

Quarantine an effective mode for control of the spread of COVID19? A review

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ABSTRACT

The outbreak of COVID- 19 disease has taken the world by surprise. The disease mainly affects the respiratory system and is caused by a strain of coronavirus named SARS-CoV-2. Due to its high recombination rates the virus has an immense potential to spread rapidly. Within months of the first case being reported in Wuhan China, the disease has turned rapidly into a pandemic. The world health experts are already actively looking for a definite cure or vaccine for the disease, but till that many of the countries across the globe are looking up onto mass quarantine measures as a method to control its spread. This article is an attempt to review the effectiveness of these measures and the possible adverse effects of the same. Other possible modes of prevention and controlling the spread of the disease have also been reviewed in the article.

Keywords: COVID-19, isolation, quarantine

Introduction

WHO Director-General declared the outbreak of corona to be a public health emergency of international concern on 30th January 2020.^[1] The outbreak is still evolving and various member states are trying to control and prevent the spread of the disease. This has been known to be caused by a novel strain of coronavirus named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) causing the disease COVID- 19.^[2]

All coronaviruses (CoV) belong to the genus *Coronavirus* in the Coronaviridae. All CoVs are pleomorphic RNA viruses having high recombination rates due to constantly evolving transcription errors and RNA dependent RNA polymerase (RdRP) jumps.

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Due to its high mutation rate, coronaviruses are found to be present in humans and various animals with a broad range of clinical features from asymptomatic course to requirement of hospitalization in the intensive care unit; causing infections in respiratory, gastrointestinal, hepatic, and neurologic systems.^[3,4]

In 2003, various reports published reporting the spread of corona in many countries such as the United States of America, Hong Kong, Singapore, Thailand, Vietnam, and Taiwan causing more than 1000 mortalities. COVID-19 was first identified and isolated from pneumonia patient belongs to Wuhan, China.^[5]

As far as the origins of the first case are considered, the infection was transmitted probably as a zoonotic agent (from animal to human). The rise in cases at Wuhan city and internationally after closing the market and evacuation of the cases in China indicated a second transmission from human-to-human.^[5,6] Since then the infection has grown into a pandemic spreading in almost 200 countries across the globe affecting more than 11 lakh patients

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and causing nearly 80 thousand deaths till the writing of this article.^[7]

Sources and Modes of Transmission

Although the virus is known to be zootonic in origin, the recent outbreak has demonstrated its strong affinity for human to human transmission. The transmission primarily spreads through the respiratory droplets from inhaled via sneeze or cough air of an infected person, which then can settle in the mouth or nasal mucosa and lungs of people. It is also suspected to transmit by touching contaminated inanimate objects and by touching the mouth, nose, or eyes. Transmission is suspected to be transmitted through asymptomatic carriers as well.^[5,8]

Prevention and Modes of Control of Spread

WHO issued guidelines for the public for protection from the disease. These guidelines primarily suggest maintaining social distancing (1 meter distance with a person who is coughing or sneezing), maintaining proper hand hygiene and respiratory hygiene (covering mouth and nose during sneezing and coughing), and to avoid touching the eye, nose, and mouth.^[9] Regarding the use of masks for individuals without having any symptoms, it's been quoted in WHO Guidelines that "A medical mask is not required for people who are not sick as there is no evidence of its usefulness in protecting them." WHO guidelines also advise not to wear medical masks when not indicated as it may result in unnecessary cost hikes and procurement burdens and may also create a false sense of security leading to the neglect of other essential measures like hand hygiene practices. The use of masks is primarily advised for patients with respiratory symptoms and health care workers or caretakers who may come in close contact with such patients.^[10]

Quarantine and Isolation

WHO describes "Quarantine of persons as the restriction of activities or separation of persons who are not ill, but who may have been exposed to an infectious agent or disease, with the primary objective of monitoring symptoms and the early detection of cases." Isolation, on the other hand, can be described as the parting of ill or infected persons from others, to avert the spread of infection or contamination.^[11] As an agreement in the public health sector, isolation is considered to be an effective approach in dealing with contagious diseases like COVID-19, which may spread from droplets in the air. It is also argued that compulsory quarantine and extensive travel restrictions may do more harm than good. Although the current estimated case fatality rate for this disease (approximately 3.4%) is much less than that of SARS (11%), its rate of transmission is much faster.^[12] Hence, it is more likely to spread from one person to another. This rate, however, seems to be dependent on region and the average age of the community.^[2,5,12]

