

COVID-19 and all-cause-mortality; differential trends between countries and selected states of India

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Abstract

Background: By 22nd January 2021, the SARS-CoV-2 virus had infected over 98 million and 10.6 million individuals globally and in India, with 1.7 million and 153,067 deaths, respectively¹. Case Fatality rates (CFR) due to COVID-19 have varied significantly between countries. In order to understand the true impact of the pandemic, we should report coronavirus (COVID-19) mortality in the context of all-cause and non-COVID-19 mortality, and compare with previous years. The consequences of the pandemic have been, and will be, different in different settings within and across countries.

Objectives: To compare the all-cause mortality in the year 2020 with previous years in three selected states of India correlate it to the burden of COVID-19 and compare all-cause mortality between three states of India to four high income countries.

We also compared the number of cases, deaths, CFR, prevalence of NCDs per million and the proportion of population > age 65 in India to four high income countries (HIC)- the UK, US, Spain and Italy.

Methods: We provide quantitative data in three states across India (Himachal Pradesh, Kerala and Odisha) and compare with high-income countries to illustrate the importance of context-specific data monitoring and public health responses.

Results: There was a 1.9% increase in deaths, with 2.8% decrease in births in 2020, compared to 2019 in Himachal Pradesh, 13.3 and 9.2% decrease in Kerala and 16.7% and 21.4% decrease in Odisha.

Conclusion: There was a direct correlation of all cause mortality to CFR on comparison between three states of India and despite the enormous burden of COVID-19 in India all-cause mortality was lower compared to previous years in addition to the CFR due to COVID-19 being lower than in selected HICs.

Introduction

All-cause mortality- lessons from current and past pandemics

Health systems worldwide, including those of developed economies are struggling to prevent spread and mortality due to COVID-19, without neglecting other health and societal priorities. It is clear that COVID-19 has direct effects through infection, and indirect effects through changes and strains on health systems and behaviours of individuals, whether patients or health professionals. Despite increasing recognition of impact on acute and long-term morbidity, mortality is the most frequently used measure of impact and of comparison between countries and over time. All-cause mortality is an important measure of overall health, relevant across a wide spectrum of diseases^{2,3}. Through a “syndemic” lens, COVID-19, NCDs (non-communicable diseases) and social determinants of health are interplaying with health system preparedness and political decision-making. All-cause, COVID-19 and non-COVID-19 mortality need to be understood to estimate and mitigate direct and indirect impact, and to inform actions required at system

level⁴. In India, with a higher NCD burden than any other country, this approach is especially important, and comparison with other countries severely affected by the pandemic, may also be informative.

Previous pandemics have been associated with increased all-cause mortality, as well as deaths not directly attributable to the pandemic, especially NCDs and other infections. For example, the Spanish flu pandemic of 1917-1918, influenza, Severe Acute Respiratory Syndrome (SARS) and Middle-Eastern Respiratory Syndrome (MERS) have followed these patterns. During the influenza pandemic globally between 1957 and 1959, excess respiratory mortality rate was 1.9/10 000 population (95% confidence interval 1.2–2.6 cases/10 000 population).⁵ Excess mortality rates varied 70-fold across countries; Europe and Latin America experienced the lowest and highest rates, respectively. The H1N1 pandemic was associated with 11.1 excess all-cause deaths per 100,000 population during the three waves of virus activity in Mexico, April–December 2009.

The effect of the COVID-19 pandemic on all-cause mortality has been highly variable across countries. In Denmark, timely lockdown measures meant that all-cause mortality for the first six months of 2020 was not increased compared with that of 2015–2019⁶. In the USA, between March 1 and May 30, 2020, there were 95,235 COVID-19 deaths, and 122,300 excess deaths⁷, leaving 22% unattributed to COVID-19. The proportion of excess deaths that were attributed to COVID-19 varied between states and increased over time. In Italy, excess and COVID-19 deaths were 26,701 and 13,710, respectively⁸, showing significant indirect effects of the pandemic. Across 21 countries, the first wave of the pandemic (from mid-February through the end of May 2020) led to over 200,000 excess deaths. Bulgaria, New Zealand, Slovakia, Australia, Czech Republic, Hungary, Poland, Norway, Denmark and Finland avoided a detectable rise in all-cause mortality, contrasting with the UK, Spain, Italy and Belgium, where the all-cause death toll was very high⁹.

Methods

The Indian scenario-

India, a country of 1.37 billion, has the largest total NCD burden in the world with significant health and social inequities. Given the scale of infection in India, and the increased risk of mortality associated with underlying NCDs, COVID-19 and non-COVID-19 mortality is expected to be high. In India, health and healthcare are organised at the state level within the federal system of the country, with significant differences between states in terms of health-related indices, but mortality has not been investigated in India compared with other countries, or between states in India in the COVID-19 context, to our knowledge. (Table 1)

Study Design: The study was an observational study.

