

# The Impact of COVID-19 Pandemic on Mother-Infant Bond: A Systematic Review

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## Abstract

**Background:** The healthy bond that develops prenatally between the mother and her infant is important for the neuropsychological development and development of the child. In stressful situations and mental disorders, the development of this bond is inhibited. With this study, an attempt is made to investigate whether the COVID-19 pandemic affected the development of the mother-infant bond. **Methods:** We have searched in the databases, PubMed, Google Scholar, PsycINFO, from July to October 2023 and we have found 18 related articles. **Results:** Most studies supported a lower mother-infant attachment during the pandemic period. We also found increased rates of depressive symptoms, anxiety and post-traumatic stress during the pandemic. **Conclusions:** The period of the pandemic and the psychological factors were the right conditions for the reduced development of the mother-infant bond. In epidemiological outbreaks, the mental health of the mother and her relationship with the infant should be a priority for perinatal care professionals.

## Keywords

COVID-19 Pandemic, Mother-Infant Bond, Postpartum Period, Postpartum Mental Health

## 1. Introduction

### 1.1. Mother-Infant Bond

The transition of a woman to the mother's role is one of the most important developmental procedures in the human experience. Although most women successfully develop a healthy relationship with their infants, there is still a minority that experiences some difficulties [1]. Bonding is a complex procedure representing numerous stages in the development of the mother-infant relationship. The

mother connects emotionally with the fetus, and this is a unique relationship different from any other maternal relationship as it is not usually affected by the presence of other children [2]. This prenatal attachment is linked to the formation of the cognitive representation of the fetus to which the mother attributes physical and psychological characteristics and is evident in her behavior, *i.e.*, following a healthy diet, avoiding harmful habits such as smoking and alcohol consumption and preparing the home setting for the coming of the infant. This attachment is related to the carer's closeness and commitment that allows a positive relationship to be created. The mother-infant bond plays a significant role not only for the infant's well-being but also for his/her cognitive and emotional development [3]. Infants, therefore, feeling the mother's protection and her commitment to respond to their needs and moods, develop the desire to get to know themselves, and explore the environment and the world around them through a safe attachment [4]. The mother's response to these messages, and her reaction to the infant's needs and mood are of paramount importance as the infant learns not only to whom and to what extent they can rely to satisfy such needs, but also qualitative characteristics are established extending to the future relations of the child with themselves and their environment. In other words, a secure or insecure attachment seems to establish some internal working models affecting the way a person regards him/herself as an infant, but also later on as a child and as an adult [5]. The child, therefore, modifies his/her behavior so as to be loved by the others, tries not to show any negative feelings, avoids creating close relations, become overly self-dependent and independent, and not express any unpleasant feelings in front of the mother, aiming at attracting her attention so as to satisfy his/her needs. In the anxious/bivalent attachment, the mother is not always available and is not sensitive towards the child's needs, tends to ignore the infant's signals for attention, and in general, she is unpredictable in her response leading to ignore the child's fears and anxieties creating a feeling of abandonment to the child. This child, with this type of attachment, is unable to control his/her impulsiveness, and demonstrates negative feelings, anti-social behavior, aggressiveness, low autonomy and low social skills. The child is frequently aggressive and exerts pressure to satisfy his/her needs. Children with an insecure type of attachment believe that they are not worthy of love, that they are insignificant, do not trust their abilities, seeing the others as dismissive, unpredictable, and perhaps, punitive [3].

