COVID-19: EARLY DISEASE CHARACTERISTICS IN INDIA

Epidemiology

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ABSTRACT

BACKGROUND: In December 2019, cases of flu-like illness by a novel coronavirus (Covid-19) were identified in Wuhan, China. Thereafter it spread to Iran, Italy, Spain and has now affected more than 200 countries in the world. The first few cases in India were detected in Kerala in Jan 2020. In recent days, infections have been identified in other Indian cities as well. Here, we provide an analysis of early data on Covid-19 positive cases and fatalities in India to describe the epidemiologic characteristics and transmission dynamics of Covid-19. **METHODS**: We collected information on demographic characteristics, exposure history, and prior co-morbidities in laboratory-confirmed cases of Covid-19 fatalities that have been reported till March 31, 2020. Since full details are not yet available we have sourced this data from press releases, statements and documents from reliable sources such as Ministry of Health & Family Welfare, Indian Council of Medical Research, newspapers, and World Health Organization. The available data were analysed retrospectively and compared to published international literature. **RESULTS:** 1637 people have tested positive for Covid-19 infection in India and there have been 38 fatalities thus far. The median age of fatal cases was 65 years and 71% were male. The majority of cases (68%) were more than 60 years of age and 23 patients had a history of travel and/or contact with a known positive case. The common co-morbidities of fatal cases were Diabetes and Hypertension. The epidemic Case Fatality Rate was 2% and the Epidemic Doubling Time was 3.7 days. **CONCLUSIONS:** India is in the early stages of an exponential curve with the number of cases and deaths expected to rise soon. The epidemic trends deciphered in our study are similar to disease activity trends in China and other nations. Although CFR in India is low compared to the global aggregate, we have likely miscalculated this figure. Urgent procedures such as social distancing, precautions from exposure and self-isolation are the need of the hour to slow down the disease transmission.

KEYWORDS

Covid-19, India, Fatality

INTRODUCTION

The novel coronavirus pandemic has taken the entire world by surprise. Its transmission, contagiousness and fatality rate has been ferocious. Developed nations like Italy, Spain and the USA are struggling to control its spread In Asia; Iran, Saudi Arabia and Malaysia are the worst hit after China. In India, the disease is still in its local transmission stage1. However, large population, poor sanitation and large gaps in healthcare infrastructure are potential risk factors to epidemic levels of transmission. With very little data on COVID cases coming out from India, it is pertinent for us to present a preliminary report on the COVID-19 cases and fatalities in India.

MATERIALS & METHODS

In this study, we collected all the information on Covid-19 related illness available from reputed sources such as Ministry of Health & Family Welfare (MoHFW), Indian Council of Medical Research (ICMR), newspapers, and World Health Organization (WHO). Demographic characteristics, exposure history, and co-morbid illnesses in laboratory-confirmed fatal cases of Covid-19 that had been reported by March 31, 2020, were retrospectively analysed. Comparisons were made with available international data.

RESULTS

The first few novel coronavirus (Covid-19) positive cases in India were detected in a cluster of 3 students evacuated from Wuhan, China on 30th January 2020. They were quarantined and recovered without any complications[12]. The first COVID-19 related fatality was reported on 12th March 2020 from Karnataka in a gentleman who had travelled to Saudi Arabia[3]. At the time of writing this article (31st March 2020), 38 patients had succumbed to this illness and 1636 has tested positive[4]

The maximum number of cases were detected in Maharashtra (302) followed by Kerala (241). Delhi had 120 positive cases. Most fatalities were noted in Maharashtra (9) followed by Gujarat (6) (Table 1). A graph of positive cases versus time was plotted and revealed an exponential growth trend (Fig.1) which closely paralleled a similar graph of related fatalities (Fig.2).

