



COVID-19 and India: Survival Strategies

Sharma N, Mohanty K.K and Patil S.A*

*ICMR- National JALMA Institute for Leprosy and other Mycobacterial Diseases, Agra, Pin code: 282001, India

ABSTRACT

The Novel Corona Virus (COVID 19) infection has become public health emergency of International significance. The situation is becoming critical due to lack of knowledge gaps in the epidemiology, transmission dynamics, investigation tools and management. In this article, we review the present condition of COVID-19 in the World, in general and in India. The transmission through aerosol is an area of great concern. The diagnosis is confirmed with PCR based testing of appropriate respiratory samples. The management is primarily supportive with screening of suspected cases and their contacts, isolation of symptomatic cases and home quarantine of asymptomatic contacts. Standard infection control and prevention techniques should be followed. To control this highly transmissible disease requires individual co-ordination.

Keywords: COVID-19, India, Measures, Coronavirus

INTRODUCTION

The Coronavirus disease (COVID-19) has been identified as the cause of an outbreak of respiratory illness with its first case identified in Wuhan, Hubei Province, China in the beginning of December 2019. World Health Organisation (WHO) has declared the COVID- 19 outbreak as a pandemic on 11 March 2020 [1]. WHO has estimated the preliminary COVID-19 transmission rate (R0) (reproductive number or the average number of people to which a single infected person will transmit the virus) between 1.4 and 2.5 [2] while others have reported higher values of R0 from 3.6 to 4.0 [3]. These values should be compared to the R0 of 1.3 for common flu and R0 of 2.0 for SARS [4]. While the R0 is greater than 1, the epidemic will continue [5]; however, when R0 is less than 1, the virus should slowly disappear [4]. As of 2nd April 2020, this epidemic has spread to 199 countries, areas or territories confirming 45525 deaths out of total 896450 confirmed cases till date (Table 1) [6].

In this review, research articles published before 3rd April 2020, were analyzed and discussed to better understand the causes, epidemiology, clinical diagnosis, prevention and control of this virus. The research domains, publication dates, authors' affiliations, and methodology were included in the analysis. All the findings in this review regarding the outbreak are based on published information as mentioned in the references. Reported symptoms are fever, cough, fatigue, pneumonia, headache, diarrhoea, haemoptysis, and dyspnea. In order to reduce transmission, measures such as masks, hand hygiene practices, social distancing, case detection, contact tracing, and quarantines have been suggested. Till date, no specific antiviral treatment has proven effective; hence, infected people primarily rely on symptomatic treatment and self immunity. The repercussions of the COVID-19

***Corresponding Author:**

shripadpatil[at]yahoo.com

Receiving Date: April 04, 2020

Acceptance Date: April 10, 2020

Publication Date: April 13, 2020

outbreak are beyond human infection and deaths, as it is associated with social distress, including racial and xenophobic attacks [7] and adverse economic implications, which have adversely affected the travel industry [8] disturbed the supply chain [9] and stock exchanges [10] and dawdled the global economy [11]. The Government of

various countries has put complete lockdown in order to restrict the increasing number of confirmed cases (Figure 1).

