

Rapid epidemic expansion of Sars-Cov-2 Omicron BA.2 subvariant during China's largest outbreaks

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Abstract

A complete and accurate statistic panorama and analysis of cases contracted Sars-Cov-2 Omicron BA.2 subvariant are given under the conditions of strict mandatory quarantine and isolation and of high rate of full vaccination. Sars-Cov-2 is still new and human know little about either its direction of variation or its propagation laws. No country other than China has been able to disclose every infected case and to have the data of heavily intervened large outbreaks. Here my study reveals that the BA.2 subvariant can still spread very fast and wide in areas with strict “dynamic zero-Covid Policy” in China, that there exist in different cities as much as twenty-time big differences of morbidity rate unrelated to any of the influence factors known and that Omicron BA.2 subvariant is unpredictable of its virulence though its severe rate of confirmed cases is low. This analysis provides a first-hand solitary and valuable information for further research of similar epidemic in the future. It may bring new thoughts for correction of present epidemiologic theory and mathematic models. It may also give other countries time to be better prepared for the coming 6th wave driven by Omicron BA.2.

Main

China has been struggling with its largest Covid-19 outbreaks driven by Sars-Cov-2 Omicron BA.2 subvariant reported by Chinese Center for Disease Control and Prevention and its Provincial centers on the press conferences since March, with over 100,000 people infected in mainland China within 31 days (hereafter also called the March outbreaks). Although there were more than a hundred disseminations and several moderate outbreaks before March, China had been stuck to its “dynamic zero-Covid policy” by zero clearing each active chain of transmission and it seemed work well even during the period of the 5th wave driven by Omicron in the world² from November off 2021 to February of 2022. These outbreaks driven by Omicron BA.2 subvariant started in Shenzhen and Dongguan, two of the most industrialized cities in Southern China who are adjacent to Hong Kong, on March 01. Hong Kong had just recorded the most critical attack in February with (Lewis, 2022) close to 900 cases of COVID-19 per 100,000 residents in Hong Kong, the highest level recorded anywhere in the world during the pandemic. The virus swept rapidly across 100 cities of all 31 provinces of the country, causing a total of 105,546 people infected in a month. Among those, there are ten cities with over 800 people infected and three of them are the most critical.

China’s “dynamic zero-Covid policy” has been evolving for a year. Mandatory quarantine and isolation measures were enriched and was said to be precise, being able to track every individual and his or her potentiality of contracting the virus on every chain of transmission so as to disclose as well as to quarantine, isolate and classify by symptoms every infected person with support of the most updated APP and large quantity of fully trained epidemiological investigators and dedicated doctors. China had already reached its high rate of full vaccination before these large outbreaks. As press conferences of the Department of State reported, over 87% of the population were fully vaccinated by the mid of February 2022. Full vaccination rate is 87.45% overall by 05 February and 87.77% by 14 March 2022. This rate of the fully vaccinated is 88.01% in overall population by 24 March 2022, with 84.36% or 222.72 million of

those aged 60 and above. A total of 138.24 million (or 52.36% of) people over 60 years old got their boost shots. China's 7th census published its population as 1.412 billion, among them 264 million or 18.70% are aged 60 or above³.

Data covers all daily reported number of new PCR positive cases from March 01 to March 31. All 10 cities with infected cases over 800 are chosen for this statistics and analysis. These 10 cities are located from north to south and some are close to each other while some are very far away from each other. All cities followed the same mandatory policy and the same test and diagnose standards published by the nation. All cities didn't implement lockdown except Shenzhen for one week. Genome-analysis revealed all outbreaks in March are driven by Omicron BA.2 subvariant according to the report from press conferences by the Department of State and CDC provincial center. There were enough doctors to diagnose and classify all infected cases daily except one-day delay once in Jilin. Every essential events will be described in the related section in order to avoid missing of possible message relevant to influence factors of transmission, infection or morbidity. During the March outbreaks, the appearances are different on many aspects in different cities and some are contradict.

