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Factors related to a disturbance in the mother-child bond and attachment

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ABSTRACT

Introduction: Establishing an adequate bond and attachment between a mother and child is essential for preventing pathologies and developing this relationship in the future.
Purpose: To identify the factors related to a disturbance of the mother-child bond or attachment.
Methods: A cross-sectional descriptive study was carried out with women with a biological child between 6 weeks and 18 months of age. The Mother-Child Bond-Attachment Questionnaire (VAMF, *for its name in Spanish*) was administered to measure the bond and postnatal attachment together with a questionnaire containing sociodemographic, psychosocial, and health variables referring to the mother and the newborn.
Results: 1114 women participated. The multivariate analysis showed that skin-to-skin contact (aOR = 0.58; 95% CI: 0.37, 0.90) and breastfeeding (aOR = 0.55; 95% IC: 0.35, 0.86) reduce the probability of presenting a bond disturbance. Anxiety during pregnancy, childbirth, and the puerperium (aOR = 3.95; 95% CI: 2.57, 6.05) and postpartum complications (aOR = 1.60; 95% CI: 1.03, 2.48) increase the chance of having a bond disturbance. Skin-to-skin contact (aOR = 0.61; 95% CI: 0.38, 1.00), breastfeeding (aOR = 0.47; 95% CI: 0.27, 0.80,) and an older age of the infant (months) (aOR = 0.77: 95% CI: 0.72, 0.82) reduces the probability of presenting an attachment disturbance.
Conclusions: Skin-to-skin contact and breastfeeding are associated with a lower probability of impaired bonding and attachment. Anxiety states during pregnancy, childbirth, and the puerperium, and complications after childbirth increase the probability of developing a bond disorder. The older the age of the infant, the lower the frequency of having an impaired attachment.
Implications to practice: Identifying the factors associated with the establishment of the mother-child bond and attachment is essential for the development of prevention strategies and early identification of cases that may present alterations and avoid their consequences on the health of the mother and child.

Introduction

The connection established between a mother and her child is essential both for the adaption to the new role by a woman and as a determinant in the development of the relationship established between them (Mercer, 2006; Mercer & Walker, 2006). Within the maternal-child relationship, two concepts must be differentiated that, although closely related, refer to different aspects of said relationship: bond and attachment.

The term "bond" was coined in the 1970s by Klaus and Kennell to refer to the emotional bond established between a mother and her newborn (Bicking Kinsey & Hupcey, 2013). Originally, Klaus and Kennell stated that this bond was formed just after birth in the so-called "critical period" where skin-to-skin contact was decisive for its formation. However, it was later shown that skin-to-skin contact was an important factor for forming the bond but not the only one (Kennell & Klaus, 1979, 1984; Klaus & Kennell, 1970; Myers, 1984). This bond is formed during pregnancy and continues to develop after birth (Bicking Kinsey & Hupcey, 2013; Nordahl et al., 2020; Taylor et al., 2005). The bond is unidirectional; that is, it goes from the mother to the newborn and refers to

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the feelings and emotions that the mother experiences toward her child (Bicking Kinsey & Hupcey, 2013).

The second concept, attachment, was described in the 1960s in the "Attachment Theory", referring to the relationship that the newborn establishes with its mother in order to feel protected, and which provides a secure base from which the infant can explore their environment (Bowlby, 1977, 1982). Unlike the bond, attachment is bidirectional, implying reciprocity between the mother and the child, and manifests itself in the form of attachment behaviors or behaviors through which the newborn tries to maintain the proximity and protection conferred by the figure of attachment: their mother (Ainsworth, 1989; Bowlby, 1982). The manner in which the attachment relationship is formed plays a crucial role in determining the attachment style (secure, insecure, or ambivalent) that a child will cultivate, not only in relation to their mother but also in interactions with others in their immediate surroundings and across their lifespan (Ainsworth, 1984; Bretherton, 1992).

There are different factors that are related to the bond and attachment, but results from previous studies are contradictory for the different factors and their directionality. Within the bond, behavioral and biological factors could be promoters or the result of these phenomena, but they are not determinants of its quality (Bicking Kinsey & Hupcey, 2013). The mother's state of mind is fundamental in bonding after childbirth, and low mood and depressive states exert a negative influence on it, as does anxiety (Bicking Kinsey et al., 2014; McNamara et al., 2019). Likewise, the birth experience could influence the bond formation process (Bicking Kinsey et al., 2014; Smorti et al., 2020). Support from the family and the partner is essential in this period and is closely related to the pre- and postpartum bond (Bicking Kinsey et al., 2014; McNamara et al., 2019; Michałek-Kwiecień et al., 2022). Likewise, the mental pictures of the woman as a mother and the mother's attachment style could affect the establishment of the bond and, subsequently, the attachment relationship with the newborn (Alhusen et al., 2013; Nordahl et al., 2019; Zdolska-Wawrzkiewicz et al., 2020). Attachment may be related to factors such as prematurity of the newborn, skin-to-skin contact after birth, and the presence of pre- and postpartum depression, among others (Kim & Kim, 2022; Norholt, 2020; Ruiz et al., 2018; Śliwerski et al., 2020).

Establishing an adequate bond and attachment between mother and child is essential for developing this relationship in the future. A disturbance of the bond is related to maternal mental health, increasing the risk of developing depressive and anxiety states, among others (Davies et al., 2021; Ohara et al., 2017). On the other hand, an attachment disturbance could be related to the child's temperament, influencing the way he relates to other children in the future (Pallini et al., 2014; Planalp & Braungart-Rieker, 2013).

In summary, few studies exist on this subject, results are inconclusive and even contradictory, and more research is recommended in this regard. Knowing the factors that influence the processes of bond formation and attachment and how they affect both processes is essential for health professionals who are in contact with mothers and newborns, as it will allow a more specific approach to the mother-child dyad, allowing the strengthening of the bond after birth and the formation of a healthy attachment relationship between the two.

