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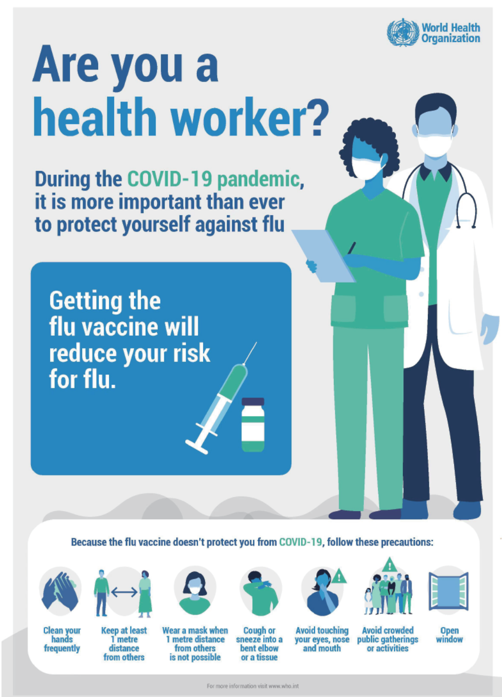

COVID-19 ISSUE (36)

Preplanned Studies

Perspectives

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Preplanned Studies

Analysis of the Practice of Community-Based Self-Sampling and Its Implication on Prevention and Control of Infectious Diseases — Fengtai District, Beijing Municipality, China, 2022

Yaping Wang[1]; Shugang Li[2]; Hao Wu[3,#]; Jue Liu[1,4,5,#]

Summary

What is already known about this topic?

So far, no descriptive analysis has been conducted on community residents with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) nucleic acid self-sampling in China.

What is added by this report?

This report found that self-sampling had a wide age and regional distribution, with the time from self-sampling to result-reporting typically taking less than one day. Additionally, self-sampling was found to save a considerable amount of manpower and medical resources compared to regular sampling.

What are the implications for public health practice?

The experience of prevention and control measures during the coronavirus disease 2019 (COVID-19) pandemic has provided a reference for the prevention and control of other infectious diseases through self-sampling.

During the coronavirus disease 2019 (COVID-19) pandemic, regular sampling has been unable to keep up with the rapidly changing situation, leading to an increased focus on self-sampling. To evaluate the health and economic effects of self-sampling, we conducted a descriptive analysis of residents who used self-sampling based on data from SoundAI Health. Results revealed that self-sampling was widely accepted among residents of all ages, ranging from 22 days to 116 years old. Of the 650,452 (71.9%) residents, the time from self-sampling to result-reporting was less than one day. Self-sampling was found to save a great deal of manpower and medical resources compared to regular sampling. The practice in Fengtai showed that self-sampling could help the public effectively and economically confront the pandemic, with characteristics of general applicability, equivalent effectiveness, and low cost. In the future, self-sampling can be implemented to introduce prevention and control measures for large-scale epidemics.

Nucleic acid testing is an important measure for detecting patients, diagnosing infection, and preventing and controlling transmission. However, with the rapid spread of the Omicron variant of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), regular sampling needs to be optimized. On November 11, 2022, China introduced the Notice on Further Optimizing the Prevention and Control Measures of COVID-19 in a Scientific and Precise Manner, providing 20 detailed measures for improving prevention and control measures of COVID-19 (*1*). In accordance with the "20 Measures," some places explored self-sampling to identify people with COVID-19. Fengtai, as a representative of areas conducting pilot projects on SARS-CoV-2 nucleic acid self-sampling in China, provided a standardized procedure for self-sampling (*2*). After face-to-face or online (self-sampling videos) training, representative residents of each household obtained sampling materials from communities, completed family members and sampling information in SoundAI Health, and finished the process of self-sampling, returning the samples to communities in time (*3*). Samples were sent to a third-party organization for testing, and residents could get their results through SoundAI Health at any time. To ensure the quality of self-sampling, staff in communities organized various types of training for residents and checked the samples carefully, and SoundAI Health sent notifications in case of any abnormal situation occurring during an operation (*4*).

In this study, a total of 890,952 community residents in Fengtai underwent self-sampling from November 24 to November 30, 2022. Registered information (after anonymous processing) from SoundAI Health, a widely used WeChat program for COVID-19 related health services in China, such as booking vaccines, querying nucleic-acid testing results, and reporting antigen self-testing results, was analyzed. Descriptive analysis was used to assess the effectiveness of self-sampling, including age, region and time distribution. Age was divided into groups of 10 years, and time was divided into 5 groups (<12 hours, 12–23 hours, 24–35 hours, 36–47 hours, and ≥48 hours). Mean±standard deviation was used to describe continuous age, and frequency and percentage were applied to describe categorical variables. All data analyses were performed in R software (4.0.3; R Core Team, Vienna, Austria).

The age of 890,952 self-sampling residents ranged from 22 days to 116 years old, with a mean of 41.72±18.31 years old. The majority of residents were between 30–39 (21.2%, 188,697) and 40–49 (19.2%, 171,008) years old (Table 1). The number of self-sampling participants increased rapidly from 1,112 in Lize Financial and Business District to 100,355 in Nanyuan Street, covering all streets of Fengtai. After initiating self-sampling, the number of participants increased rapidly from 24,604 on November 24 to 114,572 on November 26, and then remained above 150,000 per day (Figure 1). The time from self-sampling to sample-collecting was mainly within 24 hours (94.9%), particularly within 12 hours (60.0%). The time from self-sampling to result-reporting was mainly <24 hours (66.6%), with residents with time over 48 hours only accounting for 3.4% (Table 1). A total of 289,017 sampling tubes were used; 94.7% of tubes contained 5 or fewer samples for each tube, i.e. “5 Mixed in 1” (Figure 2). During the same period, the daily self-sampling size was 127,279 (890,952 in a week), and the average size of regular sampling at each station was 2,568 per day (*5*). According to the Guidelines for Normal Nucleic Acid Testing in Beijing, there are 3–5 staff for sampling, information registering, and security at each station. Self-sampling could save numerous manpower and medical resources compared with regular sampling, as it requires fewer staff and stations. The positive rate of self-sampling was 181.49 per 100,000 population, higher than regular sampling (85.71 per 100,000 population).

DISCUSSION

This study is the first to use registered data to evaluate the effect and cost of SARS-CoV-2 nucleic acid self-sampling in China. Our findings suggest that self-sampling during the COVID-19 pandemic can be an effective and economical approach to responding to the spread of emerging infectious diseases.

In response to respiratory-borne diseases, which can spread rapidly, the primary point of control is early detection, diagnosis, reporting, isolation, and treatment of the source of infection. Nucleic acid testing is an extensively used screening method with high accuracy for detecting patients and is applied in various diseases. In China, nationwide regular sampling has been effective in containing the spread of COVID-19. However, with the emergence of virus variants, self-sampling appears to be more applicable to the new epidemic situation than regular sampling, with its general applicability, equivalent effectiveness, and low cost.

In our study, the age, region, and time distribution of residents with self-sampling in Fengtai revealed its general applicability. The age distribution of residents with self-sampling was wide, ranging from 22 days to 116 years old, indicating that self-sampling is suitable for all age groups and has feasibility for promotion. The number of residents with self-sampling was significantly different among streets, which may be associated with the density of permanent population in different streets. Shortly after the beginning of pilot work, participants increased rapidly, indicating that self-sampling had excellent population acceptance and operability. In addition, 71.9% of residents had results reported within 24 hours of self-sampling, conveying that self-sampling could meet the needs of daily nucleic acid testing. During the process of pilot work, Fengtai introduced two self-sampling types: “5 Mixed in 1” (i.e. 5 or fewer samples in each tube, suitable for family use) and “10 Mixed in 1” (i.e. 6–10 samples in each tube, suitable for company use). We found that the number of samples in a tube was mostly ≤5 (94.7%), reflecting that the demand for family-type self-sampling was higher than the demand for company-type, and self-sampling was convenient without worries about environment, location, and time. Moreover, the re-check work was more concentrated if the result of preliminary screening was positive.

The results of our study indicated that self-sampling was not inferior to regular sampling in terms of effectiveness and cost. A systematic review and meta-analysis reported that there was no statistical difference in sensitivity and specificity between samples collected by health-care workers and self-collected samples (*6*). Adequate training of community residents could ensure that self-sampling and regular sampling yielded the same results. Additionally, self-sampling could save on manpower, room space, equipment, medical materials, and other running costs once the sampling

TABLE 1. Characteristics of 890,952 community residents with SARS-CoV-2 nucleic acid self-sampling in Fengtai District, Beijing, November 2022.

