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Article

Public Health Emergencies; Epidemic Management in COVID-19, a Pandemic Turbulence

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ABSTRACT

In December 2019, a novel coronavirus, severe acute respiratory syndrome-coronavirus-2, started a pneumonia outbreak in Wuhan, China, that quickly spread around the world. Asymptomatic instances or moderate symptoms such as fever, cough, sore throat, headache, and nasal congestion to severe cases such as pneumonia, respiratory failure requiring mechanical ventilation, multi-organ failure, sepsis, and mortality are among the clinical characteristics of the disease. We needed an effective therapeutic strategy to treat symptomatic individuals and implement preventative measures to contain the virus and avoid community spread, given the worrying transmission rate. The pandemic of coronavirus disease 2019 (COVID-19) is a global public health issue. This review focuses on several aspects of COVID-19, such as the scenarios and obstacles faced during the first, second, and third waves in India, as well as the steps that were taken to combat the pandemic. It also emphasizes the ethical readiness and obstacles that a developing country like India faces during a pandemic. To tackle this viral outbreak as well as to strengthen the thought of need in the improvement of health-care services and planning, this focuses on the numerous ways that we used to tackle the problems and establish new benchmarks in the sector of public health care. This story focuses on the instability caused by the COVID-19 epidemic, as well as the changes in the health-care system's ideas on public health services need of Hospital Infrastructure in India, the Government a graded response approach, toward the shortage of supplies of critical items, including medical personal protective equipment, N95 masks, test kits, medications, and ventilators, O2 supply across the country. Talking the paradigm shift in health-care trends and bringing this motive to deal with the issues during these dark times. This Article reporting from the beginning of the cumulus to the present-day situation, illustrating the position of HCPs, HCOs, and the government.

Key words: Coronavirus disease-19, Pandemic, Severe acute respiratory syndrome coronavirus-2, Outbreak, Meta-analysis, Public Health Emergencies.

1. INTRODUCTION BACKGROUND/OBJECTIVES

It is difficult to navigate the fast-rising volume of scientific material on the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic, and a continuous critical appraisal of this production is required. We wanted to compile and evaluate systematic evaluations of coronavirus illness in humans (COVID-19) and challenges faced that were accessible during the pandemic of turbulence from the start of its cumulus.

2. METHODOLOGY

The number of databases were searched to include 31 articles from Dec 2019 to March 2022 to systematically reviewed and analyzed to cover all the major aspects of the COVID-19 pandemics in India as timelined reviewed referring to its management pertains as Public Health Emergency.

3. DISCUSSION

3.1. First Wave

On December 31, 2019, strange pneumonia cases were discovered in Wuhan, Hubei Province, China. The causative agent was discovered as a novel coronavirus (2019-nCoV) on January 7, 2020, and the disease was named COVID-19 by the World Health Organization (WHO) [1].

The first case of COVID-19 infection in Kerala, India, was presented here. A 20-year-old woman presented to the Emergency Department of the General Hospital in Thrissur, Kerala, on January 27, 2020, with a 1-day history of dry cough and sore throat. Fever, rhinitis, or shortness of breath was not present. She revealed that she returned to Kerala on January 23, 2020, from Wuhan, China, due to the COVID-19 epidemic there [2].

Maharashtra, Delhi, and Gujarat were reported to be COVID-19 hotspots on May 8, 2020, with 17,974, 5,980, and 7012 confirmed cases, respectively. 16,540 people have recovered to date in India, with 1886 deaths reported [3].

On March 22, 2020, the "Janata curfew" (14-h lockdown) was imposed to impose social distance. A third lockdown began on March 25, 2020,

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for 21 days, and was prolonged until May 3, 2020, but due to a rising number of positive cases, the lockdown was extended for the third time until May 17, 2020 [3].

This demonstrated a considerable spike in social media usage in India, as well as a surge in panic (symbolizing a sense of anxiety and/or terror). Due to the later breakout of COVID-19 and the lengthy lockdown, several of these behaviors were unique to social media users in India [4].

