Literature screening report

COVID-19 vaccines approved in Switzerland Report (3)

Report submission date:	31.05.2022

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Abstract

This report provides a review of the **four** Swiss authorized COVID-19 vaccines: BNT162b2/COMIRNATY (Pfizer-BioNTech, USA), Spikevax/Moderna COVID-19 Vaccine/ mRNA-1273 (Moderna, USA), Janssen Covid-19 vaccine/ Ad26CoV2.S/ Johnson & Johnson (Janssen, USA), and Novavax/ NXV-CoV2373/ COVAVAX (USA, India)]. The current report provides the methodology and summarizes the latest data on COVID-19 vaccine-related literature as of 24 May 2022 in the form of an Excel document containing extracted data for each included study. The Excel document can be found in the supplementary material.

Content

Preamble

A large number of scientific publications become available on a daily basis, reflecting the rapid development of knowledge and progress of science on COVID-19 related issues. Leading authorities should base decisions or policies on this knowledge; hence they need to master the actual state of this knowledge. Due to the large number of publications shared daily, decision makers heavily depend on accurate summaries of these publications, in the different public health domains. Therefore, the authors of this report were mandated by the Swiss School of Public Health plus (SSPH+), upon request of the Federal Office of Public Health (FOPH), to inform the FOPH on recent findings from the literature.

Introduction

Although new knowledge and data about COVID-19 vaccination become increasingly available, many questions such as the protection provided by those vaccines remain largely unknown, especially with the introduction of new variants of concern. In Switzerland, four COVID-19 vaccines (Pfizer/BioNTech, Moderna, Janssen, and Novavax) have been approved for the adult population. As for the pediatric population, children aged 5 to 11 can be vaccinated with the Pfizer/BioNTech vaccine those aged 12 to 17 can be vaccinated with the Pfizer/BioNTech or Moderna vaccines.

The objectives of this report are to identify and review national and international scientific publications and information on the effectiveness and safety and adverse events risk estimates of COVID-19 vaccines approved in Switzerland. Specifically, this report focuses on the effectiveness of COVID-19 vaccines for the Delta and Omicron variants for different clinical outcomes such as transmission and infection (symptomatic or asymptomatic), confirmed COVID-19 infection, hospitalization, death, and long-COVID. Additionally, the effectiveness of COVID-19 vaccines in vulnerable populations such as elderly (aged 65 years and over) and immunocompromised people were also screened and reported, when the data exist.

Methodology

To produce a report with the most up to date information on the effectiveness of COVID-19 vaccination and their safety and adverse events of the administered vaccines, a rapid systematic review adhering to the PRISMA guidelines was conducted.

Literature and Information Search

To identify potentially relevant studies, we searched for the literature published since 26 April 2022 up to 24 May 2022 in the following electronic databases: Medline (PubMed), Embase, MedRxiv & BioRxiv, Cochrane Library, SSRN. In addition, the grey literature such as data produced by government agencies, academic institutions, and press releases were screened and hand searched. A design strategy composed of text words (e.g., coronavirus disease), MeSH terms or Emtree terms (e.g., covid-19 vaccine), Boolean terms (e.g., AND, OR) and truncations (e.g., immune*) to electronically identify studies related to SARS-CoV-2 vaccines effectiveness and/or safety was utilized.

Eligibility of Studies

Eligible studies were those reporting any data about efficacy and/or effectiveness (e.g., prevention of SARS-CoV-2 infection), booster doses, duration of protection, variants, and safety (e.g., adverse events) of COVID-19 vaccines approved in Switzerland. No language restriction was used but the studies were limited by publication date (26 April to 24 May 2022). Any study design using mathematical modelling was excluded.

Risk of Bias (Quality) Assessment

Due to the nature of the current reporting frequency and the overwhelming new COVID-19 information released on a daily-basis, the risk of bias and the quality of included studies were not evaluated.