## **1.2. Mother's Mental Health**

With the pregnancy and the birth of a child, mothers are confronted with significant psychological and social challenges, and for some of them, these periods may entail significant emotional pain and agony. Depression affects approximately 10% of pregnant women [6] and about one in seven women in the postpartum period [7], making postpartum depression the most widely spread clinical condition after the labor and a significant health problem. Poor mental health is one of the key risk factors for weak parent-infant interactions that can lead to adverse

impacts on bonding; however, this can also occur in psychologically healthy mothers, as, for instance, when the labor conditions lead to physical separation and the early physical contact between the mother and the neonate is prevented which is of decisive importance for the establishment and consolidation of their relationship [8]. The mother's response to the infant's needs, her closeness and availability as the main carer are affected both by her mental condition, as in the cases when postpartum depression is triggered when there is a non-treated mental disease, but also in mentally healthy mothers by the mother's age, the pregnancy characteristics, the type of labor, possible perinatal loss, the mother's primiparity or multiparity, the socioeconomic status of the family, the changes in the structure and composition of the traditional family that have resulted in the mother playing multiple roles, not only that of the parent-carer, but also of the working woman, and finally by external environmental factors. Pregnant and postpartum women face unique challenges in the context of the COVID-19 pandemic and may be at increased risk for mental health problems in this setting [8].

### **1.3. Motherhood and COVID-19**

The mother-infant bond is affected by the support the mother will have or require or need to have in periods of crisis. A relevant instance was the COVID-19 pandemic caused by the SARS-CoV-2 virus. More specifically, the COVID-19 pandemic has led to numerous social, economic, and psychological shifts that have impacted the emotional well-being of families, creating a challenging environment for parenting [9]. Research during the pandemic, has indicated a rise in parenting stress, anxiety, fear, relational conflicts, sleep disturbances, and postpartum depressive symptoms, all of which can negatively affect the parent-child bond [10]. These findings have highlighted concerns about the pandemic's effects on child development. Given that COVID-19 pandemic has affected the psycho-social life of all people, it is essential to investigate the effect of the COVID-19 on the mother-infant bond. Thus, the aim of this study is to investigate the impact of a stressful environmental factor, the COVID-19 pandemic, on the mother-infant bond, through the systematic review of the literature.

## **2. Materials and Methods**

This particular systematic review concerns only research studies to ensure consistency of data and it was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [11] guidelines, which utilize a four-phase flow diagram. The PRISMA highlights the quality of the review, enables assessment of the strengths and weaknesses of the studies, and facilitates the replication of the review methods.

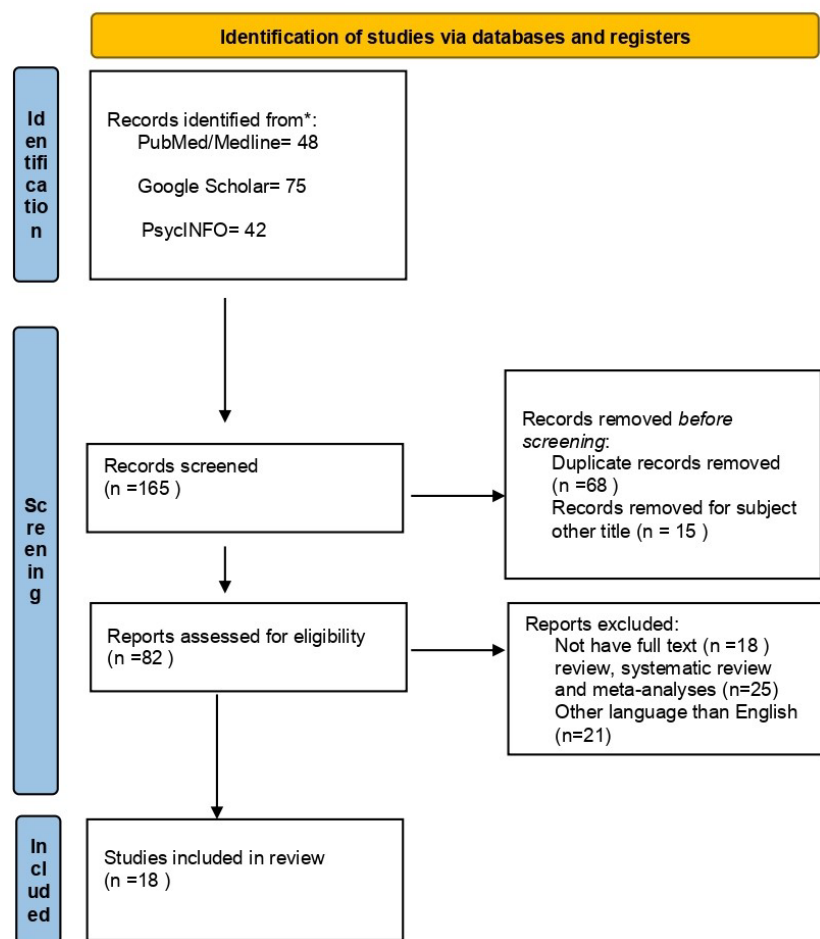
The study population consisted of mother-infant pairs exposed to the COVID-19 pandemic. As an outcome, we defined the development of the quality of maternal-infant bond development.

