



Reflections on the Cluster Epidemic of COVID-19; Lessons Learned from Wuhan's Experience: A Brief Review

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Abstract

At present, new coronavirus pneumonia (COVID-19) is circulating worldwide. The pathogen of this coronavirus pneumonia is named SARS-CoV-2. The virus has a long incubation period and is highly contagious. There is currently no specific targeted drug treatment. The focus of anti-epidemic work should be more on prevention and control while cutting off the virus transmission route while treating infected patients, and protecting healthy people. In order to protect the safety and health of the Chinese citizens and to maintain the safety of world public health, the Chinese government and people have made unprecedented efforts to control the epidemic. Many people in the international community have joined in limiting the spread of COVID-19. This article combines the development of COVID-19 epidemic situation in Wuhan, the relevant prevention and control measures of the Wuhan government and local health authorities to share Wuhan's experience on control the cluster epidemic and provide new suggestions and ideas for epidemic prevention and control.

Keywords: COVID-19; Cluster epidemic; Prevention and control measures; China

Introduction

In Dec 2019, a novel coronavirus has been risen wide attention within China and abroad (1). As the number of reported confirmed cases climbs, countries are increasingly concerned about the transmission characteristics of the unusual cases of acute pneumonia. Now the pathogen of unexplained pneumonia cases has been verified to be SARS-CoV-2 (2), and the disease is named COVID-19 (3).

There were 1,990,380 confirmed COVID-19 cases reported from over 200 countries and regions outside mainland China at present until the date

of writing this article (4). COVID-19 has evolved into a pandemic worldwide.

At the early stage of the COVID-19 epidemic, sporadic cases were the main cause. With the development of the epidemic progress, the proportion of the incidence of the clustered cases increased continuously, and the source of exposure changed greatly (5). The COVID-19 cluster cases appeared in several places, which accelerated the spread of the epidemic and put forward new challenges and higher requirements for management and control of the disease globally. The government and health authorities adopted

strong control measures, and Wuhan finally controlled the epidemic.

We summarized past experiences on control the outbreak with advice on how to avoid them.

Development of COVID-19 epidemic in Wuhan

On 31 Dec 2019, Wuhan Health Commission released the official information that 27 cases of unexplained pneumonia with seven critical cases, had been identified. Initial investigations revealed that no significant human-to-human transmission was observed and no healthcare workers were infected (6). Most of the pneumonia cases are workers at South China Seafood Wholesale Market. The market was closed for sanitation and disinfection on Jan 1, 2020, and has not yet reopened (7). Since 3 Jan 2020, the Chinese government has been reporting information on the outbreak to the WHO (8). By 20 Jan 2020, the cumulative number of confirmed cases rose to 258, some of the cases from family clusters suggested that there may have been human-to-human

transmission (9). Subsequently, 15 healthcare workers in Wuhan were confirmed to be infected with SARS-CoV-2 (10). The virus can transmit readily between people (11).

Management strategies

When faced with the grim situation of the epidemic, the Wuhan government had set up the prevention and control headquarters of COVID-19 and has taken a series of measures to contain the outbreak (Fig. 1). On 23 Jan 2020, Wuhan locked down the entire city to stop the spread of the virus (12). As it was the Spring Festival holiday, the phenomenon of crowd gathering was also increasing due to the arrangements of traffic, dinner parties and travel, etc. Significantly increasing the risk of contracting the virus. As a result, the epidemic spread to local families and communities in Wuhan and newly diagnosed cases with a history of traveling in Wuhan had been found throughout the Hubei province and even nationwide gradually.