COVID-19 deaths tend to be associated with pneumonia and acute respiratory distress. Underlying diseases that increase the risk of death include high blood pressure, cardiovascular and cerebral disease, diabetes, hyperlipidemia, peripheral vascular disease, and stroke [5].

Numerous investigations have found a link between COVID-19 patients' cardiovascular problems and their mortality risk. One of the laboratory indicators used to predict myocardial ischemia in COVID-19 patients is cardiac troponin I. In fact, this laboratory parameter implies that the individuals have heart injury. Despite the fact that cardiac damage has been identified as a risk factor for mortality in most investigations, Inciardi *et al.* observed death due to cardiac failure in a patient with COVID-19 who had no prior history of cardiovascular difficulties. However, this recent article made no mention of probable heart failure pathways [5].

Despite the fact that infection with the developing SARS-CoV was linked to a severe acute respiratory disease, most human CoVs were only responsible for minor upper respiratory tract infections like common colds, with only rare dissemination to the lower respiratory tract. Most respiratory viruses interact with DCs in the upper respiratory tract, triggering an antiviral immune response but also increasing the risk of virus dissemination due to DC migration to draining lymph nodes [6].

The exponential surge of COVID-19 cases in India, according to a multi-party committee of the Indian Parliament, may have been caused by "poor contact tracing and a little testing," as well as a plethora of advisories [7].

A total of 1,021,518 people were tested for SARS-CoV-2 between January 22, and April 30, 2020 (SARS-CoV-2). By the end of April 2020, testing had expanded from roughly 250 persons/day in early March to 50,000 specimens/day. In total, 40,184 (3.9%) tests were found to be positive [8].

The public had shown a broad disrespect for the "COVID Appropriate Behaviors or CAB," and the masks utilized were of varying quality. Due to their greater costs, N-95 masks were not widely used in India, and the majority of the population uses either local masks made of textiles or the same, worn-out masks repeatedly [9].

According to many media reports, the death toll was far higher than what is officially recorded. According to reports, the number of fatalities in some cities was over 10–15 times more than what was revealed by crematoria, municipal administrations, and other local governing organizations. We have no means of knowing if these deaths were related to Covid-19 or not [10].

3.1.1. Nasocomal infection visualized

Infected surfaces and a lack of basic hand hygiene expose health workers to COVID-19 infection, despite the use of PPEs. Due to a lack of time and handwashing equipment, Indian health personnel has been reported to have poor hand cleaning practices. In many Indian hospitals, poor social distancing and personal hygiene standards have resulted in the spread of illnesses among healthcare workers (HCWs). Coronavirus is also known to live on dry surfaces for a few days, although disinfectant liquids can destroy the virus and sanitize the surface. Nonetheless, due to minimal cleaning and visitors' poor sense of personal and respiratory hygiene, the environmental cleanliness of most public health facilities in India is usually mediocre. According to the 76th wave of the National Sample Survey, only 36% of Indians wash their hands before eating and 26% after using the toilet. Chewing tobacco (a prevalent type of smokeless tobacco) use and open spitting behaviors among people in public locations, especially hospitals, were also common. It was necessary to implement verbal and visual reminders at health institutions to educate people about the need of avoiding spitting behaviors and practicing proper respiratory and hand cleanliness. Providing alcohol-based hand disinfectants to hospital visitors can also help with hygiene practices. Decontamination measures for common areas, infected patient rooms, isolation/quarantine wards, common bathrooms, and health staff cabins and workspaces require sufficient training for hospital cleaners. Furthermore, a strong surveillance team must inspect health facilities on a regular basis for adherence to infection control rules and other cleaning measures, with harsh consequences for violations [11].

Even in the initial wave, when some hospital wards were dedicated to COVID-19, which were and non-COVID care was nearly discontinued, health systems in big cities were overloaded with cases [12].

