Advances in Bioresearch
Adv. Biores., Vol 11 (3) May 2020: 46-53

Print ISSN 0976-4585; Online ISSN 2277-1573
Journal's URL:http://www.soeagra.com/abr.html
CODEN: ABRDC3
DOI: 10.15515/abr.0976-4585.11.3.4653

Advances in Bioresearch

REVIEW ARTICLE

Role of Quarantine in the Prevention of infectious diseases; from Plague to COVID-19

Noreen Akhtar[1], Anees Muhammad[2], Syed Arshad Ullah[3],Mashooq Khan[4]
1Department of Microbiology, University of Haripur, Haripur, Pakistan
*2Department of Medical Laboratory Technology, College of Medical Technology, Bacha Khan MedicalCollege, Mardan, Pakistan
3Department of Cardiology, College of Medical Technology, Bacha Khan Medical College, Mardan, Pakistan.
4Department of Dental Technology, Institute of Paramedical Sciences, Khyber Medical University, Peshawar
Corresponding Author's Email: aneesafridi15295@yahoo.com

ABSTRACT
The history of infectious disease is fascinating. Since the dawn of history, human culture has been seriously jammed by contagious diseases. Infectious disease history is also the history of people who have identified infections, differentiate infections from one another, isolated or characterized pathogenic microorganisms, developed diagnostic tests, pioneered treatments, developed preventive measures for public health, or developed vaccines or chemoprophylaxis to prevent infections. A new strain of coronavirus infectious disease 2019 (COVID-19) not previously found in humans reported in China, in the Hubei Province, but went unrecognized again. Eight new cases were reported in December 2019 with scientists indicating to an unidentified virus. On February 11, the disease was officially named COVID-19. On March 11, 2020, the World Health Organization stated that the COVID-19 virus was officially a pandemic after spreading through 114 countries in three months and infected over 118,000 people. Without a vaccine available, the virus spread beyond Chinese borders and by mid-March, it had spread globally to more than 163 countries. This paper focuses on how quarantine helps prevent the spread of contagious diseases like COVID-19 and what preventive measures should be taken by public health workers and society.
Keywords: *COVID-19, Plague, Prevention, Quarantine*

Received 11.05.2020 Revised 28.05.2020 Accepted 02.06.2020

How to cite this article:
N Akhtar, A Muhammad, S A Ullah, M Khan. Role of Quarantine in the Prevention of infectious diseases; from Plague to COVID-19. Adv. Biores., Vol 11 (3) May 2020: 46-53

INTRODUCTION

The term "quarantine is derived out of the words "quaranta giorni," an Italian word, and its meaning is 40 days. Public health deduces that the Quarantine became increasingly used in the US, Europe as well as all over the world [1].

Quarantine may be defined as the separation or restricted movement of people who are not sick but might have been subjected to the disease. It's a condition where an individual, animal and any other substance which carries an infectious agent they prevent or delimit the spread of the diseases. In the North American Indigenous people lived in thousands of years, and their health, economy, and physical conditions are badly affected by the immigration of Europeans that began in the 1600s. On 1st, March 2018, the department of health and environment clarified that term quarantine could be used to separate individual that's been exposed to a communicable disease regions under such circumstances that stop the two-way transmission of the vehicles causing infections of vulnerable persons that are at increased risk or who may spread the agent to other people creating an illness. In addition, the control of disease outbreak is due to the result of Quarantine that has significant impacts on economic activity and Civil rights [2, 3]. Quarantine is the best tool that is used to control the spread of illness for the previous 50 years for multiple reasons [4].

The officer in Chief of Public-Health in Canada, Mr. David Butler Jones, said, "The new Quarantine may act as a substantial step into Forwards in and ready it to the influenza pandemic (5). Regarding the ancient concept, Quarantine may be studied as an effort to restrain the Black Death in the middle of the 14th' century. The detention period was thirty days i.e. the Trentino. Later on, it was modified to a period of 40 days [6, 7].

Quarantine was embraced as a necessary way of dividing individuals, animals, and products which might have an exposure to an infectious disease [7].

HISTORY OF QUARANTINE

In history, Quarantine was defined as a detention period and separation of subjects that was suspected of carrying contagious diseases. Recently the term quarantine was defined as the period in which isolation imposed on an individual, animal, or on the things which may spread infectious pathology (8, 9).

