PREPRINT

The Case for Continuing COVID-19 Vaccination of Front-Line Workers in BC: Benefits Outweight the Risk for Thrombocytopenia

Amin Adibi[a]

[a]Respiratory Evaluation Sciences Program, Faculty of Pharmaceutical Sciences, University of British Columbia, Vancouver, BC, Canada

ARTICLE HISTORY
Compiled April 3, 2021

ABSTRACT
Recently, the National Advisory Committee on Immunization (NACI) recommended against using the AstraZeneca COVID-19 vaccine pending further review of the risk for Vaccine-Induced Prothrombotic Immune Thrombocytopenia (VIPIT). Using straightforward calculations and based on current evidence, we propose that even if the risk is found to be causally related to the AstraZeneca vaccine, the benefits of continuing immunization of essential workers with AstraZeneca by far outweigh the risk. We consider the case of British Columbia as an example. The province is expected to received an addtional 246700 doses of AstraZeneca vaccine through US and COVAX until April 11th, enough to provide the first dose of vaccine to all unvacinated front-line workers.We estimate that if British Columbia continues the front-line worker vaccination program as many as 600 lives could be saved for an expected mortalilty of only 1 person, even if all essential workers were under 55 and assuming the highest estimated rate of 1 in 100,000 currently reported for VIPID.

KEYWORDS
COVID19; astrazeneca; vaccination; essentialworkers; clots; thrombocytopenia; harm-benefit; BC

1. Background

Recently, NACI recommended against using AstraZeneca COVID-19 Vaccine for Canadians under the age 55, due to concerns about the incidence of Vaccine-Induced Prothrombotic Immune Thrombocytopenia (VIPIT) based on European reports (NACI 2021). On Match 18, 2021, the European Medicines Agency estimated the incidence of VIPID at approximately 1 per 1,000,000 people vaccinated with the AstraZeneca vaccine (EMA 2021). A higher estimated rate of 1 per 100,000 by the Paul-Ehrlich Institut in Germany was published on March 19th (PEI 2021). It was this higher rate reported by the Paul-Ehrlich Institut that led NACI to recommend against using this vaccine in adults under 55 years old (NACI 2021). BC had initially slated the AstraZeneca vaccine for outbreak control and essential workers vaccination program. on March 29th and following NACI's recommendation, BC paused using the AstraZeneca vaccine for those under 55 and put the essential workers program on hold.

On April 1st, the UK Medicines & Healthcare Products Regulatory Agency updated its own previously reported data to report a total of 22 cerebral venous sinus thrombo-

CONTACT Amin Adibi. Email: amin.adibi@ubc.ca

sis (CVST) and 8 other clot-related events from 18.1 million doses of the AstraZeneca vaccine (1.66 incidents per million).

Canadian provinces are expected to receive 1.5 million doses of the AstraZeneca vaccine through US and another 316,800 doses from the COVAX program between now and April 11th.

British Columbia expects to receive 246,700 doses from these two AstraZeneca deliveries, enough to finish providing the first dose to all remaining essential workers.

The 300,690 doses of Pfizer and 105,900 doses of Moderna vaccines expected within the same time frame are currently allocated for the priority groups, indigenous population, and age-based vaccination campaign currently vaccinating those in their 70s.

2. Harm-Benefit Analysis

Assuming that BC allocates all 246,700 doses to essential workers, we can estimate the expected number of deaths due to VIPID, $E(death)_{astrazeneca}$, as shown below. To err on the side of caution, we assume that each dose of the vaccine is independently associated with the risk for VIPID, and that all recipients are under 55 and as such at higher risk for VIPID. We also assume that there is enough uptake that BC is able to administer all these doses.

$$E(death)_{astrazeneca} = d \times P(VIPIT|AZ) \times P(death|VIPIT)$$

where d is the number of doses administered, $P(VIPIT|AZ)$ is the risk of VIPIT after receiving each dose, and $P(death|VIPIT)$ is the case fatality for VIPIT.

