






Characteristics and short-term obstetric outcomes in a case series of 67 women test-positive for SARS-CoV-2 in Stockholm, Sweden

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Abstract

Introduction: The Stockholm region was the first area in Sweden to be hit by the pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The national guidelines on the care of women with a positive test for SARS-CoV-2 (detection with polymerase chain reaction [PCR]) recommend individualized antenatal care, mode of delivery based on obstetric considerations, and no routine separation of the mother and the newborn. Breastfeeding is encouraged, and although there is no specific recommendation regarding wearing a face mask to prevent viral transmission to the newborn while nursing, instructions are given to keep high hygiene standards. All studies based on cases tested on hospital admission will capture more women with pregnancy complications than in the general population. Our aim was to describe the clinical characteristics of SARS-CoV-2-positive women and their neonates, and to report short-term maternal and neonatal outcomes.

Material and methods: A retrospective case series with data from medical records including all test-positive women (n = 67) who gave birth to 68 neonates from 19

Abbreviations: BMI, body mass index; COVID 19, coronavirus disease 19; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

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March to 26 April 2020 in Stockholm, Sweden. Means, proportions and percentages were calculated for clinical characteristics and outcomes.

Results: The mean age was 32 years, 40% were nulliparous and 61% were overweight or obese. Further, 15% had diabetes and 21% a hypertensive disease. Seventy percent of the women had a vaginal birth. Preterm delivery occurred in 19% of the women. The preterm deliveries were mostly medically indicated, including two women who were delivered preterm due to severe coronavirus disease 19 (COVID-19), corresponding to 15% of the preterm births. Four women (6%) were admitted to the intensive care unit postpartum but there were no maternal deaths. There were two perinatal deaths (one stillbirth and one neonatal death). Three neonates were PCR-positive for SARS-CoV-2 after birth.

Conclusions: In this case series of 67 women testing positive for SARS-CoV-2 with clinical presentations ranging from asymptomatic to manifest COVID-19 disease, few women presented with severe COVID-19 illness. The majority had a vaginal birth at term with a healthy neonate that was negative for SARS-CoV-2.

KEY WORDS

COVID-19, delivery outcomes, pregnancy outcomes, preterm birth, SARS-CoV-2

1 | INTRODUCTION

The understanding of how the novel SARS-CoV-2 virus affects women and their neonates during pregnancy, childbirth and the immediate postpartum period is limited. Concerns have been raised regarding risks for severe disease in pregnant women, preterm delivery, possible vertical transmission and neonatal infection. These concerns are based on known risks for severe illness in pregnant women infected by other respiratory viruses, in particular other corona viruses.^{1,2} There is currently no evidence for intrauterine infection caused by vertical transmission of SARS-CoV-2.^{3,4}

In Sweden, all antenatal and delivery care is tax-funded and free of charge. For the care of pregnant women positive for SARS-CoV-2, National Swedish guidelines were published early in the pandemic and recommend individualized antenatal care, mode of delivery based on obstetric considerations, and no routine separation of the mother and newborn after birth. Breastfeeding is encouraged, and although there is no specific recommendation regarding wearing a face mask to prevent viral transmission to the newborn while nursing, instructions are given to keep high hygiene standards. All neonates born to test-positive mothers are recommended to be screened for SARS-CoV-2 within 12-24 hours after birth by nasopharyngeal swab. The Stockholm region was the first Swedish region to be hit by the pandemic and has six delivery units, which together take care of approximately 25% of all deliveries in Sweden (28 000 neonates in 2019). In two of the delivery units in Stockholm, all women admitted to inpatient care are currently screened for SARS-CoV-2 virus. The prevalence of test-positive women was approximately 4% in these units during the study period. The other four units test women only if fever or respiratory symptoms are present at the time of admission for labor or in-hospital care related to pregnancy complications. The

Key message

The majority of SARS-CoV-2-positive women had a vaginal birth at term with a healthy neonate who tested negative. One in five neonates was born preterm, and the majority of these preterm births was iatrogenic.

prevalence of test-positive women in those units was lower during the study period, varying from 1.2% to 1.9%. Women scheduled for elective care are tested 24-48 hours prior to admission if they have any respiratory symptoms. They are also tested if they become symptomatic during their hospital stay.

