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Review Article

Exploring the Early Barriers to Disease Control for COVID-19 in China

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Abstract

Barriers to communicable disease control are widespread and varying throughout the world. The COVID-19 pandemic has made poignant the need to understand and correct existing and emerging barriers to suppressing the spread infectious diseases. This paper describes the barriers faced by China and its surrounding countries that led to the global public health crisis. Critically appraising barriers on the levels of agent, case, population and system informs where public health efforts failed and how they may be rectified. As countries continue to grapple with the effects of the virus' spread, evaluating barriers faced early in the outbreak provide lessons for ongoing optimization of control measures for novel infectious agents.

Keywords: Early Barriers; Disease Control; COVID-19

Introduction

The COVID-19 pandemic rapidly progressed across the world, the early barriers to communicable disease control were not recognized and subsequently not addressed. While each country faced a unique set of challenges in preventing the spread of the disease, China's initial experience provides lessons for global public health measures. This paper explores the variety of barriers relating to the agent, case, population and systems that shaped China's response to the health crisis that impacted its surrounding countries and the world. Critical reflections on the early stages of this global public health emergency have not been thoroughly examined and systematic reviews have yet to be conducted on this area. As the pandemic continues to unfold, barrier identification may guide public health officials to effectively address these observed issues. Future public health efforts may benefit from reflecting on the identified barriers and applying lessons to inform future outbreak control.

Coronaviruses are widely dispersed in both humans and animals. While some are known to cause mild infections in humans, others such as the severe acute respiratory syndrome (SARS) and middle East respiratory syndrome (MERS) reach epidemic levels with mortality rates of 10% and 37% respectively [1]. Given the severity of known coronaviruses, vigilance for emerging communicable diseases is essential for their control; unfortunately, the novel coronavirus identified in 2019 emphasized the importance of overcoming barriers to control in their early stage.

In December 2019, the city of Wuhan in Hubei province of China reported the first cases of the novel coronavirus later officially recognized as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes the coronavirus disease 2019 (COVID-19) [2]. The first case of COVID-19 was reported in a Chinese paper on December 1, 2019 and reported by a physician as an epidemic outbreak on December 30, 2019 through the social media platform, WeChat [3]. After investigations by the Chinese government, COVID-19 was declared a public health emergency in late January 2020. Despite efforts by the Chinese government, by 11 March 2020, the World Health Organization (WHO) characterized COVID-19 as a pandemic and the severity of its rapid spread has continued to produce over 3.5 million cases in almost every nation as of 5 May

[4,5]. According to early reports by the WHO, COVID-19 transmits through droplets when in close 35 contact with an infected person. Public health officials have recommended droplet precautions 36 including thorough hand hygiene and social distancing to slow the spread of the disease. Infection presentations differ but generally follow stages beginning with an asymptomatic incubation period which may progress to a non-severe symptomatic period and, if the viral load increases, severe respiratory symptoms develop [6]. While symptoms vary between cases, common clinical characteristics of COVID-19 include fever, cough, fatigue and pneumonia [7,8]. Those with pre-existing conditions of hypertension and cardiovascular or respiratory disease are more susceptible to the development of COVID-19 [9]. Age also contributes to its pathogenesis as patients with severe cases are significantly older than those with mild cases [9]. To date, there are no known vaccines or cures.

International efforts to mitigate the effects of the pandemic have grown exponentially, but attention remains on the actions of China and its surrounding countries as they were first to experience the outbreak. Although China's strict regulations and governance played a significant role in combating the virus, many barriers to control led to the virus spreading outside of Wuhan into surrounding areas and the world. Reviewing evidence available to critically examine the barriers to disease control that affected China and its surrounding countries is essential for future application of control measures as the pandemic proceeds and outbreaks of communicable diseases continue to appear. B arriers to Control Coronavirus Outbreak Agent-level Barriers Efforts to control communicable diseases begin with an understanding of their nature and aetiology. The profound lack of information specific to COVID-19 was one of the first barriers to controlling its pathogenicity in December 2019 and January 2020. As it was not previously recorded, approaches to outbreak control were based on assumptions and estimations with unpredictable effectiveness.

