

Epidemiology of COVID-19 in Jiangxi, China

A retrospective observational study

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Abstract

To analyze the epidemiological characteristics of coronavirus disease 2019 (COVID-19) in Jiangxi Province, China, from January 21 to April 9, 2020.

COVID-19 epidemic information was obtained from the official websites of the Jiangxi Provincial Health Committee, Hubei Provincial Health Committee, and National Health Commission of the People's Republic of China. ArcGIS 10.0 was used to draw a map of the spatial distribution of the cases.

On January 21, 2020, the first COVID-19 confirmed case in Jiangxi was reported. By January 27, COVID-19 had spread rapidly to all cities in Jiangxi. The outbreak peaked on February 3, with a daily incidence of 85 cases. The last indigenous case reported on February 27. From January 21 to April 9, a total of 937 confirmed cases of COVID-19 were reported, with a cumulative incidence of 2.02/100,000. Of those, 936 patients (99.89%) were cured, and 1 (0.11%) died due to COVID-19. The COVID-19 epidemic trend in Jiangxi was basically consistent with the national epidemic trend (except Hubei). Throughout the epidemic prevention and control phase, Jiangxi province has taken targeted prevention and control measures based on the severity of the spread of COVID-19.

The COVID-19 epidemic in Jiangxi was widespread and developed rapidly. In less than 1 month, the epidemic situation was effectively controlled, and the epidemic situation shifted to a low-level distribution state. All these proved that the COVID-19 prevention and control strategies and measures adopted by Jiangxi Province were right, positive and effective.

Abbreviations: COVID-19 = coronavirus disease 2019, SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2.

Keywords: coronavirus disease 2019, epidemiology, strategy, time and space distribution

1. Introduction

In late December 2019, Wuhan, Hubei Province, China, reported a group of pneumonia cases of unknown cause.^[1–3] On January 7, 2020, Chinese scientists isolated a coronavirus from the respiratory tract specimens of the patients for the first time, and after full-gene sequencing, they identified it as a novel

coronavirus (severe acute respiratory syndrome coronavirus 2, [SARS-CoV-2]),^[1,4] which can cause coronavirus disease 2019 (COVID-19). Since then, COVID-19 has progressed rapidly in China.^[5–10] In addition, cases have been reported in other countries around the world, and the number of patients with COVID-19 has increased dramatically. On March 11, 2020, the World Health Organization assessed that COVID-19 could be characterized as a pandemic.^[11] From the first report of COVID-19 to December 31, 2020, the COVID-19 epidemic has spread to almost every country in the world, with 83 million confirmed cases within 1 year.

Jiangxi is an inland province in central China with a population of 46.5 million. It is located on the southeast border of Hubei. To leave Hubei to the east or south, one must pass through Jiangxi. Hubei has confirmed about 83% (67,803/81,907) of all COVID-19 cases in China,^[12] so Jiangxi is under intense pressure to prevent imported cases from Hubei. To prevent further spread of the epidemic in Wuhan, a first-level response to a major public health emergency was launched on January 23, 2020, and the city was sealed off. On January 21, 2020, the first case was reported in Jiangxi,^[13] and on January 24, 2020, a first level-response to a major public health emergency was promptly launched, and the most stringent prevention and control measures were taken.^[14] Within 20 days, the number of new cases per day was controlled, dropping from nearly 100 per day to less than 10. As of April 9, Jiangxi reported a total of 937 cases, the last of whom occurred on March 28. This last patient was discharged from the hospital on April 9, 2020.

So far, the global COVID-19 epidemic continues to rage.^[15–18] Although COVID-19 vaccine has been developed^[19–22] and high-risk workers have been vaccinated firstly. It is still far from

Editor: Bruno M. Carneiro.

This research was funded by science and technology planning project of Health Commission of Jiangxi Province, China (NO: 202130994).

The authors have no conflicts of interests to disclose.

Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

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How to cite this article: Dong Y, Ding S, Zhang J, Liu Y. Epidemiology of COVID-19 in Jiangxi, China: a retrospective observational study. *Medicine* 2021;100:43 (e27685).

Received: 31 March 2021 / Received in final form: 26 September 2021 / Accepted: 13 October 2021

<http://dx.doi.org/10.1097/MD.00000000000027685>

universal immunization. Since the beginning of winter in 2020, large clusters of COVID-19 outbreaks have occurred in Hebei, Heilongjiang and Jilin provinces in China. All these remind us that the prevention and control of COVID-19 epidemic cannot relax our vigilance. Therefore, it is very necessary to retrospectively analyze the COVID-19 epidemic characteristics in Jiangxi Province.

Now, there has been no report on the epidemiological characteristics of COVID-19 in Jiangxi or comparative analysis between Jiangxi and the country as a whole. Therefore, this study intends to use a retrospective observational design to describe the epidemic trends of COVID-19 in Jiangxi and compare them with trends in the whole country (excluding Hubei). In addition, we also accessed the science of prevention and control strategies and measures in order to provide a basis for the formulation of regular prevention and control measures for COVID-19 in Jiangxi in the future.

2. Materials and methods

2.1. Data sources

This study was a retrospective observational study. COVID-19 epidemic data were obtained from the epidemic information published daily on the official websites of the Jiangxi Provincial Health Commission,^[23] Hubei Provincial Health Commission^[24] and National Health Commission of the People's Republic of China.^[25] In this study, we chose April 9, 2020, as the cut-off date mainly because it was the second day after Wuhan lifted the blockade, and since then, Jiangxi has not reported a locally confirmed case.

2.2. Case definition

Confirmed and suspected cases of COVID-19 were defined in accordance with the COVID-19 Diagnosis and Treatment Plan issued by the National Health Commission of the People's of China.^[26]

2.3. Research contents

The epidemiological characteristics of COVID-19 cases in Jiangxi, such as time distribution and regional distribution, were described. And the epidemic trend in Jiangxi was compared with that in Hubei and the whole country (excluding Hubei). In addition, the COVID-19 prevention and control measures in Jiangxi were described.

2.4. Ethical approval

There was no need for ethical approval because all data were from official channels of epidemic information release and all information used was anonymous in this retrospective observational study.

2.5. Statistical methods

ArcGIS 10.1 software (Environmental Systems Research Institute, Redlands, CA, USA) was used to draw a map of the spatial distribution of cases. Microsoft Excel 2016 (Microsoft Corporation) was used to draw an epidemic curve of when cases were reported.

3. Results

3.1. Time distribution characteristics

Since the first confirmed COVID-19 case in Jiangxi province was reported, the number of new cases per day rose sharply in the following days. The number of new cases per day peaked at 85 on February 3, then declined. By February 16, the number of new cases per day was below 10. The last indigenous case was reported in Jiangxi on February 27. Jiangxi reported 1 imported case from abroad on March 21, and another on March 28 (see Fig. 1).

On January 26, 2020, the first suspected COVID-19 case was reported (there was no definition of "suspected case" before), and the number of suspected cases reached 50 that day. From January 30 to February 4, the number of new suspected cases was above 100 per day. Two suspected cases occurred since February 16, but these were ruled out quickly.

3.2. Regional distribution characteristics

From January 21 to April 9, 2020, all 11 cities in Jiangxi reported COVID-19 cases. Nanchang, Jiujiang, Xinyu, Yichun, and Shangrao had more than 100 cases. Jingdezhen had the least number of confirmed cases, with only 6. In terms of the crude incidence of COVID-19 in the whole population, the incidence of COVID-19 in Jiangxi was 2.02%. The incidence of COVID-19 reached 10.95 per 100,000 in Xinyu and 4.20 per 100,000 in Nanchang. The incidence of COVID-19 in Jingdezhen, Ganzhou, and Ji'an was lower than 1.00 per 100,000 (see Table 1).