Volunteers have to rely on tech-centric ways for bed availability when looking for hospital beds (with oxygen, intensive care unit [ICU], or other critical care services). This included employing government dashboards that did not represent real-time availability and forcing volunteers to monitor the portals on a constant basis in a race against the clock. Institution administrations lacked human resources, with only one nodal officer assigned to an entire hospital (some even catering to more than 1500 patients). These nodal officers were dispatched to check for bed availability; but, due to an overload of calls and other responsibilities, many were unable to respond during the peak of the cases [12].

It was also critical to match the demand for medical equipment and pharmaceuticals with the rising supply of infrastructure and human resources. The use of private hospitals raised the demand for personal protective equipment (PPE) [13].

During the early stages of the COVID-19 outbreak, public hospitals relied on the reverse transcription-polymerase chain reaction (RT-PCR) technology, which provided high-accuracy results but required a 24-h turnaround time. As private laboratories began to do tests and use the antibody blood test, which provided findings in <30 min but had an accuracy of just 50%, the scale of testing grew. The Indian Council of Medical Research (ICMR) established guidelines requiring unconfirmed cases with negative antigen test results to undergo RT-PCR testing; however, only about 1% of individuals with negative antigen test findings in Delhi underwent an RT-PCR test [13].

The most significant challenge to ensuring the safety of health-care personnel was a lack of PPE, which has been noted in most of the afflicted countries. Respirator face masks, eye protection goggles/facial protection, face shields, clean, long-sleeved gowns, and hand gloves were all examples of PPE. Before the commencement of the COVID-19 outbreak, studies in India found a scarcity of N95 masks for use by HCWs, especially in high-risk areas of hospitals [11].

The rapid spread of COVID-19 infection, along with a persistent lack of PPEs, had reportedly put the lives of HCWs in Mumbai, India, in peril. According to reports from several parts of India, doctors were treating suspected COVID-19 patients without masks, with less protective surgical masks, and even with cloth and rainwear masks. Many times, a lack of PPEs has forced health workers to reuse and extend their use, putting them in danger of infection [11].

The demand for liquid medical oxygen surged from 700 metric tonnes/day (MTPD) to 2800 MTPD during the first wave [14].

COVID-19 revealed a key flaw in the health-care system: medical oxygen generation and delivery. Due to a rise in oxygen consumption due to COVID-19, the Center for Global Development stressed the importance of striking a balance between urgent needs and long-term cost-effectiveness. Considerations for setting up liquid oxygen tanks, prostate-specific antigen oxygen plants, oxygen cylinders, and oxygen concentrators were included in the note [15].

Contingency arrangements for an expected rise in cases were also implemented in India. A total of 2500 railway coaches were converted into isolation wards, resulting in an extra capacity of 40,000 beds. At the municipal, district, and state levels, paramedical staff, including volunteers, ex-service members, homeopathic and ayurvedic practitioners, medical students, teachers, doctors (including retired doctors), and others were identified to create an online data pool of 15,896,093 human resources for various activities required to combat COVID-19; each person was designated a "COVID warrior," and a surveillance policy of one COVID warrior per 250 citizens was devised [13].

The laborers were not dispersed evenly, with the majority opting to work in places with better infrastructure and opportunities for family life and growth. When compared to the Southern states, the poorer parts of Northern and Central India have lower densities of health personnel [13].

The efficiency of PPE devices and IPC measures is determined by their proper application. The need for active training of health workers in prescribed sanitary measures and barrier safeguards cannot be overstated. Health personnel has the right to get systematic training in the use, removal, and disposal of PPEs, as well as IPC practices, before being exposed to COVID-19 patients, according to the WHO standards [11].

In South Asian nations, particularly India, inadequacies in the proportion of health personnel trained as well as limits in training content for good IPC practice were frequent. The previous research from India has found that a lack of training, as well as time limits and excessive workload restrictions, contribute to health personnel' inadequate knowledge and practice of infection control. Another study found that only about half of the personnel at 50 government and commercial hospitals in Southern India were educated in infection control procedures [11].