Recently the Quarantine in the larger sense was used to restrain the movement as a result of people or goods on sea or land due to the existence of an infectious disease that has been conferred attention by the historians in public health [10,11].

In 1636 the epidemic outbreak of bubonic plague occurred in London and Westminster. Thousands of people left the town; many more isolated at a guesthouse or were quarantined in their houses. After all, when 1637 ended, those epidemics in London and Westminster ware demonstrated, moderate as compared to 1625 or 1603 where, it carried off 10,400 people, 7.5% of the city, and its liberties' estimated total Population (12). Whenever the SARS outbreak happened in Singapore, the gov't ordered almost 500 people who were probably being exposed to the virus into home quarantine [13].

The epidemic of yellow fever occurred in 1973 in the summer. During this epidemic, 5000 people killed nearby Philadelphia, a group of physicians in New York, organized committee to stop the ships from Philadelphia, from entering New York ports. People in 2003 Quarantine was used across the global response to SARS in recent history with many countries established mandatory Quarantine. In the United State, public-health officials rely on voluntary Quarantine of Exposed people [14].

During the spring season, the 668 people of Taiwan suffered SARS**,** and 346 cases were confirmed during the spring of 2003. As a growing rate of SARS patients, a total of 151,270 people were quarantined; 55,215 were health care workers and are exposed to an isolated patient, close contacts of a SARS patient, or anyone sitting within three rows of a SARS patient on a plane. The remaining 95,955 people quarantined were people returning from a SARS affected area (16). In addition, Multi-drug resistant organisms (MDRO) were isolated from four reviews (18, 19). Temperature is maintained by quarantine people and food was provided to them for three days by public health staff [20].

Recently a study has also reported the outbreak of Ebola virus in 2014-2015 that spread to six countries, including West Africa and other four outside of the region that includes the United States and discussed Quarantine and social distancing [21]. However, the previous study about Quarantine in the United States and all over the world demonstrates that there was a huge variation in how the government utilizes it, and how the population received it [22]. Infectious Diseases in the United States were increased including yellow fever. To overcome these diseases, a nationwide quarantine based in 1878 was implemented [23, 24].

Quarantine was also used recently to address the cholera outbreak and other events associated with infectious diseases worldwide in history (23, 25). An Epidemic of a new strain of coronavirus happened in Wuhan, Hubei Province, China, in December 2019, later on, it was spread to the whole world in a very limited time [26]. World Health Organization (WHO) named, coronavirus as Coronavirus Disease-2019 (COVID-19) On 11, February 2020 [27]. In accordance with Markel, the term quarantine had its origin from "Quaranta giorni" which are Italian words. European nations called the word Quarantine as Maritime Quarantine and cordons Sanitaire. Quarantine was used as a safeguard against infectious and sexually transmitted diseases like plague, leprosy, cholera, as well as many others. It was recognized that Quarantine has been only partially effective, and is permeable. At the end of the 19th century, Quarantine was used for controlling the worldwide spreading of infectious diseases like plague and cholera.

SOCIAL DISTANCING, ISOLATION, AND QUARANTINE

Public health officials consider the use of social distance as a measuring tool to face not only political, ethical, and moral challenges but also limited empirical evidence to support the policy's effectiveness on the pathogen attack. Quarantine and isolation are instruments for monitoring public health and for preventing the spread of infections among individuals and communities [28, 29].

Social Distancing

Social distancing' may be defined as "The reduced relation among people in a community, between them some of the individuals were infectious but will not have been isolated and identified yet. As the spread of disease by respiratory droplets need the immediacy of individuals, the disease was overcome by the distancing of individuals and reduced transmission. Social distancing was used in a place in which the illness instances are unclear where community transmission has been considered to have happened [14]. The ideal example of distancing comprises the closure of all markets and the closure of schools or office buildings along with gatherings 'cancellation. Isolation' is the separation of sick people with contagious diseases from non-infected individuals to protect non-infected people, and normally happens in hospital settings. An isolation chamber was set to have a facility of negative pressure and to decrease disease transmission through aerosols. In addition, droplets such as COVID-19, disease management were achieved without negative pressure rooms. Isolation of patients had been effective in beating disease transmission if the disease was discovered in the first phase. Influenza disease transmits before clinical signs and symptoms appear, then isolation was too late to be successful to control an influenza pandemic and to reduce transmission. The incubation period of COVID-19 is longer than for influenza [30] And viral shedding was very high if the patient was ill. So that longtime incubation allows more time to identify cases and set them in isolation. The incubation period of this COVID-19 was the median of 5 days [31].