3.3. Spatial and temporal distribution characteristics

The spatial and temporal distribution characteristics were showed in Figure 5. On January 21, 2020, Fuzhou and Pingxiang in Jiangxi, China, each reported 1 confirmed COVID-19 case. This was the first reported COVID-19 outbreak in Jiangxi. Subsequently, COVID-19 epidemic spread rapidly throughout Jiangxi, and by January 27, it had spread to all 11 cities in the province. On February 3, the daily number of confirmed COVID-19 cases peaked at 85. Nanchang was the only city with a total of more than 100 confirmed cases. On February 27, the last confirmed COVID-19 case was reported in Jiangxi. When the last imported case was reported on March 28, 5 cities (Nanchang, Jiujiang, Xinyu, Shangrao, and Yichun) had more than 100 confirmed cases. The city least affected by the COVID-19 outbreak was Jingdezhen, with only 6 cases.

3.4. Patient outcomes

The first confirmed case in Jiangxi was cured and discharged from the hospital on January 27, 2020. By March 11, all local cases in Jiangxi had been discharged from the hospital (see Fig. 2). The 2 confirmed overseas cases since that time were both discharged from the hospital before April 9. Of all confirmed COVID-19 cases, 936 were cured and discharged from the hospital, with only 1 death due to COVID-19, for a crude case fatality rate of 0.11%.

3.5. Comparative analysis of COVID-19 in Jiangxi and the whole country

The Chinese COVID-19 epidemic was mainly occurring in Hubei during the study period, with Hubei accounting for 82.76% of all confirmed cases in China as of April 9, 2020, so the situation in

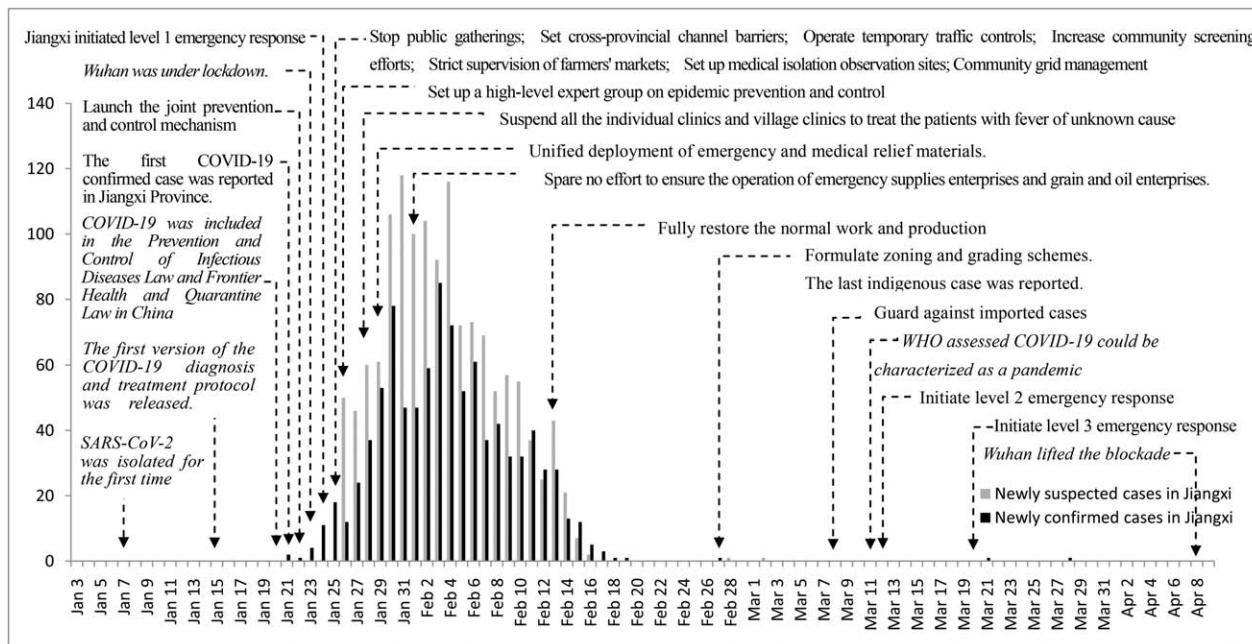


Figure 1. Epidemic curve of newly confirmed and suspected COVID-19 cases in Jiangxi Province, China, and the epidemic prevention and control measures taken at different times.

