






Mother-infant attachment behaviors and related psychological factors in covid-19 pandemic: a review study

Zahra Sadat Mousavi ¹ , Zahra Alizadeh ² , Narjes Aghaie ³ , Mahsa Kahrobaie ⁴ , Shadi Goli ^{5*} 

¹ Nursing and Midwifery Care research Center, Isfahan University of Medical and Health Services, Reproductive Health, Isfahan, Iran.

² Department of Pediatric Nursing, School of Nursing and Midwifery, Shiraz University of Medical Sciences, Shiraz, Iran.

³ School of Nursing and Midwifery, Tehran University of Medical Sciences, Tehran, Iran.

⁴ School of Nursing and Midwifery, Iran University of Medical Sciences, Tehran, Iran.

⁵ Department of Midwifery, Nursing and Midwifery Sciences Development Research center, Najafabad Branch, Islamic Azad University, Najafabad, Iran.

Corresponding author and reprints: Shadi Goli, Assistant professor, Department of Midwifery, Nursing and Midwifery Sciences Development Research center, Najafabad Branch, Islamic Azad University, Najafabad, Iran.

Email: Shadi_goli@yahoo.com

Received: 6 June 2021

Accepted: 10 Aug 2021

published: 11 Aug 2021

Abstract

Introduction: Covid-19 epidemic and the fear of its infection in infants as a global threat is a challenge for mother-infant attachment behaviors.

Methods: The present study was a review study conducted based on the information collected from searches in SID, PubMed, Science Direct, Elsevier, Scopus databases and Google Scholar search engine using the conjunctions of “AND” and “OR” between the keywords. The articles were searched using systematic search with the keywords of attachment behaviors, mother-infant bonding, maternal attachment, Covid-19, and neonates, with all possible combination of important words from December 2019 to April 2021. The initial search for relevant sources related to mother-infant attachment and Covid-19 led to 65 articles. Then, by applying the time filter, this number was reduced to 31 articles. In the final stage, by excluding duplicate articles and examining the relationship of articles with the subject of study, 7 articles were selected as relevant and final sources.

Results: The results of reviewing of the studies showed low to moderate level of mother-infant attachment behaviors during Covid-19 crisis. Mothers with lower levels of attachment to their infants were more likely to experience depression, anxiety, and peritraumatic distress. Women who gave birth during quarantine had lower levels of attachment to their infants compared to other women.

Conclusion: Covid 19 epidemic caused a high prevalence and a wide range of psychological disorders and a reduction in the level of attachment in mothers of infants under 12 months. Providing timely psychological support is essential to improve the level of attachment of mothers to their infants.

Keywords: Covid-19; Infant; Mother-Child Relations; Mothers; Review.

Cite this article as: Mousavi ZS, Alizadeh Z, Aghaie N, Kahrobaie M, Goli S. Mother-infant attachment behaviors and related psychological factors in covid-19 pandemic: a review study. *Soc Determinants Health*. 2021;7(1):1-12. DOI: <http://dx.doi.org/10.22037/sdh.v6i1.35722>

Introduction

A number of unexplained cases of pneumonia were reported in Wuhan, China in late December 2019 (1), the World Health Organization registered the virus as coronavirus and in January 19, 2020. The virus has spread so rapidly that the World Health Organization has introduced it as a pandemic infectious disease. The current epidemic situation of Covid-19 around the world is severe and alarming. At present, the main epidemiological risk factors for Covid-19 include close contact with infected individuals within 14 days of the onset of symptoms. Data suggest a 5-day incubation period (2 to 14 days) (2).

Coronaviruses are a family of viruses that can cause a wide range of illnesses, from the common cold to acute respiratory symptoms, and can cause death due to pneumonia and respiratory problems (3). Previous experience on pandemic viral pneumonia, including influenza outbreaks in 1918 and 2009 (4), and acute respiratory distress syndrome (5), has raised concerns that pregnant women may be at higher risk for infection of Covid-19 and death caused by it, because pregnant women are thought to have relatively low immunity level and theoretically may be more likely to be infected (6). Delivery of mother infected with Covid-19 complicates the disease's condition, as the effects of the mother's infection on the fetus and delivery must be investigated (7). However, pregnant women with Covid-19-related pneumonia have higher risk of obstetric complications (preterm labor, premature rupture of membranes, preeclampsia, need for cesarean section) (8-10). There is evidence that the risk of developing a critical disease might be higher in later stages of pregnancy. Clinical results of pregnant women during the SARS epidemic in 2003 showed that pregnant women needed more endotracheal intubation than non-pregnant women and kidney failure

and diffuse intravascular coagulation were observed in these women after delivery (11). Quarantine and restrictions of social distancing during an epidemic are associated with psychological consequences, including increased symptoms of peritraumatic distress, confusion and anger, fear of infection in mother and infant, impatience, inadequate access to resources, insufficient information and quarantine and separation of mother from infant worsens the psychological state of mothers given birth recently (12, 13). Limited studies have been conducted on the psychological status of women in the postnatal period during the Covid-19 epidemic. Most delivery wards have applied some restrictions during the epidemic. Attachment was first defined in 1950 as the "strong bonding between two people" by Ainsworth and Bowlby, who proposed the attachment hypothesis (14).