For these reasons, this study aims to identify the factors that may be related to a disturbance of the mother-child bond and attachment.

Methods

Design and subject selection

A cross-sectional descriptive study was carried out with women with a biological child between 6 weeks and 18 months of age. The inclusion criteria were women with an age between 18 and 45 years of age. The exclusion criteria are women who have had multiple births (two or more newborns) and do not speak or do not know the Spanish language (language barrier).

To recruit women for our study sample, different associations were contacted that were related to pregnancy, childbirth and postpartum, and support groups for breastfeeding and parenting throughout the Spanish territory. The questionnaires were administered online. We contacted the coordinators/administrators of the associations and they distributed the questionnaire to their members by telematic means. These associations have meetings both in person and online with their members. After having informed the women who are part of these associations about the study they provided a QRS code and a link so that the questionnaire could be completed at a time participants found most appropriate. A chat was set up so that any questions or doubts could be raised. After applying the inclusion and exclusion criteria, the participants were informed about the objective and mode of participation in the study and, after accepting the informed consent for participation in the research, they were administered the questionnaire. The study was carried out from September 2022 to March 2023.

To estimate the sample size, the maximum modeling criterion was followed, where for each independent variable included in the model, 10 subjects who present the problem under study must be included (Peduzzi et al., 1996). That is, for each independent variable, 10 mother-child dyads with a bond and/or attachment disturbance were required. For this estimation we have used a 9% prevalence of a bond disturbance based on the results found by Lehnig et al. (Lehnig et al., 2019). In this way, with 10 independent variables in the model, we would need a minimum of 100 dyads with a bond disturbance and a total of 1111 mother-child dyads for study.

Data collection

A questionnaire was developed by investigators and administered to participants containing sociodemographic, psychosocial, and health variables related to the mother and newborn, such as: mother's age, income level, number of children, type of birth, the woman's assessment of her birth experience and the way she was treated by the health professionals, length of hospital stay, skin-to-skin contact, early initiation of breastfeeding, presence of health problems during pregnancy, diagnosis of depression before or during pregnancy, symptoms of anxiety during pregnancy, birth or postpartum, post-partum complications (ongoing pain, hemorrhage, surgical intervention, etc.), perceived support from the partner and family, and the presence of health problems in the newborn.

The woman's risk of experiencing intimate partner violence was assessed using the short version of the Woman Abuse Screening Tool (WAST) questionnaire (Brown et al., 1996). This short version of the questionnaire was validated for use in primary care in the Spanish population by Plazaola-Castaño et al., and have good psychometric properties with a specificity of 44.8, a sensitivity of 96.1, with a positive predictive value of 66.7 and a negative predictive value of 90.9 according to the scoring criteria followed in this study (Plazaola-Castaño et al., 2008).

The mother-child bond and attachment were measured with the VAMF (*for its name in Spanish*) questionnaire developed by Diaz-Ogallar (Diaz-Ogallar, 2024) in 2024. This questionnaire is made up of a total of 29 items divided into two subscales, one for bond (VAMF-bond) consisting of 16 items and another for attachment (VAMF-attachment) with 13 items. The VAMF has been designed and validated for mother-child dyads whose children are between 6 weeks and 18 months old. The VAMF has good psychometric capabilities, with an internal consistency of $\alpha = 0.836$. Each item has 4 response options: never, sometimes, often, always, with a score ranging from 1 to 4. The higher the score, the higher the quality of the bond and attachment between mother and child. The dyad is considered to have impaired

bonding or attachment if it has a total score on the questionnaire below the 10th percentile.

Statistical analysis

The statistical analysis was conducted using the program SPSS 28.0. First, descriptive statistics were performed using mean with standard deviation (SD) for continuous variables and absolute and relative frequencies for categorical variables.

Next, the relationship of potential sociodemographic and clinical factors that could be related to an impaired bond (VAMF-bond subscale) or attachment (VAMF-attachment subscale) was evaluated. For this, binary logistic regression was used for both bivariate and multivariate analyses, obtaining crude (OR) and adjusted Odds Ratios (aOR) with their respective 95% confidence interval (95% CI). For the multivariate analysis, the backward and forward step system was used to form the risk model for an impaired bond using the VAMF-bond subscale, as well as with the risk of impaired attachment using the VAMF-attachment subscale.

Ethical considerations

This study was approved by the Research Ethics Committee of the province of Jaén (DCVA-21/ 2012-N-21). The participants were informed about all aspects related to the study, after which they agreed to participate through the acceptance of informed consent. Once they accepted the informed consent, the women received and completed the corresponding questionnaire.

This study has been carried out following the current legal regulations in the field of protection of personal data: Regulation (EU) 2016/679 of the European Parliament and of the Council of April 27, 2016 (GDPR) and Organic Law 3/2018, of December 5, on the Protection of Personal Data and Guarantee of Digital Rights (LOPD, *for its name in Spanish*). Informed consent was obtained from all participants. At the beginning of the online questionnaire, an obligatory section was enabled that contained the information sheet for participants with all the information regarding to the study and an email, a telephone and a chat was offered to resolve any possible doubts and/or questions that might arise, as well as the acceptance or refusal to participate in the study. If they rejected to participate in the study, the questionnarie was automatically closed and blocked.

Results

A total of 1114 women participated in this study. The mean age of the participants was 34.4 years (SD = 3.88), 56.9% (633) of the women were primiparous and 59.1% (658) had a normal birth. Breastfeeding was initiated early in 78.5% (875) of the mothers and 83.9% (935) had skin-to-skin contact. 87.9% did not have any chronic illness or health problem arising from pregnancy/birth/postpartum at the time of completion of the survey and 42.1% (469) presented some health problem during pregnancy. 40.5% (451) rated the birth experience as very good and, 59% (657) considered the care received during it was very good. 39% (434) of the women received very high support from their partner and 32.1% (358) received the same degree of support from their family. (Table 1) The average score on the VAMF-Bond subscale was 57.76 (SD = 3.94) and the 10th percentile was situated at 53 points, with 12.7% (141) of the dyads presenting a bond disturbance. As for the mean score on the VAMF-attachment scale, the mean score was 43.88 (SD = 4.58) and the 10th percentile stood at 37 points, presenting 11.5% (128) altered attachment. (Table 1) (Fig. 1).