Big differences of morbidity rate in main cities

Mainland China reported 103,979 indigenous Covid-19 cases infected by Omicron BA.2 subvariant from 01 March 2022 to 31 March 2022. There have been obvious differences of morbidity rate between 11 cities since the start of the March outbreaks. Their morbidity rates vary from 4% to 83% and the nationwide average rate is 37%. Since Shanghai has the lowest morbidity rate of 4% and highest number of total infected cases (36,548), the nationwide average morbidity rate excluding Shanghai rises to 55%. Changchun has the highest, 83%, which is twenty times of that of Shanghai.(Fig. 1 and Fig. 2)

The reason why there are such differences is unknown. They are not related to any of the influence factors known today. There are two pairs of cities that can be compared since two cities of each pair are very close to each other and both have the same climate, population density and characteristics, diet and living habit, religious background, education background and medical resources, etc. Shenzhen and Dongguan, both adjacent to Hong Kong, are adjacent too. Both of them are located on the eastern bank of Zhujiang Delta with very high density of population, 17 to 20 million people on about 100 square miles of land each. Being immigrant cities, the average ages of their population are relatively young, Shenzhen at 32.5 years while Dongguan at 34 year.

They have also had almost the same scale of circulation of people and cargo with Hong Kong. Large quantity of contaminated cargo and drivers arrived Shenzhen and Dongguan with unknown quantity of virus every day during the surge of infected cases of Omicron BA.2 in Hong Kong in the early stage of its Covid-19 outbreak in February 2022. When its medical system was lashed breakdown by the epidemic, Hong Kong was unable to admit all Covid-19 patients who needed hospitalized. People wished to escape from the outbreak. Border between Hong Kong and Shenzhen or Dongguan was strictly controlled to allow a certain limited number of passengers which is around 10% percent of that in year 2019. Illegal

entries from Hong Kong to Shenzhen and Dongguan were reported as many dozens and it was believed to be fact. Hide and seek followed in order to implement mandatory isolation and PCR tests. Outbreaks started from the end of February in both Shenzhen and Dongguan and brought 994 infected cases in Shenzhen and 1,314 infected cases in Dongguan in one month. Contradictory figures of morbidity rate of the two cities appeared from the very beginning, starting from 100% to 92% in Shenzhen while 68% to 0% in Dongguan (Fig. 3). Each of these two outbreaks develops simultaneously on its own path of morbidity rate and their rates seemed not likely to change much until they were close to be controlled by stronger anti-epidemic measures and the difference of their final rates, which is 75% in Shenzhen while 12% in Dongguan, was still enormous. Their final morbidity rates were close to their beginning rates though daily rates may show strong fluctuation due to fewer daily new cases. One essential event was a whole area locking down in Shenzhen, including 11 districts, for one week starting from 14 March 2022 which was announced in the evening of 13 March 2022. On 18 March 2022, Shenzhen authority cancelled the lockdown of 5 districts with "zero active Covid-19 case". Final cancelling of lockdown was started from 00:00 on 21 March 2022.

Dongguan's outbreak didn't follow the expansion pattern of its neighbor Shenzhen and had two extraordinary surge of asymptomatic cases (Fig. 4, the red triangle line). The first wave was from 03 March to 06 March and the second was from 09 March to 12 March. There are belated prevention measures disclosed later on but this kind belated measures usually bring to the society occulted transmission likely with an outcome of higher morbidity rate. But this didn't happen in Dongguan. Its morbidity rate kept steadily low (fig. 3)

Similar pair of cities are Changchun and Jilin, who are the first two large cities in Jilin Province in northeastern China and are about 111 kilometers apart, with a much larger scale of outbreaks reaching a total number of infected cases of 20,675 in Changchun and 25,227 in Jilin. Their outbreaks started from Jilin on 03 March 2022, and were late reported with a source from South Korea. Before 03 March, infected case had been cleared to zero in Jilin and Changchun for days. Changchun's outbreaks followed one day after Jilin. Their morbidity rates also differed apparently from the beginning and their levels seemed steady also, with Changchun's around 85% and Jilin around 50%. Jilin's number of daily new cases is declining steadily from its peak on 26 March 2022 while Changchun is on its platform. By far the morbidity rates are 83% in Changchun while 54% in Jilin (Fig. 5).

Morbidity rate didn't fluctuate much

Shanghai's outbreak had a very slow start with 2 infected cases on 01 March 2022, reaching over 100 cases on 13 March. Rapid expansion of numbers of daily reported new infected cases appeared and the number reached nearly 6,000 per day within a period of 17 days (Fig. 6). Total number reached 36,548 on 31 March 2022. Morbidity rates of daily new cases here were from 8% to 0% in 24 days of the whole month (31 days) (Fig. 5). Morbidity rate of total infected cases by far is 4% (Fig. 5). As a city with the most critical number of infected cases among the three (the other two are Changchun and Jilin), Shanghai's morbidity rate is the steadiest among all 10 cities with statistical significance.