Isolation

'Isolation' is the separation of sick people with contagious diseases from non-infected individuals to protect non-infected people, and normally happens in hospital settings. An isolation chamber was set to have a facility of negative pressure and to decrease disease transmission through aerosols. In addition, droplets such as COVID-19, disease management were achieved without negative pressure rooms. Isolation of patients had been effective in beating disease transmission if the disease was discovered in the first phase. Influenza disease transmits before clinical signs and symptoms appear, then isolation was too late to be successful to control an influenza pandemic and to reduce transmission. The incubation period of COVID-19 is longer than for influenza [30]. The viral shedding was very high if the patient was ill. So that longtime incubation allows more time to identify cases and set them in isolation. The incubation period of this - n CoV 2019 was the median of 5 days [31].

Quarantine

On the other hand, the term quarantine was used to separate or limit the activities of those individuals who are in direct contact with infectious disease and kept under observation, whether or not they get the disease later [32]. Quarantine is a good measure, which was often used to control the spreading of several human and animal infectious diseases, i.e. severe acute respiratory distress syndrome (SARS) from 2003 along with the 2009 swine influenza outbreak [33].

Quarantine' is a very excellent and beginner tool for limiting the outbreak of disease. This measure of public health has been used widely in the fourteenth-century in Italy were boats in the Venice port out of plague-infected vents had to stop and wait patiently for 40 days before landing their passengers [34]. Quarantine was executed during the SARS outbreak in 2003 as an effective step [35].

Quarantine means to restrict the movement of persons who were exposed to the infectious disease but wasn't sick, possibly because they were not infected or since they were in the incubation period [4]. Quarantine might be willingly chosen or executed compulsory. If symptoms occurred, they need to be isolated at a center with treating disease acquainted. Where detection of cases is instantaneous, quarantining was successful in those sittings. Contacts could be recorded and tracked in a period with the issuance of Quarantine with voluntary compliance to this issuance.

CONDITIONS, DURATION, AND PROTOCOL OF QUARANTINE (INFECTIOUS DISEASE OR OTHERS) SARS

Globally, when the epidemic of the severe acute respiratory syndrome (SARS) occurred in 2003, public-health officials presented that all affected regions should be directed to quantify and manage the spread of this illness. However, treatment and isolation of infected people were more successful. Several studies analyzed that Quarantine was likely significant in stopping the spread of SARS in a different location [4, 7, 36].

The Ebola outbreak came from Guinea in December 2013. On 9th, May 2015, the World Health Organization (WHO) declared that the outbreak has been eliminated in Liberia; and it resulted in 11,291 deaths. However, to eradicate this epidemic to be valuable to present disease transmission domestically and internationally ..

Chickenpox

Varicella was a very highly transmissible disease that is caused by the virus i.e. varicella-zoster virus (VZV), and VZV is transmitted from one person to another by close contact, inhalation of aerosols from vesicular lesions and possibly through the respiratory secretions. Peoples who were non-immune or exposed to disease had been quarantined for 21days (incubation period of chickenpox) from the exposure, before verification of the VZV immunity. Control measures like isolation of cases, quarantining and cohorts of contacts involving limitation of movement that was present represent a test [37].

Influenza virus

The annual flu season affects individuals around the world and often claims the lives of thousands of people each year (38). Influenza is a virus that infects cells of the human body by integrating their DNA into the original cell structure [39]. Pandemic influenza could also be monitored in a way that allows scientists and public-health officials to effectively predict the course of an outbreak and devise quarantine protocols.

Dengue fever

Dengue fever is caused by mosquito bites. In history, dengue fever spread in the world. It was discovered that 390 million individuals are infected with dengue fever annually, of which 96 million have been clinically severe2014, Guangzhou outbreaks dengue fever in China [40]. Over 35 million cases of dengue fever were reported in Guang dong state, including those 20 cases of severe disease and 6 cases of deaths [41].