Next, we used both bivariate and multivariate analyses to evaluate the relationship between different factors and a bond disturbance using the bond subscale of the VAMF questionnaire (VAMF-bond). In the multivariate analysis it was observed that skin-to-skin contact

Table 1
Sociodemographic and clinical characteristics of the study sample.

Variable	n (%) N = 1114
VAMF-bond Mean (SD)	57.8 (3.95)
VAMF-attachment Mean (SD)	43.2 (4.58)
Age mother (years) Mean (SD)	34.4 (3.88)
Age newborn (months) Mean (SD)	8.1 (5.07)
Income level approx.	
<1000 euros/month	210 (18.9)
Between 1000 and 1900 euros/month	597 (53.6)
Between 2000 and 2900 euros/month	248 (22.3)
>3000 euros/month	59 (5.3)
Current illness	
No	979 (87.9)
Yes	135 (12.1)
No. of pregnancies	
One	633 (56.9)
Two	315 (28.3)
Three or more	164 (14.7)
Vaginal births	
None	231 (20.7)
One	666 (59.8)
Two or more	217 (19.5)
Cesarean sections	
No	819 (73.5)
Yes	295 (26.5)
No of children	
One	821 (73.7)
Two	256 (23.0)
Three or more	37 (3.3)
High-risk pregnancy	
No	938 (84.2)
Yes	176 (15.8)
Planned pregnancy	
No	104 (9.3)
Yes	1010 (90.7)
Fertility treatment	
No	956 (85.8)
Yes	158 (14.2)
Prenatal education	
No	329 (29.5)
Yes	785 (70.5)
Health problem during pregnancy	
No	645 (57.9)
Yes	469 (42.1)
Type of delivery	
Normal	658 (59.1)
Instrumental	207 (18.6)
Planned cesarean section	65 (5.8)
Emergency cesarean section	184 (16.5)
Analgesia/birth anesthesia	
No	221 (19.8)
Yes	893 (80.2)
Birth experience	
Very bad/bad	135 (12.1)
Ok	197 (17.7)
Good/Very good	782 (70.2)
Treatment received during birth	
Very bad/bad	49 (4.4)
Ok	92 (8.3)
Good/Very good	973 (87.3)
Bond disturbance	
No	973 (87.3)
Yes	141 (12.7)
Attachment disturbance	
No	986 (88.5)
Yes	128 (11.5)
Early breastfeeding	
No	239 (21.5)
Yes	875 (78.5)
Skin-to-skin	
No	179 (16.1)
Yes	935 (83.9)
Complications following birth	
No	928 (83.3)
Yes	186 (16.7)
Length of hospital stay	

Table 1 (*continued*)

Variable	n (%) $N = 1114$
1 day	141 (12.7)
2 days	581 (52.2)
3 days	263 (23.6)
Between 3 days and one week	120 (10.8)
>1 week	9 (0.8)
ICU admission	
No	1098 (98.6)
Yes	16 (1.4)
Hospital readmission	
No	1088 (97.7)
Yes	26 (2.3)
Tiredness/fatigue during pregnancy, birth, postpartum	
No	119 (10.7)
Yes	995 (89.3)
Anxiety during pregnancy, birth, postpartum	
No	569 (51.1)
Yes	545 (48.9)
Mental health problems	
No	838 (75.2)
Yes	276 (24.8)
Depression before/during pregnancy	
No	1006 (90.3)
Yes	108 (9.7)
Support received from partner	
Very low/low	59 (4.4)
Moderate	183 (16.4)
High/Very high	872 (87.3)
WAST disturbance	
No	1023 (91.8)
Yes	91 (8.2)
Support received from family	
Very low/low	105 (9.4)
Moderate	225 (20.2)
High/Very high	784 (78.3)
Alcohol consumption during pregnancy	
None	368 (33.0)
Occasional	667 (59.9)
Routine consumption	79 (7.1)
Prematurity	
No	1062 (95.3)
Yes	52 (4.7)
Continued breastfeeding	
No	179 (16.1)
Yes	935 (83.9)
Newborn health problem	
No	1004 (90.1)
Yes	110 (9.9)
Newborn hospital admission	
No	984 (88.3)
Yes, in the Neonatal unit	96 (8.6)
Yes, in the Neonatal ICU	34 (3.1)

(aOR = 0.58; 95% CI: 0.37, 0.90), and continuing with exclusive breastfeeding (aOR = 0.55; 95%CI: 0.35, 0.86) reduced the probability of presenting a bond disturbance. On the other hand, having anxiety during pregnancy, childbirth, and the puerperium (aOR = 3.95; 95% CI: 2.57, 6.05) and postpartum complications (aOR = 1.60; 95% CI: 1.03, 2.48) increased the probability of having a disturbed bond. In this model, the diagnosis of depression before or during pregnancy also remained as a factor that increases the probability of a bond disturbance, but without reaching statistical significance ($p = 0.071$). The bivariate and multivariate analysis can be found in Table 2.

Finally, the relationship between different factors and impaired attachment was analyzed through the VAMF-attachment subscale, performing the bivariate and multivariate analysis which is shown in Table 3. The probability of presenting an impaired attachment is lower in those dyads that had skin-to-skin contact after birth (aOR = 0.61; 95% CI: 0.38, 1.00), those who were exclusively breastfed (aOR = 0.47; 95% CI: 0.27, 0.80) and in which the children were older (months) (aOR = 0.77: 95% CI: 0.72, 0.82).

