

Predictors Of Obstetric Outcomes Among Pregnant Women With COVID-19 In Jordan, Pregnancy Complications, Associated Socio-Demographic Characteristics, And Medical Conditions

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Abstract

Background: COVID-19 infection during pregnancy has raised global concerns due to its potential adverse impact on maternal and neonatal outcomes. However, region-specific data, particularly from Jordan, remain limited. **Aim:** This study aimed to investigate the association between previous COVID-19 infection during pregnancy and adverse pregnancy outcomes among women in Jordan. **Methods:** A descriptive cross-sectional study was conducted using a web-based questionnaire targeting women with laboratory-confirmed COVID-19 infection during pregnancy. A total of 509 responses were analyzed. The survey collected data on sociodemographic characteristics, medical and obstetric history, COVID-19-related symptoms, and pregnancy outcomes, including miscarriage, placental abruption, placenta previa, and preterm delivery. **Results:** Among the respondents, 14.5% (n=74) reported at least one pregnancy complication. Of these, 52.7% experienced placental abruption, 20.3% had spontaneous miscarriage, and 10.8% had preterm delivery. Multivariate logistic regression analysis identified high parity, low monthly income, and the presence of chronic diseases as significant predictors of adverse pregnancy outcomes. Women with 1–3 children and those with more than three children were 2.13 (95% CI: 1.06–4.27, p=0.034) and 2.73 (95% CI: 1.45–5.16, p=0.002) times more likely, respectively, to experience complications compared to nulliparous women. Similarly, women with chronic illnesses had increased odds of complications (OR = 2.39; 95% CI: 1.24–4.62, p=0.01). Low family income (<700 USD/month) was also significantly associated with adverse outcomes (p<0.001). **Conclusion:** COVID-19 infection during pregnancy may lead to adverse maternal outcomes such as placental abruption, miscarriage, and preterm birth, particularly in women with high parity, low income, and preexisting chronic conditions. These findings underscore the need for targeted preventive and clinical strategies to support vulnerable pregnant populations during public health crises.

Keywords: miscarriage, abortion, placental abruption, preterm birth, stillbirth, maternal and child health.

1. Introduction

Coronavirus disease 2019 (COVID-19), caused by the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), first emerged in late 2019 and rapidly progressed into a global pandemic, placing unprecedented strain on public health systems worldwide [1, 2].

Over the past two years, a growing number of pregnant women have been infected with COVID-19 and required hospitalization, raising serious concerns regarding both maternal and neonatal outcomes [3].

Although SARS-CoV-2 is not the first virus to trigger a pandemic, it is distinguished by its high basic reproduction number (R₀), rapid global spread, and significant mortality rate, making it one of the most impactful pandemics in modern history [4, 5, 6].

Physiological and immunological changes during pregnancy may increase susceptibility to severe respiratory infections, including pneumonia [7, 8]. While pregnant women are not necessarily at higher risk of contracting

SARS-CoV-2 compared to non-pregnant women of similar age [9], those who develop symptoms are more likely to experience severe illness requiring intensive care unit (ICU) admission and mechanical ventilation.

Emerging evidence—though sometimes inconsistent—suggests that COVID-19 during pregnancy may be associated with adverse maternal outcomes such as preeclampsia, preterm birth, increased cesarean delivery rates, miscarriage, maternal mortality, acute respiratory distress syndrome (ARDS), pneumonia, ICU admission, sepsis, thrombocytopenia, venous thromboembolism, myocarditis, and cardiomyopathy [10, 11].

In addition, some studies have reported adverse fetal outcomes, including fetal growth restriction (FGR), stillbirth, and increased neonatal morbidity and mortality [12]. However, other studies suggest a more limited impact, indicating an increased risk of preterm birth without significant effects on fetal growth or stillbirth rates [13]. Given these conflicting findings, this study aims to examine the association between prior maternal COVID-19 infection during pregnancy and adverse pregnancy outcomes in Jordan.

1.1 Study methodology and research instrument

To ensure the development of a valid and reliable research instrument, the questionnaire utilized in this study was carefully designed based on an extensive review of the existing literature. Several items were adapted and modified from previously validated Pregnancy Outcome Questionnaires to align with the objectives and contextual framework of the current study [14, 15]. This approach was intended to enhance content validity by incorporating well-established measures grounded in prior empirical research.

The questionnaire was developed using the Google Forms platform, providing a practical and accessible tool for data collection. To further improve its clarity and relevance, the instrument underwent expert evaluation by two specialists in women's health. Their feedback was carefully considered and incorporated to ensure the appropriateness of the questionnaire within the cultural and clinical context of the study population.