Here, we report a case series of 67 women with a positive test for SARS-CoV-2, who gave birth between 19 March and 26 April 2020 in the Stockholm region, Sweden. The women presented with symptoms ranging from asymptomatic to manifest severe COVID-19 disease. This corresponds to 2.1% of the general birthing population in the Stockholm region during that time. Our objective is to describe the clinical characteristics of these women and their 68 neonates, and to report maternal and newborn short-term outcomes.

2 | MATERIAL AND METHODS

All women who gave birth between 19 March and 26 April 2020 in the Stockholm region and who were polymerase chain reaction (PCR)-positive for SARS-CoV-2 by nasopharyngeal swab were included ($n = 67$). One case included in our study was reported earlier, and 35 cases from the two delivery units that had a universal screening policy for SARS-CoV-2 infection for all pregnant women on admission to the hospital were also included in a recently published report.^{5,6}

Prespecified information was retrieved retrospectively from medical records by a clinician at each delivery unit. Data were then compiled in de-identified form in a database.

2.1 | Statistical analyses

Means, proportions and percentages were calculated.

2.2 | Ethical approval

This study was approved by the Ethical Review Agency in Sweden (DNR: 2020/02124) on 25 May 2020.

3 | RESULTS

Maternal baseline and clinical characteristics and pregnancy outcomes are presented in Tables 1 and 2. A majority of the women were overweight or obese, and half were born in a non-Nordic country (Table 1). Furthermore, 21% were diagnosed with a hypertensive disorder and 15% had pregestational or gestational diabetes (Table 1). Of the 67 women, 47 had a vaginal delivery and 20 were delivered by a cesarean section. Seven of the 20 cesarean deliveries were elective and were performed due to a non-COVID-19-related obstetric indication and 13 were emergency cesareans related to fetal indication (7/13), maternal obstetric indications (4/13) or severe COVID-19 in the mother (2/13). In total, four women (6%) were admitted to ICU due to COVID-19. Two of those women were admitted after preterm cesarean due to COVID-19 and two were admitted after vaginal births at term (Table 1). One of them required invasive mechanical ventilation for 12 days but the others did not. There were no maternal deaths.

Preterm delivery occurred in 13 of 67 women who gave birth to 14 of 68 neonates. Nine preterm deliveries were medically indicated, including the two that were due to COVID-19, corresponding to 15% of the preterm deliveries. Four had spontaneous onset of labor (Table 1). Among the 68 neonates, there was one neonatal death in a neonate at 22^{+6/7} gestational weeks after preterm prelabor rupture of membranes (PPROM) at 22^{+3/7} gw (Table 2) and one stillbirth at 27^{+1/7} gestational weeks in a pregnancy with known severe fetal growth restriction (Table 2). Among the 67 live born neonates, three were diagnosed as small for gestational age, and two neonates had an Apgar score of < 7 at 5 minutes of age. Twelve neonates were admitted to a neonatal intensive care unit (NICU) (Table 2) – nine for prematurity, one for observation for possible hypoglycemia and two for pulmonary adaptation disorder.

All but five live-born neonates (62/67) were screened for SARS-CoV-2; three of them had a positive PCR test result (Table 2). All three were born at term with normal Apgar scores. One was born by elective cesarean section, one by emergency cesarean section and one vaginally.

TABLE 1 Maternal characteristics and outcomes among 67 women who tested positive for SARS-CoV-2