Rapid spread under strict measures

China had been managed well Covid-19 prevention by sticking to its “dynamic zero-Covid Policy”⁴ until the Omicron BA.2 attacked it. The daily infected new cases remained no more than 100 before 01 March. There was no step-back of strict mandatory quarantine and isolation. But the rapid expansion of daily reported new infection cases revealed that the BA.2 subvariant could still spread very fast and wide in China with the fastest in Shanghai (Fig. 6). Present strict prevention measures were not able to stop the rapid expansion of Omicron BA.2. China once again had to face the choice of whether or not to take a higher economic and social cost to control the transmission.

Omicron BA.2 transmission unpredictable

The transmission of Omicron BA.2 is unpredictable, nor is its morbidity rate. Chinese cities are more like isolated islands than those of other countries because of strict prevention measures. This Omicron BA.2 subvariant seems had developed different pattern of virulence and transmission in these isolated cities of China. Among the ten cities with outbreaks in March, there are half them who had a very low morbidity rate, including Shanghai (4%), Langfang (8%), Binzhou (10%), Dongguan (12%) and Shengyang (18%). On the other hand, these five cities have very high percentage of asymptomatic cases of the infected, accordingly including Shanghai (96%), Langfang (92%), Binzhou (90%), Dongguan (88%) and Shengyang (82%). Two cities have high morbidity rate of their infected cases and they are Shenzhen (75%) and Changchun (83%). All Data had been updated to 31 March 2022.

There are good aspects of the data, as briefed in the following:

Low severe rate and fatality rate

Nationwide data of China in March showed a percentage of 0.16% for ratio of severe cases to confirmed cases, or 0.06% (0.09% in Jilin Province) for the ratio of severe cases to total infected cases since 12 March 2022 (Number of the accumulated severe cases dropped from 19 on 01 March to 6 on 12 March due to cue of the hospitalized Covid-19 patients from February). Fatality rate is less than 1/50,000, as 2 deaths was reported by Jilin on 18 March 2022.

Fewer cases need hospitalized

Only Jilin province published Data of classification of diagnosed Covid-19 patients daily. Jilin's data showed 98.18% of the confirmed cases were diagnosed as mild patients. 0.62% of the confirmed cases were diagnosed as moderate and 0.13% of that were diagnosed as severe patients in Jilin Province. Recovered cases returning to positive were not reported but were estimated about 1%, close to the figure announced by Shenzhen 3rd People's Hospital on a new release in March 2022.

The asymptomatic case converting

The ratio of the asymptomatic cases converting to the confirmed cases is 4.35%–4.64% and 0.25% accordingly in Jilin province, nationwide excluding Shanghai and in Shanghai.

Conclusion

Sars-Cov-2 Omicron BA.2 subvariant can transmit rapidly even under the conditions of very strict mandatory measures. Its transmission and morbidity rate in a specific area is unpredictable. Enormous difference of morbidity rate may appear in different areas and may not be related to any of the influence factors known. 45% of the infected cases were asymptomatic in China during March of year 2022. The percentage of mild cases in confirmed cases may be as high as 98% and the percentage of severe cases in confirmed cases may be as low as 0.16% under the circumstances of strict mandatory prevention and of a vaccination rate over 87% to population. Thus only 2% of the confirmed cases need to be hospitalized. Deaths may be very rare. And finally, 1% of recovered confirmed cases may return to positive.

Methods

I analyzed daily indigenous cases of SARS-CoV-2 in mainland China from 01 March 2022 to 31 March 2022 from publicly released data provided by the National Health Commission of the People's Republic of China. This was accessible through the website of the National Health Commission news daily briefing ([Http://nhc.gov.cn](http://nhc.gov.cn)). The National Health Commission releases daily updates on the number of confirmed new cases and asymptomatic new cases, with a breakdown by province and cities, and severe cases, deaths and recoveries nationwide.

