COVID-19 IMMUNITY TASK FORCE

GROUPE DE TRAVAIL SUR L'IMMUNITÉ FACE À LA COVID-19

Summary report # 7

COVID-19 vaccine safety

Background

Since the introduction of COVID-19 vaccines, more than 11.5 billion doses have been administered to 5.6 billion people worldwide – more than 66% of the global population (1). In Canada, as of April 14th 2022, more than 83 million does of vaccine were administered (2). Based on this extensive use in real world settings, the data have shown that the COVID-19 vaccines are safe.

Surveillance in Canada has revealed that adverse effects from immunization (AEFI) are exceedingly rare (2):

- Total reported adverse events following immunization: **0.054%**[1]
    - Non-serious – **0.043%**
    - Serious – **0.011%**
    - Deaths – **0.00000273%** (224*)
        - *includes 56 cases still under investigation as to whether they were caused by a vaccine.

All vaccines approved in Canada went through rigorous testing during clinical trials and passed stringent approval processes under the auspices of Health Canada. The COVID-19 Immunity Task Force (CITF) and its Vaccine Surveillance Working Party continue to support vaccine safety and effectiveness studies of approved COVID-19 vaccines in collaboration with:

- Public Health Agency of Canada (PHAC)
- Canadian Immunization Research Network (CIRN)
- National Advisory Committee on Immunization (NACI)

Nonetheless, vaccine safety is a valid concern, about which we seek to reassure the public by presenting evidence from ongoing research. With this in mind, the CITF assembled a panel of experts to address the latest evidence regarding COVID-19 vaccine safety for the seventh in our *Research Results and Implications* seminar series, in partnership with CanCOVID.

[1] Data to April 8, 2022 https://health-infobase.canada.ca/covid-19/vaccine-safety/

Researchers and CITF-funded studies included

Focus	Lead researcher(s) and affiliation	Research population	Location of study
Introducing vaccine safety	**Dr. Scott Halperin** Dalhousie University, Chair of the CITF Vaccine Surveillance Working Party	General	Global perspective
Canadian National Vaccine Safety (CANVAS-COVID) Network	**Dr. Julie Bettinger** University of British Columbia	Pediatric (age 5 to 17) - Pregnant population	Canada
Canadian Immunization Monitoring Program, ACTive (IMPACT) - Special Immunization Clinic Network	**Dr. Karina Top** Dalhousie University	Pediatric (age 0 to 16) - Patients age 5 and older	Canada
Myocarditis / pericarditis following mRNA vaccine	**Dr. Jeff Kwong** University of Toronto	People over the age of 12	British Columbia, Ontario, Quebec

At a glance: key findings from CITF-funded research

The findings in this summary are preliminary and, for the most part, unpublished, and have therefore not yet been peer-reviewed. Details about these findings are found below.

Key findings[2]:

- The **Pfizer vaccine is well-tolerated in children**, causing minor effects such as soreness, swelling, and redness at the injection site in approximately half of those to whom it is administered, but rarely provoking severe events that disrupt normal activity or necessitate a medical visit.
- Most patients with adverse events following immunization (AEFIs) requiring assessment in by a SIC-affiliated expert were **safely revaccinated** with a COVID-19 vaccine.
- Myocarditis and pericarditis (1971 cases reported in Canada) following mRNA vaccines are among the safety concerns being actively monitored by Health Canada (along with thrombosis with thrombocytopenia syndrome – 269 cases - and Guillain-Barré Syndrome - 39 cases). **Research has revealed strategies that can mitigate the risk of myo/pericarditis**:
    - Avoid giving Moderna vaccines to adolescents and young males (at least under the age of 30, and perhaps under 40).
    - Employ longer intervals between doses.
- Vaccines have not been shown to adversely effect pregnancy outcomes.
- More pregnant people **experience serious events from COVID-19 infections than from COVID-19 vaccination**, which tend to be more severe in this population than in non-pregnant controls.

[2] Data accurate as of May 5, 2022.

More in depth

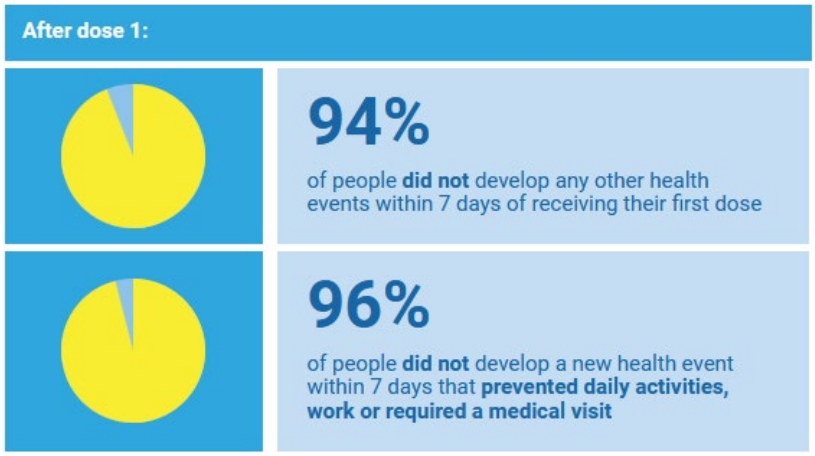
COVID-19 vaccines are safe, rarely causing serious adverse effects