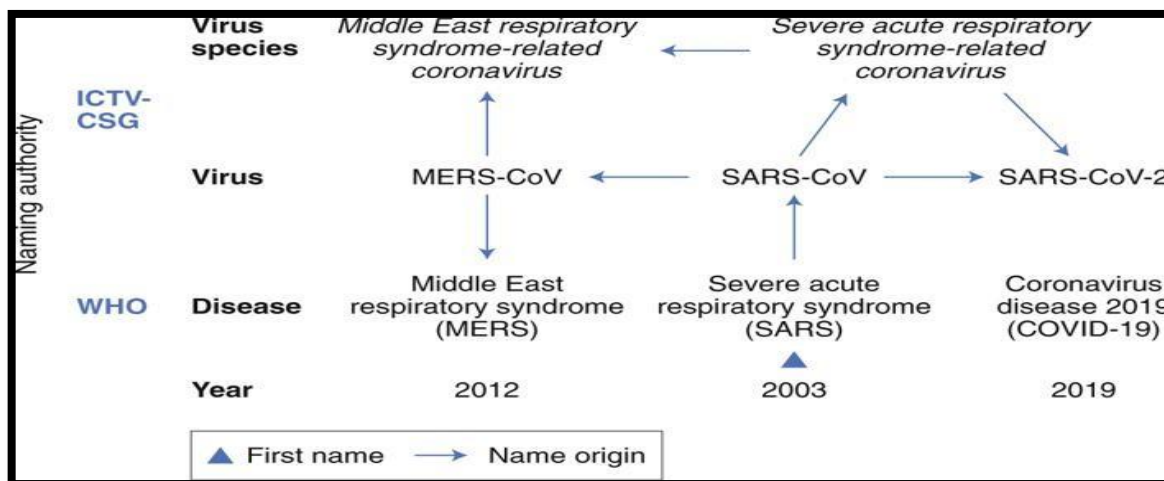


Figure 1: History of coronavirus naming during the three zoonotic outbreaks in relation to virus taxonomy and diseases caused by these viruses [12]

Coronaviridae is the family of Coronaviruses which are positive-sense single-stranded RNA viruses. Animals are mostly infected but birds and mammals are infected too. The symptoms are similar like common cold caused in humans though it generally causes mild respiratory infections. However, SARS (Severe Acute Respiratory Syndrome) and MERS (Middle East Respiratory Syndrome) endemics are recent examples of the human coronavirus infections which resulted in deadly endemics. Betacoronavirus genus within Coronaviridae is the classification under which both are classified and both are caused by zoonotic coronaviruses. In 2003, Southern China faced endemic due to SARS-CoV and it's the origin of SARS-CoV. The 8098 cases of SARS were reported globally, with 774 associated deaths, and an approximate case- fatality rate of 14%–15% [13]. Saudi Arabia in 2012 faced first case of MERS. Ever since then, 2,494 cases of infection have been reported, with 858 associated deaths, and an approximate high case-fatality rate of 34.4% [14]. Whereas no case of SARS-CoV infection has been reported since 2004, MERS-CoV has been approximately since 2012 and has caused numerous irregular outbreaks in different countries.

There is now grave concern regarding the Indian National Health system's capacity to effectively respond to the needs of patients, who are infected and require intensive care for COVID-19. The first confirmed case in India was reported on 30th January. The number of patients infected since then in India closely follows an exponential trend. Our analysis might help government and health authorities to allot resources including personnel, hospital beds and ventilators, intensive care facilities etc. by prognosticating/forecasting the number based on graphs that can be plot from till date data. This data will give more precise idea of trend, number and nature of the infected cases. This will also help in understanding the need of mass screening, social distancing and quarantine to manage the situation in the next few days and weeks.

India has had 2301 confirmed cases according to the Indian Council of Medical Research as of April 3rd, 2020, and 56 deaths with 157 cured/discharged/migrated (Table 2) [15].

Table 2: MoHFW Report on confirmed cases in India (COVID-19 INDIA, as on: 03 April 2020, 09:00 GMT+5:30)

S. No.	Name of State / UT	Total Confirmed cases (Including 55 foreign Nationals)	Cured/Discharged/	Death
			Migrated	
1	Andhra Pradesh	132	1	1
2	Andaman and Nicobar Islands	10	0	0
3	Arunachal Pradesh	1	0	0
4	Assam	16	0	0
5	Bihar	24	0	1
6	Chandigarh	18	0	0
7	Chhattisgarh	9	2	0
8	Delhi	219	8	4
9	Goa	6	0	0
10	Gujarat	87	8	7
11	Haryana	43	21	0
12	Himachal Pradesh	6	1	1
13	Jammu and Kashmir	70	3	2
14	Jharkhand	2	0	0
15	Karnataka	124	10	3
16	Kerala	286	27	2
17	Ladakh	14	3	0
18	Madhya Pradesh	99	0	6
19	Maharashtra	335	42	16
20	Manipur	2	0	0
21	Mizoram	1	0	0
22	Odisha	5	0	0
23	Puducherry	3	1	0
24	Punjab	46	1	4
25	Rajasthan	133	3	0
26	Tamil Nadu	309	6	1
27	Telangana	107	1	3
28	Uttarakhand	10	2	0
28	Uttar Pradesh	113	14	2
29	West Bengal	53	3	3
Total number of confirmed cases in India		2301*	157	56
*Remaining 18 cases are being assigned to states for contact tracing				