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- 4 Dyani Lewis, news at Nature <https://doi.org/10.1038/d41586-022-00884-z>

Figures

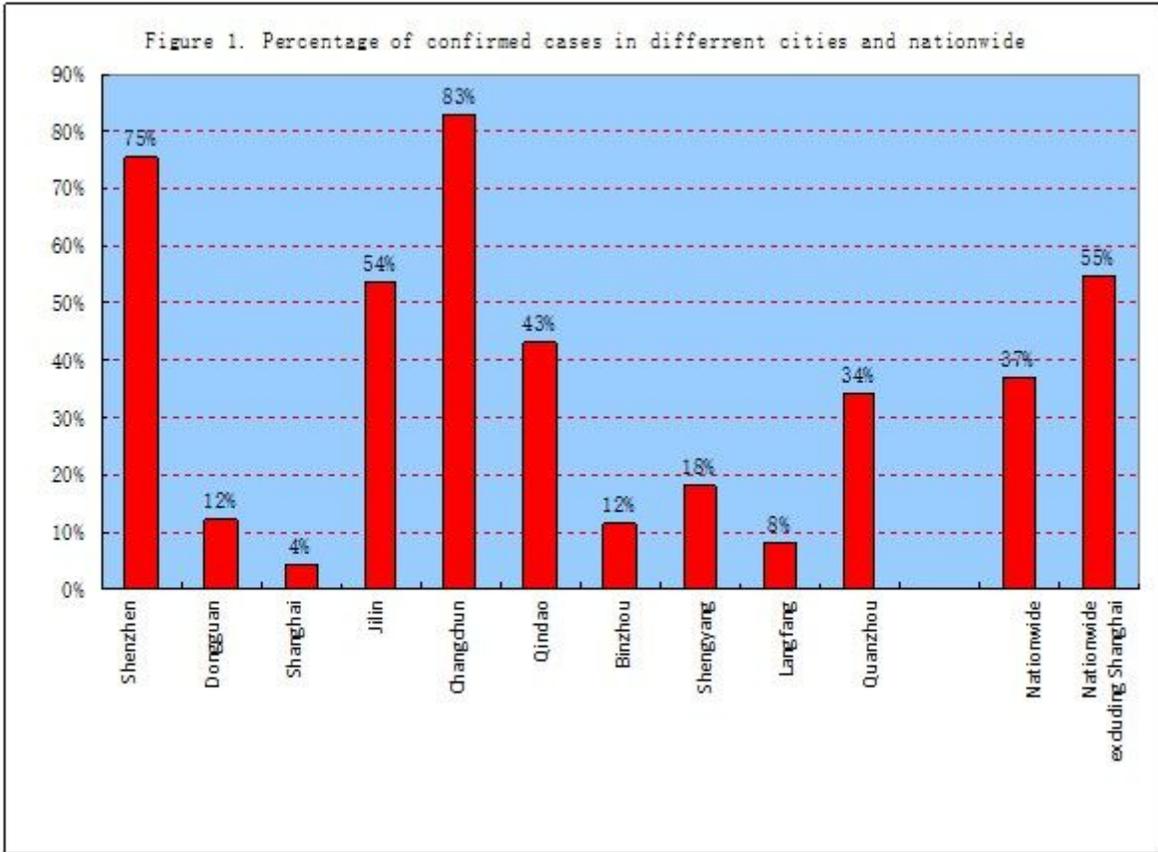


Figure 1