Maternal characteristics, N = 67	Means, percentages and proportions
	mean (min-max)
Maternal age (years)	32 (19-42)
	% (n/N)
Parity (proportion of nulliparous women)	40% (27/67)
Maternal country of birth	
<i>Nordic</i>	43% (29/67)
<i>Non-Nordic</i>	49% (33/67)
<i>Unknown</i>	7% (5/67)
	mean (min-max)
BMI, kg/m ²	27 (18-38)
	% (n/N)
<i>Underweight (BMI <18.5) and normal weight (BMI <24.9)</i>	37% (25/67)
<i>Overweight (BMI 25-29.9)</i>	33% (22/67)
<i>Obese (BMI >30)</i>	28% (19/67)
<i>Unknown</i>	1% (1/67)
Smoking habits (first antenatal visit), non-smoker	99% (66/67)
Preeclampsia/hypertensive disease	21% (14/67)
Asthma	9% (6/67)
Diabetes (pregestational and gestational)	15% (10/67)
Twin pregnancies	1% (1/67)
Maternal outcomes, N = 67	% (n/N)
Mode of delivery	
<i>Vaginal delivery</i>	70% (47/67)
<i>Cesarean delivery (CD)</i>	30% (20/67)
Mode of onset of CD (proportion of all deliveries)	
<i>Elective CD, non-COVID-19 indication</i>	10% (7/67)
<i>Emergency CD, fetal indication</i>	10% (7/67)
<i>Emergency CD, maternal non-COVID-19 indication</i>	6% (4/67)
<i>Emergency CD, maternal COVID-19 indication</i>	3% (2/67)
Mode of onset of CD (proportion of all CD)	
<i>Elective CD, non-COVID-19 indication</i>	35% (7/20)
<i>Emergency CD, fetal indication</i>	35% (7/20)
<i>Emergency CD, maternal non-COVID-19 indication</i>	20% (4/20)
<i>Emergency CD, maternal COVID-19 indication</i>	10% (2/20)
Preterm delivery (<37 ⁺⁰ gw)	19% (13/67)
Mode of onset of preterm delivery (proportion of all deliveries)	
<i>Spontaneous onset</i>	6% (4/67)
<i>Medically indicated</i>	13% (9/67)

(Continues)

TABLE 1 (Continued)

Maternal characteristics, N = 67	Means, percentages and proportions
Mode of onset of preterm delivery (proportion of all preterm deliveries)	
Spontaneous onset	31% (4/13)
Medically indicated	69% (9/13)
Women admitted to intensive care unit (ICU)	6% (4/67)

Note: BMI, body mass index; gw, gestational weeks.

TABLE 2 Perinatal outcomes among 68 neonates whose mothers who tested positive for SARS-CoV-2

Outcomes among all neonates, N = 68	Percentages and proportions
	% (n/N)
Live-born neonates	99% (67/68)
Stillborn neonates	1% (1/68)
Neonate born preterm (<37 ^{+0/7} gw)	21% (14/68)
Moderately to late preterm birth (32 ^{+0/7} -36 ^{+6/7} gw)	13% (9/68)
Very preterm birth (28 ^{+0/7} -31 ^{+6/7} gw)	4% (3/68)
Extremely preterm birth (<28 ^{+0/7} gw)	3% (2/68)
Neonates tested for SARS-CoV-2	91% (62/68)
Neonates tested positive for SARS-CoV-2 (proportion of all neonates)	4% (3/68)
Neonates tested positive for SARS-CoV-2 (proportion of tested neonates)	5% (3/62)
Outcomes among live born neonates, N = 67	
Neonatal death (infant born 22 ^{+6/7} gw)	1% (1/67)
Small for gestational age ^a (SGA)	4% (3/67)
Apgar score <7 at five minutes (n = 2 unknown)	3% (2/67)
Neonate admitted to neonatal intensive care unit (NICU)	18% (12/67)
Proportion of neonates admitted to NICU born preterm	75% (9/12)

Note: gw, gestational weeks.

^aBirthweight below two standard deviations (SD) of sex-specific mean weight per gestational age.

4 | DISCUSSION

In this case series of 67 SARS-CoV-2-positive women with varying clinical presentation ranging from asymptomatic to manifest COVID-19 disease, the majority had a vaginal, term birth and delivered a healthy normal weight neonate that did not test positive for SARS-CoV-2. The majority of women were overweight or obese. Diabetes, hypertensive disorder and non-Nordic origin were common. One woman delivered twins and has been reported earlier.⁶ No woman died and few women fell severely ill with COVID-19,

needing intensive care or invasive mechanical ventilation. There were two perinatal deaths. One in five newborns was born preterm. Two preterm births were related to COVID-19 in the mother. Admission to NICU was mostly due to preterm birth. Three neonates tested positive for SARS-CoV-2 but were healthy term neonates.