COVID-19 is a zoonotic disease, as research suggests bats as the original source [10]. Eradication is unlikely and reintroduction to the population is an ongoing threat as it may remain in an animal reservoir [10]. This is especially concerning for China and its surrounding countries as wet markets have been long standing cultural traditions and contact with live animals promotes indirect transmission that have precipitated past outbreaks [11]. It is crucial to identify the origination and intermediary of transmission of a pathogen in order to develop successful preventative and control strategies blocking its re-emergence [10]. The unknown source of human transmission continues to be a barrier as re-emergence from the animal reservoir remains a threat to any control or eradication efforts. Uncertain transmission routes and unknown periods of communicability meant fully informed and effective control efforts were delayed. By the time widespread testing and quarantines were enforced in China, the outbreak had crossed international borders [3,12]. Recent studies conducted in China have estimated the basic reproduction number of COVID-19, also known as the R0 to be 2.0-3.3 [13]. These estimates indicated the unprecedented increase in cases leading specific and targeted control measures to quickly become unfeasible. Epidemic doubling time in Wuhan before quarantine measures were enforced was estimated to be 5 days, indicating the difficulty healthcare workers faced in any attempt to identify and isolate the onslaught of new cases that presented each day [13]. Despite these unavoidable barriers largely stemming from lacking information, the importance of taking pre-emptive and potentially extensive precautions could counter the now-ongoing consequences of these agent-level issues. Case-level Barriers Epidemiological reporting on who is infected in which location on what date is key for identifying cases and enacting control measures in an effective and timely manner [14]. Until 20 February, initial case definitions for COVID-19 in China were too narrow, leading to low sensitivity for case detection as well as the possible missed detection of milder cases [15]. Another barrier to case identification was the unknown sensitivity and specificity of testing methods. Without estimates of false negatives or positives or certainty that the virus was being detected accurately and precisely, cases could have been missed [16]. This yielded spillover effects to surrounding nations as there was a lack of uniformity of testing and estimates of the spread were differentially informed, blocking collaborative and targeted control efforts while contributing to the iceberg of disease [17].

Inadequate case definitions hindered identification as similarities between COVID-19 and MERS observed in South Korea caused diagnostic delays, increasing the opportunity for further spread [18]. The absence of licensed diagnostic tests and lack of uniformity of testing procedures in different countries led to an unclear epidemiologic representation of the virus. Proper detection of cases is also important for accurate description of the issue and reducing the iceberg of disease.

The iceberg of disease remains throughout an infectious out-

break as people with mild or asymptomatic presentation are less likely to seek medical attention needed to be detected as a case. The growing scale of the COVID-19 outbreak remains a barrier to comprehensive and complete testing of exposed populations; non-severe cases will likely continue to spread COVID-19 as a result [19].

China's inadequate testing capacity for COVID-19 in China by mid-February caused many suspected cases to go unreported [19]. It was observed that asymptomatic transmission between close contacts could still cause severe symptomatic cases [20]. The communicable period for COVID-19 could be up to twenty-one days during which patients could develop mild to severe symptoms. This highly communicable infection may spread through direct contact by people who may be asymptomatic [20]. Assumed asymptomatic carriers were found to show mild symptoms that often went undetected and not taken into account as COVID-19 cases [20]. Controlling infection in those without clinical presentation prevents effective control measures around contact tracing, quarantine, surveillance and the true number of cases is significantly underestimated [13].

Initial efforts in China to control the spread of disease in symptomatic individuals ignored screening of asymptomatic or presymptomatic individuals [21]. Despite communication with China, the first nation to experience the outbreak, other countries and health authorities set narrow testing protocols that led to barriers in case detection and further spread of COVID-1 [17]. With accurate case definitions to create robust surveillance systems and control disease spread, future outbreaks can be managed effectively and efficiently.