Table 1. Statewise distribution of Covid-19 cases and fatalities till 31st March 2020 (Data sourced from MoHFW Website https://www. mohfw. gov. in/ accessed on 1st April 2020)

S. No.	Name of State / UT	Total Confirmed cases (Including 49 foreignNationals)	Death
1	Andhra Pradesh	83	0
2	Andaman and Nicobar Islands	10	0
3	Bihar	23	1
4	Chandigarh	13	0
5	Chhattisgarh	9	0
6	Delhi	120	2
7	Goa	5	0
8	Gujarat	74	6
9	Haryana	43	0
10	Himachal Pradesh	3	1
11	Jammu and Kashmir	55	2
12	Karnataka	100	3
13	Kerala	241	2
14	Ladakh	13	0
15	Madhya Pradesh	47	3
16	Maharashtra	302	9
17	Manipur	1	0
18	Mizoram	1	0
19	Odisha	4	0
20	Puducherry	1	0
21	Punjab	41	3
22	Rajasthan	93	0
23	Tamil Nadu	124	1
24	Telengana	94	3
25	Uttarakhand	7	0
26	Uttar Pradesh	103	0
27	West Bengal	26	2
	Total number of confirmed cases in India	1636	38

Fig. 1 Timeline of confirmed cases in India (Data sourced from National Disaster Management Authority Website https:// gis. ndma. gov.in/arcgis/apps/sites/#/data accessed on 1st April 2020)

Confirmed Cases in March 2020
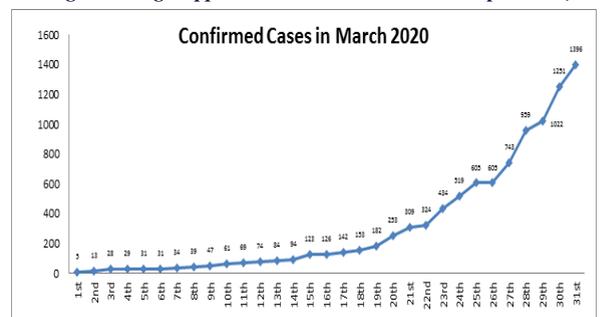
Fig. 2 Timeline of deaths in confirmed cases in India (Data sourced from National Disaster Management Authority Website https://gis.ndma.gov.in/arcgis/apps/sites/#/data accessed on 1st April 2020)
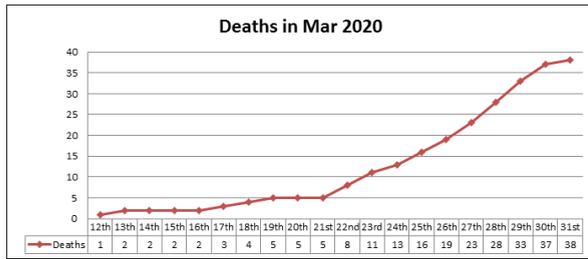
The median age of fatal cases was 65 years. 12 (32%) patients were below 60 years of age and 27 (71%) were males. 20 patients had known pre-existing disease, commonest of which was Diabetes (13) followed by Hypertension (10). 23 patients had a history of foreign travel or of having come in contact with a positive case. In two cases, from Buldhana[5] and Mohali[6], there was no history of travel and mode of transmission of disease to them remains unclear (Table 2).

Table 2. Demographic data on fatalities of confirmed cases in India till 31st March 2020

