

# Impact of the COVID-19 outbreak on routine obstetrical management: a cohort study

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## Abstract

**Objectives:** our department was the first in Israel to construct a separate, designated complex for its COVID-19-exposed patients. We aimed to evaluate the effect of the COVID-19 pandemic infection control measures on obstetrical care in the emergency department and delivery unit. **Design:** cohort study. **Setting:** tertiary medical center. **Population:** pregnant women attending the obstetrical emergency department (ED). **Methods:** February-March 2020 data were collected and compared to a parallel period in 2019. **Main outcome measure:** rate of referrals, deliveries, mode of delivery, neonatal outcomes. **Results:** During February-March 2020, 3,897 women were referred to the ED, compared to 4,067 in the previous year. Mean duration of treatment until decision and referral indications did not differ between 2020 and 2019 (207 vs. 220 minutes,  $p=0.26$ ; urgent referrals: 58.8% vs. 59.2%,  $p=0.83$ ). Per-week comparison showed a significant reduction in ED referrals only in the last week of the period [337 (2020) vs. 515 (2019),  $p<0.001$ ]. The proportion of women admitted to the delivery unit in active labor was higher in the last three weeks (39.1% vs. 28.2%,  $p=0.005$ ), and the rate of discharge was inversely correlated (45.8% vs. 56.7%,  $p=0.01$ ). Deliveries number and proportions of spontaneous onset of labor, trials of labor, preterm delivery, post-term deliveries, operative vaginal and cesarean deliveries did not differ between February-March of 2020 and 2019. In the per-week comparison, the number of deliveries did not differ between the periods. **Conclusion:** With timely preparation and proper management, high-level routine obstetrical care during the COVID-19 outbreak can be maintained.

## Results:

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**Conclusion:** With timely preparation and proper management, high-level routine obstetrical care during the COVID-19 outbreak can be maintained.

**Keywords:** COVID-19, infection prevention, emergency department, delivery, cesarean delivery, neonatal outcome

**Funding:** no external funding.

**Tweetable abstract:** High-level routine obstetrical care and maternal and neonatal outcomes can be preserved during the COVID-19 outbreak.

## Introduction

Coronavirus Disease 2019 (COVID-19), which is manifested by a highly contagious and infectious pneumonia, is a public health emergency of international concern<sup>1-3</sup>. The COVID-19 pandemic has immensely affected medical systems in countries worldwide, causing critical burden, especially in countries that did not adopt strict isolation, closure and massive population policies.<sup>4</sup> Channeling medical resources for COVID-19 treatment and management can potentially endanger routine, life-saving, healthcare practice.

Obstetrics is a discipline requiring emergent management, especially in the setting of labor and delivery.<sup>5</sup> In our country, hospitals are the sole place that provides obstetric services. Thus, the COVID-19 pandemic may adversely affect the treatment and management of healthy pregnant women attending maternity units.

Evidence is currently accumulating regarding the impact of the COVID-19 on infected pregnant women.<sup>6-8</sup> However, the impact of the COVID-19 pandemic on routine obstetrical care is still largely under-reported.

In aim to provide optimal infection control without endangering the parturient population, our obstetrics and gynecology department was the first in our country to construct a separate, geographically isolated, complex for its COVID-19-exposed patients.

We aimed to evaluate the effect of the COVID-19 pandemic infection control measures on obstetric care in the setting of the obstetrical emergency department (ED), and the short-term outcomes following hospitalization and delivery, in light of the undertaken prevention measures.

## Materials & Methods

We conducted a cohort study between February and March 2020, the time period of the COVID-19 pandemic outbreak onset in our country. The Sheba Medical Center, a tertiary, university affiliated hospital, is the largest hospital in the Middle East. Our department serves large, heavily populated urban and rural areas, and treats a heterogeneous population with over 10,000 deliveries per year.

We collected data from the obstetrical emergency department, hospitalization and delivery units.

We compared the two-month period in 2020, the pandemic period, to a parallel period in 2019. We subsequently divided the periods into eight weeks that we compared week vs. week.

We collected the following data from the ED: number of ED referrals, referral indications, time duration spent in ED, discharge rate, delivery unit admission rate and hospitalization rate. Delivery unit data collected included the number of deliveries, maternal characteristics ( age and obstetrical history), pregnancy and delivery characteristics (number of fetuses, gestational age at delivery, intrapartum fever, mode of the onset of labor, length of the 2<sup>nd</sup> stage of labor and mode of delivery), and neonatal outcome (birthweight and a composite of adverse neonatal outcome).