Theoretical Framework

Through this communication, mothers respond with behaviors such as smiling, responding and paying attention to infant movements, touching, hugging, direct eye-to-eye contact, and kissing. Moreover, infant responds to these behaviors with some defined reactions (15). Usually the mother of a newborn infant is not ready to separate from her infant. This premature separation causes fear for the safety and health of infant and increases the risk of psychological problems such as anxiety and depression in mothers, which can negatively affect the interaction and attachment of mother and infant (6, 17). Concerns about the mental state of pregnant women have been already reported. Given restrictions such as not allowing direct contact and skin-to-skin contact between mother and infant during childbirth or prohibition to go to the hospital after delivery, have made it difficult for mothers to cope with this issue in postnatal period (18, 19). Positive mother-infant interactions

reduce depression, anxiety, and violent behaviors in the mother (20).

Also, concerns about the effect of maternal stress during pregnancy have an impact on the development of mother and infant attachment, which may result in neural growth disorders in the infant (21).

During postnatal period, respiratory secretions and saliva are one of the main concerns in the possible transmission of the virus from infected mothers to their infants, since they are the main means of transmission of Covid-19 to their infants (22, 23).

Based on this rare evidence, organizations and experts have prepared recommendations and statements on managing mother-infant contact during postnatal period. Some agree on the importance of mother-infant cohabitation in shaping the mother and infant attachment, even in the cases in which the mother Covid-19 test is positive, provided that appropriate measures have been taken for mother-infant contact (24-26).

Regarding breastfeeding, most treatment centers recommend continuation of breastfeeding as long as the mother does not have Covid-19 (27).

Therefore, the stress of pregnancy and delivery during a global epidemic such as Covid-19 epidemic increases, especially when associated with social distancing to prevent transmission of the infection of infant from mothers can have a direct impact on immune systems of mothers and infants. It also disrupts many aspects of their health and family system.

Given what was stated above and due to epidemic of Covid-19 in the world and the increasing fear and anxiety of being infected with Covid-19 in new mothers and their infants, more studies are needed on the occurrence of psychological disorders in mothers and its effect on their interaction and attachment to infants to adopt the best approach to improve the mental health of mothers and infants during Covid-19

epidemic by increasing the number of evidence-based studies in the area of mental health, obstetrics, midwifery and nursing in the country and by relying on the results of these studies.

Knowledge of epidemiology, pathogenesis, disease progression and clinical course of Covid-19 is constantly changing with the emergence of new information and evidence. Limited knowledge about the effect of Covid-19 on pregnant women and women given birth recently, and its psychological effect on mother-infant interaction, dependence, and attachment behaviors, as well as limited studies conducted in this regard have made the issue of mother-infant attachment and fear and stress of Covid-19 between one of the them as a potential challenge. The aim of present study was to investigate the status of mother and infant attachment behaviors during Covid-19 disease pandemic.

Methods

The present study was a review study conducted based on the information collected from searches in SID, PubMed, Science Direct, Elsevier, Scopus databases and Google Scholar search engine using the conjunctions of “AND” and “or” between the keywords. The articles were searched using systematic search with the keywords of attachment behaviors, mother-infant bonding, maternal attachment, Covid-19, and neonates, with all possible combination of important words from December 2019 to April 2021.

In addition, a list of references to the obtained articles was reviewed to identify articles that were not obtained using the above methods. The initial search led to 65 articles. Then, by applying the time filter, this number was reduced to 31 articles. In the final stage, by excluding duplicate articles and examining the relationship of articles with the subject of study, 7 articles were selected as relevant and

final sources. The initial search steps were taken separately by two researchers. In the next step, more limited searches were performed to eliminate unrelated cases.

Then, duplicate articles were excluded. After reviewing the abstract and the title of each study and eligibility criteria, possible articles were identified (Figure 1). Inclusion criteria included original articles and studies on the status of mother and infant attachment behaviors. Anonymous reports from gray literature, book chapters, personal views, letters to editor, historical articles, and non-scientific articles were excluded from our study. The information was recorded.