Subsequently, a pilot study was conducted on a sample of 10 participants to assess the clarity, acceptability, and suitability of the questionnaire items. Based on the pilot feedback, minor modifications were implemented, contributing to improved face validity and construct validity.

The final version of the questionnaire collected comprehensive data, including participants' sociodemographic characteristics, medical history, and gynecological and obstetric profiles, in addition to detailed information regarding confirmed COVID-19 infection during pregnancy. Furthermore, it captured data on a range of pregnancy outcomes, enabling the investigation of potential associations between COVID-19 exposure and adverse maternal and neonatal outcomes.

2. Materials and Methods

2.1 Study design and sample

A descriptive cross-sectional study was conducted in Jordan in 2021 to evaluate pregnancy outcomes among women with confirmed COVID-19 infection during pregnancy. Data were collected through a self-administered online survey targeting mothers who had tested positive for SARS-CoV-2 at any stage of their gestational period. Eligible participants were adult women with a confirmed diagnosis of COVID-19 during pregnancy who were willing to provide informed consent.

2.2 Data analysis

All statistical analyses were performed using IBM SPSS Statistics (IBM Corp., Armonk, NY, USA). Descriptive statistics, including frequencies and percentages, were used to summarize participants' demographic characteristics and clinical variables.

To assess associations between demographic factors and the implications of COVID-19 infection, Pearson's chi-square test was applied. Furthermore, binary logistic regression analysis was conducted to identify potential predictors of adverse birth outcomes among the study population.

The strength of associations was expressed as odds ratios (ORs) with corresponding 95% confidence intervals (CIs). A p-value of less than 0.05 was considered statistically significant for all analyses.

2.3 Ethical considerations

Ethical approval for this study was obtained from the Institutional Review Board (IRB) of King Abdullah Hospital (Approval No: 22/139/2021; Date: March 22, 2021). All ethical standards were strictly adhered to in order to ensure participants' privacy, confidentiality, and autonomy.

No personally identifiable information was collected, and all data were anonymized prior to analysis. Participation was entirely voluntary, and electronic informed consent was obtained from all participants before the commencement of the survey.

2.4 Characteristics of the study sample

A total of 509 completed responses were obtained from pregnant women with a history of COVID-19 infection during their current pregnancy. As presented in Table 1, the majority of participants (63%) were aged between 25 and 35 years. Regarding socioeconomic status, 60% reported a monthly income ranging from 700 to 1,000 USD.

Most participants (80%) held a university degree, while 64% were unemployed. In terms of obstetric history, approximately 40% of the women were nulliparous, whereas 35% had more than three children.

Only 13% of participants reported having controlled chronic conditions, including cardiovascular diseases, hypertension, diabetes, and respiratory disorders.

Table 1: Baseline Characteristics of the Study Sample (n=509)

	Characteristics		Frequency	Percent
Socio-demographic data	Age	Less than 25 years old	108	21.2
		25-35 years old	321	63.1
		More than 35 years	75	14.7
	Educational level	School level	100	19.7
		College/ or university level	409	80.4
	Monthly income (JD)	Less than 300	91	17.9
		301-500	111	21.8
		500 - 700	307	60.3
	Employment status	Yes	181	35.6
		No	328	64.4
Medical History – co morbidity	Chronic diseases	Yes	66	13.0
		No	443	87.0
Maternal History	Parity	Null-parity	203	39.9
		1-3 children	128	25.1
		More than 3 children	178	35.0
Characteristics of COVID-19 infection during pregnancy	Gestational age at the time of COVID-19 infection	The 1 st trimester	158	31.0
		The 2 nd trimester	152	29.9
		The 3 rd trimester	199	39.1
	The main symptoms of COVID-19 infection	No symptoms	224	44.0
		Pneumonia	8	1.6
		Throat sore	130	25.5
		Fever	50	9.8
		Chronic cough	23	4.5
		Breath difficulty	58	11.4
		Other	16	3.1
	Hospital stay of COVID-19 infection	Not hospitalized	435	85.5
		Staying 2 weeks and less	58	11.4

	Hospitalization to ICU due to COVID-19 infection	Staying more than 2 weeks	16	3.1
		No admission	498	97.8
		Less than 10 days	7	1.4
		10 days and more	4	0.8
	Need for medication of COVID-19 infection	No	421	82.7
		Yes	88	17.3
	Having pregnancy complications	No	435	85.5
		Yes	74	14.5

3. Results

The characteristics of COVID-19 infection among participants are presented in Table 1. Approximately one-third of the women reported contracting COVID-19 during each trimester of pregnancy, with 31.0%, 29.9%, and 39.1% infected during the first, second, and third trimesters, respectively.