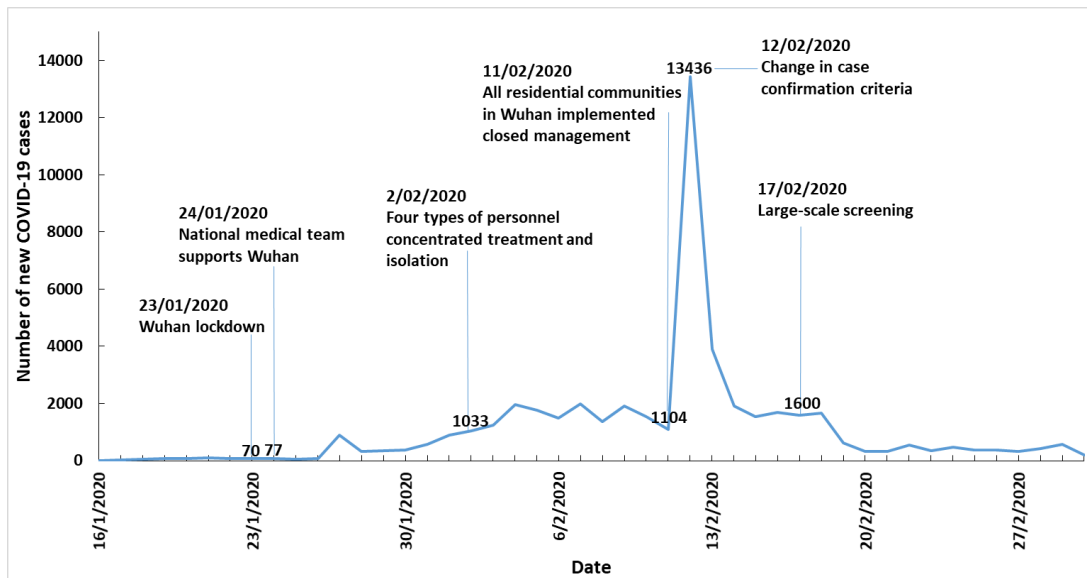


Fig. 1: Timeline of events and reported newly confirmed cases with COVID-19 in Wuhan, China. Newly confirmed case report numbers were acquired from National Health Commission of the People's Republic of China and Wuhan Municipal Health Commission

In January 2020, due to the growth of newly confirmed cases, local medical resources in Wuhan became increasingly strained. There was no more healthcare workers and beds for newly infected patients. To alleviate the shortage of beds in designated hospitals in Wuhan, epicenter of the novel coronavirus outbreak, the local authority decided to convert public facilities such as conference venues and sports stadiums into temporary hospitals to accommodate COVID-19 patients with milder symptoms and observe close contacts (13). What's more, Wuhan completed construction of two 1,000 beds temporary isolation hospitals in 10 d to receive and treat patients with COVID-19 (14, 15). Over 42,000 medical workers of 346 medical teams across China, including the army, rushed to Hubei and Wuhan to provide medical help from 24 Jan 2020 (16). Wuhan's ability and conditions to receive and isolate confirmed patients have been greatly improved and the treatment effect and success rate of critically ill patients have been improved.

To effectively control the source of infection, cut off the transmission route and contain the spread of the epidemic, on 2 Feb 2020 Wuhan announced that four categories of people including confirmed patients, suspected patients, patients with fever and close contacts, will be classified centralized treatment and isolation (15). Suspected patients must be centralized and isolated. Severe patients must be sent to designated hospitals for treatment. If mild patients cannot all enter designated hospitals for treatment, other hospitals or hotels must be recruited as temporary treatment areas for centralized treatment. To effectively prevent the family cluster transmitted infections, home isolation was not allowed. The test result was "double negative", but patients with clinical symptoms consistent with the COVID-19 were still managed as suspected patients. For patients with fever with pneumonia that cannot be explicitly ruled out for SARS-CoV-2 infections, referred to suspected patients for centralized isolation and observation, and isolate them from suspected patients to prevent cross infection. This method can effectively prevent the spread of disease from person to person.

Because some cases were contagious during the asymptomatic incubation period, close contacts of confirmed patients should also be observed in isolation.

Moreover, all residential communities within Wuhan were managed by enclosed type from 11 Feb 2020 to further strengthened control over the source and minimized the flow of people (17). China has improved case confirmation standards as disease awareness increases and diagnostic guidelines update, the number of newly confirmed cases on a single day on 12 Feb 2020 reached a peak of 13,436 (18). Starting from 17 February 2020, Wuhan had carried out a large-scale net screening for three consecutive days, and some confirmed cases without hospitalization found in some areas (19). With unremitting efforts, the number of daily newly confirmed cases has gradually decreased since 13 Feb 2020. By 19 Mar 2020, no new cases of SARS-CoV-2 infection had been found in Wuhan, and the outbreak was basically under control (20).

Discussion

In this outbreak, Wuhan made huge sacrifices and suffered huge losses to control the epidemic and eventually control the epidemic with the support and help of the country and the world. What can we learn from the experience? One question we need to consider is how to avoid such huge losses in the face of public health emergencies.

