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Pregnancy during the COVID-19 pandemic: impact on pregnant women

SUMMARY OF THE THESIS

**PhD Supervisor:
PROF. UNIV. DR. PELTECU GHEORGHE**

**PhD Student:
CIGĂRAN RUXANDRA-GABRIELA**

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Universitatea de Medicină și Farmacie „Carol Davila” din București
*Strada Dionisie Lupu nr. 37 București, Sector 2, 020021 România, Cod fiscal: 4192910Cont:
RO57TREZ70220F330500XXXX, Banca: TREZORERIE sect. 2
+40.21 318.0719; +40.21 318.0721; +40.21 318.0722
www.umfcd.ro*

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Introduction

The COVID-19 pandemic, declared by the World Health Organization (WHO) in March 2020, triggered a global crisis with profound consequences for the economy, healthcare systems, and quality of life (1–4). In Romania, the first confirmed case was reported on 26 February 2020 (5). Controlling the spread of SARS-CoV-2 required the implementation of exceptional public health measures, including the isolation of suspected cases, contact tracing, systematic collection of epidemiological data and the adaptation of diagnostic and therapeutic procedures. Vulnerable populations necessitated additional restrictions on mobility and social interaction (6,7). In Romania, measures included movement restrictions, quarantine, closure of educational institutions, mandatory face mask use and physical distancing policies, reorganization of the healthcare system (3,4,6,8–12). Regarding obstetric care, prenatal services were reduced to the minimum necessary and supplemented by telemedicine, while access to maternity wards, including partner presence during childbirth, was restricted (13).

At the onset of the COVID-19 pandemic, substantial uncertainties existed regarding transmission mechanisms, clinical manifestations, the risk of complications, and available therapeutic options (4,14–16). SARS-CoV-2 infection is characterized by a wide spectrum of clinical presentations, ranging from asymptomatic forms to acute respiratory distress syndrome, with increased severity observed among individuals with underlying comorbidities (2,3). The virus can induce multisystem involvement, including multisystem inflammatory syndrome, and complications such as respiratory failure, acute kidney injury, septic shock, or cardiac arrest are associated with an unfavourable prognosis (17–19).

In the context of pregnancy, physiological and immunological changes increase susceptibility to severe forms of disease; however, at the beginning of the COVID-19 pandemic, data regarding clinical outcomes in pregnant women, transplacental transmission, or transmission through breast milk were limited (14,20–24). Several risk factors for severe disease during pregnancy have been identified, including advanced maternal age, obesity, and comorbidities such as gestational diabetes and arterial hypertension (25–29). Although some studies suggested that pregnancy does not increase the risk of SARS-CoV-2 infection or disease severity compared with non-pregnant women, severe COVID-19 in pregnancy has been associated with obstetric complications, including preterm birth, preeclampsia, cesarean delivery and perinatal mortality (30–32). Vertical transmission, although rare, may

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result in clinical manifestations ranging from mild disease to severe, potentially fatal outcomes in the neonate (33).

The COVID-19 pandemic has intensified the emotional vulnerability of pregnant women, with anxiety primarily driven by fear of infection and concerns regarding potential consequences for both the mother and the fetus (34). A social context characterized by uncertainty, public panic, and misinformation further exacerbated stress levels, disproportionately affecting vulnerable populations such as pregnant and breastfeeding women (23,24,35). Pregnancy itself represents a period of increased psychological vulnerability, and existing literature indicates that maternal stress may negatively influence pregnancy outcomes, the postpartum period, and child development (36–40).

During COVID-19 pandemic, the prevalence of anxiety and depressive disorders among pregnant women increased significantly, exceeding levels observed in the general population (34). Although COVID-19 vaccination represented a crucial tool for reducing morbidity and mortality, vaccination decisions among pregnant women were frequently accompanied by additional anxiety, driven by initially limited evidence regarding vaccine safety and efficacy during pregnancy and breastfeeding (41,42).

My aim was to investigate the emotional and behavioural changes observed among pregnant and breastfeeding women during the COVID-19 pandemic, as well as the factors associated with increased levels of stress, anxiety and uncertainty. The study highlights the specific vulnerabilities of this population group in the context of a public health crisis and delineates directions for targeted psychological support and intervention.

The research comprises four cross-sectional studies, each based on a questionnaire developed by a multidisciplinary team of obstetricians and a psychiatrist.

This study makes an original contribution to the national literature by providing empirical data on the relationship between sociodemographic factors, risk perception, access to healthcare services, and maternal psychological well-being. In addition, it examines the psychological support needs of pregnant women during the pandemic period, thereby offering a foundation for the development of tailored interventions in public health emergency contexts.

The significant impact of the pandemic on both physical and mental health at the population level - further amplified among pregnant and breastfeeding women - underscores the importance of a rigorous assessment of psychological consequences and of the measures required to protect maternal mental health and optimize perinatal care in emergency situations.

GENERAL SECTION

1. SARS-CoV-2, COVID-19 disease, COVID-19 pandemic

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the causative agent of severe acute respiratory syndrome, initially emerged in Wuhan Province, China, and subsequently evolved into a global public health emergency (43). SARS-CoV-2, which is considered more pathogenic compared with SARS-CoV and MERS-CoV, is responsible for coronavirus disease 2019 (COVID-19) (1).

Although infection may be asymptomatic in some cases, the majority of patients develop mild to moderate respiratory symptoms, including cough, fever, headache, myalgia, and gastrointestinal disturbances such as diarrhea, nausea, or vomiting (44–46). The respiratory system is most frequently affected; however, SARS-CoV-2 may also involve other organs, either through direct viral injury or as a consequence of the host immune response (19). Dyspnea resulting from hypoxemia is the most common symptom associated with severe forms of the disease (45,47). Following the onset of dyspnea, respiratory failure frequently develops in patients with severe COVID-19, who typically meet the diagnostic criteria for acute respiratory distress syndrome (ARDS) (48). ARDS represents a form of lung injury characterized by inflammation and loss of aerated lung tissue. In addition, severe COVID-19 may lead to extrapulmonary involvement, including gastrointestinal manifestations and acute injury to the heart, kidneys, and liver, as well as arrhythmias, rhabdomyolysis, coagulopathy and shock (19,49).

To reduce the risk of COVID-19 transmission, the Centers for Disease Control and Prevention (CDC) issued a series of recommendations, including avoidance of close contact with infected individuals, isolation of persons exhibiting symptoms of illness, frequent disinfection of households and commonly used items, regular hand hygiene, and the use of face masks in public settings (9).

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2. Pregnancy and the Risks of Viral Infections: Pre-existing Knowledge Prior to the COVID-19 Pandemic

In the context of viral infections during pregnancy, it is essential to consider both maternal effects and the impact on pregnancy outcomes and fetal health. Clinical manifestations may range from mild illness to life-threatening complications for the pregnant woman (50). Regarding to pregnancy outcomes, effects may be absent or, in severe cases, may include spontaneous miscarriage, preterm birth, or fetal infection, which may or may not be associated with congenital syndromes (50,51). However, the effects of infectious diseases on the fetus may sometimes be unknown and difficult to predict, and the diagnosis of fetal or neonatal infection can be challenging (52).

Influenza is considered one of the leading causes of morbidity and mortality related to febrile respiratory illnesses worldwide (53,54). During the 2009 pandemic, infection with influenza A (H1N1) virus during pregnancy was associated with an increased risk of hospitalization, intensive care unit admission, and mortality (55). Pregnant women who received delayed treatment or had additional risk factors were at a higher risk of developing severe disease. Regarding pregnancy outcomes in the context of viral infection, an increased incidence of preterm birth and emergency cesarean delivery has been reported (55). For these reasons, influenza vaccination is recommended for pregnant women during the influenza season (32). Risk factors associated with severe influenza-related complications among pregnant women include maternal obesity, asthma, anemia, multiparity, arterial hypertension, diabetes, multiple gestation, Black or other minority ethnicity, and smoking (53,56–61).