Results

(Table 1) summarizes the information of 7 articles evaluated on the status of mother-infant attachment behaviors during Covid-19

epidemic. The items listed in (Table 1) include the author and year of study, title, location, tools used, number of samples and population, study method and related results. According to (Table 1), the status of mother-to-infant attachment behaviors during the Covid 19 epidemic can be assessed at different periods (from birth to 12 months after delivery). All studies have investigated the status of mothers’ attachment behaviors towards their infants under 12 months of age and their associated factors in the Covid-19 epidemic crisis in six countries of China, USA, Turkey, Italy, UK, and Portugal using standard tools and quantitative method. As seen in (Table 1), studies on mother-infant attachment were conducted in three groups of mothers with a definitive diagnosis of Covid-19 and non-Covid 19 mothers (30-32, 34) and one

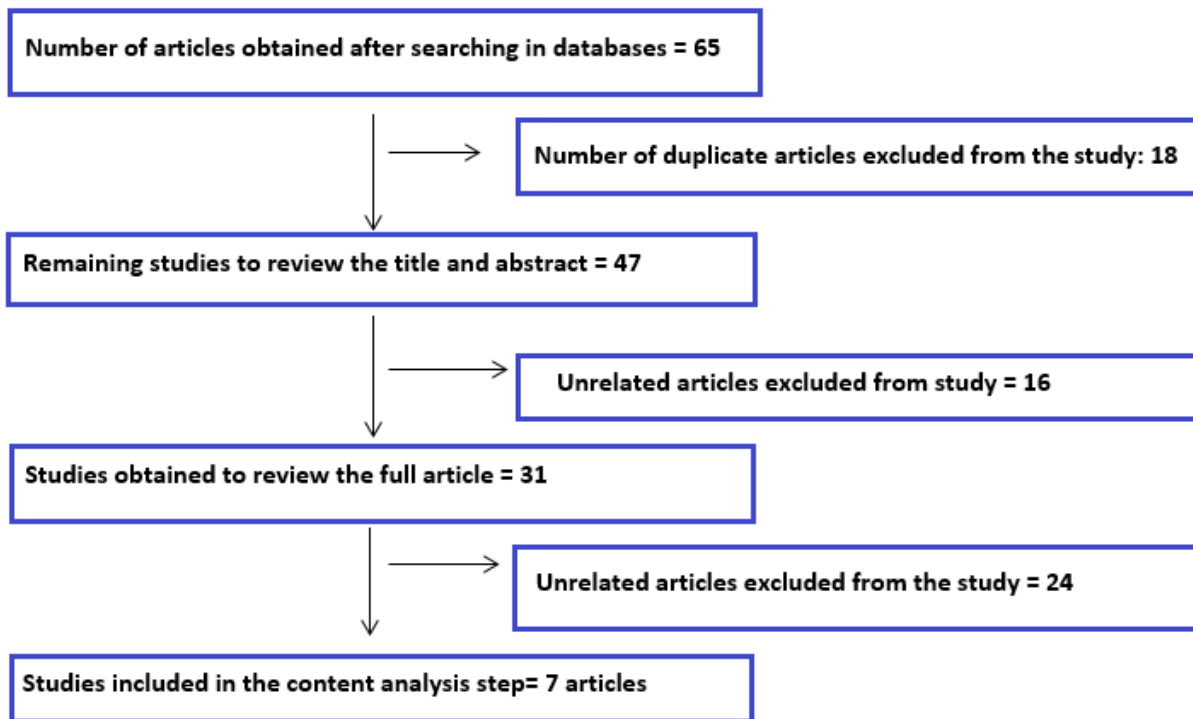


Figure 1. The process of reviewing databases, and screening and finding articles

Table 1. Review of previous studies

Author /year	Title of study	Location	Method of study	Sample size	Tools used	Results
(Wang et al., 2020) (28)	The effect of Covid-19 on the psychological behavioral status of the mother	China	Descriptive-cross-sectional (data collection in 4 stages: Covid -19 diagnosis stage, one week, one and three months after delivery)	57 Pregnant mothers with Covid 19	Edinburgh Postnatal Depression Scale (EPDS), Social-Emotional- Scale (SE)	The rate of mental disorder in mothers in the first week and the first month was 22.2%, while none of the mothers had any mental disorders after three months. At end of maternal quarantine, 28 mothers (49.1%) also decided to prolong the distance between mother and infant (8 days on average; between 5 and 23 days). Postnatal breastfeeding rate was 8.8% in the first week, 19.3% in the first month and 36.8% in the first three months. Examining the emotional-social status of mother and infant 3 months after birth in each communication area increased from 13.5% in the first week and 63.1% in the first month, while this rate in socio-emotional area increased by 86.4%
(Mayopoulo et al., 2021) (29)	Investigating the relationship between maternal Covid-19 infection during pregnancy and mother-infant attachment status	USA	Descriptive-correlational (during two months after delivery)	637 women diagnosed with Covid 19 during pregnancy	Peritraumatic Distress Inventory (PDI), Mother-to-Infant Bonding Scale (MIBS) and Mother-infant Attachment Inventory (MAI)	The response of acute distress to childbirth had a significant effect on mother-infant bonding, mother-infant attachment and breastfeeding, so that peritraumatic distress explained 0.56 of variance of primary mothers' bonding problems, 0.22 of variance of mother-infant attachment and 0.24 of variance of breastfeeding problems. The higher acute distress response, in turn, was directly associated with more difficulties in mother-infant bonding and late initiation of breastfeeding.

