

Article

Comparison of the pregnancy outcomes and health indicators of newborns before and after the pandemic of covid-19 in Iran

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Abstract

Background: COVID-19 originated from China and causes pneumonia and respiratory, digestive and many other symptoms. The risk of adverse pregnancy outcomes may increase in pregnant women infected with this virus.

Objectives: This study aimed to compare the pregnancy outcomes and health indicators of newborn born in two periods before (the first 6 months of 2019) and after (the first 6 months of 2020) the COVID-19.

Methods: In this cross-sectional study, 2303 newborns were studied. Of these, 1195 were born in the first 6 months of 2019 and 1108 were born in the first 6 months of 2020. The data collection tool was a checklist that was extracted from the integrated health system (SIB) of the Iranian Ministry of Health. The SPSS26 was used for data analysis.

Results: The newborns born in these two periods before and after COVID-19 pandemic had no statistically significant differences in terms of maternal age, gestational age, birth weight, height and head circumference at birth (P-Value>0.05). There was no statistically significant difference in terms of gender, stillbirth and twins or multiples variables in the two time periods before and after COVID19 (P-Value>0.05). Cesarean section rate after the COVID19 pandemic in the first 6 months of 2020 (60.8 %) was higher than before pandemic in the first 6 months of 2019 (56.7 %) (P-Value<0.05). In addition, the birth rate in rural areas after the COVID-19 pandemic was higher than before pandemic (P-Value=0.005).

Conclusion: Caesarean section rate after the COVID-19 pandemic has increased significantly compared to before



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Implications of this paper in nursing and midwifery preventive care:

- This study showed that COVID-19 can cause negative consequences during pregnancy for the mother and the fetus, therefore it is necessary to pay attention to these risk groups during viral epidemics such as Covid-19.

Introduction

Corona virus disease 2019 (COVID-19) is a pneumonic pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). This disease was first detected in December 2019 in the Wuhan city (China). The World Health Organization (WHO) declared COVID-19 as a public health emergency and a pandemic disease on March 11, 2020 [1,2]. Despite extensive and global research, the impact of SARS-CoV-2 on the developing fetus is still not fully understood. Some case reports suggest that vertical transmission is uncommon. However, there is evidence that infection of the placenta and fetus can occur [3,4].

Physiological changes during pregnancy have a significant effect on the body's immune system, respiratory system, cardiovascular function and coagulation, which may have positive or negative effects on the progression of the disease of COVID-19 [5]. Pregnant women are particularly vulnerable to respiratory pathogens and severe pneumonia due to physiological and immune changes, such as changes in T-lymphocyte immunity, increased oxygen consumption, decreased functional residual capacity, and decreased chest compliance [6-9]. In addition to the direct effects of the disease, indirect factors of the epidemic, including reduced access to reproductive health services, increased psychological stress, and increased economic

deprivation may affect maternal and fetal health [10]. Studies have shown that during the SARS epidemic, in addition to physical health consequences, pregnant women experienced high levels of anxiety and worry about being infected with the disease [11-13]. Empirical evidence shows that high prenatal stress may be associated with adverse birth outcomes such as stillbirth, abortion, premature birth, low birth weight, maternal death, hypoxia, disseminated intravascular coagulation, intrauterine fetal death, intrauterine growth restriction and high rates of cesarean section [3,13,14]. However, some studies have reported decrease in preterm births and low birth weight infants during the COVID-19 pandemic. Positive lifestyle effects during the COVID-19 restrictions by reducing exposure to common workplace stressors, air pollutants, increased family support, better avoidance of infections, improved sleep, nutrition and exercise are mentioned as the reasons for this reduction [15-17].

Therefore, considering the importance of maternal and newborn health as one of the important indicators of development in each country and the limited and contradictory studies conducted regarding the possible impact of the COVID-19 pandemic on maternal health and the anthropometric indicators of newborns, the current study was designed and implemented with the aim of comparing the pregnancy outcomes and health indicators of infants born in the first 6 months of 2020 (simultaneously with the COVID19 pandemic) with the first 6 months of 2019 before the COVID19 epidemic.

Methods

This cross-sectional study was designed to compare the pregnancy outcomes and health indicators of newborns born in the first 6 months of 2020 (simultaneously with the COVID-19 pandemic) with the first 6 months of 2019 before the COVID-19 pandemic in Semnan city of Iran. The study population was all mothers who gave birth in the first six months of 2019 and 2020 in Semnan city. A total of 2303 newborns were studied in these two time periods, of which 1195

in the first 6 months of 2019 and 1108 were born in the first 6 months of 2020. The study was conducted as a census and all newborns in these two time periods were included in the study.

In this study, a checklist was used to collect data. This checklist included the variables of maternal age, gestational age, type of delivery, birth weight, height, head circumference at birth, gender, stillbirth, abortion and multiple births. These data were extracted from the integrated health system (SIB) of the Iranian Ministry of Health. Due to the lack of complete access to the information of each newborn from this system, the information was collected in aggregate form. It should be mentioned that the Integrated Health System (SIB) was designed to provide health care services in the form of programs and projects for the transformation of the health system in Iran.