With respect to fetal involvement, the influenza virus does not appear to exert a direct effect on the fetus, as transplacental transmission is rare (50,53). Nevertheless, fever resulting from viral infection may be associated with an increased risk of adverse outcomes, such as neural tube defects (50). In addition, the presence of pneumonia and acute respiratory syndrome may contribute to impaired fetal development (53).

2.1. The Immunological Role of the Placenta in Fetal Protection

The maternal immune response to infection may reach the fetal circulation or may predispose the maternal organism to abnormal reactions to other pathogens, potentially

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leading to pregnancy complications such as spontaneous miscarriage, intrauterine growth restriction, or preterm birth (62,63). Viral infection of the placenta may increase susceptibility to secondary bacterial infections and promote the onset of preterm labor (62). It is essential to consider that during pregnancy the placenta also fulfils an immunological function, acting as a physical and immunological barrier that prevents the vertical transmission of infections from mother to fetus (64,65).

2.2. The Impact of Maternal Viral Infection on the Placenta and the Fetus

Numerous studies have demonstrated that severe maternal viral infections can have a significant impact on fetal development, being associated with preterm birth, low birth weight, congenital cardiac or neurological malformations, an increased predisposition to cardiovascular disease in adulthood, as well as neurological and behavioral disorders such as schizophrenia (66–76). In addition, evidence suggests that, beyond the adverse effects on prenatal growth, influenza virus infection may impair the development of the fetal immune system, thereby compromising postnatal immune responses to secondary infections (68).

3. The Effects of Stress During Pregnancy

Prenatal stress has been associated with both direct and indirect effects on fetal health, development, and long-term functioning (37,77). Indirectly, maternal stress may increase the risk of adverse birth outcomes - such as preterm birth or low birth weight - which, in turn, negatively influence subsequent child development (38,39,78). In addition, prenatal stress may contribute to the onset of perinatal depression in the mother, thereby affecting mother–infant interaction and the quality of postnatal care, factors that are essential for the infant’s psycho-emotional development (37,79). Beyond these indirect mechanisms, prenatal stress may also exert direct effects on fetal neurobiological development by influencing the hypothalamic–pituitary–adrenal (HPA) axis and the regulation of stress responses (37,40,80). Maternal anxiety during pregnancy has been correlated with emotional problems, attention-deficit/hyperactivity disorder (ADHD), difficulties in emotion regulation, and delays in cognitive development in offspring (37,79).

4. Pregnancy During the COVID-19 Pandemic

4.1. Specific Risks of SARS-CoV-2 Infection in Pregnant Women

Most pregnant women who tested positive for SARS-CoV-2 generally experienced mild to moderate symptoms of COVID-19 (65,81). In particular, risk factors such as race, nutritional status, maternal age, and pre-existing chronic conditions, including obesity, diabetes, arterial hypertension, cardiovascular disease and asthma, may exacerbate adverse COVID-19–related outcomes during pregnancy (65,81).

In cases of severe COVID-19, laboratory abnormalities suggestive of a “cytokine storm” syndrome have been identified, characterized by an excessive inflammatory response that is implicated in the development of severe and fatal forms of the disease (82). The cytokine storm plays a central role in the pathogenesis of severe COVID-19, being responsible for the initiation of an intense systemic inflammatory response that may lead to pneumonia, sepsis, and ultimately a potentially lethal inflammatory syndrome (83).

4.2. Specific Risks of SARS-CoV-2 Infection During Pregnancy for the Fetus and the Newborn

Large cohort studies indicate a clear association between COVID-19 during pregnancy and an increased rate of iatrogenic preterm births, often by caesarean delivery, a procedure frequently chosen to protect maternal and fetal health in the context of infection (65,84–86). In addition, the association between SARS-CoV-2 infection and preeclampsia has led to higher rates of caesarean delivery and neonatal intensive care unit admission, most likely as a consequence of complications related to prematurity (87).

Fever represents the most common clinical symptom among pregnant women with COVID-19. This raises a theoretical concern, as maternal fever during organogenesis in the first trimester could be associated with an increased risk of congenital anomalies, such as neural tube defects, or with spontaneous miscarriage. However, available studies have not demonstrated an increased incidence of these adverse outcomes (82).

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4.3. Vertical Transmission of SARS-CoV-2

Although cases of intrauterine transmission of SARS-CoV-2 have been reported, such events remain rare, likely due to the low levels of maternal viremia (88). Vertical transmission of SARS-CoV-2 appears to be more likely in cases of severe maternal COVID-19, particularly when pregnant women require critical care or experience fatal outcomes (33,89).

Transmission of SARS-CoV-2 through breast milk has been largely ruled out, as viral presence in breast milk has been detected infrequently and inconsistently; when identified, viral loads were very low and without clear evidence of replicative capacity (33). In contrast, breast milk contains specific antibodies, especially following maternal vaccination with mRNA-based vaccines, thereby potentially conferring passive immunity to the newborn (33).

4.4. Neonatal COVID-19

Neonatal SARS-CoV-2 infection is clinically apparent in approximately half of affected newborns, who generally present with mild symptoms, possibly due to the lower expression of angiotensin-converting enzyme 2 (ACE2) receptors in the pulmonary alveoli compared with adults (90). Although rare, critical cases of neonatal COVID-19 have also been reported, with severe clinical manifestations requiring admission to intensive care units (25,91). Neonatal COVID-19 predominantly presents with respiratory involvement but may also include neurological, cardiovascular, and gastrointestinal symptoms (92).

4.5. COVID-19 Vaccination During Pregnancy: Safety, Efficacy and Maternal–Fetal Impact

Available evidence strongly supports the safety and efficacy of COVID-19 vaccination during pregnancy (93–99). These findings should contribute to strengthening confidence in vaccination and support recommendations for immunizing pregnant women, with the aim of reducing maternal–fetal morbidity and protecting the newborn (93–99).

4.6. Mental Health of Pregnant Women During the Pandemic

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Both during previous epidemics and pandemics and throughout the COVID-19 pandemic, several major stressors have been identified as significant contributors to increased overall stress levels in the general population, with a substantial negative impact on psychological well-being and mental health (100,101). These stressors include home quarantine, mobility restrictions, social isolation, fear of infection, insufficient supplies, inadequate or unclear information, economic disruption, major changes in access to healthcare services, and stigmatization (100–104).

A comparative study between pregnant and non-pregnant women demonstrated that, as the pandemic progressed, pregnant women exhibited significantly greater increases in levels of depression and anxiety compared with non-pregnant women (105). A comparative analysis of depression, anxiety, and stress levels among pregnant women during the COVID-19 pandemic versus non-pandemic periods revealed a significantly higher prevalence of depressive symptoms during the pandemic (10.36% compared with 0.55%) (106). With respect to anxiety, no significant differences were observed between the two periods. Interestingly, stress symptoms were more prevalent prior to the pandemic than during the pandemic period (69.39% versus 60.45%) (106). In addition, a multinational study conducted across five European countries at the end of the first pandemic wave reported high levels of depressive symptoms and generalized anxiety among pregnant and breastfeeding women (107).

Approximately one in six pregnant or postpartum women reported clinically significant symptoms of depression or anxiety during the third wave of the COVID-19 pandemic. These findings highlight the need for continuous and systematic monitoring of mental health among pregnant and postpartum women, both during the pandemic and throughout the post-pandemic recovery period (108).

The majority of studies in the existing literature emphasize the importance of integrating psychological and emotional support into prenatal and postnatal care in order to help women cope with the stress generated by the COVID-19 pandemic (109–116).

5. Conclusions

These findings underscore the need to develop and implement effective support and intervention strategies aimed at protecting maternal mental health and optimizing perinatal care in crisis contexts (20,23,24,117).

ORIGINAL RESEARCH

6. Introduction

In the context of the pandemic, Part II (Original Research) integrates and analyzes data derived from four studies conducted among pregnant and breastfeeding women in Romania during the COVID-19 pandemic.

