



Management of Pandemic Crisis: COVID-19

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ABSTRACT

The world is threatened with a novel corona virus (COVID-19) which has posed an unpredictable challenge to the public health workforce. It originated from the Wuhan City of China and spread across the globe creating havoc among the public and healthcare workers which led to WHO declaring it to be pandemic. Transmission of this virus is through symptomatic and asymptomatic patients in the form of fomites produced while coughing or sneezing. This has led to a global crisis subsequently leading to the scarce availability of health care resources such as personal protective equipment, ventilators, ICU beds, medication. Healthcare workers have been a vital human resource in providing treatment and assistance to the infected patients though they were facing a high risk of themselves getting infected by the coronavirus. They suffered from fatigue, physical, and psychological violence as they tend to work for longer hours. Detection of infected patients was implemented, as the widely used RT-PCR method was accurate but took more time for the definite results. Hence, for quick results and to detect more number of infected patients, the rapid antigen test was conducted. Therefore, this virus has resulted in a greater impact on the economy and social development and this article of many infected countries.



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extenuate the impacts of pandemics by international communities. Many countries had to formulate pandemic plans over the growing concerns and threat posed by Severe Acute Respiratory Syndrome (SARS) in 2003 and the avian influenza (U.S. Department of Health and Human Services 2005). Due to delay in reporting of initial SARS cases, all World Health Organization (WHO) member states were required to meet specific standards for screening, diagnosing, and responding to outbreaks as per the updated International Health Regulations (IHR) by World Health Assembly (WHO 2005) (Jamison *et al.*, 2017).

INTRODUCTION

The infectious disease on the large-scale epidemics are called pandemics which causes major economic, social, and political disturbance and can significantly escalate morbidity and mortality in a wide geographical area. There is progress made to

There is a present global outbreak of a novel coronavirus, also known as COVID-19 or SARS-CoV-2 originated from Wuhan in China (Cheng and Shan, 2020). The whole genomic structure of SARS-CoV-2 is 86% similar to that of SARS-CoV-1. Initial source of outbreak was thought to be the sale of multiple live domestic and wild animals in markets to heavily

populated areas ([Prasad et al., 2020](#)).

By 30th January 2020, COVID-19 was confirmed a public health concern globally and later on 11th March 2020 WHO affirmed it as a pandemic ([Coronavirus Disease, 2020](#)). Cases in worldwide has reached to 784,794 and caused 37,788 deaths since 30th March 2020 ([Coronavirus Update, 2020](#)). First case in India was reported on 30th January 2020 and total number of cases rose to 1,251 and 32 deaths by 30th March 2020 ([Ministry of Health and Family Welfare, 2020](#)).

The COVID-19 blowout in India was because of incoming travelers who visited the affected countries. Transmission of this virus is mainly through large droplets produced while symptomatic patients cough and sneeze. It can also spread through asymptomatic people and before sign of any symptom ([Rothe et al., 2020](#)). In order to detect symptomatic people returning from different affected countries, there were screening mechanisms installed at airports. This was an important initiative to curb the viral spread by early detection of symptomatic people by shifting them to isolation and further testing them for COVID-19. However, what made the viral disease (COVID-19) more communicable and a cause of concern is the fact that asymptomatic carriers also had viral shedding ([Singhal, 2020](#)).

Although, India was in the initial stages of this epidemic, it is essential to forecast how COVID-19 will progress amongst the population, which helps in assessment of health care requirements and permit a sustainable distribution of resources ([Chatterjee et al., 2020](#)). The goal of this article is to highlight the ongoing condition of India and other countries dealing with the pandemic COVID-19.

Crisis due to pandemic

The situation report of World Health Organization (WHO) on COVID-19, globally the number of positive cases rose to 1,610,909 with 99,690 deaths reported ([World Health Organisation \(COVID-19\), 2020b](#)). This depicts the contagious nature of COVID-19 being transferable from symptomatic and asymptomatic patients. And moreover, patients with severe underline medical condition are at higher risk ([Bhinder and Kamble, 2018](#)).

Increased number of cases can be sustained only when health care resources are available at the right quantity. A major challenge is insufficient availability of healthcare resources. As per estimation by ICMR, India has approximately 70,000 ICU beds and few ventilators ([Jayaram and Ramakrishnan, 2008](#)). It also estimated that if nearly one-third or 25,000

ICU beds were allocated for COVID-19 cases alone, it would cause scarcity of ICU care resources for other serious diseases. Statistics showed that increase in number of cases was around 15% every day ([Chatterjee et al., 2020](#)).

