

ASSESSING PREGNANCY OUTCOMES DURING AND BEFORE THE OUTBREAK COVID-19 PANDEMIC

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ABSTRACT

BACKGROUND: Due to its nature, the COVID-19 pandemic had adverse effects on pregnant mothers, fetuses, and newborns.

OBJECTIVE: This study aimed to investigate pregnancy outcomes in obese women who gave birth during and before the COVID-19 pandemic outbreak.

METHODS: This descriptive-analytical study was conducted on 444 obese pregnant women in two groups - before and during the COVID-19 outbreak. The study investigated the pregnancy outcomes and the role of COVID-19 in their development. Data were collected through online questionnaires, and the analysis involved the use of a logistic regression model and odds ratio analysis.

RESULTS: The independent t-test between the two groups revealed an average BMI of 32.95 and 33.12, respectively. The statistical analysis showed that this difference was not significant ($P(T > t) = 0.7076$, $t = -0.5469$). Additionally, COVID-19 had no significant effect on pregnancy outcomes such as gestational vomiting, gestational diabetes, high blood pressure, pre-eclampsia, postpartum hemorrhage, and weight gain during pregnancy. However, it did increase the chances of urinary infections, the need for cesarean section, and premature delivery, although these increases were not significant.

CONCLUSION: The results of this study show that COVID-19 pandemic had consequences for obese pregnant women, that various issues can affect the risk of this consequence in this group, and that different aspects should be considered in future studies.

KEYWORDS: COVID-19 Pandemic; pregnancy outcomes; obesity; women; pregnancy

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INTRODUCTION

Pregnancy represents a crucial period in a woman's life, which influences the future health of both mother and children. A balanced diet and a proper weight gain during pregnancy are associated with better maternal and perinatal outcomes¹. To assess nutrition status, most frequently, the body mass index (BMI) is calculated using the pre-pregnancy weight, which has a fundamental role in determining the total amount of weight gain, monitoring gestational development and providing nutritional counseling².

Obesity is measured based on body mass index, and people with a BMI greater than 30 are considered obese^{3, 4}. The prevalence of obesity and weight gain in women of all age groups is increasing, especially in the range of 25 to 34 years. Considering that fertility is at the highest level in this age range, weight gain and obesity can be considered as an important issue in pregnancy care. The complications of obesity and being overweight include frequent miscarriages and congenital anomalies, increased blood pressure, pre-eclampsia, gestational diabetes and venous thromboembolism⁵.

Maternal weight gain and obesity may lead to caesarean section. Also, babies born to overweight or obese mothers often have macrosomia and require long-term hospitalization⁵. In this way, the obesity of the pregnant mothers can also affect the future health of the children⁶. There is a strong relationship between weight gain and maternal obesity and their adverse results on the health of the mothers and their babies during pregnancy, delivery and after delivery⁷. Pre-pregnancy weight, as well as weight gain during pregnancy, are important risk factors in the future weight gain of mothers and babies⁷.

Doi et al. (2020) in a study titled Cohort Study of High Maternal Body Mass Index and the Risk of Adverse Pregnancy and Childbirth Outcomes in Scotland, it was found that compared to women with normal weight, the chances of gestational diabetes outcomes, preeclampsia, induction of labor, and

emergency caesarean section for overweight and obese women, and pregnancy blood pressure has increased significantly⁸.

The severe acute respiratory syndrome which is caused by corona virus, was named the COVID-19 pandemic by the World Health Organization and was first identified in December 2019 in the Chinese city of Wuhan. It can cause an asymptomatic to severe acute respiratory infection. Pregnant women and babies must receive more care and attention against this disease because there is a concern about possibility of transmission of this virus through mother to fetus. There are also related concerns about creation of abnormalities and transmission of the virus during delivery and breastfeeding⁹. Tagvi et al. (2021), in examined pregnancy, maternal, and newborn outcomes in COVID-19, compared to healthy pregnant women in Iran. Hormozgan studied 55 pregnant women with COVID-19 as case controls and 55 pregnant women as peer controls and showed that the pregnancy outcomes in the case control group - such as mode of delivery, premature rupture of the membranes, postpartum hemorrhage, perineal removal rate, birth weight of the baby, Apgar score and the rate of infant suffocation were similar to pregnant women without COVID-19¹⁰.

Also, previous findings in pregnant patients with obesity and COVID-19 indicate frequent thromboembolism and pre-eclampsia, higher risk of hospital-acquired infections, more hospitalizations in intensive care units, frequent use of invasive and non-invasive oxygen therapy, and maternal death¹¹. Considering the quick spread of this pandemic and the lack of information on the relationship between pregnancy outcomes of women, especially obese individuals, and COVID-19, the present study investigated pregnancy outcomes in obese women who gave birth during the outbreak of the COVID-19 and before it. This study was conducted for the first time in Iran and can be considered in the field of health policy.