7. Aim of the Study

The primary aim of this research is to comprehensively examine the impact of the pandemic on pregnant and breastfeeding women, identify the psychological, emotional, and healthcare-related factors influencing maternal experiences, and propose targeted support and intervention strategies.

8. Research Hypothesis and Overall Objectives

The general research hypothesis is based on the premise that the COVID-19 pandemic has had a significant impact on the psychological and emotional health of pregnant and breastfeeding women, leading to increased levels of stress, anxiety, and depressive symptoms, influenced by individual, social, and contextual factors specific to the pandemic period.

The overall objectives of this dissertation are as follows:

- To evaluate the psychological and emotional impact of the COVID-19 pandemic and SARS-CoV-2 infection on pregnant and breastfeeding women.
- To identify factors associated with the intensification of negative psychological symptomatology (such as stress and anxiety), according to sociodemographic, medical, and contextual variables (including gestational age, socioeconomic status, obstetric history, social support and exposure to pandemic-related information).
- To determine the relationship between perceived risk of SARS-CoV-2 infection and the emotional well-being of pregnant and breastfeeding women.
- To analyze the effects of isolation, quarantine, and social restrictions on maternal mental health and on perceptions of access to healthcare services and psychological support.

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- To identify the psychological and educational support needs of pregnant and postpartum women during the pandemic period, with the aim of formulating intervention strategies to improve maternal–fetal care in public health crisis situations.

9. General methodology of the thesis

To achieve the proposed objectives, four cross-sectional studies were conducted, each based on a questionnaire specifically designed for data collection. The research instruments were available online, in the Romanian language, and were disseminated through social media platforms, particularly within pregnancy- and breastfeeding-related groups, as well as professional communities, throughout the pandemic period. The questionnaires were developed by a multidisciplinary team consisting of obstetricians and a psychiatrist, ensuring the clinical and psychological relevance of the content.

Study I. The Psychological Impact of the COVID-19 Pandemic on Pregnant Women

Study II. The Psychological Impact on Romanian Women Infected with SARS-CoV-2 during Pregnancy

Study III. The Experience of Breastfeeding Women During the Pandemic in Romania

Study IV. Breastfeeding Practices and Psychological Experiences of Romanian Mothers With SARS-CoV-2 Infection

10. STUDY I. The Psychological Impact of the COVID-19 Pandemic on Pregnant Women (118)

10.1. Introduction

This study was designed to explore the perceptions of pregnant women in Romania regarding both the COVID-19 pandemic and the associated restrictions, as well as their healthcare experiences during the pandemic. The findings are expected to contribute to strengthening support for this vulnerable population and to improving prenatal care services in public health crisis situations.

10.2. Research Hypothesis

- The COVID-19 pandemic is associated with increased levels of stress, anxiety, and depressive symptoms among pregnant women in Romania.
- Significant differences in psychological well-being are observed among pregnant women according to sociodemographic variables, including age, educational level, occupational status, and number of previous pregnancies.
- Higher perceived risk of SARS-CoV-2 infection and limited access to healthcare services are positively correlated with increased levels of stress and anxiety.
- Perceived social support exerts a protective effect on psychological well-being, being associated with lower levels of anxiety and depressive symptoms.
- Pregnant women who report major changes in daily life due to the pandemic (such as restrictions, social isolation, and concerns about fetal health) exhibit more pronounced emotional symptomatology.

10.3. Objectives

- To assess levels of stress, anxiety, and depressive symptoms among pregnant women in Romania during the COVID-19 pandemic.
- To analyze the relationship between sociodemographic factors (age, educational level, occupational status, and family situation) and the psychological well-being of pregnant women.

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- To determine the influence of pandemic-specific contextual factors (fear of infection, social restrictions, and access to healthcare services) on levels of stress and anxiety.
- To investigate pregnant women's perceptions of social and medical support during the pandemic and their relationship with emotional well-being.
- To identify the main sources of stress and concern related to pregnancy and childbirth in the context of the COVID-19 pandemic.

10.4. Materials and Methods

10.4.1. Design

The study employed a cross-sectional design, and a multidisciplinary team comprising obstetricians and a psychiatrist developed a 26-item questionnaire in Romanian for data collection. The questionnaire was completed anonymously using Google Forms and disseminated via Facebook within pregnancy-related groups and professional communities between May and October 2020.

The questionnaire included basic demographic items, pregnancy-related questions, and items addressing changes in pregnant women's daily lives, their perceptions of the COVID-19 pandemic, as well as aspects related to the impact of the pandemic on prenatal care and the childbirth process in Romania.

10.4.2. Participants

A total of 559 pregnant women residing in Romania during the pandemic completed the questionnaire; however, only 557 responses were considered valid for analysis.

10.4.3. Data Analysis

The variables were collected in an Excel database, which was subsequently imported and converted into an SPSS database. Descriptive statistics and significance tests were performed. The Chi-square test was used to assess associations between variables, along with appropriate corrections when test assumptions were not met (likelihood ratio and Fisher's exact test). Effect size was determined using Phi and Cramér's V coefficients.

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10.4.4. Results și 10.5. Discussions

Research on SARS-CoV-2 infection, disease progression, and treatment is still ongoing, and much of the available information remains uncertain, suggesting that pregnancy may be particularly affected by the infection.

From an emotional perspective, negative feelings are even more understandable and to be expected, especially among pregnant women. Pregnancy is widely recognized as a vulnerable period for women, frequently associated with depression and anxiety, which may have a significant impact on pregnancy outcomes (36–38). All pandemic-related changes have contributed to increased feelings of loneliness, anxiety, and depression (119,120).

During the COVID-19 pandemic, pregnant women experienced notable lifestyle changes as a result of restrictive measures and the deterioration of social life, concerns regarding virus transmission, and perceived threats posed by SARS-CoV-2 infection to their own lives and to their unborn children, as well as fears of inadequate prenatal care due to changes in healthcare services and clinical protocols (13,20,23,24).

In our study, preventive restrictions implemented during the pandemic led to significant changes in the daily lives of pregnant women and were associated with negative emotional responses. The majority of participants reported isolating themselves from family and friends, discontinuing certain routine activities (such as the use of personal care services) or avoiding international travel. We observed that attention to self-image was correlated with the level of social exposure: the more socially connected women were, the more interested they were in maintaining personal care routines. Consequently, these women were more adversely affected by the restrictions imposed by authorities during the pandemic period.

Among our participants, women who stopped working reported panic and anxiety more frequently, whereas those who continued working under unchanged conditions more often experienced fear related to the possibility that their pregnancy might be affected by the virus. Previous studies have demonstrated that physical activity and social support reduce the risk of depression during pregnancy (121–123). Our findings are consistent with this evidence, confirming that pregnant women who remained active - either professionally or socially - during the pandemic experienced fewer negative emotions.

Another factor contributing to increased anxiety among pregnant women was the implementation of preventive measures in hospitals (4,5,14–16), as well as changes in prenatal care delivery (13,124,125). We believe that women avoided hospital settings or preferred private healthcare services due to restrictive policies, fear of virus exposure, and

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reduced waiting times associated with overcrowding in public hospitals during the pandemic.

According to our results, emotional aspects are closely interconnected, and pandemic-related changes in pregnant women's lives—such as alterations in daily activities (personal care, professional activity, social life), deterioration of partner relationships, and intensified concerns—were associated with lower levels of trust in the healthcare system. Moreover, subjective emotional states influenced perceptions of others' behavior; thus, negative life changes experienced by pregnant women were associated with a more negative perception of healthcare professionals. A perceived reduction in medical staff dedication may, in turn, further influence fear and trust in the healthcare system.

Multiple studies suggest that social isolation, fear of contracting the virus and its potential adverse effects on pregnancy outcomes, inadequate maternity care, and the widespread flow of misinformation are responsible for depressive and anxiety symptoms during the COVID-19 pandemic (13,20,23,24,35).