The Americas area reported in 2016, that 2.35 million cases of dengue fever, together with Brazil, led 1.5 million cases, which is roughly three times greater than in 2014 [42]. The procedures which were used to control dengue fever are infected people quarantine measures and vector management approach [43].

ROLE OF QUARANTINE IN EMERGENCIES AND PANDEMICS

Quarantine plays a significant role in coronavirus control. Diseased people will be analyzed through this process and positioned them in a separate place until they recover. Schools, restaurants, and gyms should close to control disease transmission in public. Overall, an efficient review has reported evidence that involved isolation, and Quarantine was the most effective method to help in respiratory virus epidemics (58). Island countries may include the opportunity of border quarantine in present influenza epidemic strategies, and Quarantine was effective in island settings from 1918-1959 (44).

ROLE OF QUARANTINE IN RESPIRATORY INFECTIONS (INFLUENZA (1918, 1957, 1968 AND 2009) SARS, MERS AND COVID-1)

Influenza (1918)

In 1918, the influenza pandemic was implemented as an emergency measure in response to some health challenges, which found the world in 3 rollers from 1918-1919. The majority of scientists observe that the disease-causing agent was a bacterium, Richard Pfeiffer, who recognized it as Haemophilus *influenza* in 1892 [45].

Throughout the second flu outbreak of this Twentieth century, the “Asian flu" pandemic of 1957--1958 a few countries implemented steps to control the spread of this disease. The disease was generally milder than that, which was caused by 1918 flu and also the situation prevailed. Understanding of flu (influenza) had improved, the causative agent was discovered in 1933, vaccines for epidemics were accessible, and medications were provided to take care of complications.

The World Health Organization has employed a worldwide flu surveillance system that provided early warnings when novel Influenza (H2N2) virus started spreading in China in February 1957 and globally a later year. When the pandemic started to propagate with the initiation of schools in many countries, vaccines were developed in Western nations but were not accessible [46].

For the very first time, the virus has been discovered in Hong Kong in early 1968 and was introduced to the USA in 1968, coming from Vietnam. Globally the virus spread from the winter of 1968 -- 69; the result was restricted, also there were not any containment measures.

Quarantine and other public-health practices are beneficial and Powerful approaches to control disease outbreaks and stress. The approaches have been discussed, understood as uncontrollable, and also accompanied by a hint of distrust, suspicion, and riots and under most regimes that are political in every era. These tactical steps were increased (and continue to increase) diversity of political, economic, social, and moral dilemmas [47].

Severe Acute Respiratory Syndrome (SARS) 2003

SARS outbreak occurred in 2003. A quarantine, initiated on March 17, for several probable connections of doubtful of SARS cases has reached a total of 55,632 individuals quarantined, and Level B quarantine, employed on April 28, of travelers arriving at boundaries from infected regions

that liked 95,525 (17). Other items that were a measure to execute during the epidemic of SARS comprise temperature observation, SARS fever hotline, hand washing, and limited reach to all healthcare centers, fever screening in specified local hospitals, in addition to compulsory facemask-wearing while at hospitals, public transport, and other enclosed public areas, the majority of which were implemented on April 25, the day an after the initial SARS casualty had happened in Taiwan.
It was acknowledged that intervention measures like their Quarantine and isolation of cases and their Contacts that are traced were instrumental in restraining the previous SARS outbreak [48, 49].

MERS: Middle East Respiratory Syndrome

An epidemic of the Middle East Respiratory Syndrome (MERS- CoV) occurred in Korea from May to December 2015, which leads to 186 cases of the disease, 38 deaths (20.4 percent of total cases), also 16,692 exposed people that experienced Quarantine for 2 weeks (50). It was described as a tragedy, and the managing of this was led by the Korean Centers for Disease Control and Prevention (KCDC) that has been responsible for the supervision of the hospital.