(Oskovi Kaplan et al., 2020) (30)	The effect of Covid-19 epidemic and social restrictions on the rate of depression and maternal attachment in the postnatal period	Turkey	Descriptive-analytical (from birth to discharge from hospital)	223 women giving birth without Covid-19	Edinburgh Postnatal Depression Inventory, Maternal Attachment Inventory (MAI)	33 (14.7%) of women were at risk for postnatal depression. The mean attachment score of 223 women was 100 and attachment scores were significantly lower in depressed women (73 vs. 101, respectively)
(Ostacoli et al., 2020) (31)	Investigating the prevalence of peritraumatic distress symptoms in women during Covid 19 epidemic and its relationship with infant attachment style	Italy	Descriptive-cross-sectional (from birth to discharge from hospital)	223 women giving birth without Covid 19 163 mothers over the age of 18 who gave birth during the Covid-19 epidemic	Edinburgh Postnatal Depression Inventory, Impact of Event Scale-Revised Event Scale (IES-R), Adult Attachment Relationship Questionnaire (RQ)	Symptoms of postnatal depression were mild in 72 (44.2%) women and severe in 50 (30.7%) women. In general, Peritraumatic stress symptoms were mild in 70 (42.9%) women and severe in 48 (29.4) women. The majority of mothers reported insecure attachment style, 60 (38%) of women reported avoidant attachment style was present in, 25 (15.8) women reported avoidance style. In mothers with major depression, insecure attachment style was more prevalent.
(Vazquez et al., 2021) (32)	The effect of quarantine due to the prevalence of Covid-19 on infant feeding experiences and practices	UK	Descriptive-analytical (study from birth to discharge from hospital)	1365 women over 18 years of age with infants under 12 months who gave birth before and after the epidemic	Researcher-made questionnaire including maternal mental health status, experience of childbirth and after it (mother-to-infant attachment and the relationship between them, breastfeeding status)	The mother-to-infant bonding and skin-to-skin contact and initiation of breastfeeding did not differ between groups. 59% of neonates born during the epidemic period were in direct skin-to-skin contact, compared with 39% of the infants born before this epidemic . 13% of women who gave birth during the epidemic reported the problem of not establishing a bond between themselves and their infants during childbirth. Among women who gave birth before and after the epidemic, 57% and 69%, respectively, had stopped breastfeeding.

(Peng et al., 2021) (33)	COVID-19 A multicenter study on mothers' postnatal mental health and attachment to their infants during COVID-19	China	Descriptive-analytical (study during 3 months after delivery)	23 women with definite diagnosis of Covid- 19 and 15 mothers suspected of having Covid-19 with negative test and 33 mothers without Covid-19	The Maternal Postnatal Attachment Scale (MPAS), the Zung Self-rating Anxiety Scale, and the Zung Self-rating Depression Scale	<p>The period of separation of mother and infant in the definitive diagnosis group (33.9 ± 20.9 days) was significantly longer than the suspected group (16.7 ± 12.2 days) and the healthy group (10.7 ± 8.4 days). Total attachment score was significantly lower in mothers with Covid-19 (indicating less mother-infant dependence).</p> <p>There was a negative correlation between mother and infant separation period and attachment scores. The rate of postnatal anxiety in the definitive, suspected and control groups was 4.3%, 6.7% and 12.1%, respectively. The rate of postnatal depression in the definitive, suspected and control groups was 39.1%, 33.3% and 30.3%, respectively. There was no significant difference among mothers of these groups in terms of postnatal anxiety and depression.</p>
(Fernandes et al., 2021) (24)	Mental health of Portuguese mothers, parents' thinking. Mother and infant bonding	Portugal	Descriptive-analytical (from birth to discharge from hospital)	567 mothers (18-46 years) with an infant aged between 0 and 12 months	Hospital Anxiety and Depression Scale(HADS), Parental Stress Scale (PSS), Mindfulness in Parenting Scale (IM-P), Postnatal Bonding Questionnaire (PBQ)	<p>Most mothers reported normal or mild levels of symptoms of anxiety and / or depression (411, n = 72.5%) and 27.5% (n = 156) of mothers given birth during Covid-19 showed lower level of emotional awareness of the infant and more disorders in mother-infant communication. Disorder in mother-infant bonding was positively and significantly correlated with symptoms of anxiety ($r = 0.28$, $p < 0.001$), depression ($r = 0.36$, $p < 0.001$), parental stress ($r = 0.66$)</p>

study in three groups of definitive diagnosis of Covid-19, suspected of having Covid 19 with negative test, and no Covid-19 (33). In terms of the period of study, the studied have been conducted in three periods: from birth to discharge from hospital (30-32), 2 months (29), 3 months (28, 33) and 12 months after birth (34).