The most of pregnant women in our study continued to undergo prenatal investigations in accordance with specialist recommendations, while lack of prenatal care was rare and occurred more frequently among the subgroup of women who received prenatal care within public hospitals. The costs associated with pregnancy-related investigations - likely reflecting difficulties in accessing the public healthcare system- may negatively affect subsequent care when financial security is threatened. Another important factor in maintaining prenatal care is partner support; accordingly, it was observed that deterioration in the couple's relationship was associated with higher rates of discontinuation of prenatal care. The presence of fear among pregnant women was also associated with the abandonment of prenatal care, while lack of care may further exacerbate fears—issues that will be explored in greater detail in a subsequent study.

It is well established that mood disorders increase the risk of somatization and may also exacerbate pain perception (126). A plausible explanation for the perception among fearful women those medical consultations were denied due to failure to meet emergency criteria may be related to symptoms that were more strongly rooted in emotional distress than in an underlying organic medical condition. Although emergency criteria were not met in these cases, the suffering generated by psychological processes was real and potentially severe, requiring specialized intervention and psychological counseling.

In our study population, women experiencing negative emotional states reported a more negative perception of the absence of their partner during labor or hospitalization, as

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well as an overall negative perception of the healthcare system. At the same time, these women also expressed a negative perception of the mother - infant relationship during hospitalization.

This study highlights the increasing need for a multidisciplinary approach to the care of pregnant women - integrating obstetric and psychological support - given the consequences of the pandemic, and underscores the emerging responsibility of healthcare professionals to ensure psychological comfort for pregnant women who are unable to benefit from emotional support from their families.

10.6. Conclusions

We can conclude that the primary concerns of pregnant women are related to threats to their own lives and to their infants' health arising from the uncertain and largely unknown aspects of the pandemic. It is important to recognize that changes in maternity care have had a negative impact on pregnant women, who require increased support to cope with this period. In light of our findings, the negative emotions experienced by women as a result of restrictive measures - particularly those related to pregnancy care - should be taken into account when designing and implementing preventive measures during a pandemic.

Furthermore, psychological support is essential for improving the mental health of pregnant women during the pandemic, in order to prevent adverse pregnancy outcomes and long-term negative effects on both mothers and their children.

11. STUDY II. The Psychological Impact on Romanian Women Infected with SARS-CoV-2 during Pregnancy (127)

11.1. Introduction

The aim of this study is to assess the psychological impact of SARS-CoV-2 infection among pregnant women in Romania and to analyze their main concerns during this period. I consider it essential that measures adopted during public health crises aim to mitigate the negative emotional impact on pregnant women and to protect maternal mental health.

11.2. Research Hypothesis

- SARS-CoV-2 infection during pregnancy is associated with increased levels of stress, anxiety, and depressive symptoms among affected women.
- Pregnant women who experience moderate or severe forms of COVID-19 exhibit higher levels of anxiety and stress compared with those who have mild forms of the disease.
- Concerns related to fetal health and pregnancy progression represent the main emotional factors associated with the intensification of maternal stress.
- The perceived level of medical and social support is inversely correlated with anxiety and depression levels; pregnant women who feel adequately supported demonstrate greater emotional stability.
- Sociodemographic factors such as age, educational level, and occupational status differentially influence the psychological responses of pregnant women infected with SARS-CoV-2.

11.3. Objectives

- To evaluate the psychological impact of SARS-CoV-2 infection on pregnant women in Romania by assessing levels of stress, anxiety, and depressive symptoms.
- To identify the main concerns and fears of pregnant women diagnosed with COVID-19, related to their own health, fetal health, and pregnancy outcomes.
- To analyze the relationship between the severity of COVID-19 symptoms and the psychological well-being of infected pregnant women.

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- To determine the influence of sociodemographic and medical factors (age, educational level, trimester of pregnancy, hospitalization, and family support) on levels of stress and anxiety.
- To explore pregnant women's perceptions of the medical and social support received during illness and to examine its association with their emotional state.

11.4. Materials and Methods

11.4.1. Design

A 40-item questionnaire was developed for data collection (128–130). The questionnaire was designed in Romanian by a multidisciplinary team consisting of obstetricians and psychiatrists and was administered using Google Forms.

11.4.2. Participants

A total of 317 women who anonymously self-identified as having been diagnosed with SARS-CoV-2 infection during pregnancy between February 2021 and January 2023 were recruited online.

11.4.3. Data analysis

The data were processed and analyzed using Python 3, employing dedicated libraries for data processing, statistical analysis, and visualization. Categorical variables were summarized using frequencies and percentages, and associations between them were assessed using Fisher's exact test and the chi-square test. Correlations between numerical variables were analyzed using Pearson's correlation coefficient.

Data structure and participant stratification according to levels of psychological impairment were investigated using Principal Component Analysis (PCA), while factors independently associated with altered psychological status were identified through multinomial logistic regression. The discriminative ability of psychological impairment levels was evaluated using a support vector machine (SVM) algorithm, with validation performed on training and testing datasets.

11.4.4. Result și 11.5. Discussions

Information regarding pregnancy and SARS-CoV-2 infection remains unclear, and this uncertainty represents a significant source of stress for pregnant women. As observed in our study group, 66.88% of pregnant women reported that the information they received

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suggested potential risks to the fetus in the event of SARS-CoV-2 infection during pregnancy, while 23.66% believed that severe COVID-19 symptoms could occur during pregnancy. Fear related to pregnancy impairment in the context of SARS-CoV-2 infection (69.1%), panic and uncertainty generated by the unknown nature of COVID-19 (33.8%), low energy levels (33.4%), and concerns for personal safety and that of loved ones (31.2%) were frequently reported by participants.

Overall, 91% of respondents experienced mild to moderate forms of COVID-19, while 2% reported severe symptoms, and only 9% required hospitalization. A total of 4% of women considered that SARS-CoV-2 infection had a major impact on their physical health.

Analysis of the data indicates that difficulties related to post-infection recovery exerted a more pronounced psychological impact than the clinical manifestations of the infection itself. In addition, participants who required hospitalization reported high levels of stress, and for many of them hospitalization was associated with a substantial deterioration in mental health, perceived to a great or very great extent.

Many aspects of COVID-19 remain unclear and continue to evolve (131). Numerous healthcare services implemented new medical guidelines, and medical infrastructure underwent substantial modifications. In addition, the Romanian healthcare system experienced significant changes, with a notably restrictive approach to healthcare service provision in managing cases during the pandemic period (43,132). As a consequence of these unpredictable changes, many countries have reported a significant increase in the prevalence of maternal mental health problems (117).

However, within our study group, 75% of women did not experience difficulties in accessing healthcare services during SARS-CoV-2 infection, and 92% continued to undergo the recommended pregnancy follow-up investigations after recovery from COVID-19. In a limited number of cases, participants were denied access to medical services due to the absence of a recent negative PCR test, and these situations represented a significant source of stress. Women who reported difficulties in accessing healthcare services during the course of the illness rated their mental health status significantly more unfavorably. Furthermore, women who gave birth during active SARS-CoV-2 infection exhibited considerably higher levels of stress compared with those who delivered after recovery.

Among the respondents, the most frequently reported feeling during SARS-CoV-2 infection was fear for one's own life or the baby's life (51.4%), followed by anxiety (34.1%), vulnerability (30.6%), and helplessness (30%). Regarding the self-assessed psychological impact of SARS-CoV-2 infection during pregnancy, 17% of participants considered

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themselves to be affected to a great extent, while 8% reported being affected to a very great extent. Data analysis revealed a positive correlation between self-assessed mental health status and the perceived difficulty of the recovery process following illness. Both affective symptoms experienced during the pandemic and during the acute phase of infection, as well as perceived access to healthcare services, were strongly associated with the perception of impaired mental health.

