CANADIAN SURVEILLANCE OF COVID-19 IN PREGNANCY: EPIDEMIOLOGY, MATERNAL AND INFANT OUTCOMES

Report #1: Released December 2nd, 2020

Early Release: Maternal and Infant Outcomes (March 1, 2020 to September 30, 2020) from Three Canadian Provinces

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Funders: Provincial Health Agency of Canada, the Canadian Institutes for Health Research, the Better Outcomes Registry & Network Ontario and the BC Women's Health Foundation

BACKGROUND

In December 2019, a novel coronavirus, eventually named Severe Acute Respiratory Syndrome associated Coronavirus-2 (SARS-CoV-2) was identified in Wuhan, China. On March 11, 2020 the World Health Organization declared Coronavirus Disease 19 (COVID-19), the respiratory illness caused by SARS-CoV-2 infection, an official global pandemic. Although this report will focus on pregnant positive cases from March 1st until September 30th, 2020, the current global statistics are as follows. As of November 22nd, 2020, globally, COVID-19 has infected more than 50,000,000 people and caused over 1,000,000 deaths.[1] As of November 25th, 2020, Canada has seen over 300,000 cases and more than 11,000 deaths.[2]

Given that pregnant women exhibit greater susceptibility to severe illness from some other respiratory infections including both Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS), the global spread of COVID-19 raises unique questions and significant concerns for the health of this priority population.[3,6] Until recently there was a global dearth of data regarding the burden of COVID-19 on pregnant populations. A number of early reports concluded there was no increased risk of severe illness related to COVID-19 in pregnant compared to non-pregnant populations.[8] However, more recent reports internationally have started to present evidence to the contrary, For example, US reports indicate that pregnant people appear to be at increased risk of admission to the intensive care unit (ICU).[4,5] They are also more likely to require ventilation and extracorporeal membrane oxygenation.[4,5]

Current data also suggests that COVID-19 has been associated with adverse pregnancy outcomes.[4,7,9] According to the US Centre for Disease Control and Prevention (US CDC), among 3912 live births with reported gestational age, 12.9% were born preterm (<37 weeks gestation) compared to 10.2% in the general US population.[7] Of those COVID-19 related preterm births, 3.8% were delivered at <34 weeks gestation.[7] Increased frequency of preterm births has also been documented in a living systematic review of COVID-19 in pregnancy.[4] Further to this, among term infants, 9.3% were admitted to the neonatal ICU (NICU).[7]

Adding to the growing body of evidence that suggests that pregnant women are at increased risk of severe illness related to COVID-19, this report highlights preliminary findings from three provinces [Ontario (ON), Alberta (AB), and British Columbia (BC)] participating in the Canadian Surveillance of COVID-19 in Pregnancy: Epidemiology, Maternal and Infant Outcomes (CANCOVID-Preg) project. On behalf of public health officials, with support from the Provincial Health Agency of Canada, the Canadian Institutes for Health Research, the Better Outcomes Registry & Network (BORN) Ontario and the BC Women's Health Foundation, this national, prospective, surveillance project was initiated in order to monitor pregnant women during the pandemic and assess both maternal and infant outcomes related to COVID-19. This national surveillance initiative is supported by central coordination at the University of British Columbia, based at the Women's Health Research Institute, in Vancouver, BC.

METHODS

Data on laboratory-confirmed COVID-19 affected pregnancies were electronically reported to the CANCOVID-Preg team in each province by provincial public health. For AB and BC, clinical information was abstracted from medical records for affected pregnancies and entered directly into a Research Electronic Data Capture (REDCap) database, which utilizes a robust data confidentiality and security protocol. In ON, data was entered, at the point of care, into a data collection tool and securely transferred to the BORN Information System (where it was linked with the corresponding pregnancy or birth record). Only high-level summary data was amalgamated for the purposes of this first report (i.e., individual, record-level data is not yet available). Given the rapidly evolving nature of the pandemic, and the implications that this data has for pregnant populations in Canada, the CANCOVID-Preg Investigative Team resolved to release an early interim report. Of note the data for this report was censored at September 30th and future data pulls will be done monthly or bimonthly.

Available subset data (ON, AB, BC) for n=430 pregnant positive cases, from March 1st 2020 until September 30th, 2020 were therefore amalgamated for this report (with the exception of Figure 1). Data elements have varying denominators based on the data sources used in each of the three participating provinces. Cells with less than 6 data points have been aggregated and reported as <6.