Jiangxi was not comparable to that in the whole country. We therefore excluded Hubei from the epidemic situation in order to perform a comparative analysis between Jiangxi and the whole country. The Figure 3 showed that the cumulative number of confirmed cases in Jiangxi was basically the same as that in the whole country. The Figure 4 also showed that before January 30, 2020, the daily fluctuation of confirmed cases in Jiangxi was relatively large. On the whole, before February 6, the daily number of confirmed cases in Jiangxi was higher than that in the whole country on a day-on-day basis, and the day-on-day growth rate after that was basically consistent with that of the whole country.

Table 1
Incidence rate of COVID-19 in different cities of Jiangxi Province, China.

City	Confirmed cases	Total population*	Incidence rate (1/100,000)
Nanchang	233	5545544	4.20
Jingdezhen	6	1673213	0.36
Pingxiang	33	1933154	1.71
Jiujiang	118	4896847	2.41
Xinyu	130	1186731	10.95
Yingtian	18	1175012	1.53
Ganzhou	76	8677603	0.88
Ji'an	22	4956568	0.44
Yichun	106	5573243	1.90
Fuzhou	72	4047152	1.78
Shangrao	123	6810661	1.81
Total	937	46475728	2.02

* Data from the website: <http://www.jxstj.gov.cn/resource/nj/2019CD/indexch.htm>.

3.6. Coping strategies

3.6.1. Prevention and control strategy. Figure 1 showed the epidemic response measures taken in Jiangxi, China. In the stage of cluster epidemic, the most important strategy was “external anti-input, internal non-proliferation” strategy. On January 24, 2020, Jiangxi launched the first-level emergency response at the beginning of the epidemic. The main measures included stopping public gatherings, setting cross-provincial channel barriers, operating temporary traffic controls, increasing community screening efforts, strictly supervising farmers’ markets, setting up medical isolation observation sites, and so on. According to the severity of the spread of the epidemic, the level of emergency response had been constantly adjusted. In addition, zoning and grading schemes were formulated. While controlling the epidemic, Jiangxi also took into account social and economic development. On February 13, 2020, the whole society was mobilized to resume work and production in an orderly manner. After April 8, 2020, Jiangxi province entered the stage of normal epidemic prevention and control. During this stage, the main strategy was “external anti-input, internal defense rebound” strategy.

3.6.2. Treatment strategy. The most important treatment strategy was to focus all healthcare resources on treating COVID-19 patients free of charge. On January 15, 2020, National Health Commission of the People’s Republic of China released the first version of the COVID-19 diagnosis and treatment protocol (see Fig. 1). At the same time, according to the treatment situation of a large number of patients, the National Health Commission had constantly adjusted and optimized treatment measures and updated the COVID-19 diagnosis and treatment protocol. During the course of treatment, 4 principles were adhered to: centralized patients, centralized medical experts, centralized medical resources and