The prevalence of Covid-19 may be associated with psychological consequences and problems in mothers and infants, including low levels of attachment between mother and infant. A review of published studies in this area shows some of these consequences, mentioned in table 1.

Mother-infant attachment behavior status

In the study conducted by Wang et al., a tendency to create a distance between mother and infant for more than one to about 3 weeks was reported. The tendency to breastfeed after birth was less than 40% during the three months, but emotional-social status of mother and infant three months after birth increased in the area of communication and socio-emotional area (28).

This study has provided a more precise relationship between the days of mother-infant separation and early growth retardation in many areas such as communication, movement, problem solving, personal-social and social-emotional relationships. In another study, majority of mothers reported an insecure attachment style 48 hours after birth (31).

In another study, 59% of infants born during the Covid-19 epidemic had direct skin-to-skin contact, but about 13% of women complained of skin-to-skin contact with their infant (32).

The results of another study revealed a lower level of attachment between mother infected with Covid 19 and infant during 3 months of evaluation (33).

The results of a study conducted by Fernandes et al. also showed that mothers

whose infants were born during the Covid-19 epidemic reported higher mother-infant attachment disorder until discharge from hospital (35).

Factors related to mother-infant attachment

Acute stress response to delivery

The higher acute stress response was directly associated with more difficulties in mother-fetus bonding and the onset of late breastfeeding (29).

Peritraumatic distress

Peritraumatic distress explains 0.56 of variance of problems related to initial bonding of mothers, 0.22 of variance of problems related to mother-infant attachment, and 0.24 of variance of problems related to breastfeeding (29).

Depression

Attachment scores were significantly lower in depressed women (30). In mothers with major depression, insecure attachment to infant style was higher (31).

Anxiety

Impairment in establishing mother-infant bonding was positively and significantly associated with symptoms of anxiety, depression, and maternal stress (36).

Discussion

The aim of present study was to review the status of mother-infant attachment behaviors and related psychological factors systematically during Covid-19 pandemic. The results of this study showed that the prevalence of Covid-19 disease could be associated with a reduction in the level of mother-infant attachment. This study provided new insights into the psychological impact of Covid-19 on women after childbirth in terms of traumatic stress and maternal attachment views. In general, the separation of mother from infant is a problem that is significant during the Covid-19 epidemic. In China, all

treated patients are quarantined for 14 days to control recurrence of Covid-19.

The results of a study showed that even after quarantine, almost half of mothers were separated from their infants in the early months for fear of infecting their infants through breastfeeding. In addition to early cessation of breastfeeding, early separation of mother from her infant was also associated with infant brain growth and development, parental psychological well-being, and mother-infant relationship (37).

The results of a recent study in Turkey revealed that 14.7% of pregnant women were at a higher risk of postnatal depression within 48 hours of birth, and mother-infant bonding status was higher in depressed women than in non-depressed women during the Covid-19 epidemic (30).

Also, the presence of stress response to delivery due to Covid-19 among the mothers was associated with symptoms of peritraumatic distress and bonding problems and breastfeeding in the early postnatal period. These conditions may lead to mental illness in the mother and impair the growth of infant (29).

Results of the present study highlight unfavorable effects of traumatic childbirth experiences during the recent epidemic. Acute stress response to childbirth was evident among pregnant women in this study. Factors such as fear of exposure to virus in the mother or infant during hospitalization, reduced social support during childbirth, and limited communication between mother and infant, and consequently, differences between antenatal expectations before this epidemic and actual experience of childbirth during the epidemic may have caused this stress (38).

Depression threatens mothers and affects their emotional and physical capacity to care for and develop the mother-infant attachment (22).

Moreover, the study reported that depression symptoms were negatively

associated with mothers' emotional attachment to their infants (23).

Thus, childbirth provides a unique opportunity to screen acute postnatal stress because it is predictable and the expansion of mental health screening in hospitals and maternity centers during the Covid-19 epidemic to identify women at high risk for negative mental health outcomes is crucial, as a reduction in the level of attachment and interaction between mother and infant leads to worse long-term outcomes for the health of women and infants (29).

According to the World Health Organization, the Royal College of Midwives, the Royal College of Child Health, all medical centers should continue to take measures such as promoting early mother-infant contact and exclusive breastfeeding, despite the difficulties posed by the Covid-19 epidemic. This, these centers should follow guidelines that encourage the continuation of these practices during the Covid-19 epidemic (39-42).

