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COMPARATIVE ANALYSIS OF COVID-19 EPIDEMIC IN HUBEI PROVINCE AND REST PARTS OF MAINLAND CHINA

Epidemiology

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ABSTRACT

Background: China 's national-level anti-COVID-19 campaign has been going on for a month. With the development of the epidemic, it is found that COVID-19 severity in Hubei province (Hubei) is different from the rest of mainland China (Rest of China). It is necessary to compare the two areas, summarize experiences and lessons, analyze the epidemic trend and further point out the direction for the campaign.

Methods: Prevent, quarantine and treat the disease according to *The Novel Coronavirus Infected Pneumonia Diagnosis and Treatment Standards.* Collect the numbers of total close contacts, daily observation cases, daily suspected cases, total confirmed cases, daily severe cases, total deaths from January 20 to February 19, input them into SPSS 25 and Microsoft office 2019 excel for data processing, statistical analysis and drawing.

Findings: Total confirmed cases in Hubei account for 83.2% of the country. Daily suspected cases growth rates for both areas have become negative since February 9. Daily observation cases in Rest of China reached highest point on February 5 as opposed to February 13 in Hubei, and total close contacts growth rates for the last three days are declining steadily to 1.9% and 3.8% respectively. Total confirmed cases growth rate has hit the lowest levels in Rest of China at 0.34% by comparison with 0.57% in Hubei. Mean fatality rate and mean percentage of severe cases for the last three days in Rest of China are 0.67% and 5.83% in contrast to 3.12% and 18.2% in Hubei. There have been very significant differences in fatality rate and percentage of severe cases existing in the two areas since January 23 and 24 respectively ($P<0.01$).

Interpretation: Hubei is the main epidemic area. COVID-19 has low fatality rate and high transmissibility. Cutting off the source of infection is pivotal in containing COVID-19 outbreak and has a guiding effect on prevention and control of pandemic worldwide. *The Novel Coronavirus Infected Pneumonia Diagnosis and Treatment Standards* has played an important role in helping medical staff across the country to fight the epidemic. Coordinating national medical resources to support disaster areas, making full use of the existing facilities to isolate and quarantine, providing timely and accurate treatment can reduce fatality rate. Further efforts are needed to develop highly effective Chinese medicines, western drugs and vaccines in order to eradicate the virus or prevent the epidemic from continuing.

KEYWORDS

Hong Kong Chinese Medicine Development Fund (19B2/032A)

INTRODUCTION

A cluster of patients with pneumonia of unknown cause was linked to South China Seafood Market in Wuhan, Hubei Province since 8 December 2019[1]. After receiving the report, Wuhan Municipal Health Commission, Health Commission of Hubei Province and National Health Commission of People's Republic of China have conducted relevant case searches, retrospective investigations, and epidemiological studies [2]. Since January 1, 2020, the Market has been closed and measures have been taken to further strengthen disease prevention and environmental hygiene in public places in the city. On January 10, 2020, the pathogenic nucleic acid gene sequencing of 8 bronchoalveolar lavage fluid samples from Wuhan pneumonia patients was completed which showed that the virus was closely related (with 88% identity) to two bat-derived severe acute respiratory syndrome (SARS)-like coronaviruses, bat-SL-CoVZC45 and bat-SL-CoVZXC21 [3,4].The University of Hong Kong performed bioinformatics analysis on a virus genome from a patient with Wuhan pneumonia and compared it with other related coronavirus genomes, the genome of 2019-nCoV has 89% nucleotide identity with bat SARS-like-CoVZXC21 and 82% with that of human SARS-CoV [5]. On January 20,2020, a total of 291 cases of COVID-19 have been reported in Wuhan and other provinces, It has become a national epidemic, and will become a worldwide pandemic if the virus spread cannot be curbed[6-9].