Characteristic	Number	Percentage (%)
Age group (years)		
0–9	56,891	6.4
10–19	55,132	6.2
20–29	100,172	11.2
30–39	188,697	21.2
40–49	171,008	19.2
50–59	165,294	18.6
60 and above	153,758	17.3
Street name		
Wangzuo Town	9,812	1.1
Shiliuzhuang	4,328	0.5
Liuliqiao	8,138	0.9
Lize Financial Business District	1,112	0.1
Xiluoyuan	17,170	1.9
Yungang	10,467	1.2
Dahongmen	11,363	1.3
Qingta	13,520	1.5
Fangzhuang	14,355	1.6
Fengtai Science and Technology Park	9,960	1.1
Donggaodi	17,735	2.0
Taipingqiao	18,451	2.1
Wanping	23,346	2.6
Wulidian	24,311	2.7
Changxindian	32,632	3.7
Heyi	33,760	3.8
Huaxiang	33,961	3.8
Yuquanying	36,082	4.0
Youanmen	37,752	4.2
Chengshousi	43,013	4.8
Lugouqiao	48,136	5.4
Majiabao	50,830	5.7
Xincun	51,750	5.8
Kandan	57,957	6.5
Dongtiejiangying	80,734	9.1
Fengtai	99,922	11.2
Nanyuan	100,355	11.3
Time from self-sampling to sample-collecting (hours)		
<12	534,394	60.0
12–23	311,050	34.9
24–35	24,104	2.7
36–47	13,979	1.6
≥48	7,425	0.8
Time from self-sampling to result-reporting (hours)		
<12	47,355	5.3
12–23	593,097	66.6
24–35	178,810	20.1
36–47	41,574	4.7
≥48	30,116	3.4

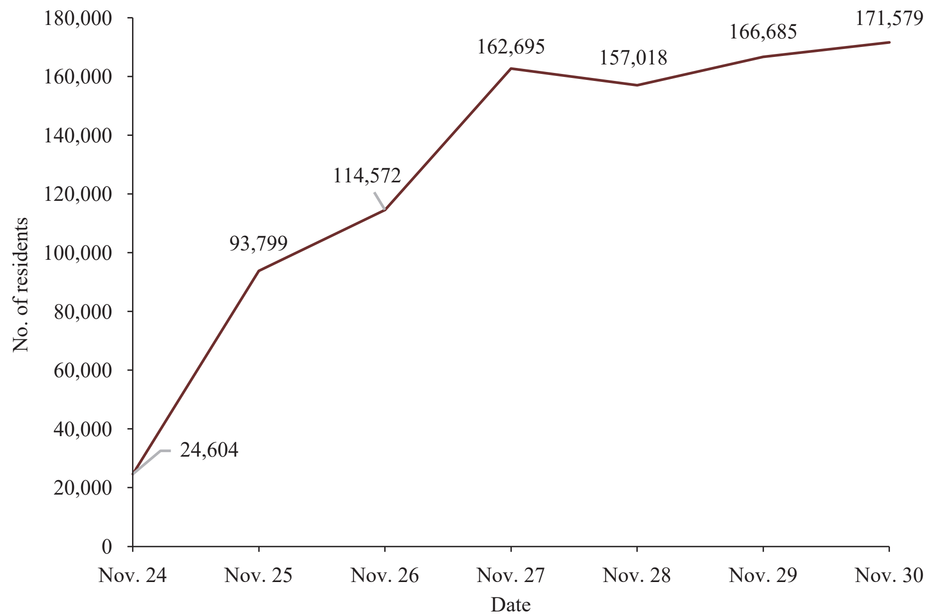

FIGURE 1. Time trends of 890,952 community residents with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) nucleic acid self-sampling in Fengtai District, Beijing, November 2022.

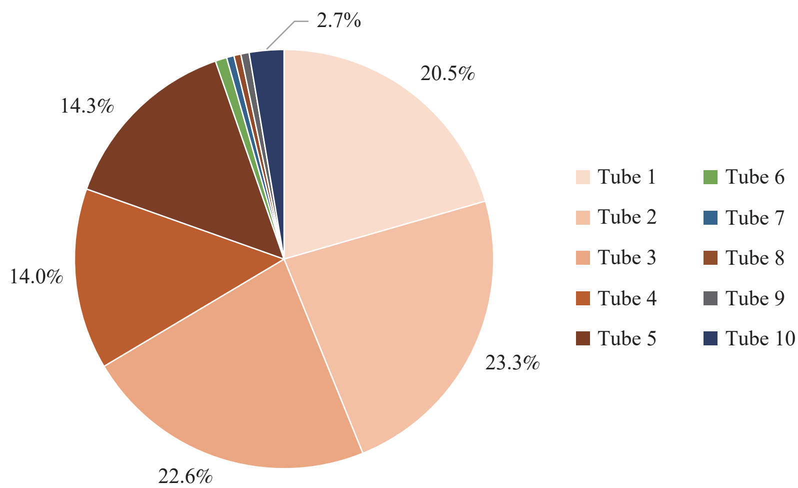

FIGURE 2. Distribution of the number of samples in each self-sampling tube in Fengtai District, Beijing, November 2022.

operation was assigned to individuals.

Additionally, self-sampling could strengthen individuals' roles in the prevention and control of infectious diseases. On December 2, 2022, the Beijing Municipal Health Commission published the article "Fulfill the Responsibility of Epidemic Prevention and Be the First Line of Defense in Your Own Health," which emphasized individual responsibility in epidemic prevention and control (*7*). On December 7, 2022, China further introduced the Notice on Further Optimizing and Implementing the Prevention and Control Measures of COVID-19, proposing 10 targeted measures (*8*). In line with the "20 Measures" and "10 Measures," many provincial-level administrative divisions (PLADs) in China have announced new regulations on nucleic acid testing, such as no requirements for general testing, no requirements for a negative result when accessing public places except for several special places, and no requirements for testing mobile people (*9*). These policies and measures increased public awareness of self-responsibility in health and highlighted the feasibility of self-sampling in confronting emerging infectious diseases.

Our study had several limitations. First, due to the information system not collecting sufficient residents' characteristics, such as marital status and education, we were unable to develop a more in-depth analysis on characteristics of residents with self-sampling. Second, as we were unable to obtain the gold standard testing results, the sensitivity and specificity of self-sampling and regular sampling were unknown. Third, our study focused on self-sampling under the background of the COVID-19 pandemic, which may limit the ability to extrapolate results. However, the self-sampling model has been used in other countries for primary detection of patients with COVID-19 and other infectious diseases, such as HIV infection (*6*,*10*). Therefore, our findings provide an inspiration for model innovation, a public-participation model, for responding to emerging infectious diseases.

In conclusion, self-sampling could help the public effectively and economically respond to large-scale epidemics, with characteristics of general applicability, equivalent effectiveness, and low cost. However, our study only conducted a qualitative economic evaluation of self-sampling, and the testing results may be affected by many factors, such as whether the sampling process is standard or not. Therefore, further research is needed to explore the sensitivity, specificity, and economic effect of self-sampling in the real world. In the future, self-sampling can be implemented to introduce prevention and control measures for infectious diseases.

Conflicts of interest: No conflicts of interest.

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Corresponding authors: Hao Wu, wushunzhe@ccmu.edu.cn; Jue Liu, jueliu@bjmu.edu.cn.

[1] Department of Epidemiology and Biostatistics, School of Public Health, Peking University, Beijing, China; [2] School of Public Health, Capital Medical University, Beijing, China; [3] School of General Practice and Continuing Education, Capital Medical University, Beijing, China; [4] Institute for Global Health and Development, Peking University, Beijing, China; [5] Global Center for Infectious Disease and Policy Research and Global Health and Infectious Diseases Group, Peking University, Beijing, China.

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Preplanned Studies

Safety and Effectiveness of SA58 Nasal Spray Against COVID-19 Infection in Medical Personnel: An Open-Label, Blank-Controlled Study — Hohhot City, Inner Mongolia Autonomous Region, China, 2022

Shujie Si[1,&]; Canrui Jin[2,&]; Jianping Li[2]; Yunlong Cao[3,4]; Biao Kan[5]; Feng Xue[6]; Xiaoliang Sunney Xie[3,4]; Liang Fang[2]; Gang Zeng[2]; Shuo Zhang[7,#]; Yaling Hu[6,#]; Xiaoping Dong[5,8,9,10,#]

Summary

What is already known about this topic?

The active ingredient of the SA58 Nasal Spray is a broad-spectrum neutralizing antibody with a high neutralizing capacity against different Omicron sub-variants in vitro studies.

What is added by this report?

This study demonstrated the safety and effectiveness of SA58 Nasal Spray against coronavirus disease 2019 (COVID-19) infection in medical personnel for the first time.

What are the implications for public health practice?

This study provides an effective approach for the public to reduce their risk of COVID-19 infection. The findings of this research have the potential to significantly reduce the risk of infection and limit human-to-human transmission in the event of a COVID-19 outbreak.