RESULTS

To provide perspective, we are reporting on 430 of the 1584 cumulative, pregnant, positive cases that were reported in Canada as of November 23rd, 2020 (Figure 1). Of the 1584 cases, 172 resided in BC, 345 in AB, and 387 in ON (Figure 1). Figure 2 illustrates the cumulative progression of pregnant positive cases among 6 Canadian provinces. Notably, Alberta's cases increased from less than 200 on September 7th to over 300 by September 21st, 2020.

Among pregnant positive cases, 41.4% were between the ages of 30 and 35 (Table 1). Most cases were diagnosed between 28 and 37 weeks gestation (34.9%), with infection most often acquired via the community-at-large (69.7%). The most common underlying conditions in the subset were obesity and diabetes (10.7% and 5.2%, respectively) and the most common symptoms were cough (47.3%), fever (28.3%), anorexia (26.2%), and sore throat (25.6%) (Figure 3). The rate of hospitalization was 11% and rate of ICU admission was 2.3%. Notably, compared to their non-pregnant counterparts, pregnant women were at increased risk of being hospitalized (RR = 6.57, 95% CI: 4.82 to 8.95) and admitted to the ICU (RR=8.49, 95% CI: 4.13 to 17.46) (Table 3).

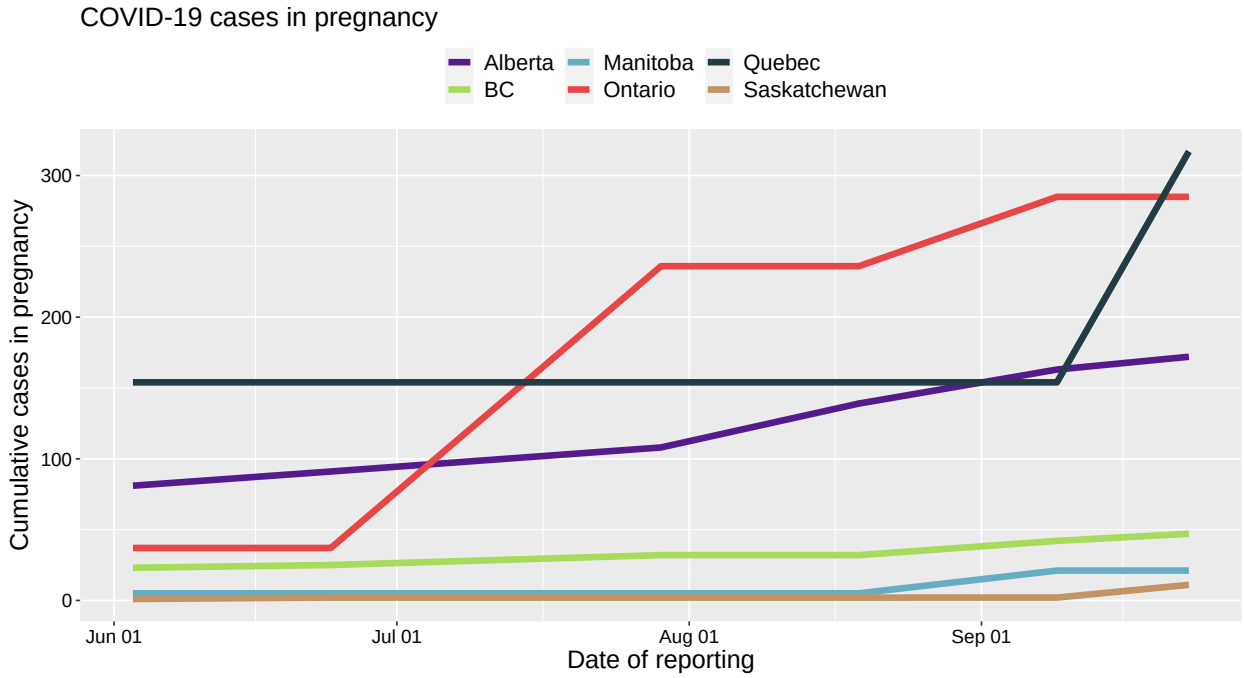
Among the 311 reported pregnancy outcomes, 94.9% were live births and < 6 were stillbirths (≥20 weeks gestation) (Table 4). Among pregnant positive deliveries, 85% occurred at term, with 15% born preterm. Information on spontaneous versus medically indicated preterm birth rates is forthcoming. The majority of infants (85.3%) were in the normal range for birth weight (i.e., 2500-4000 grams) (Table 5). Most infants were not admitted to the NICU (84.6%). To date, of the 46 infants tested for SARS-CoV-2, < 6 nasopharyngeal swabs have indicated a positive result (Table 6).