Population-level barriers

Population movement was elevated at the beginning of the COVID-19 outbreak as it was a holiday season which increased travel rates. This issue was salient in China and its surrounding countries as the widely celebrated Chinese New Year approached [22]. Ease of travel and increased globalisation meant the virus reached widespread populations rapidly [22]. High population densities amplified the spread throughout China and the Western Pacific [3].

Urban areas of China were first to be placed under quarantine to inhibit movement of dense areas, but the effectiveness of this action was restricted by the degree of population mixing before this point [3]. The issues of movement and density turned catastrophic in the case of the Japanese cruise ship, the Diamond Princess, where 634 cases were confirmed in the 2 weeks [23]. This demonstrated the rapid spread that took place when close proximity of travellers prevents effective isolation.

The cultural norms of populations in the Asian region serves as an additional barrier to controlling infectious diseases of zoonotic origins. The availability of wet markets in Asian countries are known sources of influenza and coronaviruses [1]. Due to their importance to cultural practices and livelihoods of many individuals, limiting their effects would be difficult, but are important to consider [11]. The potential of reintroduction from the animal reservoir to the human population, high density areas and migration patterns may lead to severe outbreaks with increased exposure to transmission routes reversing control measures unless these barriers are addressed.

Systemic-level barriers

Systemic barriers to control emerged as governments and organizations reacted to the outbreak. In the early stages of the COVID-19 pandemic, there was a delay to respond. Despite the first reported case occurring in early December 2019 and suspicion of a potential epidemic weeks later, it was not until 20 January 2020 that the novel coronavirus was officially reported (Hua and Shaw, 2020). This delay in investigative action and lack of control efforts during this early phase was already proving detrimental.

The Chinese government compelled those drawing attention to the novel virus to apologize for spreading this information, doubts and mistrust in the severity of the issue ensued. This manifested as populations becoming intolerant of quarantine and contact tracing. The nondisclosure and suppression of information meant the threat of the incoming pandemic was not realized before the outbreak could be controlled. China's history of censorship inhibited access to information early on that hindered control efforts internationally [3,12]. Had a complete description of the issue been provided earlier, control measures could have been more specific and containment may have been achievable.

Additionally, researchers found it difficult to analyze and draw conclusions from Chinese reliable data between December 2019 to February 2020 from the wide-ranging sources including websites,

social media and research organisations. Misinformation provided by several sources made it difficult to filter and collect accurate information for data analysis [3]. These information issues manifested in other nations as well with language barriers in reports, convoluted sources and subsequent reliance on unofficial reports for information while official investigations were ongoing [3]. The absent epidemiological knowledge proved difficult for surrounding countries when establishing control measures.

A country's ability to produce and allocate an appropriate amount of healthcare resources is crucial in disease control, all of which were suddenly in high demand [24]. Each decision to prioritise one area over another was intended to help progress towards outbreak control, but there was a lacking in the completeness of any approach, as evidenced by the ongoing pandemic. The lack of human resources and personal protective equipment (PPE) in areas with a high number of cases proved detrimental to efficient disease control [25]. The lack of preparedness at the macro- level was exacerbated due to the rapid escalation of the virus' spread. The language barriers, misinformation and unprecedented scarcity of these essential health resources impeded aspects of disease control as they were not comprehensive enough to fully capture and contain the outbreak.

Conclusions

Barrier identification, emergency preparedness and open communication among nations are crucial for disease control strategies. Reflecting on these issues informs how these barriers may overcome as lessons are carried forward. Outbreak control measures for novel infectious agents will be informed by these missteps for a better and stronger collective public health response in the future. Further epidemiologic studies that aim to investigate the origin and pathogenesis of the virus will aid in providing and developing guidelines that will stop the continued rapid spread of the pandemic. Systemic barriers will need to be a focus of public health efforts for future infectious outbreaks as they carry the strongest potential for long-term impact.