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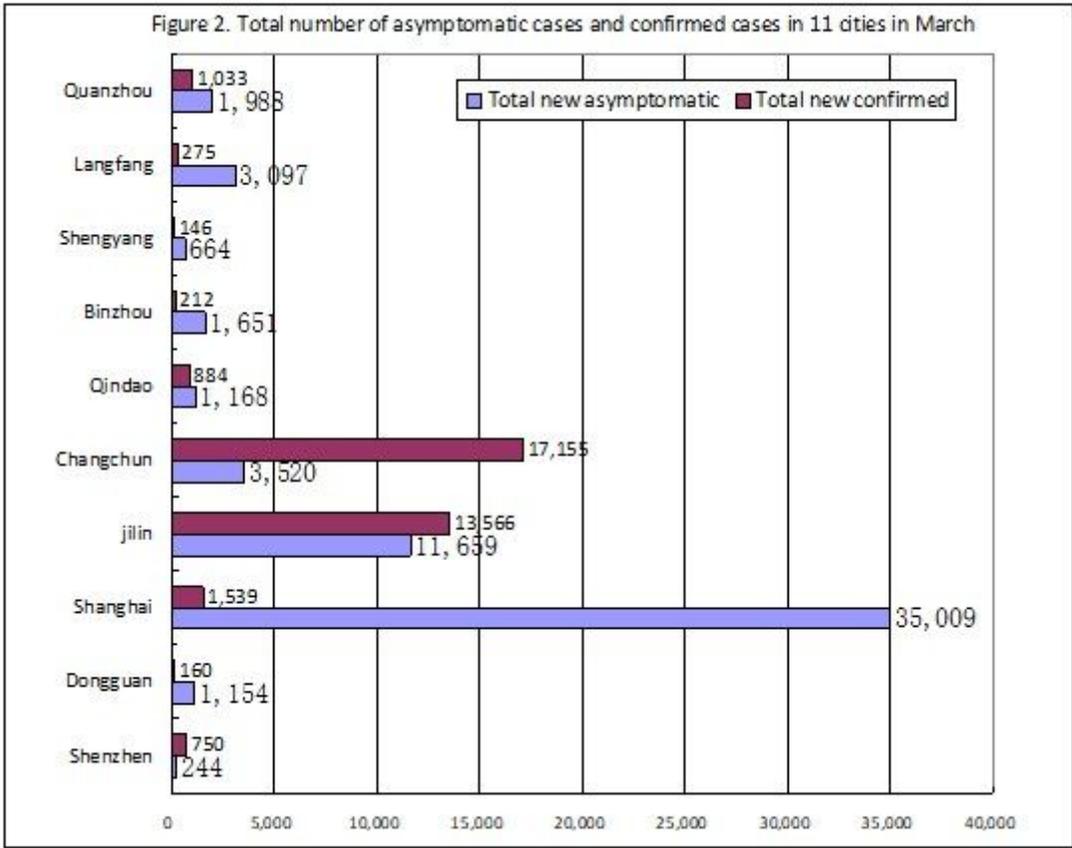


Figure 2

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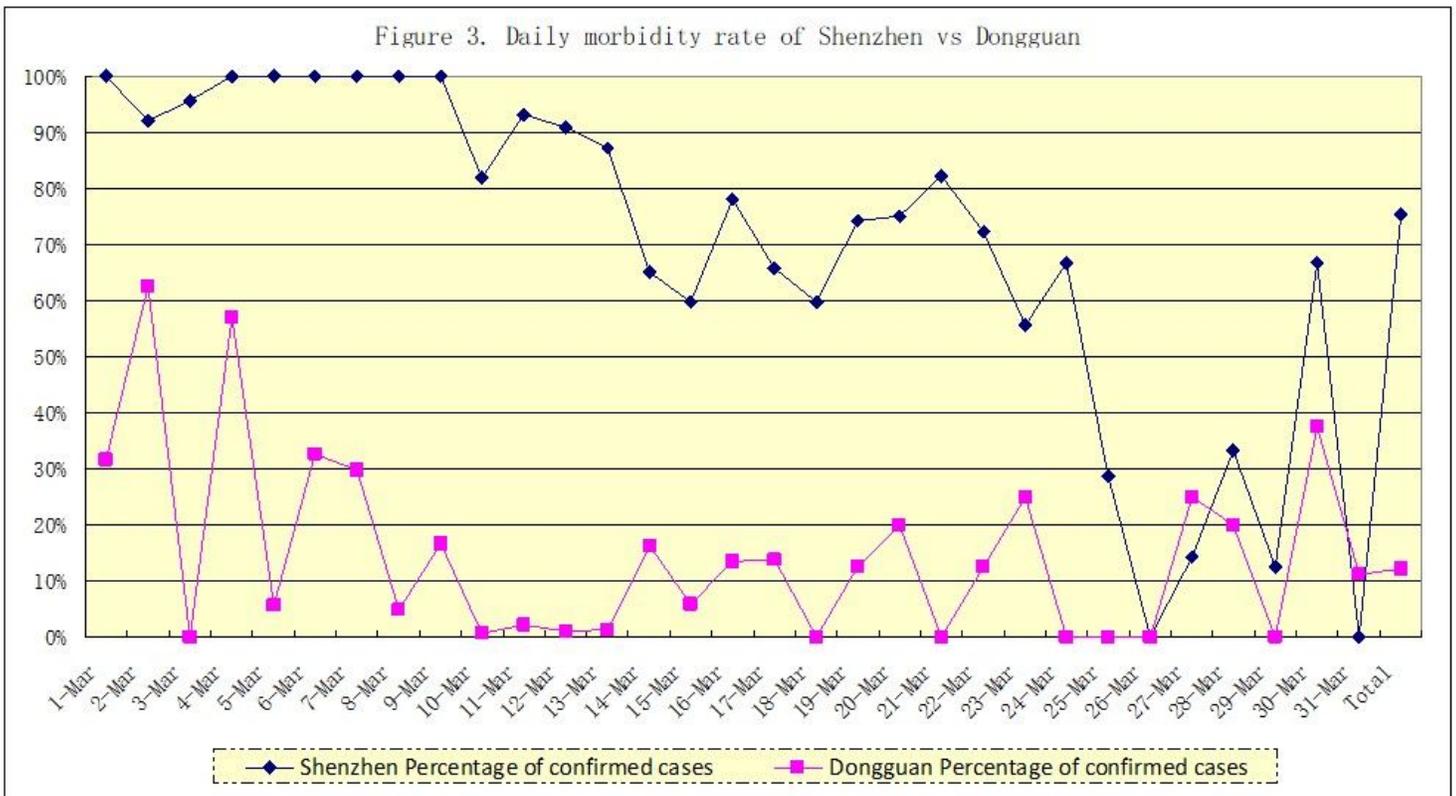


