An Overview of COVID-19 PAN India

N. Syed Abbas[1], Sanya Arora[2], Rashi Anand[2], Sujata Bhardwaj[1], Jesudoss Dinakaran[1], Babeeta Chrungu Kaula[3]*, Syed Nasreen[4], Alka Bansal Vadakan[5]

Abstract

COVID -19 is a highly contagious viral disease that affects human populations very differently ranging from mild-to-moderate flu-like symptoms to serious complications involving mainly the respiratory system. The causative pathogen is a new virus Severe Acute Respiratory Syndrome Coronavirus 2. The viral disease gripped millions of lives in a short span, due to which World Health Organization announced it as pandemic on March 11, 2020. Various measures were adopted at local and global levels to stop immediate escalation of the viral infection. A complete lockdown was imposed, movement was restricted, industries were shut down, vehicles were prohibited to ply; only the production and supply of essential services were permitted. On one hand, the fatal disease posed a serious threat to life and quarantine caused loneliness but on the other hand, such unprecedented crisis had a positive impact on overall healing of nature. The economy and health infrastructure of various countries collapsed in fighting the pandemic. To revive, switching over to green economy may be the most viable option and it will also be a climate-conscious approach. The current review article gives an insight about COVID-19 pandemic and fight against it from India's perspective.

Keywords: AY.4.2 variant, COVID-19, Endemic, Pandemic, Psychological health, Social consequences, Vaccination

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Introduction

COVID-19 is coronavirus disease caused by the novel coronavirus known as Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2). The viral disease being contagious spread so very fast across the globe that it was announced as pandemic on March 11, 2020, by the World Health Organization (WHO). It was first time reported in December 2019 from Wuhan, a city in China. Similar, pandemics reported in the past, in 2003 and 2012 were caused by the same family of viruses SARS-CoV-2.[1,2] Coronaviruses belong to the genus *Coronavirus* –the largest group of viruses. They are typically round, enveloped, single-stranded, positive-sense, RNA viruses with spike proteins on their surface which gives them a crown-like appearance that helps in the attachment of virus.[3] Multiple new mutant strains were also reported, out of which few strains were variants of concern (VOCs; variants that have higher transmissibility, increased virulence, or decreased susceptibility to available diagnostics, vaccines, and therapeutics) and some were variants of interest (VOIs; strains which have caused community transmissions and are suspected to be detrimental). VOCs include strains of different lineages that belong to various countries. WHO labeled the strains as alpha, beta, gamma, and delta that originated in countries such as the United Kingdom, South Africa, Brazil, and India respectively. VOI identified by WHO as Eta was reported from many countries, Iota from the USA, Kappa from India, and Lambda from Peru.[4]

India's first COVID-19 case was a student from Kerala who had returned from Wuhan in January 2020.[5] Two months later the first loss of life owing to COVID-19 from Karnataka was reported on March 12, 2020. With the escalation of COVID-19 cases, Janata (public) curfew was enforced on March 22, 2020, which was foundation of the nationwide lockdown imposed from March 25, 2020, to May 31, 2020. Eventually, phase reopening began after 75 days of lockdown from June 8, 2020, onwards. Unfortunately, a second wave, more severe wave of coronavirus hit the country and a second lockdown was imposed in April 2021. During this timeline of pandemic events and the consequences thereupon; undoubtedly affected nation's economy, social life, and mental health. Although India ranks second in population in the world yet it managed to tackle initial

[1]Department of Botany, Bhaskaracharya College of Applied Sciences, University of Delhi, Sector 2, Dwarka, New Delhi, India.

[2]Department of Biomedical Science, Bhaskaracharya College of Applied Sciences, University of Delhi, Sector 2, Dwarka, New Delhi, India.

[3]Department of Botany, Zakir Husain Delhi College, University of Delhi, Jawaharlal Nehru Marg, New Delhi, India.

[4]Department of Emergency Medicine, Government Medical College, ESI Hospital, Coimbatore, Tamil Nadu, India.

[5]Department of Botany, Maitreyi College, University of Delhi, Chanakyapuri, New Delhi, India.

Corresponding Author: Babeeta Chrungu Kaula, Department of Botany, Zakir Husain Delhi College, University of Delhi, Jawaharlal Nehru Marg, New Delhi - 110 002, India. E-mail: dr.bckaula@zh.du.ac.in

wave of COVID-19 pandemic quite efficiently. The mortality rate was low despite encountering higher number of COVID-19 cases and insufficient medical facilities. Mostly people with comorbidities such as hypertension, diabetes, cardiovascular dysfunction, kidney failure, and chronic obstructive pulmonary disease lost their lives due to COVID-19.[6] As comorbidities increase with age; elderly people were more susceptible to the virus. A plausible explanation for low mortality rate may be that majority of India's population comprises younger age group. The second wave, however, completely changed the scenario, as there was a sharp escalation in COVID-19 cases that led to a severe shortage of beds in hospitals and medical oxygen which created a grave situation, and 38,000 deaths were reported in April 2021.[7]

India being the second most populated developing country with more than one billion people, the fight against COVID-19 was extremely challenging. The vigilant government of India (GoI) took

needful steps at the right time by imposing lockdown and social distancing practices. The COVID-19 warriors worked selflessly round the clock to protect the nation. Healthcare workers made sure that the patients get immediate medical assistance, the policemen maintained overall law and order situation, and masses abided by the restrictions enforced. The sanitation workers played a pivotal role in maintaining proper cleanliness and hygiene that was crucial to curb the spread of virus.