As a part of Emergency Medical Teams (EMT) initiative, WHO deployed five international EMTs to eight countries on 5th April 2020. To support and reinforce local national health systems across all regions, Twenty-nine EMTs were allotted. In addition to this, WHO has collaborated efforts with EMTs worldwide to identify coordinators and technical experts who can support clinical teams and public health care ([World Health Organisation \(COVID-19\), 2020a](#)).

Health Care Workers (HCWs) play a vital role in providing care and treating patients at the front lines. With regard to COVID-19 and routine health services, health care workers provide critical care to patients and make sure that Infection Prevention and Control (IPC) measures are executed effectively in order to limit healthcare associated infections ([World Health Organisation \(COVID-19\), 2020b](#)).

As health care workers are the front line care providers, they are more prone to get infected by COVID-19. Further, as health care workers (HCWs) treat patients infected with COVID-19, they are subjected to longer working hours, fatigue, physical and psychological violence. Hence, it is essential that efforts are put to maintain the physical and mental health of health care workers (HCWs) ([World Health Organisation \(COVID-19\), 2020b](#)). It is also necessary to understand the importance of informing the detailed infection prevention and control (IPC) measures required to protect health care workers from infection. Initial results suggested that health care workers are being infected both in the workplace and coming in contact with infected family members.

Risk factors that infect health care workers include: late recognition or suspicion of COVID-19 in patients, longer duty hours, working in a higher-risk department, non-adherence to following the infection prevention control (IPC) measures like hand hygiene practices whenever in contact with any infected patients as well as surfaces and scarce availability of or improper use of personal protective equipment (PPE) by health care workers ([Ran et al., 2020](#)). Other risk factors include inadequate infection prevention control (IPC) training for sample collection of respiratory pathogens and long exposure in areas in healthcare facilities where care is provided for COVID-19 patients.

On 8th April 2020, 22, 073 cases of COVID-19 among health care workers were reported to WHO from 52 countries. There are few publications and national situation reports which provide definite information, if any, on number of infected health care workers. For instance, China CDC confirmed 44,672 cases, 1688 (3.8%) infections and five deaths among health care workers on 17th February 2020. Whereas in Italy, a situation report dated 10 April 2020 confirmed 15,314 (11%) infections among health care workers ([Surveillances, 2020](#)).

The COVID-19 has affected our healthcare means extremely. One of the most pressing issues is the quick exhaustion of personal protective equipment (PPE) used in treating patients. Personal Protective Equipment (PPE) is a major concern for health and safety of healthcare workers. Soon many countries will face a problem of depleting their stock of PPE.

UNICEF has been leading joint UN efforts to access considerable quantities of critical health care items such as Personal Protective Equipment (PPE) and resources for intensive care, through a joint agreement where the overall allocation of supplies is being guided by WHO and the Supply Chain Inter-Agency Coordination Cell ([Jayaram and Ramakrishnan, 2008](#)).

CDC has laid guidelines ([Integrated surveillance of COVID-19, 2020](#)) recommending minimization of requirement of usage of respiratory protection by individuals and implementing practices extending the use and/or limit the reuse of N95 respirators etc., while conserving supplies and safeguarding healthcare workers in such circumstances. Reuse and decontamination of PPEs may be another solution but reuse of decontaminated PPEs is highly not recommended because it might degrade the performance of respirator. However, mentioned uncertainty of decontaminated PPEs on respirator performance, health care workers should avoid wearing these when carrying out or present for an aerosol-generating procedure.

Protocol for Decontamination of Coveralls and N95 Respirators

The contaminated or used coveralls (manufactured by Dupont or by Kimberly Clark and all types of N95 respirators) should be deposited into separate closed Red biomedical bins with Red double bags/sealed bags. They should be set aside in locked room till they are collected for reprocessing and decontamination. The solution used in the procedure is 11% commercially available stabilized Hydrogen Peroxide (for example- Bacchi shield or Eco shield) ([Centers for Disease Control, 2020](#)).

Protocol for Re-use of Face shields and Goggles

The contaminated or used face shields or goggles should be deposited into separate closed Red biomedical bins with Red double bags/sealed bags. Similarly, it should be set aside in locked room till they are collected for reprocessing and decontamination. The solution used in the procedure is 0.5% Sodium Hypochlorite- freshly prepared and 70% alcohol (Bacillol solution). The staff involved in the reprocessing of contaminated PPEs should be on hydroxychloroquine prophylaxis ([Centers for Disease Control, 2020](#)).