## 2.1. Inclusion/Exclusion Criteria

The studies were related to exposed or unexposed mothers to SARS-Cov-2, during the COVID-19 pandemic. The inclusion criteria for the systematic review were a) study the same variables with our review, i.e. the COVID-19 pandemic and the mother-infant bond; b) only research articles; c) published in the English language.

The exclusion criteria were related to a) all systematic reviews, meta-analyses, literature reviews and letters to the editor; b) articles written in a language other than English; c) articles studying the COVID-19 pandemic or the mother-infant bond irrespective of the relationship between them.

## 2.2. Study Selection



**Figure 1.** Identification of studies included in the systematic review.

A systematic review of relevant studies was performed using the databases PubMed/Medline, Google scholar, PsycINFO, in the period June 2023-October 2023. According to our search in the databases, PubMed/Medline, Google Scholar, PsycINFO, eighteen [18] articles were included (Figure 1).

The terms used were: covid-19 OR coronavirus OR covid-19 pandemic AND

mother-infant bond OR mother-infant attachment OR mother-infant isolation AND postpartum period OR perinatal period AND postpartum mothers OR perinatal mothers AND postpartum mental health.

### 3. Results

**Table 1.** Main Characteristics and outcomes of the included studies.

Author/ Year/ Country	Study Design	N	Exposure of Population	Measures	Main Outcomes	Additional Outcomes	Quality Assessment
Layton H. 2021 Canada [12]	Randomized controlled trial	298	Mothers during the COVID-19 who had infant <1 year old	1. EPDS 2. GAD-7 3. PBQ	No statistically significant differences in mother-infant bonding	1. Postpartum depression 2. Anxiety symptoms	CONSORT: Medium risk
Fernandes 2021 Portugal [18]	Cross- sectional study	125	Mothers during the COVID-19 who had infant between 0-12 months of age (between the 2 pandemic periods)	1. SCS-SF 2. IM-P—In- fant version 3. PSS 4. PBQ	Mothers showed less impaired mother-infant attachment, during the 2 <sup>nd</sup> period than the 1 <sup>st</sup>	1. Mothers showed significantly higher levels of self-compassion 2. lower levels of depressive symptoms during the 2 <sup>nd</sup> period than the 1 <sup>st</sup>	CEBM: 9/12
Mayopoulos 2021 USA [13]	Cross- sectional study	1611	Postpartum mothers during the COVID-19	1. PDI 2. PCL-5 3. LEC-5 4. MIBS	Less maternal-infant bonding	1. Posttraumatic stress symptoms 2. Breastfeeding problems	CEBM: 11/12
Fernandes 2021 Portugal [19]	Cross- sectional study	567	Mothers during the COVID-19 who had infant between 0 - 12 months of age	1. HADS 2. PSS 3. IM-P— Infant version 4. PBQ	Lower levels of Emotional Awareness of the Child More impaired bonding with their infant	1. Anxiety symptoms 2. Depressive symptoms	CEBM: 8/12
Takubo 2021 Japan [24]	Cross- sectional study	1095	Postpartum mothers during the COVID-19 one month after birth	1. EPDS 2. MIBS	No statistically significant differences in mother-infant bonding	1. Anxiety symptoms 2. Lower depression and anhedonia	CEBM: 10/12