CURRENT SITUATION OF COVID-19 AND QUARANTINE GLOBALLY

China

Coronaviruses are non-segmented RNA viruses and enveloped positive-sense and commonly spread in humans and other mammals. In China, up to 80000 as for the 18th of March 2020, infected individuals were exceeded and the virus distributed to more than 100 countries over the world. Coronavirus is a range of symptoms with fatigue, breathing difficulty, dry cough, fever, and in severe cases, bilateral lung infiltration, similar to SARS-CoV and MERS-CoV infections (51). But patients with diabetes, cardiovascular disorders, respiratory diseases, or cancer are more at risk. The mortality rate is high as 5- 11 % for ages over 70. lt has 7,074 deaths globally as reported till 16 March 2020 with greater than I, 79,073 confirmed cases. The current outbreak incident had led in 81,048 (67794 of that are Hubei) confirmed cases and 3204 deaths in China [52]. Infrequent cases exported from Wuhan have been reported in the Republic of Korea, Thailand, Hong Kong, Taiwan, Australia, Italy, Japan, and the USA and also have spread to155 countries to date [53].
If governments focus on tested public health outbreak response to coronavirus 2019 (COVlD-19) in China (54) . Community containment, isolation, Quarantine, and social distancing were rapidly executed. In China, patients with COVID-19 were quickly isolated in chosen existing hospitals as well as in new hospitals. Home quarantine was initiated, and large gatherings were cancelled.

Italy

Italy was among the most suffering countries. As of 16th, March 2020 the number of cases in Italy was reached 27980, ranking second globally, the confirmed deaths were 2158, and the frequency of death as high as 7.71%, that has maximum among the key prevalent countries. However, restricted revisions assessed the prevalent status in Italy [5]. On the earliest, Jan 31 first cases of COVID- 19 were detected in Italy. Italy was the very first country to announce a state of alternative. Since that time, to restrain the 52 spread of COVlD- 19 various measures have been implemented [55-57].

Outcome & Consequence of Quarantine (possible benefits)

Quarantine may help in a different way to limit and to separate the movements of people that suffer from an infectious disease and also observe if they contracted the disease over time [32].
Quarantine is among the control steps to defend towns and the lives once the outbreak of plague epidemics happen in the 14th , century [32]. The WHO recognized this crisis and stated COVlD-19 as a pandemic. Italy has the highest number of deaths, which declared a nationwide quarantine to address COVlD-19 [58]. These events attracted the community's interest in isolation, Quarantine, and preventative measures that save lives and could protect health. People quarantined in outbreaks of infectious diseases have adverse psychological health effects following the quarantine period.
The size of the coronavirus is so small that it does pass from any mask cloth and never spread in the atmosphere and live on anything in the universe. The life of the corona is 1 2 hours. lt will die by soap and water. When it fell on the clothes whose life is 9 hours while washing clothes and put in the sun also died after 2 hours while it lives for 10 minutes on the hands. The possibility of spreading the coronavirus in dry weather is very low therefore the world scientist stated that till June July 2020 the panic will be finished and every country of the world is waiting for the stated time [59].

Improve Quarantine strategies for Future (recommendations)

For SARS, there are no valid medicines or vaccines, actions to control the transmission of SARS had to take two main forms: close observation of asymptomatic individual's isolation of symptomatic persons, and Quarantine [7, 60]. Species introduced by viruses and microbes SARS signifies the most recent challenge to well-being [61]. Attempted to obtain an advantage for its simple generative number R0 to measuring the

methods for debated and isolation management of SARS by Taking a Look at the role of disease spread limitations in the reduction of R0 along with the incidence of this disease [7,61].

Coronavirus was authoritatively called COVID-19 by WHO (World Health Organization).On 30th, January 2020 the epidemic was acknowledged as a Public Health Emergency of International Apprehension by WHO. In the absence of both vaccine and medicine, the strategies of actual allocating of them are not considered yet [31], and social distancing Costs and civil rights issues associated with Quarantine could significantly reduce [63]. Modeling of extra QIT accounts, integrating analytical tests into the replicas could improve the isolation activate and statement rules. Furthermore, future models could comprise specific treatments upon early warning to modulate infection outcomes.