China 's national-level anti-COVID-19 campaign began on January 20 followed by Wuhan City blocked at 10 o'clock on January 23 and has been going on for a month. Despite the concealment and delay at the beginning, the Chinese central government has given greater attention and efforts to 2019 novel coronavirus prevention and control ever since[10]. It is unprecedented for China to implement the closure of Wuhan City, blocking the export of disease to the whole country and the world.

As of February 19, 2020, there are a total of 62031 confirmed cases, 214096 close contacts, 10337 discharged cases, 2029 deaths and 11178 daily severe cases in Hubei by comparison with 12545, 375067, 5818,89, 686 respectively in Rest of China. The sum of the two data is the total of China, with 74576 confirmed cases, 589163 close contacts, 16155 discharged cases, 2118 deaths and 11864 daily severe cases. A total of 99 cases were diagnosed in Hong Kong (65, two deaths), Macao (10) and Taiwan (24, one death). 1010 cases were reported overseas in 26 countries with 5 deaths. With the development of the epidemic, it is found that COVID-19 severity in Hubei is different from Rest of China, as summarized below.

METHODS

The Novel Coronavirus Infected Pneumonia Diagnosis and Treatment Standards[11]. Adopt the criteria for close contact, observation case, suspected case, confirmed case, severe case, differential diagnosis, clinical classification, discharge standard from this code to prevent, quarantine, diagnose, and treat the disease[12,13].

Collect all data released daily by the Health Commission of Hubei Province, National Health Commission of People's Republic of China, on China's fight against COVID-19 epidemic, including numbers of total close contacts, daily observation cases, daily suspected cases, total confirmed cases, daily severe cases, total deaths from January 20 to February 19. Input them into SPSS 25 statistical analysis package for data processing and statistical analysis such as Pearson chi-square test to process the count data. Apply Microsoft office 2019 excel for drawing double Y-axis plots. The growth rate of all data is today's data minus yesterday's data divided by yesterday's data. Total represents the total number of consecutive accumulations, daily represents the number of cases on that day.

RESULTS

Total confirmed cases in Hubei Province account for 83.2% (62031 ÷ 74576) of the country, and 82% (62031 ÷ 75685) of the world. The

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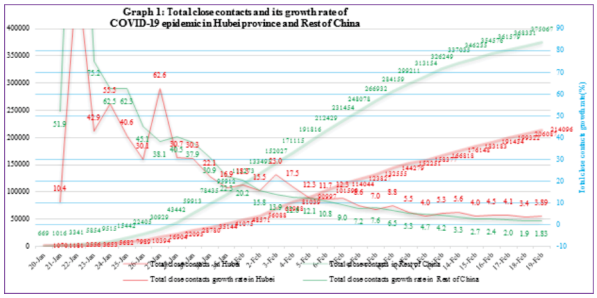
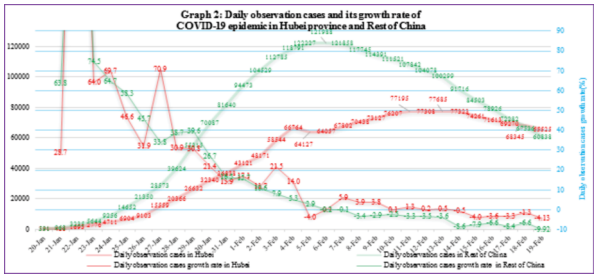
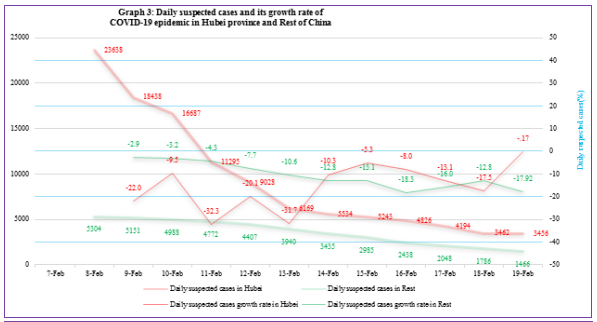
latest fatality rate for whole China is 2.84% (2118 ÷ 74576 or 2121 ÷ 74675)and 2.81% (2126 ÷ 75685) for whole world.