Nearly half of the participants (44.0%) were asymptomatic, while the majority (85.5%) did not require hospitalization. Among symptomatic cases, the most commonly reported symptoms included throat soreness (25.5%), breathing difficulties (11.4%), fever (9.8%), cough (4.5%), and pneumonia (1.6%). Additionally, 17.3% of participants required medication to manage their symptoms.

Among those who were hospitalized (14.5%), approximately 11.4% had a hospital stay of two weeks or less, whereas 3.1% remained hospitalized for more than two weeks. Only 2.2% of the participants required admission to the intensive care unit (ICU).

Furthermore, as illustrated in Figure 1, out of the total 509 mothers with a history of COVID-19 infection, 74 (14.5%) experienced pregnancy complications. These complications included 39 cases of placental abruption, five cases of placenta previa, 15 miscarriages, eight preterm births, and seven stillbirths.

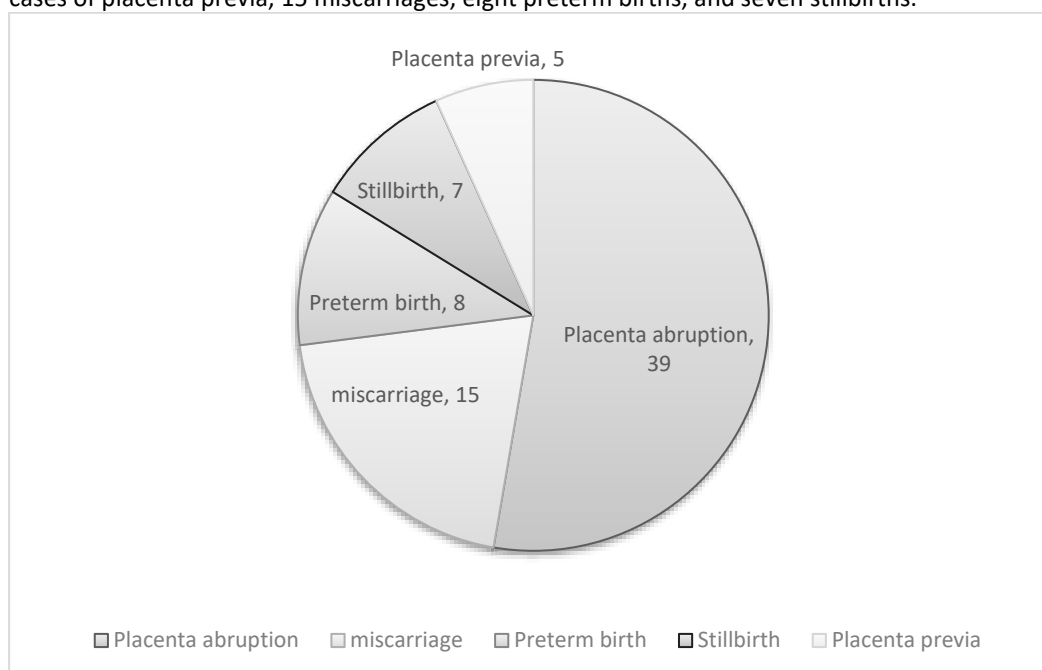


Figure 1: Pregnancy Complications Among Mothers with a History of COVID-19 Infection (n = 509) Source: Researchers

Table 2 presents a comparative analysis between women who did not experience pregnancy complications and those who did. The chi-square test revealed that the occurrence of pregnancy complications was significantly associated with several factors, including low monthly income ($p < 0.001$), unemployment ($p = 0.029$), high parity ($p = 0.021$), and the presence of chronic diseases ($p = 0.006$).

Table 2: Comparison between Women who Did not Experience any Pregnancy Complications and Those Who Faced Complications by Sociodemographic Characteristics and Medical Conditions