DISCUSSION

In this preliminary CANCOVID-Preg analysis, data from three provinces was amalgamated to facilitate early planning and support for COVID-19 affected pregnancies in Canada. Similar to the US findings, in this interim analysis, pregnant women diagnosed with COVID-19 were more likely than their non-pregnant counterparts to be hospitalized and admitted to the ICU. This finding may be related to physiological and immunological changes that occur during pregnancy, resulting in a greater predisposition and susceptibility to more severe consequences of infection.[3] Unlike findings reported by the US CDC and the living systematic review of COVID-19 in pregnancy, the majority of deliveries in our sample, to date, occurred at term (85%) and most infants were not admitted to the NICU (84.6%).[3,7] This discrepancy may be due to the selection of more severe cases of COVID-19 in the US CDC report in relation to CANCOVID-Preg wherein reporting from public health may provide a broader clinical spectrum of the virus during surveillance. Infant SARS-CoV-2 testing was infrequent, however among infants known to be tested, positive cases were rare. This finding supports the growing body of evidence that perinatal infection is uncommon.

Our preliminary analysis is subject to a number of limitations. First, only three provinces were able to participate in this subset. Results are therefore not representative of the entire Canadian context. However, these three provinces represent approximately 60% of pregnancies in Canada.[10] Subsequent analyses will be conducted with additional provincial/territorial representation for a more comprehensive understanding of the national burden of COVID-19 in pregnancy. Next, for a number of outcomes, cell sizes were too small to draw meaningful conclusions. Also, hospitalization, ICU admission, and ventilation data among non-pregnant COVID-19 positive females (aged 18-45) residing in AB was not available. Finally, clinical guidelines for infant SARS-COV-2 testing, following delivery, have not yet been standardized in Canada resulting in a deficit of data related to this outcome. Despite these limitations, this preliminary report can help inform public policy and urgently needed evidence-based guidelines for clinical care during a rapidly evolving global pandemic. The Canadian maternity care system is a global leader and informs maternity care in many countries internationally. With an assembled pan Canadian team, we are poised to provided critical Canadian data to guide healthcare for pregnant women and their infants.

FIGURE 1. Prevalence of pregnant positive cases in Canada (as of Nov. 23rd, 2020).



*Reports of infection for other participating provinces/territories were not available during this time period.

FIGURE 2. Cumulative prevalence of pregnant positive cases among 6 Canadian provinces from June until September 30, 2020.

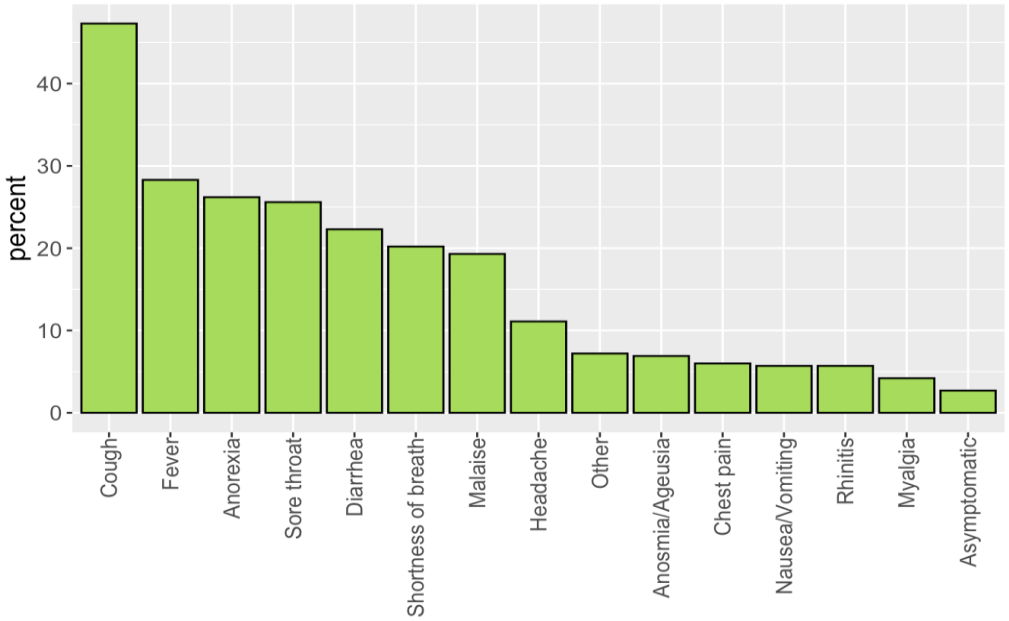


FIGURE 3. Maternal COVID-19 symptomatology among n=332 pregnant positive cases from March 1, 2020 until September 30, 2020 in ON, BC, and AB.