Since maternal attachment is the basis for infant attachment that is related to social, emotional and cognitive development in childhood (43,44), it is important to provide support that leads to secure attachment and interaction between the infant and mother, especially for families of mothers with Covid-19 (33).

In the present study, it was reported that many mothers suffer from separation of their infants due to hospitalization and the centralized quarantine protocol during the COVID-19 epidemic. In other words, the mother separation from her infant may affect her mood in postnatal period, while the mental security of the mother and infant is a priority (30).

The health status of the unborn child during Covid-19 epidemic, the consequences of preventive measures and fear of infecting the infant, lack of motivation to receive less support and care during childbirth or postnatal period can increase psychological

anxiety in mothers, resulting in reduced levels of mother's attachment to her infant. It seems that emotional awareness is less common in mothers who have given birth during an epidemic, and this may prevent them from expressing their feelings (34).

The present study revealed that the symptoms of postnatal depression were associated with high levels of labor pain and insecure unavoidable attachment style, while peritraumatic stress symptoms were associated with a fearful-avoidant attachment style (31).

In other words, a sense of security and non-isolation may be the reason for obtaining a higher score on mother-infant attachment behaviors. Keeping mother and infant together and preventing breastfeeding disorders due to concerns about COVID-19 infection is crucial in minimizing psychological stress and the unfavorable effects on nutrition and bonding (45).

Initial assessment of attachment style during prenatal period can be another strategy to identify women at higher risk for postnatal psychological distress and provide them with preventive interventions (31).

The results of studies have confirmed the higher prevalence of psychological distress in pregnancy during the Covid-19 epidemic (46-49).

The present study revealed that mothers whose Covid-19 test was positive were less dependent on their infants compared to suspected and healthy groups (33).

However, further investigation is needed to know whether a decline in mother-infant attachment will affect the development of children growth. An increase in depression and peritraumatic symptoms in women who gave birth during Covid-19 outbreak may be related more to a general epidemic alert than to specific factors with a direct impact on the childbirth experience (31).

Further investigations are needed to evaluate the long-term effects of Covid-19 on maternal emotional distress and its effect

on their attachment styles and behaviors with their infants. The present study, like many studies, suffered some limitations, including limitations on access to the full text of some articles, which led to non-inclusion of articles into the process. Another limitation of the present study was that all studies have been conducted in a short period, and since new studies are increasingly conducted on the psychological consequences of this disease, we had to collect and review the studies published until the second half of April 2021.

Conclusion

Results of the present study revealed that Covid-19 disease outbreak reduces the level of mother-infant attachment and it is associated with psychological consequences. The study also identified several predictors for mother-infant attachment during the Covid-19 epidemic, suggesting that higher levels of stress, anxiety, depression, and peritraumatic stress were associated with impaired mother-infant bonding. These variables seem to be more important in explaining the bonding than psychological symptoms and contextual variables such as information about Covid-19. It is recommended for experts and researchers in this area conduct further studies and design effective interventions and practical strategies to improve and reduce the psychological problems between mother and infant due to the outbreak of Covid-19 disease.

References

1. Farnoosh G, Alishiri G, Hosseini Zijoud S, Dorostkar R, JalaliFarahani A., Understanding the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) and Coronavirus Disease (COVID19) Based on Available Evidence A Narrative Review. *J Mil Med.*, 2020, 12(1): 1-11.
2. Rasmussen S, Jamieson D., Coronavirus disease 2019 (COVID-19) and pregnancy: responding to a rapidly evolving situation, *Obstetrics and Gynecology*, 2020, 2 (5): 4154-26.

