



Combating pandemics in India – A comparison study between the 1918, 2009 and 2019-2020 pandemics

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ABSTRACT

Out of the many pandemics and epidemics that India has gone through in the last two centuries, two pandemics have been chosen-the 1918 Influenza pandemic and the 2009 H1N1 pandemic, to be compared with the current state of affairs with the Covid-19 pandemic. Critical review and analysis of pandemic preparedness and India's response to the three pandemics was made through PubMed cited articles, exclusive reports from the Government in 1918, and authentic news coverage of the Covid-19 pandemic in line of healthcare, logistics and communication. Increase in healthcare facilities, laboratory services and research capacities noted through the three pandemics. Better surveillance methods and improved awareness of the public observed over the years. The readiness of the country for emergency measures with some inequalities discussed. Three different pandemics have been compared with an adequate interval between them barring the factor of healthcare inequity and virulence of the respective organism. It should be noted that there is no single solution for combating pandemics. Combined measures put together can help towards facing them with ease the next time around.

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INTRODUCTION

A pandemic can be defined as a large-scale outbreak of a disease, usually spread worldwide. With a highly populous country such as India, the diffusion of a pandemic can be rapid and easy if timely measures are not taken. The most devastating pandemic known until now has been the 1918 flu, commonly known as 'the Spanish Flu'. Following that,

India experienced the next major pandemic, namely the H1N1 flu of 2009. After a decade, we are going through the second pandemic of the 21st century - Coronavirus pandemic also referred to as the Covid-19 pandemic. The 1918 pandemic is believed to have originated from the soldiers who fought in World War I and disseminated the disease all over the globe (European Army, 2021). When a British troopship came in carrying soldiers to the Bombay port in May 1918, it also came carrying the Influenza virus causing the most devastating 1918-1919 pandemic, which would lead India with the largest death toll in the world, ranging at 10-20 million (Lancet, 1923). The 2009 H1N1 pandemic was found earliest in western coastal North America and Mexico, which then spread to the rest of the world. It was caused by Influenza A virus strain (p-09-H1N1) that was highly transmissible but less virulent. Within 16 months (May 2009 – August 2010), India had 38,730 confirmed cases of which there were 2024 deaths, in the H1N1 Influenza pandemic (MOHFW, 2010). Coronavirus originated from a seafood mar-

ket in Wuhan, China in late December 2019 and has taken over the world by a storm. Eleven months since the first case of Covid-19 entered India, we are at 2,27,546 active cases, 99,97,272 recoveries and 1,50,114 deaths as of January 6, 2021, taking the place of the second highest number of confirmed cases in the world (MOHFW, 2021b). This article aims to determine the strengths and limitations in the pandemic planning and preparedness of India through comparison of the country's response to the past two major pandemics, with which better strategies can be adopted for combating the current Covid-19 pandemic and for the future.

MATERIALS AND METHODS

Multiple PubMed cited articles about the epidemiological aspects, the standard of health care systems, availability and accessibility of treatment, surveillance, communication methods and strength of preparedness of all three pandemics were reviewed. Global, national and local pandemic preparedness plans were studied and compared. Examination of reports of the sanitary commissioner of India between 1918-20 was done. News coverage and the main Government of India's sites (MOHFW, Government of India, PIB) were used for updates about the coronavirus pandemic. Information obtained was checked for authenticity. A critical review was done to determine the similarities and differences between 1918, 2009 and 2019 pandemic preparedness in view of:

Healthcare

1. Availability of structurally and functionally operational hospitals and other health facilities
2. Efficient health service delivery for the affected
3. Laboratory services and its capacities
4. Availability of medicines
5. Research and development of vaccines

Logistics and communication

1. Prompt measures taken for emergencies: operational readiness from existing capacities
2. Surveillance and information management systems
3. Awareness of the public

RESULTS AND DISCUSSION

Healthcare

Availability of the structurally and functionally operational hospitals and other health facilities

As seen in Table 1, a shortage of health care workers was noted in 1918. When the 2009 pandemic hit India, the health care system had progressed substantially. The Government of India had already drafted a pandemic preparedness response plan in 2004, ready to go into effect (John and Moorthy, 2010). An ample number of public hospitals were functioning with the provision of subsidized care. A few inequalities such as delay in referral of cases to higher centers favored the use of the private health care system. Still, access to it was found limited among the rural regions, especially among the poor and the women (Kumar and Quinn, 2012).