VACCINATION

In India the vaccination drive started on January 16, 2021, with the two licensed vaccines –"Covaxin" (Bharat Biotech) and Covishield (a vaccine of AstraZeneca and manufacturer is Serum Institute of India). Later on Sputnik –V (developed by Gamaleya Research Institute, Russia) was granted approval in April 2021 by the Drugs Controller General of India (DCGI) and was launched in India on May 14, 2021. Dr. Reddy's Laboratories Ltd. is working with the Russian Direct Investment Fund for the manufacture of India-made Sputnik –V which is expected to be available soon. All three vaccines have got the EUA status which is the Emergency Use Authorization (EUA) or Permission for Restricted use. However, Sputnik-V is yet to get approval from WHO. These vaccines are currently being given to the people above 18 years only and vaccine for children is under clinical trials. The Covaxin is a coronavirus vaccine made from inactivated coronavirus whereas Covishield is viral vector (Chimpanzee adenovirus) based. Sputnik-V is also an adenovirus vector vaccine. However, all the three vaccines are quite effective and are believed to reduce the mortality rates to a great extent.

The policy decisions with respect to COVID-19 vaccinations are being taken in India by a National Expert Group on Vaccine Administration for COVID -19 (NEGVAC) which was set up on August 7, 2020, by the Cabinet Secretariat. The chairperson of NEGVAC is member of NITI Aayog and co-chairperson is secretary of Health and and Family Welfare it has representations from many other sectors related to health, medicine, research, biotechnology and few state governments as well. NEGVAC has given guidance on all aspects of vaccine introduction, trials, selection, finance, attainment, distribution, delivery mechanism, selection of priority groups, monitoring the vaccine safety, etc.

Based on the approval of GoI and the recommendations of NEGVAC, priority groups were formed and vaccination started from January 16, 2021, for Health Care Workers. Second to receive the vaccine were the frontline workers from February 2, 2021. The third priority group of individuals over 60 years received the vaccine from March 1, 2021. This category also included those individuals who were over 45 years of age but had the identified comorbidities. Then from April 1, 2021, the vaccination drive was extended to all people who were 45 years and above, and subsequently from May 1, 2021, it began for all adults above 18 years.

Revised guidelines for the vaccination program came into implementation from June 21, 2021, under which GoI is providing free vaccines to states. Thus all citizens can get free vaccines at government centers though it is expected that those with a paying capacity should use the private hospitals for vaccination on a payment basis.[8,9] India has made a world record by delivering more than 25 million COVID-19 vaccine doses a day, the highest ever till date. The nation has not only delivered over one billion doses of COVID-19 vaccine to its citizens but also exported more than 65 million doses of COVID-19 vaccine to the neighboring countries under the Maitri program.[10,11]

Dosage

As per the Drugs Controller General (India), two doses are required to be administered for all the three vaccines with a gap of 12–16 weeks for Covishield, 4–6 weeks for Covaxin, and 3 weeks for Sputnik V. Intermixing of vaccines between the two doses is not permitted as per the global data. Thus both the doses administered to a person should be of the same vaccine. It takes about 2–3 weeks for a vaccinated individual to develop an immune response after the second dose is administered.

However, the time period for which the immune response is effective in a vaccinated person is yet not ascertained. But there is no directive of a booster dose as of now. Hence the COVID-19 appropriate behavior is to be followed even after vaccination.

The Indian vaccination has been facilitated by the Co-WIN portal which is the Indian government web portal and stands for Covid Vaccine Intelligence Network. It is owned and operated by the Ministry of Health and Family Welfare. It is the only comprehensive platform involved in facilitating COVID-19 vaccination in India. It allows for COVID-19 vaccination registration and displays all booking slots available in the nearby areas as well as the entire country which can be booked online based on convenience of location and time. The portal allows for scheduling or rescheduling appointments as well. The vaccination facilities of both government and private centers are integrated with this portal and therefore the vaccination data is recorded for certification. The vaccination certificates can then be obtained on providing the registered mobile number or the reference ID instantly. These certificates have universal authenticity. The portal also allows for tracking the vaccination schedule in between two doses. Travel and office portals can also integrate their platforms with this portal.[10,12] A total of 90,79,32,861 vaccination doses have been administered as on October 4, 2021. Out of these, 66% of the country's adult populace got at least the first jab of COVID-19 vaccine. The average vaccination rate has gone up to about seventy lakhs to one crore jabs per day. Keeping in view the population size of India and the availability of the vaccine it will take some more time to vaccinate the maximum people across the country.[13]

According to reports in some leading newspapers (TOI, HT) dated October 1, 2021, Zydus Cadila is in the process of rolling out the first COVID-19 vaccine for children in the age group 12–18 years. Union health secretary Rajesh Bhushan in a press briefing held by the government on September 30, 2021, said that Zydus Cadila's COVID -19 vaccine will soon be included in the national vaccination program. ZyCoV-D is a needle-free vaccine manufactured by Ahmedabad-based Zydus Cadila and is the second Indian vaccine for COVID-19 apart from Covaxin. This vaccine has also got its EUA from India's drug regulators and is a three-dose vaccine for children between 12 and 18 years. According to the Department of Biotechnology ZyCoV-D is the world's first DNA-based vaccine.[11,14]

To fight the pandemic scientifically, over 100 crore doses of vaccine have been successfully delivered to PAN India [Table 1]. This Herculean task was accomplished only by the utmost dedication of various teams working round the clock. India has helped other nations too to fight COVID-19 by providing vaccines for which the WHO chief has expressed his gratitude.[15]

IMMUNE TRAINING AGAINST THE CORONAVIRUS

As India is a diverse country with various cultures and traditions, it follows indigenous system of medicine along with modern

Table 1: COVID-19 Vaccination Coverage PAN India. Source: https://www.mohfw.gov.in/pdf/
CummulativeCovidVaccinationReport23october2021.pdf

