



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



Correspondence

Second wave of COVID-19 in India: Dissection of the causes and lessons learnt



ARTICLE INFO

Keywords

SARS-CoV-2
 COVID-19
 Second wave
 B.1.617
 Variants
 Vaccination
 India

Dear Editor,

The second wave of coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [1], has struck India severely, with a significant case fatality rate (Fig. 1). The present article highlights the plausible causes behind the second wave in India and lessons learnt from the current scenario to prevent the subsequent waves in the future. In India, 29.27 million cases have been reported so far during the pandemic, with a case fatality rate of 1.24% (363,079 deaths) up to June 11, 2021 [2]. During this ongoing second wave, India's healthcare system has been overburdened, causing a dearth of medical oxygen, hospital beds, and other essentialities for the COVID-19 patients.

Multiple factors may be involved in driving the second wave of COVID-19 in India, such as the complex interplay of mutant strains, violation of COVID appropriate behaviour, and government and public complacency on initiation of the vaccination drive. The emergence of new SARS-CoV-2 lineage B.1.617, a "variant of concern" in India, has been associated with a surge in daily infections [3]. The high transmissibility of the B.1.617 variant can be deduced from its rapid spread to multiple countries apart from being India's dominant strain. Till June 11, 2021, approximately 0.073% (21,365) of the positive samples (29,274,823) in India have been sequenced and uploaded to the Global Initiative on Sharing All Influenza Data (GISAID) database to identify the SARS-CoV-2 variants [4]. Thus, there is an urgent need to expand genome sequencing to better track, understand and control emerging and more transmissible SARS-COV-2 variants in various states of India [5]. Furthermore, the mutations and recombination which cause the emergence of novel lineages such as B.1.617, can reduce the sensitivity of certain diagnostic approaches such as RT-qPCR. Thus, effective primer designing is essential to improve the sensitivity and specificity of the detection process for the accurate mass screening of samples.

The pandemic fatigue and leniency in following the COVID-19 protocols were surfacing during the initial phase of the second wave. The vaccination drive was announced in India on January 16, 2021, the day on which the total active cases were just 15,144. As the COVID-19 seemed to be under control, the public became complacent on

contemplating the end of the pandemic and, the government relaxed its containment approach as well, allowing mass election rallies and social and religious gatherings such as Kumbh Mela (approximately 7 million people), where pilgrims turned into nationwide super-spreaders leading to the resurgence of the second wave. India is the largest democratic country globally; however, looking at the current COVID-19 situation, the state elections (Assam, Puducherry, Kerala, Tamil Nadu, and West Bengal) could have been postponed till normality. Despite being stuck in the unsteerable situation amid the grave COVID-19 second wave, incidences of the breach in COVID-19 protocols keep on resurfacing, such as the mass gathering of around ten thousand people at the funeral procession of an Islamic leader in the state of Uttar Pradesh on May 10, 2021. It is clear that people lowered the guard and did not follow the guidelines and protocols after the first wave of COVID-19. To prevent the further spread of this havoc in India, the Government of India and its citizens need to take the responsibility to overcome the ongoing pandemic wave by following Standard Operating Procedures (SOP), which would also help to mitigate subsequent waves of COVID-19. The union government needs to replicate and implement the success stories of a few states in India, such as Mizoram, which implemented time to time SOP to control this pandemic and consistently maintained a higher recovery rate with a low fatality rate (0.41%) [2].

Besides the compliance of mitigation measures, there is an urgent need to expand the available vaccine supply by the implementation of public health policies such as single-dose vaccination of individuals with a history of SARS-CoV-2 infection, so that more naive individuals may be immunized by double dose, until the vaccine supply limitations are eased and booster protocols are revamped. In conclusion, the Government of India needs to take immediate and stringent action to control the ongoing second wave of the pandemic with strict protocols and boost COVID-19 immunization speed so that the projection of 1.19 million deaths by October 1, 2021 [as per the Institute for Health Metrics and Evaluation (IHME)] may be averted [6].

<https://doi.org/10.1016/j.tmaid.2021.102126>

Received 14 May 2021; Received in revised form 12 June 2021; Accepted 14 June 2021

Available online 16 June 2021

1477-8939/© 2021 Elsevier Ltd. All rights reserved.

