

Is COVID-19 mortality associated with test number?

Kentaro Iwata¹, Chisato Miyakoshi²

¹Division of Infectious Diseases Therapeutics, Kobe University Graduate School of Medicine, ²Department of Research Support, Center for Clinical Research and Innovation, Kobe City Medical Center General Hospital, Kobe, Japan

ABSTRACT

Introduction: With the ongoing pandemic of coronavirus disease 2019 (COVID-19), there is an argument on whether we should increase the number of testing for the coronavirus (SARS-CoV-2) to mitigate the epidemic in a given country. Therefore, we investigated the correlation between testing number and mortality to evaluate the hypothesis. **Methods:** Data on an open-access database of COVID-19 was retrieved. Member countries of the Organization for Economic Co-operation and Development (OECD), BRICs nations (Brazil, Russia, India, and China), and Taiwan were included in the analysis, but 2 countries were removed as outliers. **Results:** There was a weak, positive correlation between mortality and testing ($r = 0.34$, $P = 0.03$). On regression analysis, there was a positive slope but the coefficient was very small (0.00064). **Conclusions:** We found a very small positive correlation between testing number and mortality for COVID-19.

Keywords: COVID-19, mortality, PCR-testing

Introduction

Coronavirus disease-2019 (COVID-19) pandemic has caused a significant burden to the world. As of this writing in December 2021, More than 260 million people were infected with SARS-CoV-2, and more than 5 million people have been killed by the disease.^[1]

There is a large difference in the use of diagnostic tests. Some countries such as the United States or the United Kingdom are known to have conducted more testing than other nations, while countries like Japan are known for, and sometimes criticized for, low testing rates.^[2-4] However, whether the number of the testing affects the outcomes of COVID-19 is not well understood. Some argue that more testing will lead to the identification of infected people with the faster solution of the problem, and others

argue excessive testing will be time and cost-consuming, causing problems of both false positive and negative test results.^[5-7]

Physicians including primary care physicians and family physicians might be perplexed in regards to what is the appropriate testing strategy both to diagnose and contain COVID-19 outbreak at each given region.^[8]

Therefore, we investigated the relationship between the number of testing and the mortality due to COVID-19, to make sure whether or not the test number matters.

Methods

We retrieved the data from an open-access database “Worldometer: coronavirus” (<https://www.worldometers.info/coronavirus/>). The database has compiled and updated data from various resources, and it has documented various important variables, such as “total cases”, “total deaths”, or “total tests”.^[9] We first collected data of 37 member countries of the Organization for Economic Co-operation and Development (OECD), plus so-called BRICs nations (Brazil, Russia, India, and China), as well as those of Taiwan, at 09:00 GMT on March 10, 2021.^[5] After

Address for correspondence: Dr. Kentaro Iwata,

Division of Infectious Diseases Therapeutics, Kobe University Graduate School of Medicine, Kusunokicho 7-5-2, Chuoku, Kobe, Hyogo 650-0017, Japan.
E-mail: kentaro iwata1969@gmail.com

Received: 13-08-2021

Revised: 02-12-2021

Accepted: 03-12-2021

Published: 14-05-2022

Access this article online

Quick Response Code:



Website:
www.jfmpc.com

DOI:
10.4103/jfmpc.jfmpc_1633_21

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Iwata K, Miyakoshi C. Is COVID-19 mortality associated with test number? J Family Med Prim Care 2022;11:1842-4.

screening their data, we removed Denmark and Luxembourg because they have conducted far more testing than other nations (3,162,934 and 3,467,136 per 1 million population respectively), and were judged to be outliers. Data of the remaining 40 nations were analyzed.

Pearson correlation coefficient was measured between the total number of deaths per 1 million population and the total number of testing per 1 million population at the time of the data retrieval. A simple linear regression analysis was also performed for these two variables. We used the R software program, version 3.5.1 (R Foundation for Statistical Computing, Vienna, Austria) for the analysis.

Results

Data on both mortality and testing were available for all the 40 nations investigated. There was a weak, positive correlation between mortality and testing ($r = 0.34$, 95% confidence interval 0.03–0.59, $P = 0.03$). On regression analysis, there was a positive slope but the coefficient was very small (0.00064 with a standard error of 0.00029) [Figure 1].

Discussion

We found very little correlation between the number of the testing and COVID-19 mortality. Although the association was statistically significant, we consider the correlation was so weak and is unlikely to be meaningful both clinically and epidemiologically. Based on our findings, the number of the testing is not likely to affect disease mortality.