Methods: We compared population size, COVID-19 and non-COVID deaths, crude fatality rate (CFR), prevalence of NCDs (from Global Burden of Disease 2016 data)¹⁰ and proportion of the population > 65

years of age in India, USA(National Vital Statistics System, NVSS)¹¹, UK(Office for National Statistics),¹² Spain (Instituto Nacional de Estadística, INE)¹³ and Italy(Worldometer).¹⁴For the Indian states of Himachal Pradesh, Kerala, and Odisha, birth and death data were collated from Local Self Government websites and State Epidemiology offices of respective states¹⁷, comparing 2020 with the preceding five years. (Table 1)The three Indian states were selected on the basis of data availability.

India has faced lower burden of COVID-19 cases and deaths per million (758 and 11) than other countries (e.g. USA: 6649 and 112, and UK: 4526 and 120 respectively), resulting in a relatively lower CFR (1.4%), compared with USA (1.7%) and UK (2.6%).¹⁵ The proportion of the population aged >65 years is lower, and the burden of NCDs per million population per year is also lower, compared with other countries¹⁶ (Table 2).

Results

(Figure 1)In the northern state of Himachal Pradesh,there was a 1.9% increase in deaths, with 2.8% decrease in births in 2020, compared to 2019. In the southern state of Kerala, all-cause mortality and total birth rate reduced by 13.3% and 9.2% respectively in 2020, compared to 2019.All-cause mortality and births decreased by 16.7% and 21.4% in the eastern state of Odisha. Himachal Pradesh has the higher CFR (1.7%) than Kerala (0.4%) and Odisha (0.6%).

Conclusion

Lessons from India

Many potential causes have been proposed to explain the low CFR in India, including extensive BCG vaccination coverage, enteric biomes, relatively low population density in rural India and younger population. Official statistics suggest the role of the relatively younger age of the Indian population and the lower prevalence of NCDs,compared with many developed countries worse affected by the pandemic.

The decrease in all-cause mortality in Kerala and Odisha has been underlined by significant reductions in emergencies in specialties from paediatrics andcardiology to neurology and orthopaedics,as reported by respective clinical associations and media, although under-reporting is possible.Decreases in clinical interventions and surgical procedures, as well as sales of antibiotics have also been reported as low, which tally with reduced burden of disease.

Kerala, like the majority of states in India, has had low case fatality rates, compared with the USA, UK, Spain and Italy, despite significant COVID 19 case-load. The response of Kerala to COVID-19 with good political commitment, active community engagement, proactive care of elderly and vulnerable and through a social equity lens has been highlighted previously.

The present pandemic has ushered certain drastic changes in our social and behavioural habits, which is now considered the new normal. The lockdown, physical distancing, face masks, frequent hand washing

and other sanitary measures are likely to continue as a behavioural change even after the pandemic recedes.

Reduced all-cause mortality could be related to reductions in deaths due to myocardial infarctions, strokes, road traffic accidents, non-COVID lower respiratory tract infections, and acute exacerbations of chronic respiratory diseases. Other contributing factors may include behavioural changes, such as use of masks, hand washing and sanitisation, decreased alcohol and tobacco consumption due to lack of availability and healthier dietary habits. Moreover, lockdown has led to lower environmental pollution, potentially better care of vulnerable groups and greater attention to health at individual, community and media level. On the other hand, indirect effects of the pandemic on treatment of acute and chronic non-COVID disease, including cancer, cardiovascular disease and rehabilitation care may lead to morbidity and mortality in coming months and years.

All-cause mortality figures need to be supplemented with breakdown by cause of death and age-adjustment. We only present data from three states in India, which have a good record in implementing public health programmes. Data from other states is required to before generalising for the rest of the country.

There are significant differences in incidence, deaths and CFR due to COVID-19 between populations and countries. In terms of spread of a pandemic, COVID-19 is the most extensive with all nations affected. Unlike previous pandemics, all-cause mortality has actually been lower or on par with previous years in three states of India, compared with significantly higher mortality rates in many high income countries. High quality data from all states is required to facilitate further research regarding the low COVID 19 case fatality rate in Kerala and India, as well as breakdown of cause of death and age-specific mortality.

List Of Abbreviations

NCD non-communicable disease

CFR case fatality rate

CVD cardiovascular disease

HIC high income country

SARS severe acute respiratory syndrome

MERS Middle-East respiratory syndrome

Declarations

Ethical approval: not applicable for this commentary

Patient consent for publication: Not applicable

Data availability: The datasets generated during and / or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests: None of the authors have any conflict of interest to declare

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Authors contributions: JCM, PSR, AB, SR were responsible for the concept, studying data and the first draft, KM and BKS were responsible for providing data from the state of Odisha, OB, SR provided the data from Himachal Pradesh, DJ formatted the manuscript and provided data from HICs, all authors contributed to the final manuscript.

