REVIEW

Fault Lines in India's COVID-19 Management: Lessons Learned and Future Recommendations

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Abstract: With about 0.4–0.5 million COVID cases diagnosed every single day in a row over the past three weeks back in May 2021, India was at the epicenter of the global viral rampage. The catastrophe of this crisis was unprecedented, pushing the health care system to its breaking point. Although significant progress has been made in identifying these highly transmissible variants, what is somewhat lacking is the competence to exploit this information for risk mitigation and effective disease management through an integrated nationwide coordinated approach. With a positivity rate of 15–20% (April–May 2021) and the healthcare system pushed to its limit, accompanied by increased mortality, the situation was rather grim then. Though the central command scrambled all its resources and logistics to streamline the supply chain, the efforts were insufficient in response to the ongoing crisis due to a disproportionate rise in the case. We examined the current scenario emerging from this 2nd COVID wave and identified the possible lacunae. We also suggested few recommendations that may be adopted to avoid similar failures in the future.

Keywords: COVID-19, pandemic, India, healthcare, economy, vaccine

Plain Language Summary

What We Already Know

- India was the second most affected country in the world, accounting for 1/7th of the world's COVID burden.
- With the emergence of the highly transmissible Delta variant (1.617.2), the Delta Plus variant (K417N and additional mutation) of SARS-CoV2, there had been over 0.5 million cases every day for consecutive three weeks (April–May 2021).
- This led to an unprecedented crisis in providing healthcare support to meet the demand of its sizeable affected population.
- Furthermore, with just 20% of the population fully vaccinated (62% received one dose), vaccine shortage was one of the many challenges for the world's 2nd most populous nation back in March–May 2021, besides the logistics to deliver and store the vaccines.
- A nationwide lockdown was declared to curb the pandemic. Though this initiative somewhat seems to contain the disease spread, it has a tremendous effect on the socio-economic condition of two-thirds of people in India living under poverty: 69% of the Indian population lives on less than $2 a day.

What This Article Adds

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- We analyzed the fault lines at the crisis time, which could have a significant effect on risk mitigation.

- On disease surveillance, we propose several key steps enhancing the SARS-CoV2 genome sequencing, procurement of vaccine promptly, intellectual property rights, wastewater surveillance, and monitoring of virus shedding in the sewage for community screening.

- We propose that India looks forward to establishing zoonotic research labs to track spillover infections and more diagnostic and screening tests to screen large populations and build capacity to produce drugs, PPEkits, ventilators, medical oxygen, etc., of a crisis. Funds committed to boosting public healthcare with strict accountability are much needed.

- India must focus on capacity-building measures in training human resources, expert workforces, healthcare workers, researchers, and data analysts to manage pandemics of this magnitude.

Introduction

India was under seize due to the 2nd COVID wave. It was engaged in multiple battles simultaneously. Strangely, the Coronavirus is just one component of it—a thin slice of the larger pie. The rest of the pie, the so-called non-viral causes, seems to play a more decisive role in the current pandemic. With 0.4–0.5 million COVID cases per day for more than three weeks in a row back in April May 2021[1] it seems to have a long-lasting dent on India's fragile healthcare system, which barely managed to recover from the 1st assault of the pandemic in 2020.[2,3] What is even more significant is that perhaps the worst may still not be over. It is as if the nation is sucked into a whirlpool of misery and misfortune. When the Indian leadership inaugurated the nationwide vaccination program back in Jan 2021,[4] it started staggered, prioritizing the frontline workers and healthcare personals followed by senior citizens (60+ years). What began as a success story (referred to as "Tika Utsav" or vaccination ceremony) picked up some controversies and bitterness later on, firstly with vaccine stocks running low due to a lack of foresight in the supply–demand management followed by establishing a coherency between the center and the states on vaccine availability and pricing.[5–9] In spite of these bottlenecks, India has so far vaccinated a total of 670 million people (687 million vaccine doses for the coronavirus (COVID-19) as of September 6, 2021), with 500 million received the first dose and another 165 million with both doses. What is accomplished so far is still just a tiny fraction in the vast ocean of 1.4 billion people, roughly 1/6 of the world's population.[10] With the emergence of "immune evasive highly transmissible double