Figure 3

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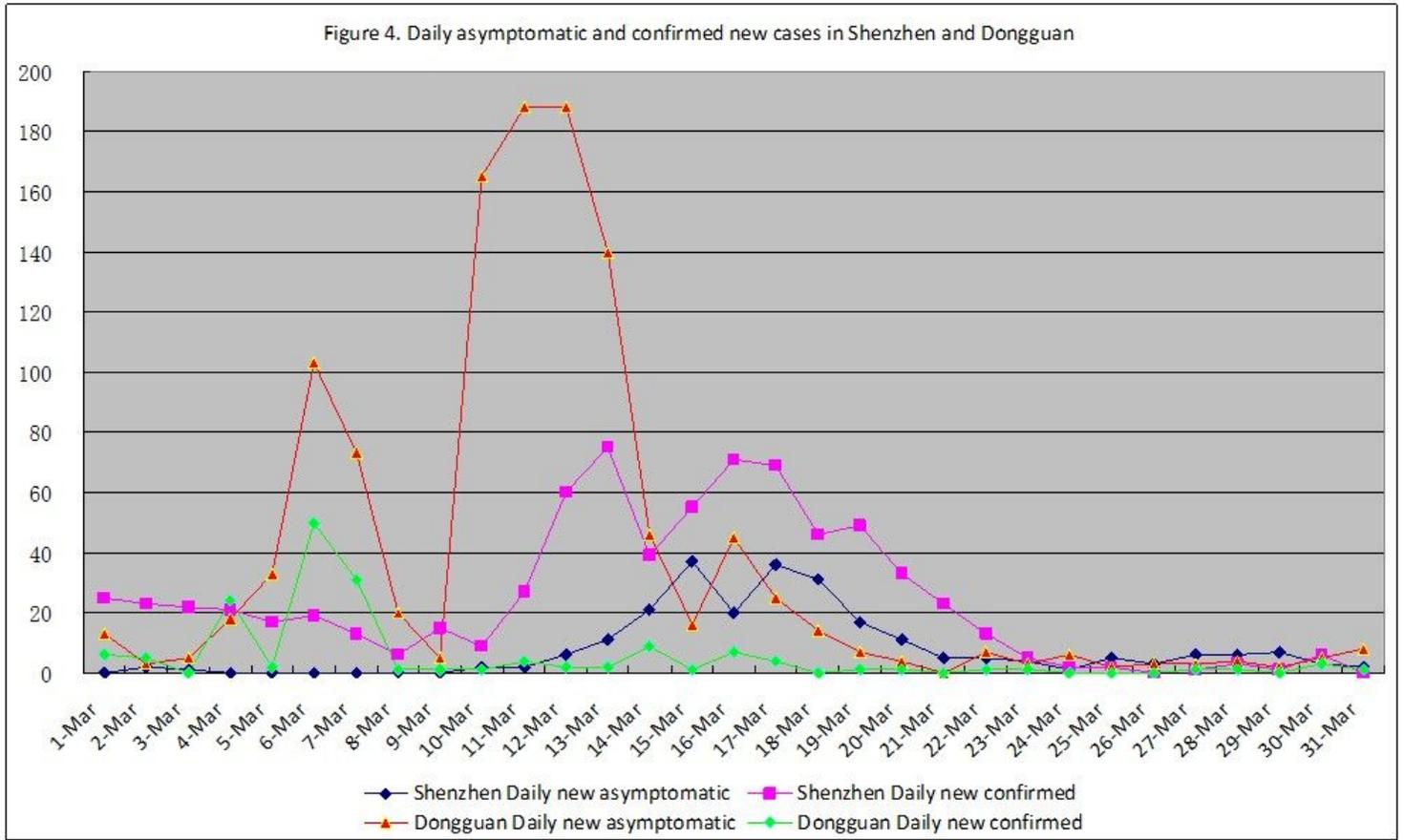


