

Myths versus facts: COVID-19 vaccine effects on pregnancy, fertility, and menstruation

Some of the most prevalent myths and the latest facts about fertility and COVID-19.

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Reproductive-age women and birthing persons may be hesitant to receive the COVID-19 vaccines due to concerns about hypothetical effects on pregnancy and fertility. Community physicians are well positioned to help share reliable and trustworthy

advice with patients who may have been exposed to disinformation online. However, keeping up with the latest myths and facts can be challenging in an era where both science and social media move rapidly. This article addresses some of the most prevalent myths and shares the latest facts about fertility and COVID-19.

Fact: The COVID vaccine does not cause infertility.

Disinformation about vaccines and miscarriage appears to have flourished in December 2020, when a blog post surfaced citing that a former employee of Pfizer believed that antibodies resulting from the COVID-19 vaccine could attack the placenta.¹ Subsequently, a myth propagated that antibodies that recognize the SARS-CoV-2 spike protein could cross-react with placental proteins called syncytins. Syncytin-1 protein acts in cell-to-cell adhesion, playing an essential role during placental attachment to the uterus during pregnancy; therefore, these claims provoked fear of placental damage with COVID-19 vaccination.² Since then, the original blog post has been taken down, and this myth has been debunked in several ways. Researchers have investigated the coronavirus's spike protein and compared it with placental syncytin-1, finding no significant similarities in their amino acid sequences.³ They also looked at serum from women with COVID-19 and did not detect reactions between these patients' antibodies and the syncytin-1 protein.³ Furthermore, if these myths were true about COVID-19 antibodies attacking placental syncytins, the pandemic

would have theoretically led to mass sterilization and miscarriage in women naturally infected with the virus, which has not occurred.

Despite the accumulating safety data, false rumors have continued to spread about the COVID-19 vaccines and infertility, generating feelings of hesitancy among pregnant people and people who plan to conceive. Recently, vaccine clinical trials have demonstrated that the rate of accidental pregnancies in vaccinated groups (29 of 39 848 individuals, 0.073%) was not significantly different from that in unvaccinated groups (28 of 39 845 individuals, 0.070%).¹ These findings suggest that fertility rates do not decrease with COVID-19 vaccination. A recent statement from the Society of Obstetricians and Gynaecologists of Canada confirmed: "There is absolutely no evidence, and no theoretic reason to suspect that the COVID-19 vaccine could impair male or female fertility. These rumors are unfounded and harmful."⁴

Research has also been conducted to address concerns regarding the impact of COVID-19 infection on fertility and assisted reproductive technology outcomes. A retrospective cohort study published in *The Lancet* followed 65 patients positive for SARS-CoV-2 antibodies and 195 matched patients negative for SARS-CoV-2 antibodies who underwent assisted reproductive technology treatments.⁵ Clinical pregnancy rates in the control group (54 clinical pregnancies out of 110 embryo transfer [ET] cycles, 49.1%) were not significantly different from rates in patients with mild or asymptomatic COVID-19 infections

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(14 pregnancies out of 32 ET cycles, 43.8%).⁵ Overall, results showed no differences in ovarian reserve, ovarian response, biochemical pregnancy rate, clinical pregnancy rate, early miscarriage rate, and implantation rate between the case and control groups, demonstrating that COVID-19 infection has no impact on female fertility or assisted reproductive technology outcomes.⁵ Another observational study looked at 1347 pregnant women positive for SARS-CoV-2 infection in which 1273 (94.5%) had spontaneous pregnancies and 74 (5.5%) had IVF pregnancies. The distribution of asymptomatic and symptomatic patients was similar between the two conception groups (43.2% of IVF pregnancies had asymptomatic infections versus 51.5% of spontaneous pregnancies with asymptomatic infections; $P = .166$), and the analysis of clinical presentation (mild to moderate symptoms, pneumonia, complicated pneumonia/shock) between the two groups showed no significant differences.⁶ Overall, the COVID-19 symptomatology and symptom severity were the same in both the IVF and spontaneous conception groups.⁶ Furthermore, recent investigations show that receiving the SARS-CoV-2 mRNA vaccine has no effects on patients' performance in their subsequent IVF cycle, specifically no differences in patients' ovarian reserve or developing gametes and embryos.⁷ Thirty-six couples received two doses of vaccines and resumed their subsequent IVF treatment cycle 7 to 85 days after the second vaccine.⁷ Three pregnancies were recorded in 10 patients who underwent ET, indicating an acceptable pregnancy rate (30% per transfer).⁷ In January 2022, a study published in *Obstetrics & Gynecology* included 222 vaccinated and 983 unvaccinated patients who underwent ovarian hyperstimulation cycles.⁸ Results show no association between COVID-19 vaccination and fertilization rates.⁸ Moreover, 214 vaccinated and 733 unvaccinated patients who underwent frozen-thawed embryo transfer also showed a lack of significant association between COVID-19 vaccination and clinical pregnancy (adjusted odds ratio [aOR] 0.79; 95% CI, 0.54-1.16).⁸ Community physicians might find it helpful to be aware of these emerging findings regarding assisted reproductive technology, COVID-19, and COVID-19 vaccines to

address patient questions with accurate information and guide clinical decision-making.

