HSA's Safety Update #6

COVID-19 Vaccines

(30 December 2020 – 30 September 2021)

Introduction

This is HSA's 6th safety update of the COVID-19 vaccines covering the period from the roll-out of the vaccines on 30 December 2020 to 30 September 2021. It provides an overview of the reports by healthcare professionals of ***suspected adverse events[1] (AEs)*** associated with COVID-19 vaccines to the Health Sciences Authority (HSA) and our current assessment of these AEs.

Summary (as of 30 September 2021)

- A total of 9,209,201 doses of the Pfizer-BioNTech/Comirnaty and Moderna/Spikevax mRNA vaccines have been administered, out of which 12,589 suspected AE reports (0.14% of administered doses) were received. Of these, 581 reports (0.006% of administered doses) were classified as serious AEs.

- The most commonly reported AEs were consistent with those typically observed following vaccination. They include allergic reactions (such as rash, itch, hives and swelling of eyelids, face and lips), dizziness, shortness of breath, chest tightness/discomfort, palpitations, injection site reactions such as pain and swelling and fever. These typically resolve within a few days. Among the serious AE reports, the most frequently reported AEs were anaphylaxis and other severe allergic reactions.

- In the age group of 12 to 18 years, the most commonly reported AEs include rash, hives, angioedema (swelling of the eyelids, face and lips), chest tightness/discomfort, shortness of breath, fever, dizziness and light-headedness.

- The AEs reported in individuals who had been administered booster doses of the mRNA vaccines were similar to the profile of AEs associated with Dose 1 and Dose 2 of the vaccines. These include rash, angioedema (swelling of eyelids, face and lips), chest discomfort, shortness of breath, fever, generalised weakness and dizziness.

- Rare instances of anaphylaxis, a severe life-threatening allergic reaction, have been linked to the COVID-19 vaccines. It is a known adverse reaction associated with vaccines in general. The incidence rate of anaphylaxis locally is similar to those reported overseas.

[1] An adverse event is any untoward medical occurrence in a patient administered a pharmaceutical product (including vaccines) but does not necessarily have a causal relationship with this treatment/vaccination.

- Rare cases of myocarditis and pericarditis have been reported with mRNA COVID-19 vaccines both overseas and locally. They are caused by inflammation of the heart muscles and outer lining of the heart, respectively. Myocarditis and pericarditis are not heart attacks, which are usually caused by blockage of the blood vessels that supply the heart. The risk of myocarditis and pericarditis is observed to be higher in young males aged 30 years and below who received the vaccine. Most of the cases have responded well to treatment and have recovered or were discharged well from hospital.

- Cases of Bell's Palsy (facial muscle weakness caused by inflammation of the facial nerve) have also been observed in some vaccine recipients. Generally, patients will recover completely even without treatment. The incidence rate is within the background incidence.

- One hundred and eleven suspected AEs (0.06% of doses administered) including nine serious ones (0.005% of doses administered) were reported following the administration of 180,903 doses of Sinovac-CoronaVac COVID-19 vaccine. Three suspected AEs (0.02% of doses administered) were reported with Sinopharm COVID-19 vaccine after 17,630 doses were administered.

- Overall, based on the data to date, the benefits of the Pfizer-BioNTech/Comirnaty and Moderna/Spikevax COVID-19 vaccines approved under the Pandemic Special Access Route continue to outweigh the known risks in a pandemic. HSA will continue to closely monitor the safety profile of the COVID-19 vaccines and relevant regulatory actions will be taken to safeguard public health.

Background

2 HSA has granted interim authorisation for two mRNA COVID-19 vaccines in Singapore under the Pandemic Special Access Route (PSAR) (Table 1).

Table 1. Authorisation of COVID-19 vaccines in Singapore

Vaccines	Authorisation date	Vaccination roll-out date
Pfizer-BioNTech /Comirnaty^ COVID-19 Vaccine*	**14 December 2020**	**30 December 2020**
Moderna/Spikevax^ COVID-19 Vaccine	**3 February 2021**	**12 March 2021**

*HSA extended the use of the Pfizer-BioNTech/Comirnaty COVID-19 Vaccine to adolescents aged 12-15 years on 18 May 2021
^HSA approved the new brand names Comiraty and Spikevax for Pfizer-BioNTech and Moderna COVID-19 vaccines respectively on 14 September 2021

3 As with all other vaccines, HSA actively monitors the safety of the COVID-19 vaccines to ensure that the benefits of the vaccines continue to outweigh the risks. This is achieved through AE monitoring systems to detect any potential safety concerns so that relevant measures can be taken to ensure that the vaccines remain safe for use. HSA reviews the submitted adverse event reports, in consultation with our expert panels[2].