Intrapartum fever was defined as body temperature of 38 degrees Celsius or above, measured orally or rectally.<sup>9</sup> The composite neonatal adverse outcome consisted of any of the following: stillbirth, neonatal death during the first 24 hours, mechanical ventilation during the first 24 hours, asphyxia, 5-minute Apgar score <7, pH arterial cord blood <7.0, neonatal intensive care unit admission.

### *Statistical analysis*

Patient characteristics are described as proportions for categorical variables and as means and standard deviations for continuous variables. Significance between groups was assessed by the Chi square test and Fisher's exact test for categorical variables, and the Mann-Whitney U test, a non-parametric test for continuous variables without a normal distribution. A 2-sided P-value < 0.05 indicated statistical significance.

The data were analyzed using Software Package for Statistics and Simulation (IBM SPSS version 24, IBM Corp, Armonk, NY).

## Results

### *Emergency Department*

During February-March 2020, 3,897 women were referred to the ED, compared to 4,067 women in the previous year (Table 1, Figure 1). The mean duration of treatment until decision and referral indications did not differ between 2020 and 2019 (207 vs. 220 minutes,  $p=0.26$ ; urgent referrals: 58.8% vs. 59.2%,  $p=0.83$ ). The per-week comparison showed a significant reduction in ED referrals only in the last week of the period [337 (2020) vs. 515 (2019),  $p<0.001$ ] (Figure 1). The proportion of women admitted to the delivery unit in active labor was significantly higher in the last three weeks (39.1% vs. 28.2%,  $p=0.005$ ), and the rate of discharge was inversely correlated (45.8% vs. 56.7%,  $p=0.01$ ).

### *Delivery Unit*

During February-March 2020, 1,666 women delivered, compared to 1,654 during February-March 2019 (Table 1). The proportions of spontaneous onset of labor, trials of labor, preterm delivery, post full-term deliveries, operative vaginal delivery and cesarean deliveries did not differ between the periods. The duration of the second stage of labor did not differ either. A trend was observed toward a lower rate of composite adverse neonatal outcomes in 2020 compared to 2019 (5.8% vs. 7.1%,  $p=0.08$ ). In the per-week comparison, the number of deliveries did not differ between the periods (mean 208 vs. 206,  $p=0.88$ ) (Table 2).

## Discussion

In this study of the current COVID-19 pandemic versus the parallel period in the previous year, we report a similar rate of ED referrals and deliveries, and similar delivery and perinatal outcomes.

Pregnant women traditionally deliver in hospitals. During pandemics, an important area of concern is the implementation of infection control practices in delivery units, with emphasis on the best practices to keep healthy pregnant and postpartum women and newborns from being exposed to infected individuals.<sup>10</sup>

Patients' fear of seeking hospital-based care may be an important determinant of hospital services utilization during a pandemic outbreak.<sup>11</sup> Thus, a hospital's level of preparedness for pandemics may play a central role in a woman's decision to attend it.

The first COVID-19 confirmed infection in Israel occurred in February 27. However, Sheba Medical Center was the first Israeli hospital to construct a specifically designated, geographically isolated complex for COVID-19-exposed patients, more than two weeks prior to the first confirmed infection. On February 20, the first Israeli persons exposed to COVID-19 were hospitalized in this complex. Subsequently, our department was the first department of obstetrics and gynecology in Israel to construct a separate, designated complex for its COVID-19-exposed patients. This complex was constructed to provide all obstetrical and gynecological treatment and management facilities including a fully equipped ED, delivery unit, operating rooms and hospitalizations rooms. Women suspected with COVID-19 infection were first identified at a triage ward at the department's entrance. These women were subsequently referred to the designated complex for further treatment. The measures undertaken in our hospital, aimed at providing optimal isolation and separation of healthy population and COVID-19 suspected persons, were widely reported over television broadcasts in Israel.

Our results, indicating similar ED number of referrals between 2020 and 2019, suggest that the measures taken to provide isolation accessibility at our hospital reassured the parturient population to attend it, despite increasing restrictions on mobility imposed by the government.

The World Health Organization has advised to consider reducing prenatal clinic visits to a minimum during the Pandemic Influenza A.<sup>12</sup> Concurrently, Turrentine et al have described a drive-through prenatal care model to reduce the number of in-person prenatal visits during the COVID-19 outbreak.<sup>13</sup>

Current data regarding hospital referrals rate during the COVID-19 from other medical centers are still lacking. However, a study on the SARS outbreak has found a significant decrease in the number of hospital admission rate during this period.<sup>11</sup> This is in contrast with our results, but evidently does not represent exactly the same population.