Figure 4

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Figure 5. Trend of daily morbidity change of infected cases in Shanghai, Changchun and Jilin

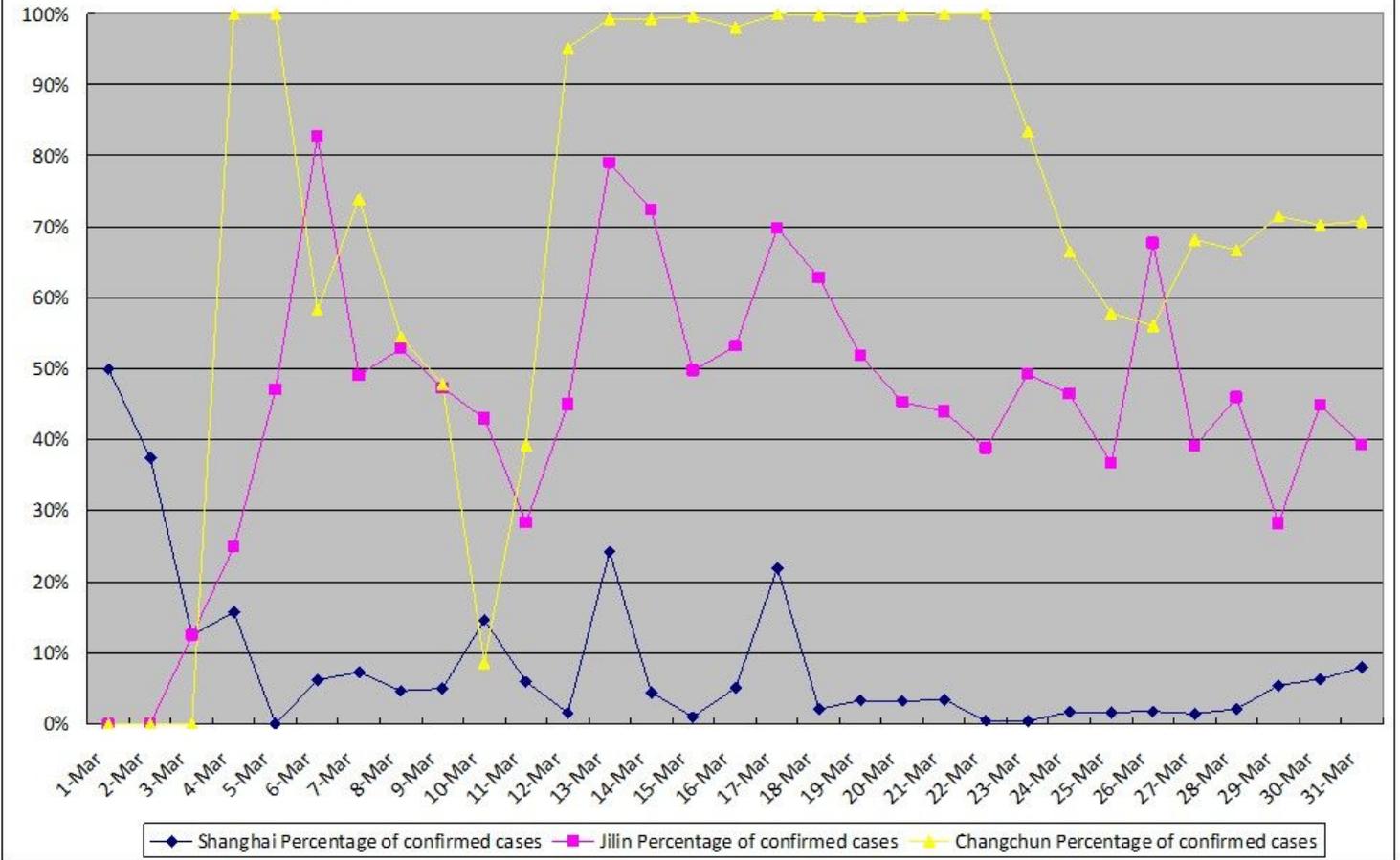


