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| RESEARCH ARTICLE

Impact of COVID-19 Infection on Maternal Outcomes in Saudi Arabia: A Retrospective Case Control Study

Nojood Atyah Alharthi [1] ✉ and Nawal Abdulghani[2]

[1]*Regional Midwifery Coordinator in Nursing Administration in Taif Health Affairs, Taif, Saudi Arabia*
[2]*Faculty of Nursing, Umm Al-Qura University, Makkah, Saudi Arabia*

Corresponding Author: Nojood Atyah Alharthi, **E-mail**: Nojoood73@gmail.com

| ABSTRACT

Pregnant women infected with COVID-19 may experience increased maternal morbidity because of pregnancy-related physiological and immunological changes. Evidence from Saudi Arabia remains limited, particularly regarding maternal clinical outcomes among infected and non-infected pregnant women. The main aim of this study was to examine the association between COVID-19 infection during pregnancy and selected maternal outcomes among women who gave birth in Taif, Saudi Arabia. A quantitative retrospective case-control design was conducted at King Faisal Hospital in Taif, Saudi Arabia. The study involved 170 women (85 with confirmed COVID-19 and 85 women without COVID-19 infection). Data were extracted retrospectively from medical records using a structured maternal outcomes checklist adapted from Elsaddig & Khalil (2021). Descriptive statistics were used to summarize participants' characteristics, and chi-square or Fisher's exact tests were used to examine association between COVID-19 status and maternal outcomes. Statistical significance was set at P<.o5. COVID-19 infection was significantly associated with mode of delivery, headache, pain, intensive care unit admission, intubation , respiratory distress and discharge outcome. No statistically significant association were observed for excessive bleeding, postpartum hemorrhage, deep vein thrombosis, postpartum depression, infection, or length of hospitalization. COVID-19 infection during pregnancy was associated with several adverse maternal outcomes, particularly respiratory complications and increased clinical interventions. Early identification, close antenatal surveillance, and evidence-based management pathways are essential to reduce maternal morbidity among pregnant women with COVID-19.

| KEYWORDS

COVID-19; pregnancy; maternal outcomes, case-control study; Saudi Arabia; obstetric complications

| ARTICLE INFORMATION

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1. Introduction

The coronavirus infection (COVID-19) pandemic placed substantial pressures on maternity services worldwide and raised important concerns about maternal and perinatal safety. It is estimated that 219,287,476 instances of COVID-19 have been reported around the world, with 4,545,531 deaths as a result (WHO, 2021). In Saudi Arabia, more than 544,449 confirmed cases of COVID-19, including 8,545 fatalities, have been documented (WHO, 2021). Pregnant women are considered a clinically vulnerable group because pregnancy involves physiological, respiratory, cardiovascular and immunological adaptions that may increase susceptibility to respiratory infection and related complications (AlOmran et al., 2020; Center for Disease Control and Prevention [CDC], 2020).

Early evidence suggested that pregnant women with COVID-19 may be more likely than non-pregnant women to require hospitalization, intensive care admission, respiratory support, or urgent obstetrics intervention (Khalil et al., 2020). Although most

pregnant women experience mild or moderate symptoms, sever infection may be associated with respiratory distress, increased cesarean birth, preterm birth, and maternal deterioration (Di Mascio et al., 2020; Kasraeian et al., 2020).

In Saudi Arabia, studies have reported generally favorable maternal and neonatal outcomes among many infected pregnant women, while also identifying psychological distress and clinical complications in some groups (Al-Matary et al., 2021; Meraya et al., 2021). However, evidence remains limited regarding the direct association between COVID-19 infection and specific maternal outcomes in Saudi maternity settings. Local evidence is important because clinical pathways, service organization, population characteristics, and pandemic-related restrictions may differ across countries and healthcare systems.

Therefore, this study aimed to examine the association between COVID-19 infection during pregnancy and selected maternal outcomes among women who gave birth in Taif, Saudi Arabia. The findings may support maternity care providers and health service planners in developing targeted strategies for early detection, monitoring, and management of pregnant women with COVID-19.

2. Materials and Methods

2.1 Study design, setting, and population

A quantitative retrospective case-control design was utilized in this study. Women with confirmed COVID-19 infection during pregnancy were classified as cases, whereases women without COVID-19 infection during pregnancy were classified as controls.
The study was conducted at King Faisal Hospital in Taif, Saudi Arabia. The target population included women who gave birth during the study period and whose medical records included sufficient information about COVID-19 status and maternal outcomes.

2.2 Sample, Sampling, and Eligibility Criteria

The sample size was calculated using Epi Info software based on previous studies. The final sample included 170 women; 85 cases and 85 controls. Cases were women who gave birth and had confirmed COVID-19 infection during pregnancy. Controls were who gave birth during the same period and had no documented COVID-19 infection during pregnancy.

