

Case-Fatality Rates for COVID-19: Are we Ignoring Something?

Usama Waqar^{1,*}, Shaheer Ahmed², Daniyal Ali Khan¹, Kantesh Kumar Lohana¹

¹Medical College, Aga Khan University, Karachi, Pakistan.

²Islamabad Medical & Dental College, Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad, Pakistan.

Abstract: The availability of accurate data is of vital importance in the COVID-19 pandemic which has presented itself as a formidable challenge. The objective of our paper was to identify the flaws in simple estimates of case-fatality rate (CFR), the epidemiological indicator currently in use, and compare it to another more effective indicator, the adjusted case-fatality rate (aCFR). aCFR is defined as the number of COVID-19-associated fatalities*100/ total cases that reached outcome, i.e. death or recovery, according to the methodology of Ghani and colleagues. The results showed varying CFRs and aCFRs for several countries, signifying the problem with using CFR. Belgium is a prime example of such a case as it had a CFR of 15.82% while an aCFR of 36.38% and the number of cases in Belgium is high enough to make the discrepancy in these results significant. The deaths caused by COVID-19 are being underrepresented by CFR. It can lead to misleading results, especially when comparing countries and regions on their mortalities.

Keywords: COVID-19, COVID-19 pandemic, SARS-CoV-2, 2019-nCoV, Epidemiology, Epidemiologic measurements, Case-fatality rate.

INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic has rapidly spread to all continents, resulting in many fatalities. Italy was initially found to have a significantly higher case-fatality rate than most countries [1]. This opened the world to potential hypotheses explaining this peculiar revelation. These included Italy having higher proportion of older COVID-19 patients, a different definition of COVID-19-associated

deaths, different testing strategies, among others [2]. However, there is another side that has been ignored so far.

Case-fatality rate (CFR) is the proportion of fatalities from a disease compared to the total cases diagnosed in a certain time. However, this definition does not account for the continuous evolution of cases as an outbreak progresses, as in the case of COVID-19. Simple estimates of case-fatality rates can be deceiving if outcomes (death or recovery) are unknown for

