Vaccination against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) started in Norway in the spring of 2021 for healthy adolescents born in 2002–2009. The two mRNA vaccines, Comirnaty (BNT162b2, Pfizer-BioNTech) and Spikevax (mRNA-1273, Moderna) were administered, with adolescents receiving Comirnaty predominantly. The Norwegian authors conducted this nationwide registry-based study to assess the risks of 17 preselected adverse events in older adolescents aged 12–19 years after vaccination with mRNA COVID-19 vaccines in predefined risk windows of 14, 28, 42, and 56 days after vaccination.

In mRNA vaccines, a mRNA sequence determines the structure and assembly of the immunogen, the SARS-CoV-2 spike (S) glycoprotein. The mRNA is protected from degradation by lipid nanoparticles (LNPs) and taken up by the cells as an LNP-mRNA complex through simple endocytosis.

The authors emphasized that previous phase 3 clinical trials conducted in adolescents reported an increased risk of lymphadenopathy (16+ years) and Bell's palsy (18+ years) after mRNA vaccination. A large Israeli population-based study in adolescents 16+ years found an association between the Comirnaty vaccine and myocarditis, lymphadenopathy, appendicitis, and herpes zoster. A recent retrospective pharmacovigilance study with a comprehensive analysis of potential safety signals associated with myocarditis/pericarditis after the primary and up to three booster doses of mRNA COVID-19 vaccines showed that the highest percentages of myocarditis/pericarditis were reported in the 18–24 years old (20.6%) and 12–17 years old (16.8%) groups.
https://discovermednews.com/vaers-reporting-rates-of-myocarditis-pericarditis-after-mrna-vaccination/

About the study

This nationwide registry-based study used data from the Norwegian Emergency Preparedness Registry for COVID-19 (Beredt C19), which contains individual-level data on demographics, SARS-CoV-2 infection and immunization, and diagnoses from primary and specialist health services. The researchers compared the results of adolescents vaccinated with Comirnaty or Spikevax with those of unvaccinated participants.

The clinicians identified 17 outcomes of interest following the SARS-CoV-2 vaccination, namely: acute appendicitis, anaphylactic reaction, arrhythmia, arthropathy, cerebrovascular events, encephalomyelitis and meningitis, epilepsy/convulsions, facial nerve palsy, Guillain-Barré syndrome, Henoch-Schönlein purpura, herpes zoster, idiopathic thrombocytopenic purpura, lymphadenopathy, a multisystem inflammatory syndrome in children, myocarditis/pericarditis, venous thromboembolic events, and death.

The study estimated the incidence rate of 17 preselected outcomes in predefined risk windows of 14, 28, 42, and 56 days after the vaccination.

Results

The study included 496,432 adolescents aged 12–19 years. 181,556 were vaccinated with one dose, 168,698 with two doses, and 59,092 with more than two mRNA COVID-19 vaccines. 87,086 adolescents were not vaccinated. The proportions of 12–15-year-olds, 16–17-year-olds, and 18–19-year-olds were 51.1%, 24.4%, and 24.5%, respectively, with a

slight male predominance (51.4%).

There were no statistically significant associations between the first dose of the vaccine and any outcome occurring within the risk windows. The second vaccine was associated with an increased risk of lymphadenopathy, myocarditis/pericarditis, and an anaphylactic reaction. The authors emphasized that this finding should be interpreted with caution due to the small number of cases after the second dose (less than 5 cases).

Outside the risk windows, statistically significant associations were observed between vaccination and acute appendicitis, anaphylactic reaction, myocarditis/pericarditis, and death. When longer risk windows of 42 or 56 days were used, analyses demonstrated a significantly increased risk of acute appendicitis after the first and second doses of the mRNA vaccine.

The age-stratified analysis showed that the first vaccination was associated with an increased risk of acute appendicitis and anaphylactic reaction in adolescents aged 12–15 years, but the latter was based on a few cases. The second vaccination in this age group increased the risk of myocarditis/pericarditis, but the number of cases was also small.

In adolescents aged 16–17 years, the second vaccination was associated with an increased risk of acute appendicitis.

In adolescents aged 18–19 years, the second vaccination was associated with an increased risk of lymphadenopathy, myocarditis/pericarditis, and epilepsy/convulsions. In this age group, the second vaccination also increased the risk of anaphylactic reactions, but only a few cases were reported.

Conclusion

This nationwide registry-based study has shown increased risks of adverse events, including anaphylactic reaction, lymphadenopathy, and myocarditis/pericarditis in older adolescents aged 12–19 years, after the second mRNA COVID-19 vaccination. An increased risk of acute appendicitis was observed when longer risk windows were used (42 or 56 days).

According to the authors, further adolescent studies should explore potential age-specific adverse events related to mRNA COVID-19 vaccines or boosters.

The results of this study have been published on a preprint server and are currently being peer-reviewed.

Reference

Larsen VB, Gunnes N, Gran JM et al. Adverse Events Following SARS-CoV-2 mRNA Vaccination in Adolescents. A Norwegian Nationwide Register-Based Study. medRxiv preprint. https://doi.org/10.1101/2023.12.13.23299926