The coronavirus disease 2019 (COVID-19) pandemic has had a significant impact on public health, society, and the economy. In September 2022, an outbreak of the COVID-19 Omicron variant occurred in the Inner Mongolia Autonomous Region, particularly in Hohhot. To accommodate the influx of COVID-19 patients, several designated COVID-19 hospitals and Fangcang shelter hospitals were built in Hohhot. Medical teams from across China were deployed to these hospitals, but they were at high risk of contracting COVID-19 and experienced significant infections within weeks. The approved COVID-19 vaccines have limited effectiveness in protecting against infection and blocking transmission (*1*), and other countermeasures, such as pre-exposure or postexposure prophylaxis, are urgently needed to protect against SARS-CoV-2 nosocomial infection in hospitals. Sinovac Life Sciences Co., Ltd. has recently developed a nasal spray of broad-spectrum antibody against COVID-19 (SA58 Nasal Spray) (*2*–*6*). This study evaluated the safety and effectiveness of SA58 Nasal Spray in protecting medical personnel who worked in the designated COVID-19 hospitals and Fangcang shelter hospitals during the outbreak in Hohhot.

In this open-label, blank-controlled study conducted in Hohhot, Inner Mongolia Autonomous Region, medical personnel aged 18 years and older who worked in the two designated COVID-19 hospitals and four Fangcang shelter hospitals were recruited. Participants who agreed to use SA58 Nasal Spray were asked to provide informed consent and subsequently administered SA58 twice a day with an interval of six hours for approximately 30 days, while the remaining medical personnel who did not use the drug were divided into the control group. This study received approval from the Institutional Review Board of the Inner Mongolia Fourth Hospital (202223). This study is registered at ClinicalTrials.gov as NCT05664919.

Throat swab sampling and RT-PCR (reverse transcription-polymerase chain reaction) testing were conducted daily for all participants. COVID-19 case monitoring began on the day of SA58 Nasal Spray administration and continued for 30 days. All participants who used SA58 Nasal Spray were asked to report any adverse events (AEs) daily for 30 days via an APP for medication information collection in WeChat.

The effectiveness of SA58 Nasal Spray was evaluated based on the cumulative incidence of COVID-19 cases. The cumulative incidence for each group was defined as the number of COVID-19 cases divided by the number of person-days during the observation period. As medical personnel were not working on a fixed schedule in the hospitals and many were working on different shifts and rotations during the 30-day observation, the working person-day was mainly used for further analysis.

A total of 6,662 RT-PCR negative medical personnel working in two designated hospitals and four Fangcang shelter hospitals receiving COVID-19 cases in Hohhot, the Inner Mongolia Autonomous Region, were enrolled in this study. During the observation period, 1,596 participants from other provinces' medical teams left Hohhot within two days of receiving the SA58 Nasal Spray, and were thus excluded from the Effectiveness Assessment Set. Of the 3,368 participants using SA58 Nasal Spray, 1,736 reported their medication information via an APP. The median age of the APP-reported participants was 34 years (ranging from 24 to 58 years), with approximately 23% in their twenties, 53% in their thirties, 21% in their forties, and 2% in their fifties. The gender ratio (M/F) was 23%/77%. No special coexisting conditions were recorded among the participants.

A total of 135,544 working person-days were counted, with 27,103 person-days in the drug group and 110,441 in the control group (Figure 1).

A total of 135 RT-PCR positive cases were identified, resulting in a crude infection rate of 2.66% (135/5,066). Of these 135 positive cases, 128 were in the control group and 7 were in the drug group. The cumulative number of cases during the observation period showed a rapid increase of positive cases in the control group, while the drug group experienced a notably slower increase (Figure 2). The cumulative incidence was 0.026% (7 cases out of 27,103 person-days) in the drug group and 0.116% (128 cases out of 110,441 person-days) in the control group. The effectiveness of the SA58 Nasal Spray in protecting medical personnel working in COVID-19 designated hospitals and Fangcang shelter hospitals was calculated to be 77.7%.

Of the 1,736 medical personnel who reported the SA58 Nasal Spray medication information via APP, 1,794 AEs were reported by 497 medical personnel. The incidence of AEs was 28.6% (497/1,736). The majority of AEs were administrative site AEs, including rhinorrhea (14.5%), nasal mucosal dryness (9.6%), sneezing (8.7%), nasal obstruction (6.0%), headache and dizziness (2.0%), pharyngolaryngeal discomfort (1.0%), discomfort in the nose (0.9%), cough (0.5%), nausea (0.4%), expectoration (0.4%), and rash (0.3%), which were infrequently reported (Figure 3). Fever and

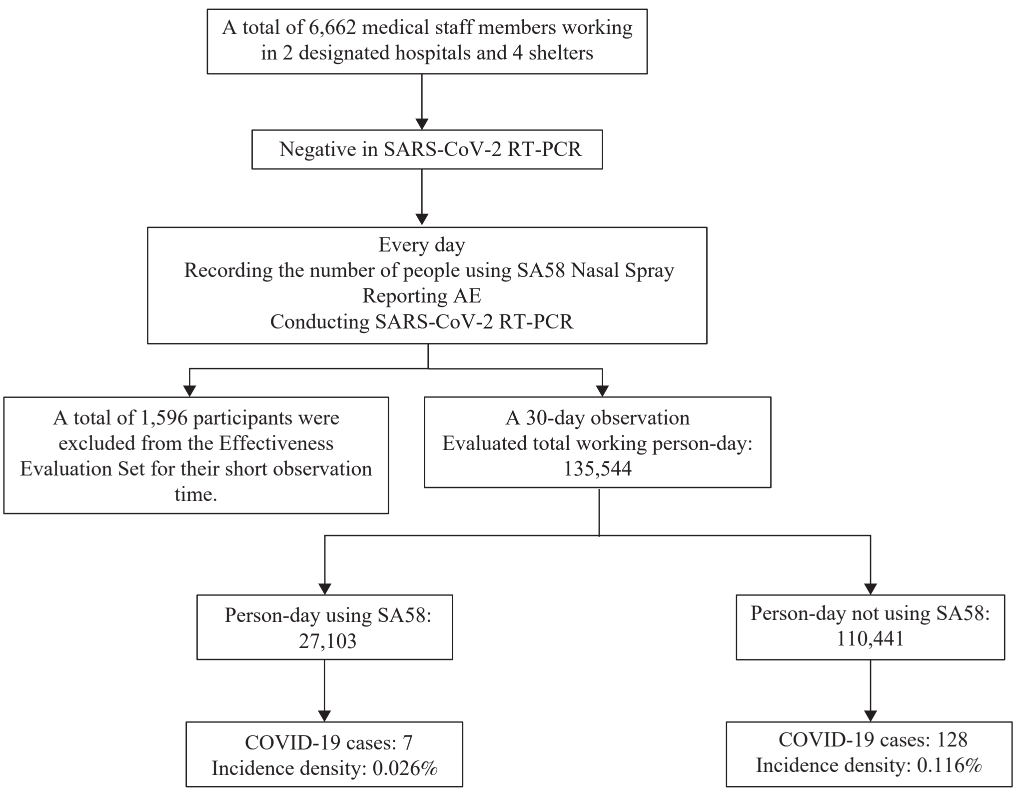

FIGURE 1. Study design and procedures of SA58 Nasal Spray in medical personnel.
Abbreviation: RT-PCR=reverse transcription-polymerase chain reaction; AE=adverse event; COVID-19=coronavirus disease 2019.

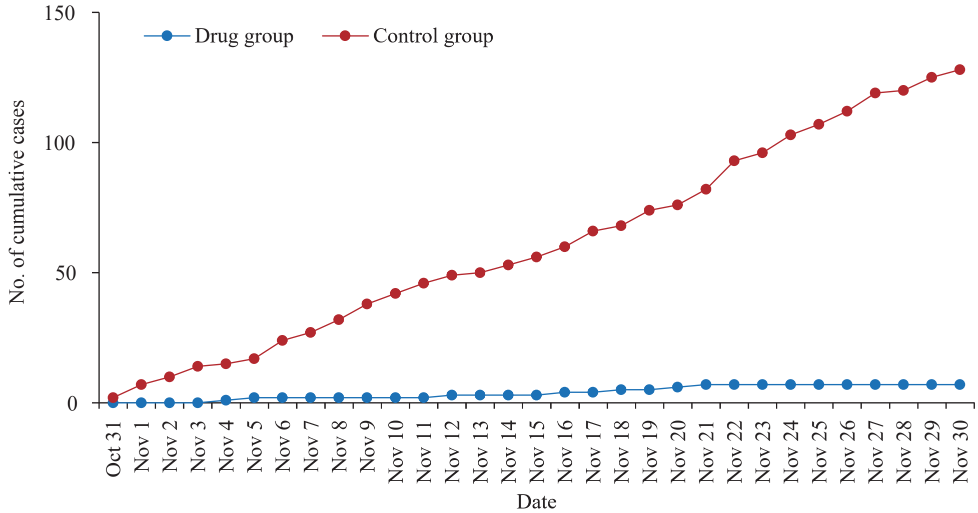

FIGURE 2. Cumulative coronavirus disease 2019 (COVID-19) cases in the drug group and the control group over a 30-day observation period, 2022.