Discussion

In the present study, dyads that had had skin-to-skin contact after childbirth and who were breastfed were less likely to develop a bond disturbance, while having anxiety during pregnancy, childbirth, and puerperium and postpartum complications increased this probability, as did depression before or during pregnancy. For its part, it has been found that an impaired attachment is less likely to develop in those dyads that have skin-to-skin contact after birth, that are breastfed, and in which the children are older.

Regarding factors that increases the probability of develop an impaired bonding, maternal mental health plays a fundamental role in establishing the bond between mother and child after birth (Alhusen et al., 2012; Martucci et al., 2021). In this study, having anxiety disorders before and during pregnancy was associated with a greater risk of developing a bond disturbance, and an association was found, although not statistically significant, between prenatal depression and the risk of a mother-child bond disturbance. In their study, Nath et al. (Nath et al., 2019) observed that mothers who had anxiety during pregnancy had a more negative perception of the bond, although the interaction between mother and child was not altered and they had the same sensitivity as mothers who had not had anxiety. This negative perception was greater when it was associated with the presence of depressive symptoms (Nath et al., 2019). Researchers of various other studies found that the presence of depression before and during pregnancy is associated with less bonding and bond impairment (Alhusen et al., 2012; Śliwerski et al., 2020), as we also show in our results.

In the present study we found that postpartum complications in general increase the risk of developing a bond disturbance between mother and child. Along the same lines, authors such as Makeen et al. (Makeen et al., 2022) and Karsnitz (Karsnitz, 2013) found that specific postpartum complications, such as acute pain and urinary tract infections in the postpartum period, could influence the establishment of the bond between mother and child. In their study on postpartum hemorrhage and the emotional impact on women and their partners, Ricbourg et al. (Ricbourg et al., 2015) found that there were no differences in the relationship between mothers who had suffered this specific complication and those who had not. Latt et al. (Latt et al., 2023), showed that the mothers who suffered postpartum hemorrhage reported a break in the bond due to separation from their child during hospitalization in another unit, as well as the impossibility of being able to touch, hug, and breastfeed their child. This implies negative consequences in the future relationship of mother and child, which they perceive as difficult during the first weeks after discharge (Latt et al., 2023).

On the other hand, there are some factors that decrease the probability of developing an impaired bonding and attachment between mother and child. Klaus and Kennell first described the association between skin-to-skin contact and the development of the postnatal bond in the 1970s (Kennell & Klaus, 1979; Klaus & Kennell, 1970), since then researchers have continued to delve into this relationship and the benefits of skin-to-skin contact during early postpartum and the formation of the bond (Fegran et al., 2008; Gupta et al., 2021; E. R. Moore et al., 2016; Widström et al., 2019). Our results are in line with those found by these authors, as skin-to-skin contact after childbirth favors the proper establishment of the maternal-child relationship by establishing the bond between mother and child, although, as Myers et al. (Myers, 1984) and Klaus and Kennell (Kennell & Klaus, 1984) subsequently stated, it is not the only factor involved in the development of the bond, as also demonstrated by the results obtained in the present study. Among others, breastfeeding, a positive birth experience and maternal mental wellbeing are factors related to a good bonding establishment (Bicking Kinsey et al., 2014; Davis & Sclafani, 2022; P. Kim et al., 2011; E. Moore et al., 2016). Skin-to-skin contact after birth is related, among other things, to the levels of oxytocin produced during the interaction between mother and child, playing a fundamental role in the bonding process (Scatliffe et al., 2019). Likewise, skin-to-skin contact

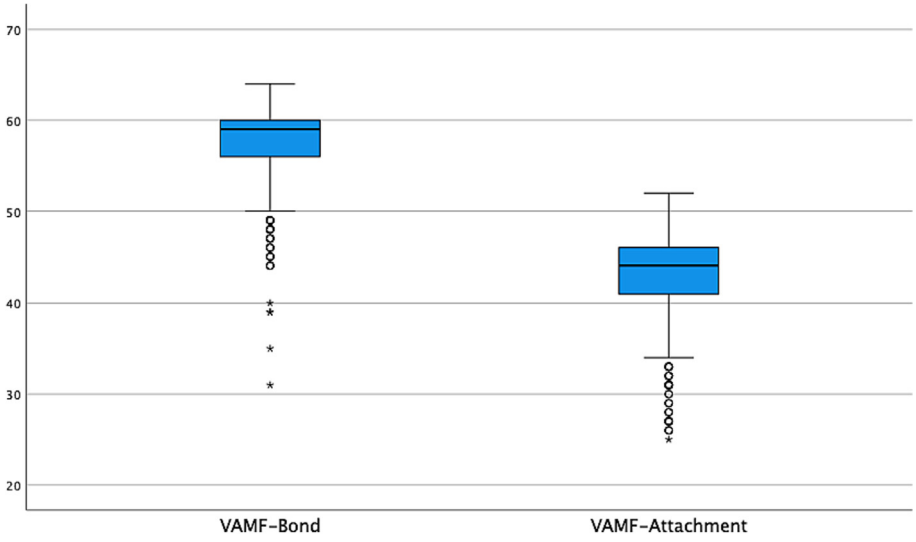

Fig. 1. Distribution of the scores on the VAMF subscales bond and attachment.

after birth is associated with greater maternal sensitivity and a greater probability of developing a secure attachment (Norholt, 2020), in line with our results.