India's health-care system has long suffered from a chronic shortage of HCWs. There were just 0.9 doctors/1000 people in the country, much fewer than in countries with large COVID-19 burdens like Italy (4.1), the United States (2.8), and China (2.0). Furthermore, the difficulty is exacerbated by the unequal distribution of health-care personnel resources. Only 40% of health workers service India's rural population, which accounts for more than 70% of the country's overall population [11].

During the COVID-19 epidemic, India's health personnel must be efficiently engaged, as well as the lives of the country's limited number of HCWs must be protected. *Ad hoc* appointments of private-sector health workers and the use of allied health professionals in emergency treatment after completing relevant training can be beneficial. It was advised that a small group of health workers manage COVID-19 cases to avoid disruptions in health services in the event that these health workers become ill or need to be isolated [11].

Health workers over the age of 60 and those with comorbidities must be kept away from hospital grounds due to their increased vulnerability to infection. They might work from home on teleconsulting, coordination, and administrative responsibilities. Furthermore, it was critical to ensure the health professional's willingness to work. The largest element impacting health workers' motivation during a pandemic was their belief that they will be protected [11].

With the enormous influx of migrant laborers returning to their home states following the lockdown, there was a significant increase in the demand for health human resources in rural areas of the country. Community health workers such as Auxiliary Nurse Midwives, Accredited Social Health Activists, and Anganwadi Workers were actively involved in public awareness, contact tracing of discovered cases, and community surveillance activities to address these needs [11].

Given India's poor doctor-to-patient ratio, an increase in COVID-19 patient load could be exceedingly taxing on the country's medical workers. It was crucial to provide adequate rest intervals, nutritious food, and time off for critical personal requirements such as a child or elderly care. A roster for health-care personnel can help to provide a balanced workload and rest breaks for them. Furthermore, as infection rates among their colleagues rise, health workers' worry levels rise. Furthermore, they were constantly concerned about infecting their family members. Due to the stigma and fear of becoming infected with COVID-19, some Indian doctors have reported receiving eviction threats from their landlords and neighbors [11].

To provide protection and re-establish trust among health personnel, the government actively opposed such behavior. To help relieve their stress and mental weariness, designated counselors and psychologists were provided mental support and encouragement services to health personnel. In addition, good communication about the staff working hours and the facilitation of mutual encouragement among peer health workers were benefited [11].

HCWs suffer from emotional tiredness, which can result in medical errors, a lack of empathy when treating patients, decreased productivity, and greater turnover rates. It was critical for HCWs to be able to manage stressors effectively for the sake of their patients, their families, and themselves. Psychological resilience, or the ability to adjust constructively to adversity to shield oneself from stress, varies among providers. Before COVID-19, much research had shown the multifaceted nature of health-care pressures, including electronic health record responsibilities, insurance, and billing concerns, any patient dissatisfaction, and managing busy work-life schedules [16].

In India's health-care industry, the private sector is well-known as the main player. Nearly 75% of healthcare spending originates from household budgets, and catastrophic health-care costs were a major source of poverty. The lack of regulation in the private sector, as well as the resulting variance in service quality and costs, exacerbates the situation [17].

Lessons from previous experiences may be useful in exceptional times like today. During the 2009 influenza epidemic in India, all transactions were limited to the public sector to keep track of cases and provide inexpensive healthcare. As a result, there was an infrastructure deficit, necessitating policy changes to include private sector assistance. Such earlier epidemic experiences were likely to have influenced our HCWs' belief that India's private sector may play a larger role [18].

Fever, headache, and reddish swollen skin over the nose and around the eyes were all prominent signs and symptoms of mucormycosis during or after therapy with COVID-19. Visual anomalies, eye swelling, ocular discomfort, facial edema, and breath shortness were also reported by patients. Diabetic individuals had also reported experiencing diplopia, which is a sign of infection. Sinus discomfort, proptosis, periorbital enlargement, orbital apex syndrome, ulcer of the palate, and cranial nerve palsy were the main symptoms of mucormycosis infection, according to scientific terminology [19].