Data Abstraction and Analysis

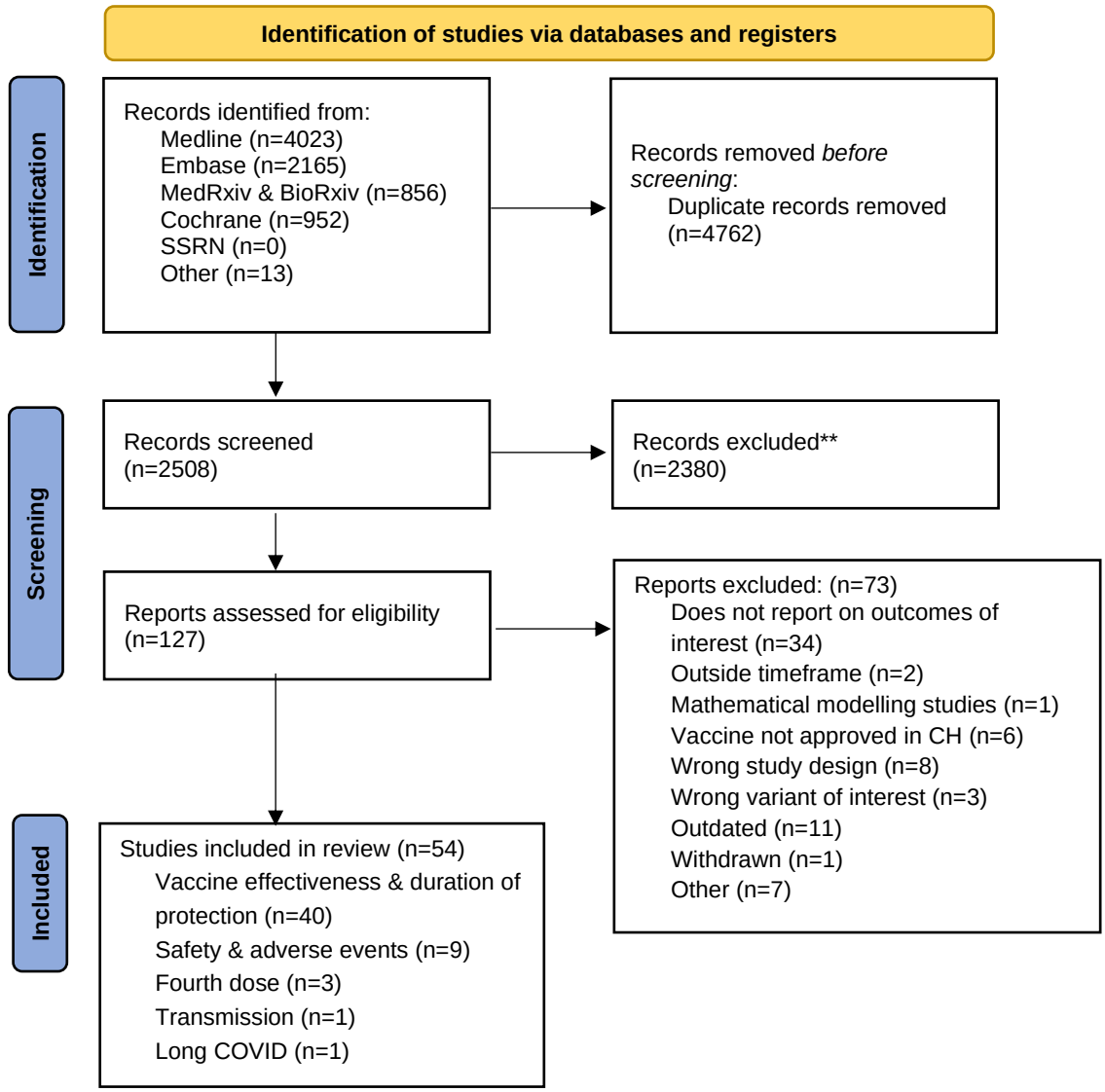
We extracted data from eligible studies, which include, but are not limited to, vaccine effectiveness as well as safety and adverse events. We categorized the data into different sections: vaccine effectiveness and duration of protection, safety and adverse events, fourth dose, transmission, and long COVID. We finally proceeded to report on the current topics of interest, namely the effectiveness and adverse events. We analyzed the data based on the vaccine type, vaccine doses (primary schedule and booster doses), and topics (e.g., effectiveness, duration of protection, variants, safety, and heterologous vaccines). Information extracted from studies included study characteristics, population characteristics, intervention details, variants, and results. The variables covering the study characteristics are 'Date added to table', 'Author', 'Title/ URL', 'Publication Date', 'Journal', 'Peer-reviewed?', 'Sponsor/ Funding', 'Country', 'Study Timeframe', 'Study Design', and 'Sample size/ Participant number'. The variables for population characteristics are 'Subgroup/ Demographic', 'Immune Status', 'Age interval', 'Age group', and 'Previously infected'. The variables for intervention details are 'Effect size', 'Vaccine Schedule', 'Vaccine Platform', 'Outcome', 'Interval after dose', 'Received booster?', '3rd vaccine Platform', 'Interval after 3rd dose', and 'Time between 2nd and 3rd dose'. As for the variables for results, the variables 'Vaccine Effectiveness (95% CI)', 'Incidence Rate (per 100000 persons)', and 'Results (RR or OR)' were included in the table. In addition to those variables, the table includes a variable for variants, and notes/comments.