Consequently, these findings highlight the need for the implementation of integrated public health interventions during crisis periods, aimed at supporting maternal mental health and mitigating adverse effects on children (101,133–135). It is considered essential for psychological and emotional support to become a routine component of care for pregnant women, in order to help them cope with the stress generated by the COVID-19 pandemic and SARS-CoV-2 infection (109–116). The promotion of effective coping strategies is regarded as having potential long-term protective effects on maternal mental and physical health (109).

11.6. Conclusions

Psychological support during pregnancy represents one of the potential solutions that should be considered to improve maternal mental health and to prevent adverse pregnancy outcomes as well as long-term negative effects on mothers and infants.

While the medical management of COVID-19 during pregnancy should be prioritized, emotional support must also be provided. Furthermore, negative feedback resulting from restrictions and changes in healthcare services should be taken into account by healthcare providers when establishing preventive measures during pandemic situations.

12.STUDY III. The Experience of Breastfeeding Women During the Pandemic in Romania (136)

12.1. Introduction

Gaining insight into the pandemic-related changes that affected breastfeeding mothers and intensified their concerns may contribute to strengthening the support provided to this vulnerable group and to guiding improvements in maternity care - both during public health crises and in the post-crisis period - with the aim of reducing adverse effects on maternal and infant health.

12.2. Research Hypothesis

- The COVID-19 pandemic had a negative impact on the breastfeeding experience by increasing stress levels and restricting access to support and counseling services.
- Women infected with SARS-CoV-2 experienced greater difficulties in maintaining breastfeeding and reported higher levels of stress compared with non-infected women.
- Perceived social and medical support plays a protective role in maternal psychological well-being and is associated with a higher likelihood of maintaining exclusive breastfeeding.
- Uncertainty regarding viral transmission through breastfeeding and isolation measures represented major sources of anxiety and insecurity among breastfeeding women.
- Mothers who received professional breastfeeding counseling reported a more positive breastfeeding experience and lower levels of stress compared with those who did not have access to such services.

12.3. Objectives

- To analyze the impact of the COVID-19 pandemic on the breastfeeding experience among women in Romania by identifying the difficulties, changes, and adaptations that emerged during this period.

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- To compare breastfeeding experiences between women who were infected with SARS-CoV-2 and those who were not, with regard to duration, exclusivity, and encountered challenges.
- To evaluate the influence of infection status, as well as social and medical support, on emotional well-being and overall perceptions of breastfeeding in the pandemic context.
- To identify the main sources of stress and concern related to breastfeeding and infant care during the pandemic (e.g., fear of viral transmission, limited access to healthcare services, lack of professional support).
- To explore the role of professional and informal support (familial, medical, and community-based) in maintaining breastfeeding and reducing maternal stress.

12.4. Materials and methods

12.4.1. Design

Data were collected using a 46-item online questionnaire addressed to women in Romania who breastfed during the COVID-19 pandemic. Participants were anonymously self-recruited through online dissemination of the questionnaire. The instrument, available in Romanian and administered via Google Forms, was developed by a multidisciplinary team consisting of obstetricians and psychiatrists.

12.4.2. Participants

A total of 261 women self-identified as eligible participants. They were divided into two groups based on self-reported COVID-19 infection status confirmed by a positive PCR or antigen test: the experimental group included women who were infected with SARS-CoV-2 during the breastfeeding period, while the control group comprised women who were not infected during the same timeframe.

12.4.3. Data analysis

Data analysis was performed using Python version 3.7. The Pandas library (137) was employed to organize the data into DataFrame structures, select variables and conduct descriptive statistical analyses. SciPy (138) was used to perform chi-square tests, while Matplotlib (139) was utilized for data visualization. A p-value of less than 0.05 was considered statistically significant, and throughout the study the level of statistical significance was coded as follows: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

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12.4.4. Results

To explore how maternal SARS-CoV-2 infection influenced the breastfeeding experience during the pandemic, we compared an experimental group of women diagnosed with COVID-19 while breastfeeding with a control group consisting of women who were not infected. This comparison enabled the identification of differences between challenges and coping strategies specifically associated with infection and those arising from broader pandemic-related disruptions, such as social isolation, limited access to healthcare services, and changes in daily routines. By including a control group, the study aimed to determine whether SARS-CoV-2 infection generated unique barriers to breastfeeding or whether the observed experiences reflected stressors common to all mothers during this period. This approach enhances the validity of the interpretation of the findings and provides relevant evidence for the development of tailored support strategies for both infected and uninfected women in the context of a public health crisis.

The study included 261 participants, of whom 125 were assigned to the SARS-CoV-2 group and 136 to the control group. Among all participants, 54% were aged between 26 and 35 years, and the majority had completed higher education (92.3%) (Table 12.1). Regarding breastfeeding practices during the pandemic, 81.6% of the total sample reported exclusive breastfeeding. Comparative analysis revealed that 86.4% of mothers in the SARS-CoV-2–infected group practiced exclusive breastfeeding, compared with 77.2% of mothers in the control group. Additionally, across the entire sample, most mothers breastfed for more than one year (Table 12.1).

	SARS-CoV-2	Control	All Respondents	Chi2 p-value
Number	125	136	261	
Age				
18-25	1 (0.8%)	2 (1.5%)	3 (1.1%)	0.9414
26-35	66 (52.8%)	75 (55.1%)	141 (54.0%)	0.7981
36-45	57 (45.6%)	59 (43.4%)	116 (44.4%)	0.8138
46-55	1 (0.8%)	0 (0.0%)	1 (0.4%)	0.9663
Education				
middle school	0 (0.0%)	1 (0.7%)	1 (0.4%)	0.9663
vocational school	1 (0.8%)	0 (0.0%)	1 (0.4%)	0.9663

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high school	5 (4.0%)	6 (4.4%)	11 (4.2%)	0.8863
post-secondary school	3 (2.4%)	4 (2.9%)	7 (2.7%)	0.9099
higher education	116 (92.8%)	125 (91.9%)	241 (92.3%)	0.9708
Living Environment				
Rural	12 (9.6%)	15 (11.0%)	27 (10.3%)	0.8608
Urban	113 (90.4%)	121 (89.0%)	234 (89.7%)	0.8608
breastfeed during the pandemic				
No	0 (0.0%)	7 (5.1%)	7 (2.7%)	0.0287*
Yes, breastfeed and formula	17 (13.6%)	24 (17.6%)	41 (15.7%)	0.467
Yes, exclusively breastfed	108 (86.4%)	105 (77.2%)	213 (81.6%)	0.0792
breastfeeding duration				
< 1 month	0 (0.0%)	5 (3.7%)	5 (1.9%)	0.0868
1-3 months	1 (0.8%)	8 (5.9%)	9 (3.4%)	0.0563
3-6 months	3 (2.4%)	9 (6.6%)	12 (4.6%)	0.1837
6-12 months	9 (7.2%)	17 (12.5%)	26 (10.0%)	0.2219
more than 1 year	112 (89.6%)	97 (71.3%)	209 (80.1%)	0.0004***

Table 12.1. Study population characteristics

* p < 0.05, *** p < 0.001

12.5. Discussions

This study explored the experiences of breastfeeding mothers in Romania during the COVID-19 pandemic. Women who gave birth and breastfed during the COVID-19 pandemic faced new challenges in addition to the usual stress associated with early motherhood. Overall, mothers reported both challenges and benefits related to breastfeeding during the pandemic period. The analysis focused on comparing women infected with SARS-CoV-2 and those who were not infected, as infection status represented a key variable with the potential to influence both breastfeeding practices and maternal psychological experiences. The existing literature similarly highlights that the pandemic generated both positive and negative effects among breastfeeding mothers, often leading to complex and ambivalent emotional responses (140–144). In particular, many women who breastfed during the pandemic experienced heightened feelings of guilt, anxiety and depression (140). These emotional challenges may represent risk factors for the continuation and success of breastfeeding (140–144).

