

Global BCG Vaccination Coverage versus Cases and Mortality in the SARS-CoV-2 Pandemic

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Abstract

Background: We examined if BCG vaccination policies adopted by different countries might influence the SARS-CoV-2 transmission patterns and associated morbidity and mortality through the vaccine's capacity to confer heterologous protection.

Method: The focus of this study was on the initial impact of SARS-CoV-2 as on March 23, 2020. We compared the number of cases per million and deaths per million of population of 20 countries with a national BCG immunization program and 20 of those that did not have or have ceased their national BCG vaccination programs.

Results: The Mann Whitney U-tests was significant ($p < .001$) for both the number of cases and for number of death per capita. Countries with BCG vaccine coverage had significantly less cases and significantly lower mortality.

Discussion and Conclusion: Until a specific vaccine for SARS-CoV-2 is developed, vulnerable populations could be immunized with BCG vaccines to attain heterologous nonspecific protection from the new coronavirus. The choice of the best vaccine strain is important.

Keywords: SARS CoV-2, covid19, BCG immunization, mortality

INTRODUCTION

The lower than expected number of cases reported in countries in Asia and Africa with extensive travel and trade links with China might stem from the BCG immunization-induced heterologous protective activity of the vaccine.

It is also noteworthy that relatively very high numbers of cases and high mortality have been reported from Italy which historically never had a national BCG vaccination policy for its population.

We compared the epidemiological data from BCG vaccinated and unvaccinated populations at the early stage (March 2020) of the SARS-CoV-2 pandemic. The focus of this study was on the initial impact of SARS-CoV-2 as on March 23, 2020.

METHOD

Coronavirus related statistics presented in this article are based on data obtained from <https://www.worldometers.info/coronavirus/> as on March 23, 2020, 20:44 GMT.

The data therefore represent **the initial impact** of SARS-CoV-2.

Only countries with 500 cases and above were included. We selected 20 representative countries with national BCG coverage and 20 that did not have or have ceased their national BCG vaccination programs, see Table 1.

BCG vaccination status of each country was derived

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from https://www.who.int/immunization/sage/meetings/2017/october/1_BCG_report_revised_version_online.pdf, <http://www.bcgatlas.org/> and from data presented by Ritz and Curtis in 2009.^[1]

The outcome data (N of cases and death toll per

Table 1. BCG vaccination, cases and mortality per capita

Countries with National BCG Immunization Coverage			Countries with no National BCG Immunization Coverage		
Country	Cases per 1M	Deaths per 1M	Country	Cases per 1M	Deaths per 1M
China	56	2.258	Italy	1,057	100.480
Iran	274	21.541	USA	128	1.560
S. Korea	175	2.168	Spain	708	47.223
Portugal	202	2.255	Germany	347	1.409
Brazil	8	0.160	France	304	13.167
Turkey	18	0.436	Switzerland	988	13.640
Malaysia	47	0.433	UK	98	4.937
Japan	9	0.335	Netherlands	277	12.424
Ireland	228	1.216	Austria	496	2.331
Ecuador	56	1.028	Belgium	323	7.594
Pakistan	4	0.027	Norway	470	1.845
Poland	20	0.214	Sweden	203	2.480
Chile	39	0.105	Canada	54	0.610
Thailand	10	0.014	Australia	67	0.273
Greece	67	1.639	Denmark	250	4.138
Indonesia	2	0.170	Israel	167	0.116
Romania	30	0.365	Czechia	115	0.093
Saudi Arabia	16	Data not Available	Luxembourg	1,398	12.782
Singapore	87	0.342	Finland	126	0.180
Qatar	174	Data not Available	Iceland	1,723	2.930

RESULTS

The difference between countries with BCG vaccine coverage and those without the coverage was highly significant both for the number of cases ($p < .001$) and for number of death per capita ($p < .001$). Countries without the coverage usually had greater numbers of cases and a higher mortality.

DISCUSSION

Our results suggest that the BCG immunization-induced heterologous protective activity of the vaccine may provide some protection against SARS-CoV-2 with respect both to the number of cases and mortality.

Additional scientific statistics on our tabular data were recently published by Cernovsky, Fernando, and Chiu^[2], suggesting that BCG vaccination may account

for 26.0% of variance in the number of cases and 7.3% of variance in mortality.

The BCG vaccination was previously demonstrated to prevent acute respiratory tract infections even in the elderly. It appears that until a specific vaccine is developed for SARS-CoV-2, the results of clinical trials to test the efficacy of BCG vaccine against the transmission of SARS-CoV-2 could help planning medical strategies to stop the pandemic.

Since there are different strains of the BCG vaccine, it is important to select the best ones to protect the population. Our discussion of the different strains of the BCG vaccine and of the relationships of the vaccine to the transmission patterns and to the gradual progression of SARS-CoV-2 over recent months have been published only very recently, see Gursel and

Gursel, epub ahead of print.^[3] The data and calculations presented in that article represent the various stages of the spread of the virus as recorded on March 23, March 29, and March 31.

CONCLUSIONS

Countries without the BCG coverage usually have greater numbers of SARS-CoV-2 cases and also a higher mortality.

Tests of different strains of BCG vaccine could determine whether some strain of the BCG vaccine could provide a valuable initial strategy to curtail the transmissions of SARS-CoV-2, until a specific vaccine is developed.

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