- **Mild adverse effects** – such as pain, swelling, or redness at the injection site – are frequent (53% adults and 48% children after dose 2)[3,4].
- **Moderate effects** – which prevent daily activities but do not require further medical intervention are common. These include headache (4.3% adults and 2.1% children after dose 2), flu-like symptoms (fatigue, muscle-ache, general feeling of being unwell, 6% adults and 2.8% children after dose 2), nausea, vomiting, diarrhea (2.3% adults and 1.4% children after dose 2) and fever (1.5% children after dose 2)[3,4].
- **An event is considered serious** if it:
    - is life-threatening (patient was at risk of death at the time of the event/reaction),
    - requires in-patient hospitalization or prolongation of existing hospitalization,
    - results in persistent or significant disability/incapacity,
    - results in a congenital anomaly/birth defect,
    - results in death

  Health Canada data shows that serious events are rare in adults and even more rare in children.

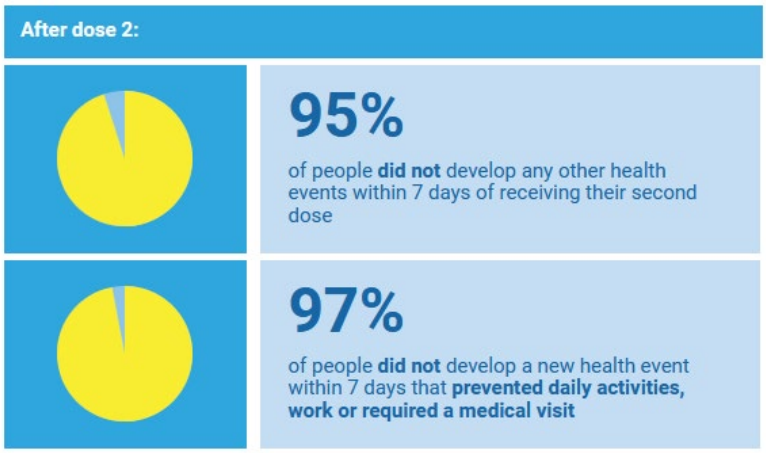
The Pfizer vaccine is well-tolerated in children

CANVAS-COVID gathered safety data on the Pfizer vaccine in those under the age of 16 after a first dose (almost 250,000 participants) and second dose (nearly 125,000 participants) as of April 20, 2022. The findings, presented by Dr. Julie Bettinger, revealed that those **health events considered severe (defined as causing work or school absenteeism, preventing daily activities or requiring a medical visit) were very uncommon**. Approximately half of those who were vaccinated did experience pain, swelling or redness at the injection site (46% following a first dose and 48% after the second). The percentages for any other events are shown in the figures below.



3- https://canvas-covid.ca/results/adult-results/
4 - https://canvas-covid.ca/results/pediatric-results/

FINAL



Dr. Karina Top presented Health Canada data, which includes data from her IMPACT study, revealing that **adverse effects following immunization were even more rare among children under the age of 17 than among adults**.

AEFIs in adults

Based on 318 adult patients referred to one of 15 Special Immunization Clinics (SIC) across Canada, Dr. Top showed that **most patients assessed for AEFIs were:**

- women
- between the ages of 40 and 64
- following a Pfizer vaccine.

The majority of patients were seen for adverse events following a first vaccine dose. Most patients were revaccinated without recurrence of their adverse events.

Myocarditis / pericarditis

Multiple countries, including Canada, have reported increased myocarditis (inflammation of the heart muscle) and pericarditis (inflammation of the lining around the heart) risk after mRNA vaccines, especially among **adolescent and young adult males, after a second dose, and following the Moderna vaccine**. Independent of COVID-19, before the pandemic, males had higher rates of myocarditis and pericarditis than females (in the 12- to 59-year-old age group for myocarditis and for all males 12 and older for pericarditis) (3).

Dr. Jeff Kwong's study uncovered distinct patterns underlying the occurrence of these conditions based on age, gender, vaccine type, and dosing intervals:

- For those ≥40 years, the myocarditis/pericarditis incidence was higher after SARS-CoV-2 infection than after mRNA vaccination, especially in males.
- For those 30-39 years, the myocarditis/pericarditis incidence was higher after infection than after vaccination for females and Pfizer recipients.