CONCLUSION

The study summarizes the data available in history regarding infectious diseases (i.e. Plague, MERS, and SARS) and how quarantine helps prevent the Corona Virus Disease (COVID-19) pandemic. While the early implementation of quarantine and its combined effect with all other measures for public health may decrease the spread of the virus, key uncertainties exist as to how best to take these measures and when they can be laidback. Most of the people infected with the COVID-19 virus experienced mild to moderate respiratory illness were quarantined and recovered without requiring special treatment. There are no specific COVID-19 vaccinations or medications available at this point. However, evaluating potential treatment many ongoing clinical trials are in process. As long as scientific results are available WHO should proceed to have updated details. However, the best way to prevent the spread of COVID-19 pandemic and protect the individual from being infected is quarantine, social distancing, isolation, wearing a mask and other protective measures that should be adopted in such countries in which the pandemic is spreading very fast.

REFERENCES

1. Hossain MM, Sultana A, Purohit N. (2020). Mental Health Outcomes of Quarantine and Isolation for Infection Prevention: A Systematic Umbrella Review of the Global Evidence. SSRN Electron J. 1–27.
2. Capuzzi D, Gross DR. (2017). Introduction to the counseling profession: Seventh Edition. Introduction to the Counseling Profession: Seventh Edition. 1-474 p.
3. Schabas R. (2004). Severe acute respiratory syndrome: Did quarantine help? Can J Infect Dis. 15(4):204.
4. Cetron M, Landwirth J. (2005). Public health and ethical considerations in planning for Quarantine. Yale J Biol Med. ;78(5):325–30.
5. Schabas R. (2007). Is the Quarantine Act relevant? Cmaj. ;176(13):1840–2.
6. Ckson SMI. (1929). The origin of "quarantine." Br Med J. 1(3564):790.
7. Gumel AB, Ruan S, Day T, Watmough J, Brauer F, Van Den Driessche P, et al. (2004). Modeling strategies for controlling SARS outbreaks. Proc R Soc B Biol Sci. 271(1554):2223–32.
8. The Oxford English Dictionary (Book, 1989) [WorldCat.org] [Internet]. [cited 2020 May 2]. Available from: https://www.worldcat.org/title/oxford-english-dictionary/oclc/17648714
9. Rotz LD, Khan AS, Lillibridge SR, Ostroff SM, Hughes JM. (2002). Public health assessment of potential biological terrorism agents. Emerg Infect Dis. 8(2):225–30.
10. Qualls N, Levitt A, Kanade N, Wright-Jegede N, Dopson S, Biggerstaff M, et al.(2017). Community mitigation guidelines to prevent pandemic influenza - United States, 2017. MMWR Recomm Reports. 66(1):1–34.
11. Schoch-Spana M, Bouri N, Rambhia KJ, Norwood A. (2010). Stigma, health disparities, and the 2009 H1N1 influenza pandemic: How to protect latino farmworkers in future health emergencies. Biosecurity and Bioterrorism. ;8(3):243–54.
12. Shutt Up: (2020). Bubonic Plague and Quarantine in Early Modern ... Pages 51 - 63 - Text Version | AnyFlip [Internet]. Available from: http://anyflip.com/ccpe/hujx/basic/51-63
13. Peng LO, Lim S, Suok KC. (2005). Use of Quarantine in the control of SARS in Singapore. Am J Infect Control. ;33(5):252–7.
14. CDC (Centre for Disease control and Prevention). (2004) , there have not been any known cases of SARS reported anywhere in the world . The content in this PDF was developed for the 2003 SARS epidemic . But , some guidelines are still being used . Any new SARS updates will be posted on this Web site. Cdc [Internet]. 2003–5. Available from: https://www.cdc.gov/sars/surveillance/absence.pdf
15. Markel H, Gostin LO, Fidler DP. (2007). Extensively drug-resistant tuberculosis: An isolation order, public health powers, and a global crisis. Vol. 298, Journal of the American Medical Association. American Medical Association;. p. 83–6.
16. Chen KT, Twu SJ, Chang HL, Wu YC, Chen CT, Lin TH, et al. SARS in Taiwan: (2005). An overview and lessons learned. Int J Infect Dis.;9(2):77–85.
17. Hsieh YH, King CC, Chen CWS, Ho MS, Lee JY, Liu FC, et al. (2005). Quarantine for SARS, Taiwan. Emerg Infect Dis. ;11(2):278–82.