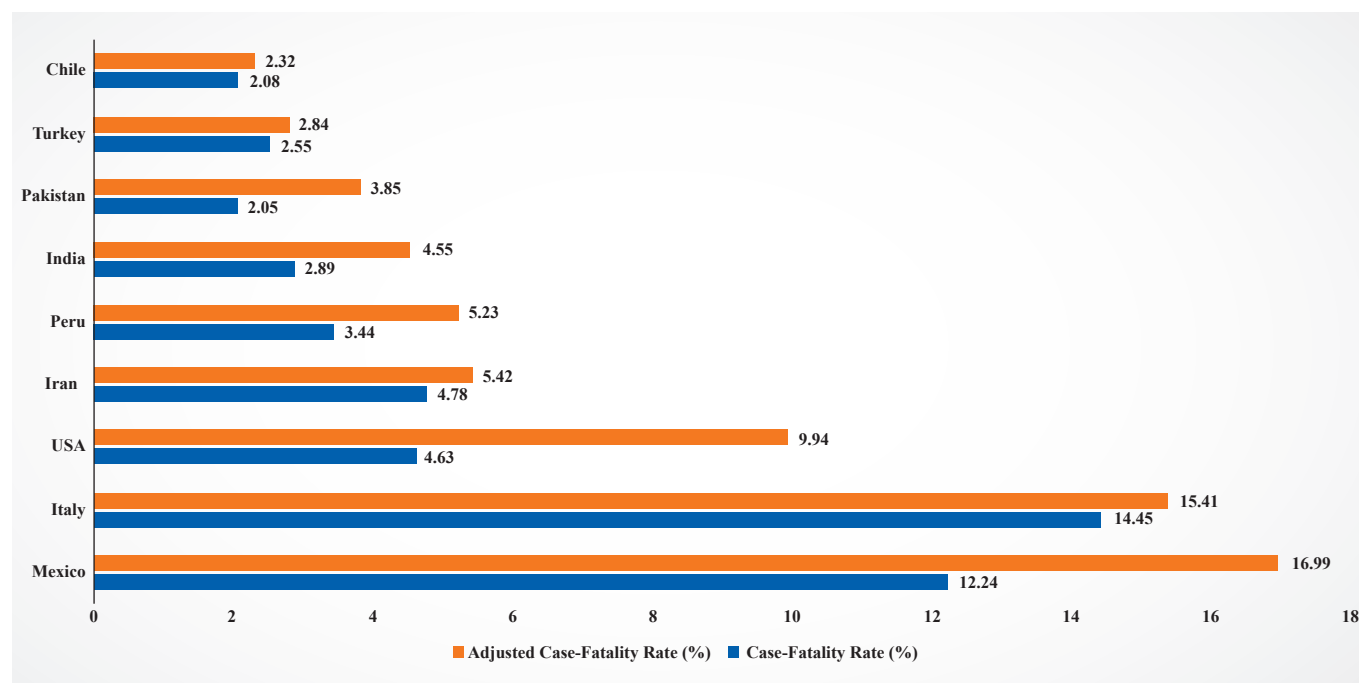


Fig. (1). Comparison of CFR and aCFR for Countries with Cases $\geq 200,000$ as of July 3rd 2020.

*Address correspondence to this author at the Medical College, Aga Khan University, Karachi, Pakistan. E-mail: usama.waqar@scholar.aku.edu

significant cases at the time of the analyses. Most epidemiological assessments have failed to regard this and calculated CFR by dividing total deaths with total cases, thus providing potentially misleading results. Therefore, we recommend the methodology of Ghani and colleagues to calculate an adjusted CFR (aCFR) [3].

MATERIALS AND METHODS

We used data provided by Worldometer to calculate aCFR using the following formula:

$aCFR = \text{Total deaths} * 100 / \text{Total cases that reached outcome, i.e. death or recovery}$ [4].

RESULTS

Using this approach, we found that several countries have contrasting CFRs and aCFRs. Mexico has the highest aCFR (16.99%) and while Italy has the highest CFR (14.45%) among countries with over 200,000 cases as of July 3. The aCFR for the United States is 9.94%, but its CFR is 4.63% (Fig. 1). Surprisingly, Yemen, Belgium, France, and Honduras were found to have the highest aCFRs globally (38.78%, 36.38%, 28.01% and, 21.25%) while their CFRs are 26.62%, 15.82%, 17.96%, and 2.80% respectively. Yemen has limited cases that can potentially make estimations of its CFR and aCFR questionable. However, the case with Belgium is significant, considering that the country was one of the earliest to import the outbreak and has 61,727 patients currently.

CONCLUSION

According to our findings, CFR is underrepresenting the COVID-19-associated deaths and providing misleading results, especially when comparing countries and regions on their mortalities. This is because the outbreak is still evolving; CFR should be used once all cases have reached their outcomes.

aCFR, however, has its own set of limitations. Neither the World Health Organization nor the European Center for Disease Prevention and Control report data on COVID-19 recoveries, because of which, we had to use another source for our assessment [4]. Countries also lack uniform definitions for COVID-19 outcomes, adding the element of inconsistency in the available data.

The pandemic is still growing, and accurate epidemiological

assessments are required to inform and prioritize policymaking, especially in countries where significantly high mortalities among total outcomes are masked by low to average case-fatality rates. However, this is difficult without countries reporting real-time data on COVID-19 recoveries while using standardized outcome definitions.

FUNDING DISCLOSURE

None to declare.

ETHICAL APPROVAL

Ethical approval was not required for this study because it did not involve human or animal subjects.

CONFLICT OF INTEREST

Declared none.

ACKNOWLEDGEMENTS

We acknowledge all our fellow colleagues.

AUTHORS' CONTRIBUTION

All authors have equally contributed.

REFERENCES

- [1] The Wall Street Journal. Italy, with aging population, has world's highest daily deaths from virus. 2020; Available from: <https://www.wsj.com/articles/italy-with-elderly-population-has-worlds-highest-death-rate-from-virus-11583785086>.
- [2] Onder G, Rezza G, Brusaferro S. Case-fatality rate and characteristics of patients dying in relation to COVID-19 in Italy. *JAMA* 2020; 323(18): 1775-6. DOI: 10.1001/jama.2020.4683
- [3] Ghani A, Donnelly C, Cox D G *et al.* Methods for estimating the case fatality ratio for a novel, emerging infectious disease. *Am J Epidemiol* 2005; 162(5): 479-86. DOI: 10.1093/aje/kwi230
- [4] Worldometer. COVID-19 Coronavirus Pandemic. 2020; Available from: <https://www.worldometers.info/coronavirus/#countries>.