Laboratory test

The COVID-19 outbreak has mostly effected the microbiology laboratories ([Richard Mark Kirkner, 2020](#)). There are different types of diagnostic tests performed for diagnosis of COVID-19 infection. Different types of swab test is done for screening of patients and collecting initial specimen of respiratory tract for diagnosis of COVID-19. High viral load is revealed in upper and lower respiratory tract within 5 – 6 days of any sign of symptoms ([Tang et al., 2020](#)). Two types of swab such as an oropharyngeal (OP) swab and/or nasopharyngeal (NP) swab are frequently suggested for screening primary infection ([Pan et al., 2020](#); [Chan et al., 2004](#)). Most preferred type of swab used is nasopharyngeal swab, as it is much safer for the operator and endured better by the patient. An essential quality of this swab is that it usually reaches the precise area in nasal cavity which is to be tested. It was reported by Wang et al. that oropharyngeal swabs (n=398) 58 were used more in number than nasal swabs (n=8) during the outbreak in China. Nevertheless, the COVID-19 RNA was identified in 32% of oropharyngeal swabs, which was quite low when compared to 63% of nasal swab ([Kim et al., 2011](#)).

While collecting a swab sample, there might be a transmission risk of COVID-19 as it is transmitted through airborne method. On the other hand, personal protective equipment (PPE) cannot be completely used due to shortage of such personal protective equipment (PPE). The supplementary method of collecting sample from upper respiratory tract is required ([Richard Mark Kirkner, 2020](#)). One substitute method to collect an upper respiratory tract specimen is self-collected saliva sample of suspected COVID-19 patients. High viral RNA of COVID-19 was also observed in fecal material of infected patient ([Richard Mark Kirkner, 2020](#)).

To confirm diagnosis of COVID-19, WHO recommended reverse transcription polymerase chain reaction (RT-PCR) ([Wang et al., 2020b](#)). RT-PCR technique is preferred for molecular testing because

Cluster (containment zone) & Large Gathering:

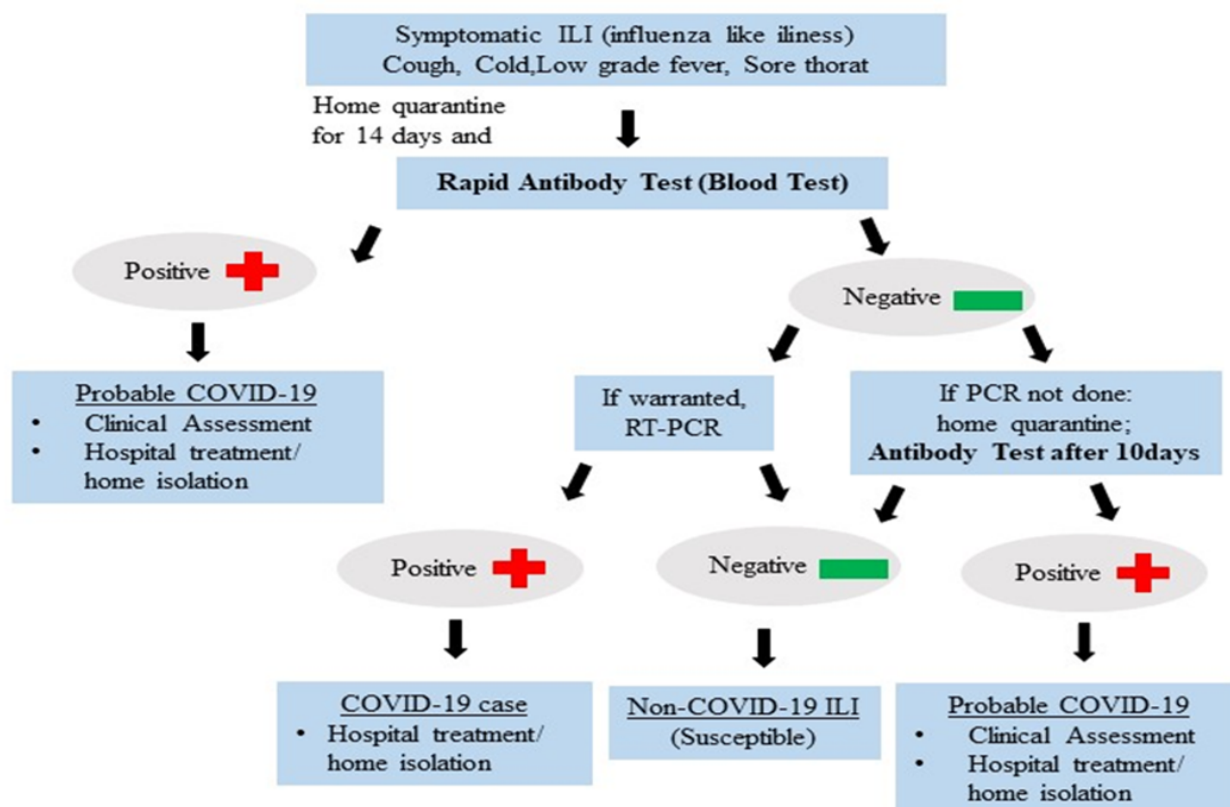


Figure 1: Strategy for use of Rapid Antibody based Blood test

of its key advantage of extension and analysis which is done parallelly in closed system to reduce false-positive results. Compared to these, the least limit of detection in vitro and specificity and higher sensitivity was observed in COVID-19-RdRp assay (Richard Mark Kirkner, 2020). The other disadvantage of this assays is the test results would take few days to confirm the diagnosis. The process of testing is slow. Although it is believed that the testing process provides results in the couple hours, the average time to report the given results usually requires a lot of time because of constraints in logistics and restriction in availability of analytical equipment (Potdar et al., 2020).

To rapidly detect COVID-19 antigens or antibodies, immunoassays were developed. Such antibody test were advanced for identifying antibodies (IgM and IgG) or antigens against viral disease. Advantage of these rapid antigen assays was to afford quick results in low cost, but they probably suffer from less sensitivity based on the outcome obtained from influenza (Flu) viruses (Casella, 2020).

ICMR suggested the usage of rapid antibody test for COVID-19 on 4th April 2020. All the facilities were instructed to use these rapid antibody for symp-

tomatic Influenza like Illness (ILI) individuals (Figure 1). Furthermore, ICMR proposed a strategy for areas of mass gathering or evacuees' centers. This rapid antibody test plays a significant part in the epidemiology of COVID-19 and in detecting the asymptomatic patient's immune status, but are uncertain in screening of early infections. Nonetheless, it may be advantageous for the confirmation of detecting of COVID-19 infection.

Country wise dealing of crisis

China

Wuhan Municipal Health Commission (WMHC) testified 27 cases of viral pneumonia with few being severely ill on 12th December 2019. After investigation, it was found that most patients visited Huanan Seafood Wholesale Market in Wuhan, China and were exposure to the virus (Cheng and Shan, 2020). For the purpose of environmental sanitation and disinfection, this Market in Wuhan city was closed on 1st January 2020. Later on, all the routes in Wuhan city were temporarily closed (Advisory to start rapid antibody based blood test for COVID-19, 2020). Installation of around 35 infrared thermometers was done in all transportation facilities. Public awareness was initiated across public area

informing about disease prevention and environmental hygiene (Wang *et al.*, 2020a).

Chinese universities utilized their alumni resources to urgently set material support channels to raise the availability of medical supply. During the epidemic, many medical universities assisted emergency research and supported by providing treatment to local patient. Psychological assistance like counseling was provided to the health care workers and citizens to cope with this crisis. Educational institutions had to postpone their opening which helped to control the personnel flow and started conducting its classes through online platforms accepting their social responsibility (Advisory to start rapid antibody based blood test for COVID-19, 2020).

Republic of South Korea

With onset of cases the Government of South Korea had decided to scale up the national alert level to Yellow (Level 2) from Blue (Level 1) (Coronavirus Update, 2020). The Health Authority of South Korea had increased its investigation in health facilities for any pneumonia case since 3rd January 2020. Isolation and screening measures were improved for incoming travelers from Wuhan. Public risk communication was enhanced (World Health Organization situation reports, 2020). Government of South Korea had installed screening booths for any detection of COVID-19 among its citizens. These screening booths helped to identify symptomatic and asymptomatic cases which further resulted in provision of quick treatment plans. Due to this aggressive and extremely high detection rate of individuals, South Korea was successful in controlling the epidemic.