METHODS

Study Overview:

This descriptive-analytical study focused on obese women who gave birth and received care at Iran University of Medical Sciences from 2019 to 2021. Ethical approval (IR.IUMS.REC.1401.628) was obtained, and participants were informed. The sample included obese women with BMI above 30, identified from pre-pregnancy health files.

Sampling:

Purposive sampling through health care personnel identified eligible obese women. Health workers, trained for online questionnaires, contacted participants, and 444 women were sampled based on pilot study outcomes. The sample included 222 obese mothers pre-pandemic (2019) and 222 during the COVID-19 pandemic (2021).

Inclusion and Exclusion Criteria:

Inclusion criteria: obesity, non-smoker, second birth and later, uncomplicated previous pregnancies, exact gestational age (22-42 weeks), and no physical/mental disorders. Exclusion criteria: unwillingness to participate and incomplete questionnaire responses.

Questionnaires:

Two questionnaires captured demographic data and pregnancy outcomes (vomiting, urinary infection, weight gain, gestational diabetes, preeclampsia, eclampsia, premature birth, cesarean section, small for gestational age (SGA), large for gestational age (LGA), postpartum bleeding).

Data Analysis:

SPSS and STATA software analyzed data. Descriptive statistics reported demographic and basic variables. T-test compared average BMI before and during the COVID-19 pandemic. Multinomial logistic regression assessed the impact of reduced pregnancy care on outcomes during the pandemic, and logistic regression examined the relationship between pregnancy outcomes during and before the pandemic.

RESULTS:

The age of most mothers in both groups before the outbreak of COVID-19 and during the period of it was between 18 and 35 years (81.07 and 70.72 percent), and most of them had an education below high school diploma. 98.20% in the the group of mothers before COVID19 and 97.30% in the mothers' group during the COVID-19 pandemic were housewives. The household income in both groups was almost the same, with most having a medium income. Regarding the variable number of previous pregnancies, which was examined in 5 categories, the results showed that almost 50% of mothers had two previous pregnancies. The number of miscarriages in previous pregnancies also indicated that 18.80% of mothers in the group of mothers before covid-19 and 77.93% of mothers in the mothers' group during the covid-19 pandemic had no history of miscarriage. Regarding the consumption of vitamin D during pregnancy, 62.61% of mothers in the group of mothers before covid-19 and 69.82% in the mothers' group during the covid-19 were in the regular consumption category. The important variable in Table 1 is the number of routine pregnancy visits.

Table 1: Demographic and basic variables in the studied population

Variable	Class	Before the outbreak of COVID-19 pandemic		During the outbreak of COVID-19 pandemic	
		Frequency	Percentage	Frequency	Percentage
Mother's age during pregnancy	Under 18 years old	1	0.45	1	0.45
	18 to 35 years	180	81.8	157	70.72
	35 years and older	41	18.47	64	28.83
Education	High school	136	61.26	105	47.30
	Diploma	61	27.48	78	35.14
	University	25	11.26	39	17.75
Job	Housewife	218	98.20	216	97.30
	Employed	4	1.80	6	2.70
Family income	Low	86	38.74	78	35.14
	Medium	130	58.56	141	63.51
	High	6	2.70	3	1.35
Pregnancy number	1	1	0.45	3	1.35
	2	117	52.70	118	53.15
	3	71	31.98	69	31.08
	4	24	10.81	18	8.11
	More than 4	9	4.05	14	6.31
Number of miscarriages in previous pregnancies	0	178	80.18	173	77.93
	1	37	16.67	39	17.57
	2	7	3.15	10	4.50
Vitamin D intake during pregnancy	regular	139	62.61	155	69.82
	Irregular	51	22.97	53	23.87
	no	32	14.41	14	6.31
Number of routine pregnancy visits	Less than 4	16	7.21	24	10.81
	4 to 6	93	41.89	73	32.88
	6 to 8	113	50.90	125	56.31
	Number	222	100	222	100

Half of the mothers received 6 to 8 visits . 41.89% of mothers in the group of mothers before covid-19 received 4 to 6 visits, while in the mothers' group during the COVID-19 pandemic,32.88% of mothers were in this category. It was also found that 7.21

and 10.81 percent of mothers in the two groups had received less than 4 prenatal visitsTable 2 reports the frequency of pregnancy outcomes before and during the outbreak of COVID-19 pandemic in the studied samples.

