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# An epidemiological study of an evolving pandemic for future containment strategies in Karnataka

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## Abstract

**Introduction:** COVID-19 is a pandemic with a clinical spectrum ranging from mild to moderate respiratory infection to a fatal illness. Elucidating the epidemiology of such disease is important to understand and characterize its potential impact. **Methods:** This study is an epidemiological analysis of confirmed COVID-19 cases in Karnataka from 9th March to 7th June 2020 and aims to study patterns of the disease to provide useful analysis for measures that can be taken in the future. **Results:** The study concluded that young men were most infected while the mortality was higher among the elderly (Case fatality rate of 12.3% in patients for more than 60 years). The total case fatality rate of the state (1.11%) was lesser compared to the national rates (2.81%). In the zonal colour coding of the districts, the state capital was a hotspot and had the highest number of cases in the state until 1st June. After the first week of the lifting of the lockdown, the Udupi district recorded the highest number of cases. An increase in the number of cases in the state in the first week of June, can be attributed to the influx of passengers from other states. **Conclusion:** Regulation of activities involving crowd gathering and movement and active surveillance and contact tracing by the Government of Karnataka contained the spread of the virus to some extent in the state and had lower case fatality rates and deaths per 10 million, compared to national averages. Identification of risk factors operating in the hotspot areas and recognizing the health promotion factors that benefitted the recovered cases can help the government to plan strategies to overpower the evolving epidemic.

**Key words:** Epidemiology, Karnataka, pandemic

## Introduction

Coronavirus disease-2019 (COVID-19) or the severe acute respiratory syndrome Coronavirus-2 (SARS-CoV-2) caused by a beta-coronavirus, named 2019-novel coronavirus (2019-nCoV or nCoV-2); has a spectrum ranging from asymptomatic cases to mild or moderate respiratory infection, requiring no special treatment to a fatal illness, particularly in

the elderly population and people with underlying co-morbidities or a suppressed immune system. According to the World Health Organization (WHO), the incubation period for COVID-19 is five to six days on average but can go up to 14 days. [1]

Previous pandemics have highlighted the importance of elucidating the epidemiology of the disease to understand and characterize the potential impact. [2] This research aims to look at COVID-19 through an epidemiological lens in Karnataka - a state in the southern part of India to study patterns of the disease in the period before, during and one-week post lockdown to provide useful analysis for measures that can be taken in the future.

## Methods

To contain the spread of the epidemic, the Indian government had imposed a nationwide lockdown, in four phases, from 24th March 2020. The lifting of

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this lockdown on 31st May 2020 in various phases was initiated in all areas except the containment zones of the country. This study is a secondary data analysis of confirmed COVID-19 cases reported between 9th March 2020 and 7th June 2020 in Karnataka.

The daily media bulletins and reports posted on the COVID-19 information portal of the Government of Karnataka, accessible to the public, at <https://covid19.karnataka.gov.in><sup>[9]</sup>; have been used for the study. These documents were followed up; data was compiled in MS excel and interpreted. Background literature was extracted from various online databases using search phrases and Boolean operators and from various media available in the public domain. Data from unconfirmed sources were discarded.

## Results

### *Timeline*

Karnataka's index case was a male, software professional, aged 46 years, who had landed in Bengaluru on 1st March from the United States. He was confirmed as positive on 9th March 2020. Till that date, a total of 86,588 passengers had been screened in Karnataka at two airports- the Kempegowda International Airport, Bengaluru and Mangalore International airport and 5,323 passengers had been screened at Mangalore and Karwar seaports. A total of 982 from the above, had been identified for quarantine and of them, 266 had completed 28 days of observation, 700 persons were in-home quarantined, 12 were admitted in selected isolation and four had left the country to return to China on 30th January 2020. Out of the reported samples until that day, 364 had tested negative and this was the first sample that tested positive.

The Ministry instituted guidelines on 19th March, under which passengers having symptoms of COVID-19 were classified as 'A' category and sent to hospitals for isolation, confirmation and other procedures as per the standard operating procedures in place. Diabetic passengers or those with high blood pressure or other chronic diseases were classified as 'B' (medium risk) category, regardless of the presence of symptoms. They were compulsorily kept under

observation in the government hospitals for 14 days. Passengers with no symptoms were classified as C (low risk) and subjected to be 'home quarantined', with the same marked on their forearms.

The number of cases rose from one to 565, as of 30th April 2020. A month later, as of 31st May 2020, Karnataka had conducted a total of 2,93,575 tests, of which 3,221 cases had tested positive. Karnataka was conducting 4,584 tests per million populations as of 31st May and this rose to 6,095 as of 7th June. In the first week of unlocking, a total of 90,867 persons were tested with additional 2,231 cases; leading to total 5,452 cases as on 7th June. The paper now reflects on the characteristics of these cases.

### *Person characteristics*

A contact and network analysis shown in the daily media bulletin on 7th June 2020, revealed that 1,042 (19.1%) of the 5,452 cases had spread via contact, 208 (2.6%) had an international travel history and the majority, i.e. 3,922/5,452 (61.6%) had a domestic travel history from which 3,537 had travelled from Maharashtra. The other cases were diagnosed while they were under investigation for influenza-like illness (ILI), severe acute respiratory infections (SARI) or other illnesses.