Women were excluded from both groups if they had documented chronic medical conditions or chronic mental health conditions that could confound maternal outcomes. Eligibility criteria were applied consistently to both group before data abstractions.

2.3 Instrument of the study

Maternal outcomes were assessed through retrospective review of medical records using a structured checklist adapted from Elsaddig & Khalil (2021). The checklist captured mode of delivery, excessive bleeding, postpartum hemorrhage, deep vein thrombosis, postpartum depression, infection, intensive care unit admission, intubation, maternal death, respiratory distress, discharge outcome, length of hospitalization, and gestational age at birth.

2.4 Data Collection

After ethical and administrative approvals were obtained, the researchers visited the selected hospital and identifies eligible medical records. Data were extracted retrospectively from March 2020 onward. A standardized abstraction protocol was used to ensure consistency. The data collection tool was piloted before that main data extraction to assess clarity and feasibility. No personal identifiers were collected, and all extracted data were handled anonymously.

2.5 Ethical and administrative consideration

Ethical approval was obtained from the Research and Studies Department at the Directorate of Health Affairs in Taif (Approval No. 648; December 7, 2021). Administrative approval was also obtained from the Ministry of Health. The study relied on retrospective medical record review and did no involved direct participant contact, the risk to participants was minimal. Data confidently and anonymity were maintained throughout the study.

2.6 Data analysis

Data were analyzed using Social Sciences (SPSS, IBM Version 24) in order to accomplish the purpose of the study through the process of data analysis. The category and numerical variables were used to handle the demographic data, which included things like age, gender, experience, and educational level, among other things. Data entry for demographic variables was done using numerical code for each demographic variable in the questionnaire. Inferential statistics such as independent sample *t*-tests and One-Way ANOVA were used to answer the research questions and to investigate the association between COVID-19 and maternal outcomes.
Significance level was set at P=<0.05 value, in which a result which is below p= <0.05, indicates significant correlation or association.

3. Results

A total of 170 women were participated in the study. The participants who are 30 – 39 years constitute 47.6% of the study sample, while those who are below 30 years old constitute 24.1% of the study sample. Regarding participants' marital status, the majority (98.8%) of participants are married, while 1.2% of them are divorced. Regarding the employment status of the study participants, the majority (95.9%) of them are unemployed, while 4.1% of them are employed. Moreover, 88.2% of the study participants live in cities, while 11.8% of them live in villages (Table 1).

Table 1: Sample distribution according to the participant's age, marital status, employment, and residence (n=170)

Variables	Number	Percentage (%)
Age groups		
<30 years	58	34.1
30 – 39 years	81	47.6
≥40 years	31	18.2
Marital status		
Married	168	98.8
Divorced	2	1.2
Employment		
Employed	7	4.1
Unemployed	163	95.9
Residence		
City	150	88.2
Village	20	11.8

In addition, more than half (60.6%) of participants had 1 – 3 pregnancies, 29.4% of them had 4 – 6 pregnancies, while one-tenth (10.0%) of them had more than 6 pregnancies. Regarding the number of deliveries, 68.8% of participants had 1 – 3 deliveries, 25.3% of them had 4 – 6 deliveries, and 5.9% had more than 6 deliveries. Moreover, 72.9% of participants never had abortions, 22.9% of participants had one abortion, while 4.1% of them had two or more abortions. Regarding the number of living children, 69.4% of participants have 1 – 3 children, 24.7% have 4 – 6 children, while 5.9% of them have more than 6 children (Table 2).

Table 2: Sample Distribution According to the Participants' Obstetric history (n=170)

Variables	Number	Percentage (%)
Number of pregnancies		
1 – 3 times	103	60.6
4 – 6 times	50	29.4
> 6 times	17	10.0
Number of deliveries		
1 – 3 times	117	68.8
4 – 6 times	43	25.3
> 6 times	10	5.9
Abortion		
Never	124	72.9
Once	39	22.9
Twice or more	7	4.1
Living children		
1 – 3 Children	118	69.4
4 – 6 Children	42	24.7
> 6 children	10	5.9

There is a significant association between participants' mode of delivery and COVID-19 occurrence (p<0.05). Post hoc test showed that those who do not have COVID-19 tend to deliver their babies by spontaneous vaginal birth more than those who have COVID-19, in which 91.8% of those who do not have COVID-19 have their delivery by spontaneous vaginal birth.

In addition, there is a significant association between participants' pain and COVID-19 occurrence (p<0.05). Those who have COVID-19 tend to have pain during pregnancy more than those who do not have COVID-19, with which 27.1% of those who have COVID-19 complain of pain more than those who do not have COVID-19. Furthermore, there is a significant association between participants' headaches and COVID-19 occurrence (p<0.05). Those who have COVID-19 tend to have headaches during pregnancy more than those who do not have COVID-19, with which 25.9% of those who have COVID-19 complain of headaches more than those who do not have COVID-19 (Table 3).