Table 2: Frequency of pregnancy outcomes before and during the outbreak of COVID-19 pandemic

Pregnancy outcome	Before the outbreak of COVID-19 pandemic			During the outbreak of COVID-19 pandemic		
	Frequency	Percentage	Standard error	Frequency	Percentage	Standard error
Pregnancy vomiting	56	21%	6.48	52	21%	6.32
Gestational diabetes	19	7%	4.17	21	8%	4.37
Increased blood pressure	12	5%	3.37	19	8%	4.17
Preeclampsia	3	1%	1.72	6	2%	2.42
Eclampsia	0	0%	0	2	1%	1.41
Hospitalization due to postpartum hemorrhage	1	0%	1	4	2%	1.98
Urinary infections	20	8%	4.27	22	9%	4.46
Natural childbirth	139	53%	7.22	102	41%	7.44
Preterm delivery	14	5%	3.62	21	8%	4.37

As can be seen in the above table, the frequency of all pregnancy outcomes during the outbreak of the COVID-19 pandemic have increased, the rate of natural childbirth has decreased, and cesarean section has increased, compared to before. Table 3

compares the average body mass index in the obese women who gave birth in the two groups, before and during the outbreak of COVID-19 pandemic.

Table 3: Average body mass index in obese women who gave birth in two groups

Group	Number of views	Average	Standard error	Standard deviation	95% confidence interval
The period before the outbreak of COVID-19 pandemic	222	32.95	0.21	3.19	33.37-32.53
The period of the outbreak of COVID-19 pandemic	222	33.12	0.23	3.43-57/	33-66/32
Combination of the two groups	444	33.03	0.15	3.31	34/33-72/32
Difference	0	-0.17	0.31		44/0-79/0-
Statistical characteristics		diff = mean(1) - mean(2)			t = -0.5469
		Ho: diff = 0		degrees of freedom =	442
		Ha: diff < 0	Ha: diff != 0	Ha: diff > 0	
		Pr(T < t) = 0.2924	Pr(T > t) = 0.5847	Pr(T > t) = 0.7076	

According to the results obtained from the independent t-test between the two groups, the average BMI in the two groups was 32.95 and 33.12, respectively, which indicates that this index is higher in women who got pregnant during the COVID-19 pandemic period, but considering the obtained statistics ($\Pr(T > t) = 0.7076$ and $t = -0.5469$), this difference is not significant. In Table 4, the role of reducing the frequency of prenatal care on pregnancy outcomes is reported.

Table 4: Decreasing the frequency of pregnancy visits on the pregnancy outcomes

Pregnancy outcome	Period	Odds ratio	Standard error	Z	IP> I Z	CI%95
Vomiting in pregnancy	The period before the outbreak of COVID-19 pandemic	1.23	0.3	0.86	0.39	0.1-76.98
	The period of the outbreak of COVID-19 pandemic	0.98	0.22	-0.08	0.93	0.1-62.55
Gestational diabetes	The period before the outbreak of COVID-19 pandemic	1.04	0.39	0.12	0.9	0.2-49.20
	The period of the outbreak of COVID-19 pandemic	2.13	0.65	2.46	0.01	1.3-16.09
Blood pressure	The period before the outbreak of COVID-19 pandemic	1.6	0.71	1.06	0.29	0.3-66.85
	The period of the outbreak of COVID-19 pandemic	0.95	0.34	-0.13	0.9	0.1-47.92
Preeclampsia	The period before the outbreak of COVID-19 pandemic	1.29	1.15	0.29	0.77	0.7-22.40
	The period of the outbreak of COVID-19 pandemic	1.75	0.95	1.03	0.3	0.5-6.12
Urinary infections	The period before the outbreak of COVID-19 pandemic	1.1	0.4	0.28	0.78	0.2-53.28
	The period of the outbreak of COVID-19 pandemic	0.6	0.23	-1.30	0.19	0.1-28.28
Hospitalization due to postpartum hemorrhage	The period before the outbreak of COVID-19 pandemic	2.67	3.88	0.68	0.49	0.46-15.25
	The period of the outbreak of COVID-19 pandemic	2.33	1.52	1.29	0.19	0.8-64.43
Weight gain during pregnancy	The period before the outbreak pregnancy	0.8	0.16	-1.04	0.29	0.1-53.21
	The period of the outbreak of COVID-19 pandemic	1.19	0.23	0.91	0.36	0.1-81.75
Type of delivery (caesarean section)	The period before the outbreak of COVID-19 pandemic	0.98	0.21	-0.06	0.95	0.1-63.52
	The period of the outbreak of COVID-19 pandemic	0.68	0.13	-1.88	0.06	0.1-45.08
Preterm delivery	The period before the outbreak of COVID-19 pandemic	1.75	0.72	1.36	0.17	0.3-78.95
	The period of the outbreak of COVID-19 pandemic	1.31	0.41	0.86	0.39	0.2-7.45
Weight gain of the baby at birth	The period before the outbreak	0.64	0.13	-2.05	0.04	0.0-42.98
	The period of the outbreak of COVID-19 pandemic	0.69	0.13	-1.91	0.05	0.1-47