Several reported risk factors for COVID-19 illness, such as obesity, hypertension and diabetes, were more common in our case series than in the general birthing population in Stockholm.⁷ The selective testing in women with symptoms at the time of inpatient care (four delivery units) most likely results in a group with more pregnancy complications than in the general birthing population. During 2019, approximately 52% of all women giving birth in Stockholm were overweight or obese, 3% had preeclampsia, 7% had some type of diabetes and 46% were nulliparous.^{8,9} A large prospective, population-based cohort study from the UK of women admitted to hospital with confirmed SARS-CoV-2 infection reported that the incidence of hospital admission with confirmed SARS-CoV-2 infection varied with ethnic group, maternal age and body mass index (BMI).¹⁰ As in our study, the majority of the women in that study were overweight or obese and 12% had gestational diabetes. Diabetes and hypertensive disease were also slightly more common in our study than reported from China, Italy or France¹¹⁻¹³ but are in line with the study from the UK.¹⁰ This discrepancy may be due to BMI-related differences in the populations, although BMI was not reported in the Chinese or Italian case series.^{11,12} It is possible that the rates were also influenced by parity. Gestational diabetes and hypertensive disease are more common in overweight and obese women,¹⁴ who are therefore more prone to be admitted due to complications and thereby tested for SARS-CoV-2. A French study reports that the proportions of obesity, maternal age > 35 years and preexisting diabetes were higher in those with critical disease than in women with non-severe disease.¹⁵ This indicates that the proportion of disadvantageous maternal characteristics may also reflect the case composition in different studies. In our study, few women needed intensive care, in line with data reported in other studies.^{10-12,16} No maternal deaths occurred in our study. In the UK study by Knight et al,¹⁰ there were five maternal deaths (5/427) and in the French study by Kayem et al,¹⁵ one maternal death (1/617) was reported. Similar to the Chinese and Italian reports, few women needed intensive care and no women died.^{11,12}

Our observed vaginal birth rate of 70% was high compared with the early reports from China and the UK, where approximately 40% had a vaginal birth.^{10,17,18} Other studies report higher rates of around 60%.^{12,13} The proportion of vaginal births in the general birthing population in Sweden is around 80%.⁹ We observed a low frequency (4%) of test-positive neonates, confirming previous reports of little support for vertical transmission in both cesarean and vaginal births.^{12,19} Preterm birth was observed at a similar rate to that reported in previous studies^{10-12,15} but was more than three times the rate in the general birthing population in Sweden (approximately 6%).²⁰

Our data suggest that few women present with severe COVID-19 disease. Moreover, the present policy in Sweden with mode of delivery based on obstetric considerations does not seem to generate more test-positive neonates than reported by other studies. Since our information was captured only in women who were tested late in pregnancy with subsequent deliveries, this finding must be interpreted with great caution.

We observed high rates of comorbidities among the delivered women. Future studies should focus on identifying pregnant women at increased risk of complications caused by COVID-19. We noted a considerably higher rate of preterm birth compared with the general birthing population, which calls for further research regarding the mechanisms of preterm birth related to SARS-CoV-2 virus. Further, there is currently limited data on long-term follow-up of neonates born to mothers positive for SARS-CoV-2, warranting future studies in this field.

A strength with this case series is that we were able to disentangle ICU admissions due to COVID-19 disease from other indications, ie severe preeclampsia with a co-existing SARS-CoV-2-positive test. Further, we were able to describe important maternal characteristics. Of these, BMI is particularly important, since obesity is a risk factor for maternal pregnancy complications in general and has been described as a risk factor for developing severe COVID-19 disease in the non-pregnant population.⁷

A major limitation is the lack of a comparison group. Other limitations include the small sample size, the mixed policy for testing, and lack of possibility to present characteristics and outcomes stratified on test-positivity from screening vs symptoms. For this reason, generalization may not be possible until we have a larger sample of test-positive women to evaluate.

5 | CONCLUSIONS

In this case series of 67 test-positive women, few women presented with severe COVID-19 illness. The majority of these had a vaginal birth at term with a healthy neonate that was test-negative for SARS-CoV-2.

CONFLICT OF INTEREST

None.

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