The doctor population ratio of India in a 2010 survey was 1:1800, while the latest reports from 2020 show development with a ratio of 1:1404 (MOHFW, 2021a). Although we fall short of the recommended 1:1000 WHO guideline, the lessening of the gap cannot be left unacknowledged given the population explosion within a decade. Division of the hospitals for Covid-19 (Table 1) has helped with the increase in number of healthcare centers available for the affected. Hostels, hotels, schools, stadiums and lodges - both public and private, have been used as Covid care centers during this time of crisis. Innovative measures of turning the railways into Level 1 containment compartments have been implemented. Dedicated Covid Health Centre involves full hospitals or a separate block in the hospitals, including both public and private hospitals. Dedicated Covid hospitals are full hospitals or a separate block in the hospitals, which also serves as the referral centers for the former two (MOHFW, 2021c). However, reports showed a shortage of beds and ventilators, resulting in critical patients queuing in a waiting line, which calls for further advancements in health infrastructure facilities (Singh, 2020).

Laboratory services and its capacities

The flu in 1918 was diagnosed on clinical view. This resulted as an unreliable source for diagnosis because the efficiency and accuracy depended on the idiosyncrasy of the clinician (European Army, 2021). With medical and technological advancements through a century, 79,272 cases were tested, out of which 15,411 cases were positive, within 7 months (Nov 2009) of the origin of the H1N1 pandemic in India (MOHFW, 2009). In 2020, the rate of testing was initially low (0.28 per 1000 people as of

Table 1: Comparison of health care components of the three pandemics

Health care	Spanish flu	H1N1	COVID-19
Availability of Health Facilities	Inadequate health facilities 3111 institutions with a noted decrease in in-patients, out-patients and operations performed due to lack of healthcare workers in 1918 (European Army, 2021). The general public preferred indigenous methods over Western practises (Lancet, 1923).	11,613 Government hospitals having 5,40,328 beds in the country (6,281 hospitals in rural area with 143069 beds and 3,115 hospitals in the Urban area with 3,69,351 beds) as of March 2009 (CBHI, 2009).	25,778 Government hospitals with 7,13,986 beds (21403 hospitals with 265275 beds in rural areas and 4375 hospitals with 448711 beds in urban areas) are functioning in the country as of the latest statistics National Health Profile 2019. (CBHI, 2021).
Health Service Delivery	Deficiency of doctors and other health care workers due to insufficient turn out from medical colleges and schools, and war demands	Hospitals were assigned by the Government of India for exclusive H1N1 cases to provide special care and mitigate the mortality rates. (John and Moorthy, 2010).	Government of India has designated the health care system into 3 categories: Covid care centre (for mild or very mild cases), Dedicated Covid health centre (for moderate cases) and Dedicated Covid hospital (for clinically severe cases) (MOHFW, 2021c).
Laboratory Services	No diagnostic tests were available.	Apex laboratories - National Institute of Virology in Pune and National Institute of Communicable Diseases. Expansion to 16 other laboratories and private labs with BSL -3/2+ clearance around the country (IAPSM, 2021).	Apex laboratory - ICMR - NIV, Pune. A total of 2299 laboratories (1201 Government laboratories and 1098 Private laboratories) all over the country has been approved by ICMR for testing as of 03 January 2021 (ICMR, 2021).
Treatment Availability	Not available	Antiviral drugs like Neuraminidase inhibitors: oseltamivir, zanamavir and peramivir were used for treatment and prophylaxis.	Clinical trials have been in progress for the development of antiviral therapy for Coronavirus.
Research and Development of Vaccines	Pasteur Institute of Shillong, Bombay Bacteriology Laboratory, Central Research Institute, Kasauli and King Institute, Guindy were involved in the development and production of a vaccine for the 1918 Influenza virus strain. It was ineffective as the vaccine was developed with Pfeiffer's Bacillus and B. influenzae (European Army, 2021).	The production of the first indigenous vaccine (LAIV) was with WHO and it was available to the public from July 2010. The use of the vaccine was found highest in 2010 and 2011 (Goel et al., 2011).	Several clinical trials are underway for immunoprophylaxis and chemoprophylaxis globally (Covid-19 vaccine, 2021).

