Wetering AP, Endendijk JJ, Van Baar AL, Potharst ES, and Pop VJM (2019). Risk and protective factors for pre- and postnatal bonding. Infant Mental Health Journal, 40(6): 768-785. https://doi.org/10.1002/imhj.21811 **PMid:31430393**

da Rosa KM, Scholl CC, Ferreira LA, Trettim JP, da Cunha GK, Rubin BB, and de Matos MB (2021). Maternal-fetal attachment and perceived parental bonds of pregnant women. Early Human Development, 154: 105310. https://doi.org/10.1016/j.earlhumdev.2021.105310 **PMid:33508560 PMCid:PMC7910275**

Delavari M, Mohammad-Alizadeh-Charandabi S, and Mirghafourvand M (2018). The relationship of maternal-fetal attachment and postpartum depression: A longitudinal study. Archives of Psychiatric Nursing, 32(2): 263-267. https://doi.org/10.1016/j.apnu.2017.11.013 **PMid:29579522**

Denbow J (2019). Good mothering before birth: Measuring attachment and ultrasound as an affective technology. Engaging Science, Technology, and Society, 5(2019): 1-20. https://doi.org/10.17351/ests2019.238

Doster A, Wallwiener S, Müller M, Matthies LM, Plewniok K, Feller S, and Reck C (2018). Reliability and validity of the German version of the maternal–fetal attachment scale. Archives of Gynecology and Obstetrics, 297(5): 1157-1167. https://doi.org/10.1007/s00404-018-4676-x **PMid:29404742**

Erickson N, Julian M, and Muzik M (2019). Perinatal depression, PTSD, and trauma: Impact on mother–infant attachment and interventions to mitigate the transmission of risk. International Review of Psychiatry, 31(3): 245-263. https://doi.org/10.1080/09540261.2018.1563529 **PMid:30810410**

Giardinelli L, Innocenti A, Benni L, Stefanini MC, Lino G, Lunardi C, and Faravelli C (2012). Depression and anxiety in perinatal period: Prevalence and risk factors in an Italian sample. Archives of Women's Mental Health, 15: 21-30. https://doi.org/10.1007/s00737-011-0249-8 **PMid:22205237**

Glynn LM, Howland MA, and Fox M (2018). Maternal programming: Application of a developmental psychopathology perspective. Development and Psychopathology, 30(3): 905-919. https://doi.org/10.1017/S0954579418000524 **PMid:30068423 PMCid:PMC6274636**

Golmakani N, Shaghaghi F, Ahmadi Z, Gholami M, Kamali Z, and Mohebbi-Dehnavi Z (2021). Investigating the relationship between the dimensions of mindfulness and maternal attachment to the fetus during pregnancy. Journal of Education and Health Promotion, 10: 433.

Güney E and Uçar T (2019). Effect of the fetal movement count on maternal–fetal attachment. Japan Journal of Nursing Science, 16(1): 71-79. https://doi.org/10.1111/jjns.12214 **PMid:29774647**

Hassan NMM and Hassan FMAE (2017). Predictors of maternal fetal attachment among pregnant women. IOSR Journal of Nursing and Health Science, 6(1): 95-106. https://doi.org/10.9790/1959-06010695106

Hendrick SS (1988). A generic measure of relationship satisfaction. Journal of Marriage and the Family, 50(1): 93-98. https://doi.org/10.2307/352430

Jangjoo S, Lotfi R, Assareh M, and Kabir K (2021). Effect of counselling on maternal–fetal attachment in unwanted pregnancy: A randomised controlled trial. Journal of Reproductive and Infant Psychology, 39(3): 225-235. https://doi.org/10.1080/02646838.2019.1673891 **PMid:31599168**

Joas J and Möhler E (2021). Maternal bonding in early infancy predicts childrens' social competences in preschool age. Frontiers in Psychiatry, 12: 687535. https://doi.org/10.3389/fpsyt.2021.687535 **PMid:34489753 PMCid:PMC8416914**

Jussila H, Ekholm E, and Pajulo M (2021). A new parental mentalization focused ultrasound intervention for substance using pregnant women. Effect on self-reported prenatal mental health, attachment and mentalization in a randomized and controlled trial. International Journal of Mental Health and Addiction, 19: 947-970. https://doi.org/10.1007/s11469-019-00205-y

Karakoça H and Ozkanb H (2017). The relationship with prenatal attachment of psychosocial health status of pregnant women. International Journal of Health Sciences, 5(1): 36-46. https://doi.org/10.15640/ijhs.v5n1a6

Kordi M, Fasanghari M, Asgharipour N, and Esmaily H (2016). Effect of guided imagery on maternal fetal attachment in nulliparous women with unplanned pregnancy. Journal of Midwifery and Reproductive Health, 4(4): 723-731.