and triple mutants", the second COVID wave lashed the Indian subcontinent with all its might and fury. But even before the current COVID-19 storm picked up its strength, there were enough indications that a calamity was on the way. Indian SARS-CoV2 Genome Sequencing Consortium (INSACOG), overseeing the SARS-CoV2 genome sequencing with assistance from the Central Surveillance Unit (CSU) under Integrated Disease Surveillance Programme (IDSP) at the National Centre for Disease Control (NCDC), were assigned to track the emergence of new stains and viral infection dynamics as well as to establish the clinical correlation between virus genotypes and patient symptoms, their travel history, morbidity, and mortality.[11,12] Of the 10,787 samples they sequenced until March 2021, 771 variants of concern (VoC) were detected, 94% of which were positive for the highly transmissible UK B1.17 variant (5% showed the South African B1.351 and 1% the Brazilian P1 variant)[13,14.] Also, we need to accept that India has sequenced fewer genomes of SARS-CoV2 than it should be, with raw sequencing data not easily accessible for the larger scientific community.[15–17] World Health Organisation's advisory for sequencing is about 0.3% of confirmed cases, while this number is just 0.05% for India.

What is unprecedented is that while these highly contagious variants were first reported in the UK back in November 2020. An effective check to contain their transmission with proper contact tracing could potentially avoid a snowball effect into something of large magnitude.[13,18] One way to counter this threat is to vaccinate at a breakneck speed. However, as per the Government's vaccine registration portal CO-WIN, both the vaccination sites and the rates kept fluctuating and were shrunk in mid-April (64,982 on April 11, nearly half of 1.2 lakh sites that were operational a week ago), indicating shortages in inventory.[6,19,20] India's capacity to vaccinate has been through ups and downs, from 0.22 million shots on the first day of vaccination (January 16, 2021) to about 0.13 million shots a month later on February 16 to again 1.9 million shots in March.[21] However, recently (August 8th 2021), India's Covid-19 vaccination drive set a new record with more than 10 million ministered in a single day across the country for the first time ever since the inception, according to data on the Union health ministry's Co-WIN dashboard. One factor contributing to these fluctuations and shortages could be India's initial decision to authorize just the two domestically produced vaccines under an emergency authorization (Covishield from AstraZeneca manufactured by the Serum Institute

(SII) and Covaxin by Bharat Biotech (BBIL),[22] restricting the entry of other players[23] (India recently approved Russian-made Sputnik). This hesitancy was not due to concerns about the vaccine safety or its mode of action. This is primarily due to concerns about bridging trials of these entries in India.[24,25] Bridging trials are clinical trials conducted in a new region to provide clinical data on efficacy, safety, dosage, and dose regimen in that region for that target population. Then, there are country- and region-specific regulatory issues that cannot be ignored. Country Readiness and Delivery (CRD) workstream is part of COVAX mandate. Through the CRD, organizations like the WHO, UNICEF, and the GAVI Secretariat are working together at the global and regional levels to develop and disseminate adaptable global resources (eg, guidance, pieces of training, and advocacy materials) to support COVID-19 vaccines. There was some time loss during the initial days either to procure adequate vaccines or allow international manufacturers to step in. Precious time may have been saved in this dilemma that would have otherwise opened doors for other vaccine manufacturers to fill in the shortage.[26,27] Pfizer dropped its plan to launch its vaccine in India due to this dilemma.[28]

India's daily requirement stands at over 10 million doses, far exceeding the joined production capacity (of Serum and BBIL) of 3 million doses. The result: by the time the second wave hit India with full intensity in April, just 0.5% of Indians had been fully vaccinated.[29]