Figure 5

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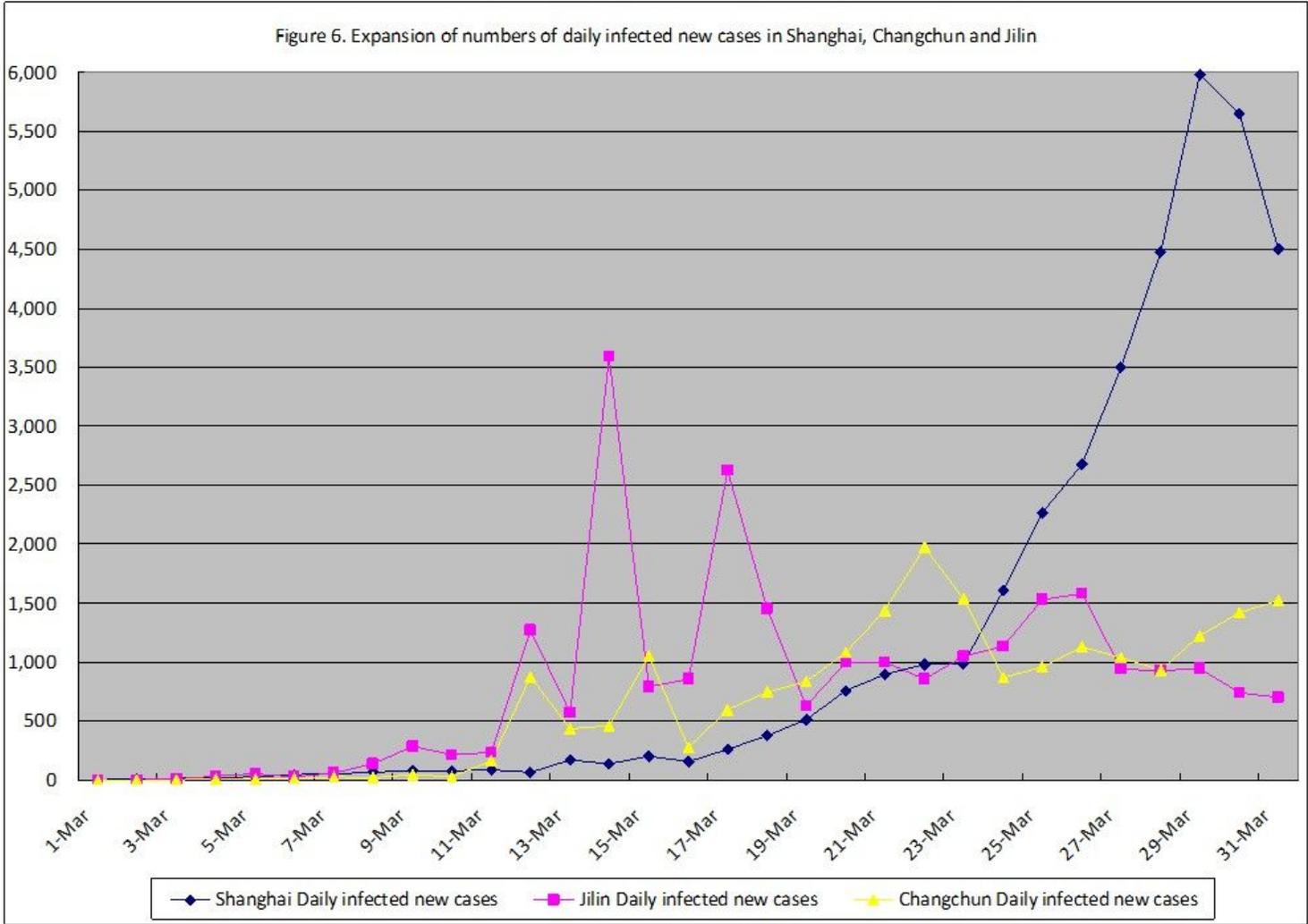


Figure 6

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