PAN India		Total beneficiaries vaccinated		
		Dose-I	Dose-II	Total doses
		71,57,33,309	30,53,09,949	1,02,10,43,258
S. No.	State/UT	Total beneficiaries vaccinated		
		Dose-I	Dose-II	Total doses
1.	Andaman and Nicobar Islands	2,93,112	1,89,393	4,82,505
2.	Andhra Pradesh	3,16,24,975	1,82,85,466	4,99,10,441
3.	Arunachal Pradesh	7,68,476	5,10,393	12,78,869
4.	Assam	1,98,84,281	71,86,338	2,70,70,619
5.	Bihar	4,85,30,918	1,61,24,528	6,46,55,446
6.	Chandigarh	9,22,279	5,24,862	14,47,141
7.	Chhattisgarh	1,44,60,737	67,16,089	2,11,76,826
8.	Dadra and Nagar Haveli	3,86,865	1,76,619	5,63,484
9.	Daman and Diu	2,71,049	1,79,217	4,50,266
10.	Delhi	1,28,93,328	71,53,457	2,00,46,785
11.	Goa	12,53,513	8,59,836	21,13,349
12.	Gujarat	4,43,81,420	2,42,57,770	6,86,39,190
13.	Haryana	1,76,09,045	77,40,640	2,53,49,685
14.	Himachal Pradesh	57,00,386	32,08,548	89,08,934
15.	Jammu and Kashmir	94,74,394	47,00,559	1,41,74,953
16.	Jharkhand	1,46,56,236	51,03,197	1,97,59,433
17.	Karnataka	4,18,51,568	2,14,48,318	6,32,99,886
18.	Kerala	2,51,94,796	1,28,50,111	3,80,44,907
19.	Ladakh	2,08,273	1,50,746	3,59,019
20.	Lakshadweep	55,060	45,145	1,00,205
21.	Madhya Pradesh	4,97,61,120	1,87,77,947	6,85,39,067
22.	Maharashtra	6,55,19,863	2,96,45,650	9,51,65,513
23.	Manipur	12,41,394	6,45,829	18,87,223
24.	Meghalaya	10,95,353	5,99,759	16,95,112
25.	Mizoram	7,07,294	5,00,702	12,07,996
26.	Nagaland	7,04,664	4,65,995	11,70,659
27.	Odisha	2,49,85,986	1,06,23,708	3,56,09,694
28.	Puducherry	7,25,288	3,83,431	11,08,719
29.	Punjab	1,57,37,816	60,12,157	2,17,49,973
30.	Rajasthan	4,22,68,910	1,92,21,686	6,14,90,596
31.	Sikkim	5,20,981	4,37,464	9,58,445
32.	Tamil Nadu	4,03,89,100	1,58,98,199	5,62,87,299
33.	Telangana	2,14,06,061	87,86,090	3,01,92,151
34.	Tripura	25,04,205	15,44,615	40,48,820
35.	Uttar Pradesh	9,58,81,826	2,95,29,689	12,54,11,515
36.	Uttarakhand	74,52,106	36,31,699	1,10,83,805
37.	West Bengal	5,21,73,222	1,96,30,641	7,18,03,863
38.	Miscellaneous	22,37,409	15,63,456	38,00,865

medicine system. Ayurveda, Unani, and Siddha are different types of traditional medicinal systems used by large sections of the population. During COVID-19 crisis, Ministry of AYUSH, GoI spread the awareness regarding the immunity-boosting interventions through their various programs, to ensure public health safety.[16,17] Moreover, India is known for its traditional home remedies which were extensively used by the people in these times to protect themselves from viral infection. The Union Health Ministry released a list of home remedies such as drinking one cup of Ayush kwath, taking one gram of Giloy, consuming 1–3 g of Ashwagandha and Mulethi powder, adding Amla and Chyawanprash to their diets, drinking warm turmeric milk, and gargling with turmeric and salt for immunity boosting and for quick recovery from COVID-19.[18]

COVID-19 showed a very different and interesting trend in the way it affected developed and developing nations. A few months after the start of pandemic the graph of infection rate depicted an upward trend in the USA and Europe but on the contrary in India, the rate of infection was less and in the graph, it depicted a naturally flattened curve.[19] A report of CSIR suggested that due to the exposure of people especially of economically weaker

sections to pathogens of communicable diseases at an early age helps in building innate immunity known as "immune training" among people and such type of exposure may have helped during pandemic to deal with high level of fatalities.[20]

EPIDEMIOLOGY

According to the data available on http://www.worldometers. info/coronavirus/#countries, during almost 1 and ½ years of the pandemic period, India ranks second in the world in total number of COVID-19 cases reported with the highest recovery rate and lowest death rate [Table 2]. Death rate was highest in Brazil and Russia (2.79) followed by Argentina (2.19) and Iran (2.15) whereas India had one of the lowest death rate of 1.33 among these countries [Figure 1a]. Based on the number of cases confirmed for recovery in top ten countries, India was able to manage the pandemic quite efficiently with highest recoveries 98% [Figure 1b] and one of the lowest death rates in spite of being second in COVID-19 cases across the world. In India, soon after COVID-19 first case was reported (January 30, 2020), the infection rate kept on growing. However,

there was a drop in the number of cases infected with coronavirus in the beginning of the year 2021 but in April-May, the cases shot up again with a peak higher than before [Figure 2a].

In India, first life was lost to COVID-19 on March 12, 2020, and the death toll hit a peak on June 16, 2020, when 2006 deaths were reported in a single day. The number of deaths due to COVID- 19 substantially increased till September (2020) after which there was a decline. Soon after the new year, COVID-19 cases increased rapidly with the newer strains causing new symptoms. The situation worsened and there were on an average around 2700 deaths reported per day. The second wave hit a peak on May 18, 2021, with 4525 deaths in one day, which was more than double the number reported in the previous wave [Figure 2b]. The death rate data [Figure 3], of various states and union territories of India, depicts that states such as Punjab (2.75) have the highest death rate followed by Uttarakhand (2.15), Nagaland (2.13), and Maharashtra (2.12).

An analysis of the death rate of COVID-19 cases across India [Table 3] reveals that among various states, maximum COVID-19 cases were reported from Maharashtra followed by Kerala, Karnataka, Tamil Nadu, and Andhra Pradesh. However, the death rate reported among these states was the lowest in Kerala. Other states such as Nagaland and Sikkim reported less number of COVID-19 cases but their death rate was comparatively higher. As per the data Southern part of India was highly affected by COVID-19 cases. Interestingly, the data indicate that the overall rate of recovery across most states and union territories was more than 90%.