Role of Social Media and Internet

Social media played a crucial role in the pandemic, galvanizing connectivity and sharing updates and information in real-time.[30–32] Further knowledge and awareness about the disease, signs and symptoms, blood testing and diagnosis, consultation with physicians, and information about available hospital and ICU beds were all made feasible by the internet and social media. Post COVID-19 witnessed a surge in mental depression and psychiatric problems mainly arising out of massive job loss, economic slowdown, inflation, and price hikes.[33] Further post COVID recovery requires an innovative human resource management strategy that can often be accomplished through social media and online platforms.[34]

India COVID-19 Vaccination Drive

As per the current guidelines, anyone above the age of 18 is eligible to receive vaccines. But with uncertainty in vaccine stocks and availability, accomplishing this is

a significant hurdle for the Government. Also, as cases peaked in April and May 2021, a large section of the vaccine workforce got exposed and had to go for quarantine, thereby impeding the vaccination rate.[35,36] So, we have both shortages and the slowed pace of vaccination. India has over 65% of its population in the age bracket of fewer than 35 years.[37,38] This amounts to a headcount of over 900 million; factor it by 2 for a double dose; it needs 1800 million or 1.8 billion jabs. Even with the maximum achievable vaccination rate of 25 million jabs/day, it will take at least 18 months to fully vaccinate this population, provided there is no shortage of stocks. This means a substantial population will remain vulnerable for about a year and more to infection. Then, there are issues with vaccine hesitancy[39,40] and challenges in reaching out to those in distant and remote locations.[41,42] With the plans to reopen the schools, an increasing number of kids seem to be vulnerable to infection (though worldwide mortality in this group seems to be the least). They are still perhaps the most vulnerable group, without any vaccine support, either through noncompliance with social distancing or the virus's airborne transmissibility.[43] There are debates about whether the benefits of reopening schools will override the health risks.[43,44] Apart from the health point of view, kids are also the ones most socially affected. Extended lockdown and virtual classrooms have almost stretched their patience to the limit. The loss of jobs for family members has further added to this crisis. As per one estimate, globally, 150–200 million children have been pushed into poverty due to the COVID pandemic, with a substantial fraction never returning to school. With about 25–30% of these children representing India, we expect to see about 45–50 million kids in extreme poverty who this Pandemic[45,46] will directly impact. At present, the mission to vaccinate them is somewhat unclear, though clinical trials are on with kids aged 12 and above. India has a large senior population. According to the Population Census 2011, there are nearly 104 million elderly persons (aged 60 years or above) in India, 53 million females and 51 million males. This number is expected to grow to 173 million in 2026 as per the United Nations Population Fund and HelpAge India.[47]

Non-Viral Contributors: Planning and Logistics

Apart from infectious agents, non-viral factors played a significant role in the COVID crisis. The second factor to

blame is India's abysmal investment in public healthcare over the last few decades.[8,49] The current crisis has not only crippled the feeble public healthcare system but has also exposed its vulnerabilities. Then, there are issues with infrastructural inadequacies, a shortage of trained manpower and human resources, inadequate funding, poor accountability, corruption, bureaucracy, and state-wise-region-wise variabilities of healthcare services and the availability of physicians.[50–55] India's public spending on healthcare has been nearly stagnant with just around 1–1.15% of GDP for over a decade, even though there were multiple promises to increase this spending that really did not take off[56,57]- Compare India to other nations; US (16.9%), Germany (11.2%), France (11.2%) and Japan (10.9%). Further, healthcare spending in India is also the lowest amongst the BRICS nations. Even in the Healthcare Access and Quality (HAQ) Index, India, ranked 145th out of the 195 countries in terms of quality and accessibility to healthcare.[58] HAQ is a metric that measures amenable mortality, deaths from causes that should not occur in the presence of adequate medical care— In 2016, the HAQ score for India was at 41.2, while Iceland was at the highest with 97.1 points.[50]

