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Letter to the editor

## COVID-19 vaccination is highly effective to prevent SARS-CoV-2 circulation



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Dear Editor,

Several lines of evidence attest that coronavirus disease 2019 (COVID-19) vaccination should complement widespread adoption of physical measures for preventing and/or limiting the medical, social and economic impact of SARS-CoV-2 [1]. Several studies and meta-analyses concluded that the efficacy of COVID-19 vaccines is considerably high in preventing severe illness [2–4], better than that achievable by influenza vaccination [5], although vaccine effectiveness seems to wane over time, typically within 5–7 months after completing a primary vaccination cycle [6]. Administration of vaccine “booster” doses is hence seen as a reliable approach for restoring effectiveness against the risk of developing symptomatic illness [7], even if the impact to reduce virus circulation remains speculative, as recently highlighted by Alshamrani and co-authors [8]. This study was hence aimed to define the extent of protection against SARS-CoV-2 infection given by primary COVID-19 recent vaccination and administration of COVID-19 vaccine booster doses (Fig. 1).

We retrieved information on progression of COVID-19 vaccination and newly diagnosed cases of SARS-CoV-2 infection from the weekly report of the Italian National Institute of Health (Istituto Superiore di Sanità, ISS; Last available update, January 1, 2022) [9]. At the time of our analysis, 39.9 million people had completed a primary COVID-19 vaccination cycle (69.7% with Pfizer/BioNTech, 18.5% with AstraZeneca, 10.2% with Moderna and 1.6% with Johnson & Johnson, respectively), of whom 13.6 million (34.0%) within 120 days from the last dose, whilst an additional 5.7 million Italian

citizens had already received a recent COVID-19 vaccine booster (all with either mRNA-based Pfizer/BioNTech or Moderna vaccines).

The odds ratio (OR) with 95% confidence interval (95%CI) of SARS-Cov-2 infection was calculated with MedCalc (Version 20.015; MedCalc Software Ltd., Ostend, Belgium). The study was conducted in accordance with Helsinki Declaration, under terms of relevant local legislation. The research was based on public ISS data, so that Ethical Committee approval was unnecessary.

The rate of SARS-CoV-2 infections in non-vaccinated, vaccinated with primary cycle < 120 days and in those who received a recent booster vaccine dose was 2.5%, 0.7% and 0.4%, respectively. Overall, the risk of SARS-CoV-2 infection was 71% (OR, 0.29; 95%CI, 0.29–0.29;  $p < 0.001$ ) and 86% (OR, 0.14; 95%CI, 0.14–0.14;  $p < 0.001$ ) lower in people who received primary vaccination < 120 days and recent booster dose compared to the unvaccinated population, but was also nearly half (OR, 0.49; 95%CI, 0.48–0.49;  $p < 0.001$ ) in those who received a recent booster dose compared to the population who only recently completed the primary vaccination cycle.

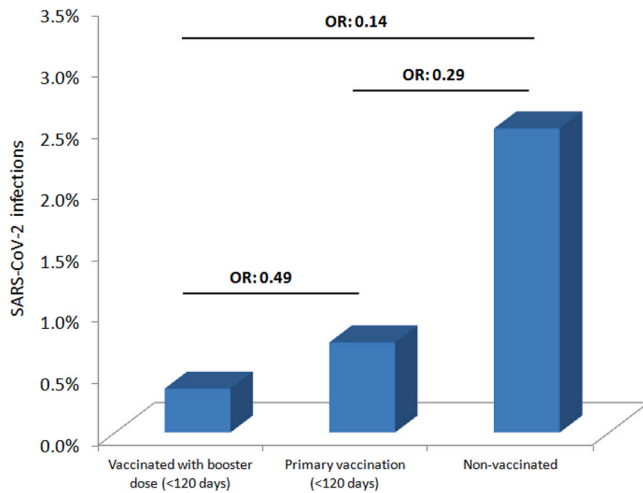
Although we acknowledge that the lack of data on infection-induced immunity may be a drawback in our analysis, it seems reasonable to conclude that COVID-19 vaccines not only decrease the risk of severe COVID-19 illness, but may also be effective to limit virus circulation. Importantly, we found that vaccine booster doses amplify vaccine effectiveness, by further reducing by nearly 50% the risk of SARS-CoV-2 infection compared to recent primary vaccination. This is of pivotal importance for lowering the risk of emergence of new and highly mutated variants (e.g., Omicron) in areas with lower herd immunity and larger SARS-CoV-2 circulation [10].

Abbreviations: SARS-CoV-2, Severe Acute Respiratory Syndrome Coronavirus 2; COVID-19, Coronavirus Disease 2019

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**Fig. 1.** Efficacy of primary coronavirus disease (COVID-19) vaccination cycle and administration of COVID-19 vaccine booster doses in preventing severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infections in the general population. OR, odds ratio.

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### Conflicts of interest

None declared.

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