[2] HSA has appointed four Expert Panels to adjudicate neurological AEs, cardiac AEs, thromboembolic and haematological AEs and severe hypersensitivity reactions such as anaphylaxis.

How to interpret the data

4 AEs are reported by healthcare professionals to HSA when they suspect that the AEs may be associated with the vaccine. This does not necessarily mean that the vaccine has caused the AEs. In some instances, these AEs are related to an underlying or undiagnosed disease or the natural progression of an underlying disease. It may be coincidental that the event occurred around the same time when the vaccine was given but is not caused by the vaccine. The causality based on isolated cases of individual events usually cannot be established as many illnesses cause the same symptoms and signs, and there are generally no confirmatory tests for diagnosing an AE. Hence, AEs are assessed and interpreted in the context of background incidence rates of such occurrences (i.e., historical rates in our general population unexposed to the COVID-19 vaccines). While each individual report is carefully reviewed, the totality of data from all sources (e.g. mechanistic actions, clinical assessments, epidemiological studies and literature) has to be considered before drawing any evidence-based conclusions on the safety of the vaccine.

5 The type and number of reports received for the different COVID-19 vaccines are not directly comparable as the vaccines may have been used in the vaccination programme for different lengths of time, and may have been administered to different numbers of people, with different underlying medical conditions and across different settings. Similarly, the AE numbers or rates between countries should not be directly compared as the usage of the vaccines may be different and the AE reporting systems are often also different.

6 The description of suspected AEs in this update reflects the available information known at the time by HSA. These data may undergo changes as more information on individual reports becomes available through follow-up, and as more data are reported and evaluated.

Pfizer-BioNTech/Comirnaty and Moderna/Spikevax COVID-19 Vaccines

7 As of 30 September 2021, HSA has received 12,589 suspected AE reports (0.14% of doses administered) associated with the use of Pfizer-BioNTech/Comirnaty and Moderna/Spikevax COVID-19 vaccines (Table 2).

Table 2. Overview of vaccination data and no. of suspected AE reports reported by healthcare professionals for COVID-19 vaccines (as of 30 September 2021)

	COVID-19 Vaccines (Pfizer-BioNTech/Comirnaty and Moderna/Spikevax)
No. of persons who have received at least Dose 1	**4,586,497**
No. of persons who received two doses*	**4,384,958**
No. of persons who received booster doses	**237,746**
Total no. of doses administered	**9,209,201**
No. of suspected AE reports	**12,589** (**0.14%** of doses administered)
No. of suspected serious[3] AE reports	**581** (**0.006%** of doses administered)

* The primary vaccination regimen for Pfizer-BioNTech/Comirnaty and Moderna/Spikevax COVID-19 vaccines comprises 2 doses. The no. of persons who received two doses includes those who had received the first dose.