There were also reports of the development of a mysterious fungal infection known as mucormycosis or Black fungus in COVID-19 patients. In India, 8 COVID-19 people have been diagnosed with this pandemic disease (mucormycosis), with a total of 8848 cases recorded as of May 22, 2021 [19].

The Indian government released the "Aarogya Setu" mobile app for COVID-19 containment through contact tracing and information dissemination. Moreover, in India, a number of state governments and health-care groups have built apps to enforce lockdowns, raise awareness, and track isolated individuals. The purpose of this study was to find and evaluate COVID-19-related smartphone apps in India. Another goal was to define the apps' capabilities, map them against the WHO standards on Digital Health Interventions, and identify gaps so that future mHealth projects can be better planned [20].

The Arogya Setu is a COVID-19 tracking application launched in India. It provides pertinent cautions and educates users about the risk assessment. This app had over 50 million downloads and a 4.6/5 average rating from 273,646 users until April 21, 2020 [21].

In India, free immunization against COVID-19 began on January 16, 2021, and the government asked all of its inhabitants to get vaccinated as part of what is likely to be the world's largest vaccination program. Four of the eight COVID-19 vaccines currently undergoing clinical trials in India were created there. Covishield (the Oxford-AstraZeneca vaccine) and Covaxin, a home-grown vaccine produced by Bharat Biotech, have been licensed for limited emergency use by India's medicines authority. Manufacturers in India have said that they will be able to meet the country's future COVID-19 vaccination needs [22].

The workforce and cold-chain infrastructure in place before the pandemic were sufficient to vaccinate 30 million HCWs in the first instance. The Indian government has taken immediate steps to increase the country's vaccine manufacturing capacity, as well as a computerized system to address and monitor all elements of vaccine administration [22].

Oxford-AstraZeneca, Codagenix, and Novavax have all struck agreements with the Serum Institute of India (SII) in Pune. It is now mass-producing the Oxford-AstraZeneca Adenovirus vector-based vaccination AZD1222 (also known as "Covishield" in India), and it has roughly 50 million doses on hand. After January 2021, the company plans to produce 100 million doses/month. SII plans to increase its capacity to 2 billion doses/year. The Drugs Controller General of India (DCGI) and the Indian Council for Medical Research have granted Covishield an "at-risk manufacturing and stockpiling license" (ICMR). Clinical trials of the Covishield vaccine, created with master stock from Oxford-AstraZeneca, were financed by the ICMR [22].

Covaxin™, India's first domestic COVID-19 vaccine, was developed and manufactured by Bharat Biotech International Limited in collaboration with the ICMR's National Institute of Virology, and is one of the company's two vaccines currently undergoing clinical trials and being stockpiled under an "at-risk manufacturing and stockpiling license" [22].

Covaxin™ is a virus vaccine that was created in Vero cells. As an adjuvant, the inactivated virus is mixed with Alhydroxiquim-II (Algel-IMDG), a chemosorbed imidazoquinoline onto aluminum hydroxide gel that boosts immune response and provides longer-lasting immunity. A licensing arrangement with Kansas-based ViroVax allows this technology to be deployed. The use of TLR7/8 agonists (Imidazoquinoline adjuvants) alters the T-cell response toward Th1, a T-Helper 1 phenotype (which is deemed safer than Th2 responses against SARS-CoV-2) and minimizes the likelihood of immunopathological induced increased disease [22].

A comparison of COVID-19-positive cases/day in India and the rest of the world, as represented in the repository "ourworldindata," revealed that the first wave in India began in March 2020, peaked in September 2020 with over 90,000 confirmed cases/day, and then gradually faded with 10,000 confirmed cases/day in February 2021 [23].