18. Morgan DJ, Diekema DJ, Sepkowitz K, Perencevich EN. (2009). Adverse outcomes associated with contact precautions: A review of the literature. Am J Infect Control. 37(2):85–93.
19. Abad C, Fearday A, Safdar N. (2010). Adverse effects of isolation in hospitalised patients: A systematic review. J Hosp Infect.76(2):97–102.
20. Bensimon CM, Upshur REG. Evidence and effectiveness in decisionmaking for Quarantine. Am J Public Health. 2007;97 Suppl 1:44–8.
21. WHO | Ebola situation reports: archive. WHO. 2016;
22. Rothstein MA, Alcalde MG, Elster NR, Majumder MA, Palmer LI, Stone TH, et al. Quarantine and isolation: Lessons learned from SARS. 2003;(November). Available from: http://www.iaclea.org/members/pdfs/SARS REPORT.Rothstein.pdf
23. History of Quarantine | Quarantine | CDC [Internet]. [cited 2020 May 2]. Available from: https://www.cdc.gov/quarantine/historyquarantine.html
24. Michael JM. The National Board of Health: 1879-1883. Public Health Rep. 2011;126(1):123–9.
25. Tognotti E. Lessons from the history of Quarantine, from plague to influenza A. Emerg Infect Dis. 2013;19(2):254–9.
26. Bruce Aylward (WHO); Wannian Liang (PRC). Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19). WHO-China Jt Mission Coronavirus Dis 2019 [Internet]. 2020;1(February):40. Available from: https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf
27. Coronavirus (COVID-19) events as they happen [Internet]. [cited 2020 May 2]. Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen
28. Coronavirus (COVID-19) events as they happen [Internet]. [cited 2020 May 3]. Available from: https://www.who.int/ emergencies/diseases/novel-coronavirus-2019/events-as-they-happen
29. Tognotti E.(2013). Lessons from the history of Quarantine, from plague to influenza A. Vol. 19, Emerging Infectious Diseases. Centers for Disease Control and Prevention (CDC); p. 254–9.
30. Boxberger et al. (2008). NIH Public Access. Bone. ;23(1):1–7.
31. Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. (2020). Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. N Engl J Med. 382(13):1199–207.
32. Quarantine and Isolation | Quarantine | CDC [Internet]. [cited 2020 May 6]. Available from: https://www.cdc.gov/quarantine/index.html
33. Sato H, Nakada H, Yamaguchi R, Imoto S, Miyano S, Kami M. When should we intervene to control the 2009 influenza A(H1N1) pandemic? Eurosurveillance. 2010;15(1):1–4.
34. Cetron M, Simone P. (2004). Battling 21st-century scourges with a 14th-century toolbox. Emerg Infect Dis.;10(11):2053–4.
35. Goh KT, Cutter J, Heng BH, Ma S, Koh BKW, Kwok C, et al. (2006). Epidemiology and control of SARS in Singapore. Ann Acad Med Singapore. 35(5):301–16.
36. Nishiura H, Patanarapelert K, Sriprom M, Sarakorn W, Sriyab S, Ming Tang I. (2004). Modeling potential responses to severe acute respiratory syndrome in Japan: The role of initial attack size, precaution, and Quarantine. J Epidemiol Community Health. ;58(3):186–91.
37. Public Health England. Guidance on Infection Control for Chickenpox and Shingles in Prisons, Immigration Removal Centres and other Prescribed Places of Detention. 2014;2017(August). Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/367467/Guidance_on_Infection_Control_for_Chickenpox_and_Shingles_in_Prisons_24_Oct_2014.pdf.
38. Jahn R, Sudhof T. M Embrane F Usion and E Xocytosis. Annu Rev Biochem [Internet]. 1999;777–810. Available from:http://arjournals.annualreviews.org/doi/abs/10.1146/annurev.biochem.68.1.863%5Cnpapers3://publication/uuid/37777FFE-E284-4B0C-9648-9DF205012ADD
39. Dengue and severe dengue [Internet]. [cited 2020 May 6]. Available from: https://www.who.int/news-room/fact-sheets/detail/dengue-and-severe-dengue
40. Castro-Arroyave D, Monroy MC, Irurita MI. (2020). Integrated vector control of Chagas disease in Guatemala: a case of social innovation in health. Infect Dis poverty. 14;9(1):25.
41. Sharpe FR, Lotka AJ. L. (1911). A problem in age-distribution . London, Edinburgh, Dublin Philos Mag J Sci. Apr;21(124):435–8.
42. Dietz K. Introduction to McKendrick (1926). Applications of Mathematics to Medical Problems. 1997;(1926):17–57.
43. Eichner M, Schwehm M, Wilson N, Baker MG. (2009). Small islands and pandemic influenza: Potential benefits and limitations of travel volume reduction as a border control measure. BMC Infect Dis. 9:160.
44. Tognotti E. (2020). Lessons from the History of Quarantine, from Plague to Influenza A. Emerg Infect Dis [Internet]. 2013 Feb [cited 2020 May 2];19(2):254–9. Available from: http://wwwnc.cdc.gov/eid /article/19/2/12-0312_article.htm
45. Pallot J. The USSR.(2013). Policies Plans Rural People An Int Perspect.;120–41.
46. Wynia MK. (2007). Ethics and public health emergencies: Restrictions on liberty. Am J Bioeth. ;7(2):1–5.
47. Chau PH, Yip PSF. (2003). Monitoring the severe acute respiratory syndrome epidemic and assessing effectiveness of interventions in Hong Kong Special Administrative Region. J Epidemiol Community Health.;57(10):766–9.