The relevant data were entered into the SPSS26 for analysis. In descriptive analyzes, mean and standard deviation were used for quantitative variables, and number and relative frequency were used for qualitative variables. Box plot was also used to show the qualitative variables in the two time periods. Then, independent sample t-test and chi-square test were used to compare quantitative and qualitative variables in these two time periods, respectively and P-Value <0.05 was considered as a significant level.

Results

Table 1 shows comparison of quantitative variables in the population under study in two periods before and after COVID-19. The mean ($\pm$ S.D) of mother's age, gestational age and birth weight in these two periods were 29.43 ($\pm$ 5.99) vs. 29.08 ($\pm$ 5.88) years, 37.10 ($\pm$ 3.15) vs. 37.03 ($\pm$ 3.00) weeks and 2891.27 ($\pm$ 771.40) vs. 2873.15 ($\pm$ 693.11) grams, respectively. As can be seen, the results of the independent sample t-test showed that the newborns born in these two periods before (the first 6 months of 2019) and after (the first 6 months of 2020) the COVID-19 pandemic had no statistically significant differences in terms of maternal age, gestational age, birth weight, height and head circumference at birth (P-Value>0.05).

Table 1: Comparison of quantitative variables in the population under study in two periods before and after COVID19

Variables	Period	Number	Mean	S.D*	S.E**	P-Value***
Mother's age (year)	2019	1195	29.43	5.99	0.21	0.253
	2020	1108	29.08	5.88	0.21	
Gestational age (week)	2019	1195	37.10	3.15	0.11	0.748
	2020	1108	37.05	3.00	0.11	
Birth weight (gr)	2019	1195	2891.27	771.40	25.85	0.618
	2020	1108	2873.15	693.11	25.47	
Height at birth (cm)	2019	1195	48.94	5.03	0.18	0.913
	2020	1108	48.91	4.93	0.18	
Head circumference at birth (cm)	2019	1195	33.90	2.82	0.10	0.352
	2020	1108	33.76	3.03	0.11	

*Standard Deviation

**Standard Error

***Independent sample t-test

Table 2 shows comparison of qualitative variables in the population under study in two periods before and after COVID-19. The number (%) of boys in in these two periods was 653 (54.6) and 505 (45.6), respectively. The number (%) of cesarean section in in these two periods was 677 (56.7) and 673 (60.8), respectively. As can be seen, the results of the chi-square test showed in these two periods before and after the COVID-19 pandemic had no statistically significant differences in terms of gender, stillbirth, birth

weight, gestational age and twins or multiples (P-Value>0.05). However, there was a statistically significant difference in terms of cesarean section rate, so that this rate after the COVID-19 pandemic in the first 6 months of 2020 was higher than before pandemic in the first 6 months of 2019 (P-Value<0.05). In addition, the birth rate in rural areas after the COVID-19 pandemic in the first 6 months of 2020 was higher than before pandemic in the first 6 months of 2019 (P-Value=0.005).

Table 2: Comparison of qualitative variables in the population under study in two periods before and after COVID19

Variable		2019 N (%)	2020 N (%)	P-value*
Baby's gender	Boy	653(54.6)	505(45.5)	0.915
	Girl	542(45.4)	603(54.5)	
Type of delivery	Cesarean section	677(56.7)	673(60.8)	0.047
	Vaginal delivery	518(43.3)	435(39.2)	
Stillbirth	Yes	7(0.6)	5(0.5)	0.654
	No	1188(99.4)	1103(99.5)	
Birth weight (gr)	<1000	11(0.9)	8(0.8)	0.590
	1000 - 1500	10(0.8)	10(0.9)	
	1500 -2500	96(8.3)	98(8.8)	
	≥2500	1078(90)	992(89.5)	
Gestational age	<28	11(0.9)	5(0.6)	0.443
	28 - 32	16(1.4)	15(1.3)	
	32 – 37	174(14.6)	153(13.8)	
	>37	994(83.1)	935(84.3)	
Multiple births	Single	711(92.3)	691(93.4)	0.433
	Twin or multiple	59(7.7)	49(6.6)	
Place of residence	urban	748(97.1)	697(94.2)	0.005
	rural	22(2.9)	43(5.8)	

Discussion

This study was designed to compare these indicators before and after the COVID-19

pandemic in Iran. The results of this study showed the The newborns born in these two periods before and the COVID-19 pandemic had no

statistically significant differences in terms of maternal age, gestational age, birth weight, height and head circumference at birth. There was no statistically significant difference in terms of gender, stillbirth and twins or multiples variables in the two time periods before and after COVID-19. In addition, the birth rate in rural areas after the COVID19 pandemic was higher than before pandemic.

Some studies have shown that viral infections may be associated with maternal and infant mortality during pregnancy and childbirth. However, studies on the association of COVID-19 with these outcomes are limited [18].