India being densely populated country, there was a community spread of COVID-19 due to insufficient knowledge about precautionary measures, resulting in radical increase in the number of cases (24683242) as reported on May 15, 2021 [Figure 4]. The second wave rendered the country incapacitated. However, the situation was brought under control by strict implementation of COVID-19 protocol, another lockdown and vaccination. These measures were instrumental in the drastic decline in cases and deaths in India.

ENVIRONMENTAL IMPACT

It's an irony that as millennial and post-millennial we have always craved for fresh air to breathe and when we have it, we are either locked in our homes or moving outside wearing a mask. The current pandemic situation across the globe has frozen all development-related activities. For very long, human activities have posed a serious threat to the environment that has led to its continuous degradation. COVID-19 lockdown turned out to be a boon for healing the planet earth and its resources [Figure 5]. It
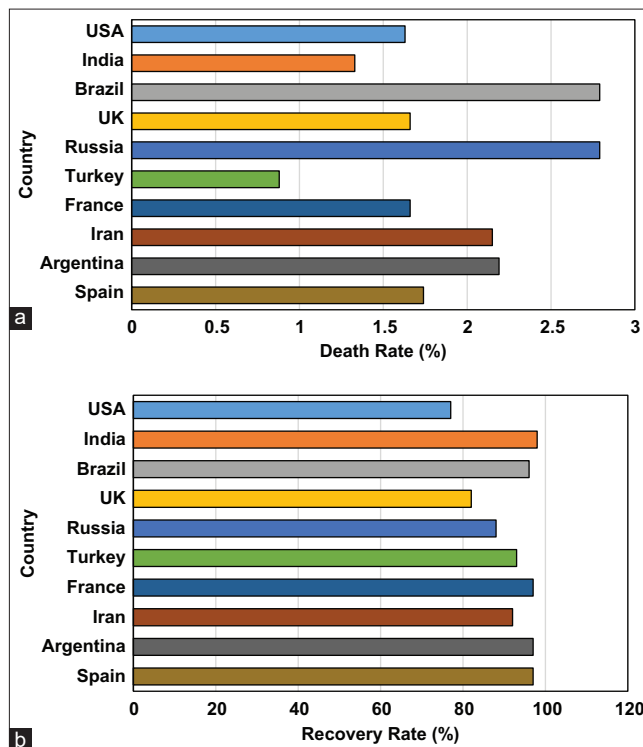
is amply evident that nature around us can repair, restore and prosper at a rapid rate if left undisturbed.

Improvement in Air Quality

Carbon emissions had globally fallen by 17% and air quality had improved.[21] The air quality index across the world has shown significant dip during COVID-19 lockdown as the industrial production of goods was halted and vehicular traffic was almost off the roads [Figure 5]. This resulted in considerable reduction in the most potent pollutants in the air like particulate matter (PM) 2.5 and nitrogen dioxide (NO_2). There was a significant fall (71%) in the level of PM 2.5 in New Delhi recorded in just 7 days, with an actual fall to 26 $\mu g/m^3$ on 27th March from 91 $\mu g/m^3$ on 20th March. The level of NO_2 also dropped significantly to 15 from 52 $\mu g/m^3$. Similarly, Mandal and Pal (2020)[22] reported a steep fall in air contaminants in many major cities in India. Fall in the release of main air polluting agents had drastically brought down illnesses, especially respiratory problems and even premature deaths. Such fall in the levels of air pollution was also witnessed by locals in Jalandhar, Northern Punjab who viewed the entire range of Himalayan Mountain for the first time in three decades.[23]

Reduction in Noise and Water Pollution

Pandemic has been rewarding for the environment as in addition to improvement in the quality of air, there has been reduction in the levels of noise and water pollution as well. The major contributors of noise pollution are vehicular traffic, building construction, industries, etc. and all these sources of noise pollution came to a standstill during pandemic. Noise pollution is very harmful for health and it is

Table 2: Top 10 Countries with Highest Number of COVID -19 Cases and Recovery Rate. http://www.worldometers.info/coronavirus/#countries

S. No.	Country	Total cases	Death rate	Recovery rate
COVID -19 Cases in Top Ten Countries, October 15, 2021				
1.	USA	45,740,265	1.63	77
2.	India	34,052,687	1.33	98
3.	Brazil	21,627,476	2.79	96
4.	UK	8,361,046	1.66	82
5.	Russia	7,925,176	2.79	88
6.	Turkey	7,601,626	0.88	93
7.	France	7,080,375	1.66	97
8.	Iran	5,765,904	2.15	92
9.	Argentina	5,271,361	2.19	97
10.	Spain	4,984,386	1.74	97