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In our study, participants, particularly those who had been infected with SARS-CoV-2, reported an intense fear that their newborn or child might contract the virus, along with concerns regarding their own lives and the safety of their loved ones. Other emotional responses, such as panic driven by uncertainty surrounding the disease and a tendency toward compulsive behaviours including excessive washing, disinfection and self-isolation, were also reported and were more pronounced among infected women. Although the majority of participants did not perceive the pandemic as a whole as having a negative impact, direct experience with SARS-CoV-2 infection represented a significant source of stress for mothers.

An interesting finding of our study was that women who were infected with SARS-CoV-2 during the breastfeeding period reported a significantly longer duration of breastfeeding, as well as higher rates of exclusive breastfeeding, compared with non-infected mothers. Within the study sample, 80.1% of participants breastfed for more than one year, with an even higher proportion observed among women who contracted the infection. Although the mechanisms underlying this difference are not fully elucidated, several contextual factors specific to Romania may have contributed to this phenomenon. It is possible that infected mothers perceived breast milk as an essential source of immunological protection for their infants, thereby reinforcing their motivation to maintain breastfeeding for a longer period. In addition, infection-related isolation and limited access to feeding alternatives, such as infant formula or direct breastfeeding support, may have inadvertently favoured the continuation of breastfeeding.

According to the obtained results, the COVID-19 pandemic did not have a negative impact on the overall duration of breastfeeding. These observations highlight a potential adaptive behavioural response among mothers during the course of illness, which warrants further investigation. Future research, particularly qualitative studies focusing on maternal motivations and decision-making processes, could help clarify these underlying mechanisms and contribute to the development of public health strategies aimed at supporting breastfeeding during public health crises.

The findings revealed an apparent paradox: mothers infected with SARS-CoV-2 reported higher levels of psychological stress, yet also longer breastfeeding durations. One possible explanation is that, within the context of the pandemic, breastfeeding assumed a dual role, functioning both as a source of stress and as a coping mechanism. On the one hand, mothers faced heightened anxiety, limited support, and uncertainty regarding infection risk, factors that may have exacerbated psychological distress. On the other hand, breastfeeding

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may have been perceived as one of the few active means by which mothers could protect their infants during the crisis, thereby strengthening their motivation to continue despite the associated challenges.

These findings suggest that, in contexts characterized by heightened uncertainty, mothers' persistence in maintaining breastfeeding does not reflect an absence of stress, but rather a conscious decision to tolerate it for the perceived benefit of the infant. Breastfeeding may simultaneously function as a protective mechanism against psychological distress and as a proactive strategy for caregiving and child protection during crisis situations, such as the COVID-19 pandemic.

As observed, Romanian mothers faced a dual challenge during the COVID-19 pandemic: elevated levels of psychological stress alongside a sustained commitment to breastfeeding, particularly among those infected with SARS-CoV-2. These results further underscore the importance of strengthening support systems for mothers, designed to concurrently address lactation-related needs and maternal psychological well-being.

12.6. Conclusions and 12.7. Limitations

In conclusion, this research highlights not only the challenges but also the resilience and perseverance of mothers who breastfed during the COVID-19 pandemic, offering valuable insights for strengthening maternal and child health systems in Romania, as well as in other comparable international contexts. Further research is needed to assess the long-term impact of the pandemic on breastfeeding practices and infant health, and to identify effective interventions to support mothers during public health crises.

This study has several limitations, including its cross-sectional design, which does not allow for causal inferences, and recruitment via social media, which may affect sample representativeness and the generalizability of the findings. The lack of clearly defined criteria for certain subgroups and the use of ad hoc instruments to assess psychological variables may limit the interpretation and reliability of the results. In addition, the analyses were based primarily on bivariate comparisons, without controlling for potential confounding factors. Future studies using representative samples and validated assessment tools are required to confirm and extend these findings.

13.STUDY IV. Breastfeeding Practices and Psychological Experiences of Romanian Mothers With SARS-CoV-2 Infection

(145)

13.1. Introduction

This study aims to analyze the impact of maternal COVID-19 infection on breastfeeding experiences and on the continuation of breastfeeding. The ultimate objective is to generate evidence that supports the development of targeted support strategies to help mothers manage COVID-19–related stress and to promote positive breastfeeding outcomes.

13.2. Research Hypothesis

- Maternal SARS-CoV-2 infection, even in mild to moderate forms, is associated with increased emotional stress and with changes in subjective breastfeeding experiences.
- Mothers who experienced moderate forms of COVID-19 are expected to report higher levels of emotional stress compared with those who experienced mild disease.
- Disease severity (mild versus moderate) is differentially associated with breastfeeding duration and/or breastfeeding exclusivity.
- Mothers with moderate disease are more likely to report greater difficulties in accessing breastfeeding support compared with mothers who experienced mild forms of COVID-19.

13.3. Objectives

- To evaluate the impact of maternal SARS-CoV-2 infection on breastfeeding experiences, including perceived stress and breastfeeding continuity, among mothers in Romania with mild and moderate forms of COVID-19.
- To compare levels of emotional stress between women with mild COVID-19 infection and those with moderate infection during the breastfeeding period.
- To assess differences in breastfeeding duration and exclusivity according to disease severity.

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- To analyze maternal perceptions of difficulties encountered in accessing breastfeeding support as a function of disease severity.
- To identify factors perceived as the main sources of stress among mothers infected with SARS-CoV-2 during the breastfeeding period.

13.4. Materials and methods

13.4.1. Design

A cross-sectional study was conducted based on a 46-item questionnaire administered to women in Romania who were breastfeeding and had been infected with SARS-CoV-2. The instrument was developed and conceptually validated by a multidisciplinary team of obstetricians and psychiatrists and was administered in Romanian via Google Forms and distributed online. The questionnaire predominantly consisted of closed-ended items and addressed demographic characteristics, breastfeeding practices, experiences related to SARS-CoV-2 infection during breastfeeding, perceptions of the COVID-19 pandemic, as well as emotional and psychological variables.

13.4.2. Participants

A total of 120 women who self-identified as having breastfed while infected with SARS-CoV-2 were recruited. Women with mild and moderate forms of COVID-19 were compared in order to explore whether disease severity influenced maternal experiences, breastfeeding practices, and psychological well-being.

13.4.3. Results

The study included 120 participants, of whom 62 were assigned to the group with mild SARS-CoV-2 infection and 58 to the group with moderate infection. Among all participants, 54.2% were aged between 26 and 35 years, while 44.2% were between 36 and 45 years at the time of questionnaire completion. The majority of participants had higher education (93.3%) (Table 13.1). Regarding breastfeeding practices during the pandemic, 85.8% of participants reported exclusive breastfeeding. Group comparisons revealed minimal differences, with a slightly higher prevalence among women with moderate COVID-19 compared to those with mild disease (87.9% vs. 83.9%). Additionally, across the entire sample, most mothers (89.2%) reported breastfeeding for a duration longer than one year (Table 13.1).