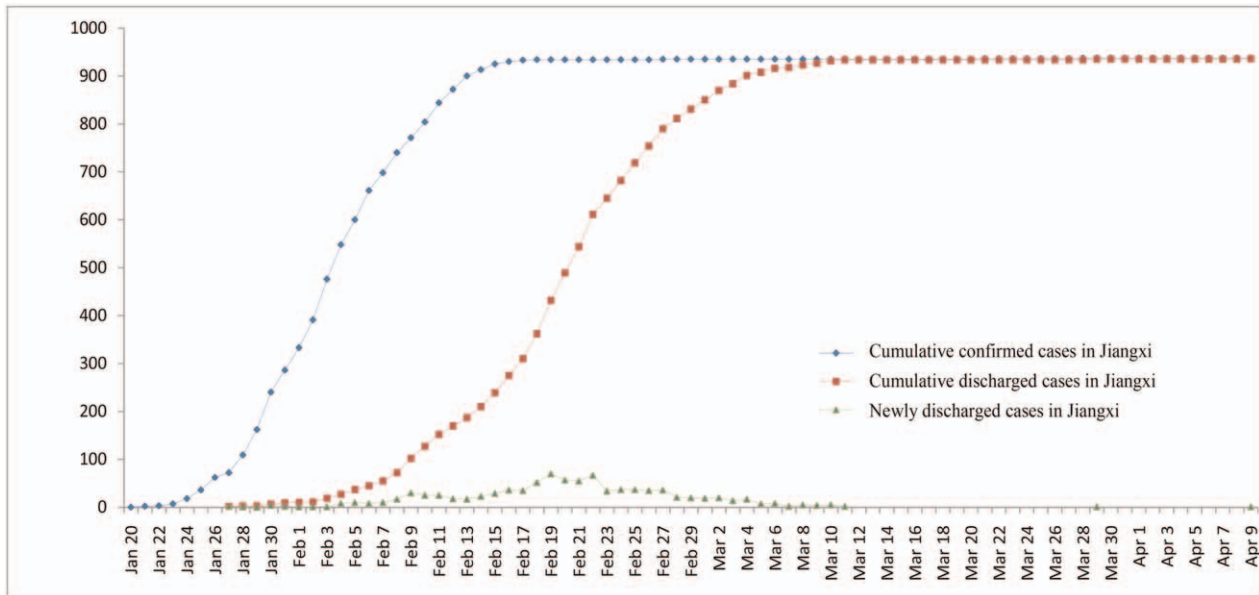


Figure 2. Curve graph of cumulative confirmed/ cumulative discharged/newly discharged COVID-19 cases in Jiangxi, China.

centralized treatment. All the individual clinics and village clinics were suspended to treat the patients with fever of unknown cause.

4. Discussion

This study described the epidemiological characteristics of the 937 confirmed cases of COVID-19 reported in Jiangxi from January 21 to April 9, 2020. We found that the COVID-19 epidemic in Jiangxi spread rapidly and to a wide range. On January 24, 2020, Jiangxi launched a first-level emergency response to a major public health emergency to deal with the

COVID-19 epidemic. Strict prevention and control measures were adopted. In less than 1 month, the epidemic was effectively controlled, and the epidemic situation shifted to a low-level distribution state. From the perspective of our national COVID-19 epidemic trend (except Hubei), the COVID-19 epidemic trend in Jiangxi Province and the national epidemic trend is basically consistent.^[27,28]

To date, the specific transmission process of SARS-CoV-2 is still undetermined. Animal experiments showed that dogs,^[29] cats,^[29] ferrets,^[29] tree shrews,^[30] hamsters,^[31] bats,^[32] pigs,^[32] and chickens^[32] could be infected by SARS-CoV-2. Studies have