Of late, a great initiative by the present Indian Government has announced an equivalent of 9.87 billion dollars to rejuvenate the health sector.[59] This includes US$ 915.72 million for PMJAY (Ayushman Bharat Yojana) in Union Budget 2020–21, under which the Government of India aims to provide free access to healthcare for 50 crore people in the country.[60–62] But the problem related to India's healthcare is deep-rooted, and we need to accept that even though the healthcare system was insufficiently resourced, a rapid unplanned influx of funds might not be of significant benefit unless it is routed through a rigorous check and accountability system to ensure that it reaches to the real beneficiaries. India's health care system was started as a three-tier system with a primary care system at the village level, a secondary care system to cover smaller urban centers, and tertiary care for specialized treatment.[63–65] Over the years, though, the emphasis has moved to for-profit-making tertiary care hospitals, mainly in big cities, with state-of-the-art that provided care specifically to the urban rich and often out of reach for the low and middle incomes.

The Government of India aims to increase healthcare spending to 2.5–3% of the Gross Domestic Product (GDP) by 2022.[66,67] With investment in public healthcare and infrastructure, out-of-pocket expenditure in urban centers can be substantially reduced. As per economic survey 2021, an increase in public health expenditure to 3% of the GDP can reduce out-of-pocket expenses from 60% currently to nearly half and, therefore, ease the health-related spending in low- and middle-income groups. Then, there needs to be long-term planning strategies to counter shortages of doctors (low doctor: patient ratio), paramedics in rural setup besides improving on basic infrastructure and fund allocation. To precisely summarize what Arvind Kasturi suggested,[68] adopting 5 "A" seems to be the mantra in that direction. These are "awareness", "accessibility", "availability of trained human resource", "affordability of healthcare", and "accountability".

Awareness refers to health and disease awareness and to consult the physician as early as possible. Awareness is related to literacy and being able to reach the knowledge source. With the advent of mobile-based technology and social media, an increasing trend in awareness is clearly visible. Accessibility refers to "The right or opportunity to use or benefit from (healthcare)". There could be physical and logistic issues related to this. India needs to invest and steadily engage in the availability of trained human resources for a long-term capacity-building measure. The affordability of healthcare needs to be a serious agenda for India. With private sectors dominating nearly 75–80% of India's healthcare system, the expenditure is beyond reach for most of India's middle class and poorer sections. An alternative is to develop cheap and affordable public hospitals and cap the prices to be affordable for its vast population. Last but not least is accountability, without which none of the above plans could materialize. It involves honesty and the courage to take responsibility. The recent COVID tsunami exposed the fault lines in the system, from the inability to control super-spreader events like political rallies[69,70] and mass religious public gatherings[71,72] to adequately stockpile vaccines, medicines,[73–75] life-saving PPE,[76,77] diagnostic kits[78,79,] and medical oxygen.[80–82] With fault lines in public healthcare, private hospital and clinics have a free run. Price was ramped for everything, from oxygen beds, doctors fees, medicines to PPE kits several-fold, making people go bankrupt to pay the bills.[83,84] It is even more troublesome than many hospital charges are not adequately detailed with breakups, making it nearly impossible to trace the expenses incurred. In most cases, the patients are caught in the crossfire between the private hospitals and the regulators with allegations of backdoor advocacy and lobbying by hospital corporates who are often well connected and affluent.[85–87] With diminishing investment in Public

healthcare, private hospital chains have almost regulation-free growth, mushrooming as a parallel support system to fall back on emergencies.[88,89] This resulted in nearly reduced Government effort in capping prices, quality, and authenticity of services. The nexus runs deep with the involvement of several healthcare professionals in this loop, catalyzing the growth of private clinics and hospitals at the cost of public healthcare.[90]