We did observe a decrease in the number of referrals in the final week of the study period, probably due to further enforcement of lockdown. This finding is in line with the observation that a higher proportion of women were admitted to the delivery unit and a lower proportion of women were discharged home in the final weeks of the period, and to the decreased time spent in the ED during the final week of the period.

We did not observe a significant difference in delivery or neonatal outcomes between the 2020 and 2019 periods, and on a week per week stratification. This is an important point to underline, as burnout and exhaustion of obstetrical staff imposed by physical strain of personal protection equipment, physical isolation and long shift hours might impact medical staff and result in decreased relational skills, an impairment of empathic skills and a negative or hasty approach.<sup>14,15</sup> However, the radical shift in working practice characteristics during the outbreak did not result in a difference in obstetrical outcome.

Following professional recommendations and guidelines to reduce elective and ambulatory antenatal care to minimum<sup>15,16</sup>, during the study period in 2020, the hospital's ambulatory activity was decreased to a minimum, and medical staff was allocated to provide care for urgent cases. Nevertheless, as our results demonstrate, we have managed to keep our obstetrical care in routine standard.

Our study is not without limitations. Its comparison to retrospective data from the previous year may increase the risk of bias inherent to such investigations. Second, we could not obtain data of referrals' rate from other medical centers in our area, limiting our ability to infer conclusions from our number of ED referrals. Third, the limited period of time evaluated in our study might underrepresent the actual impact of the current outbreak on obstetrical care in our center.

The main strength of our study is the relatively large cohort of patients and deliveries in a short period. Second, the meticulous data collection and the stratification of the period to weeks allowed optimization of our study results.

In conclusion, with timely preparation and proper management, negative impact of the COVID-19 outbreak on obstetrical emergency departments and delivery units can be reduced. Our results can aid in better decision management in the current and future infection outbreaks.

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**Contribution to authorship:**

AR, GL, NH and EK reviewed the literature and wrote the paper. GL performed the statistical analyses for this study. All authors read and approved the final manuscript.

**Details of ethical approval:**

Institutional review board approval of the Sheba Medical Center was obtained for this study (7068-20-SMC, 03/30/2020).

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**Legends for tables and figures**

**Figure.** Obstetric emergency department referrals.

**Table 1.** Characteristics of deliveries and neonates in February-March of the years 2019 and 2020.

**Table 2.** Characteristics of deliveries and neonates in February and March 2020, compared to February and March 2020, stratified by weeks.

**Table 1.** Characteristics of deliveries and neonates in February-March of the years 2019 and 2020.

p-value	2020	2019	Characteristics
	1,666	1,654	Deliveries (n)
			<b>Women</b>
0.96	32 ± 5.2	32 ± 5.5	Age (y)

p-value	2020	2019	Characteristics
0.23	255 (15.3)	278 (16.8)	Previous cesarean
0.10	118 (7.1)	142 (8.6)	Multiple pregnancy
			<b>Gestational age at delivery</b>
0.26	40 <sup>2/7</sup> ± 2 <sup>2/7</sup>	40 <sup>1/7</sup> ± 2 <sup>2/7</sup>	Gestational age (weeks)
0.95	53 (3.2)	52 (3.1)	Delivery <34 weeks
0.46	177 (10.6)	189 (11.4)	Delivery <37 weeks
0.85	146 (8.8)	142 (8.6)	Delivery >41 weeks
			<b>Intrapartum characteristics</b>
0.34	46 (2.8)	55 (3.3)	Intrapartum fever
0.20	684 (41.1)	715 (32.2)	Spontaneous onset of labor
0.42	80 ± 111.2	76 ± 77.1	2 <sup>nd</sup> stage of labor (min)
			<b>Mode of delivery</b>
0.33	491 (29.5)	463 (28.0)	Cesarean delivery
0.26	114 (6.8)	118 (7.1)	Intrapartum cesarean delivery
0.25	124 (7.5)	108 (6.5)	Operative vaginal delivery
			<b>Neonatal outcome</b>
0.30	3,138 ± 604	3,117 ± 598	Birthweight (g)
0.12	96 (5.8)	117 (7.1)	Composite adverse neonatal outcome*

Continuous variables are expressed as means ± standard deviation. Categorical variables are presented as n (%).

A composite neonatal adverse outcome consisted of any of the following: stillbirth, neonatal death during the first 24 hours, mechanical ventilation during the first 24 hours, asphyxia, 5-minute Apgar score <7, pH arterial cord blood <7.0, neonatal intensive care unit admission.