To err on the side of caution, we will follow NACI's lead and assume the highest reported rate of VIPIT, which is 1 in 100,000 recipients, so $P(VIPIT|AZ) = \frac{1}{100,000}$. On the other hand, as reported by NACI, case fatality due to VIPID is currently estimated at 40%, but is likely to decrease as there will be more awareness and better early treatment. Again to err on the side of caution, we'll keep the estimate at 40%: $P(death|VIPIT) = 40\%$

$$\begin{aligned} E(death)_{astrazeneca} &= d \times \frac{1}{100,000} \times \frac{40}{100} \\ &= 246,700 \times \frac{4}{1,000,000} \\ &\approx 1 \end{aligned}$$

If the second dose of the AstraZeneca vaccine is not associated with increased and renewed risk for VIPIT, given the current evidence our best estimate for the number of death associated with AstraZeneca vaccination campaign for essential workers would be 1. If, however, we assume that the second dose will pose additional risk of VIPIT, delivering an additional 300,000 doses of the AstraZeneca vaccine will likely double that estimate, for an expected mortality of 2 persons in BC.

In its analysis of AstraZeneca vaccine, NACI weighed the risk of adverse events against age-stratified risk of mortality due to COVID-19, pending an overall risk-assessment. However, benefits of the AstraZeneca vaccine go beyond preventing COVID-related mortality, and include protection against more common COVID com-

plications in younger adults including severe disease, hospitalizations, and Long COVID. The recent sharp decline of COVID-19 cases in the UK suggests that the AstraZeneca vaccine might also provide protection against onward transmission of the virus, which could be especially critical in essential workers during the current wave of COVID cases.

Estimating all benefits of the AstraZeneca vaccine requires transmission and contact-network modelling. A recently published compartmental modelling preprint by Mulberry and colleagues at SFU which also considered potential spread of variants of concern suggests that vaccinating front-line workers alongside the age-based campaign might save an additional 600 more lives and prevent as many as 200,000 infections in BC during a 6-8 months period (Mulberry et al. 2021).

3. Limitations

Our analysis is based on currently available estimated rates of 1 in million to 1 in 100,000 for VIPIT and might need correction should higher rates of this complication be reported. We also did not consider the difference in logistics of distributing different vaccines. If, for example, it is logistically possible to switch the vaccine allocation for above 55 years old age groups to the AstraZeneca vaccine and use either Pfizer or Moderna vaccines for younger essential workers without delay, that might be the preferred approach.

We have also not considered potential sex differences in the risk for VIPIT. Although cases identified to date have been predominantly female, it remains unclear whether this was due to more females receiving the AstraZeneca vaccine or due to an intrinsic difference in risk.

References

EMA. 2021. *COVID-19 Vaccine AstraZeneca: benefits still outweigh the risks despite possible link to rare blood clots with low blood platelets.* Technical Report. European Medicines Agency. Accessed 2021-04-02. https://www.ema.europa.eu/en/news/covid-19-vaccine-astrazeneca-benefits-still-outweigh-risks-despite-possible-link-rare-blood-c

Mulberry, N., P. Tupper, E. Kirwin, C. McCabe, and C. Colijn. 2021. "Vaccine Rollout Strategies: The Case for Vaccinating Essential Workers Early." *medRxiv* 2021.02.23.21252309. Publisher: Cold Spring Harbor Laboratory Press, Accessed 2021-04-03. https://www.medrxiv.org/content/10.1101/2021.02.23.21252309v1.

NACI. 2021. *NACI rapid response: Recommended use of AstraZeneca COVID-19 vaccine in younger adults.* Technical Report. National Advisory Committee on Immunization (NACI). Accessed 2021-04-03. https://www.canada.ca/en/public-health/services/immunization/national-advisory-committee-on-immunization-naci/rapid-response-recommended-use-astrazeneca-covid-19-vaccine-younger-adults.html.

PEI. 2021. *COVID-19 Vaccine AstraZeneca - Safety assessment result: The vaccine is safe and effective in the fight against COVID-19.* Technical Report. Paul-Ehrlich-Institut (PEI), Federal Institute for Vaccines and Biomedicine. Accessed 2021-04-02. https://www.pei.de/EN/newsroom/hp-news/2021/210319-covid-19-vaccine-astrazeneca-safety-assessment-result-vaccine-safe-and-effective.html.