3. Mullins E, Evans D, Viner R, O'Brien P, Morris E., Coronavirus in pregnancy and delivery: rapid review and expert consensus, *Med Rxiv*, 2020, 4(1): 1-10.
4. Harris J., Influenza occurring in pregnant women, *JAMA*, 2019, 7(2): 978–780.
5. Jamieson D, Honein M, Rasmussen S., H1N1 2009 influenza virus infection during pregnancy in the USA, *Lancet*, 2009, 7(4): 451-458.
6. Qiao J., What are the risks of COVID-19 infection in pregnant women?, *Lancet*, 2020, 9(5): 760-762.
7. Du Y, Wang L, Wu G, Lei X, Li W, Lv J., Anesthesia and protection in an emergency cesarean section for pregnant woman infected with a novel coronavirus: case report and literature review, *Journal of Anesthesia*, 2020, 4(1): 613-618.
8. Rothe C, Schunk M, Sothmann P., Transmission of 2019-nCoV infection from an asymptomatic contact in Germany, *New England Journal of Medicine*, 2020, 3 (10): 970-971.
9. Mullins. E, Evans D, Viner, RM et al., Coronavirus in pregnancy and delivery: Rapid review, *Ultrasound Obstet Gynecol*, 2020, 5(5): 586-592.
10. Schwartz D., An analysis of 38 pregnant women with COVID-19 their newborn infants and maternal-fetal transmission of SARS-CoV-2: maternal coronavirus infections and pregnancy outcomes, *Archives of pathology & laboratory medicine*, 2020, 4(7): 799-805.
11. Knight M, Bunch K, Vousden N., Characteristics and outcomes of pregnant women admitted to hospital with confirmed SARS-CoV-2 infection in UK: national population based cohort study, *BMJ*, 2020, 6(1): 114-127.
12. Zanardo. V, Manghina V, Giliberti L VM, Severino L, Straface G., Psychological impact of COVID19 quarantine measures in northeastern Italy on mothers in the immediate postpartum period, *Int J Gynaecol Obstet*, 2020, 10(2): 184–188.
13. Esterwood E, Saeed S., Past epidemics natural disasters COVID19 and mental health: learning from history as we Deal with the present and prepare for the future, *Psychiatric quarterly*, 2020, 5(3): 1-13.
14. Ainsworth M, Bowlby J., An ethological approach to personality development, *American psychologist*, 1991, 6(4): 333-348.
15. Maltese A, Gallai B, Marotta R, Lavano F, Lavano S, Tripi G, Salerno M., Neurosciences and attachment theory: A brief review, *Sciences*, 2017, 5(10): 1-10.
16. Galeshi M, Mirghafourvand M, Alizadeh Sharajabad F, Sanaati F., Predictors of mother-child bonding, *Hayat(Persian)*, 2016, 2(1): 13-26.
17. Pennestri M, Gaudreau H, Bouvette Turcot A, Moss E, Lecompte V, Atkinson L., Mavan Research Team, Attachment disorganization among children in neonatal intensive care unit: Preliminary results, *Early human development*, 2016, 9(10): 601-606.
18. Viaux S, Maurice P, Cohen D J., Giving birth under lockdown during the COVID-19 epidemic, *J Gynecol Obstet Hum Reprod*, 2020, 9(6): 785-790.
19. Hermann A, Deligiannidis K, Bergink V, Monk C, Fitelson E, Robakis T, & Birndorf C., Response to SARS-Covid-19-related visitor restrictions on labor and delivery wards in New York City, *Archives of women's mental health*, 2020, 6(2): 1-2.
20. Venta A, Bick J, Bechelli J., COVID-19 threatens maternal mental health and infant development: possible paths from stress and isolation to adverse outcomes and a call for research and practice, *Child Psychiatry & Human Development*, 2021, 3(2): 1-5.
21. Abdoli A, Falahi S, Kenarkoohi A S, Mir H, Jahromi MAM., The COVID-19 pandemic, psychological stress during pregnancy and risk of neurodevelopmental disorders in offspring: a neglected consequence, *J Psychosom Obstet Gynaecol*, 2020, 12(1): 1-13.
22. Zhu H, Wang L, Fang C., Clinical analysis of 10 neonates born to mothers with 2019-nCoV pneumonia, *Transl Pediatr*, 2020, 9(1): 51-60.
23. Chen H, Guo J, Wang C., Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records, *Lancet*, 2020, 3 (10): 809-815.
24. Chen. D, Yang H, Cao Y ea., Expert consensus for managing pregnant women and neonates born to mothers with suspected or confirmed novel coronavirus (COVID-19) infection, *Int J Gynaecol Obstet*, 2020, 9(2): 130-6.
25. Wyckoff A., AAP Issues Guidance on Infants Born to Mothers with Suspected or Confirmed COVID-19, *American Academy of Pediatrics*, 2020, 2(9): 1-13.
26. Pietrasanta C, Pugni L, Ronchi A ea., Management of the mother-infant dyad with suspected or confirmed SARS-CoV-2 infection in a highly epidemic context, *Neonatal Perinatal Med*, 2020, 12(3): 307- 311.
27. Ronchi A, Pietrasanta C, Zavattoni M, Saruggia M, Schena F, Sinelli, Pugni L., Evaluation of rooming-in practice for neonates born to mothers with severe acute respiratory syndrome