Fact: The COVID-19 vaccine does not increase the risk of miscarriage or stillbirth.

Some young women and birthing persons are reluctant to be vaccinated because they fear it might affect a current or future pregnancy. This myth has become so pervasive that even some health care professionals have reported delaying vaccination. For example, members of the BC Nurses' Union were reported to

Current research shows that COVID-19 vaccines do not cause infertility or increase the risk of miscarriage or stillbirth.

have expressed concerns about the effects of COVID-19 vaccines on fertility and pregnancy, which contributed to many young nurses and other health care workers in BC remaining unvaccinated.⁹ Several studies have debunked these myths and confirmed that the risk of miscarriage after receiving the COVID-19 vaccine was not increased compared to the general population.¹⁰ Correspondence published in the *New England Journal of Medicine* found that out of 2456 participants enrolled in the Centers for Disease Control and Prevention's v-safe COVID-19 Vaccine Pregnancy Registry, the cumulative risk of spontaneous abortion from 6 to less than 20 weeks of gestation was 14.1% (95% CI, 12.1-16.1). This is consistent with the expected risk of spontaneous abortion of 11% to 22% in all recognized pregnancies.¹⁰ Additionally, BORN Ontario reports the stillbirth rate in individuals who received one or more COVID-19 vaccine doses before or during pregnancy to be 0.35%, which is similar to background stillbirth rates of 0.4% to 0.6% in Ontario.¹¹ The University of Washington conducted a prospective cohort study including 17 525 participants who were pregnant, lactating, or planning a pregnancy at the time of their first dose of the COVID-19 vaccine.¹² Results show that the odds of having several reactions

were statistically significantly decreased in pregnant individuals (i.e., fever after Pfizer dose 2: OR 0.44; 95% CI, 0.38-0.52; $P < .001$ and after Moderna dose 2: OR 0.48; 95% CI, 0.40-0.57; $P < .001$) compared with individuals who were not pregnant or lactating.¹² Obstetrical symptoms were reported in 346 of 7809 (4.4%) pregnant participants after the first vaccine dose and in 484 of 6444 (7.5%) pregnant participants after the second dose.¹² Overall, vaccine reactions and experiences were well tolerated and similar between pregnant or lactating individuals versus age-matched individuals who were neither pregnant nor lactating.¹² These findings were consistent with early data from the Canadian COVID-19 Vaccine Registry for Pregnant and Lactating Individuals (COVERED), showing no adverse events associated with the vaccines.¹² A large registry published in the *New England Journal of Medicine* reported that among 35 691 v-safe participants aged 16 to 54 who identified as pregnant, local and systemic reactions (injection-site pain, fatigue, headache, myalgias) were similar to patterns observed in nonpregnant women.¹³ Of the 3958 participants enrolled in the v-safe pregnancy registry, 827 individuals completed their pregnancies, with 86.1% live births, 12.6% spontaneous abortions, 0.1% stillbirths, and 1.2% with other outcomes. These findings were comparable to incidences published in current literature; therefore, results do not indicate any adverse pregnancy or neonatal outcomes in those who received mRNA COVID-19 vaccines.¹³ In summary, all the data at hand confirm that COVID-19 vaccines do not increase miscarriage or stillbirths in pregnant persons, and current literature suggests no safety concerns in those who are pregnant or lactating.

In contrast, a considerable amount of data show that outcomes are worse in pregnant individuals infected with SARS-CoV-2. COVID-19 is more likely to adversely affect pregnant women, leading to a 7% to 11% risk of being hospitalized for COVID-19-related morbidity, and a 1% to 4% risk of requiring intensive care.¹⁴ A Canada-wide study, CANCOVID-Preg, reported that pregnant people with COVID-19 infection have a stillbirth rate of 1.06%, which is twice that of the general population, though recent data suggest