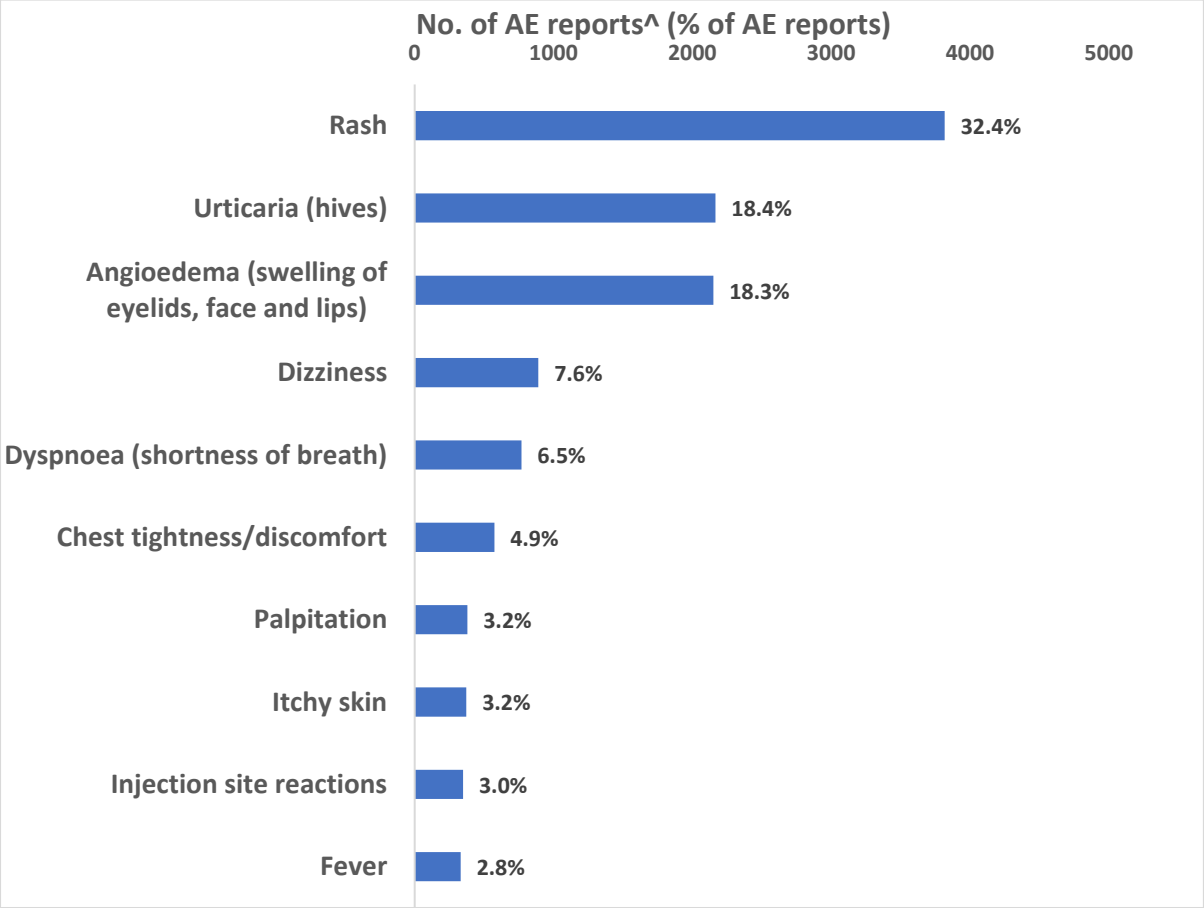
[3] An adverse event is classified as serious when the event resulted in hospitalisation/extended stay in hospital, resulted in a significant reduction in functioning level/disability, resulted in a life-threatening illness (e.g. anaphylaxis) or death, resulted in birth defects or is a medically important event.

8 About 79% of the AEs were reported in individuals less than 60 years old. It was noted that in the clinical trials of both vaccines, persons younger than 60 years of age tend to experience more reactogenic AEs than those aged 60 years and above. Generally, younger individuals have more active immune responses and may experience more AEs to the vaccines. This is part of the body's natural response to build immunity against COVID-19 infection. About 67% of the AEs were reported in females.

Commonly reported adverse events

9 The most commonly reported AEs (Figure 1) are consistent with those typically observed following vaccination. These include allergic reactions (such as rash, itch, hives and swelling of eyelids, face and lips), dizziness, shortness of breath, chest tightness/discomfort, palpitations, injection site reactions such as pain and swelling and fever. These reported AEs generally resolved within a few days. These AEs are also in line with those reported overseas.

Figure 1. Most commonly reported AEs associated with the use of Pfizer-BioNTech/Comirnaty and Moderna/Spikevax COVID-19 vaccines (as of 30 September 2021)



^ *Each report may describe more than 1 adverse event*

10 Since the roll out of the vaccination programme in students aged 12 years and above on 3 June 2021, HSA has received 616 AE reports (0.1% of doses administered) associated with the use of Pfizer-BioNTech/Comirnaty or Moderna/Spikevax vaccine in adolescents aged 12 to 18 years old. The commonly reported AEs include rash, hives, angioedema (swelling of the eyelids, face and lips), shortness of breath, chest tightness/discomfort, fever, dizziness, light headedness and syncope (fainting and temporary loss of consciousness). These reported AEs generally resolved within a few days, and they are also in line with the events reported overseas.

Serious adverse events

11 Of the 12,589 suspected AE reports received, 581 of the reports were assessed as serious. Serious AEs comprised 0.006% of doses administered. The most frequently reported serious AEs were anaphylaxis (77 reports) and other severe allergic reactions (52 reports). Other serious AEs include exacerbation of underlying asthma condition, breathing difficulty, fast heart rate, an increase or decrease in blood pressure, chest discomfort and pain, pericarditis or myocarditis (inflammation of the heart muscles and the outer lining of the heart, respectively), syncope, limb numbness, weakness or pain, seizures (fits), nerve inflammation, muscle injury, joint pain, blood clots, low platelets, tinnitus (ringing in the ears), changes in vision, increase in liver enzymes, thyroid gland dysfunction, abnormal renal function, menstrual disorder, severe skin reactions and infections. These serious AEs are being closely monitored by HSA. Background disease incidence[4] or underlying medical conditions are taken into consideration when determining if the vaccine had any contributory role to these events. Most of the individuals who developed serious AEs were reported to have recovered or are recovering.