Bibliography

1. Huang C., *et al*. "Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China". *The Lancet* 395 (2020): 497-506.

2. Wu JT., *et al*. "Estimating clinical severity of COVID-19 from the transmission dynamics in Wuhan, China". *Nature Medicine* (2020b): 1-5.

3. Hua J and Shaw R. "Corona virus (Covid-19) "infodemic" and emerging issues through a data lens: The case of china". *International Journal of Environmental Research and Public Health* 17 (2020): 2309.

4. World Health Organization. Coronavirus disease 2019 (COVID-19): situation report 51 (2020b).

5. World Health Organization. Coronavirus disease 2019 (COVID-19): situation report 106 (2020c).

6. Shi Y., *et al*. "COVID-19 infection: the perspectives on immune responses". *Nature Publishing Group* (2020).

7. Guan W-J., *et al*. "Clinical characteristics of coronavirus disease 2019 in China". *New England Journal of Medicine* 382 (2020): 1708-1720.

8. Wang D., *et al*. "Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus–infected pneumonia in Wuhan, China". *JAMA* 323 (2020b): 1061-1069.

9. Yang J., *et al*. "Evolving epidemiology and transmission dynamics of coronavirus disease 2019 outside Hubei province, China: a descriptive and modelling study". *The Lancet Infectious Diseases* (2020).

10. Shereen MA., *et al*. "COVID-19 infection: origin, transmission, and characteristics of human coronaviruses". *Journal of Advanced Research* (2020).

11. Webster RG. "Wet markets--a continuing source of severe acute respiratory syndrome and influenza?" *The Lancet* 363 (2004): 234-236.

12. World Health Organization. Coronavirus disease 2019 (COVID-19): situation report 1 (2020a).

13. Wu D., *et al*. "The SARS-CoV-2 outbreak: What we know". *International Journal of Infectious Diseases* 94 (2020a): 44-48.

14. Wang CJ., *et al*. "Response to COVID-19 in Taiwan: big data analytics, new technology, and proactive testing". *JAMA* 323 (2020a): 1341-1342.

15. Tsang TK., *et al*. "Effect of changing case definitions for COVID-19 on the epidemic curve and transmission parameters in mainland China: a modelling study". *The Lancet Public Health* (2020).

16. Bai HX., *et al*. "Performance of radiologists in differentiating COVID-19 from viral pneumonia on chest CT". *Radiology* (2020): 200823.

17. Lippi G and Plebani M. "The critical role of laboratory medicine during coronavirus disease 2019 (COVID-19) and other viral outbreaks". *Clinical Chemistry and Laboratory Medicine (CCLM)* 1 (2020).

18. Shim E., *et al*. "Transmission potential and severity of COVID-19 in South Korea". *International Journal of Infectious Diseases* (2020).

19. Wu Z and Mcgoogan JM. "Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention". *JAMA* 323 (2020): 1239-1242.

20. Hu Z., *et al*. "Clinical characteristics of 24 asymptomatic infections with COVID-19 screened among close contacts in Nanjing, China". *Science China Life Sciences* (2020): 1-6.

21. Villa S., *et al*. "The COVID-19 pandemic preparedness or lack thereof: from China to Italy". *Global Health and Medicine* (2020).

22. Mizumoto K., *et al*. "Estimating the asymptomatic proportion of coronavirus disease 2019 (COVID-19) cases on board the Diamond Princess cruise ship, Yokohama, Japan, 2020". *Eurosurveillance* 25 (2020): 2000180.

23. Emanuel EH., *et al*. "Fair allocation of scarce medical resources in the time of Covid-19". *Massachusetts Medical Society* (2020).

24. Oh J., *et al*. "National Response to COVID-19 in the Republic of Korea and Lessons Learned for Other Countries". *Health Systems and Reform* 6 (2020): e-1753464.