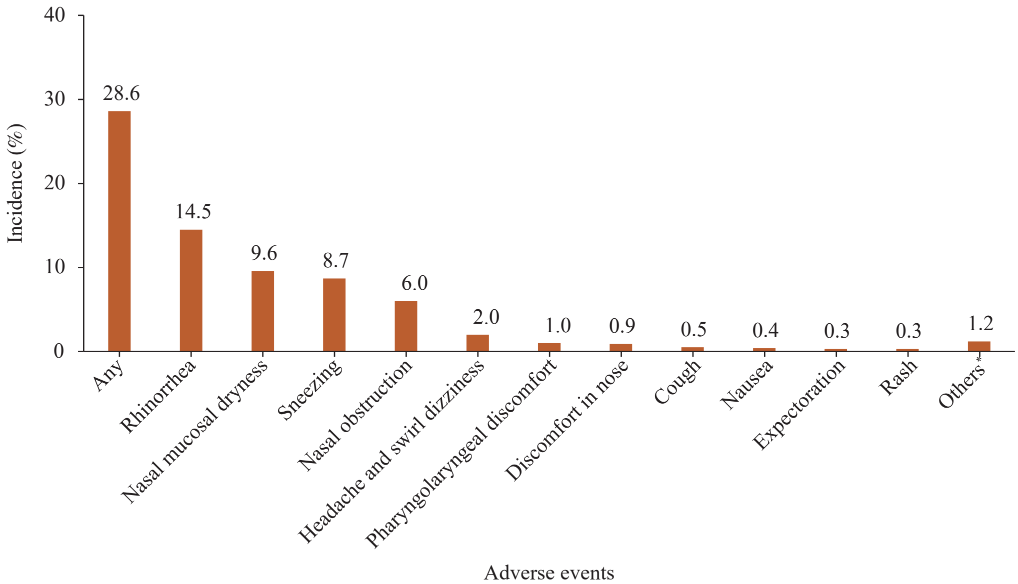

FIGURE 3. Incidence of reported adverse events (AEs) in the drug group during the 30-day observation.
Note: The X-axis indicates various AEs, and the Y-axis indicates the incidence of AEs.
* Others included mild fever, palpitation, muscle pain, bleeding nose, cold sweat, pruritus cutaneous, gastrointestinal reaction, eye pain, gasping, tight chest, dry mouth, redness of eyelid conjunctiva, and skeletal pain.

other systemic AEs were extremely rare. The severity of all the AEs was mild, and all of them resolved quickly without affecting daily activities.

DISCUSSION

An open-label, blank-controlled study of SA58 Nasal Spray was conducted among medical personnel working in designated hospitals and Fangcang shelter hospitals for COVID-19 from October 31 to November 30, 2022. Virus genome sequencing assay showed that in Hohhot, the Omicron VOCs circulating during this period were BF.7, BA.5.2, BA.5.2.1, BQ.1.2, etc., with BF.7 being the predominant one. SA58 Nasal Spray demonstrated notable efficacy, as evidenced by a substantially lower incidence of COVID-19 cases in the drug group compared to the control group during the 30-day follow-up period. The effectiveness of SA58 Nasal Spray for preventing SARS-CoV-2 infection among medical personnel working in the COVID-19 designated hospitals and Fangcang shelter hospitals was as high as 77.7%. The SA58 Nasal Spray was also well-tolerated. Of the 1,736 participants, 497 reported AEs with an incidence rate of 28.6%. Given that participants who did not experience AEs may have been less likely to report their medical information through the APP, it is possible that the actual incidence of AEs may be lower than the reported 28.6%. Among those participants who reported local AEs, most of them using SA58 Nasal Spray recorded that those mild AEs were almost ignorable and did not affect their daily work.

Infection and transmission of COVID-19 are not only attributed to virus variants, but also to many other physical components. It is worth emphasizing that all participants in this study were medical personnel dealing with COVID-19 cases, a population at high risk for infection. Despite being equipped with appropriate personal protective equipment (PPE), the medical personnel in the control group reported a crude COVID-19 infection rate of 2.66% during the 30-day observation, which was notably higher than the infection rate in the general population in Hohhot during that period. In addition to PPE, the SA58 Nasal Spray provides another specific protection tool that is easy to use for medical personnel and other high-risk professionals when in service.

Omicron VOCs have generally been associated with mild clinical severity, however, they can still cause severe clinical outcomes in the elderly or those with underlying diseases (*7*). Vaccinating these populations is essential to avoid severe consequences (*8*–*9*), although it is not effective at preventing infection. Currently, there is no SA58 Nasal Spray data available for the elderly and those with underlying diseases; however, the mild AEs observed in this study suggest that the spray may be safe for these populations.

We must acknowledge that this study is not a placebo-controlled, double-blind study, which could introduce data bias. The frequent rotation of medical personnel between different medical institutions makes it difficult for many participants to complete the full 30 days of observation. Additionally, it is also difficult to accurately monitor the daily frequency of medications. The protective efficacy of SA58 Nasal Spray requires further verification through additional clinical trials.

In conclusion, this clinical study of the SA58 Nasal Spray on medical personnel demonstrated good tolerance and effectiveness in preventing COVID-19 infection, suggesting potential application in other populations in the real world.

Conflicts of interest: X. Xie and Y. Cao are the inventors of the provisional patent applications for the anti-COVID-19 monoclonal antibody (SA58), which has been transferred to Sinovac Life Sciences Co., Ltd. for clinical development. C. Jin, J. Li, G. Zeng, and L. Fang are employees of Sinovac Biotech Co., Ltd., while F. Xue and Y. Hu are employees of Sinovac Life Sciences Co., Ltd. All other authors declare no competing interests.

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[#] Corresponding authors: Shuo Zhang, zhangshuo001@163.com; Yaling Hu, huyl@sinovac.com; Xiaoping Dong, dongxp238@sina.com.

[1] Pharmacy Department, Inner Mongolia Fourth Hospital, Hohhot City, Inner Mongolia Autonomous Region, China; [2] Clinical Research and Development Department, Sinovac Biotech Co., Ltd., Beijing, China; [3] Biomedical Pioneering Innovation Center (BIOPIC), Peking University, Beijing, China; [4] Changping Laboratory, Beijing, China; [5] State Key Laboratory for Infectious Disease Prevention and Control, NHC Key Laboratory of Medical Virology and Viral Diseases, National Institute for Viral Disease Control and Prevention, Chinese Center for Disease Control and Prevention, Beijing, China; [6] Research and Development Department, Sinovac Life Sciences Co., Ltd., Beijing, China; [7] Inner Mongolia Blood Center, Hohhot City, Inner Mongolia Autonomous Region, China; [8] Center for Biosafety Mega-Science, Chinese Academy of Sciences, Wuhan City, Hubei Province, China; [9] China Academy of Chinese Medical Sciences, Beijing, China; [10] Shanghai Institute of Infectious Diseases and Biosafety, Shanghai, China.
[&] Joint first authors.

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Preplanned Studies

Hesitancy to Receive the Booster Doses of COVID-19 Vaccine Among Cancer Patients in China: A Multicenter Cross-Sectional Survey — Four PLADs, China, 2022

Yuxiao Wang[1,&]; Lei Zhang[2,&]; Siyu Chen[3,&]; Xinquan Lan[4,5]; Moxi Song[4,5]; Rila Su[6,7]; Jianzhou Yang[8,#]; Zixin Wang[3,#]; Junjie Xu[5,#]

Summary

What is already known about this topic?

Cancer patients are more vulnerable and have higher mortality rates from severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) than the general population; however, coverage for booster doses of the coronavirus disease 2019 (COVID-19) vaccine was low among cancer patients in China.

What is added by this report?

Overall, 32.0% and 56.4% of cancer patients from four Provincial Level Administrative Divisions (PLADs) expressed hesitancy toward the first and second booster doses, respectively. Factors negatively associated with hesitancy to receive booster doses included positive attitudes, perceived support, and higher exposure to COVID-19 vaccination information. Conversely, postvaccination fatigue was positively associated with vaccine hesitancy.

What are the implications for public health practice?

Improved COVID-19 vaccination coverage is needed to promote health for cancer patients.