Continued

Mayopoulos 2021 USA [14]	Cross-sectional study	68 confirmed COVID-19 2,276 reporting COVID-19 negativity	Postpartum mothers during the COVID-19 6 months after birth	1. PDI 2. LEC-5	Virus confirmed mothers were more likely to be alone in the room and separated from the neonate for several days due to inclusion to the neonatal intensive care unit.	Virus confirmed mothers were more likely to have traumatic birth experience and acute stress than non confirmed mothers	CEBM: 9/12
Koire 2021 USA [15]	Cross-sectional study	686	Pregnant women during the COVID-19	1. CRISIS 2. COVID-19-related resource worries 3. Connor-Davidson Resilience Scale 4. Distress Tolerance Scale 5. The Life Events measure 6. CES-D 7. GAD-7 8. MAAS	Higher levels of concern about the health impact of COVID-19 were significantly associated with improved attachment	-	CEBM: 11/12
Craig 2021 Italy [20]	Cross-sectional study	1179	Pregnant women during the COVID-19	1. STAI 2. PAI	State anxiety related to COVID-19 outbreak in pregnant women may affect the prenatal attachment process of the expectant mother negatively	-	CEBM:
Mirzaki 2022 Iran [25]	Prospective study	253	Pregnant women during the COVID-19	1. CDAS 2. MAI 3. PSOC	A significant negative effect on the maternal-infant attachment	1. Anxiety symptoms	NOS: Medium risk

## Continued

Liu 2022 USA [16]	Cross-sectional study	429	Postpartum mothers during the COVID-19	1. GAD-7 2. CES-D 3. MSES 4. MSPSS	The COVID-19-related grief was significantly associated with lower bonding. The COVID-19-related health worries were associated with higher levels of maternal-infant bonding.	Maternal self-efficacy was associated with higher maternal-infant bonding	CEBM: 10/12
Tohme P. 2022 Lebanon [26]	Prospective study	95	Pregnant women during COVID-19	1. PAI 2. DASS 3. IES-R	COVID-19 significantly affected prenatal attachment	1. Anxiety 2. Stress	NOS: Medium risk
Viaux-Savelon 2022 France [21]	Prospective study	164	Postpartum mothers during the 1 <sup>st</sup> lockdown of the COVID-19	1. EPDS 2. PPQ 3. DAS-16 4. MIBS	Slightly reduced mother-newborn interactions	1. Postpartum depression 2. Posttraumatic stress 3. Strong relationship with the partner	NOS: Low risk
Erten 2022 Turkey [27]	Cohort study	178	Postpartum mothers 6 weeks after birth during the COVID-19	1. EPDS 2. MIBQ	Reduced mother-infant bonding was associated with increased rates of depression	1. Postpartum depression	NOS: Medium risk
Handelzalts 2022 Israel [28]	Cross-sectional study	140	Postpartum mothers 6 weeks after birth during the COVID-19	1. EPDS 2. PBQ	COVID-19 significantly affected mother-infant bond	1. Postpartum depression	CEBM: 8/12
Şanlı 2022 Kazakhstan [29]	Cross-sectional study	235	Postpartum mothers between 1-40 days after birth during the COVID-19	1. MIBS 2. Corona-virus Fear Scale	Mother to infant bonding is affected by regular doctor check-ups, being vaccinated against COVID-19, and losing family members due to COVID-19	-	CEBM: 7/12