Figure 1: COVID-19 Recovery Rate (a) and Death Rate (b) in Top 10 Countries Based on Number of Cases Confirmed.
Source: https://www.worldometers.info/coronavirus
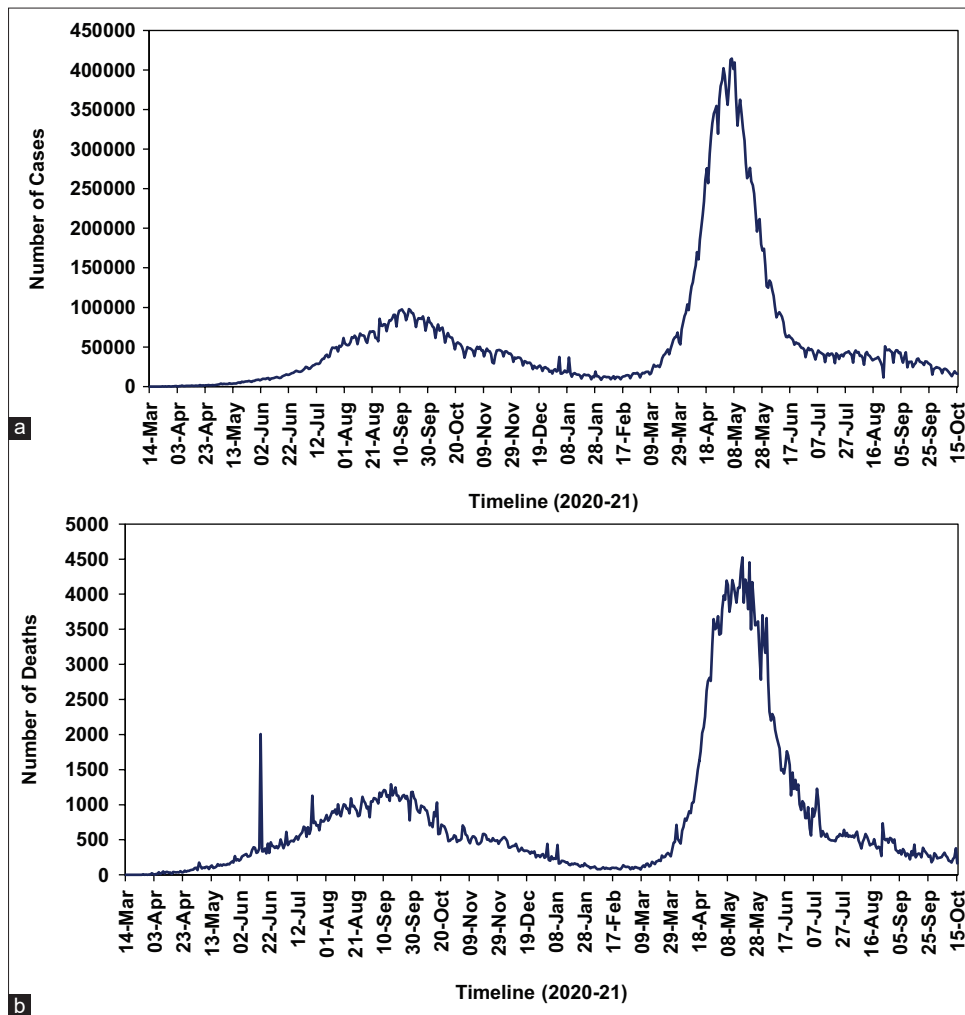
Figure 2: Daily variation in the number of COVID-19 cases a) and deaths due to COVID-19 (b)
Source: www.worldometers.info/coronavirus/country/india/
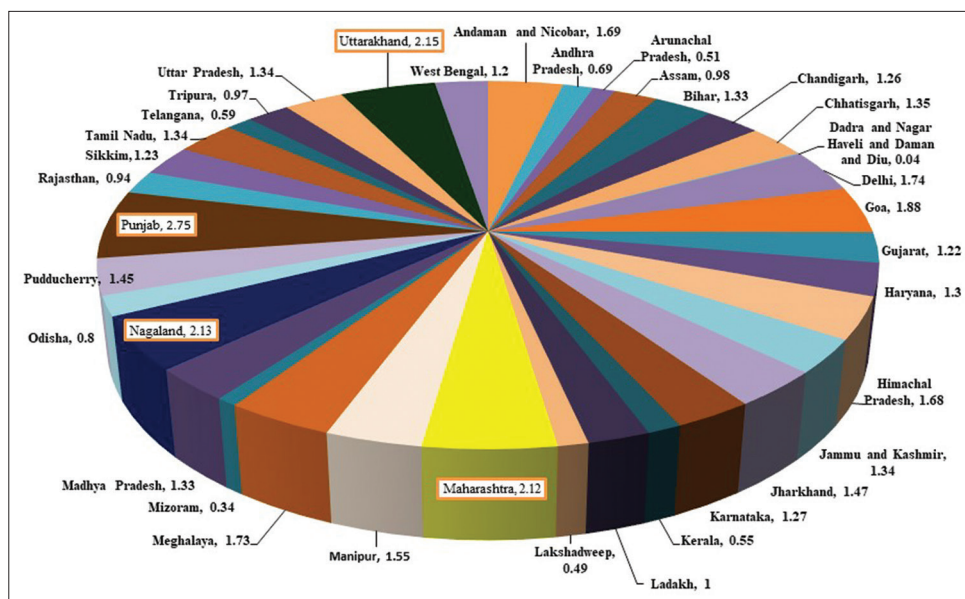
Figure 3: Death rate of COVID-19 cases in India (October17, 2021)
Source: https://www.mygov.in/corona-data/covid19-statewise-status/

Table 3: COVID-19 cases and death rate in India, October 17, 2021
Source- www.mygov.in/corona-data/covid19-statewise-status/