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	Mild SARS- CoV-2	Moderate SARS- CoV-2	All Respondents	Chi² p- value
Number	62	58	120	
Age				
18-25	1 (1.6%)	0 (0.0%)	1 (0.8%)	0.9733
26-35	29 (46.8%)	36 (62.1%)	65 (54.2%)	0.1344
36-45	31 (50.0%)	22 (37.9%)	53 (44.2%)	0.2516
46-55	1 (1.6%)	0 (0.0%)	1 (0.8%)	0.9733
Education				
high school	3 (4.8%)	2 (3.4%)	5 (4.2%)	0.9393
vocational school	0 (0.0%)	1 (1.7%)	1 (0.8%)	0.9733
post-secondary school	0 (0.0%)	2 (3.4%)	2 (1.7%)	0.4466
higher education	59 (95.2%)	53 (91.4%)	112 (93.3%)	0.6428
Living Environment				
Rural	5 (8.1%)	7 (12.1%)	12 (10.0%)	0.6699
Urban	57 (91.9%)	51 (87.9%)	108 (90.0%)	0.6699
breastfeed during the pandemic				
breastfeed and formula	10 (16.1%)	7 (12.1%)	17 (14.2%)	0.7073
exclusively breastfed	52 (83.9%)	51 (87.9%)	103 (85.8%)	0.7073
breastfeeding duration				
1-3 months	0 (0.0%)	1 (1.7%)	1 (0.8%)	0.9733
3-6 months	2 (3.2%)	1 (1.7%)	3 (2.5%)	0.9533
6-12 months	6 (9.7%)	3 (5.2%)	9 (7.5%)	0.5555
more than 1 year	54 (87.1%)	53 (91.4%)	107 (89.2%)	0.6452

Table 13.1. Study population characteristics

13.5. Discussions and conclusions and 13.6. Limitations

This study aimed to examine the experiences of women in Romania who breastfed during SARS-CoV-2 infection. The exclusive comparison of mild and moderate cases was justified by the need to analyze breastfeeding practices and maternal psychological experiences in situations in which direct mother–infant contact was maintained. The

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inclusion of severe or critical cases would have introduced a significant source of methodological confounding, as hospitalization and mother–infant separation are factors that interfere with breastfeeding independently of maternal intention. By restricting the analysis to mild and moderate forms of disease, the study allowed for a more accurate assessment of differences in maternal perceptions and behaviours attributable to disease severity rather than to external clinical constraints.

Understanding both the positive and negative effects of maternal SARS-CoV-2 infection is essential for the development of appropriate interventions and support strategies for breastfeeding women. A balanced perspective enables healthcare providers to deliver tailored counseling and guidance that address both lactation-related needs and maternal psychological well-being.

In our study, more than half of the participants reported a strong fear regarding the possibility of transmitting the infection to their infant, with slightly higher proportions among women with mild forms of the disease, although this difference did not reach statistical significance. These concerns frequently extended beyond the infant, encompassing worries about their own health and the well-being of other family members. One possible interpretation is that, in cases of moderate disease, mothers may have developed a greater degree of resignation or acceptance regarding the potential risk of infant infection.

The high level of uncertainty during the pandemic frequently contributed to panic and emotional distress. Some mothers reported behavioural changes, including excessive handwashing, frequent use of disinfectants and strict self-isolation. Overall, women with moderate SARS-CoV-2 infection reported a more pronounced emotional burden compared with those with mild disease. Although differences in most negative emotional symptoms did not reach statistical significance, the higher proportions observed among women with moderate disease suggest a potential association between disease severity and psychological distress. Notably, feelings of hopelessness were significantly more frequent among women with moderate infection, indicating an increased vulnerability to mental health impairment. While for many participants the infection was not perceived as directly disrupting breastfeeding practices, the psychological burden associated with COVID-19 remained substantial.

The significantly higher proportion of women with moderate SARS-CoV-2 infection who reported substantial physical impairment reflects the expected clinical impact of more severe disease. The observed tendency toward a greater negative impact on mental health in

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this group, although not statistically significant, suggests that disease severity may also influence psychological well-being. Despite these challenges, breastfeeding itself was not substantially affected. Most women were able to continue breastfeeding their infants, and many maintained exclusive breastfeeding for more than one year.

The widespread adoption of additional hygiene measures indicates maternal awareness of transmission risks and an active effort to mitigate them while continuing breastfeeding. Notably, nearly all participants refrained from isolating themselves from their infants, underscoring the prioritization of maternal–infant proximity and bonding over strict separation measures. Overall, the findings suggest that although SARS-CoV-2 infection constituted a considerable burden for mothers, their commitment to breastfeeding remained strong.

The most of participants (70.0%) reported that SARS-CoV-2 infection did not compromise the breastfeeding process, with only a minority indicating some degree of negative impact. Similarly, very few women (5.8%) perceived a significant impairment of the mother–infant bond. These findings suggest that, despite the challenges posed by maternal illness, breastfeeding practices and the mother–child relationship were largely preserved. The absence of significant differences at the group level further indicates that infection severity did not substantially alter maternal perceptions of breastfeeding or the mother–infant bond.

Interestingly, women who experienced a moderate form of COVID-19 during breastfeeding more frequently described the breastfeeding experience as positive compared with those who had mild forms of the disease, although the difference approached but did not reach statistical significance. A similar trend was observed with respect to overall satisfaction with breastfeeding. This finding may suggest that, despite the physical and psychological burden associated with moderate disease, some women perceived breastfeeding as an important source of comfort and resilience throughout the course of the infection.

The observed difference in perceived family support, although not statistically significant, may suggest that women with moderate forms of the disease more frequently limited direct contact with family members, either voluntarily or following medical recommendations, in an effort to reduce the risk of transmitting the infection to their close relatives. In this context, family support may have been perceived as less accessible or less physically feasible, even when family members were willing to provide assistance.

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Moreover, moderate forms of the disease may involve a greater symptom burden, increased fatigue, a higher perceived level of isolation and a heightened need for precautionary measures, all of which can restrict family involvement in daily activities and infant care. Finally, anxiety related to the risk of viral transmission may have further contributed to avoiding requests for direct support, favouring a more autonomous management of the situation.

These findings underscore the importance of continuous support for maternal mental health, alongside the promotion of breastfeeding during infectious disease outbreaks in Romania. Future studies involving larger and more diverse populations are needed to confirm these results, explore long-term outcomes, and more robustly inform evidence-based policies and interventions.

The results indicate that breastfeeding women experienced both physical and emotional difficulties during SARS-CoV-2 infection, without breastfeeding practices or the mother–infant relationship being significantly affected. The majority of mothers continued breastfeeding, often adopting additional hygiene measures, reflecting the perception of breast milk as an essential protective factor for the infant. Disease severity had a limited influence on maternal decision-making, in line with international recommendations. This study, the first of its kind conducted in Romania, provides relevant data to support the development of breastfeeding-related policies and interventions in public health crisis contexts.

The study is limited by the use of a self-selected, non-representative sample, the assessment of psychological variables using non-validated items, and the reliance on bivariate statistical analyses without controlling for potential confounding factors. Future research employing representative samples, validated instruments, and multivariate analyses is required to confirm and extend these findings.

14. Conclusions. Novelty of the Research. Future Directions.

Limitations

The COVID-19 pandemic represented an unprecedented context that amplified the emotional and social vulnerabilities of pregnant women and breastfeeding mothers. The findings of this doctoral dissertation demonstrate that uncertainty, changes in access to healthcare services, epidemiological restrictions and fear of infection had a significant psychological impact on these populations, corroborating international evidence indicating an increased susceptibility to stress, anxiety, and depression during the perinatal period.

Furthermore, the research highlights those changes within the healthcare system during the pandemic, such as limited access to prenatal consultations, restrictions on birth companions, strict infection control measures and mother–infant separation in certain healthcare facilities, contributed to heightened emotional distress. These phenomena underscore the need to implement support measures adapted to public health crisis contexts, aimed at protecting maternal mental health and optimizing perinatal care. The results of the four studies allow for the formulation of specific yet interrelated conclusions.

The COVID-19 pandemic led to profound changes in the daily lives of pregnant women, affecting their routines, professional activities and social relationships, factors that were associated with increased concern and heightened emotional vulnerability. Alterations within the healthcare system, together with limited and evolving information regarding the risks of SARS-CoV-2 infection during pregnancy, generated negative emotional responses, reduced trust in medical services and, in some cases, discontinuation of prenatal care.

Pregnant women experienced uncertainty and fear for their own health and that of the fetus with particular intensity, a finding that underscores the need to integrate psychological support and effective communication into crisis management strategies. These results highlight the importance of addressing both medical and psychosocial dimensions of care in order to mitigate the emotional impact of public health emergencies on maternal well-being.