Recent concerns have been raised about waning protection against coronavirus disease 2019 (COVID-19) after completing the two-dose primary vaccination series (*1*). Cancer patients have been found to have higher mortality from severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) than the general population, but only 52% [95% confidence interval (*CI*): 35%–70%] of this population were willing to accept the COVID-19 vaccine (*2*). To date, no study has evaluated the hesitancy of cancer patients to receive the booster doses of the COVID-19 vaccines in China. A multicenter cross-sectional study was conducted in four Chinese cities. Medical staff approached all cancer inpatients aged 18 years or above, and 893 patients completed a face-to-face interview. This study was based on a sub-sample of 525 participants who completed the primary vaccination series. Logistic regression models were fitted to identify the factors associated with vaccine hesitancy. Among the participants, 32.0% and 56.4% were hesitant to receive the first and second COVID-19 vaccine booster doses. Positive attitudes, perceived support from significant others and perceived behavioral control related to the booster dose, higher exposure to COVID-19 vaccination information, and thoughtful consideration about the veracity of COVID-19-specific information were associated with lower hesitancy to receive the booster doses. Vaccination fatigue was positively associated with vaccine hesitancy. Cancer patients in China were more hesitant than the general population to receive COVID-19 vaccine booster doses. Health sectors should advocate the benefits of vaccination with COVID-19 booster doses to cancer patients, which would improve the coverage and promote health.

In Chinese mainland, the National Guideline recommends a third dose of COVID-19 vaccine as a booster for cancer patients six months after completing the two-dose primary vaccination series (*3*). Many cancer patients may be hesitant to receive the booster doses. A previous study identified some factors associated with hesitancy to complete the primary vaccination series among cancer patients (*4*). Vaccine fatigue, which is defined as people's inaction towards vaccine instruction due to perceived burden and burnout (*5*), could be a factor in this hesitancy. Thoughtful consideration of the veracity of the information may mitigate the negative impact of misinformation related to COVID-19 and COVID-19 vaccination. This study examined the effects of sociodemographics, cancer-related characteristics, perceptions, vaccine fatigue, and media influences associated with vaccine hesitancy.

This was a multicenter, cross-sectional study of cancer patients in four Chinese cities from four Provincial Level Administrative Divisions (PLADs) (Changzhi, Hohhot, Urumqi, and Shenzhen) conducted between May and June 2022. All study sites adhered to the national guideline and recommended a third dose of the COVID-19 vaccine as a booster for cancer patients (*3*).

Participants of the original study were included if they met the following criteria: 1) cancer patients who were hospitalized in the four participating hospitals during the study period, 2) aged 18 years or above, and 3) willing to provide written informed consent to complete the survey. Exclusion criteria included: 1) critical illness or intensive care unit admission, 2) a diagnosis of lymphoma, leukemia, mental illness, or taking medication for mental illness, or 3) dementia or inability to communicate effectively with the investigators. Medical staff from the selected hospitals approached all cancer inpatients, screened their eligibility, briefed them about the study, and invited them to participate in a face-to-face interview. No incentives were provided. The data collection procedures are shown in Figure 1. Ethics approval was obtained from the Institutional Review Board of Changzhi Medical College (reference: RT2022027).

Participants reported sociodemographic information, and medical staff extracted cancer-related characteristics and presence of other chronic diseases from medical records. We first asked whether participants had received the first booster dose, and for those who had not, we further asked their likelihood of receiving it (response categories: 1=very unlikely, 2=unlikely, 3=neutral, 4=likely, and 5=very likely). Since China has not yet provided the second booster dose, we asked all participants their likelihood of receiving it if it is available (response categories: 1=very unlikely, 2=unlikely, 3=neutral, 4=likely, and 5=very likely). Vaccine hesitancy was defined as "very

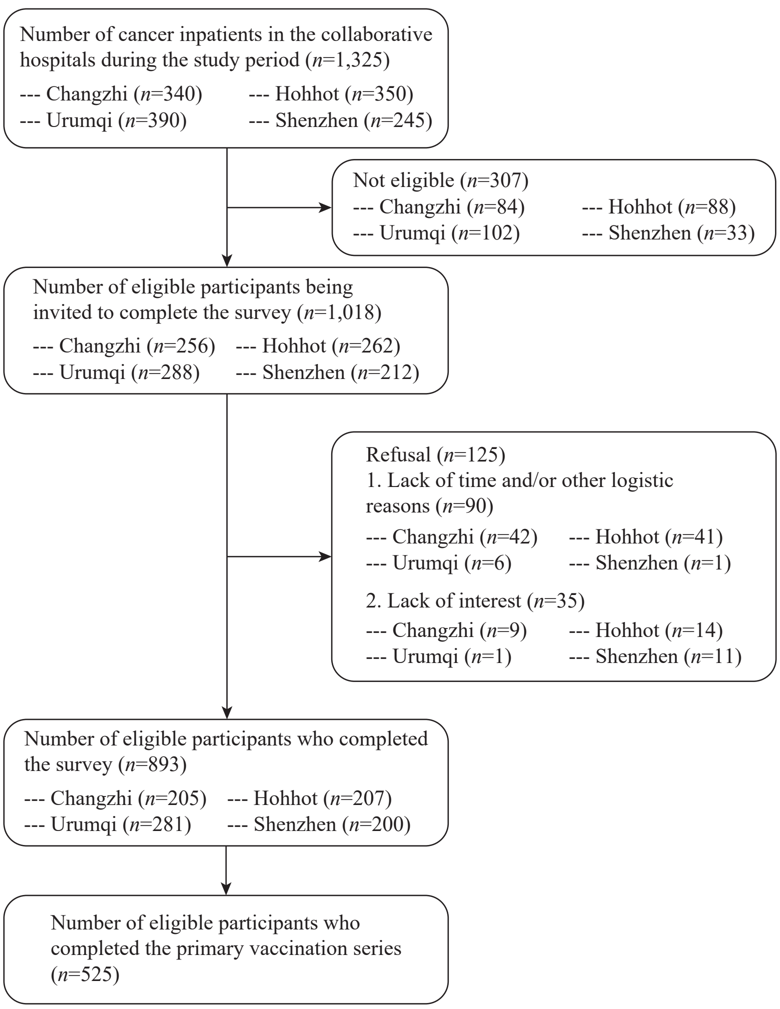

FIGURE 1. The data collection procedures of this study.

unlikely," "unlikely," or "neutral." We used the Theory of Planned Behavior (TPB) to measure perceptions related to COVID-19 vaccine booster dose (*6*). We used the 3-item Positive Attitude Scale and modified the 5-item Negative Attitude Scale, both of which were validated in older Chinese adults (*7*). In addition, perceived subjective norm and perceived behavioral control were measured by two single-item scales validated in the Chinese population (*8*). Vaccine fatigue was measured by a single item ("You are tired of receiving COVID-19 vaccination over and over again"). We adopted four items validated in the Chinese population to measure media influences related to COVID-19 and COVID-19 vaccination (*8*). A validated single item assessed the frequency of thoughtful consideration about the veracity of COVID-19 specific information. The Cronbach's alpha of the Positive Attitude Scale, Negative Attitude Scale, and the Media Exposure Scale was 0.90, 0.84, and 0.90, respectively.

Frequency distributions of all variables were measured, and the mean and standard deviation (SD) of the scale and item scores were presented. Reliability tests were used to obtain the Cronbach's alpha for the scales. Hesitancy to receive the first and second COVID-19 vaccine booster doses were used as dependent variables, and univariate logistic regression models were used to examine significant associations between background characteristics and dependent variables. Perceptions, vaccine fatigue, and media influence were used as independent variables, and associations between one of these independent variables and the dependent variables with adjustments for significant background characteristics were assessed using adjusted odds ratios (AORs) and their corresponding *CI*s. There were no missing values for the participants who completed the primary vaccination series. Data analysis was conducted using IBM SPSS Statistics (version 26.0, IBM Corp., Armonk, NY, USA) and $P<0.05$ was considered statistically significant.

A total of 893 participants provided written informed consent and completed the interview. Of the 525 eligible cancer patients who completed primary COVID-19 vaccination, 41.8% were over 60 years old and 55.8% were male. The most common type of cancer was lung cancer (20.8%), followed by colorectal cancer (18.5%), and 6.7% had metastatic cancers. Most participants (93.0%) were under cancer treatment. In addition to cancers, 21.5% had at least one other chronic disease (Table 1). Of the participants, 49.9% had received the first COVID-19 booster dose. Of those who had not yet received the first booster dose, 36.1% intended to get vaccinated. The prevalence of hesitancy to receive the first and the second booster doses was 32.0% and 56.4%, respectively (Supplementary Table S1, available in https://weekly.chinacdc.cn/).