**Table 2. Characteristics of deliveries and neonates in February and March 2020, compared to February and March 2020, stratified by weeks.**

p-value	2/8/2020	2/8/2019	p-value	2/1/2020	2/1/2019	Characteristic
NS	225	252	NS	222	211	Deliveries (n)
NS	42.7	43.7	NS	42.8	44.5	Spontaneous onset of labor (%)
NS	2.2	3.2	NS	5.4	6.6	Intrapartum fever (%)
NS	84	69	NS	68	79	2 <sup>nd</sup> stage of labor (min)
NS	4.0	4.0	NS	0.9	1.9	Delivery <34 weeks (%)
NS	13.8	12.7	NS	9.9	14.2	Delivery <37 weeks (%)
NS	8.4	10.3	NS	11.3	7.1	Delivery >41 weeks (%)
NS	67.1	63.1	NS	59	64.5	NVD (%)
NS	7.1	7.9	NS	7.7	8.0	OVD (%)
NS	25.8	29.0	NS	33.3	27.5	CD (%)
NS	3086	3105	NS	3174	3093	Birthweight (g)
NS	8.0	6.7	NS	3.6	6.6	Composite neonatal* (%)

p-value	2/22/2020	2/22/2019	p-value	2/15/2020	2/15/2019	Characteristic
NS	209	223	NS	207	174	Deliveries (n)
0.01	40.7	52.5	NS	36.7	43.7	Spontaneous onset of labor (%)
NS	1.4	1.8	0.02	1.4	5.7	Intrapartum fever (%)
NS	102	66	NS	68	64	2 <sup>nd</sup> stage of labor (min)

p-value	2/22/2020	2/22/2019	p-value	2/15/2020	2/15/2019	Characteristic
NS	3.3	3.1	NS	2.4	3.4	Delivery <34 weeks (%)
NS	8.6	13.9	NS	8.7	12.6	Delivery <37 weeks (%)
NS	7.2	8.5	NS	7.2	6.3	Delivery >41 weeks (%)
NS	60.7	69.5	NS	59.4	70.1	NVD (%)
NS	5.3	7.6	0.02	9.7	2.3	OVD (%)
0.01	34.0	22.9	NS	30.9	27.6	CD (%)
NS	3145	3122	NS	3130	3074	Birthweight (g)
NS	7.7	6.3	0.04	4.8	10.3	Composite neonatal* (%)

p-value	3/8/2020	3/8/2019	p-value	3/1/2020	3/1/2019	Characteristic
NS	211	192	NS	192	217	Deliveries (n)
NS	48.3	41.1	NS	39.6	41.5	Spontaneous onset of labor (%)
NS	1.4	1.6	NS	3.6	3.2	Intrapartum fever (%)
NS	73	87	NS	83	75	2 <sup>nd</sup> stage of labor (min)
NS	4.3	2.6	NS	3.1	4.6	Delivery <34 weeks (%)
NS	8.5	8.3	NS	11.5	10.1	Delivery <37 weeks (%)
NS	10.4	7.8	NS	7.8	9.7	Delivery >41 weeks (%)
NS	71.6	63	NS	63	68.2	NVD (%)
NS	5.2	5.7	NS	4.7	5.5	OVD (%)
NS	23.2	31.3	NS	32.3	26.3	CD (%)
NS	3174	3151	NS	3140	3100	Birthweight (g)
NS	5.2	6.8	NS	5.2	8.3	Composite neonatal* (%)

p-value	3/22/2020	3/22/2019	p-value	3/15/2020	3/15/2019	Characteristic
NS	178	191	NS	222	194	Deliveries (n)
NS	41.6	40.8	NS	36.0	36.6	Spontaneous onset of labor (%)
NS	1.7	2.1	NS	4.5	2.6	Intrapartum fever (%)
NS	81	75	NS	83	92	2 <sup>nd</sup> stage of labor (min)
NS	5.6	3.1	NS	2.3	2.1	Delivery <34 weeks (%)
NS	14.6	8.9	NS	9.9	9.8	Delivery <37 weeks (%)
NS	7.9	12.0	NS	9.5	6.2	Delivery >41 weeks (%)
NS	64.1	60.7	NS	59.9	65	NVD (%)
NS	9.5	8.4	NS	10.4	5.6	OVD (%)
NS	26.4	30.9	NS	29.7	29.4	CD (%)
NS	3113	3179	NS	3140	3113	Birthweight (g)
NS	5.6	6.8	NS	5.9	5.2	Composite neonatal* (%)

NVD- normal vaginal delivery, OVD- operative vaginal delivery, CD- cesarean delivery, NS- non significant

A composite neonatal adverse outcome consisted of any of the following: stillbirth, neonatal death during the first 24 hours, mechanical ventilation during the first 24 hours, asphyxia, 5-minute Apgar score <7, pH arterial cord blood <7.0, neonatal intensive care unit admission.

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