Among pregnant women infected with SARS-CoV-2, the psychological impact was substantial, particularly in those with severe disease or a difficult recovery. Hospitalization, childbirth during active infection, and difficulties in accessing healthcare services emerged as major stressors. Fear of adverse pregnancy outcomes and anxiety related to maternal and fetal survival were predominant, increasing the risk of depressive and anxiety symptoms. These findings clearly indicate the need for a multidisciplinary approach that includes

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psychological intervention, effective communication from healthcare professionals, and protocols specifically designed to reduce maternal anxiety.

The pandemic constituted a substantial emotional burden for breastfeeding mothers; paradoxically, however, it did not reduce breastfeeding duration. On the contrary, mothers infected with SARS-CoV-2 reported longer breastfeeding durations and higher rates of exclusive breastfeeding compared with non-infected mothers. This phenomenon suggests that breastfeeding functioned simultaneously as a source of stress and as an adaptive coping strategy, being perceived both as a means of immunological protection for the infant and as a source of emotional support for the mother.

The study addressing the experiences of breastfeeding mothers during the pandemic makes a significant contribution to the national literature by documenting how Romanian mothers maintained essential caregiving practices despite limited access to professional support, thereby highlighting maternal resilience and the need to strengthen breastfeeding support infrastructures.

Women who breastfed during SARS-CoV-2 infection experienced both physical and emotional challenges, which were more pronounced in cases of moderate disease severity. Nevertheless, the majority continued breastfeeding and adopted additional measures to protect their infants, reflecting strong maternal motivation. Maternal infection did not significantly disrupt the mother–child relationship or breastfeeding practices, a finding that is consistent with international recommendations supporting the continuation of breastfeeding during COVID-19 infection. These results highlight the importance of coherent clinical protocols, avoidance of unnecessary mother–infant separation, and transparent communication from healthcare professionals.

Overall, this research highlights the complex impact of the COVID-19 pandemic on emotional health, pregnancy experiences, and breastfeeding practices in Romania. Pregnant women and breastfeeding mothers demonstrated a remarkable capacity for adaptation, maintaining essential caregiving practices under restrictive conditions. Nevertheless, their emotional vulnerability and the difficulties encountered in accessing appropriate services underscore the need for integrated strategies in crisis situations, including: strengthening psychological support during the perinatal period; implementing coherent policies that avoid mother–infant separation; developing and improving access to breastfeeding counseling services, including online support; ensuring clear, evidence-based communication between healthcare professionals and patients; establishing preparedness programs for public health emergencies.

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Future research, particularly qualitative studies and investigations involving representative samples, is essential to further elucidate these findings and to inform the development of sustainable interventions aimed at protecting maternal and infant health during periods of crisis.

This dissertation makes significant original contributions to the understanding of the impact of the COVID-19 pandemic on maternal health in Romania through an integrated investigation of the experiences of pregnant women and breastfeeding mothers across different stages of the perinatal period. The novelty of the research derives from several key aspects:

- The first coherent set of studies in Romania to simultaneously examine the psychological impact of the pandemic on pregnant women, the experience of pregnancy in the context of maternal SARS-CoV-2 infection, and breastfeeding practices during illness. This multidimensional approach provides a comprehensive and unique perspective on how the pandemic affected motherhood.
- The first large-scale national analysis of breastfeeding during maternal SARS-CoV-2 infection, documenting differences in maternal behaviors between infected and non-infected women, as well as between mild and moderate forms of the disease. This represents a novel contribution to the international literature, as data from Romania had previously been unavailable.
- Identification of the relationship between COVID-19 disease severity and maternal emotional responses, both during pregnancy and the breastfeeding period. For the first time in Romania, the studies demonstrate that moderate forms of the disease are associated with significantly higher levels of psychological stress, yet not with breastfeeding discontinuation—an innovative and paradoxical finding.
- Description of the impact of healthcare system reorganization on access to prenatal care, childbirth services, and breastfeeding support. The dissertation identifies concrete ways in which epidemiological measures influenced women's perceptions of the healthcare system and their care-seeking behaviours.
- Highlighting breastfeeding as a compensatory and adaptive mechanism during the pandemic. The results show that, despite elevated stress levels, infected

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mothers reported longer breastfeeding durations, suggesting an increased maternal motivation to protect the infant—an observation that is both novel and highly relevant to public health.

- Addressing a major gap in the Eastern European literature, where data on maternal and infant health during the pandemic are limited. This research provides essential contextual evidence to inform health policies aimed at managing future public health crises.

Through these contributions, the dissertation provides an integrated and innovative perspective on how the COVID-19 pandemic affected the physical, emotional, and behavioural health of pregnant women and breastfeeding mothers, offering relevant insights for improving perinatal care and enhancing the preparedness of healthcare systems for emergency situations.

The research has several limitations that should be considered when interpreting the results. First, participant recruitment was conducted through online self-selection, which may introduce selection bias, as the sample may not fully reflect the general population of pregnant and breastfeeding women in Romania. Second, the cross-sectional design of the study allows for the identification of associations between variables but does not permit the establishment of causal relationships between the analyzed factors and the observed psychological outcomes. In addition, emotional and psychological variables were assessed using ad hoc questions specifically designed for this study, which may limit the comparability of the findings with other research based on standardized psychometric instruments. To strengthen the validity of the results, future research should employ standardized psychometric tools for the assessment of emotional and psychological variables, thereby ensuring greater validity and comparability of the data.

Despite these limitations, the study provides relevant and timely information regarding the impact of the COVID-19 pandemic on maternal mental health, contributing to a deeper understanding of the psychosocial effects of the pandemic context on pregnant and breastfeeding women.

15. Personal Contributions

This doctoral dissertation makes significant personal contributions to understanding the impact of the COVID-19 pandemic on maternal health in Romania through the design, development, and implementation of original studies investigating the experiences of pregnant and breastfeeding women. The main personal contributions are outlined below:

1. **Research Design Development:** I developed the overall structure of the research program, including the definition of objectives, research hypotheses, and methodologies for the four cross-sectional studies, specifically adapted to the pandemic context in Romania.
2. **Development of Data Collection Instruments:** I was directly involved in the development of the questionnaires used across the four studies, in collaboration with a multidisciplinary team. My contributions included item formulation, contextual validation, and adaptation of the instruments for online distribution.
3. **Coordination of the Data Collection Process:** I managed the dissemination of the research instruments through social media platforms, professional groups, and pregnancy- and breastfeeding-related communities, facilitating access to a large and diverse sample of participants.
4. **Data Analysis and Interpretation:** I conducted the descriptive and inferential statistical analyses, interpreted the results, and formulated conclusions for each of the four studies.
5. **Documentation of Maternal Experiences in Romania During the Pandemic:** I made an original contribution by collecting the first national-level data addressing: the psychological impact of the pandemic on pregnant women; pregnancy experiences in the context of maternal SARS-CoV-2 infection; the effects of maternal infection on breastfeeding practices; maternal behaviours and coping strategies among Romanian mothers during illness.
6. **Identification of Risk Factors for Perinatal Mental Health During the Pandemic:** Through integrated analysis, I identified factors associated with increased psychological stress during pregnancy and breastfeeding (including uncertainty, limited access to healthcare, fear of infection, and disease severity), providing a foundation for future interventions.

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7. Proposal of Applied Directions for Perinatal Care in Crisis Situations: Based on the study findings, I formulated practical recommendations aimed at: increasing awareness of perinatal mental health needs and promoting initiatives to improve access to support and resources; integrating psychological support into prenatal care; standardizing medical communication in emergency situations; avoiding mother–infant separation; expanding breastfeeding counseling services, including online support; enhancing healthcare system preparedness for future public health crises.
8. Integration of Findings into a Comprehensive Model of Maternal Experience During the Pandemic: A major personal contribution consists of synthesizing the findings from the four studies into an integrated framework that highlights the relationships among psychological vulnerability, healthcare system changes, and maternal behaviours during the COVID-19 pandemic.

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ANNEXES

The papers developed by the doctoral student as part of their doctoral research will be presented in the form of copies in the "Annexes" section.