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Effectiveness of COVID-19 vaccination against multisystem inflammatory syndrome in children: A systematic review and meta-analysis

KEYWORDS
COVID-19;
MIS-C;
Vaccine

Dear Editor,

Multisystem inflammatory syndrome in children (MIS-C) is a serious condition, which can rarely develop in children 2–6 weeks after SARS-CoV-2 infection.[1,2] As of October 3, 2022, 9006 cases of MIS-C after COVID-19, including 74 deaths, had been reported to the Centers for Disease Control and Prevention. Because MIS-C can be associated with high morbidity and mortality rates, preventing children from MIS-C has become a crucial issue.[2] Although COVID-19 vaccines have shown to be effective in avoiding SARS-CoV-2 infection,[3–5] the preventive effect of vaccination on MIS-C after COVID-19 has remained unclear. Therefore, we conducted this systematic review and meta-analysis to provide reliable and quantitative information on the effectiveness of the COVID-19 vaccine on MIS-C prevention.

We identified randomized controlled trials (RCTs) or observational studies from PubMed, Cochrane Library, and EMBASE without language restrictions from inception to August 2022. We used search terms as ((((COVID-19 Vaccines) or (2019-nCoV Vaccine mRNA-1273)) or (BNT162 Vaccine)) or (Ad26COVS1)) and ((((MIS-C) or (Systemic Inflammatory Response Syndrome)) or (Inflammatory Response Syndrome, Systemic)) or (Multisystem Inflammatory Syndrome in Children)). Data were synthesized using the random-effects model. Statistical analysis was performed with Review Manager Version 5.4.1.

A total of four observational studies[6–9] were included in this meta-analysis. Three studies[6,8,9] were conducted during the period dominated by the Delta variant, and one[3] was conducted during the Omicron variant. The vaccines used were almost BNT162b2, with only one study[7] including BNT162b2, mRNA-1273, and other vaccines. The definition of fully vaccinated varies. Two studies[6,8] defined as $\geq$ 14 days after the second dose, one[7] defined as $\geq$ 14 days after the first dose, and another one[9] used $\geq$28 days after the second dose. Overall, the risk of MIS-C among vaccinated individuals was significantly lower than in unvaccinated individuals (odds ratio [OR], 0.09; 95% confidence interval [95% CI],0.05–0.15; P < .0001) (Fig. 1), which indicated the vaccine effectiveness was 91%. Subgroup analyses according to the prevalent variant of concerns (VOCs) and number of vaccine doses were performed. Statistically significant effect remains in all subgroups (Omicron variant: OR, 0.11; 95% CI,0.04–0.31; P < .0001; Delta variant: OR, 0.08; 95% CI,0.05–0.15; P < .0001; second dose: OR, 0.09; 95% CI,0.05–0.16; P < .0001; firs dose: OR, 0.09; 95% CI,0.04–0.24; P < .0001). Additionally, no heterogeneity was detected in all analyses.

In summary, this meta-analysis disclosed that the COVID-19 vaccine effectively prevents MIS-C in children after SARS-CoV-2 infection and indicated that MIS-C is a vaccine-preventable disease with a vaccine effectiveness of 91%. Based on the GRADE framework, the outcome was judged to be moderate-quality evidence and further supports the administration of COVID-19 vaccination for children.

This study has several limitations. First, only four studies were included in this meta-analysis; second, all included studies were non-RCT. Third, there were differences among included studies regarding the study population,

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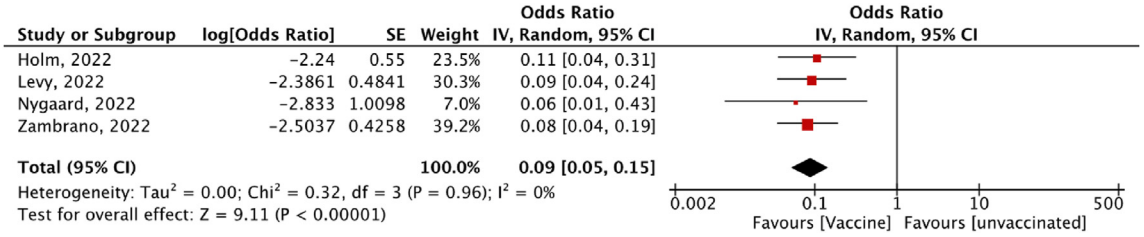

Figure 1. Forest plot of preventive effectiveness of COVID-19 vaccine against multisystem inflammatory syndrome in children after SARS-CoV-2 infection.

predominant variant of concern, and the definition of full vaccination.

In conclusion, based on the moderate-quality evidence, COVID-19 vaccines are effective in the prevention of MIS-C among children after SARS-CoV-2. However, further RCT is warranted to confirm our findings.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jmii.2023.08.002.

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