In the univariate analysis, cancer patients who were ethnic minorities had lower hesitancy to receive the first COVID-19 vaccine booster dose (Supplementary Table S2, available in https://weekly.chinacdc.cn/). After adjusting for significant background characteristics listed in Supplementary Table S2, positive attitudes toward the booster dose (AOR: 0.83 & 0.66), perceived higher support from significant others (AOR: 0.55 & 0.40), perceived higher behavioral control to take up the booster dose (AOR: 0.51 & 0.25), higher exposure to information related to COVID-19 vaccination (AOR: 0.94 & 0.90), and thoughtful consideration about the veracity of COVID-19-specific information (AOR: 0.65 & 0.52) were associated with lower hesitancy to receive the first and the second booster doses (Table 2). Vaccination fatigue was also positively associated with hesitancy to receive the first and second booster doses (AOR: 1.36 & 1.52). Additionally, hesitancy to receive the first booster dose was associated with higher hesitancy for the second booster dose (AOR: 14.05).

DISCUSSION

This is the first study to investigate hesitancy to receive the first and second COVID-19 vaccine booster doses among cancer patients. This study has several strengths, including its coverage of different geographic regions in China, its large sample size, and its examination of potential determinants at different levels. The level of hesitancy to receive the first COVID-19 vaccine booster dose among our participants was much higher than that of the general population in China (*9*).

This study provided practical implications for developing health promotion. Addressing vaccination fatigue may be beneficial for future health promotion for cancer patients. Rapid changes in policies and recommendations related to COVID-19 booster doses caused confusion among the general public (*5*). This confusion was further exacerbated when health authorities recommended the second booster dose. Modifying perceptions related to COVID-19 vaccine booster doses is also important. Updated evidence of

TABLE 1. Background characteristics of 525 participants who completed the primary COVID-19 vaccination series.

Background characteristic	No. of participants	Percentage (%)
Sociodemographic characteristics		
Age group in years		
18–45	87	16.6
46–60	219	41.7
61–75	194	37.0
>75	25	4.8
Gender		
Male	293	55.8
Female	232	44.2
Ethnicity		
Han majority	426	81.1
Other ethnic minority groups	99	18.9
Education level		
Junior high school and below	338	64.4
High school education or equivalent	102	19.4
College-level and above	85	16.2
Relationship status		
Single/divorced/widowed	39	7.4
Married	486	92.6
Employment status		
Full-time	138	26.3
Part-time/self-employed/unemployed/retired/students	387	73.7
Characteristics of cancer		
Type of cancer		
Lung cancer	109	20.8
Gastric cancer	66	12.6
Liver cancer	15	2.9
Breast cancer	30	5.7
Colorectal cancer	97	18.5
Esophageal cancer	26	5.0
Ovarian cancer	43	8.2
Other types of cancer	139	26.5
Metastatic cancers		
No	490	93.3
Yes	35	6.7
Current treatment for cancer		
Untreated patients	17	3.2
Chemotherapy only	338	64.4
Radiotherapy only	89	17.0
Immunotherapy only	12	2.3
Chemotherapy and radiotherapy	34	6.5
Immunotherapy and chemotherapy/radiotherapy	15	2.9
Treatment completion	20	3.8
Presence of other chronic diseases		
Diabetes mellitus	30	5.7
Hypertension and/or hyperlipidemia	73	13.9
Chronic cardiovascular diseases	13	2.5
Chronic respiratory diseases	4	0.8
Chronic liver and/or kidney diseases	7	1.3
Other chronic diseases	15	2.9

TABLE 2. Factors associated with hesitancy to receive the first and second booster doses of the COVID-19 vaccine (*N*=525).

Characteristic	Hesitancy to receive the third dose of COVID-19 vaccine				Hesitancy to receive the fourth dose of COVID-19 vaccine			
	OR (95% *CI*)	*P* value	AOR* (95% *CI*)	*P* value	*OR* (95% *CI*)	*P* value	AOR* (95% *CI*)	*P* value
Individual-level variables								
Positive attitude scale	0.83 (0.76, 0.92)	<0.001	0.83 (0.76, 0.92)	<0.001	0.65 (0.60, 0.74)	<0.001	0.66 (0.60, 0.74)	<0.001
Negative attitude scale	1.01 (0.97, 1.06)	0.553	1.01 (0.97, 1.06)	0.560	1.03 (0.99, 1.08)	0.147	1.03 (0.99, 1.08)	0.195
Perceived subjective norms	0.54 (0.43, 0.67)	<0.001	0.55 (0.44, 0.69)	<0.001	0.39 (0.30, 0.49)	<0.001	0.40 (0.31, 0.51)	<0.001
Perceived behavioral control	0.54 (0.43, 0.67)	<0.001	0.51 (0.40, 0.63)	<0.001	0.25 (0.19, 0.34)	<0.001	0.25 (0.19, 0.34)	<0.001
Vaccination fatigue (tired of receiving COVID-19 vaccination over and over again)	1.34 (1.18, 1.58)	<0.001	1.36 (1.18, 1.58)	<0.001	1.48 (1.28, 1.71)	<0.001	1.52 (1.31, 1.78)	<0.001
Hesitancy to receive the third dose of COVID-19 vaccine	NA	NA	NA	NA	14.05 (7.94, 24.79)	<0.001	14.05 (8.05, 24.52)	<0.001
Interpersonal variables								
Media exposure scale	0.93 (0.89, 0.99)	0.012	0.94 (0.89, 0.99)	0.033	0.90 (0.85, 0.95)	<0.001	0.90 (0.85, 0.95)	<0.001
Frequency of thoughtful consideration about veracity of COVID-19-specific information	0.64 (0.53, 0.77)	<0.001	0.65 (0.54, 0.79)	<0.001	0.51 (0.42, 0.62)	<0.001	0.52 (0.43, 0.64)	<0.001

Abbreviation: *OR*=crude odds ratio; AOR=adjusted odds ratio; *CI*=confidence interval; NA=not applicable.
* Adjusted for significant background characteristics listed in Supplementary Table S2.

booster doses in reducing mortality and severe consequences caused by COVID-19 among cancer patients should be disseminated in an accessible manner. Future programs might consider involving significant others of cancer patients to create a subjective norm favoring COVID-19 vaccine booster doses uptake. Healthcare workers may facilitate cancer patients to form a plan to receive a booster dose during clinical visits, which may help to improve perceived behavioral control. Higher exposure to topics related to COVID-19 vaccination and the Omicron variant was associated with lower hesitancy to receive booster doses. Health authorities should consider using these mass media channels to disseminate messages promoting booster doses. Similar to the findings among the general population in China, thoughtful consideration played an essential role in reducing hesitancy to receive booster doses. Thoughtful consideration could mitigate the negative impacts of misinformation on vaccine hesitancy (*8*).

This study has several limitations. First, our findings could not be generalized to all cancer patients, as we only targeted inpatients. Second, the sample was selected conveniently and could not represent all cancer patients in China. Third, we could not obtain the characteristics of cancer patients who refused to join the study, leading to selection bias. Additionally, this was a cross-sectional survey and could not establish a causal relationship. To address vaccination fatigue, modify perceptions related to booster doses, disseminate booster dose promotion messages through mass media, and improve thoughtful consideration of the veracity of COVID-19-related information might be helpful strategies.

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[#] Corresponding authors: Jianzhou Yang, jzyang@aliyun.com; Zixin Wang, wangzx@cuhk.edu.hk; Junjie Xu, xjjcmu@163.com.

[1] Clinical Research Academy, Peking University Shenzhen Hospital, Shenzhen Peking University-The Hong Kong University of Science and Technology Medical Center, Shenzhen City, Guangdong Province, China; [2] Department of Radiotherapy, Peking University Shenzhen Hospital, Peking University, Shenzhen City, Guangdong Province, China; [3] JC School of Public Health and Primary Care, Faculty of Medicine, The Chinese University of Hong Kong, Hong Kong, China; [4] Department of Epidemiology, China Medical University, Shenyang City, Liaoning Province, China; [5] Clinical Research Academy, Peking University Shenzhen Hospital, Shenzhen

City, Guangdong Province, China; [6] Cancer Center at Inner Mongolia People's Hospital, Hohhot City, Inner Mongolia Autonomous Region, China; [7] John Hopkins Bloomberg School of Public Health, Baltimore, United States; [8] Department of Public Health and Preventive Medicine, Changzhi Medical College, Changzhi City, Shanxi Province, China.
[&] Joint first authors.

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SUPPLEMENTARY MATERIAL

SUPPLEMENTARY TABLE S1. Hesitancy to receive COVID-19 vaccine booster doses and descriptive statistics of independent variables of interest (among 525 participants who completed the primary vaccination series).