S. No.	States and Union Territories	Cases	Deaths	Death rate
1.	Andaman and Nicobar	7641	129	1.69
2.	Andhra Pradesh	2,060,040	14302	0.69
3.	Arunachal Pradesh	54,980	280	0.51
4.	Assam	6,06,263	5944	0.98
5.	Bihar	7,26,021	9661	1.33
6.	Chandigarh	65,299	820	1.26
7.	Chhattisgarh	1,005,638	13570	1.35
8.	Dadra and Nagar Haveli, Daman and Diu	10,675	04	0.04
9.	Delhi	1,439,358	25089	1.74
10.	Goa	1,77,462	3342	1.88
11.	Gujarat	8,26,280	10086	1.22
12.	Haryana	7,71,061	10049	1.3
13.	Himachal Pradesh	2,21,306	3719	1.68
14.	Jammu and Kashmir	3,30,967	4426	1.34
15.	Jharkhand	3,48,423	5135	1.47
16.	Karnataka	2,983,133	37937	1.27
17.	Kerala	4,846,766	26791	0.55
18.	Ladakh	20,876	208	1
19.	Lakshadweep	10,365	51	0.49
20.	Maharashtra	6,589,982	139760	2.12
21.	Manipur	1,22,633	1895	1.55
22.	Meghalaya	82,898	1434	1.73
23.	Mizoram	1,12,599	383	0.34
24.	Madhya Pradesh	7,92,679	10523	1.33
25.	Nagaland	31,571	674	2.13
26.	Odisha	1,034,634	8282	0.8
27.	Puducherry	1,27,344	1849	1.45
28.	Punjab	6,02,008	16541	2.75
29.	Rajasthan	9,54,388	8954	0.94
30.	Sikkim	31,745	391	1.23
31.	Tamil Nadu	2,685,874	35884	1.34
32.	Telangana	6,68,833	3937	0.59
33.	Tripura	84,305	816	0.97
34.	Uttar Pradesh	1,710,019	22898	1.34
35.	Uttarakhand	3,43,747	7397	2.15
36.	West Bengal	1,579,906	18963	1.2
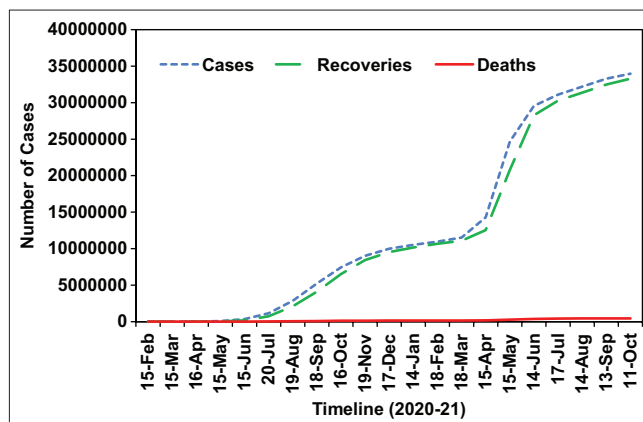
Figure 4: COVID-19 Scenario in India.
Source: www.statista.com/statistics/1104054/
india-coronavirus-covid-19- daily-confirmed-recovered-death-cases

Increase in O$_3$ Concentration

A study conducted on different cities in India about the impact of lockdown on the quality of air revealed very interesting results. The lockdown period was a boon for the revival of air quality in addition to improving overall health of the earth [Figure 5]. During lockdown, there was a significant decrease in the air pollutants such as (PM 10 and PM 2.5), NO$_2$, and SO$_2$ in some cities. However, there was not much respite in air pollution levels of some places during this period also. An increase in the concentration of ozone was reported in places where the coal power plants were operational. Ozone is one of the harmful air pollutants and increase in its concentration may be attributed to several factors such as temperature, reduction in the levels of nitrogen oxide and volatile organic compounds.[26,27]

Generation of Medical and Plastic Waste

Globally waste generation is among the major concerns of COVID-19 pandemic. During this period there was an unprecedented rise in the use of plastic in many sectors like healthcare, household, online packaged delivery of essential goods and many other sources. There is a dire need to bring down plastic footprint and plastic waste footprint by developing sustainable and effective disposal systems.[28] For the safety of human health, the indiscriminate use of plastic that has compromised environmental health needs to be reduced drastically. The pandemic period also witnessed a steep fall in the use of petroleum and that encouraged cheaper production of virgin plastic from the fuel for economic gains compared to recycling of used plastic.[29] Simultaneous reduction in recycling of plastic and increase in waste of single use plastic posed a major concern. The other major concern is posed by the volumes of non-recyclable medical waste that has also risen considerably during pandemic. The contaminated masks, gloves, used or expired medications all contribute to more and more waste generation, which further increases the risk of contamination of land and water.[30] Though the employment of single use plastic has been a life saver for frontline health workers in the fight against COVID-19 but it is also creating a long term negative impact on terrestrial and marine ecosystems due to less efficient waste management systems. Moreover, the use of single use plastic has also increased tremendously due to the increase in home delivery of basic goods, especially food.

a real menace especially in the cities. The reduction in noise level has proven significantly beneficial for the health of people.[22]

The quality of water bodies improved considerably to the extent that water of the River Ganga became drinkable after several decades with the reduction in pollution level in the lockdown period.[24] During the same period, River Yamuna witnessed innumerous Indian and migratory bird visitors owing to the improvement in its water quality. In Mumbai, spotting a record-breaking number of migratory Flamingoes made it an unusual sight. As humans were confined to their homes; various animals were seen enjoying their freedom! With the reduction in anthropogenic activities there had been great improvement in the water quality of river Beas. A survey by the Punjab Pollution Control Board revealed that the Beas River was no longer polluted as the majestic Indus-River-Dolphins (rarest animals) were seen at Beas Conservation Reserve.[25]