Adverse events with booster doses

12 The national COVID-19 booster vaccination programme was rolled out on 15 September 2021 and 237,746 individuals have received the booster doses. HSA has received 14 AE reports (0.006% of doses administered) associated with the use of Pfizer-BioNTech/Comirnaty or Moderna/Spikevax vaccine as booster dose. The AE reports described similar AEs associated with Dose 1 and Dose 2 of the mRNA vaccines, which includes rash, angioedema (swelling of the eyelids, face and lips), chest discomfort, shortness of breath, fever, generalised weakness and dizziness. There were 2 SAE reports (0.0008% of administered doses) describing blood clots in the veins of the legs and anaphylaxis. As the booster dose programme was recently rolled out, HSA continues to closely monitor the adverse events and will inform the public on any significant events that are observed as well as take relevant regulatory actions as required.

Adverse events of special interest[5]

13 An adverse event of special interest (AESI) is a medically significant event that has been observed historically with other vaccines, of which some examples include anaphylaxis, Bell's Palsy, myocarditis and pericarditis. Hence, HSA is closely monitoring the occurrence of such adverse events to detect any increase over baseline incidences.

Anaphylaxis reports

14 Anaphylaxis is a rare and potentially life-threatening allergic reaction that can occur following vaccination in certain susceptible individuals. Safeguards have been implemented to mitigate this risk, which include pre-vaccination screening, observing all vaccinated persons for 30 minutes after vaccination and ensuring that all vaccination centres are medically equipped and staffed by qualified medical professionals at all times to provide medical treatment in the rare event that they are needed.

[4] The incidence of new cases of disease in a population over a specified period of time in the absence of vaccination

[5] Definition of AESI adapted from World Health Organization (WHO), Dec 2020. *COVID-19 Vaccines: Safety Surveillance Manual*[online] [24 Mar 2021 viewed]. Available from: https://www.who.int/publications/i/item/10665338400

15 There were 77 cases of anaphylaxis reported with the Pfizer-BioNTech/Comirnaty and Moderna/Spikevax COVID-19 vaccines. All the patients were reported to have recovered after medical treatment. The incidence rate of anaphylaxis reported locally with the vaccines is about 0.87 per 100,000 doses administered, which is similar to the incidence rates reported overseas.

Myocarditis and pericarditis reports

16 An increased risk of myocarditis and pericarditis (inflammation of the heart muscles and outer lining of the heart, respectively) associated with the mRNA vaccines have been observed both overseas and locally. While myocarditis and pericarditis have many different causes, most are due to viral infections and immunological reactions. The typical symptoms are chest pain, shortness of breath, and fast heartbeat. In most cases, the inflammation is mild. Myocarditis and pericarditis are separate and distinct from heart attacks. Heart attacks are generally caused by blockage of the blood vessels supplying the heart. In myocarditis and pericarditis, the blood vessels usually appear normal.[6,7] Majority of the individuals who develop myocarditis or pericarditis respond well to treatment and recover. Locally, the background incidence of myocarditis or pericarditis leading to hospitalisation is estimated to be about 5 to 7 in 100,000 persons per year, or about 280 to 400 cases a year.

17 In our earlier reports, HSA has highlighted a positive signal of myocarditis and pericarditis following vaccination of young people. HSA received 81 local reports of myocarditis and pericarditis following more than 8.9 million doses of mRNA vaccines administered in Singapore. The incidence rate per 100,000 doses are: 5.9 for those aged 12-19 years old, 1.8 for those aged 20-29 years old, and 0.59 for those aged 30 years and above. The risk is observed to be higher in younger males than females. Of the 47 cases which occurred in those below 30 years of age, 43 (91%) occurred in males. There is also a small observed increase in risk for males aged 30 to 49 years old. Of the 12 cases which occurred in those aged 30-39, 7 occurred in males.

Heart attacks and strokes

18 Heart attacks and strokes can occur naturally within our population, regardless of whether people are vaccinated. Due to the large numbers of people being vaccinated, it is expected that, by coincidence, some individuals may experience other medical events such as heart attacks and strokes in the days or weeks after vaccination which may not be related to the vaccination. We will continue to monitor these events closely and update the public if there are significant findings.