Hesitancy to receive COVID-19 vaccine booster doses and individual-level variables	No. of participants	Percentage (%)
Hesitancy to receive COVID-19 vaccine booster doses		
Uptake of the first COVID-19 vaccine booster dose (the third dose)		
No	263	50.1
Yes	262	49.9
Behavioral intention to receive the first COVID-19 vaccine booster dose (among participants who had not received it, *n*=263)		
Likelihood of outcomes: unlikely to neutral	168	63.9
Highly probable	95	36.1
Hesitancy to receive the first COVID-19 vaccine booster dose (the third dose)		
No	357	68.0
Yes	168	32.0
Hesitancy to receive the second COVID-19 vaccine booster dose (the fourth dose)		
No	229	43.6
Yes	296	56.4
Individual-level variables		
Positive attitudes toward COVID-19 vaccine booster dose, *n* (%) agree/strongly agree		
Receiving a booster dose can maintain your antibody level and strengthen the protection against COVID-19	289	51.2
A booster dose is highly effective in protecting you from COVID-19 variants of concern (e.g., Omicron)	190	36.2
A booster dose is highly effective in preventing severe consequences of COVID-19	253	48.2
Positive attitude scale*, Mean (SD)	10.8	(2.1)
Negative attitudes toward COVID-19 vaccine booster dose, *n* (%) agree/strongly agree		
The protection offered by COVID-19 vaccine booster dose is weaker among people with cancers	184	35.0
Cancer therapy would reduce the protection of COVID-19 vaccine booster dose	167	31.8
The side effects of COVID-19 vaccine booster dose are more severe among people with cancers	195	37.1
The duration of protection of COVID-19 vaccine booster dose is shorter among people with cancers	101	19.2
COVID-19 vaccine booster dose would negatively affect the control of cancers	191	36.4
Negative attitude scale†, Mean (SD)	16.1	(4.0)
Perceived subjective norm related to COVID-19 vaccine booster dose, *n* (%), agree/strongly agree		
People who are important to you, such as family members or healthcare providers, would likely support you in receiving a booster dose	190	36.2
Item score, Mean (SD)	3.2	(0.9)
Perceived behavioral control to receive a COVID-19 vaccine booster dose, agree/strongly agree		
Receiving a COVID-19 vaccine booster dose is easy for you if you want to	253	48.2
Item score, Mean (SD)	3.4	(0.9)
Vaccination fatigue: *n* (%) agree/strongly agree		
You are tired of receiving COVID-19 vaccination over and over again	90	17.1
Item score, Mean (SD)	2.5	(1.3)
Media influences related to COVID-19 and COVID-19 vaccination		
Frequency of exposure to the following contents on TV, radio, newspaper, and internet, *n* (%) sometimes/always		

TABLE S1. (Continued)

Hesitancy to receive COVID-19 vaccine booster doses and individual-level variables	No. of participants	Percentage (%)
Infectivity of the Omicron variant of COVID-19	407	77.5
Risk of having severe consequences or death is relatively low following infection of the Omicron variant of COVID-19	341	65.0
COVID-19 pandemic is not under control after COVID-19 vaccination rollout	283	53.9
Some people contract COVID-19 after completion of their primary vaccine series	314	59.8
Media exposure scale§, Mean (SD)	11.1	(3.4)
Frequency of thoughtful consideration about veracity of COVID-19-specific information		
Almost never	102	19.4
Seldom	108	20.6
Sometimes	206	39.2
Always	109	20.8
Item score, Mean (SD)	2.6	(1.0)

Abbreviation: COVID-19=coronavirus disease 2019; SD=standard deviation.

* Positive Attitude Scale. 3 items. Cronbach's alpha: 0.90. Exploratory factor analysis identified one factor, explaining 83.38% of total variance.

† Negative Attitude Scale. 5 items. Cronbach's alpha: 0.84. Exploratory factor analysis identified one factor, explaining 72.05% of total variance.

§ Media Exposure Scale, 4 items, Cronbach's alpha: 0.90, one factor was identified by exploratory factor analysis, explaining 76.39% of total variance.

SUPPLEMENTARY TABLE S2. Associations between background characteristics and hesitancy to receive the first and second booster doses of the COVID-19 vaccine among 525 participants who completed the primary vaccination series.

Characteristic	Hesitancy to receive the first COVID-19 vaccine booster dose			Hesitancy to receive the second COVID-19 vaccine booster dose		
	Prevalence of vaccine hesitancy *n*/*N* (%)	*OR* (95% *CI*)	*P* value	Prevalence of vaccine hesitancy *n*/*N* (%)	*OR* (95% *CI*)	*P* value
Age group in years						
18–45	29/87 (33.3)	1.0		48/87 (44.2)	1.0	
46–60	68/219 (31.1)	0.90 (0.53, 1.53)	0.699	125/219 (57.1)	1.08 (0.66, 1.78)	0.762
61–75	62/194 (32.0)	0.94 (0.55, 1.61)	0.820	106/194 (54.6)	0.98 (0.59, 1.63)	0.934
>75	9/25 (36.0)	1.13 (0.44, 2.85)	0.804	17/25 (68.0)	1.73 (0.67, 4.42)	0.255
Gender						
Male	93/293 (31.7)	1.0		151/293 (51.5)	1.0	
Female	75/232 (32.3)	1.03 (0.71, 1.49)	0.886	145/232 (62.5)	1.57 (1.10, 2.23)	0.012
Ethnicity						
Han majority	146/426 (34.3)	1.0		254/426 (59.6)	1.0	
Other ethnic minority groups	22/99 (22.2)	0.55 (0.35, 0.92)	0.022	42/99 (42.4)	0.50 (0.32, 0.78)	0.002
Education level						
Junior high school and below	112/338 (33.1)	1.0		198/338 (58.6)	1.0	
High school education or equivalent	31/102 (30.4)	0.88 (0.55, 1.42)	0.604	54/102 (52.9)	0.80 (0.51, 1.24)	0.313
College-level and above	25/85 (29.4)	0.84 (0.50, 1.41)	0.512	44/85 (51.8)	0.76 (0.47, 1.22)	0.257
Relationship status						
Single/divorced/widowed	10/39 (25.6)	1.0		20/39 (51.3)	1.0	
Married	158/486 (32.5)	1.40 (0.66, 2.94)	0.378	276/486 (56.8)	1.25 (0.65, 2.40)	0.505
Employment status						
Full-time	46/138 (33.3)	1.0		86/138 (62.3)	1.0	

TABLE S2. (Continued)

Characteristic	Hesitancy to receive the first COVID-19 vaccine booster dose			Hesitancy to receive the second COVID-19 vaccine booster dose		
	Prevalence of vaccine hesitancy *n*/*N* (%)	*OR* (95% *CI*)	*P* value	Prevalence of vaccine hesitancy *n*/*N* (%)	*OR* (95% *CI*)	*P* value
Part-time/self-employed/ Unemployed/retired/students	122/387 (31.5)	0.92 (0.61, 1.39)	0.696	210/387 (54.3)	0.72 (0.48, 1.07)	0.102
Type of cancer						
Lung cancer	34/109 (31.2)	1.0		55/109 (50.5)	1.0	
Gastric cancer	20/66 (30.3)	0.96 (0.49, 1.86)	0.902	36/66 (54.5)	1.18 (0.64, 2.18)	0.600
Liver cancer	6/15 (40.0)	1.47 (0.49, 4.46)	0.496	12/15 (80.0)	3.93 (1.05, 14.70)	0.042
Breast cancer	12/30 (40.0)	1.47 (0.64, 3.39)	0.366	24/30 (80.0)	3.93 (1.48, 10.36)	0.006
Colorectal cancer	39/97 (40.2)	1.48 (0.84, 2.63)	0.178	64/97 (66.0)	1.90 (1.08, 3.35)	0.025
Esophageal cancer	6/26 (23.1)	0.66 (0.24, 1.60)	0.418	12/26 (46.2)	0.84 (0.36, 1.98)	0.693
Ovarian cancer	13/43 (30.2)	0.96 (0.44, 2.06)	0.908	26/43 (60.5)	0.91 (0.55, 1.51)	0.724
Other types of cancer	39/139 (27.3)	0.83 (0.48, 1.44)	0.507	67/139 (48.2)	1.50 (0.73, 3.08)	0.267
Metastatic cancers						
No	161/490 (32.9)	1.0		280/490 (57.1)	1.0	
Yes	7/35 (20.0)	0.51 (0.22, 1.20)	0.121	16/35 (45.7)	0.63 (0.32, 1.26)	0.191
Current treatment for cancer						
Untreated patients	4/17 (23.5)	1.0		10/17 (58.8)	1.0	
Chemotherapy only	127/338 (37.6)	1.96 (0.62, 6.13)	0.250	212/338 (62.7)	1.18 (0.44, 3.17)	0.746
Radiotherapy only	14/89 (15.7)	0.61 (0.17, 2.13)	0.436	34/89 (38.2)	0.43 (0.15, 1.24)	0.120
Immunotherapy only	4/12 (33.3)	1.63 (0.32, 8.40)	0.562	6/12 (50.0)	0.70 (0.16, 3.10)	0.638
Chemotherapy and radiotherapy	7/34 (20.6)	0.84 (0.21, 3.40)	0.810	14/34 (41.2)	0.49 (0.15, 1.60)	0.237
Immunotherapy and chemotherapy/radiotherapy	5/15 (33.3)	1.63 (0.34, 7.67)	0.540	7/15 (46.7)	0.61 (0.15, 2.49)	0.493
Completion of treatment	7/20 (35.0)	1.75 (0.41, 7.45)	0.449	13/20 (65.0)	1.30 (0.34, 4.93)	0.700
Presence of any other chronic diseases						
No	136/412 (33.0)	1.0		242/412 (58.7)	1.0	
Yes	32/113 (28.3)	0.80 (0.51, 1.27)	0.344	54/113 (47.8)	0.64 (0.42, 0.98)	0.038

Abbreviation: COVID-19=coronavirus disease 2019; *OR*=crude odds ratio; *CI*=confidence interval.