Source: Ministry of Health and Family Welfare, Government of India

On March 22, 2020, the Indian Government implemented extraordinary measures to limit viral transmission including restricting movement, screening, management and social distancing,

quarantine in the country that intended to minimise the likelihood that people who are not infected come into contact with people who are infected. This decision is certainly courageous and important. In Maharashtra and Kerala region, despite extraordinary efforts to restrict the movement of people at the expense of the Indian economy, we are dealing with an even greater fear— that the number of patients, who present to the emergency room will become much greater than the system can cope with. The number of intensive care beds necessary to give the maximum number of patients the chance to be treated will reach several hundred, but the exact number is still a matter of discussion among experts. Health-care professionals have been working day and night since January, and in doing so around few of them have become infected. The official numbers of infected people during the COVID-19 virus outbreak in Indian are indicative of the spread of the infection, and of the challenges that will be posed to Indian hospitals and, in particular, intensive care facilities.

DISCUSSION

The most difficult prediction is to ascertain the maximum number of infected patients that will be reached in India and, most importantly, the maximum number of patients who will require intensive care unit admission. This prediction is of crucial importance to plan for facilities like isolation wards in hospitals and to calculate the time period in which these need to be available. In doing so, we cannot overlook the fact that the effect of travel restrictions on the spread of the COVID-19 outbreak and the extraordinary community measures taken within and outside of Wuhan are unlikely to be replicated elsewhere. We also realize that there is heterogeneity in the transmission dynamics between the city of Wuhan and elsewhere in the province, where the number of people who are infected remains lower. Therefore, it might not be unrealistic to assume that what is going to happen in India soon might mirror what happened in Hubei. According to our forecast, we have only a few weeks to accomplish this goal in terms of procuring personnel, technical equipment, and materials. These considerations may also apply to other European countries that could have parallel numbers of patients infected and similar needs concerning intensive care admissions.

CONCLUSION

In theory, we are in a better position than many other countries to react to the current outbreak. However, an aggressive approach needs to be taken with patients who are critically ill with COVID-19, often including ventilatory support. We hope that the present analysis will help political leaders and health authorities to move as quickly as they can to ensure that there are enough resources, including personnel, hospital beds, and intensive care facilities, for what is going to happen in the next few days and weeks. Finally, our analysis tends to suggest that measures to reduce transmission should certainly be implemented, as our government did on March 22, by inhibiting people's movement and social activities, unless strictly required. The most effective way to contain this viral outbreak in India is probably to avoid close contact at the individual level and social meetings as well. The government should prepare to pass legislation that will enable the health service to hire more doctors and nurses and to provide more ventilators to Indian hospitals. These measures are a step in the right direction, but our model tells us that they need to be implemented urgently, in a matter of days. Otherwise, a substantial number of unnecessary deaths will become inevitable.

Reporting Country/Territory/Area†	Total Confirmed ‡cases	Total Deaths	Reporting Country/Territory/Area†	Total Confirmed ‡cases	Total Deaths	Reporting Country/Territory/Area†	Total Confirmed ‡cases	Total Deaths
Western Pacific Region			Denmark	3107	247	Region of the Americas		
China	82724	3327	Russian Federation	2777	440	United States of America	187302	24103
Republic of Korea	9976	169	Poland	2554	243	Canada	9005	1310
Australia	4976	21	Romania	2460	215	Brazil	5717	1138
Malaysia	2908	45	Luxembourg	2319	141	Chile	3031	293
Japan	2384	57	Finland	1446	62	Ecuador	2372	132
Philippines	2311	96	Greece	1375	61	Peru	1323	258
Singapore	1000	3	Iceland	1220	85	Dominican Republic	1284	175
New Zealand	723	1	Serbia	1060	160	Mexico	1215	121
Viet Nam	218	0	Croatia	963	96	Panama	1181	192
Brunei Darussalam	131	1	Slovenia	841	27	Argentina	1054	88
Cambodia	109	0	Ukraine	804	135	Colombia	906	108
Mongolia	14	0	Estonia	779	34	Costa Rica	347	33
Lao People's Democratic Republic	10	0	Lithuania	581	48	Uruguay	338	18
Fiji	5	0	Armenia	571	39	Cuba	212	26
Papua New Guinea	1	0	Hungary	525	33	Honduras	172	33
Territories **			Bosnia and Herzegovina	464	51	Cameroon	139	0
Guam	77	3	Latvia	446	48	Nigeria	139	28