After mid-June, patient recovery increased in lockstep with a decline in infection incidence, and active cases fell below 15,000 in January 2021. After that, in March 2021, the second wave began, with a greater number of active cases than the first wave, due to a lack of hospital beds, vaccines, medicines, oxygen cylinders, and oxygen. At the beginning of May 2021, the daily reported cases had risen to around 4.5 lakhs [19].

India has enough capacity to produce vaccines (about 2.4 billion doses/year) as well as medical and surgical disposables such as vials, stoppers, syringes, gauze, and alcohol swabs. The first obstacle, however, was the vaccine storage and shipment, which had very particular temperature regimens. Some vaccines being developed and manufactured in other regions of the world require storage temperatures as low as 80°C. Fortunately, the vaccines that India was the first to launch for distribution only require a storage temperature of 2–8°C [22].

India began its vaccination program on 16 January 2021, operating 3006 vaccination centers on the onset. Each vaccination center offered either Covishield or Covaxin, but not both [22].

The UIP in India currently employs 55,000 cold-chain employees and 2.5 million health-care personnel. Health workers were the first to receive the vaccination because they were first responders. According to government officials, the vaccination may not require additional people to give to HCWs due to the present infrastructure. A substantially higher number of qualified medical and paramedical workers experienced in vaccine delivery was kept on standby for the second round of vaccination of priority groups such as the elderly, people with comorbidities, pregnant women, and youngsters. These freshly hired employees were, understandably, received the immunization before joining the workforce. Vaccination of persons over the age of 60 and those over 45 with comorbidities began on March 1, 2021 [22].

COVID-19 (the disease produced by the SARS-COV-2) had wreaked havoc on global health-care systems, with ramifications affecting every part of modern life. The WHO declared the COVID-19 epidemic a worldwide emergency on January 30, 2020, highlighting the scope of the disease. Governments had implemented border closures, travel restrictions, and quarantine in nations that make up the world's top economies to "flatten the curve," raising fears of an approaching economic crisis and recession [24].

We summarize the effect of COVID-19 on individual aspects of the world economy in an attempt to understand the economic turmoil. We focus on primary sectors, which include industries involved in the extraction of raw materials, secondary sectors, which include industries involved in the production of finished products, and tertiary sectors, which include all service provision industries [24].

These asymptomatic spreaders go undiscovered because they were asymptomatic. Research conducted on the Diamond Princess cruise ship early in the first wave found that 54% of asymptomatic SARS-CoV-2 patients had positive computed tomography (CT) findings. Two numerous international and, more crucially, national researchers have since backed up this finding. Kashyap and Jain conducted a fascinating study in which they separated 1499 individuals into two groups: symptomatic and asymptomatic. Interestingly, regardless of their symptoms, the percentage of positive high-resolution computed tomography (HRCT) was similar, contradicting the idea that asymptomatics have a low rate of positive imaging examinations [25].

The high false-negative rate of reverse transcription-polymerase chain reaction (RT-PCR) (30–40%) discovered during the first wave was another drawback. As a result, those who were falsely negative can be super spreaders. HRCT positivity had been demonstrated in persons with negative RT-PCR by a number of international and national researchers. HRCT can help minimize the number of false negatives and SARS-CoV-2 super spread. It is worth noting that CT can be negative in the presence of a positive RT-PCR and vice versa. These tests were not competing, but rather complementing [25].

Triage was required to quickly establish where these patients will be managed to maximize the use of medical resources while avoiding overcrowding. It was also helpful to figure out when the patient needs to be admitted, whether to award or straight to the ICU, and what oxygen needs were expected, such as O_2 through nasal cannula, non-invasive ventilation, or invasive ventilation. Patients may also progress quickly, which must be anticipated. A low proportion of aerated lungs correlates with a bad prognosis; the level of lung involvement was a suitable surrogate for detecting disease burden [25].