Cerebral venous thrombosis reports

19 There have been rare cases of cerebral venous thrombosis (CVT) reported with the Pfizer-BioNTech/Comirnaty and Moderna/Spikevax COVID-19 vaccines, both overseas and locally. CVT is a very rare type of blood clot occurring in the veins of the brain. The yearly background incidence of CVT in the general population is 1.3 to 2 per 100,000 persons. CVT

[6] Yilmaz A, Mahrholdt H, Athanasiadis A, et al. Coronary vasospasm as the underlying cause for chest pain in patients with PVB19 myocarditis. Heart 2008; 94:1456-63

[7] Lim Y, Singh D, Loh PH, Poh KK. Multivessel coronary artery spasm in pericarditis. Singapore Med J. 2018;59(11):611-613. doi:10.11622/smedj.2018138

has also been reported to be associated with COVID-19 infection at an incidence of 8.4 per 100,000 infections in a local study.[8]

20 HSA has received 10 suspected reports of CVT with the Pfizer-BioNTech/Comirnaty and Moderna/Spikevax COVID-19 vaccines. None of the cases had a fatal outcome. The number of cases of CVT reported is small and with observed fluctuations in the yearly background incidence rates locally, it cannot be determined if there is an increased incidence of CVT associated with the use of the mRNA vaccines. So far, no overseas regulators have identified CVT as a safety signal with mRNA vaccines.

Bell's Palsy reports

21 Bell's Palsy, also known as peripheral facial nerve palsy, is caused by inflammation of the facial nerve. It is a condition that causes temporary weakness or paralysis of the facial muscles. It was reported in the clinical trials of the Pfizer-BioNTech/Comirnaty and Moderna/Spikevax COVID-19 vaccines, but the numbers were assessed to be within background incidences. Most of the patients will generally have complete recovery even without treatment.

22 One hundred and three cases of Bell's Palsy have been reported, with most of the reports being non-serious. The local incidence rate is estimated to be 2.4 per 100,000 persons per month, which is within the background incidence of 1.1 to 4.4 per 100,000 persons per month prior to the introduction of vaccination.

COVID-19 Vaccines on HSA's Special Access Route[9] (SAR)

Sinovac-CoronaVac and Sinopharm COVID-19 Vaccines

23 Vaccination for Sinovac-CoronaVac COVID-19 vaccine and Sinopharm COVID-19 vaccine were rolled out on 18 June 2021 and 30 August 2021, respectively. As of 30 September 2021, HSA has received 111 (0.06% of doses administered) and 3 (0.02% of doses administered) suspected AE reports following the administration of 180,903 doses and 17,630 doses of Sinovac-CoronaVac and Sinopharm COVID-19 vaccines respectively.

24 The commonly reported AEs include rash, angioedema, shortness of breath, chest discomfort and dizziness. Nine (0.005% of doses administered) of the reports received with Sinovac-CoronaVac vaccine were assessed as serious, which included Bell's Palsy, blood clots, numbness, palpitations, vertigo with tinnitus (ringing of the ears) and serious allergic reactions including three reports of anaphylaxis. No serious AEs were reported with Sinopharm COVID-19 vaccine. It should be noted that the type and number of reports received for different COVID-19 vaccines are not directly comparable as the vaccines have been used in the vaccination programme for different durations of time. In addition, these vaccines have been administered only to a very small proportion (< 2%) of the population compared to the much larger scale of deployment for the mRNA vaccines.

25 Overall, the AEs were consistent with those typically observed following vaccination. HSA will continue to monitor the AEs with Sinovac-CoronaVac vaccine and Sinopharm COVID-19 vaccine.

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[8] Koh JS, De Silva DA, Quek AML, et al. Neurology of COVID-19 in Singapore. *J Neurol Sci*. Nov 15, 2020; 418:117118. doi: 10.1016/j.jns.2020.117118.

[9] https://www.hsa.gov.sg/therapeutic-products/register/special-access-routes/SAR-covid19

Conclusion

26 Based on the local AE reports received, most of the AEs are largely expected with vaccination and reflect what has been reported in the clinical trials. HSA's current assessment is that the benefits of the Pfizer-BioNTech/Comirnaty and Moderna/Spikevax COVID-19 vaccines continue to outweigh the known risks in a pandemic.

27 HSA and MOH will continue to monitor the safety profile of the COVID-19 vaccines closely, take the necessary regulatory actions and update members of the public of any significant safety concerns detected with the vaccines.

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