## Continued

Babu 2022 USA [17]	Prospective study	2205	Postpartum mothers during the COVID-19	1. PCL-5 2. MAI 3. PDI	Posttraumatic growth associated with better mother-infant bond	Childbirth- related acute stress was linked with elevated posttraumatic growth	NOS: Low risk
Benarous 2023 France [22]	Cross- sectional study	127	Postpartum mothers during the 2 <sup>nd</sup> day after birth during the COVID-19	1. EPDS 2. STAI-YA 3. MIBS 4. CRISIS	The COVID- 19-related grief was significantly associated with lower bonding.	1. Anxiety symptoms 2. Depressive symptoms	CEBM: 7/12
Schaming 2023 France [23]	Cross- sectional study	721	Postpartum mothers after 6 months from birth during the COVID-19	1. PBQ 2. PPSSi 3. EPDS	Almost half of the mothers had attachment disorders	1. High depressive symptoms similar than the pre COVID-19 period	CEBM: 10/12

**Notes:** Edinburgh Postnatal Scale (EPDS); Generalized Anxiety Disorder-7 (GAD-7); Postpartum Bonding Questionnaire (PBQ); Prenatal Attachment Inventory (PAI); Depression, Anxiety and Stress Scale (DASS); Impact of Event Scale-Revised (IES-R); Dyadic Adjustment Scale; (DAS-16); Perinatal Posttraumatic Stress Disorder Questionnaire (PPQ); Mother-Infant Bonding Scale (MIBS); Center for Epidemiologic Studies-Depression (CES-D); Maternal Self-Efficacy Scales; Perceived Social Support (MSPSS); Self-compassion (SCS-SF); Mindful parenting (IM-P—Infant version); Parental Stress Scale (PSS); Postnatal Sense of Security Instrument (PPSSi); Hospital Anxiety and Depression Scale (HADS); state-trait anxiety inventory (STAI-YA); coronavirus health impact survey questionnaire (CRISIS); Peritraumatic Distress Inventory (PDI); Posttraumatic Checklist for DSM-5 (PCL-5); Life Events Checklist for DSM-5 (LEC-5); Corona disease anxiety scale (CDAS); Müller Maternal Attachment index (MAI); Parenting sense of competence scale (PSOC); COVID-19-related resource worries COVID-19; Connor-Davidson Resilience Scale; Distress Tolerance Scale; The Life Events measure.

This systematic review included 18 articles. More specifically, 12 cross-sectional studies, 5 prospective and cohort studies and a randomized controlled trial. The total number of women was 12,452 with data been collected via self-completed questionnaires. All papers investigated the exposure of pregnant or postpartum women in the COVID-19 period and the kind of mother-infant quality of attachment as an outcome. The total sample contained data from Canada [12], USA [13]-[17], Portugal [18] [19], Italy [20], France [21]-[23], Japan [24], Iran [25], Lebanon [26], Turkey [27], Israel [28] and Kazakhstan [29] (Table 1). Differences in the methodological quality and risk of bias of the following articles were insignificant (Quality assessment column of Table 1). The quality assessment of the studies was evaluated through deferments tools. The cross-sectional studies were evaluated with the Centre for Evidence-Based Medicine Critical Appraisal (CEBM) [30], the cohort and prospective studies with the Newcastle-Ottawa scale (NOS) [31] and the randomized controlled trial with the CONSORT [32]. The results show that the risk of bias remains medium to low (Table 1).

### 3.1. Mother-Infant Bonding during the COVID-19

The majority of the studies [13] [14] [18]-[23] [25] [26] [28], indicated that the COVID-19 pandemic negatively affected the mother-infant bond. Among the papers, the results all of them contacted on pregnant women showed that COVID-19, significantly affected prenatal attachment [20] [25] [28]. On the other hand, no statistically significant differences in mother-infant bonding, indicated only from two papers conducted in Canada [12] and Japan [24]. It is worth noting that, although the main findings of the study of Liu from the USA [16], conducted on postpartum mothers showed that the COVID-19-related grief was significantly associated with lower mother-infant bonding, only when there are concerns about infection by the virus is the mother-infant bond positively affected. Additionally, there are three papers [15] [17] [27] indicating that the mother-infant bond is affected by factors other than the COVID-19 pandemic. More specifically, the paper by Koire [15], supports that the mother's depressive symptoms negatively affect the mother-infant bond, while concerns about the virus reveal a high attachment to the fetus. However, the paper of Erten from Turkey, also supports that the postpartum depression regardless of COVID-19, can affect negatively the mother-infant bonding. Moreover, the paper of Şanlı [29], shows that the mother-infant bond is negatively affected by the continuous check-ups, the ongoing vaccination against the virus, and the loss of family members and friends due to the virus.