S. No	Age	Sex	City of Residence/ Hospitalisation	Travel to	Date of Death	Comorbidities
1	79	M	Kalburgi,Karnataka	Saudi Arabia	12/03/2020	Asthma,HTN
2	69	F	Delhi	Italy	13/03/2020	DM,HTN
3	64	M	Mumbai	Dubai	17/03/2020	HTN
4	70	M	Nawanshar,Punjab	Germany	18/03/2020	*
5	72	M	Punjab	Italy	19/03/2020	DM, HTN
6	38	M	Patna	Qatar	22/03/2020	CKD
7	63	M	Mumbai	*	22/03/2020	HTN,CAD,DM
8	67	M	Surat	*	22/03/2020	*
9	55	M	Kolkata	*	23/03/2020	*
10	68	M	Mumbai	*	23/03/2020	Ashtma,DM
11	69	M	Kangra	USA	23/03/2020	*
12	64	M	Mumbai	UAE	24/03/2020	*
13	65	F	Navi Mumbai	Ahmedabad	24/03/2020	DM,HTN
14	64	M	Madurai	*	25/03/2020	*
15	65	F	Indore	Ujjain	25/03/2020	*
16	85	F	Ahmedabad	Saudi Arabia	25/03/2020	*
17	65	M	Srinagar	Delhi	26/03/2020	*
18	65	F	Gauribidanur	Saudi Arabia	26/03/2020	DM,CAD,Hip Fractures
19	70	M	Bhavnagar	Delhi	26/03/2020	DM,HTN,CAD, Cancer
20	38	M	Ujjain	Neemuch	27/03/2020	HTN
21	60	M	Tamakuru	Delhi	27/03/2020	DM
22	65	F	Mumbai	*	27/03/2020	*
23	65	M	Indore	India	27/03/2020	DM
24	46	F	Ahmedabad	*	28/03/2020	DM,HTN
25	60	M	Delhi	Yemen	28/03/2020	*
26	69	M	Ernakulam	Dubai	28/03/2020	*
27	74	M	Hyderabad	Delhi	28/03/2020	*
28	85	M	Delhi	*	28/03/2020	*
29	40	F	Mumbai	*	29/03/2020	HTN
30	45	M	Ahmedabad	*	29/03/2020	DM
31	45	M	Buldhana	Nil	29/03/2020	DM
32	52	M	Srinagar	Delhi	29/03/2020	Liver Disease
33	65	M	Hosiarpur	*	29/03/2020	*
34	42	F	Ludhiana	*	30/03/2020	*
35	44	F	Kalimpong,	Chennai	30/03/2020	Obesity
36	45	F	Bhavnagar	*	30/03/2020	*
37	52	M	Pune	*	30/03/2020	DM,HTN
38	65	M	Mohali	Nil	31/03/2020	*

* Details not available; DM- Diabetes Mellitus; HTN- Hypertension; CAD- Coronary Artery Disease;(Data sourced from Newspapers, Government and MoHFW statements)

Crude Case Fatality Rate (CFR) of COVID-19 fatalities was calculated using the following formula-

CFR= Total number of deaths due to Covid-19/ Total number of diagnosed cases.

Using the above formula, Indian CFR was calculated to be 2%.

Epidemic Doubling Time(EDD) was calculated using the following formula-
$$N(t) = N_0 2t/^{Td}$$

N(t) = the number of cases at time t
T_d = doubling period (the time it takes for cases to double in number)
N_0 = initial number of cases
t = time

Using the above formula an EDD of 3.7days was derived.

DISCUSSION
WHO has described four levels of COVID-19 transmission. These are countries or local areas with 1. No cases reported. 2. Sporadic cases. 3. Clusters of cases (grouped in place and time), or 4. Community transmission[4]. As of now, India is at Level 2 where there are only cases of Local Transmission or Foreign Import[1]. Countries are putting in place a range of public health and social measures to control disease spread. Some such measures are social distancing, hand washing, self-isolation and aggressive testing[4]. The ultimate aim is to allow cases to recover before contacting healthy people and break the chain of transmission.

In our study, data available in the public domain were collected retrospectively from Jan 2020 till 31 Mar 2020. This was tabulated and thoroughly analysed using rigorous mathematical models. Comparisons were then made to data available from other countries to derive actionable information.

