

Impact of Non-Pharmaceutical Interventions (NPIs) and BCG vaccine on COVID-19 transmission in East Africa

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Key messages

- The effect of non-pharmaceutical interventions and BCG vaccine on COVID-19 transmission is assessed
- Two scenarios are considered: with and without age-structure population, and with BCG vaccination.
- NPIs reduced COVID-19 transmission across all the three target countries.
- BCG vaccination didn't significantly affect COVID-19 transmission as demonstrated across the age-groups

Introduction

The emergence of COVID-19 pandemic overwhelmed health systems in both developed and developing countries alike. In Africa, however, the weak health systems may overburden the continent and therefore result in devastating consequences. Although the mortality rates due to the disease were low, there is limited evidence on how the different intervention strategies including non-pharmaceutical interventions (NPIs) impacted the transmission of COVID-19. Furthermore, previous practices, for instance, the use of the Bacillus Calmette–Guérin (BCG) vaccine against tuberculosis were proposed to reduce the severity of COVID-19¹. The objective of this study was to assess the impact of BCG vaccination and NPIs enforced on COVID-19 cause-death-recovery counts disaggregated by population structure in selected countries in East Africa.

Data and methodology

The study utilized two sets of datasets: COVID-19 time series data (2020-2021) obtained from WHO and John Hopkins University (JHU) repositories^{2,3}, and country-level age-structured population obtained from United Nations (UN) records⁴. To isolate the BCG vaccinated group, the population was divided into two (those aged 39 years and below, and those above 39 years). Those below this age were considered vaccinated based on the first introduction of the vaccine in the early 1980s. The

data on NPIs were obtained from websites and media platforms.

This study adopted a semi-mechanistic Bayesian hierarchical model (BHM) combined with Markov Chain Monte Carlo (MCMC) simulation to the age-structured pandemic data obtained from Ethiopia, Kenya, and Rwanda. Key parameters included the number of infections, recovery, and fatality distributions.

Key findings

The analysis was conducted under two scenarios: with and without age-disaggregation and BCG vaccination consideration for the 2020-2021 period. Assuming a homogenous population (i.e., the without scenario), the COVID-19 transmission was relatively low on average across the three target countries, with the highest transmission reported in Rwanda, followed by Ethiopia, and the least in Kenya. For the NPIs, lockdowns and curfews had a large effect on reducing disease transmission in Kenya, the declaration of emergency and regional lockdowns reduced human-to-human transmissions had the largest effect in Ethiopia, while in Rwanda the largest effect was attributed to dusk-to-dawn curfews. The results of the “with” scenario (i.e., age-structure and BCG vaccine), however, did not show any significant difference in COVID-19 transmission between the BCG vaccinated and non-vaccinated groups, suggesting the transmission is age neutral. Beyond

age-structure and NPIs, we found no significant association between COVID-19 and BCG vaccine-induced protection. Continued interventions should be strengthened to control transmission of SARS-CoV-2.

Policy Implications and Recommendations

Establishing the magnitude of various government interventions both pharmaceutical and non-pharmaceutical is important for efficient and effective policy responses. The effectiveness of NPIs also varies from country to country suggesting the need for isolated national-level analysis of the different interventions. Policy efforts to promote the identified country-specific NPIs therefore may reduce the infection rate of the COVID-19 pandemic. Considerations for the COVID-19 vaccine are paramount as previously administered vaccines associated with SARS did not show any association with the reduction of the disease infections.

References

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This work received financial support from the following organizations and agencies: BioInnovate Africa, International Centre of Insect Physiology and Ecology (icipe), grant number: B8401F; The European Union; the Swedish International Development Cooperation Agency (Sida); the Swiss Agency for Development and Cooperation (SDC); the Federal Democratic Republic of Ethiopia; and the Government of the Republic of Kenya. The views expressed herein do not necessarily reflect the official opinion of the donors.