NEGATIVE IMPACTS

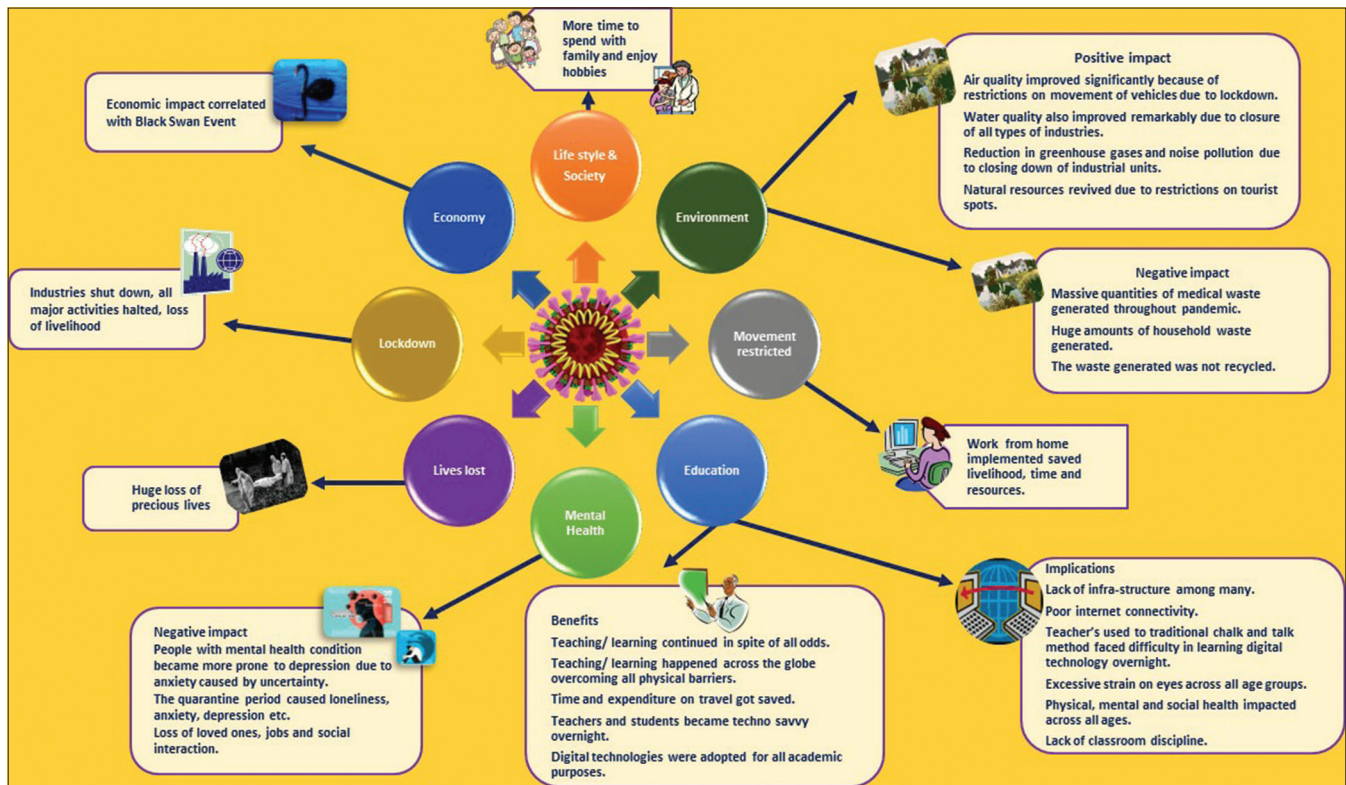The impact of COVID-19 crisis on the environment also had some negative consequences.

Figure 5: Impact of COVID-19 PAN India

Generation of Electronic Waste

According to UN report around 50 million tons of e-waste is produced every year which is expected to double in the near future, i.e., 110 million tons by 2050.[31] The life-style changes that came along with COVID-19 has caused a significant increase in e-waste as the demand of electronic devices has gone up tremendously due to work from home. Currently poor e-waste recycling and inadequate disposal methods are the major issues. People working in e-waste processing industries develop many respiratory conditions due to inhalation of toxic fumes of substances like Chromium, Lead, Cadmium, Brominated flame retardants and Polychlorinated biphenyls. Such working conditions render the workers more prone to COVID-19 infection.[32]

SOCIAL CONSEQUENCES

COVID-19 pandemic not only created havoc in the health sector but also imposed a greater risk on socio-economic factors, thus increasing the social differences among the population. Social distancing, adopted as a preventive measure has proven to be an effective tool to check spread of Coronavirus disease but this led to the changes in social behavior of people [Figure 5]. In India, people faced various social stigmas due to the fear of pandemic. There were several cases of hostility encountered by frontline corona warriors like doctors, nurses, health professionals, sanitation workers and police. People instead of co-operating, expressing gratitude and respect towards COVID-19 warriors, turned suspicious towards them due to the fear of getting infected. Even the patients who recovered from COVID-19 and their family members had to face and deal with such situations. Incidents like this escalated the

suffering of people and resulted in increasing the spread of disease as those at a risk of catching it may avoid seeking healthcare advise by the fear of social stigma.[33]

Social distancing added to the woes of social inequality. Prevailing inequalities due to vertical distancing (along class and caste lines) have further widened now when horizontal distancing has come into play.[34] Most affected social groups were the laborers, road side vendors, small traders and specially the migrant workers who had left their homes to seek jobs in industries, constructions and agriculture. These people were more vulnerable and were on the verge of starvation due to lack of basic amenities. In a developing country like India which is already dealing with major problems such as poverty, illiteracy and unemployment, such unprecedented situations added to their misery. According to UN's International Labor Organization, the COVID-19 pandemic will push millions of workers into poverty in India.[35] The current pandemic has posed several serious challenges, but the positive outcome of COVID-19 pandemic has emphasized the critical role of scientists, researchers and academia to combat any such situation.

PSYCHOLOGICAL CONSEQUENCES

The nationwide lockdown and social distancing affected considerably mental health of people across all age groups. Initially the lockdown appeared to be a good opportunity to rebuild relationships and bring families closer than ever before, but soon the uncertain future became a heavy burden because of socio-economic crisis and that was taking a toll on the mental health [Figure 5]. Every sect of society was reeling under the tremendous pressure in terms of the mongering fear of catching COVID-19

infection, the financial burden for treatment of the coronavirus disease and the loss of near and dear ones.[36,37]

Some of the most common mental health issues that many people have developed are insomnia, depression, anxiety etc. The pandemic period was highly challenging for the people suffering from mental health issues as they became more vulnerable and were at a higher risk.[38] Mental health is an important issue of the society and needs to be addressed and treated by the health professionals at the earliest. The current situation has made a severe impact on the psychological well-being of individuals across the globe. People of all the age groups experienced consternation due to the apprehension of catching infection and losing lives. Inadequate knowledge and checking daily details about COVID-19 also contributed towards mental agony.[39] Studies also showed that the fear causes stress which ultimately leads to the suppression of immune system by increasing the release of hormones like cortisol and adrenaline which makes people more prone to infections and diseases.[36] The apprehension of losing loved ones, loneliness, restrictions on movement, financial crisis, mental exhaustion, and managing work-imbalance ultimately led to suicidal thoughts in severe cases.[38] Moreover, the extreme physical discomfort along with mental illness further deteriorated the condition of some patients. Even the survivors were at a higher risk of developing depression due to constant anxiety and Post Traumatic Stress Disorder.[37] The frontline workers who include healthcare professionals, police, bankers, and armed forces were more vulnerable to mental health challenges. In India the situation precipitated further due to the excess load of COVID-19 patients on already overloaded healthcare system.[39]