- For those 18-29 years, the myocarditis/pericarditis incidence was higher after the Moderna vaccine than after an infection for males.
- For those 12-17 years, the myocarditis/pericarditis incidence was comparable after a SARS-CoV-2 infection and after a Pfizer vaccine.
- The incidence of myocarditis/pericarditis is higher with a shorter dosing interval compared to with a longer dosing interval for those over the age of 18 years.

Dr. Kwong points out that **the overall benefits of vaccination must be taken into account** when assessing the risk of this particular effect.

Vaccination did not increase the risk of miscarriages or other pregnancy complications

There was **no difference in pregnancy-related events between those vaccinated with COVID-19 vaccines and those unvaccinated**, pointed out Dr. Bettinger, based on the CANVAS-COVID study (4). Also, pregnant people experienced no more adverse effects from vaccination than individuals who were not pregnant. CITF-funded researcher Dr. Deborah Money had previously shown, in her CANCOVID-Preg data, that unvaccinated pregnant people had a **higher risk of severe outcomes (including hospitalization and ICU admission) from COVID-19 infection than from vaccines** (5).

The data show mRNA vaccines are **safe in pregnancy**:

- Those who are pregnant did not have different rates or types of AEFI than non-pregnant people from vaccination.
- There was no difference in emergency department visits or hospitalization between vaccinated and unvaccinated pregnant people.
- No differences were detected for pregnancy related events between vaccinated and unvaccinated pregnant people

It is noteworthy that pregnant people were more likely than non-pregnant vaccinated individuals to visit emergency departments or be hospitalized following a second dose of the Moderna vaccine. This difference was not noted between vaccinated and unvaccinated pregnant people.

Policy implications

COVID-19 vaccinations have proven themselves to be very safe through extensive real-world use around the globe. As such, NACI and public health authorities in all jurisdictions across Canada recommend that those over the age of 12 receive three doses of vaccine. As antibody levels to SARS-CoV-2 have been shown to wane over time, fourth doses are being made available to some populations, especially the elderly and immune compromised populations (Quebec has made fourth doses available for all adults).

Strategies to mitigate against the risk of adverse effects:

1. Dr. Kwong recommends the **Pfizer vaccine for males under 30** and **longer intervals** between doses (>8 weeks) intervals for all adults in order to reduce the risk of myocarditis and pericarditis.

2. As Dr. Halperin made clear, **vaccine hesitancy** – which remains a significant impediment to efforts at mitigating the severity of illness caused by SARS-CoV-2 – is driven largely by misperceptions.

   Dr. Halperin suggested that public health interests would be well-served by strategic efforts to **disseminate the facts that emphasize the truth behind COVID-19 vaccines**:
   - far from being new to science, lessons learned from SARS-CoV-1 – with which Toronto was particularly hard hit in 2003 – have informed the approach to SARS-CoV-2;
   - mRNA vaccines are a well-studied technology that has been in clinical trials for more than a decade;
   - a “moon shot” strategy and the adoption of regulatory efficiencies helped streamline vaccine development without resorting to short cuts.

3. **Continued education** will be necessary to convince people that vaccination is their most effective protection against COVID-19. Dr. Bettinger suggests counseling of expected AEFIs can help ease concerns of pregnant people. Indeed, advice offered by trusted medical professionals is seen as an effective means of overcoming vaccine hesitancy.

4. Moreover, **continued vaccine surveillance** will be essential for monitoring adverse effects, analyzing the data, and devising strategies to minimize their occurrence. More than one-quarter of CITF-funded studies are concerned with these efforts to ensure the safety of Health Canada approved COVID-19 vaccines, in collaboration with PHAC, CIRN, and NACI.

References

1 https://www.bloomberg.com/graphics/covid-vaccine-tracker-global-distribution/, as of April 2022.

2 Data to April 8, 2022: https://health-infobase.canada.ca/covid-19/vaccine-safety/.

3 Nasreen S, Calzavara A, Buchan SA, Thampi N, Johnson C, Wilson SE, Kwong JC. **Background incidence rates of adverse events of special interest related to COVID-19 vaccines in Ontario, Canada, 2015 to 2020, to inform COVID-19 vaccine safety surveillance**. medRxiv 2022.01.12.22269169; doi: https://doi.org/10.1101/2022.01.12.22269169.

4 Sadarangani M, Soe P, Shulha H, Valiquette L, Vanderkooi OG, Kellner JD, Muller MP, Top KA, Isenor JE, McGeer A, Irvine M, De Serres G, Marty K, Bettinger JA. **Safety of COVID-19 vaccines in pregnancy: a Canadian National Vaccine Safety (CANVAS) Network study.** *medRxiv.* Feb 24, 2022 doi: https://doi.org/10.1101/2022.02.22.22271358.

5 McClymont E, Albert AY, Alton GD, et al. Association of SARS-CoV-2 Infection During Pregnancy With Maternal and Perinatal Outcomes. *JAMA.* Published online May 02, 2022. doi:10.1001/jama.2022.5906.