48. NEWS SARS spreads new outlook on quarantine models Report calls for overhaul of UK clinical trials. 2003;9(12):2003.
49. Cho H-W. REMOVED: (2015). Editorial. Osong Public Heal Res Perspect. 2015;6(4):219.
50. Go YY, Kim Y, Cheon S, Nam S, Ku B, Kim M, et al. (2020). COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID- company â€™ s public news and information website . research that is available on the COVID-19 resource centre -. 2020;(January).
51. Coronavirus disease 2019 [Internet]. [cited 2020 May 6]. Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019
52. Coronavirus COVID-19 (2019-nCoV) [Internet]. [cited 2020 May 6]. Available from: https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6
53. Wu Z, McGoogan JM. (2020). Characteristics of and Important Lessons from the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72314 Cases from the Chinese Center for Disease Control and Prevention. Vol. 323, JAMA - Journal of the American Medical Association. American Medical Association. p. 1239–42.
54. Liao X, Wang B, Kang Y. (2020). Novel coronavirus infection during the 2019–2020 epidemic: preparing intensive care units—the experience in Sichuan Province, China. Intensive Care Med [Internet]. ;46(2):357–60. Available from: https://doi.org/10.1007/s00134-020-05954-2
55. Ramanathan K, Antognini D, Combes A, Paden M, Zakhary B, Ogino M, et al. (2020). COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID- research that is available on the COVID-19 resource centre - including this for unrestricted research re-use a. 2020;(January):19–21.
56. Benvenuto D, Giovanetti M, Salemi M, Prosperi M, De Flora C, Junior Alcantara LC, et al. (2020). The global spread of 2019-nCoV: a molecular evolutionary analysis. Pathog Glob Health [Internet]. ;114(2):64–7. Available from: https://doi.org/10.1080/20477724.2020.1725339
57. WHO (2020). Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020 [Internet].. Available from: https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020
58. Lingappa JR, McDonald LC, Simone P, Parashar UD. (2004). Wresting SARS from Uncertainty. Emerg Infect Dis.;10(2):167–70.
59. WHO. (2003). Consensus document on the epidemiology of severe acute respiratory syndrome (SARS). Consens Doc Epidemiol Sev acute Respir Syndr. 111-134.
60. Chowell G, Fenimore PW, Castillo-Garsow MA, Castillo-Chavez C. (2003). SARS outbreaks in Ontario, Hong Kong and Singapore: The role of diagnosis and isolation as a control mechanism. J Theor Biol. ;224(1):1–8.
61. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet. 2020;395(10223):497–506.
62. Peng X, Xu X, Li Y, Cheng L, Zhou X, Ren B. Transmission routes of 2019-nCoV and controls in dental practice. Int J Oral Sci [Internet]. 2020;12(1):1–6. Available from: http://dx.doi.org/10.1038/s41368-020-0075-9
63. Agosto A, Campmas A, Giudici P, Renda A. (2020). Monitoring Covid-19 contagion growth in Europe. CEPS Working Document No 03, March 2020.