The term "quarantine" originally refers to self-quarantine or quarantine of selective individuals who are suspected to be

carriers of the infection, however, a new term "mass quarantine" is emerging nowadays, which primarily refers to the enforced quarantine of a population by the government to prevent the spread of a disease outbreak.^[13] A major purpose of mass quarantine is to flatten the curve of the spread of the disease. The curve in this scenario refers to the projected number of people that will be infected by COVID-19 over a period of time. The curve takes on different shapes, depending upon the rate of spread. A steep curve indicates the exponential spread of the disease in a shorter time. A steep rise will lead to the overloading of the health care system (as it was seen with Italy recently during the COVID-19 outbreak). This is particularly of more importance in countries with a high density of population and limited health care facilities like in India. However, a steep curve has a steep rise as well as steep fall, which means after the infection has affected as many people as it can the case numbers will drop at a faster rate as well.^[13,14]

So flattening the curve primarily means to slow down the rate of infection.^[14] It means the same number of people will get affected but over a longer period of time, which leads to lesser stress on the health care system, and in this case, may also provide us time to search for definitive therapeutic modalities like an antiviral drug or a vaccine. The mass quarantine strategies used by countries like Italy and India are aimed to flatten the curve of COVID-19 infections in these countries. As far as WHO is concerned, in the past, it has not recommended broad quarantine measures in general. However, recently in the report of the WHO-China Joint Mission on controlling the spread of COVID, China's efforts have been praised, which include measures like enforced travel restrictions on an enormous scale and mass quarantine.^[15] Willem Roper in his online report has mentioned how effectively China was able to drop down the daily admission rate of COVID patients from more than 1600 per day to less than 8 per day in less than a span of 1 month.^[16] Many authors in the past, especially after the SARS outbreak in 2006, have published articles recommending the use of aggressive quarantine strategies for controlling the spread of rapidly emerging infectious diseases.^[17-19]

Although the implementation of strict quarantine strategy by China has shown significant results in controlling the spread, there are other points to be considered. The method of containment through enforced restriction has been successful only because China has a widespread electronic surveillance and physical control over its population, which might be difficult to achieve in other countries especially developing democratic countries like India. Also, concerns regarding censorship of COVID-19 related information by the Chinese government have been raised.^[13,20]

Effectiveness of mass aggressive quarantine measures is still a matter of conflict. Lawrence Gostin, director of Georgetown's World Health Organization Collaborating Center on National and Global Health Law expressed his grave doubts about the use of mass quarantine measures used by china.^[13]

In the past authors have also published articles questioning the effectiveness of mass quarantine measures. After the SARS epidemic of 2003, Bensimon and Ross (2007) have published a systematic review, which states that the effectiveness of a public health intervention should not only be defined in (absolute and objective) scientific terms but also to be conceptualized rationally and normatively in public health decision making.^[21] Richard Schabas in his commentary published in 2004 has also expressed his concerns on how mass quarantine strategies were a failure to control the SARS epidemic in Toronto.^[22]

The use of aggressive quarantine measures has also known to have some serious economic, psychological, and social impacts. Quarantine measures, in general, are known to cause up to 4 times post-traumatic stress in quarantined individuals in comparison to non-quarantined individuals.^[23] Quite a few health care workers associated with the Ebola outbreak in Senegal reported that their families started considering their jobs to be too risky, building up intra-household tension due to quarantine.^[24] Similar such incidences have been noted in many parts of India where health care professionals were asked to move out from their residence by the landlords as a result of fear of contamination from COVID-19 (30th march 2020, The Guardian).^[25]

Area-wide quarantine, causes non exposed people to be stuck with those who are sick for unstated amounts of time, leading to a rise in the chance of being exposed. This was evident with the recent case of the Cruise ship Grand Princess.^[13,26]