French Polynesia	37	0	Republic of Moldova	423	70	Democratic Republic of the Congo	123	14
New Caledonia	16	0	Bulgaria	422	23	Rwanda	82	7
Northern Mariana Islands (Commonwealth of the)	6	0	Slovakia	400	37	Kenya	81	31
European Region			Andorra	396	20	Niger	74	54
Italy	110574	13157	Kazakhstan	386	38	Madagascar	53	0
Spain	102136	9053	Azerbaijan	359	61	Uganda	44	11
Germany	73522	872	North Macedonia	354	25	Togo	36	2
France	56261	4019	Cyprus	320	58	Zambia	36	1
The United Kingdom	29478	2532	Albania	277	34	Guinea	30	14
Switzerland	17070	378	San Marino	236	0	Mali	28	10
Turkey	15679	277	Belarus	192	40	Ethiopia	26	0
Belgium	13964	828	Uzbekistan	190	17	Congo	22	3
Netherlands	13614	1173	Malta	188	21	United Republic of Tanzania	20	1
Austria	10711	146	Georgia	121	6	Eritrea	15	9
Portugal	8251	187	Montenegro	120	15	Equatorial Guinea	14	0
Israel	5591	21	Kyrgyzstan	115	4	Benin	13	4
Sweden	4947	239	Liechtenstein	72	4	Namibia	11	0
Norway	4665	32	Monaco	37	0	Mozambique	10	2
Czechia	3589	39	Holy See	6	0	Seychelles	10	2
Ireland	3447	85	Territories **			Eswatini	9	0

Sri Lanka	143	0	Faroe Islands	173	4	Guinea-Bissau	9	0
Bangladesh	54	0	Kosovo ^[1]	125	13	Angola	8	1
Maldives	18	0	Gibraltar	69	0	Central African Republic	8	2
Myanmar	15	0	Jersey	81	18	Zimbabwe	8	0
Nepal	5	0	Guernsey	78	18	Chad	7	0
Bhutan	4	0	Isle of Man	65	13	Gabon	7	0
Timor-Leste	1	0	Greenland	10	0	Liberia	6	3
Eastern Mediterranean Region			South-East Asia Region			Cabo Verde	5	0
Iran (Islamic Republic of)	47593	2987	Thailand	1771	0	Mauritania	5	0
Pakistan	2291	252	Indonesia	1677	149	Botswana	3	0
Saudi Arabia	1720	157	India	1636	0	Gambia	3	0
Qatar	835	54	Venezuela (Bolivarian Republic of)	143	14	Burundi	2	0
United Arab Emirates	814	150	Bolivia (Plurinational State of)	115	8	Sierra Leone	2	1
Egypt	779	69	Trinidad and Tobago	89	4	Curaçao	11	0
Iraq	728	34	Paraguay	69	4	Saint Barthélemy	6	0
Morocco	676	38	Guatemala	39	3	Saint Martin	21	3
Bahrain	569	2	Jamaica	38	2	Montserrat	5	0
Lebanon	479	16	Barbados	33	0	Turks and Caicos	5	0
Tunisia	423	29	El Salvador	32	2	Islands		

