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**RESEARCH ARTICLE**

## Impact of Covid-19 on Maternal Outcomes in Saudi Arabia: Case Control Study

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### ABSTRACT

Pregnant women are at an increased risk for severe illness from COVID-19 compared to non-pregnant women. It has been reported that a high proportion of women with confirmed COVID-19 infection had preterm birth and caesarean delivery. The main aim of this study was to investigate the effect of infection with COVID-19 on maternal outcomes. A quantitative retrospective case-control design was used in Al-Taif city in Saudi Arabia. The study involved 170 participants (85 cases and 85 controls). The maternal outcomes were obtained by reviewing patients' medical records. The maternal outcome checklist tool was adapted from the study of Elsaddig & Khalil (2021). Ethical considerations were strictly followed during the course of the study. Maternal outcomes which are significantly associated with COVID-19 occurrence during pregnancy involve pain, headache, mode delivery, ICU admission, intubation, and respiratory distress ( $P < 0.05$ ). Several maternal outcomes were revealed as a result of COVID-19. Designing effective interventional programs during pregnancy for the pregnant mother with COVID-19 is extremely necessary to manage signs and complications during pregnancy.

### KEYWORDS

Maternal, Covid-19, Outcomes

### ARTICLE INFORMATION

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### 1. Introduction

The new coronavirus infection (COVID-19) is still widespread over the entire planet. It does not matter where you go. 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). Because of the physiological changes that take place during pregnancy, there is a higher risk of COVID-19 infection among pregnant women compared to the risk among the general population (AlOmran et al., 2020).

When compared to women who are not pregnant, pregnant women have a higher risk of experiencing significant illness caused by COVID-19 (Center for Disease Control and Prevention [CDC], 2020). A significant proportion of the women who were found to be infected with COVID-19 either gave delivery too soon or had to have caesarean operations (Khalil et al., 2020). It was projected that pregnant women had a higher risk of being admitted to the intensive care unit when compared to women who were not pregnant. Furthermore, around 1.9 percent of the pregnant women's neonates tested positive for COVID-19 (Khalil et al., 2020).

There is a great deal of uncertainty about the possible risks that coronavirus outbreaks might provide to pregnant women (Alfaraj et al., 2019). Two recent meta-analyses found that a high number of pregnant women who were infected with COVID-19 and experienced poor pregnancy outcomes showed no signs of vertical transmission of the virus (Di Mascio et al., 2020; Kasraeian et al., 2020). Two studies were conducted in Saudi Arabia with the purpose of determining the effects of COVID-19 on the health of mothers and newborns. The primary concerns of the initial experiment were the effects of COVID-19 infection on the mothers and newborns of infected mothers. A second study was carried out with the purpose of gaining a deeper understanding of the emotional and psychological impact that COVID-19 has on mothers and pregnant women. In spite of the fact that Matary et al.

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(2021) discovered that the majority of pregnant women infected with COVID-19 suffered mild or moderate symptoms, they did not find any indication that COVID-19 infection may potentially be passed from mother to child during pregnancy.

During the pandemic outbreak in Saudi Arabia, Meraya and colleagues (2021) discovered that the majority of pregnant women with COVID-19 had moderate to high levels of psychological distress. Other significant psychological outcomes, such as insomnia and suicidal ideation, as well as others, were not investigated previously. Meraya et al. (2021). Therefore, the major purpose of this study is to investigate the impact of COVID-19 on the outcomes for both mothers and newborns.

## **2. Materials and Methods**

### **2.1 Study design, setting, and population**

A quantitative retrospective case-control technique was utilized. In this study, the mothers who tested positive for COVID-19 served as the cases, while the women who tested negative served as the controls. Although retrospective study designs produce reliable risk estimates, they are susceptible to bias due to the presence of confounding factors in the data.

This study was carried out at King Faisal hospital in the Taif region located in Saudi Arabia. The population of the current study consisted of two groups. One group involves mothers who had COVID-19 during pregnancy and gave birth. The other group involves mothers who did not have COVID-19 during pregnancy and gave birth.

### **2.2 Sample, Sampling, and Eligibility Criteria**

For quantitative design, Epi-info software was used to calculate sample size based on previous studies. The study consisted of 170 participants (85 cases and 85 controls). There were 85 cases who had COVID-19 during pregnancy and 85 controls who did not have COVID-19. For the cases group, the mothers who gave birth and had COVID-19 during pregnancy were included to participate in the current study. For the controls group, the mothers who gave birth and did not have COVID-19 during pregnancy were not included to participate in the current study. For the cases group, mothers who have other chronic conditions and those who have chronic mental health problems. For the controls group, mothers who had other chronic conditions and those who had chronic mental health problems were excluded.

### **2.3 Instrument of the study**

To measure maternal outcomes, a review of patients' files within the hospital was performed using the checklist to collect data. This checklist was prepared to measure maternal outcomes based on the study of Elsaddig & Khalil (2021). Related outcomes to be collected by the checklist involve: mode of delivery; complications after delivery; intensive care unit admission; intubation; maternal death; length of hospitalization; and gestational age at birth.