Suggested Recommendations

Caught unprepared in the first leg of its fight against the pandemic, the Government is gearing up to put the best it can into this current scenario, installing oxygen plants in the country tops its priority list. With inadequate medical oxygen plants currently operational, the Government must re-route oxygen from industrial sources and ensure that oxygen plants are set up and made functional within the committed time frame. Aggressive imports should fill the acute shortage for now, but a long-term strategy is imperative. Besides, the Government and the state administrators must encourage domestic manufacturers for oxygen concentrators and respiratory devices through incentives and duty-free manufacturing processes. An average estimate puts the number close to only 10–12% of COVID patients who might need aggressive oxygen support. With an atmosphere of fear, anxiety, uncertainty, and media-fuelled hype, almost everyone seems to hoard the oxygen concentrators, creating an artificial crisis of these units, skyrocketing the prices; worst, those in genuine need are unable to find it for themselves. India is a mecca for biopharmaceuticals and generic drugs.[90–93] Drug manufactures have a strong base in the country, with supplies from India going worldwide.[94,95] With cases soaring and a 3rd wave that seems imminent, the Government must ensure that raw materials for the mass production of COVID-related pharmaceuticals are readily available. Reenergizing and rebooting the domestically produced ventilators, PPE kits, N95 face mask, along with the increased funding and accountability of public healthcare, district and state-level health clinics, and specialty and critical care centers in urban and rural points.[96–98] India needs to look beyond the Covid-19 crisis into an opportunity. PPE kits in the country have seen explosive growth from almost negligible amounts to two lakh units daily within a span of a few weeks. India's vision should now shift from "first local-then global" to "local with global" and grab the opportunity to be an international exporter of PPE kits and apparel which is estimated to grow to a 60 billion dollar industry in the next five years.[99,100] Simultaneously, the Government must also train and prepare an adequate workforce with technical expertise to cope with the sudden surge in cases, both in diagnostics and disease management. Epidemiological surveillance needs to be initiated to check for community transmission of the virus by analyzing sewage flow. About 50 nations are actively monitoring the spread of SARS-CoV-2 in sewage waste on the fact that whole virus particles and viral fragments are shed in the feces that could offer a cheaper alternative to track community infection without the need to test everyone.[99–102] However, for a country like India, wastewater surveillance is a stiff challenge due to the scarcity of sewage network systems in several places like rural areas and slums.[103,104] In the long run, India should navigate in that direction and focus on its wastewater epidemiology to track pandemics of this nature.

Diagnostic tests like RT-PCR and rapid screening test like "Rapid Antigen Test" (RAT) need to be promoted aggressively to scan a larger susceptible population. Quarantine centers should be established in more numbers to hold the COVID-positive individuals and prevent their mixing with the general population. Schools, stadiums, soccer fields and railway coaches need to be identified and prepared so that these may be converted into makeshift clinics for COVID care when any future cases surge.[105,107] An easily accessible COVID-19 test report and vaccine information must be made available through an integrated nation-wide data-sharing program.

On the pathogen surveillance front, India desperately needs to sequence more SARS-CoV2 genomes from different parts of the country to identify novel emerging variants and VoC that could be more contagious. A sizeable centralized databank connected to state and local-level nodes needs to be established to churn out a large variety of bio-specimens originating from different individuals. The centralized genome databank needs to be integrated with International SARS-CoV2 gene sequencing consortiums such as GISAID (https://www.gisaid.org/), ViPER (https://www.viprbrc.org/brc/home.spg?decorator=vipr), NIAID (https://www.niaid.nih.gov/research/systems-biology-consortium), NCBI SARS-CoV2 Resource (https://www.ncbi.nlm.nih.gov/sars-cov-2), NextStrain (https://nextstrain.org/sars-cov-2). Most importantly, the genome sequence information must be under open access and freely available to the scientific community since the taxpayers and public money funded most of these sequencing projects. The current SARS-CoV2 seems to have been the outcome of a spillover infection from horseshoe bats. This might not be the last pandemic of this nature. It is conceivable that in the future, we might see

similar spillover infections. India desperately needs to set up zoonotic research labs to explore these possibilities, following a recommendation by UNEP.[108] With the encroachment of forest and animal habitats for the urban expansion projects, the possibility of novel pathogens spilling from animal reservoirs to the human host seems a real possibility now.[109–114]