Kuwait	317	28	Guyana	19	7	British Virgin Islands	3	0
Jordan	278	4	Haiti	16	1	Anguilla	2	0
Afghanistan	235	43	Bahamas	15	1	African Region		
Oman	231	21	Saint Lucia	13	4	South Africa	1380	27
Djibouti	34	3	Dominica	11	0	Algeria	847	263
Libya	10	0	Grenada	9	0	Burkina Faso	261	0
Syrian Arab Republic	10	0	Saint Kitts and Nevis	8	0	Ghana	195	43
Sudan	7	0	Suriname	8	0	Côte d'Ivoire	190	21
Somalia	5	0	Antigua and Barbuda	7	0	Senegal	190	15
Territories**			Nicaragua	5	1	Mauritius	154	11
occupied Palestinian territory	134	0	Belize	3	0	Réunion	281	34
United States Virgin Islands	30	0	Saint Vincent and the Grenadines	1	0	Mayotte	116	15
Bermuda	32	5	Territories**			Guadeloupe	125	11
Sint Maarten	6	0	Puerto Rico	286	47	Aruba	55	0
Cayman Islands	14	2	Martinique	128	9	French Guiana	51	5
Subtotal for all regions: 895 738 Confirmed Cases 72 839 Total Deaths		International conveyance (Diamond Princess): 712 Confirmed Cases 0 Total Deaths				Grand total: 896 450 Confirmed Cases 72 839 Total Deaths		

Table 1: WHO Report on confirmed cases worldwide (Countries, territories or areas with reported laboratory-confirmed COVID-19 cases and deaths. Data as of 2nd April 2020)

Source: World Health Organization Report

REFERENCES

1. World Health Organization. WHO Director-General's opening remarks at the media briefing on COVID-19. (<https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>). 2020
2. World Health Organization. Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV) ([https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-\(2005\)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-\(2019-ncov\)](https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov)))
3. Zhao S, Lin Q, Ran J, Musa SS, Yang G, Wang W, Lou Y, Gao D, Yang L, He D, Wang MH. Preliminary estimation of the basic reproduction number of novel coronavirus (2019-nCoV) in China, from 2019 to 2020: A data-driven analysis in the early phase of the outbreak. *International Journal of Infectious Diseases*. 2020 Mar 1;92:214-7.
4. Worldometer COVID-19 coronavirus outbreak (2020) <https://www.worldometers.info/coronavirus/>
5. Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, Ren R, Leung KS, Lau EH, Wong JY, Xing X. Early transmission dynamics in Wuhan, China, of novel coronavirus–infected pneumonia. *New England Journal of Medicine*. 2020 Jan 29.
6. World Health Organization WHO COVID-19 Situation Report-73, Data as reported by national authorities by 10:00 CET 2 April (2020) https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200402-sitrep-73-covid-19.pdf?sfvrsn=5ae25bc7_2
7. M. Shepherd The Science Of Why Coronavirus Exposes Racism And Xenophobia *Forbes* (2020) <https://www.forbes.com/sites/marshallshepherd/2020/02/28/the-science-of-why-coronavirus-exposes-racism-and-xenophobia/#6270dfe33695>
8. C. Isidore The travel industry is suffering its worst shock since 9/11 because of coronavirus *CNN Business* (2020) <https://edition.cnn.com/2020/02/29/business/travel-industry-coronavirus-economic-impact/index.html>
9. T. Gryta, R. Adams Coronavirus Is Different. It's Rapidly Hitting Supply and Demand *The Wall Street Journal* (2020) <https://www.wsj.com/articles/coronavirus-is-different-almost-no-company-is-safe-11583064000>
10. A. Tappe Dow falls 1,191 points the most in history *CNN Business* (2020) <https://edition.cnn.com/2020/02/27/investing/dow-stock-market-selloff/index.html>
11. W. Horobin Virus Pushes Global Economy Toward First Contraction Since 2009 *Bloomberg* (2020) <https://www.bloomberg.com/news/articles/2020-03-02/virus-pushes-global-economy-toward-first-contraction-since-2009>
12. of the International CS. The species Severe acute respiratory syndrome-related coronavirus: classifying 2019-nCoV and naming it SARS-CoV-2. *Nature Microbiology*. 2020 Mar 2:1.
13. World-Health-Organization Update 49 - SARS case fatality ratio, incubation period. https://www.who.int/csr/sarsarchive/2003_05_07a/en/
14. World-Health-Organization Middle East respiratory syndrome coronavirus (MERS- CoV). https://www.who.int/csr/disease/coronavirus_infections/faq/en/
15. Department of Health and Family Welfare, Ministry of Health and Family Welfare, Government of India, (2020) <https://www.mohfw.gov.in/>