In our study, caesarean section rate after the COVID-19 pandemic in the first 6 months of 2020 were higher than before pandemic in the first 6 months of 2019. This finding was in line with similar studies conducted in this field [19,20]. Generally, one of the important and effective factors on the caesarean section rate is unplanned pregnancies, and especially the short interval between pregnancies can increase the chance of premature birth and the need for cesarean section. For example, the study of Caruso et al., showed an increase in the rate of unplanned pregnancy in the conditions of pandemic quarantine, which is placed in the high-risk pregnancy group and may have an effect on the increase of cesarean section [19]. On the other hands, some other studies attribute the increase in high-risk births and cesarean rates to the psychological effects of the disease epidemic. For example, the study by Lee et al., which studied the psychological effects of the SARS epidemic on pregnant women, showed that the pregnant women experienced a high level of anxiety and worry about being infected with the virus, in addition to physical health consequence [21]. In addition, daily and moment-to-moment reports about the spread of the epidemic and deaths related to it by various media, increase the level of stress that every woman normally experiences during pregnancy [22,23]. The evidence also indicates that the prenatal stress is associated with higher rates of adverse pregnancy and birth outcomes such as preterm birth, low birth weight, and higher rates of cesarean delivery [24-26]. Likewise, in a prospective cohort study by Sahin et al. in Turkey with the aim of investigating the clinical course and impact of COVID-19 infection

on 553 pregnant women, a significant increase in pregnancy complications and cesarean delivery was reported at the same time as the COVID-19 pandemic [27]. Souza et al have also shown that the number of pregnancies in ART infertile couples has decreased significantly, especially at the beginning of the pandemic quarantine, which can cause low birth weight and multiple births and cesarean section [28]. A meta-analysis study reported significant association between higher rates of cesarean delivery, preterm birth, preeclampsia, and perinatal mortality with COVID19 [29]. Perhaps another reason for the increase in cesarean sections during the COVID19 epidemic is the recommendation to terminate pregnancy to prevent the increase of lung involvement in pregnant mothers with this disease, so that along with improving the mother's pulmonary ventilation, the risk of intrauterine infection of the fetus can also be reduced [30]. Also, women who are infected with the severe form of COVID-19 usually have higher rates of co-morbidities such as diabetes, gestational hypertension or pre-eclampsia, which may also lead to adverse pregnancy outcomes and an increase in cesarean section [31]. Therefore, design and implement programs to reduce the cesarean section rate in epidemics such as COVID19 may be necessary.

In the present study, there was no statistically significant difference in the stillbirths rate in the two time periods before and after COVID-19. The study of Kirchengast et al., Ranjbar et al. and Gallo et al. were also in the same direction and the epidemic of COVID-19 did not have a significant effect on the rate of stillbirth and gestational age compared to before [32-34]. On the other hand, Khalil et al.'s study showed that the stillbirth rate increased significantly during the COVID-19 epidemic. Failure to refer for receive routine or emergency services (for example, reduced fetal movements) during pregnancy due to the fear of infection and changes in obstetric services (reduction of prenatal visits, ultrasound scan and screening) due to the greater focus of the system to deal with COVID-19 have been mentioned as the main reasons for this increase [35].

Also, in this study, no statistically significant difference were observed in terms of the birth weight and gestational age of newborn at two time

points before and after COVID-19 which was consistent with some of the studies done in this field [36-38]. On the other hand, it was not consistent with the results of a number of other studies. For example, the study of Ranjbar et al reported the reduction of preterm births and low birth weight before (the first 6 months of 2019) and after (the first 6 months of 2020) the epidemic of COVID19 in Iran [34]. Different approaches to birth outcomes research and differences in the implementation of programs to fight against COVID19, different population responses and differences in the risk factors of adverse pregnancy outcomes from one community to another may be the reasons for the differences in the results of these studies.

Conclusion

The present study revealed the caesarean section rate after the COVID19 pandemic has increased significantly compared to before. In addition to the need for more studies to investigate social, environmental, and behavioral factors on the consequences of pregnancy during the epidemic of infectious diseases, it seems necessary to evaluate the health care of mothers and babies in order to have the necessary preparation to deal with future epidemics.

Ethical Consideration

This study was approved by the Deputy of Research and Ethics Committee of Semnan university of medical Sciences (Iran) (ID: IR.SEMUMS.REC.1400.009).

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These data were extracted from the integrated health system (SIB) of the Iranian Ministry of Health. The researchers are grateful to the colleagues of the Iranian Ministry of Health for providing the data.

Conflict of interest

No authors have any conflicts of interest to declare.

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Authors' contributions:

THB, EGH and MJ conceived the study, collected data and performed statistical analysis. KM and MM participated in the study design, drafted the manuscript and contributed to data analysis. THB, EGH, MJ, MM and KM helped to draft the manuscript and revised it critically. All authors read and approved the final manuscript.

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