Characteristics		Without pregnancy complications N (%)	With pregnancy complications N (%)	p-value
Maternal age	Less than 25 years old	95 (18.7)	13 (2.6)	0.210
	25-35 years old	270 (53.0)	51 (10.0)	
	More than 35 years	70 (13.8)	10 (2.0)	
Educational level	Secondary school or less	81 (15.9)	19 (3.7)	0.158
	College or university degree	354 (69.5)	55 (10.8)	
Monthly income (JD)	Less than 300	70 (13.8)	21 (4.1)	<0.001*
	300-500	81 (15.9)	30 (5.9)	
	More than 500-700	284 (55.8)	23 (4.5)	
Employment status	Yes	163 (32.0)	18 (3.5)	0.029*
	No	272 (53.4)	56 (11.0)	
Chronic diseases	Yes	49 (9.6)	17 (3.3)	0.006*
	No	386 (75.8)	57 (11.2)	
Parity	Null-parity	184 (36.1)	19 (3.7)	0.021*
	1-3 children	107 (21.0)	21 (4.1)	
	More than 3 children	144 (28.3)	34 (6.7)	
Gestational age at the time of infection	The 1 st trimester	136 (26.7)	22 (4.3)	0.542
	The 2 nd trimester	133 (26.1)	19 (3.7)	
	The 3 rd trimester	166 (32.6)	33 (6.5)	
Hospital stay	No admission	371 (72.9)	64 (12.6)	0.215
	Admission for less than 14 days	48 (9.4)	10 (2.0)	
	Admission for 14 days and more	16 (3.1)	0 (0.0)	
ICU admission	No admission	424 (83.3)	74 (14.5)	0.384
	Less than 10 days	7 (1.4)	0 (0.0)	
	10 days and more	4 (0.8)	0 (0.0)	
Need for medication	No	364 (71.5)	57 (11.2)	0.162
	Yes	71 (13.9)	17 (3.3)	

* P-value <0.05 considered significant

Source: Researchers

3.1 Predictors of birth outcomes among COVID-19 infected women

Table 3 presents the results of the multivariable logistic regression analysis identifying independent predictors of pregnancy complications among women infected with COVID-19.

Parity emerged as a significant predictor of adverse pregnancy outcomes. Compared with nulliparous women, those with 1–3 children had more than twice the odds of experiencing pregnancy complications (adjusted odds

ratio [AOR] = 2.13; 95% CI: 1.06–4.27), while women with more than three children demonstrated an even higher likelihood (AOR = 2.73; 95% CI: 1.45–5.16).

Similarly, the presence of chronic diseases was independently associated with an increased risk of pregnancy complications, with affected women showing more than twofold higher odds compared to those without comorbidities (AOR = 2.39; 95% CI: 1.24–4.62).

Low socioeconomic status also played a significant role, as women with a monthly income of less than 700 USD were at increased risk of experiencing pregnancy complications compared to those with higher income levels.

Table 3: Logistic Regression Analysis of Predictors of Birth Outcomes

Variable		OR	95% CI	P value
Parity				
	Null-parity (reference)			0.007*
	1-3 children	2.13	1.06-4.27	0.034*
	More than 3 children	2.73	1.45-5.16	0.002*
Monthly income				
	Less than 300	3.56	1.77-7.16	<0.001*
	301-500	4.80	2.55-9.03	<0.001*
	More than 500 (reference)			<0.001*
Chronic diseases		2.39	1.24-4.62	0.010*

Source: Researchers

OR = odds ratio; CI = confidence interval

* P-value <0.05 considered significant

4. Discussion

This study aims to examine the impact of Coronavirus Disease 2019 (COVID-19) infection on pregnancy outcomes among women in Jordan, within the context of an increasing need for local scientific evidence that reflects the unique epidemiological and demographic characteristics of the Jordanian population. The importance of this study arises from the clear inconsistency in the existing literature regarding the effects of SARS-CoV-2 on maternal and neonatal health. While some studies have reported an association with increased pregnancy complications, preterm birth, and low birth weight, other studies have found no statistically significant differences between infected and non-infected women, indicating a lack of stability and consistency in the current scientific evidence. Moreover, most of the available literature is primarily based on case reports or small case series, which limits their statistical power and reduces the generalizability of their findings to broader populations. In addition, the scarcity of large-scale studies from Arab or regional contexts similar to Jordan makes it difficult to directly apply international findings without considering differences in healthcare systems, quality of maternal care, and socio-economic factors.

Accordingly, this study addresses an important research gap by providing more comprehensive and context-specific evidence. This contributes to a better scientific understanding of the relationship between COVID-19 infection and pregnancy outcomes, and supports healthcare policymakers in developing more accurate and context-appropriate maternal care guidelines for pregnant women in Jordan [16, 9]. In Jordan, although the occurrence of COVID-19 infection among pregnant women has been documented, there remains a significant paucity of robust empirical evidence addressing its specific impact on obstetric and neonatal outcomes. This gap is particularly critical given the evolving nature of evidence on SARS-CoV-2 and the variability of reported maternal and perinatal effects across different populations and healthcare settings. Existing international studies have produced inconsistent and, at times, contradictory findings, further emphasizing the need for context-specific research that accounts for regional differences in healthcare infrastructure, clinical management protocols, and population health characteristics. Therefore, this study contributes valuable empirical evidence by addressing this underexplored area within the Jordanian context. It enhances the current body of knowledge by providing locally generated data that can improve understanding of maternal and neonatal outcomes associated with COVID-19 infection, and by supporting evidence-based decision-making in maternal healthcare services in Jordan [17].