In this study, we observed that breastfeeding decreased the probability of developing a bond disturbance. Kim et al. (Kim et al., 2011) highlighted the importance of early breastfeeding in establishing the relationship between mother and child, as the increase in brain activity and oxytocin levels increase maternal sensitivity and response to the signals emitted by the infant, favoring closeness between mother and newborn. Along these lines, in other studies such as the one by Roth et al. (Roth et al., 2021) researchers highlight the importance of breastfeeding in the formation of the bond and its impact on maternal mental health, specifically in the development of postpartum depression. In contrast, in studies such as that of Davis and Sclafani (Davis & Sclafani, 2022) or that of Hairston et al. (Hairston et al., 2019), researchers note that there are no differences between the type of feeding of the newborn and the risk of impairments in the bonding process. Likewise, in the review by Linde et al. (Jackson, 2016; Linde et al., 2020), Linde et al. found a discrepancy concerning the development of attachment and breastfeeding. Some authors affirm that, in line with our results, breastfeeding reduces the probability of having an impaired attachment and favors the development of a secure attachment (Jackson, 2016; Linde et al., 2020); while other authors suggest that there are no differences between the type of feeding and attachment (Britton et al., 2006; Linde et al., 2020; Wilkinson & Scherl, 2006).

Concerning the age of the child, it was observed that the older the newborn, in months, the less likely it was to present impaired attachment. Bowlby and Ainsworth (Ainsworth, 1989; Bowlby, 1958, 1977) consider that the attachment between mother and child begins to form from birth, from the first contact between the newborn and its mother, where the first attachment behaviors appear, but these become more evident from the sixth month of life, where the infant begins to have the ability to know that the mother exists even if she is not present, showing separation anxiety when the mother moves away. Our findings coincide with this premise, as the older the child, the greater the attachment behaviors that they show and that the mother perceives, and the more evident the attachment relationship is between the infant and her mother.

Limitations

In terms of limitations, as it is a questionnaire, a possible selection bias associated with non-response must not be ruled out, although there are no indications or reasons to suggest that the women who did not answer would have responded differently from those who did. Another possible bias in the study is the memory bias, due to the fact that some information is based on maternal recall. Likewise, as it is an observational study, a confounding bias cannot be completely ruled out, although with the criteria applied for the selection of the participating women and with the multivariate analysis carried out, the possible influence of this on the results has been minimal. Similarly, due to the type of study it is not possible to establish causal relationships. The variable “postpartum complications” encompasses specific complications such as postpartum hemorrhage, acute pain, urinary tract infections, etc. This variable has been operationalized in order to simplify the statistical analysis. When the questionnaire was developed, it was decided that the answers were mandatory in order to be able to complete it, save it or send it. That's why there is no missing data. The women had to complete all the answers. They were provided with information, in the explanation or formulation of the question, how they should respond in the event that the question was not applicable to her case.

Implications to practice

Knowing which are the factors that affect the formation of the postnatal bond and attachment is essential for clinical practice, as it can have important repercussions and benefits for the health of mothers and children. In this sense, nurses and pediatric nurses who are in contact with mothers and children have an important role in promoting breastfeeding and skin-to-skin contact, factors that reduce the probability of impaired bonding and attachment, especially in women with anxiety disorders and postpartum complications.

These results are general, for application in dyads in real clinical practice, these recommendations must be tailored to each specific case, considering maternal backgrounds, both physical and psychosocial, and neonatal factors. Care during intra and postpartum should be adapted to each specific dyad, seeking alternative methods when breastfeeding and skin-to-skin contact cannot be implemented, opening new lines of research in the field of maternal and child health. Also, identifying the factors associated with the establishment of the mother-child bond and attachment is fundamental for the development of prevention strategies and early identification of cases that may present alterations and avoid their consequences on the health of the mother and child.

Table 2
Bivariate and multivariate analysis bond disturbance.