Lebel C, MacKinnon A, Bagshawe M, Tomfohr-Madsen L, and Giesbrecht G (2020). Elevated depression and anxiety symptoms among pregnant individuals during the COVID-19 pandemic. Journal of Affective Disorders, 277: 5-13. https://doi.org/10.1016/j.jad.2020.07.126 **PMid:32777604 PMCid:PMC7395614**

Lutkiewicz K, Bieleninik Ł, Cieślak M, and Bidzan M (2020). Maternal–infant bonding and its relationships with maternal depressive symptoms, stress and anxiety in the early postpartum period in a Polish sample. International Journal of Environmental Research and Public Health, 17(15): 5427. https://doi.org/10.3390/ijerph17155427 **PMid:32731490 PMCid:PMC7432717**

Maroufizadeh S, Omani-Samani R, Almasi-Hashiani A, Navid B, Sobati B, and Amini P (2018). The relationship assessment scale (RAS) in infertile patients: A reliability and validity study. Middle East Fertility Society Journal, 23(4): 471-475. https://doi.org/10.1016/j.mefs.2018.04.001

Mazúchová L, Kelčíková S, Maskalová E, Malinovská N, and Grendár M (2021). Mother-infant bonding and its associated factors during postpartum period. Education, 9: 4-41. https://doi.org/10.32725/kont.2021.018

McNamara J, Townsend ML, and Herbert JS (2019). A systemic review of maternal wellbeing and its relationship with maternal fetal attachment and early postpartum bonding. PLOS ONE, 14(7): e0220032. https://doi.org/10.1371/journal.pone.0220032 **PMid:31344070 PMCid:PMC6657859**

Mercer RT (1981). A theoretical framework for studying factors that impact on the maternal role. Nursing Research, 30(2): 73-77. https://doi.org/10.1097/00006199-198103000-00003 **PMid:7010317**

Muller ME and Mercer RT (1993). Development of the prenatal attachment inventory. Western Journal of Nursing Research, 15(2): 199-215. https://doi.org/10.1177/019394599301500205 **PMid:8470375**

Nomaguchi K and Milkie MA (2020). Parenthood and well-being: A decade in review. Journal of Marriage and Family, 82(1): 198-223. https://doi.org/10.1111/jomf.12646 **PMid:32606480 PMCid:PMC7326370**

Nordahl D, Høifødt RS, Bohne A, Landsem IP, Wang CEA, and Thimm JC (2019). Early maladaptive schemas as predictors of maternal bonding to the unborn child. BMC Psychology, 7: 23. https://doi.org/10.1186/s40359-019-0297-9 **PMid:30975192 PMCid:PMC6460656**

Ohara M, Okada T, Kubota C, Nakamura Y, Shiino T, Aleksic B, and Ozaki N (2016). Validation and factor analysis of mother-infant bonding questionnaire in pregnant and postpartum women in Japan. BMC Psychiatry, 16: 212. https://doi.org/10.1186/s12888-016-0933-3 **PMid:27389341 PMCid:PMC4936305**

Ossa X, Bustos L, and Fernandez L (2012). Prenatal attachment and associated factors during the third trimester of pregnancy in Temuco, Chile. Midwifery, 28(5): e689-e696. https://doi.org/10.1016/j.midw.2011.08.015 **PMid:21955858**

Oyetunji A and Chandra P (2020). Postpartum stress and infant outcome: A review of current literature. Psychiatry Research, 284: 112769. https://doi.org/10.1016/j.psychres.2020.112769 **PMid:31962260**

Pakseresht S, Rasekh P, and Leili EK (2018). Physical health and maternal-fetal attachment among women: Planned versus unplanned pregnancy. International Journal of Womens Health and Reproduction Sciences, 6(3): 335-341. https://doi.org/10.15296/ijwhr.2018.55