India Short and Long-Term Commitments

One of India and other developing nations' hurdles in the current vaccination program is intellectual property (IP) rights waiver from developed nations, called Trade-related aspects of intellectual property rights (TRIPS)[115–117] TRIPS waiver is necessary for generic manufacturers in countries like India and Africa to produce a cheaper and more affordable version of the vaccines. Vaccine productions need a highly complex number of ingredients and technology processes from numerous sources; for example, the mRNA vaccine from Pfizer needs over 280 components from over 80 different sources. A no-objection certification is needed to accomplish this feat, which often is the cause of confusion and delay. India needs to adopt a long-term visionary approach to boost its R&D sectors to reduce its dependency on external partners. This involves a solid commitment to promoting basic and applied research, provide uninterrupted scientific funding, and nurturing young researchers with incentives like research fellowships to avoid a brain drain. India must also focus on developing centers for excellence and knowledge-based industries dedicated to this country's problems, with oncology and infectious disease at the forefront. At the grassroots level, India needs to invest in public schools, its education system and nurture young inquisitive minds to excel in STEM (Science, Technology, Engineering, and Mathematics) and related subjects to produce a massive pool of dedicated scientists, physicians, technocrats, and engineers to tackle its ongoing problems. Last but not least, it should let the experts handle the crisis.[118–120]

However, we must accept that managing COVID for India has a different set of challenges altogether. With a population that is 250 times that of New Zealand and 45 times that of Australia, 20 times that of France & Italy, and 4 times of the USA, a criticism pointing towards India's inability to control COVID-19 effectively without due consideration of its complexities might be an overkill and misleading. With its very complex demography, religious diversities, socio-economic architecture, caste, and clan system, one of the world's highest population densities along with heterogeneity in culture, language, ethnicities, dietary, and food habits,[121–125] India is truly a nation within a nation. There are enormous political and social challenges integrating a complex and diverse country like India, even more, during a crisis of this magnitude. Under the command of the political leadership, things eventually started on a war footing that seemed to ease the difficulties to some extent. It is much debated that healthcare spending in India is par low compared to many nations around the world.[48,56,126] This led to an acute shortage of the health care workforce across several categories, from primary doctors to specialists, nurses, and allied health professionals. Still, we also need to consider another facet of this. Just that only a mere 1.5 crores out of total 150 crores in India contribute to the tax,[127,128] making it challenging for the government to collect adequate revenue for nation-building and public spending. Though a large segment of Indian citizens are exempt from income tax because they fall below the annual $3700 income slab required even to pay taxes, any income, and businesses that are done mostly over cash payments escape the taxation as their actual earnings are concealed. Tax evasion is pervasive among businesses that rely on cash.[129]

India Two Pronged Approach: Health Care and Economic Revival

A multipronged approach needs to be undertaken to revive the healthcare and economy due to close interdependency (Tables 1 and 2). To keep a check control over the rising cases, a lockdown was enforced in several parts of the country, along with ramping the vaccination drive.[108–110] Though lockdown was meant to check rising case numbers, it comes with the disadvantage of jeopardizing the livelihood of numerous migrant laborers and families, most of whom are at the poverty level.[130–132] Choosing one at the cost of the other is impossible. With nearly about 80% of the workforce employed in the informal sector,[133] a vast majority are at the base of the social pyramid; lockdown translates to the loss of earnings.[134,135] As per the Centre for Monitoring Indian Economic data Pvt. the unemployment rate touched to 8.6% for April, from 6.7% about a few weeks back.[136] Massive job losses in India were seen after a similar national lockdown in the last year.[137–139] Migrant workers were