The findings demonstrate that SARS-CoV-2 infection may occur across all trimesters of pregnancy, although previous studies have reported a predominance of infections in the third trimester (84–100%) [4, 18, 19, 20].

Consistent with prior evidence, third-trimester infection has been associated with an increased risk of adverse outcomes, including preterm birth, cesarean delivery, and stillbirth [21].

In the present cohort, the most commonly reported symptoms were sore throat, dyspnea, fever, and cough. These findings are consistent with earlier studies identifying fever and cough as the predominant clinical manifestations among pregnant women with COVID-19 [22, 9, 23, 24]. Notably, 44% of participants were asymptomatic and diagnosed through laboratory testing alone, highlighting the importance of routine screening during pregnancy.

The incidence of pneumonia in this study was relatively low (1.6%), falling within the reported global range of up to 14% [25, 26]. Similarly, the rates of preterm birth (1.6%) and stillbirth (1.4%) were lower than those reported in previous studies (4–7%) [16, 20]. This discrepancy may be explained by differences in study populations, as earlier research often focused on hospitalized or severely ill patients. Conversely, the rate of spontaneous miscarriage (2.9%) was slightly higher than previously reported estimates (1.3–2.3%) [27, 4, 25]. While some studies suggest an increased risk of pregnancy loss and preterm birth associated with COVID-19 [28], others report no significant difference compared with uninfected populations, indicating generally favorable outcomes among infected pregnant women [20, 29, 30].

Approximately 15% of women required hospitalization, and 2.2% were admitted to intensive care units (ICU), findings that are consistent with existing literature [25]. Importantly, multivariable analysis identified chronic diseases, low socioeconomic status, and high parity as significant predictors of adverse pregnancy outcomes. Women with chronic conditions had nearly twice the risk of complications, consistent with findings reported by [31]. Socioeconomic disadvantage also emerged as a key determinant, likely reflecting limited access to healthcare services and increased psychosocial stress, as previously reported in studies from Canada and Saudi Arabia [32, 33].

High parity was also associated with increased risk of adverse outcomes, although this association has not been consistently reported across the literature [29]. These findings highlight the importance of considering reproductive history and underlying health status when assessing risk among pregnant women infected with COVID-19.

Overall, this study provides important empirical evidence from the Jordanian context and contributes to the broader global understanding of the effects of COVID-19 during pregnancy. By generating locally relevant data, the study helps to address existing gaps in the literature and supports a more context-sensitive interpretation of maternal and neonatal outcomes associated with SARS-CoV-2 infection. The findings highlight the importance of strengthening maternal healthcare services, particularly during public health emergencies, where healthcare systems are placed under significant strain. They also emphasize the need for developing targeted clinical and public health interventions for high-risk pregnant women in order to reduce the likelihood of adverse obstetric and neonatal outcomes. Furthermore, the study underscores the critical importance of enhancing preparedness strategies and improving the responsiveness and resilience of healthcare systems. Such efforts are essential not only for mitigating the impact of current health crises but also for ensuring more effective protection of maternal and neonatal health in future pandemics or similar large-scale public health threats [34, 35, 36].

5. Limitations

One important limitation of this study is the inability to perform stratified analyses based on gestational age at the time of infection, symptom severity (symptomatic versus asymptomatic cases), or specific types of chronic conditions, due to insufficient sample sizes within subgroups. This limitation may have reduced the depth and precision of the observed associations.

Nevertheless, despite this constraint, the study provides valuable insights from a population that remains underrepresented in the existing literature and offers a useful foundation for future research exploring COVID-19 infection during pregnancy in greater detail.

6. Final Considerations

The findings of this study highlight the potential adverse maternal and perinatal outcomes associated with COVID-19 infection during pregnancy. SARS-CoV-2 infection may be considered a relevant risk factor for complications such as placental abruption, miscarriage, and preterm birth. This risk appears to be more pronounced among pregnant women with preexisting chronic conditions, high parity, and low socioeconomic status.

These associations emphasize the importance of implementing targeted preventive strategies to reduce the risk of infection among pregnant women, particularly those in vulnerable groups. Public health interventions should

include comprehensive prevention programs, prioritization of maternal vaccination, and improved access to equitable antenatal care services.

Furthermore, there is a need to develop specialized preparedness and care models that address the unique clinical and psychosocial needs of pregnant women during infectious disease outbreaks and public health emergencies. Strengthening such strategies may help mitigate the impact of current and future pandemics on maternal and neonatal health outcomes.

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Conflict of Interest

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