Fighting the Omicron variant: experience in Shenzhen

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Almost 5 months after its novel detection in South Africa, Omicron (B.1.1.529), a SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) variant of concern, spreads prodigiously and globally.[1,2] On 27 November 2021, Hong Kong registered its first confirmed case and shortly thereafter the variant was detected in Mainland China (9 December 2021). Since then, China has experienced a series of outbreaks driven by the Omicron variant. Shenzhen, one of the biggest cities in China, is geographically adjacent and closely connected to Hong Kong where cases spiked to tens of thousands, thus presenting an unprecedented crisis.[3] The first case of Omicron in Shenzhen was registered on 15 January 2022 and triggered an outbreak alarm. The index case was a worker engaged in collection and delivery of refrigerated reagents abroad. She was in close contact with couriers from North America and wore no personal protection. More Omicron cases were reported from 12 February onwards. With the increase in the number of infected cases, the Shenzhen government implemented a series of public health measures, such as closing colleges and suggesting people work from home. Buses and subways were suspended from 14 to 20 March to help control the spread of infections (online supplementary Fig).

The epidemic was mainly triggered by cross-border movement of individuals between Hong Kong and Shenzhen. Historically, authorities have been able to curb the spread of infection at source and prevent persistent community infection but this has become extremely difficult due to the fast spread and short incubation time of Omicron BA.2.[4] It has been almost impossible to track and contain all close contacts of new cases. As Hong Kong relaxes its strict pandemic policies and faces a consequent rise in infection rates, the threat to control the outbreak in Shenzhen and therefore Mainland China has become challenging. Of the multi-district outbreaks in Shenzhen, the largest growth of cases occurred in Futian district, just across a river from Mai Po and Yuen Long in Hong Kong. Meanwhile, other districts such as Baoan, Nanshan, Yantian, and Longgang have also registered a substantial number of cases.

Based on the 'dynamic zero–coronavirus disease' strategy,[5] Shenzhen established a leading group for novel coronavirus prevention and control planning, incorporating government divisions and researchers and launched restrictions in response to these outbreaks. With the increase in the number of infected cases, Shenzhen decided to 'slow down' from 14 to 20 March 2022. During this time, Shenzhen launched three rounds of citywide nucleic acid testing. Employees were requested to work from home unless considered as essential workers, including those working in the water, gas and electricity industry. Businesses were closed except those selling daily essentials such as groceries, medicines, and takeout food. All public transportation was suspended except that between Shenzhen and Hong Kong. All passengers on flights or high-speed trains leaving Shenzhen were required to provide proof of a negative polymerase chain reaction test result in the 24 hours prior to boarding. All trucks between Shenzhen and Hong Kong were asked to change drivers at the border from 14 March 2022. Under strict restrictions, the city resumed normal work and production from 21 March 2022. Since then, Shenzhen has managed to control the number of Omicron cases to a low level, indicating that Shenzhen's existing prevention and control measures are effective against the Omicron variant.

Lessons from the methods adopted in Shenzhen to contain infection with the Omicron variant can be summarised as follows. First, early detection of coronavirus disease 2019 (COVID-19) cases supported by strong nucleic acid testing capacity and an effective testing strategy is essential. Shenzhen set up nucleic acid test sites in a manner that enabled all residents to reach one within a 15-minute walk from their home or office with waiting time of less than 30 minutes for a test. Further, different nucleic acid testing strategies can be applied to different populations at risk (Table). For example, travellers arriving at Shenzhen from high-risk COVID-19 areas must undergo a 7-day centralised quarantine, inbound arrivals are subject to a 7-day centralised quarantine as well as 3-day home health monitoring. Second, response to newly infected COVID-19 cases (the '1-4-6-24 principle') should be rapid. After reporting of primary screening positive

TABLE. Shenzhen's nucleic acid testing and quarantine strategy for populations at risk (August 2022)*

Day	1	2	3	4	5	6	7	8	9	10
Inbound travellers	PCR	PCR	PCR		PCR		PCR			PCR
Close contacts	PCR	PCR	PCR		PCR		PCR			PCR
Close contacts (large-scale epidemic)	PCR	PCR	PCR		PCR		PCR			PCR
Other contacts	PCR		PCR							
Contacts of close contacts	PCR			PCR			PCR			
Type 1 domestic travellers†	PCR	PCR	PCR		PCR		PCR			
Type 2 domestic travellers†	PCR			PCR			PCR			
Type 3 domestic travellers†	PCR		PCR							
Type 4 domestic travellers†	PCR									

Abbreviations: COVID = coronavirus disease 2019; Other contacts = contacts except for close contacts; PCR = polymerase chain reaction

* Centralised quarantine are shaded in red; home quarantine in yellow; home health monitoring in green

† Type 1 domestic travellers are travellers from high-risk regions. Type 2 domestic travellers are travellers from medium-risk regions. Type 3 domestic travellers are travellers coming or returning to Shenzhen from the county (city, district) where the medium- and high-risk regions are located. Type 4 domestic travellers are travellers from places with random locally transmitted COVID cases

cases, the epidemiological investigation team arrived at the location of the confirmed case within 1 hour, then completed the preliminary epidemiological investigation and identified relevant individuals (eg, close contacts and secondary contacts) within 4 hours, followed by transportation of these individuals to quarantine hotels and implementation of control measures in key regions within 6 hours, and finally with nucleic acid testing and epidemiological investigation of relevant individuals implemented within 24 hours. This could not have been achieved without the growing epidemiological investigation team composed of different government sectors (the Chinese Center for Disease Control and Prevention, the Police, the Ministry of Industry and Information Technology, etc) in Shenzhen. Third, quarantine and hospital bed spaces should be increased. Shenzhen tried to improve the supply of quarantine rooms by using hotels, commercial properties and school dormitories, with capacity of quarantine spaces reaching 100 000. From 28 January 2020, it took only 20 days to build an emergency isolation area (separated from the hospital headquarters by hills) at The Third People's Hospital of Shenzhen, with 800 negative pressure beds out of a total of 1600. It is the city's designated COVID-19 treatment facility and comprises an emergency ward, living and logistics areas and an independent medical and nursing team. Fourth, with non-stop emergency patient transport and a 'white list' of daily essentials to supply personnel when strict public health measures in place, communities could collect information about emergency patients (dialysis patients, patients with mental disorders, pregnant women, and the elderly people) and send patients to designated hospitals without delay. The government released the 'white list' of 674 daily necessity supply enterprises in Shenzhen, covering suppliers of daily basic goods such as food production companies, large chain supermarkets and e-commerce entities. They also established a 'white list' for take-away catering and daily-necessity delivery personnel, covering 14 000 online stores and 47 000 delivery employees in key supply enterprises.

At the time of writing this article, Shenzhen continued to apply its 'dynamic zero–coronavirus disease' policy to bring COVID-19 under control with minimum social cost in the shortest time possible to effectively protect the health of the local population. Although the Omicron variant is more transmissible than its predecessor and is now the dominant variant, Shenzhen's experience shows that strong public health measures remain effective.

Author contributions

Concept or design: B Zhu.
Acquisition of data: D Gu.
Analysis or interpretation of data: B Zhu.
Drafting of the manuscript: B Zhu.
Critical revision of the manuscript for important intellectual content: X Han, J Huang, D Gu.

All authors had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

Conflicts of interest

All authors have disclosed no conflicts of interest.

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