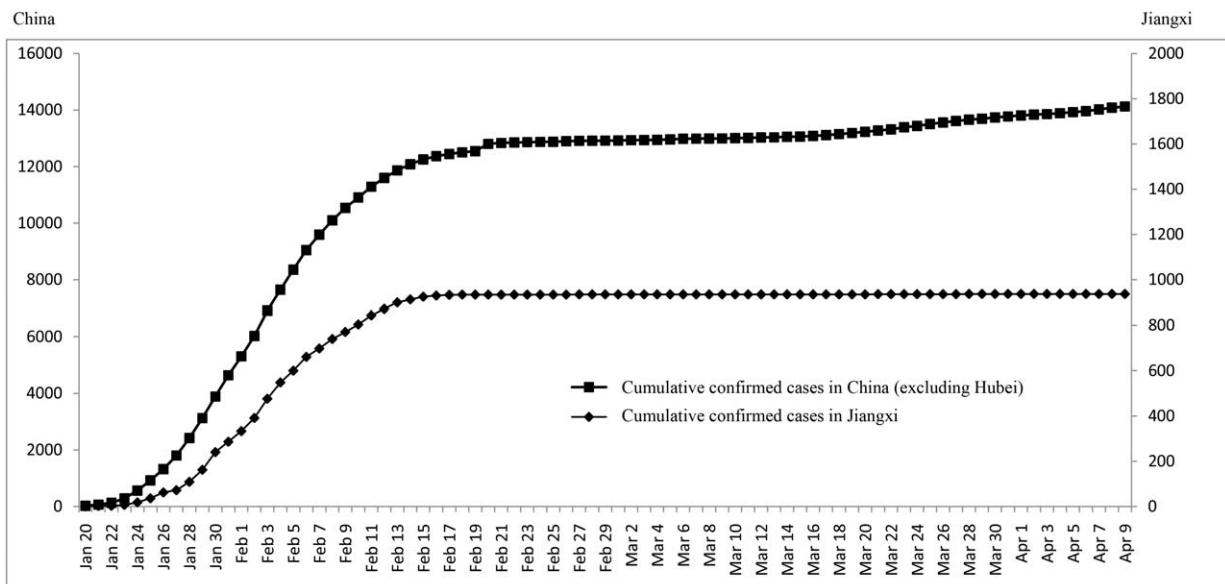


Figure 3. Contrast curve of cumulative confirmed COVID-19 cases in Jiangxi and those in China (except Hubei Province).

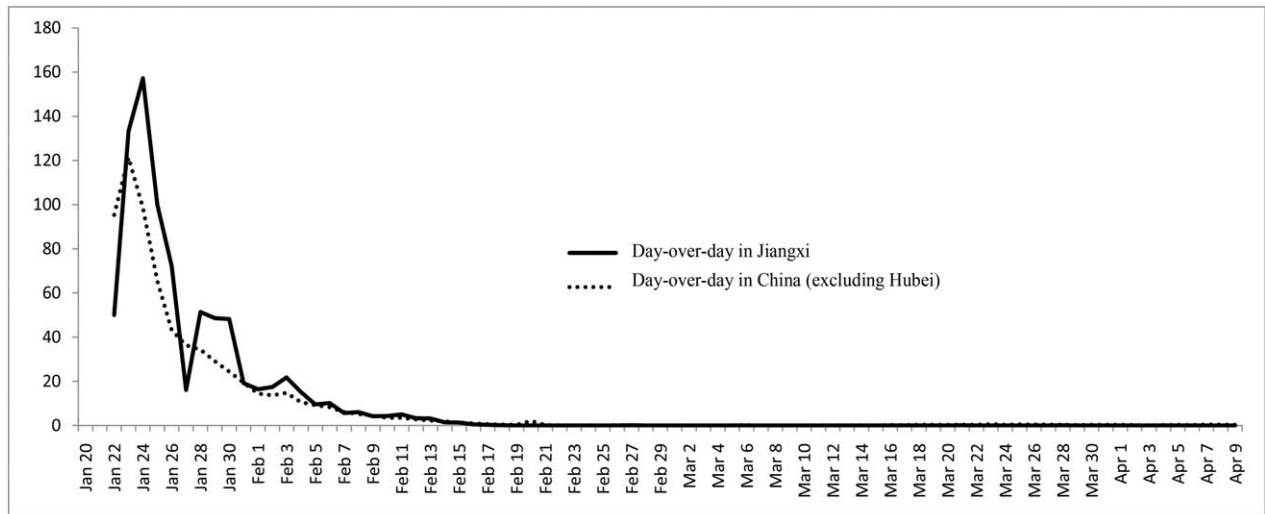


Figure 4. Day-on-day curve of newly confirmed COVID-19 cases in Jiangxi and those in China (except Hubei Province).