Schmidt D, Seehagen S, Vocks S, Schneider S, and Teismann T (2016). Predictive importance of antenatal depressive rumination and worrying for maternal–foetal attachment and maternal well-being. Cognitive Therapy and Research, 40(4): 565-576. https://doi.org/10.1007/s10608-016-9759-z

Shreffler KM, Spierling TN, Jespersen JE, and Tiemeyer S (2021). Pregnancy intendedness, maternal–fetal bonding, and postnatal maternal–infant bonding. Infant Mental Health Journal, 42(3): 362-373. https://doi.org/10.1002/imhj.21919 **PMid:33860552 PMCid:PMC8175017**

Smorti M, Ponti L, and Pancetti F (2019). A comprehensive analysis of post-partum depression risk factors: The role of socio-demographic, individual, relational, and delivery characteristics. Frontiers in Public Health, 7: 295. https://doi.org/10.3389/fpubh.2019.00295 **PMid:31709213 PMCid:PMC6821715**

Souza LH, Sperli Geraldes Soler ZA, Santos SG, de Lourdes M, and dos Santos Sasaki SGM (2017). Puerperae bonding with their children and labor experiences. Investigación y Educación en Enfermería, 35(3): 364-371. https://doi.org/10.17533/udea.iee.v35n3a13 **PMid:29767917**

Stapleton LRT, Schetter CD, Westling E, Rini C, Glynn LM, Hobel CJ, and Sandman CA (2012). Perceived partner support in pregnancy predicts lower maternal and infant distress. Journal of Family Psychology, 26(3): 453-463. https://doi.org/10.1037/a0028332

Takács L, Smolík F, Kaźmierczak M, and Putnam SP (2020). Early infant temperament shapes the nature of mother-infant bonding in the first postpartum year. Infant Behavior and Development, 58: 101428. https://doi.org/10.1016/j.infbeh.2020.101428 **PMid:32135403**

Taylor A, Atkins R, Kumar R, Adams D, and Glover V (2005). A new mother-to-infant bonding scale: Links with early maternal mood. Archives of Women's Mental Health, 8: 45-51.
https://doi.org/10.1007/s00737-005-0074-z
PMid:15868385

Terada S, Fujiwara T, Obikane E, and Tabuchi T (2022). Association of paternity leave with impaired father–infant bonding: Findings from a nationwide online survey in Japan. International Journal of Environmental Research and Public Health, 19(7): 4251.
https://doi.org/10.3390/ijerph19074251
PMid:35409930 PMCid:PMC8998345

Tsao CM, Hsing HC, Wang HH, and Guo SHM (2019). The factors related to maternal-fetal attachment: Examining the effect of mindfulness, stress and symptoms during pregnancy. Archives of Nursing Practice and Care, 5(1): 1-7.
https://doi.org/10.17352/anpc.000035

Wang D, Zhu F, Xi S, Niu L, Tebes JK, Xiao S, and Yu Y (2021). Psychometric properties of the multidimensional scale of perceived social support (MSPSS) among family caregivers of people with schizophrenia in China. Psychology Research and Behavior Management, 14: 1201.
https://doi.org/10.2147/PRBM.S320126
PMid:34393527 PMCid:PMC8358441

Yoon SH and Sung MH (2021). Does family support mediate the effect of anxiety and depression on maternal-fetal attachment in high-risk pregnant women admitted to the maternal-fetal intensive care unit? Korean Journal of Women Health Nursing, 27(2): 104-112.
https://doi.org/10.4069/kjwhn.2021.05.14
PMid:36313134 PMCid:PMC9334189

Zdolska-Wawrzkiewicz A, Bidzan M, Chrzan-Dętkoś M, and Pizuńska D (2020). The dynamics of becoming a mother during pregnancy and after childbirth. International Journal of Environmental Research and Public Health, 17(1): 57.
https://doi.org/10.3390/ijerph17010057
PMid:31861696 PMCid:PMC6982180

Zimet GD, Dahlem NW, Zimet SG, and Farley GK (1988). The multidimensional scale of perceived social support. Journal of Personality Assessment, 52(1): 30-41.
https://doi.org/10.1207/s15327752jpa5201_2

Zolfaghari M, Naseri A, Khosravi S, and Fatemi M (2019). Variance of maternal-fetal attachment in pregnant women based on personality traits. Thrita, 8(1): e12657.
https://doi.org/10.5812/thrita.12657