Several CT scoring systems, including a 20, 25, 40, and 72-point scale, as well as a percentage of lung involvement, have been proposed. All of them assess the level of lung involvement based on the percentage of each lobe's participation. The extent of involvement was turned into points, which were then added together to give a final score. This was a subjective method with high inter-and intraobserver variation, resulting in severe under- and overestimation; there was no standardization. Furthermore, this was a time-consuming approach that is ineffective in a pandemic when there were many patients to triage; quick precise results were required to aid triage these patients [25].

Finally, two key takeaways from the first wave were as follows:

In asymptomatic and/or RT-PCR-negative people, CT was highly effective in detecting COVID-19. When compared to RT-PCR, it has the added benefit of a much faster turnaround time. CT has a hitherto unknown potential as a public health tool for the early detection of superspreaders. It was important to realize that CT can be negative in people who have a positive RT-PCR, and vice versa; thus, the tests were complementary rather than competitive [25].

CT scans were particularly beneficial in determining the degree of lung involvement, which aids in patient triage and further management prognostication. Artificial intelligence was helped to properly assess the amount of disease while removing subjectivity. Another key finding of the first wave was that while AI will not be able to completely replace expert radiologists, it will be a valuable ally [25].

3.2. Second Wave

The first wave began in March 2020 and continued until November 2020 in India, while the second wave began in March 2021 and lasted until the end of May 2021 in the country. As a result, we fell behind Western countries, due to a variation in seasonal timing. The second wave wreaked havoc across the country, with severe shortages of hospital beds, drugs, and oxygen [26].

Patients infected with SARS-CoV-2 in the first wave were mostly over 60 years old, and those with concomitant illnesses were at higher risk of mortality. Surprisingly, younger persons appear to be more susceptible to infection during this cycle, and many patients, including those aged 25–50, have died at a young age [27].

India's health-care system has been overworked during this second wave, resulting in a shortage of medical oxygen, hospital beds, and other essentials for COVID-19 patients [28].

Many cases of mucormycosis, often known as the black fungus, were documented in patients with diabetes and COVID-19, as well as those recovering from the infection, during the second wave in India. The onset of opportunistic fungal infection was caused by the overuse of steroids in the treatment of COVID-19, as well as the virus's immunosuppression [27].

Although cases of black fungus were detected during the first wave, the second wave has become more prevalent in several Indian cities, prompting state governments to designate it as an epidemic as well. The Indian Ministry of Health had registered 28 252 instances of black fungus as of June 7, 2021. The white fungus Aspergillosis, which was thought to be far more deadly than the black fungus, was also on the rise, with cases reported in India [27].

In summary, the overall number of COVID-19 cases and infected individuals (active cases) in India were 2,37,03,665 and 37,10,525, respectively, up to May 13, 2021, and the counts were 3,45,87,822 and 1,00,543, respectively, on November 30, 2021. Due to its rapid spread, the second wave of COVID-19 in India initially appeared to be a possible threat to the country. However, due to the strength of public response and government intervention, the number of affected people was reduced in a short period of time [29].

3.3. Third Wave

This time Indian health-care system was well prepared.

On November 25, 2021, a novel SARS-CoV-2 B.1.1.529 variation of concern (VOC), designated as Omicron (O), was identified, with the first cases reported from Botswana and South Africa, respectively, on November 11 and 14, 2021. When vaccination and natural immunity to COVID-19 were not attained, previously discovered VOCs (alpha, beta, gamma, and delta) appeared [30].

While adapting to their new human hosts, SARS-CoV-2, like other RNA viruses, is susceptible to genetic evolution with the formation of mutations over time, resulting in mutant variations with different features than their ancestral strains. Several SARS-CoV-2 variations have been identified during the pandemic; however, only a few are classified variants of concern (VOCs) by the WHO due to their worldwide public health impact. Five SARS-CoV-2 VOCs have been detected since the beginning of the pandemic, according to a recent WHO epidemiological update, as of December 11, 2021:

- Alpha (B.1.1.7): The first variant of concern was described in the United Kingdom (UK) in late December 2020
- Beta (B.1.351): First reported in South Africa in December 2020
- Gamma (P.1): First reported in Brazil in early January 2021
- Delta (B.1.617.2): First reported in India in December 2020
- Omicron (B.1.1.529): First reported in South Africa in November 2021 [31].