Variable	Bond disturbance		Bivariate analysis		Multivariate analysis	
	No n (%) (*N* = 973)	Yes n (%) (*N* = 141)	OR 95% CI	*P* value	aOR 95% CI	P value
Age mother (years)	34.4 (3.87)	34.8 (4.01)	1.03 (0.98–1.07)	0.265		
Age newborn (months)	8.2 (5.04)	7.8 (5.32)	0.99 (0.95–1.02)	0.459		
Income level approx.				0.143		
<1000 euros/month	193 (91.9)	17 (8.1)	1 (ref.)			
Between 1000 and 1900 euros/month	519 (86.9)	78 (13.1)	1.71 (0.98–2.96)	0.057		
Between 2000 and 1900 euros/month	211 (85.1)	37 (14.9)	**1.99 (1.09–3.65)**	**0.026**		
>3000 euros/month	50 (84.7)	9 (15.3)	2.04 (0.86–4.86)	0.106		
Current illness				**0.015**		
No	864 (88.3)	115 (11.7)	1 (ref.)			
Yes	109 (80.7)	26 (19.3)	**1.79 (1.12–2.87)**			
No. of pregnancies				0.086		
One	541 (85.5)	92 (14.5)	1 (ref.)			
Two	285 (90.5)	30 (9.5)	**0.62 (0.40–0.96)**	**0.031**		
Three or more	145 (88.4)	19 (11.6)	0.77 (0.46–1.31)	0.332		
Vaginal births				**0.025**		
None	190 (82.3)	41 (17.7)	1 (ref.)			
One	587 (88.1)	79 (11.9)	**0.62 (0.41–0.94)**	**0.024**		
Two or more	196 (90.3)	21 (9.7)	**0.50 (0.28–0.87)**	**0.015**		
Cesarean sections				**0.006**		
No	729 (89.0)	90 (11.0)	1 (ref.)			
Yes	244 (82.7)	51 (17.3)	1.69 (1.17–2.46)			
No of children				0.419		
One	714 (87.0)	107 (13.0)	1 (ref.)			
Two	224 (87.5)	32 (12.5)	0.95 (0.63–1.45)	0.824		
Three or more	35 (94.6)	2 (5.4)	0.38 (0.09–1.61)	0.189		
High-risk pregnancy				0.574		
No	817 (87.1)	121 (12.9)	1 (ref.)			
Yes	156 (88.6)	20 (11.4)	0.87 (0.52–1.43)			
Planned pregnancy				**0.017**		
No	83 (79.8)	21 (20.2)	1 (ref.)			
Yes	890 (88.1)	120 (11.9)	**0.53 (0.32–0.32-0.89)**			
Fertility treatment				**0.605**		
No	837 (87.6)	119 (12.4)	1 (ref.)			
Yes	136 (86.1)	22 (13.9)	1.14 (0.70–1.86)			
Prenatal education				0.472		
No	291 (88.4)	38 (11.6)	1 (ref.)			
Yes	682 (86.9)	103 (13.1)	1.16 (0.78–1.72)			
Health problem during pregnancy				**0.034**		
No	575 (89.1)	70 (10.9)	1 (ref.)			
Yes	398 (84.9)	71 (15.1)	**1.47 (1.03–2.09)**			
Type of delivery				**0.005**		
Normal	588 (89.4)	70 (10.6)	1 (ref.)			
Instrumental	181 (87.4)	26 (12.6)	1.21 (0.75–1.95)	0.443		
Planned cesarean section	58 (89.2)	7 (10.8)	1.01 (0.45–2.31)	0.974		
Emergency cesarean section	146 (79.3)	38 (20.7)	**2.19 (1.42–3.38)**	**<0.001**		
Analgesia/birth anesthesia				0.502		
No	196 (88.7)	25 (11.3)	1 (ref.)			
Yes	777 (87.0)	116 (13.0)	1.17 (0.74–1.85)			
Birth experience				**0.001**		
Very bad/bad	106 (78.5)	29 (21.5)	1 (ref.)			
Ok	167 (84.8)	30 (15.2)	0.66 (0.37–1.17)	0.145		
Good/Very good	700 (89.5)	82 (10.5)	**0.43 (0.27–0.69)**	**<0.001**		
Early breastfeeding				**0.003**		
No	195 (81.6)	44 (18.1)	1 (ref.)			
Yes	778 (88.9)	97 (11.1)	**0.55 (0.37–0.82)**			
Skin-to-skin				**0.001**		**0.005**
No	142 (79.3)	37 (20.7)	1 (ref.)		1 (ref.)	
Yes	831 (88.9)	104 (11.1)	**0.48 (0.32–0.73)**		**0.57 (0.36–0.89)**	
Complications following birth				**0.001**		**0.038**
No	824 (88.8)	104 (11.2)	1 (ref.)		1 (ref.)	
Yes	149 (80.1)	37 (19.9)	**1.97 (1.30–2.98)**		**1.60 (1.03–2.48)**	
Length of hospital stay				**0.023**		
1 day	131 (92.9)	10 (7.1)	1 (ref.)			
2 days	512 (88.1)	69 (11.9)	1.77 (0.89–3.52)	0.107		
3 days	227 (86.3)	36 (13.7)	**2.08 (1.00–4.32)**	**0.051**		
Between 3 days and one week	95 (79.2)	25 (20.8)	**3.45 (1.58–7.52)**	**0.002**		
>1 week	8 (88.9)	1 (11.1)	1.64 (0.19–14.43)	0.657		
ICU admission				**0.033**		
No	962 (87.6)	136 (12.4)	1 (ref.)			
Yes	11 (68.8)	5 (31.3)	**3.22 (1.10–9.40)**			
Hospital readmission				0.862		
No	950 (87.3)	138 (12.7)	1 (ref.)			

(continued on next page)

Table 2 (*continued*)

Variable	Bond disturbance		Bivariate analysis		Multivariate analysis	
	No n (%) ($N = 973$)	Yes n (%) ($N = 141$)	OR 95% CI	*P* value	aOR 95% CI	P value
Yes	23 (88.5)	3 (11.5)	0.90 (0.27–3.03)			
Tiredness/fatigue during pregnancy, birth, postpartum				**0.012**		
No	113 (95.0)	6 (5.0)	1 (ref.)			
Yes	860 (86.4)	135 (13.6)	**2.96 (1.28–6.85)**			
Anxiety during pregnancy, birth, postpartum				**<0.001**		**<0.001**
No	538 (94.6)	31 (5.4)	1 (ref.)		1 (ref.)	
Yes	435 (79.8)	110 (20.2)	**4.39 (2.89–6.67)**		**3.95 (2.57–6.05)**	
Mental health problems				**<0.001**		
No	751 (89.6)	87 (10.4)	1 (ref.)			
Yes	222 (80.4)	54 (19.6)	**2.10 (1.45–3.04)**			
Depression before/during pregnancy				**0.001**		0.071
No	890 (88.5)	116 (11.5)	1 (ref.)		1 (ref.)	
Yes	83 (76.9)	25 (23.1)	**2.31 (1.42–3.76)**		1.60 (0.96–2.68)	
WAST disturbance				**0.002**		
No	903 (88.3)	120 (11.7)	1 (ref.)			
Yes	70 (76.9)	21 (23.1)	**2.26 (1.34–3.81)**			
Support received from partner				0.183		
Very low/low	47 (79.7)	12 (20.3)	1 (ref.)			
Moderate	159 (86.9)	24 (13.1)	0.59 (0.28–1.27)	0.178		
High/Very high	767 (88.0)	105 (12.0)	0.54 (0.28–1.04)	0.067		
Support received from family				**0.017**		
Very low/low	84 (80.0)	21 (20.0)	1 (ref.)			
Moderate	191 (84.9)	34 (15.1)	0.71 (0.39–1.30)	0.268		
High/Very high	698 (89.0)	86 (11.0)	**0.49 (0.29–0.84)**	**0.009**		
Alcohol consumption during pregnancy				**0.001**		
None	336 (91.3)	32 (8.7)	1 (ref.)			
Occasional	577 (86.5)	90 (13.5)	**1.64 (1.07–2.51)**	**0.023**		
Routine consumption	60 (75.9)	19 (24.1)	**3.33 (1.77–6.25)**	**<0.001**		
Stopped alcohol consumption during pregnancy				0.737		
No	35 (87.5)	5 (12.5)	1 (ref.)			
Yes	683 (85.6)	115 (14.4)	1.18 (0.45–3.07)			
Prematurity				0.546		
No	929 (87.5)	133 (12.5)	1 (ref.)			
Yes	44 (84.6)	8 (15.4)	1.27 (0.59–2.76)			
Continued breastfeeding				**0.006**		**0.009**
No	145 (81.0)	34 (19.0)	1 (ref.)		1 (ref.)	
Yes	828 (88.6)	107 (11.4)	**0.55 (0.36–0.84)**		**0.55 (0.35–0.86)**	
Newborn health problem				**0.007**		
No	886 (88.2)	118 (11.8)	1 (ref.)			
Yes	87 (79.1)	23 (20.9)	**1.99 (1.21–3.27)**			
Newborn hospital admission				0.161		
No	866 (88.0)	118 (12.0)	1 (ref.)			
Yes, in the Neonatal unit	80 (83.3)	16 (16.7)	1.47 (0.83–2.60)	0.187		