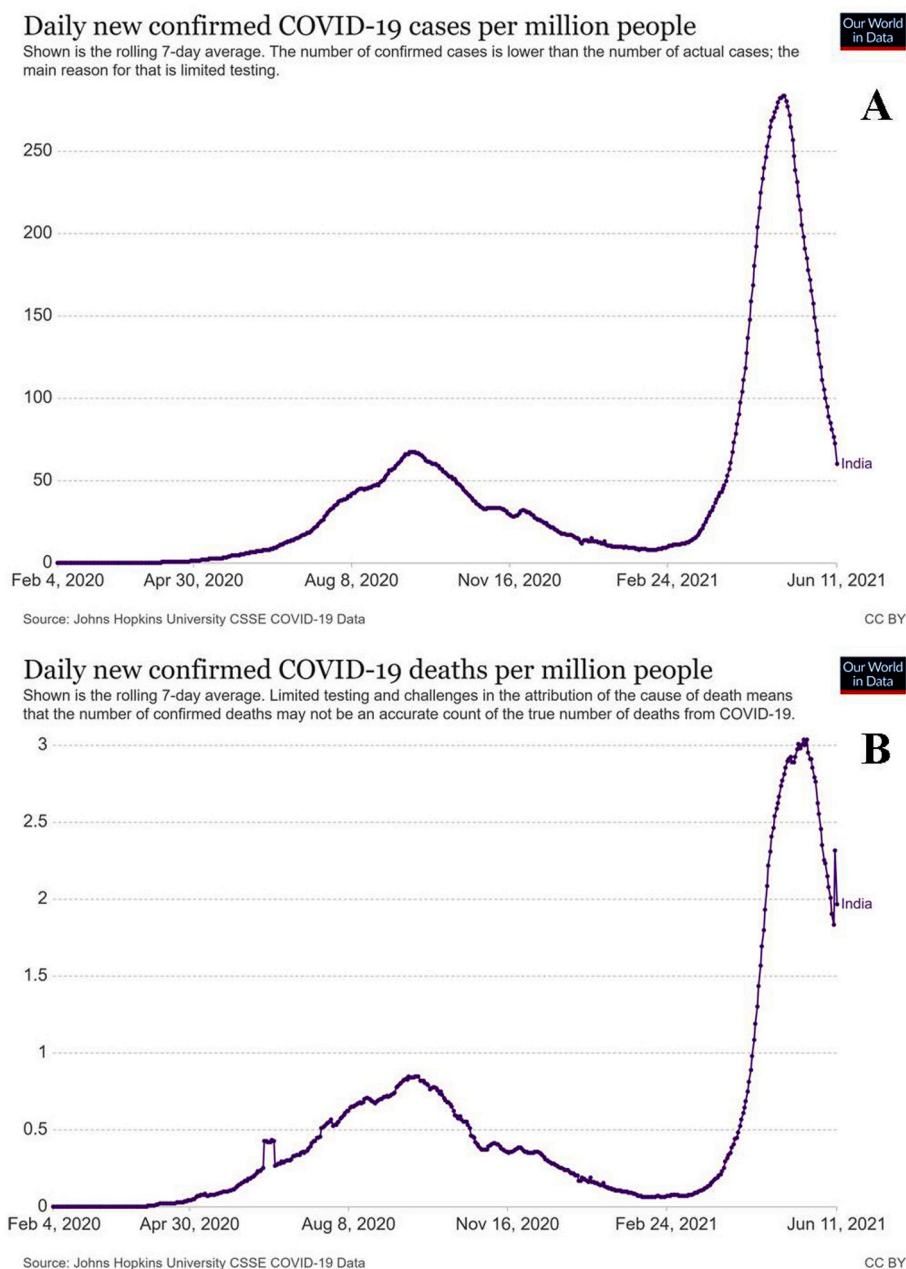


Fig. 1. Confirmed COVID-19 cases (A) and deaths (B) in the first and second waves of COVID-19 in India. Reproduced from Our World in Data (<https://ourworldindata.org/coronavirus/country/india>) under CC BY license.

CRediT author contribution statement

Om Prakash Choudhary: Conceptualization, Data Curation, Visualization, Writing - Original Draft, Writing - review & editing. Priyanka: Conceptualization, Supervision, Writing - Original Draft, Writing - review & editing. Indraj Singh: Supervision, Writing - Original Draft, Writing - review & editing. Alfonso J. Rodriguez-Morales: Writing - review & editing. All authors critically reviewed and approved the final version of the manuscript.

Ethical approval

This article does not require any human/animal subjects to acquire such approval.

Funding

This study received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Declaration of competing interest

All authors report no conflicts of interest relevant to this article.

References

- [1] Priyanka, Choudhary OP, Singh I, Patra G. Aerosol transmission of SARS-CoV-2: the unresolved paradox. *Trav Med Infect Dis* 2020;37:101869. <https://doi.org/10.1016/j.tmaid.2020.101869>.
- [2] World Health Organization. WHO coronavirus (COVID-19) dashboard. Accessed on June 11, 2021, <https://covid19.who.int/region/searo/country/in/2021>.
- [3] Yadav PD, Mohandas S, Shete AM, Nyayanit DA, Gupta N, Patil DY, Sapkal GN, Potdar V, Kadam M, Kumar A, Kumar S, Suryavanshi D, Mote CS, Abraham P,

- Panda S, Bhargava B. SARS CoV-2 variant B.1.617.1 is highly pathogenic in hamsters than B.1 variant. 2021. <https://doi.org/10.1101/2021.05.05.442760>. bioRxiv.
- [4] World Health Organization. COVID-19 weekly epidemiological update. Accessed on June 11, 2021), https://reliefweb.int/sites/reliefweb.int/files/resources/20210511_Weekly_Epi_Update_39.pdf.
- [5] Editorial. India's COVID-19 emergency. Lancet, [https://doi.org/10.1016/S0140-6736\(21\)01052-7](https://doi.org/10.1016/S0140-6736(21)01052-7); 2021. 397: 1683.
- [6] Institute for Health Metrics and Evaluation. IHME's COVID-19 projections. Accessed on June 11, 2021), <https://covid19.healthdata.org/india?view=cumulative-deaths&tab=trend>.

Om Prakash Choudhary^{a,*}, Priyanka^b, Indraj Singh^c, Alfonso J. Rodriguez-Morales^{d,**}

^a *Department of Veterinary Anatomy and Histology, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University (I), Selesih, Aizawl, 796015, Mizoram, India*

^b *Independent Researcher, 07, Type IV Quarter, College of Veterinary Sciences and Animal Husbandry, Central Agricultural University (I), Selesih, Aizawl, 796015, Mizoram, India*

^c *Medical Superintendent, Community Health Centre, Deoband, Saharanpur, 247554, Uttar Pradesh, India*

^d *Grupo de Investigacion Biomedicina, Faculty of Medicine, Fundacion Universitaria Autonoma de las Americas, Pereira, Risaralda, Colombia*

* Corresponding author.

** Corresponding author.

E-mail addresses: dr.om.choudhary@gmail.com (O.P. Choudhary), alfonso.rodriquez@uam.edu.co (A.J. Rodriguez-Morales).