Despite the fact that omicron cases were simultaneously detected in many other European countries, numerous countries, including India, imposed travel bans on African countries, implying that the variation was widespread in many countries even before it was identified[32].

According to preliminary data on omicron, the median incubation period may be reduced, around 2–3 days, compared to 5 days for the original virus. Runny nose, sore throat, headache, weariness (moderate to severe), sneezing, and night sweats were the most common symptoms described with omicron, and they were indistinguishable from a regular cold. In comparison to prior variations, fever, cough, and loss of smell/taste were less common. Symptoms normally linger a few days before disappearing completely.

Children have accounted for 12% of all COVID-19 cases in India, although accounting for 40% of the population. In June 2021, more than two-thirds of Indian children tested positive for COVID-19, indicating that youngsters were infected to the same degree as adults but were either asymptomatic or had not been tested. The impact of the omicron spike in India on youngsters was unknown because it has just recently begun. Again, the concern here was with the side effects, particularly with children's learning and mental health difficulties. India had possibly experienced the world's longest period of school closures.

For children aged 12–18 years, the Drug Controller General of India had approved two vaccines: ZyCoV-D (a DNA-based vaccination) and Covaxin (an inactivated vaccine). Covaxin showed seroconversion in 95–98% of children 4 weeks after the second dose, superior antibody titers compared to adults, and acceptable safety and reactogenicity in phase I/II safety and immunogenicity study in 526 children aged 2–18 years. Beginning January 3, 2022, the Indian government stated that all youngsters aged 15–18 years will be vaccinated with Covaxin. While vaccination against COVID-19 is desirable, addressing COVID-19's other indirect consequences in children is just as vital, if not more so.

Omicron had taken over the globe. It spreads more quickly and was better at evading natural and vaccine-induced immunity than previous versions. Despite the lower severity, due to the sheer number of cases and indirect consequences on the global economy, the public health impact was significant.

4. FUTURE PERSPECTIVES/CONCLUSION

COVID-19 is a highly contagious disease caused by SARS-CoV-2. Asymptomatic cases, minor symptoms, and life-threatening complications such ARDS, multiorgan failure, sepsis, and death are all possibilities. People who are elderly and have concomitant conditions are more vulnerable. Drug repositioning, or "old medications for new applications," is being investigated all over the world since COVID-19 is a pandemic. Hundreds of clinical trials are being done all around the world to see if these old drugs are effective in treating SARS-CoV-2 illness. To combat the pandemic, we still lack reliable clinical data.

Because there is no specific therapy at this time, prevention is the only way to keep the infection at bay. Even a minor lapse in following preventive measures would be extremely costly to humanity. The ICMR has issued certain COVID-19 preventative and treatment guidelines. These guidelines, however, are based on current evidence and may alter if more rigorous clinical data becomes available. "United we stand, divided we fall," says a classic quote. As a result, it is the responsibility of every Indian citizen to follow the norms and regulations established by our government; let us band together to combat this pandemic.

Finally, in this summary of systematic reviews, we looked at data from systematic reviews published after COVID-19 was established. As a result, in the context of the epidemic, these systematic reviews may be classed as research aimed at looking back at past circumstances and gaining insight into future possibilities. Many more new challenges are still waiting to test the Public Health Emergencies Management and thus this narrative may help. Even in times of public health crisis, studies and systematic reviews should follow established methodological requirements to provide trustworthy information to patients, doctors, and decision-makers.

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6. FOOTNOTES

This narrative review is under the responsibility of Wardha's School of Epidemiology and Public Health and the Department of Community Medicine.

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