The sudden nation-wide lockdown helped to control the spread of coronavirus in the first wave and prevented the situation to go out of hand. However, the woes that came along with the first lockdown were reflected in lack of work, money, food etc. which led to mindless migration of labor class from their place of work to their native places. The desperate attempts to go back to their hometowns without any transport made them to walk miles with families including children and face severe sufferings.[40] Preventive measures suggested to limit the spread of coronavirus included self-isolation, home confinement, more attention to hygiene, social distancing etc. and these practices were impossible for homeless people who experienced more mental agony by not being able to follow the proposed control measures.[39] Home confinement and change of daily routine made children insecure and irritable. Lack of social interaction, overburdened by daily assignments and uncertainty of the situation added to the stress levels of children, whereas in elderly people and patients with chronic illnesses, there was a considerable rise in their anxiety levels. The interplay of mental health and health problems in general further deteriorated the situation.[37,39]

Green Economy as the Path Towards Green Recovery

A shift towards green economy is need of the hour. In post COVID-19 situations, the concept of green economy would serve as a roadmap to recovery. This includes huge ecological transformation through nature-based solutions, resource conservation and de-carbonization. The "Right to Repair" campaign that promotes make of repairable electronic devices that last long, is a great initiative to reduce e-waste generation. Reusing or recycling computers can create more jobs and will be economically

favorable.[30] Green economies would help in expansion of jobs in waste management and ecological restoration, eradicating hunger, and poverty and most importantly it would ensure sustainable development and would strengthen future economies.

Third Wave of Covid-19

India has witnessed two waves of coronavirus disease so far. Both the waves differed in terms of causative agents, symptoms, age group, availability of resources for the treatment, vaccine availability, infection rate, death rate etc.[41] Based on the analysis of data of both the waves of coronavirus, there is a likelihood of the third wave striking India, but the severity and peaks may not be as high as before due to vaccination and other preventive measures.[42] The main reason behind these consecutive waves was high mutation rate of coronavirus, efficient transmission capability and less incubation period.[41] Many different lineages of the virus emerge, and they rapidly start diversifying into multiple sub-lineages. The new variants pose more challenges as they all have different transmissibility. In India the second wave that was the worst started around March 2021 and reached its peak during May 2021. It was caused by the delta variant (B.1.617.2), a dominant variant of concern. There were multiple reasons for the second wave to sweep across India. However, lessons learnt from this wave and their strict implementation can save India from third wave.[43]

Another variant K417N, i.e., delta plus variant (AY.1), sub-lineage of B.1.617.2 has emerged recently and is having mutations that may allow it to bind better to the receptors thereby increasing its transmissibility. The mutant is a mosaic of all the deadly key mutations that other variants had and hence is a variant of concern. However, due to a lack of sufficient data, nothing can be clearly predicted.[44]

Currently, another major concern is posed by the new variant AY.4.2, a sub-lineage of Delta variants (B.1.717.2) a variant of concern. The variant contains three additional mutations, including two mutations in the spike proteins: A222V and Y145H. There has been an increase in the prevalence of AY.4.2 since July 2021.[45] Until October 31, 2021, as many as 25,684 sequences of AY.4.2 lineage have been detected worldwide with majority of the sequences (24,425) reported from United Kingdoms. However, there is no case of AY.4.2 variant reported from India as on October 31, 2021.[46]

Endemic Covid-19

According to Dr. Soumya Swaminathan (Chief Scientist, WHO), COVID -19 in India may be in the endemic stage with low or moderate transmission of the virus. Thus, implying that we have learned to live with the virus by maintaining COVID-19 appropriate behavior using masks, keeping social distance, avoiding poorly ventilated areas, following respiratory and hand hygiene. Such precautions will ensure that the virus will not be able to infect enough people and thus the third wave may be averted. It is also expected that all countries will enter into endemic phase variably because of their variable host, environment, and vaccination rate.

Currently, we are witnessing that cases are not rising exponentially as they were reported a few months ago. The experts are hoping that the COVID-19 will hence become endemic over a period of time such as small pox and polio, due to vaccination and other public health efforts of maintaining social distance and wearing masks. Once the endemic phase begins, the spread

of virus will be constant in a population with low to moderate severity along with predictable patterns. In the present scenario, this essentially implies that the virus will not disappear completely, rather it is expected that a large population will gain immunity against the disease, either because of vaccination or infection by coronavirus. The coronavirus is still around but there may be low level of transmission, less requirement of hospitalization, and less deaths due to COVID-19.[47]

Conclusion

COVID -19 pandemic has hit hard and shaken the well-being of humans in every sphere of life in the last 1 and ½ years in India. In this period, coronavirus infected more than thirty-four million people with the recovery of more than thirty-three million people, and around four-hundred-fifty thousand people lost their lives. Although the pandemic caused unprecedented loss of work, that has left a long-lasting impact on economy, social lives, and psychological health, its impact due to lockdown has greatly helped the environment and improved the health of all components of the ecosystem such as water bodies, air, and earth. The pandemic has made it amply clear that anthropogenic activities are a serious threat to the environment and in their absence, nature can flourish. But most environmentalists believe that positive outcomes of lockdown are temporary, and exploitation and destruction will continue at an even higher rate.

Therefore, we as a society must act as responsible citizens and help conserve the natural resources and not exploit them for any reason. There is a dire need to come out with better policies and their strict implementation to keep our environment healthy. Furthermore, during such a crisis every sect of society must remain humane and united. Family and friends play a crucial role to help maintain good mental health and psychological well-being. Social media must report responsibly without sensationalizing the news reports as they play a critical role in maintaining harmony in the society. There is a need to understand the difference between isolation and ignorance towards the needy. The COVID-19 has paved the path for environment care and value for human relations. To help stop the spread of coronavirus disease and eventually the third wave, prophylaxis is the ultimate option for effective tackling of the pandemic.

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