Quarantine of large areas puts a risky and excessive burden on the local health care system and the workers. This is particularly of more importance in countries with limited health care facilities and limited resources and is often understaffed to deal with such epidemics. The risk of spread of infection in the health care workers also increases, which may further contribute to the problem as they are the front line of defense against such outbreaks.^[20,27]

Inadequate supplies of daily necessities like food, medicine, and other grocery supplies is another expected outcome.^[20,23,24] Vulnerable individuals and people with health conditions are at higher risk, which includes the trapping of pregnant women in “lockdown” cities.^[28] This has also been the case in many rural areas of countries like India (29th march 2020 NDTV News).^[29]

Enforced quarantine and travel restrictions may also lead to stereotyping and prejudice against certain individuals, which may be based on their appearance, ethnicity, or national origin rather than the scientific facts.^[23] This tendency is found to be present both in history as well as the current circumstances where businesses in US Chinatowns got severely affected including areas without any reported COVID-19 cases.^[13] Similar trends were also seen in India where many individuals belonging to the Northeast states of India were targeted based on their appearance (25th march 2020, News 18).^[30]

In the past studies have shown that extended durations of quarantine were also related with adverse mental health specifically, post-traumatic stress symptoms, anger, avoidance behaviors, etc., Longer quarantine periods of higher than 10 days have resulted in significantly higher post-traumatic stress symptoms in comparison to the quarantine of less than 10 days.^[23,31]

If quarantine has to be implemented it should be well-justified and reasonable, with well-thought implementation policies keeping the scientific evidence and protocols in due consideration.

WHO has advised certain measures that countries should effectively communicate and socialize to improve compliance in times of quarantine and minimize panic:^[11]

- Authorities must make available clear, up-to-date, transparent and consistent guidelines, as well as reliable information about quarantine measure;
- Constructive engagement of communities makes quarantine measures more acceptable;
- People who are quarantined, are to be provided with proper health care, financial, social, and psychosocial support, along with basic necessities such as food, water, and other essentials. The needs of vulnerable populations should be prioritized;
- Cultural, economic, and geographic factors are known to influence the success of quarantine. Rapid assessment of the local context should consider both the drivers of success and the potential barriers to quarantine, and the design is to be informed in most appropriate and culturally accepted measures.

Brooks *et al.* in their rapid review on the psychological impact of quarantine (2020), have advised some measures to minimize the detrimental effects of quarantine procedures on affected populations, which include the following points:^[23]

- **Keeping the duration of quarantine as minimal as possible:** It has been emphasized scientifically justifiable restriction for the duration of quarantine, considering the incubation periods, and avoiding the adoption of an overly precautionary approach.
- **Provide people with as much information as possible:** Those who have been quarantined must have a proper understanding of the disease in question, and clarity regarding the reasons for quarantine. Inadequate information may often lead to fear and spread of rumors.
- **Provision of adequate supplies:** Necessities like food, groceries, medicines supplies should be provided as rapidly as possible and in adequate quantities.
- **Reduce the boredom and improve the communication:** Provision of uninterrupted Internet and other entertainment services should be prioritized. Social media platforms are helpful as tools of communication and help to reduce the impact of psychological stress by making people feel connected to each other.
- **Health care workers deserve special attention:** Provision of proper and adequate numbers of personnel protective

equipments (PPE) to the health care workers must be ensured. Appreciation and less stigma may also help to provide motivational factors and minimize the psychological stress of health care workers. Organizational support also plays an important role in this.

- **Altruism is better than compulsion:** Voluntary quarantine instead of mandatory quarantine may also prove to be beneficial.

Conclusion

Local governments should encourage voluntary social distancing protocols, whenever necessary schools, mass gatherings, and public transportation systems must be stopped. Further support to lower-income and susceptible population should be provided to make voluntary measures feasible.^[11,23] Mass quarantine has both advantages and disadvantages. While imposing mass quarantine Government and administrative authorities should take into account the relative situational need with respect to the susceptibility of the population, the socio-psychological factors, geographical locations and respect to self-discipline. Accordingly, a tailor-made suitable strategic quarantine plan is required to be worked-out.

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Conflicts of interest

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