April 20), but a great number of testing kits have been sanctioned for availability. The testing per million exponentially increased to 1,19,031 as of Dec 23 (PIB, 2021). The association between the Integrated Disease Surveillance Programme (IDSP) and Virus Research and Diagnostic Laboratories (VRDL) has been strengthened due to the coronavirus crisis. After the WHO released the laboratory protocols, the apex laboratories (ICMR-NIV, Pune) standardized the testing protocols in one week and distributed among 13 DHR/ICMR VRDLs for enforcement and further approved over 2299 laboratories for testing by January 6, 2021. Within 11 months (until Jan 3, 2020), 17,56,35,761 cumulative samples have been tested (ICMR, 2021).

Availability of Medicines

Absence of proper treatment modality in 1918 was overcome in 2009 with adequate research about antiviral drugs. Oseltamivir was the drug recommended by WHO. It was initially prescribed only to the critically ill patients and the high risk population, with prophylaxis for high risk contacts of the seropositive patients under the Government of India (Suri and Sen, 2011). Currently, no definitive treatment has been found for Coronavirus yet. It is managed with supportive treatment, along with intensive care therapy such as Non-Invasive Ventilation, mechanical ventilation, extra corporeal membrane oxygenation, renal replacement therapy and symptomatically required therapy.

Research and Development of Vaccines

Availability of vaccines is only noted in the 2009 H1N1 pandemic among the earlier pandemics. In 1918, plenty of research was going towards the cause globally, but it took researchers over a decade to confirm that Influenza was a virus and not the bacilli it was widely believed to be (Centers for Disease Control and Prevention, 2021). With the case of coronavirus, the development of the vaccine is ongoing with several clinical trials underway globally. Two vaccines have successfully been created with over 90% efficacy, therefore initiating the vaccination drive in a few countries. India has several pharma companies working on vaccine development with two Indian made vaccines being approved for emergency use (Covid-19 vaccine, 2021).

Logistics and Communication

Prompt measures taken for emergencies: operational readiness from existing capacities

When it came to the Spanish flu, according to the assistant health officer of Bombay municipality's report in 1923, quarantining and isolation as a con-

cept was considered almost utopian in a place like Bombay where the virus had found its focal point. A great extent of the population was illiterate and they also preferred indigenous practices over Western medicine methods. Public places such as cinema theatres were allowed to be open with a limited number of screenings as its closure was not found economically feasible (Lancet, 1923). In 2009, as the severity of the pandemic was distributed and mild, the immediate lockdown was not necessary. However, cities with high H1N1 infected cases such as Pune and Mumbai experienced shutdown, with curfew like rules of institutions and public places like schools, cinema halls, malls and markets for 15 days (Purohit et al., 2017).

It proved helpful with decreasing the transmission of the virus (Ali et al., 2013). A powerful move with Coronavirus was the timely nationwide lockdown, considered as the largest lockdown in the world with 1.3 billion people, which has proven to flatten the curve when compared to the projected value with no lockdown. Initially, the lockdown was proposed for two weeks, further extended to another two weeks, increasing the recovery rate to 20.57 percent (The print, 2021). A further of two more lockdown phases have taken place based on profiling the districts into Red, Orange and Green zones according to the case load. This was followed by five unlock phases with gradual leniency implementation. Although the number of cases would have been multiplied enormously if not for the prompt lockdown decision, the eruption of cases still remains significant post lockdown indicating an infringement in the implementation of the same.