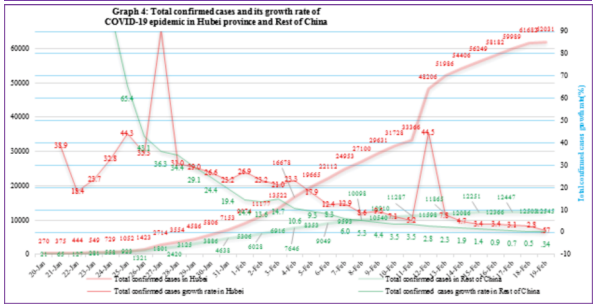
Total close contacts in Hubei and Rest of China are growing, but their mean growth rates for the last three days are declining steadily to 3.8% and 1.9% respectively, therefore, their trends are moving in a good direction. (Graph 1). Daily observation cases in Hubei and Rest of China reach highest points on February 13 and 5 respectively, indicating that the turning point has appeared since that day. (Graph 2).



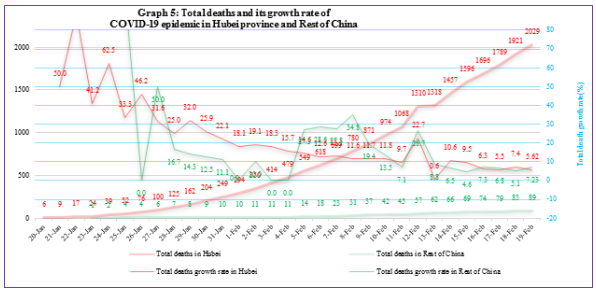


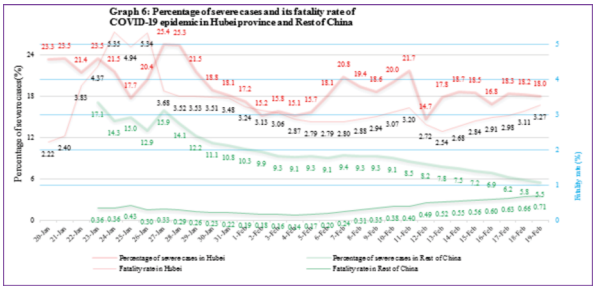
Daily suspected cases growth rates in Hubei and Rest of China have become negative since February 9, representing that suspected cases are continuously getting fewer and fewer (Graph 3). Total confirmed cases growth rate has hit the lowest levels at 0.57% in Hubei as opposed to 0.34% in Rest of China, demonstrating that total confirmed cases will reach peaks. On February 12, the diagnostic criteria for clinically diagnosed cases in Hubei no longer required nucleic acid testing reports, so the number of confirmed diagnoses suddenly increased, not because of an exacerbated epidemic, but because of changes in clinical diagnostic criteria, and the number of confirmed diagnoses dropped rapidly the next day. (Graph 4).





Mean total deaths growth rate in Hubei has declined and is currently fluctuating at 6.2% by comparison with 6.4% in Rest of China for the last three days (Graph 5). Hubei province is the source of the epidemic and hardest hit area with a higher mean fatality rate (3.12%) than Rest of China (0.67%) for the last three days. Mean percentage of severe cases for the last three days in Hubei is 18.2% in contrast to 5.83% in Rest of China (Graph 6). Using Pearson chi-square test, very significant differences in fatality rate and percentage of severe cases have been existing in the two areas of China since January 23 and January 24 respectively ($P<0.01$)