The gender distribution of the cases in Karnataka showed a male predominance as 3,443 (63.1%) were males and 2,009 (36.8%) were females. Nearly half (2,668/5,452- 48.9%) of the cases were from the age group of 20 to 40 years, with the 30 to 40 years' group, recording the majority, i.e. 1,369 (25.1%) cases. About 22.7% of cases were below 20 years of age and 28.4% were above 40 years of age with patients aged >60 years being 300 out of 5,452 (5.5%).

From the 3,221 cases on 31st May, 37.81% (1218) had been discharged, 53 had died (51 COVID and 2 non-COVID cause). Fifteen from the 1950 active cases were in the ICUs. By 7th April, 39.1% (2,132/5,452) had recovered, there were ten more deaths since 31st May, totalling to 61 COVID deaths. Only ten from the 3,257 active cases were in ICUs.

The death of 61 patients from 5,452 indicated a total case fatality rate of 1.11%, which was less than the national average of 2.81%.<sup>[4]</sup> From the deceased, 16 patients were aged >70 years, 21 were between 60 to 70 years of age, 15 between 50 to 60 years, eight between 40 to 50 years and one between 30 to 40 years. From the 300 positive patients aged more than 60 years, 37 died, therefore resulting in a fatality of 12.33% of the people affected in that age group. Karnataka recorded ten deaths per 10 million populations, which was significantly low compared to the national average of 57.3.

#### *Place distribution*

Twenty of the thirty districts in the state had reported cases as of 30th April 2020. As of 31st May, only one district out of 30, Chamarajanagar had zero reported cases. The Bruhat Bengaluru Mahanagara Palike (BBMP) had 357 (11.08%) cases, followed by 285 (8.84%) in Yadagiri, 281 (8.72%), 270 (8.38%) in Mandya, 217 (6.73%) in Raichuru, and 187 (5.80%) in Udupi. These six districts constituted approximately 50 per cent of the total caseload. The compounded daily growth rate of positive cases of five days, on 31st May 2020, stood at 7.1% for the state of Karnataka and it increased to 7.5% by 7th June, with Udupi showing the highest growth rate of 17.1%.

BBMP recorded the highest total number of cases in the state until 1st June. On 2nd June, the district of Udupi had 150 new positive cases in a single day, followed by 62, 92, 204, 121, and 13 on 3rd, 4th, 5th, 6th, 7th June, respectively, leading to a total of 902 cases, the highest in the state.<sup>[5]</sup> As of 8th June, the district recorded a total of 946 positive cases, from which 933 were cases from other states (908 from Maharashtra).<sup>[6]</sup> Even for the state, overall, from 2,231 new cases from 1st to 7th June, a total of 1,935 had domestic travel history from another state (1,854/1,935 - Maharashtra).

#### *Categorization into "Zones"*

The Government of India classified Indian districts into three categories, on 15th April 2020, based on cumulative cases reported and the doubling rate, for better strategic planning. The red zones were the hotspot districts reporting at least one positive case

in 14 days (or having many already positive cases) whereas districts that recorded no new cases in 14 days and the last reported case was 15 to 28 days before, were classified as non-hotspot orange zones. Districts with no reported new cases for more than 28 days were labelled green zones. On 30th April, Karnataka had twelve districts in green, three in orange and fifteen in the red zone.

With the recovery of cases being reported, this classification was revised on 30th April to make it multifactorial, taking incidence of cases, doubling rate, the extent of testing and surveillance feedback to classify the districts and to identify pockets of critical interventions for focused management. A district with no confirmed cases until that date or no reported case for 21 days was classified as a green zone. According to this revised classification<sup>[7]</sup>, Karnataka was divided into three red, thirteen orange and fourteen green zones. These zones were a dynamic entity, subject to revision. As of 31st May 2020, the last day of the nationwide lockdown and up to 7th June, the picture changed to three districts in red zones and 25 in orange zones. The transition of green zones to orange was mainly due to the influx of people from other states into Karnataka. From being a green zone on 27th April, to reporting the highest number of COVID-19 positive cases, Udupi district had witnessed the extremes.<sup>[6]</sup>

#### **Conclusion**

Preliminary epidemiological results revealed that younger men who form the workforce of the nation were most infected while the mortality was higher among the elderly even though the case fatality of the state was lesser compared to the national rates. Zonal colour coding of the districts was done to implement and regulate activities involving crowd gathering and movement. The State capital was a hotspot for a long time even though the other districts moved to low-risk zone after the revised classification. The lifting of lockdown restrictions and opening of interstate travel, led to an increase in cases in the state, with Udupi recording the highest numbers at the end of the first week of the lifting of the lockdown, due to an influx of people from other states, especially Maharashtra. A further detailed investigation about risk factors operating

in the hotspot areas and the health promotion factors benefiting the recovered cases can help the government to plan strategies to overpower the evolving epidemic.

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