The first cluster of Covid-19 positive cases was found among 3 students that had been airlifted from Wuhan, after news of a dangerous new illness spread. They were kept under quarantine and discharged after they tested negative[1,2]. Similar clusters kept appearing thereafter throughout the country and were associated with a history of foreign travel. A 79 year old male, from Karnataka, contracted the illness in Saudi Arabia and succumbed to it on 12 Mar 2020. He is the first documented Covid-19 death[3]. He was known to be suffering from Asthma and Hypertension as well. The month of March 2020 saw an exponential rise in the number of cases as well as deaths and was similar in behaviour to China when it first appeared in December 2019[7]. As of now, 823626 patients have been confirmed positive and 40598 have died from Covid-19 worldwide (Fig. 3).
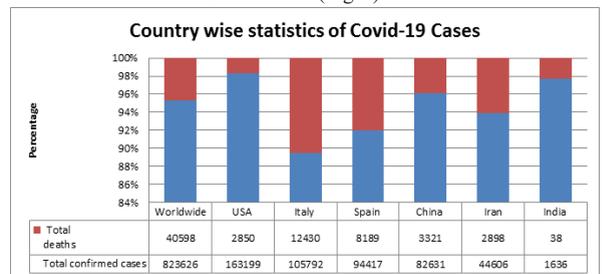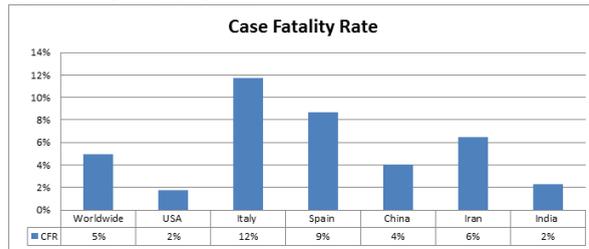

Fig. 3 Graph showing a country-wise plot of total deaths and total confirmed cases (Data sourced from WHO Website Sitrep Report 72 *https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200401-sitrep-72-covid-19.pdf?sfvrsn=3dd8971b_2* accessed on 1st April 2020)

Demographic analysis of fatal cases revealed that most were elderly males with Diabetes and/or Hypertension. Guan et al[8] had similar findings where they reported severe illness in elderly males (median age 52 years) associated commonly with Hypertension or Diabetes or both.

Crude CFR was estimated to be 2% for India. This is in variance to Italy (12%), Iran (6%) and the worldwide aggregate of 5%[4] (Fig.4). However, it would be important to point out that CFR is often difficult to estimate early on in the disease because of under-reporting of mild/asymptomatic cases and lack of enough testing centres. As all the

countries, gear up, more reliable data will be generated which would be a better measure of the CFR[9].

Case Fatality Rate

	Worldwide	USA	Italy	Spain	China	Iran	India
CFR	5%	2%	12%	9%	4%	6%	2%

Fig. 4 Graph showing a country-wise plot of CFR (Data sourced from WHO Website Sitrep Report 72 *https:// www. who. int/ docs/ default-source/coronaviruse/situation-reports/2 0200401-sitrep-72-covid-19.pdf?sfvrsn=3dd8971b_2* **accessed on 1st April 2020)**

On studying epidemic dynamics of Covid-19 in India we derived an Epidemic Doubling Time of 3.7 days. This is almost half of that reported from Wuhan[7,10]. This wide variance could be either due to a faster spread in India or due to confounding factors that plague the calculation of such statistical measurements.

DRAWBACKS OF THE STUDY
Our study is subject to several limitations such as the under-reporting of positive cases, under-diagnosis due to lack of diagnostic tests, and observer and lag-time bias. Growing awareness of the epidemic among doctors, public and media as well as increased availability of diagnostic tests may strengthen reporting over time. Due to a lack of detailed case data describing incidence trends for imported and local cases, we had to depend on news reports and press releases. Analysis of the overall trajectory of the epidemic without adjusting for confounding factors could have led to variation in calculation of CFR and EDD.

There is an urgent requirement of analysis of statistical data emanating from India. This paper has used data from confirmed fatal cases in India; however, as the disease progresses, there would be too many cases to perform such surveillance. We have to identify the most effective measures to control community spread, gather big data and test cases on a large scale. Disease dynamics in children, pregnant women and health care workers need to be studied in detail too. Only by these timely measures can we guide policymakers, politicians and administrators to ensure that the right decisions are taken.

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