reported that even fish and shrimp also could transmit SARS-CoV-2. Oude et al.^[33] performed an in-depth investigation of SARS-CoV-2 infections in animals and humans working or living in 16 mink farms, and found 68% of mink farm residents, employees, and/or individuals had been infected by SARS-CoV-2. This investigation provided evidence of animal-to-human transmission of SARS-CoV-2 within mink farms. Recent studies have reported SARS-CoV-2 might be spread via fecal-oral transmission,^[34] aerosol transmission,^[35] and mother-to-child transmission^[36] in addition to respiratory transmission and contact transmission. However, the comprehensive and clear transmission route has not been defined. Due to the vulnerability of the general population, the most effective and rapid measures to control the COVID-19 epidemic involve cutting off the transmission route as much as possible. This can be accomplished by strengthening the isolation and protection of suspected cases, confirmed cases, and close contacts, as well as by reducing social mobility.^[37] Such prevention and control measures were implemented throughout China during the severe acute respiratory syndrome outbreak of 2003, with proven effectiveness.

Regarding the current outbreak, the morbidity of the whole population in Xinyu, Jiangxi, reached 10%. This was related to the infection of medical personnel at local hospitals. Preventing the infection of medical personnel is an important part of nosocomial prevention and control of COVID-19.

On January 21, 2020, the first COVID-19 case was reported in Jiangxi. Six days later, the epidemic spread to all cities in Jiangxi and reached its peak in the following 2 weeks. However, the epidemic was effectively controlled in less than a month. The experience of epidemic prevention and control can be summarized as follows. First, when the cases of pneumonia of unknown cause first appeared in Wuhan, governmental departments keenly detected the potential risks and immediately made arrangements for prevention, control, and response preparations in Wuhan. In the first time of the outbreak, Jiangxi quickly set up a provincial emergency control and prevention headquarters under the leadership of the government. Second, Jiangxi established efficient command and prevention and control systems featuring joint prevention and control, mass prevention, and mass control

measures, and it coordinated action by the masses. Third, scientific and precise prevention and control measures were achieved. Before the outbreak in Jiangxi, epidemic risk assessments were performed daily given the epidemic situation in the whole country, especially in Wuhan. In light of the rapid changes in the epidemic situation across the country, Jiangxi promptly launched a first-level emergency response to a major public health emergency on January 24.^[14] By March 11, all confirmed local cases were discharged from the hospital, and on March 12, the outbreak response level was downgraded to second-level. Based on the evolution of the epidemic risk, the epidemic response level was downgraded to third-level on March 20. At the same time, at any stage of prevention and control, the measures of “preventing imports from outside and preventing backlash from inside” were resolutely implemented. Finally, people’s lives and health were given priority. All patients who were hospitalized for COVID-19 received free medical treatment from the state. So whatever else one can say, the most critical measure was to launch the first-level emergency response at the beginning of the epidemic. Meanwhile, 5 mechanisms were established: the joint prevention and control mechanism of all departments, the monitoring and early warning mechanism, the mass prevention and control mechanism, the regional and hierarchical management mechanism, and the community grid management mechanism.

Several limitations should be considered. Firstly, All the COVID-19 information obtained in this study was from the data published on the government website. However, there might be some cases of under-reporting or late reporting during the case reporting process, so that the current case data could not accurately reflect the actual situation of the COVID-19 epidemic. Secondly, due to the lack of basic information of COVID-19 cases such as gender, age and occupation on the government website, the epidemiological characteristics of the information could be described in more depth.

To sum up, the COVID-19 epidemic in Jiangxi was widespread. With precise prevention and control measures, the epidemic situation was effectively controlled in less than a month, and the epidemic situation shifted to a low-level distribution state. The COVID-19 prevention and control strategies and



Figure 5. Spatial and temporal distribution of cumulative confirmed COVID-19 cases among 11 cities in Jiangxi Province, China.

measures adopted by Jiangxi Province were right, positive and effective. We believed that there will be no similar large-scale outbreaks of infectious diseases in Jiangxi in the future.

Acknowledgments

We acknowledge all those medical workers who were on the frontline of controlling COVID-19 epidemic.

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