Italy

As the cases increased at a higher rate, Italy stood second among most affected countries in the world. Italy has maximum number of air connection with China which explains the increased number of infected cases. The government acted upon the outbreak by detecting and suspecting mass gatherings during epidemic outbreak and had ultimately announced closure of educational institution. As of March 16th March 2020, number of cases increased to 27,980 which was about 2.8 times higher than the cases reported on 10th March 2020. Among the confirmed cases, 2339 (8.4%) comprised of health care workers (HCWs). The impact of the crisis made on economy and psychology was massive (Lazzerini and Putoto, 2020). Lack of health care workers (HCWs), hospital beds and personal protective equipment (PPEs) are the issues faced by Italy to in flattening the curve as COVID-19 cri-

sis exposed the weaknesses of the region's national health systems. Absence of possibility of the adequate provision of life support, rises the mortality rate as patients would likely die because of respiratory difficulties.

United States of America

On 13th March 2020, President of U.S.A. declared a national emergency to fight the spread of COVID-19 in the U.S.A. This included following of social distancing measures across the country and closure of educational institutions, restaurants and canceled all events of mass gatherings. Moreover, many companies have taken a step further to allow their employees to work remotely. One of the drawbacks was that many states or regions in U.S.A. did not implement social distancing measures which became the reason for rising number of cases of COVID-19. Improved infection control measures in various health-care facilities and nursing homes aided mitigating the spread of the virus and gained control over the channels of outbreak of COVID-19 infection (Chowell and Mizumoto, 2020).

Recent reports have stated that U.S.A. was struggling to face the crisis as the availability of health care equipments including hydroxychloroquine was in shortage and the situation needed the adequate supply of hydroxychloroquine. Therefore, U.S.A. dealt with the shortage by importing hydroxychloroquine from India.

United Kingdom

As the whole world took a lock down approach to fight the COVID-19, U.K. chose a different approach to deal with the crisis. Surprising the medical community, U.K. decided not to suspend any mass get togethers or announce social distancing procedures. U.K. implemented the strategy of "herd immunity" to slow down the spread of coronavirus. Yonathan Grad, an epidemiologist at Harvard T.H Chan school of Public Health stated that, "Herd immunity can only be reached when a precise proportion of a community become resistant to an infectious disease." The Government of U.K. reversed its plan and implemented social distancing protocol because when the strategy to develop "herd immunity" was not successful one (O'grady, 2020; Wang, 2020).

Measures taken by India to combat Covid

India took a crucial decision of a complete lock down of institutions, government and private offices to curb the spread of viral disease, COVID-19. This decision was based on the public health tool which was available to control the transmission of viral disease through human contact by isolation, quarantine and social distancing (Wilder-Smith *et al.*,

2020). There has been restrictions made on gathering for any religious purposes and family functions in order to avoid people coming in close contact with each other. Quarantine involves any restriction on movement which is coupled with medical observation during that period of quarantine (Cetron and Landwirth, 2005). Quarantine can be done by people in their house or any designated places like isolation centers, hotels etc.

The screening mechanisms concentrated on testing only of the passengers who arrived from different countries which led to few positive cases being reported. This was a drawback. As the screening test of the individuals started, number of cases increased. The Government of Kerala has been aggressively testing for COVID-19 that helped them to flatten the curve in early stages. They launched a campaign named "Break The Chain" to promote hand washing techniques effectively to avoid the spread of COVID-19 infection. It has been implementing Convalescent Plasma (CP) therapy which is a classic adaptive immuno therapy that was successfully used in preventing and treating many viral diseases like SARS, MERS, and 2009 H1N1 pandemic with efficiency and safety. The study published on 6th April 2020 indicated that Convalescent Plasma (CP) therapy was accepted and enhanced the clinical consequences by neutralizing the viremia in severe COVID-19 cases (Duan et al., 2020).

CONCLUSION

This novel virus has posed the challenge against the economic, medical and public health care facilities all over the world. It is time for all countries to take extreme measures as no country is completely prepared to combat this pandemic. There is a need to support medical research and infrastructure so as to boost the development of vaccines or medicines whenever required at the time of crisis and to recover from the deficiency of any protective health care equipment. Awareness should be spread across different countries informing people on how to maintain hygiene and how to lead a healthy lifestyle in order to reduce any risk of infections. Therefore, joint efforts are ought to be made to formulate comprehensive measures which can prevent any future outbreaks.

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Conflict of Interest

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