Table 3
Bivariate and multivariate analysis Factors associated with an attachment disturbance.

Variable	Attachment disturbance		Bivariate analysis		Multivariate analysis	
	No n (%) ($N = 986$)	Yes n (%) ($N = 128$)	OR 95% CI	P value	aOR 95% CI	P value
Age mother (years)	34.4 (3.89)	34.7 (3.83)	1.02 (0.97–1.07)	0.459		
Age newborn (months)	8.6 (4.95)	4.29 (4.29)	**0.78 (0.74–0.83)**	**<0.001**	**0.77 (0.72–0.82)**	**<0.001**
Income level approx.				0.179		
<1000 euros/month	195 (92.9)	15 (7.1)	1 (ref.)			
Between 1000 and 1900 euros/month	524 (87.8)	73 (12.2)	**1.81 (1.02–3.23)**	**0.045**		
Between 2000 and 2900 euros/month	215 (86.7)	33 (13.3)	2.00 (1.05–3.79)	0.034		
>3000 euros/month	52 (88.1)	7 (11.9)	1.75 (0.68–4.52)	0.247		
Current illness				0.474		
No	869 (88.8)	110 (11.2)	1 (ref.)			
Yes	117 (86.7)	18 (13.3)	1.22 (0.71–2.07)			
No. of pregnancies				0.076		
One	549 (86.7)	84 (13.3)	1 (ref.)			
Two	289 (91.7)	26 (8.3)	**0.59 (0.37–0.93)**	**0.024**		
Three or more	146 (89.0)	18 (11.0)	0.81 (0.47–1.38)	0.434		
Vaginal births				**0.171**		
None	197 (85.3)	34 (14.7)	1 (ref.)			
One	592 (88.9)	74 (11.1)	0.72 (0.47–1.12)	0.148		
Two or more	197 (90.8)	20 (9.2)	0.59 (0.33–1.06)	0.076		
Cesarean sections				0.195		

Table 3 (*continued*)

Variable	Attachment disturbance		Bivariate analysis		Multivariate analysis	
	No n (%) (*N* = 986)	Yes n (%) (*N* = 128)	OR 95% CI	P value	aOR 95% CI	P value
No	731 (89.3)	88 (10.7)	1 (ref.)			
Yes	255 (86.4)	40 (13.6)	1.30 (0.87–1.84)			
No of children				0.246		
One	719 (87.6)	102 (12.4)	1 (ref.)			
Two	234 (91.4)	22 (8.6)	0.66 (0.41–1.08)	0.096		
Three or more	33 (89.2)	4 (10.8)	0.85 (0.30–2.46)	0.771		
High-risk pregnancy				0.841		
No	831 (88.6)	107 (11.4)	1 (ref.)			
Yes	155 (88.1)	21 (11.9)	1.05 (0.64–1.73)			
Planned pregnancy				0.987		
No	92 (88.5)	12 (11.5)	1 (ref.)			
Yes	894 (88.5)	116 (11.5)	1.00 (0.53–1.87)			
Fertility treatment				0.619		
No	848 (88.7)	108 (11.3)	1 (ref.)			
Yes	138 (87.3)	20 (12.7)	1.14 (0.68–1.90)			
Prenatal education				0.162		
No	298 (90.6)	31 (9.4)	1 (ref.)			
Yes	688 (87.6)	97 (12.4)	1.36 (0.89–2.08)			
Health problem during pregnancy				0.124		
No	579 (89.8)	66 (10.2)	1 (ref.)			
Yes	407 (86.8)	62 (13.2)	1.34 (0.92–1.93)			
Type of delivery				0.321		
Normal	590 (89.7)	68 (10.3)	1 (ref.)			
Instrumental	183 (88.4)	24 (11.6)	1.14 (0.69–1.87)	0.608		
Planned cesarean section	54 (83.1)	11 (16.9)	1.77 (0.88–3.54)	0.108		
Emergency cesarean section	159 (86.4)	25 (13.6)	1.36 (0.84–2.23)	0.215		
Analgesia/birth anesthesia				0.206		
No	201 (91.0)	20 (9.0)	1 (ref.)			
Yes	785 (87.9)	108 (12.1)	1.38 (0.84–2.28)			
Birth experience				0.241		
Very bad/bad	114 (84.4)	21 (15.6)	1 (ref.)			
Ok	173 (87.8)	24 (12.2)	0.75 (0.40–1.42)	0.379		
Good/Very good	699 (89.4)	83 (10.6)	0.65 (0.38–1.08)	0.097		
Treatment received during birth				0.497		
Very bad/bad	46 (93.9)	3 (6.1)	1 (ref.)			
Ok	81 (88.0)	11 (12.0)	2.08 (0.55–7.85)	0.279		
Good/Very good	859 (88.3)	114 (11.7)	2.04 (0.62–6.65)	0.240		
Early breastfeeding				**0.002**		
No	198 (82.8)	41 (17.2)	1 (ref.)			
Yes	788 (90.1)	87 (9.9)	**0.53 (0.36–0.80)**			
Skin-to-skin				0.101		**0.050**
No	152 (84.9)	27 (15.1)	1 (ref.)		1 (ref.)	
Yes	834 (89.2)	101 (10.8)	0.68 (0.43–1.08)		**0.61 (0.38–1.00)**	
Complications following birth				0.508		
No	824 (88.8)	104 (11.2)	1 (ref.)			
Yes	162 (87.1)	24 (12.9)	1.17 (0.73–1.89)			
Length of hospital stay				0.157		
1 day	131 (92.9)	10 (7.1)	1 (ref.)			
2 days	518 (89.2)	63 (10.8)	1.59 (0.80–3.19)	0.188		
3 days	224 (85.2)	39 (14.8)	2.28 (1.10–4.72)	0.026		
Between 3 days and one week	106 (88.3)	14 (11.7)	1.73 (0.74–4.05)	0.207		
>1 week	7 (77.8)	2 (22.2)	3.74 (0.69–20.45)	0.128		
ICU admission				0.899		
No	972 (88.5)	126 (11.5)	1 (ref.)			
Yes	14 (87.5)	2 (12.5)	1.10 (0.25–4.91)			
Hospital readmission				0.542		
No	962 (88.4)	126 (11.6)	1 (ref.)			
Yes	24 (92.3)	2 (7.7)	0.64 (0.15–2.72)			
Tiredness/fatigue during pregnancy, birth, postpartum				0.921		
No	105 (88.2)	14 (11.8)	1 (ref.)			
Yes	881 (88.5)	114 (11.5)	0.97 (0.54–1.75)			
Anxiety during pregnancy, birth, postpartum				0.655		
No	506 (88.9)	63 (11.1)	1 (ref.)			
Yes	480 (88.1)	65 (11.9)	1.09 (0.75–1.57)			
Mental health problems				0.172		
No	748 (89.3)	90 (10.7)	1 (ref.)			
Yes	238 (86.2)	38 (13.8)	1.34 (0.88–1.99)			
Depression before/during pregnancy				0.147		
No	895 (89.0)	111 (11.0)	1 (ref.)			
Yes	91 (84.3)	17 (15.7)	1.51 (0.87–2.62)			