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Tables

Table 1. COVID-19 burden and deaths, all-cause mortality comparison between 2019 and 2020, countries and states

State/Country	COVID-19			Mortality			
	Cases per 100000 population (December 31, 2020)	Case Fatality Rate	Deaths per 100,000 population	All-cause (2019)	All-cause (2020)	Annual crude death rate per 100,000 (2019)	Annual crude death rate per 100,000 (2020)
Himachal Pradesh	855	1.7	13.1	43633	44480	587	593
Kerala	2132	0.4	8.4	263901	228739	755	641
Odisha	786	0.6	4.5	340595	283483	732	603
USA	6241	1.7	106	1443000 ^	1626000 ^	872	977
UK	3911*	2.8*	111*	530841 @	604045@	792	962
Italy	3568	3.5	125	435250^	475674^	1439	1571
Spain	4190	2.6	110	187382^	231014^	802	976

^ data till June 30th , @data for the first 42 weeks of the year, *51 week data

Table 2. Comparing burden of COVID-19, NCD burden, and proportion of the population with an age > 65 years in India and four countries particularly affected by the pandemic

	INDIA	USA	UK	SPAIN	ITALY
Number of cases*	10,466,595	22,009,275	3,072,353	2,025,560	2,276,491
Total deaths	151,160	369,304	81,431	51,690	78,755
Cases per million*	758.4	6649.3	4525.7	4332.3	3765.2
Death per million*	10.9	111.6	119.9	110.5	130.2
CFR*	1.4	1.7	2.6	2.5	3.5
NCD burden calculated as DALYs per year, 1 million population [@]	192,593.4	233,333.3	224,464.8	208620.7	227677.1
Proportion of population > age 65 years	6.4%	16.5%	18%	17%	22.8%

*as of 12th January 2021 @as of 2016, Global burden of diseases

Figures

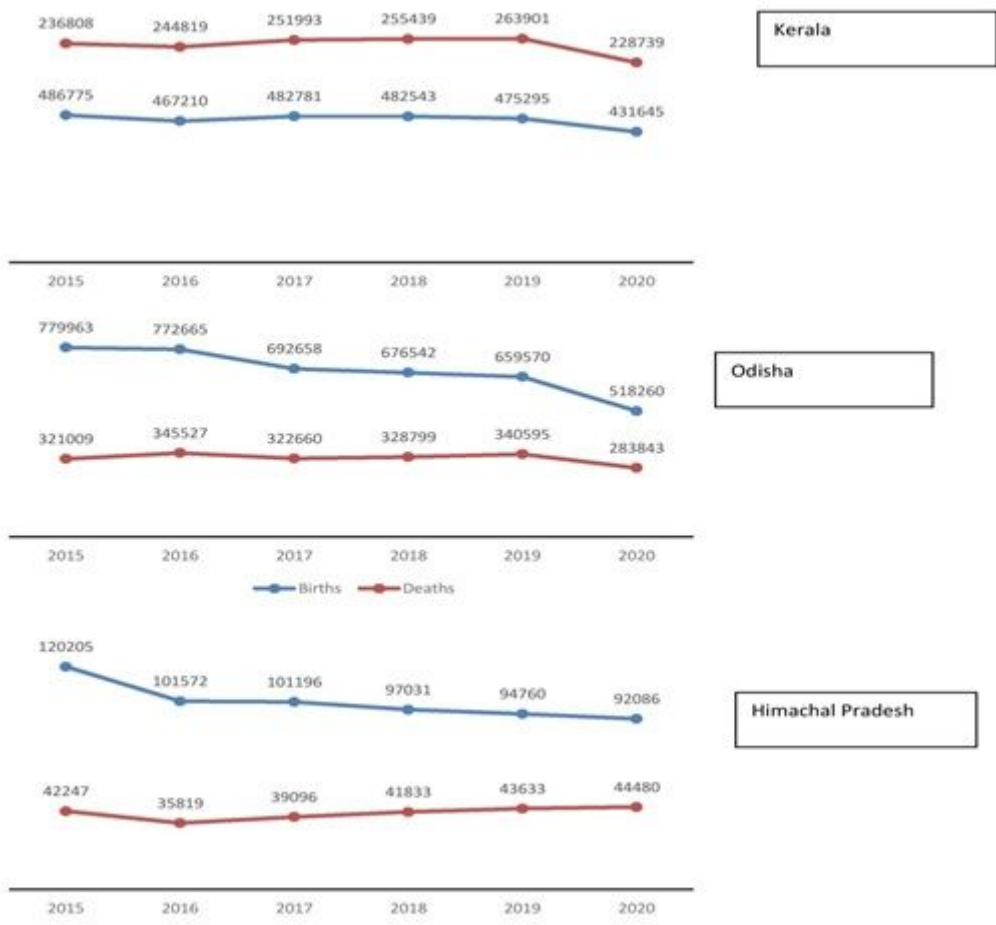


Figure 1

Trend of births and deaths across Himachal Pradesh, Kerala and Odisha