DISCUSSION

COVID-19 originated in Wuhan, Hubei Province, where is the main epidemic area. The Spring Festival is the most important festival for Chinese people to reunite or travel each year. However, before the closure of the city, it is estimated that more than 5 million residents and passengers have left the city for Chinese new year, thus contributing to further spread[10]. This is why Hubei accounted for 92.8% (270 ÷ 291)on January 20 at the beginning, then gradually dropped to 51.9%(1423 ÷ 2744) at the lowest point on January 26 when imported cases outbreaks in neighboring provinces and cities had shared the proportion. However, the largest number returned to hometowns in Hubei province, the proportion of Hubei then slowly increased. Total confirmed cases in Hubei province account for 83.2% of the country, and 82% of the world, indicating that Hubei Province is the main epidemic area. Although the government blocked the news and delayed the control of the epidemic at the beginning[14], after the lock-down in Wuhan, it has delayed the epidemic to spread to the world, at least one month of preparation time for the world has been obtained.

COVID-19 has low fatality rate and high transmissibility. The latest fatality rate is 2.84% for whole China and 2.81% for whole world, and with a higher mean fatality rate in Hubei (3.12%) than in Rest of China (0.67%) for the last three days.The reason why the fatality rate in Hubei is higher is that when COVID-19 occurred, all hospitals in Hubei, especially in Wuhan were overcrowded and there were no beds to take in patients, thus letting patients go home and isolate themselves. After waiting for several days at home, most patients became severe. Mean percentage of severe cases for the last three days in Hubei is 18.2% in contrast to 5.83% in Rest of China. Very significant differences in fatality rate and percentage of severe cases have been existing in the two areas of China since January 23 and January 24 respectively ($P<0.01$). On the whole, COVID-19 is less pathogenic than SARS-CoV (10%), and much less than MERS-CoV (40%)[8]. Estimated R_0 for COVID-19 ranges from 3.3 to 5.5, which is higher than those of SARS-CoV (R_0: 2–5) and MERS-CoV (R_0: < 1)[15]. That's why COVID-19 has infected so many people within 2 months and fatality rate is less than SARS.

Cutting off the source of infection is pivotal in containing COVID-19 outbreak and has a guiding effect on prevention and control of pandemic worldwide. No one can tell whether this epidemic will completely disappear like SARS or not, but it is certain that public health emergency of international concern (PHEIC) will repeat in the future. Isolation is the separation of ill persons from non-infected persons. Quarantine is movement restriction, often with fever surveillance, community containment includes measures that range from increasing social distancing to community-wide quarantine[14].During the Spring Festival, there was basically no visit and no travel, and some provinces and cities also implemented closure

of villages or closure of residential communities to "suffocate the virus" more or less like closure of Wuhan. China has issued the largest quarantine in history.

The Novel Coronavirus Infected Pneumonia Diagnosis and Treatment Standards has played an important role in helping medical staff across the country to fight the epidemic[11]. With the continuous improvement of disease awareness and the accumulation of experience in prevention and treatment, the guideline has been continuously updated for six times. Medical staffs can use the updated guideline to prevent, quarantine and treat the disease.

Coordinating national medical resources to support disaster-stricken areas, making full use of the existing facilities to isolate and quarantine, and providing timely and accurate treatment can reduce fatality rate. In the case of a large increase in the number of outbreaks of infectious diseases[10], it is necessary to coordinate national medical resources to support disaster areas; under circumstances of not enough beds in the hospital to fully accommodate the patients, it is imperative to make full use of the existing social facilities, such as conference centers, universities, gyms and hotels, to isolate and quarantine patients[14]; in the absence of nucleic acid diagnostic kits, it is essential to use existing drugs to treat patients immediately, and there is no need to wait for confirmed diagnosis before starting treatment, for example Chinese medicine has advantages in the treatment of viral infectious diseases.

Further efforts are needed to develop highly effective Chinese medicines, western drugs and vaccines in order to eradicate the virus or prevent the epidemic from continuing. If the epidemic spreads to the world, all parts of the world can learn from China's experience to strictly cut off the source of infection.

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