### 3.2. Depression, Anxiety, Acute and Posttraumatic Stress Disorder, as Additional Outcomes

Many of the included papers show the presence of postpartum depression or depressive symptoms during the COVID-19 period [12] [18] [19] [21]-[24] [27] [28]. From all of them, only the paper of Takubo [24], from Japan showed low depression rate during this period. It is also worth mentioning, that the Fernandes paper [18], indicated that during the first period of the pandemic, the depressive symptoms were less compared to the second period. In addition, according to the Schaming's paper from France [23], there are high depressive symptoms in postpartum mothers during the COVID-19 period, similar than the pre COVID-19 period. Anxiety and stress during the pandemic was also evident in the included studies [12] [19] [22] [24]-[26]. Most of the studies also investigated alongside the depressive symptoms of the mothers [12] [19] [22] [24], but some others the traumatic experience of birth during the pandemic [14], and the post-traumatic stress [21]. The findings of the studies, also reveal the increase in the strong relationship with the partner during the pandemic [21], breastfeeding problems [13], but also post-traumatic growth [17] and self compassion [16] [18], as factors that ultimately helped the development of the maternal-infant bond.

## 4. Discussion

According to our findings, mothers during the COVID-19 period, suffered from

mental health issues and as a result from a reduced mother-infant bonding. It is well known, that the COVID-19 period affected the mental health of the overall population [33], especially, the women during the perinatal period [34]. It seems that the incomplete knowledge about the evolution of the pandemic and the risk of loss of life, are factors in the development of post-traumatic symptoms [35]. Of course, few of our studies examined post-traumatic stress; however, the close relationship between anxiety, depression and post-traumatic stress [36], is well known in the literature, so we believe that women faced these posttraumatic symptoms. Also, the risk of losing the infant's life is considered by the mother to be a greater psychological trauma than the risk of losing her own life [37], which indicates the extent of mothers' stress at that time. On the other side, mother-infant bond, seems to be affected from mental health status [38] [39] of the mother. The relationship between low levels of maternal attachment and higher anxiety and depression or PTSD is consistent with the existing literature [38] [40]. It seems that social changes during the pandemic increased the mother's vulnerability to stressful situations, affecting the process of creating an emotional bond with the infant. Both the literature and empirical data suggest that internalized negative emotion, such as stress and postpartum depression, can hinder a mother's ability to bond with her infant [41]. On the contrary, the strong mother-infant bond reduces the negative effects of the depressive and anxiety symptoms of postpartum mothers [42], and for this reason, land support is imperative.

In conclusion, given the importance of the healthy development of the mother-infant bond, in the mental development of the child and in improving or strengthening the mental health of the mother, our findings indicate the need for intervention by midwives and specialist perinatal professionals in difficult epidemiological periods, strengthening the maternal bond and preventing psychosocial disorders in the mother-child pair. We recommend more research on the mother-infant bond, not only to investigate the current situation due to the pandemic, but to be able to deal with similar situations in the future, such as pandemics or situations that affect the mother's mental health.

### **Authors' Contributions**

Conceptualization: M.A. and E.A.; methodology: M.A.; validation: E.O. and E.A.; investigation: M.A. resources: M.A. and E.O., data curation: M.A., writing—original draft preparation: M.A., writing—review and editing: M.D. and M.I., visualization: M.A.; supervision: E.A. All authors have read and agreed to the published version of the manuscript.

### **Conflicts of Interest**

The authors declare no conflicts of interest regarding the publication of this paper.

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