As can be seen in the above table, the reduction in the number of routine pregnancy visits before the outbreak of COVID-19 pandemic led to an increase in pregnancy vomiting, gestational diabetes, increased blood pressure, increased pre-eclampsia, increased urinary infections, increased postpartum bleeding, and increased pre term delivery, but none of them were significant. In the group during the outbreak of COVID-19 pandemic,

the decrease in the number of prenatal visits increased the chances of gestational diabetes, preeclampsia, postpartum hemorrhage, weight gain during pregnancy, and premature birth, but only the increase in gestational diabetes was significant with $p=0.1$. In Table 5, the relationship between the COVID-19 infection and pregnancy outcomes has been investigated using the logistic test.

Table 5: Correlation between COVID-19 infection and pregnancy outcomes

Pregnancy outcome	Odds ratio	Standard error	Z	P> z	CI%95
Vomiting in pregnancy	0.87	0.15	-0.79	0.42	0.1-61.21
Gestational diabetes	0.59	0.16	-1.89	0.05	0.1-34.02
Blood pressure	0.77	0.23	-0.87	0.38	0.1-42.38
Preeclampsia	0.32	0.21	-1.7	0.08	0.1-09.18
Urinary infections	1.14	0.28	0.56	0.57	0.7-1.87
Hospitalization due to postpartum hemorrhage	0.42	0.34	-1.06	0.29	0.2-08.01
Weight gain during pregnancy	0.97	0.13	-0.19	0.85	0.1-73.28
Type of delivery (caesarean section)	1.19	0.17	1.19	0.23	0.1-89.59
Preterm delivery	1.09	0.29	0.32	0.74	0.64-1.85
Weight gain of the baby at birth	0.74	0.1	-2.06	0.04	0.0-56.98

As can be seen in the above table, COVID-19 infection had no effect on pregnancy outcomes such as pregnancy vomiting, gestational diabetes, blood pressure, preeclampsia, postpartum bleeding and weight gain during pregnancy, but the chances of urinary infections and caesarean section increased. It also increased the chance of premature birth, although this increase is not significant.

DISCUSSION

Pregnancy outcomes in obese women during and before COVID-19 were studied, focusing on routine pregnancy visit frequencies. Results indicated an increase in the less than 4 and the 6 to 8 visits during the pandemic, with higher percentages before the outbreak for 4 to 8 visits. All pregnancy outcomes saw an uptick during the COVID-19 period, with decreased natural childbirth and increased cesarean sections. COVID-19 impacted conditions like vomiting, gestational diabetes, blood pressure, and preeclampsia. No effects were observed on postpartum bleeding and weight gain, but chances of urinary infections, cesarean sections, and premature births increased, though not significantly.

Comparisons with Aj et al. and other studies supported increased hypertension and preeclampsia during the pandemic¹². Similar prevalence rates and patterns were observed in relation to blood pressure levels. The rate of preeclampsia aligned with Wei et al.'s findings¹³. Cesarean section rates and increased premature deliveries during COVID-19 were consistent with Aj et al. and Saran et al^{12, 14}.

The average BMI before and during the pandemic indicated a slight increase, possibly linked to inactivity caused by social restrictions. Pourfarzi et al.'s report on obesity and diabetes doubling the probability of hospitalization during COVID-19 aligned with the findings¹⁵.

A decrease in pregnancy visits from 6 to 8 to less than 4 during the pandemic led to increased adverse outcomes, although statistical significance wasn't reached. Limited cases with less than 4 visits may explain this absence.

Studies on pregnant teenagers' outcomes presented contradictory results, emphasizing the need for proper prenatal care¹⁶. Alexander et al.'s study in Carolina associated the number of care visits during pregnancy with favorable outcomes for both mothers and babies¹⁷.

CONCLUSION

The results of this study showed that COVID-19 infection has no effect on pregnancy outcomes such as gestational vomiting, gestational diabetes, blood pressure, pre-eclampsia, postpartum bleeding, weight gain during pregnancy. But the chances of urinary infections, cesarean section and premature birth were increased, although this increase was not significant.

Of course, more investigations should be done on this group of mothers, taking into account more aspects such as place of residence, race, injection or non-injection of vaccine, type of vaccine, etc. Therefore, special attention should be paid to the identification of mothers with COVID-19 pandemic. These findings should serve as a guide for pregnant women and health care workers to strictly implement all recommended preventive measures for COVID-19, including vaccination.

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