Synthesis of Information

The information was summarized in the form of an Excel table containing key data on the variables of interest cited above.

Results

PRISMA Flowchart



Summary of PRISMA

A total of 8009 studies were identified from Medline, Embase, MedRxiv and BioRxiv, Cochrane, SSRN, and other sources. Overall, 3247 studies were identified as duplicates and were discarded. The team screened a total of 2508 studies for potential relevance and excluded 2381 for not meeting the eligibility criteria. 127 texts were reviewed of which 73 were excluded for not reporting on the outcomes of interest (n=34), being outside the timeframe (n=2), being mathematical models (n=1), covering vaccines not approved in Switzerland (n=6), for having the wrong study design (n=8), covering the wrong variant of interest (n=3), being outdated (n=11), being withdrawn (n=1), and for other reasons (n=7) such as not having access to the full-text (n=5), being an editorial report describing two other studies (n=1), and not clearly stating the outcome (n=1).

There was a total of 54 studies, 40 of which were classified under vaccine effectiveness and duration of protection, 9 under safety and adverse events, 3 under fourth dose, 1 under transmission, and 1 under long COVID, inserted in the data extraction table.

Vaccine Effectiveness and Duration of Protection

The data extraction table contains 40 studies which report on the vaccine effectiveness or duration of protection for both primary schedule and booster doses of the BNT162b2, mRNA-1273, and Ad26.COV2.S COVID-19 vaccines (1-40). Most studies included utilized a test-negative case-control or cohort study design. These studies estimated vaccine effectiveness by calculating the hazard ratio, odds ratio, or incident risk ratio of vaccinated individuals against infection, hospitalization, severe outcomes, and mortality compared to unvaccinated individuals. Approximately 22 studies evaluated the vaccines effectiveness of a third (booster) dose. Most included studies covered the variants of concern Delta, Omicron, and the subvariant BA.2. Although the majority of the sample population included in the studies were adults

over the age of 18, seven studies (1, 17, 22, 27, 31, 35, 38) were conducted in a population of children and adolescents.

Safety and Adverse Events

Nine studies covering safety and adverse events were added to the data extraction table (41-49). These studies reported on a range of safety and adverse events associated with the four COVID-19 vaccines approved in Switzerland such as myocarditis and pericarditis, Multisystem Inflammatory Syndrome in Children (MIS-C), and venous thrombosis (38, 41, 42, 44, 48, 49). Most of the studies used either a case-control or retrospective cohort design. These studies stated results as the incidence rate of an adverse event per number of vaccinated individuals or doses administered, or as hazard, odds, or risk ratios.

Fourth Dose

A total of 3 studies were included in the data extraction table (50-52). These studies covered the vaccine effectiveness estimates from the administration of second booster doses, with two studies coming from Israel (50, 52) and one from Sweden (51). Most studies used a retrospective cohort design, and results estimated vaccine effectiveness by calculating the odds ratio, or hazard ratio of fourth dose boosted individuals against a variety of outcomes associated with COVID-19 as compared to third dose boosted individuals or unvaccinated people. The studies included in this section exclusively covered the Omicron variant of concern.

Transmission

One study concerning transmission was included in the data extraction table (53). This Australian study examined the attack rate of Omicron among a highly vaccinated population (>95%) during two large indoor events. This study utilized contact tracing and vaccination information from national databases and estimated attack rates from these events, stratified by time since vaccination.

Long COVID

One study concerning long COVID was included in the data extraction table (54). This study examined the relationship between breakthrough infection and post-acute sequalae of COVID-19 among vaccinated people. This study, from the United States, used a national database of veterans to compare post-acute outcomes between participants with varying status of vaccination and breakthrough infection, stating these results as hazard ratios.

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