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Immune, infectious and epidemiological aspects of COVID-19 vaccination

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Statement of the Problem: The initial COVID-19 vaccination campaign did not meet expectations due to errors in the roll-out strategy that did not take into account the incubation, index of reproduction, and duration of humoral immunity.

Purpose: To point out the factors those were neglected in creating the COVID-19 vaccination strategy.

Methodology: Critical observation of what has been done in comparison to what should have been taken into consideration from the outset.

Observations: It has been known for at least 50 years that humoral immunity following a 2-dose primary immunization last 4-6 months. Thereafter, short-incubation diseases (<8-9 days) need periodic boosting to maintain a steady protective antibody titer. In long-incubation infections, there is enough time to mount an anamnestic response to avert clinical disease, and boosters are not indispensable. Unless the herd immunity of 45% population had been attained during the B1 strain (reproduction index 1.8) predominance in Europe, no interruption of pandemic spread could have been hoped for. Instead, the pandemic spread on, "breakthrough" infections were infections that appeared after the waned specific antibody titers, and new variants allowed to boom with immune evasion and increasing reproduction index and transmissibility. Moreover, it was not appreciated that more generous spacing between the doses increased immunogenicity and that a single vaccine dose at the appropriate (3-6 months) post-recovery interval induced powerful hybrid immunity. Indeed, as of mid-2022, mRNA vaccines have been offered as a series of 3 doses at intervals of up to 8 weeks for the primary series, and at least 5 and 4 months for doses 3 and 4, respectively.

Conclusions and Significance: COVID-19 pandemic could have been controlled in the initial phases of the vaccination campaign if a faster roll-out or a 3-dose schedule had been adopted from the outset.