TABLE 1. **Maternal characteristics from March 1, 2020 until September 30, 2020 in ON, BC, and AB**

Gestational age at diagnosis (weeks) n = 215	**n**	**Percent**
<14	15	7.0
14-27	70	32.6
28-37	75	34.9
38-42	55	25.6
Maternal age (years) n = 430	**n**	
<30	144	33.5
30-35	178	41.4
36+	108	24.0
Maternal underlying conditions n = 422	**n**	**Percent**
Obesity (BMI ≥30kg/m2)	45	10.7
Diabetes mellitus	22	5.2
Other	8	1.9
Chronic hypertension	7	1.7
Chronic lung disease	0	0.0
Immunosuppression	0	0.0
Mode of COVID-19 acquisition n = 264*	**n**	**Percent**
Community	184	69.7
Healthcare worker	39	14.8
Other	20	7.6
Travel	16	6.1
Unknown	13	4.9

* Categories are not mutually exclusive

TABLE *2.* Maternal COVID-19 hospitalizations/interventions from March 1, 2020 until September 30, 2020 in ON, BC, and AB

Features/Interventions n = 353	**n**	**Percent**
Hospitalization	39	11.0
Fever	12	3.4
Abnormal X-ray or pneumonia	9	2.5
ICU admission	8	2.3
Oxygen	8	2.3
Coagulopathy	<6	NA
Mechanical ventilation	<6	NA
Other (sepsis)	<6	NA

TABLE 3. Hospitalizations, ICU admissions, and ventilation among pregnant COVID-19 positive females (18-45) in BC AB and ON compared to non-pregnant COVID-19 positive females in BC and ON

	Pregnant COVID positive female cases in BC AB and ON (n=353)	**Non-pregnant COVID positive female cases in BC and ON (n=28,472)**	**RR**	**95%CI**
Number and percent hospitalized	39 (11.0%)	479 (1.7%)	6.57	4.82 to 8.95
Number and percent admitted to ICU	8 (2.3%)	76 (0.3%)	8.49	4.13 to 17.46
Number requiring mechanical ventilation	<6	Not available	NA	NA

TABLE 4. Pregnancy Outcomes from March 1, 2020 until September 30, 2020 in ON, BC, and AB

Gravidity n = 290	**n**	**Percent**
1	74	25.5
≥2	216	74.5
Parity n = 290	**n**	
0	95	32.8
1	116	40.0
≥2	79	27.2
Multiple pregnancy n = 389	**n**	**Percent**
Multiple	7	1.8
Singleton	382	98.2
Pregnancy outcome n = 311	**n**	**Percent**
TA	<6	N/A
SA	<6	N/A
Stillbirth (≥20 weeks GA)	<6	N/A
Live birth	295	94.9
Mode of delivery n = 294	**n**	**Percent**
Cesearean section	98	33.3
Vaginal	196	66.7
Labour n = 285	**n**	**Percent**
Spontaneous	145	50.9
Induced	100	35.1
No labour	40	14.0
GA at delivery n = 334	**n**	**Percent**
Term	284	85.0
Preterm (<37 weeks)	50	15.0

TABLE 5. Infant Outcomes from March 1, 2020 until September 30, 2020 in ON, BC, and AB

Apgar (5 minutes) n = 293	**n**	**Percent**
<7	6	2.0
≥7	287	98.0
Birth weight (g) n = 306	**n**	**Percent**
Low (<2500 g)	26	8.5
Normal (2500-4000 g)	261	85.3
High (>4000 g)	19	6.2
Small for Gestational Age (SGA) n = 230	**n**	**Percent**
No	220	95.7
Yes	10	4.3
Care until discharge n = 117	**n**	**Percent**
Asymptomatic and isolated from mother	<6	N/A
Asymptomatic and kept with well mother	65	55.6
Symptomatic and isolated from mother	<6	N/A
Transferred due to clinical needs	7	6.0
Other	<6	N/A
Infant feeding n = 117*	**n**	**Percent**
Breastfed	78	66.7
Expressed breast milk	16	13.7
Donor milk	7	6.0
Substitute/formula	52	44.4
IV and/or TPN	<6	NA
NICU admission n = 305	**n**	**Percent**
No	258	84.6
Yes	47	15.4

TABLE 6. Infant SARS-CoV-2 testing March 1, 2020 until September 30, 2020 in ON, BC, and AB

Result n = 46	**n**	**Percent**
Positive	<6	N/A
Negative	37	80.4
Result pending	<6	N/A
Not performed	<6	N/A

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Additional Territories – low burden of COVID-19 – will be added should there be a shift in the pandemic

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