(*continued on next page*)

Table 3 (*continued*)

Variable	Attachment disturbance		Bivariate analysis		Multivariate analysis	
	No n (%) (*N* = 986)	Yes n (%) (*N* = 128)	OR 95% CI	P value	aOR 95% CI	P value
WAST disturbance				0.401		
No	903 (88.3)	120 (11.7)	1 (ref.)			
Yes	83 (91.2)	8 (8.8)	0.73 (0.34–1.54)			
Support received from partner				0.103		
Very low/low	50 (84.7)	9 (15.3)	1 (ref.)			
Moderate	170 (92.9)	13 (7.1)	0.43 (0.17–1.05)	0.064		
High/Very high	766 (87.8)	106 (12.2)	0.77 (0.37–1.61)	0.485		
Support received from family				0.912		
Very low/low	94 (89.5)	11 (10.5)	1 (ref.)			
Moderate	200 (88.9)	25 (11.1)	1.07 (0.50–2.26)	0.863		
High/Very high	692 (88.3)	92 (11.7)	1.14 (0.59–2.20)	0.705		
Alcohol consumption during pregnancy				**0.735**		
None	326 (88.6)	42 (11.4)	1 (ref.)			
Occasional	588 (88.2)	79 (11.8)	1.04 (0.70–1.55)	0.836		
Routine consumption	72 (91.1)	8 (8.9)	0.76 (0.33–1.75)	0.511		
Stopped alcohol consumption during pregnancy				0.910		
No	35 (87.5)	5 (12.5)	1 (ref.)			
Yes	703 (88.1)	95 (11.9)	0.95 (0.36–2.47)			
Prematurity				0.182		
No			1 (ref.)			
Yes			1.66 (0.79–3.49)			
Continued breastfeeding				0.534		**0.005**
No	156 (87.2)	23 (12.8)	1 (ref.)		1 (ref.)	
Yes	830 (88.8)	105 (11.2)	0.86 (0.53–1.39)		**0.47 (0.27–0.80)**	
Newborn health problem				0.407		
No	886 (88.2)	118 (11.8)	1 (ref.)			
Yes	100 (90.9)	10 (9.1)	0.75 (0.38–1.48)			
Newborn hospital admission				0.066		
No	879 (89.3)	105 (10.7)	1 (ref.)			
Yes, in the Neonatal unit	79 (82.3)	17 (17.7)	**1.80 (1.03–3.16)**	**0.040**		
Yes, in the Neonatal ICU	28 (82.4)	6 (17.6)	1.79 (0.73–4.43)	0.205		

Conclusions

Skin-to-skin contact following birth and breastfeeding are associated with a lower probability of impaired bonding and attachment. Anxiety states during pregnancy, childbirth, and the puerperium, and complications after childbirth increase the probability of developing a bond disorder. The age of the infant is related to attachment, the older the infant, the lower the frequency of attachment disturbance.

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Ethics approval statement

The Research Ethics Committee of the Province of Jaen approved this study at their meeting on November 25th, 2021, with the ethical code DCVA-21/ 2012-N-21. All methods were carried out in accordance with relevant guidelines and regulations. Informed consent was obtained from all participants.

CRediT authorship contribution statement

Maria Antonia Diaz-Ogallar: Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Antonio Hernandez-Martinez:** Writing – review & editing, Writing – original draft, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Manuel Linares-Abad:** Writing – review & editing, Supervision, Methodology, Investigation, Conceptualization. **Juan Miguel Martinez-Galiano:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Investigation, Conceptualization.

Data availability

All data would be available to anyone who requests it by sending an email to the corresponding author.

Declaration of competing interest

The authors report no conflict of interest.

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