Previous studies suggested that the high number of the testing might be associated with lower mortality.^[4,5] However,

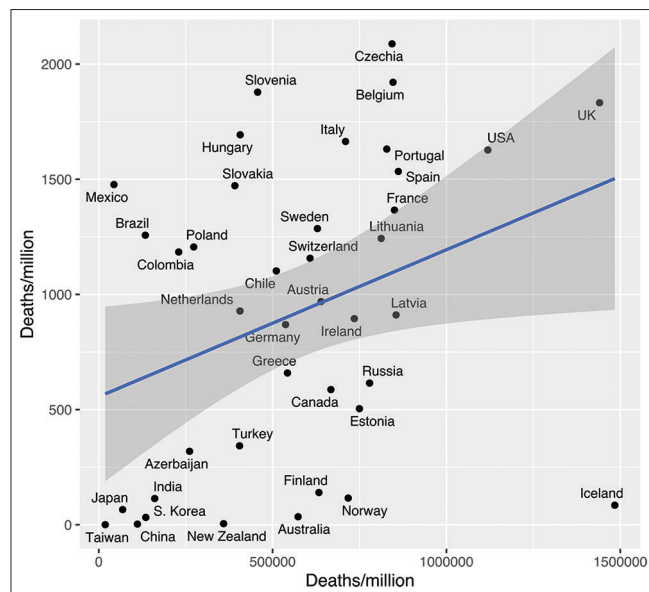


Figure 1: Correlation between the number of testing per one million population (tests) and mortality due to COVID-19 per one million population (deaths). A straight line denotes a regression line with the grey area showing a 95% confidence interval

these analyses were done using data at the very early phase of COVID-19 pandemic. At the beginning of the pandemic, many countries had difficulty in preparing and implementing COVID-19 testing capacity and it is possible to consider that the high number of testing during the early phase of the pandemic could have reflected simply a high level of healthcare overall at a given nation. In addition, both studies investigated case fatality with the number of testing. More testing would diagnose more people with SARS-CoV-2 infection, increasing denominator, and subsequently can reduce mortality. Therefore, the current study tried to see the relationship between testing number per population and the mortality per population, to overcome the possibility of overestimation of testing more.

Nearly two years have passed since the beginning of COVID-19 outbreak, and the difference of test numbers, at least among high-income nations, appears more due to the attitude or the strategy to tackle the problem, rather than the capability of conducting tests. Our analysis suggests that the number of testing per se has little, if any, impact on altering the mortality in a given nation, and a different strategy should be sought to further decrease the mortality due to COVID-19.

Primary care and family physicians have learned that the value of tests depends on the pre-test probability of each given patient to have any given disease, and the post-test probability of the disease will be provided with the sensitivity and specificity of the test. With the overwhelming pandemic of COVID-19, one often forgets this kind of principle of medicine and tends to run into testing without sound clinical reasoning. Even against COVID-19, we need to observe the principle of diagnostics, minding the risk factors and symptoms a patient has, knowing the latest epidemiological data to estimate the prevalence of COVID-19 at a given place at a given time, and decide whether the patient merits having a diagnostic test.^[10]

Our study has inherent limitations. First, our analysis investigated only correlation and did not investigate the causality. However, the lack of meaningful correlation suggests the testing number, either high or low, is less likely to cause higher or lower mortality due to COVID-19. Second, there might be some confounders, which were not sought by us. Finally, we have to be aware of the possibility that a large number of testing might be the result of, but not the cause of, the disease impact and subsequent mortality.

In conclusion, we found a very small positive correlation between testing number and mortality for COVID-19. We have to rely on the test for the diagnosis of COVID-19 in the same manner as we diagnose any other diseases.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. COVID Live Update: 263,756,444 Cases and 5,242,124 Deaths from the Coronavirus-Worldometer. Available from: https://www.worldometers.info/coronavirus/?utm_campaign=homeAdvegas1?. [Last accessed on 2021 Dec 02].
2. Iacobucci G. Covid-19: Is the UK carrying out more tests than anywhere else in Europe? *BMJ* 2020;370:m3497.
3. Martell A, Parker N. The U.S. has more COVID-19 testing than most. So why is it falling so short? Reuters. 2020 Jul 27. Available from: <https://www.reuters.com/article/us-health-coronavirus-usa-testing-insigh-idUSKCN24S19H>. [Last accessed on 2021 Mar 11].
4. Japanese government, criticized for low testing rates, eases guidelines for seeking virus tests. *The Japan Times*. 2020. Available from: <https://www.japantimes.co.jp/news/2020/05/09/national/japan-criticism-relaxes-coronavirus-testing-guidelines/>. [Last accessed on 2021 Mar 11].
5. Wikramaratna PS, Paton RS, Ghafari M, Lourenço J. Estimating the false-negative test probability of SARS-CoV-2 by RT-PCR. *Euro Surveill* 2020;25:2000568.
6. Braunstein GD, Schwartz L, Hymel P, Fielding J. False positive results with SARS-CoV-2 RT-PCR tests and how to evaluate a RT-PCR-positive test for the possibility of a false positive result. *J Occup Environ Med* 2021;63:e159-62.
7. Yamamoto K, Saito S, Hayakawa K, Hashimoto M, Takasaki J, Ohmagari N. When clinicians should repeat RT-PCR for SARS-CoV-2: Repeat PCR testing in patients with pulmonary CT findings suggestive of COVID-19. *Jpn J Infect Dis* 2021;74:161-5.
8. Lee JQ, Loke W, Ng QX. The role of family physicians in a pandemic: A blueprint. *Healthcare (Basel)* 2020;8:E198.
9. Liang L-L, Tseng C-H, Ho HJ, Wu C-Y. Covid-19 mortality is negatively associated with test numbers and government effectiveness. *Sci Rep* 2020;10:12567.
10. Wei C, Lee CC, Hsu TC, Hsu WT, Chan CC, Chen SC, *et al*. Correlation of population mortality of COVID-19 and testing coverage: A comparison among 36 OECD countries. *Epidemiol Infect* 2020;149:e1.