On the other hand, there is no significant association between excessive bleeding and COVID-19 occurrence (p>0.05). Moreover, there is no significant association between post-partum hemorrhage and COVID-19 occurrence (p>0.05). In addition, there is no significant association between deep vein thrombosis and COVID-19 occurrence (p>0.05). Furthermore, there is no significant association between postpartum depression and infection and COVID-19 occurrence (p>0.05).

Table 3: Association between COVID-19 and Maternal Outcomes (n=170)

		Case	Control	Chi-square	p-value
Mode of delivery	Spontaneous vaginal birth	41 (48.2)	78 (91.8)	43.026	0.000*
	Emergency cesarean section	16 (18.8)	7 (8.2)		
	Elective cesarean section	26 (30.6)	0 (0.0)		
	Scheduled cesarean section	2 (2.4)	0 (0.0)		
Excessive bleeding	Yes	6 (7.1)	5 (5.9)	0.097	0.500
	No	79 (92.9)	80 (94.1)		
PPH	Yes	4 (4.7)	5 (5.9)	0.117	0.732
	No	81 (95.3)	80 (94.1)		
DVT	Yes	4 (4.7)	2 (2.4)	0.691	0.406
	No	81 (95.3)	83 (97.6)		
Thrombosis	No	85 (100.0)	85 (100.0)	-	-
PPD	Yes	13 (15.3)	10 (11.8)	0.453	0.501
	No	72 (84.7)	75 (88.2)		
Headache	Yes	22 (25.9)	11 (12.9)	4.550	0.033*
	No	63 (74.1)	74 (87.10		
Pain	Yes	23 (27.1)	43 (50.6)	9.907	0.002*
	No	62 (72.9)	42 (49.4)		
Infection	Yes	1 (1.2)	1 (1.2)	0.000	1.000
	No	84 (98.8)	84 (98.8)		

Chi-Square Test, Fisher's Exact Test; *p < 0.05

Moreover, there is a significant association between intensive care admission and COVID-19 occurrence (p<0.05). Post hoc test showed that those who do not have COVID-19 tend to be admitted to intensive care more than those who do not have COVID-19, in which 4.7% of those who have COVID-19 have been admitted to intensive care. Moreover, there is a significant association between intubation and COVID-19 occurrence (p<0.05). Post hoc test showed that those who have COVID-19 tend to be intubated more than those who do not have COVID-19, in which 4.7% of those who have COVID-19 have been intubated (Table 4)

Table 4: Association between COVID-19 and complications during pregnancy and after birth (n=170)

Medical history		Case	Control	Chi-square	p-value
ICU admission	Yes	4 (4.7)	0 (0.00	4.096	0.043
	No	81 (95.3)	85.0 (100.0)		
Intubation	Yes	4 (4.7)	0 (0.00	4.096	0.043
	No	81 (95.3)	85.0 (100.0)		
Death	Yes	1 (1.2)	0 (0.0)	1.006	0.316
	No	84 (98.8)	85 ((100.0)		
Respiratory distress	Yes	23 (27.1)	1 (1.2)	23.482	0.000*
	No	62 (72.9)	84 (98.8)		

Fisher's Exact Test; *p < 0.05

There is a significant association between discharge outcome and COVID-19 occurrence (p<0.05). Post hoc test showed that those who have COVID-19 tend to be discharged from the hospital, with which 97.6% of those who have COVID-19 have been discharged from the hospital. Moreover, there is no significant association between the length of hospitalization and COVID-19 occurrence (Table 5).

Table 5: Association between COVID-19 and Discharge outcome (n=170)

Medical history		Case	Control	Chi-square	p-value
Discharge outcome	Discharge from hospital	83 (97.6)	85 (100.0)	23.482	0.000*
	Died	2 (2.4)	0 (0.0)		
Length of hospitalization	3 Days or less	39 (45.9)	47 (55.3)	3.376	0.185
	4-6 Days	26 (30.6)	27 (31.8)		
	>6 dyas	20 (23.5)	11 (12.9)		

Fisher's Exact Test ; *p < 0.05

4. Discussion

This retrospective case-control study examined the association between COVID-19 infection during pregnancy and maternal outcomes. The findings suggest the COVID-19 infection was associated with clinically important maternal outcomes, particularly mode of delivery, respiratory distress, ICU admission and intubation. These results are consistent with previous studies indicating that pregnant women with COVIS-19 may be at increased risk of respiratory complications and higher level of obstetrics intervention (Di Mascio et al., 2020; Khalil et al., 2020; Vouga et al., 2021).