the numbers are closer to population-level rates of 0.5%.¹⁵ Another complication is premature delivery, occurring in around 21.8% of pregnant individuals infected with COVID-19.¹⁶ Pre-term birth can result in extended stays in the neonatal intensive care unit (NICU) and may even lead to infant mortality. Research has also shown an association between certain risk factors, including age (≥ 35 years old), asthma, obesity, diabetes, hypertension, and heart disease, which increases the risk of severe morbidity from COVID-19 infections in pregnant persons.¹⁴ Given the abundance of data available, there are strong recommendations from the Society of Obstetricians and Gynaecologists of Canada and the National Advisory Committee on Immunization for pregnant, breastfeeding, and planning-to-become-pregnant individuals to receive the COVID-19 vaccine.^{14,17} Community physicians continue to take on the challenging and vital role of addressing the public's concerns about vaccine safety and encouraging vaccinations in pregnant people and people who plan to conceive.

Fact: The COVID-19 vaccine does not have enduring effects on menstrual periods.

News media have raised concerns regarding COVID-19 vaccines and their effects on menstruation.¹⁸ Until recently, information surrounding abnormal vaginal bleeding after vaccination has been anecdotal, and vaccine manufacturers did not record or report side effects related to menstruation.¹⁹ However, patient experiences may prompt questions about the vaccines and their effects on the menstrual cycle.¹⁹ In particular, vaccine hesitancy in the young population has been driven by false claims that COVID-19 vaccines and changes in menstrual cycles could negatively impact future pregnancy.²⁰ These concerns highlight the need for reproductive health outcomes to be included in postvaccine surveillance. Five institutions are now funded by the National Institutes of Health to conduct studies to examine this relationship between vaccination and irregular menstruation, and to address concerns that may be preventing women from receiving their COVID-19 vaccines.²¹

In January 2022, a study published in *Obstetrics & Gynecology* included 3959 individuals

Key points

- Current research shows that COVID-19 vaccines do not cause infertility or increase the risk of miscarriage or stillbirth.
- COVID-19 infection in pregnant women increases the risk of hospitalization, ICU admissions, premature delivery, and NICU admissions.
- Several guidelines, including those from the Society of Obstetricians and Gynaecologists of Canada and the National Advisory Committee on Immunization, strongly recommend COVID-19 vaccination for pregnant, breastfeeding, and planning-to-become-pregnant individuals.
- Recent studies are reporting minimal impact of COVID-19 vaccination on menstruation.
- Community physicians have a challenging and important role to play in keeping up with emerging vaccine myths versus scientific data to address the public's concerns about vaccine safety and to increase the public's trust in vaccines.

(2403 vaccinated) who prospectively tracked their cycles on a smartphone application. Overall, vaccination was associated with a less-than-one-day change in menstrual cycle length (first dose 0.71-day increase; 98.75% CI, 0.47-0.94; second dose 0.91-day increase; 98.75% CI, 0.63-1.19).²² Additionally, a retrospective study included 177 patients in a menstrual analysis and found that a quarter of patients with COVID-19 infections had influences on menstrual volume (20% had a significant decrease in menstrual volume and 5% had an increase in menstrual volume). Further analysis showed that 18% of patients had prolonged menstrual cycles, 3% had shortened cycles, and 7% showed cycle disorders. Follow-up determined that 84% of participants returned to their normal menstrual volume and 99% returned to their regular menstrual pattern after 1 to 2 months, suggesting that menstrual changes due to COVID-19 were temporary and quick to resolve.²³ Likewise, in the UK, most individuals who observed menstrual changes after vaccination also reported that their cycles returned to normal and changes were transient.²⁴ In total, 51 211 suspected menstrual cycle reactions were recorded in the UK, which is relatively low given that 74.1 million doses of COVID-19 vaccines had been administered by May 2022.²⁴ These studies, together, increase our confidence in the minimal impact of COVID-19 vaccines on menstruation. Current theories of changes in menstrual cycles focus on changes in the

immune system after receiving vaccinations.²⁵ In particular, shedding of the uterine lining during menstruation is an inflammatory response that involves the immune system. Therefore, vaccines that function by activating an immune response may temporarily change the normal course of menstruation. However, it is expected that if changes are noted, these changes would be short-term. To confirm these theories, controlled studies will need to be conducted, and researchers should put greater emphasis on including menstrual cycle tracking in future vaccine clinical trials. ■

Competing interests

Dr Dunne was a member of the *BCMJ* Editorial Board when this article was written, and is now the journal's editor, but did not participate in making the publication decision regarding this article.

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If monkeypox infection is confirmed

Advise the patient to continue infection control measures until all lesions have healed (i.e., the scabs have fallen off and re-epithelialization has occurred). Local public health will follow up with the patient for case and contact management. Treatment is largely supportive and focused on symptoms. ■

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