### **2.4 Data Collection**

The process of data collection includes: 1) Ethical approval was obtained from the Research and Studies Department at the Directorate of Health Affairs – Taif; 2) Conducting visits to the selected hospital, 3) Apply inclusion and exclusion criteria based on the proposed study, and 4) Conducting a pilot study to test validity and reliability of the tool. Assuring the participants' ethical considerations by anonymity was done. Data about mothers and infants were obtained from medical files retrospectively. Data were collected retrospectively from March 2020. An abstraction protocol was used to ensure a systematic way to collect the data; the checklist was done through an online link, and data was collected over a period of one month.

### **2.5 Ethical and administrative consideration**

The researcher carried out this experiment while adhering scrupulously to all of the relevant ethical norms. This research project was granted ethical clearance by the Research and Studies Department of the Directorate of Health Affairs in Taif (Number 648) on December 7, 2021. Also, administrative approval was obtained from the Ministry of Health. The study was anonymous; there was no personal risk from participating in this study. The questionnaire was kept with the researcher in a locked facility to preserve the data trail.

### **2.6 Data analysis**

The researcher decided to utilize the statistical program for the 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

In the present study, 170 mothers participated. 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 (%)
<b>Age groups</b>		
<30 years	58	34.1
30 – 39 years	81	47.6
≥40 years	31	18.2
<b>Marital status</b>		
Married	168	98.8
Divorced	2	1.2
<b>Employment</b>		
Employed	7	4.1
Unemployed	163	95.9
<b>Residence</b>		
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 (%)
<b>Number of pregnancies</b>		
1 – 3 times	103	60.6
4 – 6 times	50	29.4
> 6 times	17	10.0
<b>Number of deliveries</b>		
1 – 3 times	117	68.8
4 – 6 times	43	25.3
> 6 times	10	5.9
<b>Abortion</b>		
Never	124	72.9
Once	39	22.9
Twice or more	7	4.1
<b>Living children</b>		
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
<b>Mode of delivery</b>	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)		
<b>Excessive bleeding</b>	Yes	6 (7.1)	5 (5.9)	0.097	0.500
	No	79 (92.9)	80 (94.1)		
<b>PPH</b>	Yes	4 (4.7)	5 (5.9)	0.117	0.732
	No	81 (95.3)	80 (94.1)		
<b>DVT</b>	Yes	4 (4.7)	2 (2.4)	0.691	0.406
	No	81 (95.3)	83 (97.6)		
<b>Thrombosis</b>	No	85 (100.0)	85 (100.0)	-	-
<b>PPD</b>	Yes	13 (15.3)	10 (11.8)	0.453	0.501
	No	72 (84.7)	75 (88.2)		
<b>Headache</b>	Yes	22 (25.9)	11 (12.9)	4.550	0.033*
	No	63 (74.1)	74 (87.10)		
<b>Pain</b>	Yes	23 (27.1)	43 (50.6)	9.907	0.002*
	No	62 (72.9)	42 (49.4)		
<b>Infection</b>	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

The present study contributed significantly to the healthcare of mothers during COVID-19 in Saudi Arabia. It is clear that those who do not have COVID-19 tend to deliver their babies by spontaneous vaginal birth more than those who have COVID-19, with which 91.8% of those who do not have COVID-19 have their delivery by spontaneous vaginal birth. In addition, 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, 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.

On the other hand, postpartum depression, excessive bleeding, postpartum hemorrhage, deep vein thrombosis, and other postpartum conditions are not linked with the occurrence of COVID-19. In spite of the fact that Martinez-Perez et al. (2020) discovered that all patients who had vaginal births had positive outcomes, the data that we currently have do not support this result. In comparison, 13.5 percent of women who had cesarean births had catastrophic maternal outcomes, and 21.6 percent had clinical deterioration as a result of the surgery. These numbers are lower than those of vaginal births. 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.

According to Chen et al. (2020), Li et al. (2020), and Wang et al. (2020), the majority of the authors in prior studies did not mention any adverse events (Chen et al., 2020, for example).

This research also corroborates the findings of Chen et al. (2020) and Zhang et al. (2020), who discovered 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 the seven 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.

## **5. Conclusion**

Maternal outcomes which are significantly associated with COVID-19 occurrence during pregnancy involve pain, headache, mode delivery, ICU admission, intubation, and respiratory distress. Additional research is required in order to better assess or confirm the findings of this study, as well as create effective therapies to lessen the likelihood of negative outcomes occurring in pregnant women who have COVID-19. The management of symptoms and issues in pregnant women with COVID-19 involves the development of highly effective interventional techniques. This is required in order to control the symptoms and issues.

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 fact that the primary studies that are now accessible in the literature were not of sufficiently high quality with regard to their methodology is the fundamental limitation of this research evaluation. Multiple studies lacked necessary outcome data, and the possibility of biased, selective reporting could not be discounted. Our study does have a few redeeming qualities. The data were acquired through the patient files; however, there were certain data that could not be known from the patient files; as a result, the study did not contain all of the maternal outcomes.

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