Surveillance and Information Management Systems

The root of the virus dissemination in 1918 were found to be two ships at the Bombay port, but it was discovered only after the spread had been significant. The Railways played a significant part in increasing the reach of the virus, as it was packed with migrants from infected centers. The postal system also contributed to this through the Railway Postal Service (European Army, 2021). Despite evidence of spread to cities such as Lucknow, Lahore and Shimla through this, there are no reports of any measures from the Government for screening at the docks or the railway stations.

Regarding the 2009 H1N1 flu, the Government of India was quick to act with surveillance at International ports, borders and airports with observation through the Integrated Disease Surveillance Project (IDSP). Delhi, Mumbai, Chennai, Kolkata, Hyderabad and Bangalore strictly screened passengers com-

ing from affected countries once the pandemic alert level reached stage 5 (Ali *et al.*, 2013). This was also noted in the case of Covid-19 even before WHO declared it a pandemic. Stricter immigration control from China was enforced and the Government of India has taken stringent measures for contact tracing, with surveillance ranging into most cities and districts in all states in the manner of Screening, Isolation and Quarantining of infected and suspected individuals.

Awareness of the Public

Albeit Bombay had been relatively poor at combating the 1918 pandemic, progress in nation's public health conscience aided in combating the pandemic. Excluding factors such as the mutation of the virus from a more virulent organism to a less virulent one and cross protection in public, the downfall of the pandemic was also accredited to awareness and communication spread through the public, simple social distancing measures and early detection through Influenza awareness of inspectors and doctors (Chandra and Kassens-Noor, 2014).

The past two decades have seen a surge in the use of social media, which has paved a direct way for information conveyance. In 2009, the media ran awareness campaigns to educate people about the hygienic methods such as proper hand washing, sneezing and coughing methods, the importance of nutrition, not touching the face, not shaking hands and such, much alike the Coronavirus campaigns. With the first death due to H1N1 in August 2009, panic spread among the public with the irrational purchase of eucalyptus oil and Vitamin C tablets as it was thought to help with the prevention of the virus. Shortage of testing kits was also a result of public unawareness of authentic information. Establishment of a prompt, reliable channel for information from the Government to the general public and to the medical personnel could have possibly avoided the infodemic (Purohit *et al.*, 2017). This issue was overcome in 2020, with the establishment of a reliable source of information flow through websites and phone helplines. Aarogya Setu app has been set up to create a channel between essential health services and the general public (MOHFW, 2021b). This app facilitates contact tracing by informing the users of the number of positively tested patients in their vicinity from a range of 500m to 10km. It also includes necessary updates and provides a medium for donating funds for the cause.

CONCLUSION

Presence of sufficient capacities to undergo an emergency has helped with the mitigation of the

pandemics. The medical infrastructure and quality of services have substantially advanced through the years. The country going into a prompt lockdown was necessary and involved forward thinking. Additionally, owing to the increased public awareness about the developments around them through informed channels, the challenges faced earlier have been assuaged. Albeit, the number of cases in the current pandemic is significant, it could be attributed to the notable population density of the country along with the average poor socioeconomic status of the public. Mass screening might not be feasible as compared to some of our counterparts owing to the high population, but the rate of increase in tests per million and screening laboratories must be acknowledged. Furthermore, the efforts of the medical fraternity with respect to the swiftness in the development of the vaccines must not go unappreciated.

The doctors, nurses and everyone in the health care system have stood in the front line helping with the situation to their fullest, but it should be noted that it can be truly complete only with generous financial aid, without which the system cannot deliver its full potential. As we have stepped from the preparedness stage onward to the next part of the pandemic, improvement towards economic strengthening must be remembered. It has become necessary to relax the lockdown measures to revive the nation's economy, as the flattening of the infection curve seems to be proportional to the deterioration of the economy curve. Total cooperation from the community has been paramount for containing the previous pandemics implying the vitality in tackling the current and the pandemics that are yet to occur. India has noticeably been triumphant at facing the pandemics over the years, nevertheless, it will be a challenging time and every local, state and national sector of Government needs to collaborate to help each other in such a situation.

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Conflict of Interest

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