Table 1 Boosting Health Care

Ongoing Present Crisis	Suggested Recommendation	References
Lacking Adequate preparedness	Short and long term planning of manpower and logistics	Ref: [2,156–158]
Inadequate healthcare system, lack of oxygen availability, hospital admission and ICU beds	Ramp up public and private hospitals, stockpile medicines and oxygen supplies,	Ref: [159–162]
Virus sequencing for identification of VoC and pathogenic strain inadequate, set up zoonotic labs	Set up more virus genome sequencing and command centers	Ref: [163,164]
Vaccine crunch with the acute vaccine shortage (May–April 2021)	Ramp up vaccine production, arrange for vaccine raw materials, authorize international vaccines	Ref: [6,165–167]
Inadequate disease surveillance, testing and quarantine	Mass scale community screening, set up more quarantine centers	Ref: [168–170]
Non-COVID mortality high many of which were preventable	Set up parallel non-COVID healthcare system, train adequate physicians and caregivers to fill gap	Ref: [148,171–173]
Mental and physiological health of kids, depression and suicide	Set up counseling centers, engage NGOs and online platforms to prevent	Ref: [174–178]

Table 2 Boosting Economy

Ongoing Present Crisis	Suggested Recommendation	References
Economic slowdown due to pandemic	Economy revival with easy credits, loan waiver program, and reduced interest rate	Ref: [179–182]
Scarcity of PPE kits. Reduced import due to prolonged lockdown	Indigenously developed PPE kits and other COVID items	Ref: [183–185]
Massive job loss and unemployment	Create new jobs, engage the workforce in skilled and technical work	Ref: [98,186–188]
Informal sector hard hit due to lockdown and movement of migrant labor from urban setup	An incentive to bring back the workforce, revive the informal sector with cash flow and easy loan	Ref: [189–192]
Social media	Engage social media platforms to spread awareness and disease prevention	Ref: [193,194]

displaced from their homes and were forced to head back to their native villages.[140–142] Vaccine production was ramped up, and states were allocated the responsibility to vaccinate their people at the earliest. Raw materials for medicine production were subsidized, and rapid enrollment of healthcare workers in different hospitals was initiated. Assistance from the Indian Army helped fly oxygen plants from several nations, and humanitarian aid was made available by the Prime Minister Citizens Assistance and Relief during Emergency Situations (PM CARES) fund.[143,144]

Concluding Remarks

The silver lining is that when governance fails, social connectivity keeps hope alive. This is seen in the current COVID wave where people were connected through digital social networking platforms like Facebook, Whatsapp, Twitter, etc., to arrange for beds, medicines, oxygen, and doctors. The NGOs and Sikh Gurudwara conducted enormous philanthropic activities, and people came forward to contribute whatever they did through PM CARES contribution and other charities.[145–147] COVID19 has not only caused tremendous devastation in both economy and livelihood for India but also has contributed to substantial "non-Covid- preventable death." The COVID-19 tsunami has enormously affected the ongoing treatment of several manageable ailments due to the closure of these specialty clinics instead of COVID care. This led to a spike in non-COVID-related, otherwise preventable mortality.

Oncology care,[148,149] planned surgeries[150,151] cardiovascular intervention[152,153] kidney failure and dialysis,[154,155] to name a few, that were all severely affected, leading to an increase in the death count. As a country, India needs to chalk out plans to ensure that parallel healthcare services continue in pandemic times so that non-COVID patients are not left aside. These require a sufficient pool of separate sets of specialty clinics, trained physicians, and dedicated nurses. With a resounding crunch in workforce and logistics, this is something that policymakers need to ponder at as a long-term strategy.

The international community came forward and extended all their support for India. The TRIPS clause for vaccine production was quickly relaxed. For a contagious disease like this, it is in the best of everyone's interest that the virus propagation chain is terminated to prevent spillover of infection. For a country of 1.4 billion and one of the world's largest economies, a pandemic-free safe India is not just a choice but a mandate.

Author Contributions

RD and SK drafted the manuscript with assistance from KP and BJ. BJ also provided critical insights. SK conceptualized and overseen the entire work.

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