Vaccine-Induced Prothrombotic Immune Thrombocytopenia following AstraZeneca COVID-19 Vaccination in Younger Adults: An Interim Harm-benefit Analysis for British Columbia

Amin Adibi

03/04/2021

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 [1]. 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 [2]. A higher estimated rate of 1 per 100,000 by the Paul-Ehrlich Institut in Germany was published on March 19th [3]. 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 [1]. 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 thrombosis (CVST) and 8 other clot-related events from 18.1 million doses of the AstraZeneca Vaccine.

Harm-Benefit Analysis

We need to assess whether mortality risk due to AstraZeneca is larger than or comparable to the risk of mortality due to COVID-19.

Mortality Risk due to AstraZeneca Vaccine

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

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%, so

$$\begin{aligned} P(death)_{astrazeneca} &= \frac{1}{100,000} \times \frac{40}{100} \\ &= \frac{4}{1,000,000} \end{aligned}$$

So, the risk of death due to AstraZeneca COVID-19 vaccine is approximately 2 in 1 million vaccine eligible population. The population of BC under 50 years old is approximately 2 million. Assuming an 80% uptake for all COVID-19 vaccines combined and that half of vaccine recipients will receive the AstraZeneca vaccine, we can estimate the expected number of deaths in BC

$$E(death)_{astrazeneca} = 2,000,000 \text{ persons} \times \frac{80 \text{ vaccinated}}{100 \text{ persons}} \times \frac{1 \text{ vaccinated with AZ}}{2 \text{ vaccinated}} \times \frac{4 \text{ deaths}}{1,000,000 \text{ vaccinated with AZ}}$$
$$= 3.2 \text{ deaths}$$

Mortality Risk due to COVID-19

Now let's calculate the mortality risk in BC during COVID.

References

1. National Advisory Committee on Immunization (NACI). NACI rapid response: Recommended use of AstraZeneca COVID-19 vaccine in younger adults [Internet]. National Advisory Committee on Immunization (NACI); 2021 Mar [cited 2021 Apr 3]. Available from: 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

2. European Medicines Agency. COVID-19 Vaccine AstraZeneca: Benefits still outweigh the risks despite possible link to rare blood clots with low blood platelets [Internet]. European Medicines Agency; 2021 Mar [cited 2021 Apr 2]. Available from: https://www.ema.europa.eu/en/news/covid-19-vaccine-astrazeneca-benefits-still-outweigh-risks-despite-possible-link-rare-blood-clots

3. Paul-Ehrlich-Institut (PEI). COVID-19 Vaccine AstraZeneca - Safety assessment result: The vaccine is safe and effective in the fight against COVID-19 [Internet]. Federal Institute for Vaccines; Biomedicine; 2021 Mar [cited 2021 Apr 2]. Available from: https://www.pei.de/EN/newsroom/hp-news/2021/210319-covid-19-vaccine-astrazeneca-safety-assessment-result-vaccine-safe-and-effective.html