The significant association between COVID-19 status and mode of delivery is an important finding. Spontaneous vaginal birth was more common among controls, whereas cesarean birth was more frequent among women infected with COVID-19. This pattern may reflect clinicians' concern about maternal respiratory status, fetal condition, infection control considerations, or the need for urgent delivery in clinically unstable cases. Similar patterns have been reported in earlier studies although cesarean birth should be guided be obstetric indications and maternal-fetal condition (Chen et al., 2020; Martinez-Perez et al., 2021).

Respiratory distress was substantially more frequent among infected women. This finding is clinically plausible because COVID-19 primarily affects the respiratory system, and pregnancy-related changes, including reduces functional residual capacity and increased oxygen demand, may worsen respiratory compromise. ICU admission and intubation were also observed only among cases, further emphasizing the importance of early recognition of clinical deterioration and timely escalation of care for pregnant women with suspected or confirmed infection.

Headache was significantly more common among women with COVID-19 and may represent a systemic manifestation of infection. Pain was also statistically significant; however, the extracted table shows a higher proportion of documented pain among controls than cases. This discrepancy should be interpreted cautiously and may reflect documentation patterns, differences in how pain was recorded or data entry issues. In addition, Vouga et al. (2021) found that women who had COVID-19 had a higher risk of having a baby with a headache as a maternal outcome than women who did not have COVID-19.

There was no significant association identified between COVID-19 infection and postpartum hemorrhage, excessive bleeding, deep vein thrombosis, postpartum depression, or infection. These findings may suggest that COVID-19 had a stronger relationship with acute respiratory and intervention-related outcomes than with selected postpartum complications in this sample. However, the retrospective design and relatively small number of events limit firm conclusions.

This research also corroborates the findings of Chen et al. (2020) and Zhang et al. (2020), who found that cesarean sections were performed in the vast majority of cases and that fetal distress was the key driving reason in such circumstances. On the other hand, there were no negative consequences associated with spontaneous vaginal births. According to the findings of Huang et al. (2020), fever and coughing that did not produce any sputum were two of the most common first symptoms. According to the findings of Zaigham and Andersson (2020), in total, 21 percent of pregnancies appeared at an earlier gestation, and all of these babies were born healthy and without any severe complications. The most recent findings are in line with this conclusion. According to Breslin et al. (2020), who presented their findings, mothers who had COVID-19 were hospitalized in the intensive care unit on two separate occasions.

It is possible that the most common complication of pregnancy during the COVID-19 course, maternal pneumonia, is to blame for the pain, headaches, and other COVID-19 side effects that were seen by moms in this investigation (Dileep et al., 2022). According to previous studies, pregnant women who had COVID-19 were more likely to be admitted to the hospital in the second or third trimester. This highlights the significance of keeping a strict social distance from other pregnant women, particularly in the third trimester, and engaging in the intensive practice in order to prevent infection at any stage of pregnancy (RCOG, 2021). In pregnant women, SARS-COV-2 infections should be diagnosed as quickly as feasible, and effective therapy should be administered as soon as possible to limit the risk of COVID-19 pregnancy-related complications.

The findings have implications for maternity services in Saudi Arabia. Pregnant women with COVID-19 require clear triage pathways, close monitoring of respiratory symptoms, multidisciplinary collaboration, and timely refreal to higher levels of care when deterioration is suspected. In addition, standardized documentation of maternal symptoms and outcomes in needed to improve the quality of future research and service evaluation.

5. Conclusion

Maternal outcomes which are significantly associated with COVID-19 occurrence during pregnancy involve pain, headache, mode delivery, ICU admission, intubation, respiratory distress and discharge outcome. The strongest clinical signals were related to respiratory compromise and escalation of care. These findings highlight the need for early diagnosis, continuous clinical monitoring and evidence-based management pathways for pregnant women with COVUD-19. Further prospective multicenter studies are recommended to confirm these findings and to examine the influence of disease severity, vaccination status, gestational age at infection, and comorbidities on maternal outcomes.

Even while COVID-19 has been associated with an increase in the number of mental health symptoms experienced by pregnant women, the presence of social support has been shown to have a protective impact. It is important for interventional programs to incorporate social support as well as cognitive therapies. The results of this study indicate that the mental health of pregnant women should be given top priority during this time of increased stress.

6. Limitations of the study

The study has several limitations. First, the retrospective design limited the ability to control for all potential confounding variables. Second, the study was conducted in a single hospital, which may limit generalizability to other regions of Saudi arabia. Third, some outcomes may have been underreported because the study relied on documentation in medical records. Fourth, important variables such as COVID-19 severity, vaccination status, variant type, body mass index, and timing of infection during pregnancy were not available. Finally, several outcomes has small percentages, therefore, findings should be interpreted cautiously and verified using the original statistical output.

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