- coronavirus 2 infection in Italy, *JAMA pediatrics*, 2021, 1 (3): 260-266.
28. Wang Y, Chen L, Wu T, Shi H, Jiang H, Qiao J., Impact of Covid-19 in pregnancy on mother's psychological status and infant's neurobehavioral development: a longitudinal cohort study in China, *BMC medicine*, 2020, 8(1): 1-10.
 29. Mayopoulos G, Dishy G, Nandru R, Chan S, Hanley L, Dekel S., COVID-19 is associated with traumatic childbirth and subsequent mother-infant bonding problems, *Journal of Affective Disorders*, 2021, 8(1): 122-125.
 30. Oskovi Kaplan Z, Buyuk G, Ozgu-Erdinc A, Keskin H, Ozbas A, Tekin O., The effect of COVID-19 pandemic and social restrictions on depression rates and maternal attachment in immediate postpartum women: a preliminary study, *Psychiatric Quarterly*, 2020, 2 (1): 1-8.
 31. Ostacoli L, Cosma S, Bevilacqua F, Berchiolla P, Bovetti M, Carosso A, Benedetto C., Psychosocial factors associated with postpartum psychological distress during the Covid-19 pandemic: a cross-sectional study, *BMC pregnancy and childbirth*, 2020, 2 (1): 1-8.
 32. Vazquez A, Dib S, Rougeaux E, Wells J, Fewtrell M., The impact of the Covid-19 lockdown on the experiences and feeding practices of new mothers in the UK: Preliminary data from the COVID-19 New Mum Study, *Appetite*, 2021, 5(6): 985-997.
 33. Peng S, Zhang Y, Liu H, Huang X, Noble D., A multi-center survey on the postpartum mental health of mothers and attachment to their neonates during COVID-19 in Hubei Province of China, *Annals of Translational Medicine*, 2021, 9(5): 1-10.
 34. Fernandes D, Canavarro M, Moreira H., Postpartum during COVID-19 pandemic: Portuguese mothers' mental health, mindful parenting, and mother-infant bonding, *Journal of Clinical Psychology*, 2021, 6(1): 14-26.
 35. Flacking R, Thomson G, Axelin A, Ahlqvist S, Moran V, Ewald U, Dykes F., Separation Closeness Experiences in the Neonatal Environment: Closeness and separation in neonatal intensive care, *Acta Paediatr*, 2013, 10 (10): 1032-1037.
 36. Cès A, Falissard B, Glangeaud-Freudenthal N, Sutter-Dallay A, Gressier F., Pregnancy in women with psychotic disorders: risk factors associated with mother-baby separation, *Archives of women's mental health*, 2018, 2 (6): 699-706.
 37. Holdren S, Fair C., A qualitative cross-cultural analysis of NICU care culture and infant feeding in Finland and the US, *BMC pregnancy and childbirth*, 2019, 9(1): 1-12.
 38. Chan S, Ein-Dor T, Mayopoulos P, Mesa M, Sunda R, McCarthy B, Dekel S., Risk factors for developing posttraumatic stress disorder following childbirth, *Psychiatry Research*, 2020, 2(9): 980-988.
 39. WHO S., Frequently asked questions: Breastfeeding and COVID-19 for health care workers, *Journal of Human Lactation*, 2020, 6(3): 392-396.
 40. Yang L, Lehtonen L., Optimising mother-baby contact and infant feeding in a pandemic, *Rapid analytic review*, 2020, 7(2): 114-128.
 41. Narayan A., Guidance for healthcare professionals on coronavirus (COVID-19), infection in pregnancy, 2019, 5(3): 47-63.
 42. Tomori C, Gribble K, Palmquist A, Ververs M, Gross M., When separation is not the answer: Breastfeeding mothers and infants affected by COVID-19, *Maternal & Child Nutrition*, 2020, 6(4): 13-33.
 43. Ge N H, Zhichun Z., Validity and Reliability of the Chinese Version of the Maternal Postnatal Attachment Scale, *Chinese Journal of Clinical Psychology*, 2018, 2(6): 918-921.
 44. Stuebe A., Should infants be separated from mothers with COVID-19? First, do no harm, *Breastfeeding Medicine*, 2020, 5(5): 351-359.
 45. Durankuş F, & Aksu E., Effects of the COVID-19 pandemic on anxiety and depressive symptoms in pregnant women: a preliminary study, *The Journal of Maternal-Fetal & Neonatal Medicine*, 2020, 1 (3): 1-7.
 46. Saccone G, Aiello F, Venturella R, De Angelis MC, Locci M, et al., Psychological impact of coronavirus disease 2019 in pregnant women, *Am J Obstet Gynecol*, 2020, 3(2): 293-299.
 47. Wu Y, Zhang C, Liu H, Duan C, Li C, Fan J, Huang H., Perinatal depressive and anxiety symptoms of pregnant women during the coronavirus disease 2019 outbreak in China, *American journal of obstetrics and gynecology*, 2020, 3(2): 240-251.
 48. Zanardo V, Giliberti L, Vettore M, Severino L, Straface G., Psychological impact of COVID-19 quarantine measures in northeastern Italy on mothers in the immediate postpartum period, *Int J Gynaecol Obstet*, 2020, 10(2): 184-188.