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COVID-19 Science Updates

MINISTRY OF
HEALTH
MANATŪ HAUORA

7 May 2021

1. COVID-19 vaccines and their effect on viral transmission

COVID-19 vaccines are highly effective at reducing symptomatic COVID-19 disease, however, the ability of vaccines to reduce transmission of the SAR-CoV-2 virus is less clear. This information is required to understand the likely effectiveness of a vaccination programme. The ongoing evaluation of the elimination strategy for New Zealand will be informed by what we know about the impact of vaccination on transmission. This can be estimated using several approaches to build a broad scientific position:

- On a population level – by the identification of new cases in a vaccinated population,
- Within specific cohorts – by analysing the number of new infections in vaccinated individuals, and
- At an individual level – by assessing the secondary attack rate for close contacts of vaccinated individuals.

Population level

- A reduction in the number of community cases following vaccination gives an indication that vaccination is contributing towards lowering the spread of the virus. Non-pharmaceutical interventions, such as public health measures and infection, prevention and control measures will also influence transmission and confound this assessment.
- Preliminary findings from the UK's immunisation programme shows that the odds of new SARS-CoV-2 infections in the community reduced by 70% after two doses of the Pfizer vaccine. Similarly, the national vaccination campaign in Israel has resulted in a 77% drop in COVID-19 cases following vaccination of the elderly following two doses of the Pfizer vaccine.

Specific cohorts

- Several studies have investigated the effect of two doses of the Pfizer vaccine against viral infection (see table below) assessed by routine PCR testing for SARS-CoV-2 among vaccinated individuals. A benefit of this methodology is the ability to more clearly identify the impact on transmission through detection of symptomatic and asymptomatic infections. These studies consistently found that vaccination significantly reduced the rate of viral infections in the observed cohorts.

Country	Population	Effectiveness against viral infection
United States	General adult population (18+ years)	89%*
United States	Healthcare workers, first responders, and other essential and frontline workers (18+ years)	90%** (pooled data for Pfizer and Moderna vaccines)
United Kingdom	Healthcare workers (18+ years)	85%*
Israel	General adult population (16+ years)	92%*
Denmark	Long term care facility residents (77-90 years)	64%*
	Healthcare workers (36-57 years)	90%*
Southern Sweden	General adult population (18-64 years)	86%*

* >7 days after second dose
** >14 days after second dose

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Secondary Attack Rates (Individual level)

- A study by Public Health Scotland compared rates of COVID-19 cases in unvaccinated household members of vaccinated and unvaccinated healthcare workers. The study reported a 30% reduction in documented cases among household members of healthcare workers that received one dose and a 54% reduction after two doses of either the Pfizer or AstraZeneca vaccines, compared to those of unvaccinated healthcare workers. The authors commented that since household members can also be infected via other people, this risk reduction is an underestimate of the 'true' effect of vaccination on transmission.

- A study by Public Health England compared the likelihood of transmission to unvaccinated household contacts from vaccinated and unvaccinated cases.
  - The matched case-control study found that individuals who become infected 3 weeks after receiving one dose of the Pfizer or AstraZeneca vaccine were 38–49% less likely to transmit the virus to their household contacts than those who were unvaccinated. The effect of the second vaccine dose on transmissibility is yet to be studied in these cases.
  - The reduction in transmission was detected 14 days after vaccination with the first dose, which is consistent with the expected onset of protection for the vaccinated individual.

- Limitations of the study included:
  - Asymptomatic cases could not be identified within the HOSTED dataset used for the study;
  - The definition used for 'secondary' cases meant that some co-primary cases may have been included;
  - An implicit assumption was made that two or more cases occurring in a household within 2–14 days represented household transmission, but these could have been two independently acquired infections.

Further to these studies, the marked reduction in severity of COVID-19 disease among vaccinated individuals is likely to be associated with an increase in the proportion of cases who are asymptomatic. This has been reported to be associated with a decrease in viral load, which is a key determinant in the risk of transmission. A study in Israel found that the viral load decreased 4-fold for COVID-19 infections occurring 12-28 days after the first dose of the Pfizer vaccine. These reduced viral loads suggest lower infectiousness, which could also contribute towards reduced viral transmission.

Comment: A number of international studies have shown that vaccination leads to a significant reduction in the rate of transmission of SARS-CoV-2. The two preliminary studies conducted using household contacts provide an estimate of the vaccine's effect on onwards transmission. However, larger studies performed in situations with different levels of associated IPC measures in fully vaccinated cohorts are required to understand the extent to which vaccination prevents SARS-CoV-2 transmission. Similarly, most of the reported studies have been among populations with the B.1.1.7 (UK) variant as the predominant variant and further understanding the prevalence of all variants in the studied populations is required to better understand the real-world impact of Variants of Concern on vaccination effectiveness.