First, the authorities need to keep the public informed of the situation of the epidemic and the progress of prevention and control in a timely and transparent manner, release authoritative information in a unified way, popularize knowledge on prevention and control, and eliminate public panic to the greatest extent. On 8 Dec 2019, the first case of unexplained pneumonia was reported (21). At that time, medical experts had very limited knowledge and research on this new disease, and did not understand the harmfulness and severity of the disease. In fact, the virus spreads very quickly in the crowd and the people are easi-

ly infected with the virus through droplets and close contact. Subsequently, patients gathered to go to the hospital for treatment, and medical resources were difficult to cope with. Wuhan once had a large number of patients who could not be admitted to hospitals in time. Some milder patients had to go home for self-isolation, which led to an increase in family clustered cases. The rapid increase in the number of confirmed patients increased the burden of local medical assistance.

Second, isolating the source of infection, cutting off transmission routes and protecting susceptible people are the basic principles for the prevention and control of infectious diseases. After blocking the city, Wuhan has successively adopted measures such as the four categories of personnel isolation, blockade of communities and large-screen screening to effectively control the spread of the epidemic. The total number of confirmed cases continues to rise because SARS-CoV-2 is a newly discovered pathogen recently, humans do not have immunity to the new virus. Everyone is considered susceptible based on the epidemiologic characteristics observed in China recently (22). According to the latest study, before the blockade of Wuhan on 23 Jan 2020, number of confirmed cases reported was only 14% of total infections. Substantial undocumented infection facilitates the rapid dissemination of SARS-CoV-2. The undocumented infections are the main cause of the rapid spread of the COVID-19 epidemic, and also the core of the problematic prevention and control in the early stage of the outbreak (23). Therefore, authorities cannot maintain a wait-and-see attitude when facing unknown epidemic diseases, epidemiological investigations should be actively carried out, and early screening and isolation of confirmed cases, suspected cases and close contacts are essential. The temporary hospital was proved to be an innovative and effective move that will guide future such situations.

Third, it is urgent to establish and improve the disease monitoring and pre-warning network management system which can provide accurate and reliable early data for early detection, early

reporting and early control of infectious diseases and public health emergencies. COVID-19 transmission has been reported in prisons with more than 500 confirmed cases (24). Prisons appear to be blind spots for supervision. Early reporting is a vital prerequisite for early emergency response. Disease surveillance reporting system helps early detection of outbreaks. Therefore, we need to establish an efficient Internet-based disease early warning and reporting system across the country. Any such epidemic should be timely reported to the local health authorities through the system to help curb the outbreak.

Last but not least, public awareness of infectious diseases needs to be strengthened. There was low awareness of the severity of COVID-19 in population (25). Patients in peak hours are gathered and waiting in queues is too long. The emergency area of the hospital is overcrowded. Some confirmed patients did not show any suspicious symptoms at the time of testing (26). In a densely populated environment, people are more likely to be infected if they breathed air contaminated with the virus. What's more, the most commonly affected healthcare workers do not come from the department of infection, but from ophthalmology, neurology and other departments. In the early days of the outbreak, more than 3,000 health workers in China infected due to a lack of awareness and supplies (27). As a healthcare worker, only when you protect yourself well can you protect others. After clarifying the pathogens and modes of transmission, health authorities should promptly disseminate health protection knowledge to the public and improve their awareness of self-protection. During the outbreak, everyone needs to maintain good personal protection habits such as wearing masks, observing good hand hygiene, ventilation frequently, and do not gather together.

Conclusion

The prevalence of SARS-CoV-2 on a global scale poses a significant threat to the health of people all over the world and also harms the development of the world economy. Many countries

have paid an enormous price for the prevention and control of COVID-19 pandemic. Although the COVID-19 epidemic has effectively controlled in China, it is outbreaking in some other countries and regions. Nations need to strengthen cooperation in response to the challenge of this global public health issue. We can know from the experience of China that once an infectious disease identified, the source of the infection must be quickly isolated, the transmission route must cut off, and the susceptible population must be protected. And in the early stage of the outbreak, we should strengthen the screening of patients and make diagnosis and treatment according to the severity of the disease. We must carry out a series of systematic research and development on our potential dangers so that some effective prevention methods and treatment methods can be put in place before the disease comes. Only in this way can the effective control of the spread of infectious diseases be early.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

The authors declare that there is no conflict of interest.

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