Perspectives

Confronting COVID-19 and Prioritizing Aging Population

Binbin Su[1,&]; Yannan Luo[2,&]; Yaohua Tian[3]; Chen Chen[1]; Xiaoying Zheng[1,#]

ABSTRACT

Over the past three years, China has implemented rapid, vigorous, and coordinated control measures to limit the spread of coronavirus disease 2019 (COVID-19) effectively. These measures include active containment, graded management, rational resource allocation, rapid contact tracing and disposal, and targeted vaccination of key populations. These efforts have contributed to the prompt and effective control of outbreaks, protecting the health and well-being of older adults. This review provides a comprehensive summary of the changes in China's COVID-19 prevention and control experiences and other public health measures since the outbreak of the pandemic, and assesses their impact on older adults. It may serve as a valuable reference for future epidemic prevention and control efforts.

The global challenge of population aging has become increasingly pressing, with the elderly population particularly vulnerable during the coronavirus disease 2019 (COVID-19) pandemic, facing an elevated risk of mortality. In China, the government has implemented a range of measures to reduce the negative impacts of COVID-19 on the elderly. However, despite these efforts, it is likely that some elderly individuals will still succumb to the virus, especially after policy relaxations. This article provides a comprehensive overview of the measures and strategies employed to address the challenges facing the elderly during the pandemic, while also proposing innovative approaches to reduce COVID-19 mortality in the context of an aging population.

COVID-19 PREVENTION AND CONTROL STRATEGIES IN DIFFERENT STAGES IN CHINA

The COVID-19 epidemic in China can be divided into five phases based on the government's response strategy and the epidemiological characteristics of the disease (Figure 1).

During Phase 1 of the outbreak period in December 2019, China quickly implemented non-pharmaceutical intervention (NPI) strategies and measures to identify the pathogen and control the spread of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in Wuhan. On January 20, person-to-person transmission was officially confirmed, and COVID-19 was added to the national Class B infectious disease list. Class A infectious disease prevention and control measures were adopted, and direct online reporting was mandated. As a result of the top-level emergency response being launched in time, the COVID-19 epidemic growth slowed down and the scale of the epidemic spread was limited. Research found that older people were the main susceptible group during this period, with 68% of the patients being over 50 years of age (*1*).

In Phase 2, the Chinese government adjusted its overall prevention and control strategy to prioritize the prevention of both external importation and internal rebound. To handle concentrated outbreaks, the government analyzed experiences from managing epidemics in different regions and provided guidance to local authorities to improve five measures: rapid response through the chain of command, nucleic acid screenings, extensive isolation of high-risk populations, centralized treatment for infected patients, and prompt release of information.

In Phase 3 of the precision prevention and control stage, the Chinese government revised its prevention and control strategy and implemented a "dynamic zero-COVID" approach in response to the transmission of the Delta variant. In August 2021, in response to the Delta variant outbreak at Nanjing Lukou International Airport, the government implemented several measures to enhance its epidemic control and mitigation strategies, including outpatient fever surveillance and mandated testing for key populations. These measures enabled the government to improve its disease surveillance capabilities and

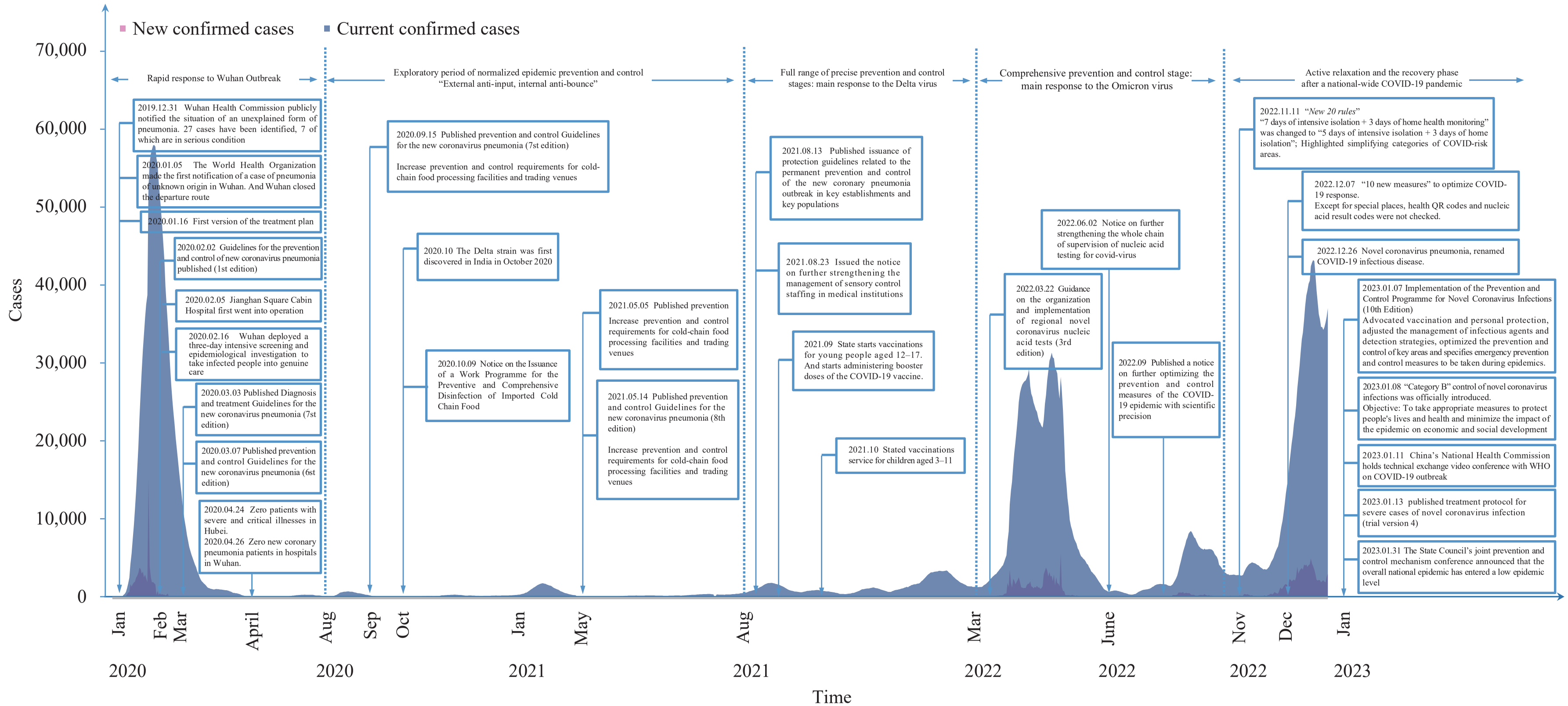

FIGURE 1. Policy measures and new & current confirmed cases by stages during the COVID-19 epidemic (January 2020 to January 2023).
Note: Data resources were up to 20 December 2022.
Abbreviation: COVID-19=coronavirus disease 2019.

timely reporting of epidemiological data, and were effective in managing the risk of outbreak expansion. This successful implementation of these measures demonstrates China's preparedness and agility in responding to emerging infectious disease threats.

In January 2022, the emergence of the highly transmissible and insidious Omicron variant in Tianjin and Henan posed a new challenge to epidemic prevention and control in China. In response, the Chinese government acted swiftly to promote the "antigen screening & nucleic acid diagnosis" surveillance model, enhance isolation and treatment capacity, improve nucleic acid testing, and ensure quality daily medical services for the public. As a result of these enhanced measures, China was able to achieve the ambitious goal of "dynamic zero" and maintain low case numbers during the first four waves of the COVID-19 epidemic (Figure 1). This comprehensive prevention and control phase was essential in containing the spread of the virus.

In Phase 5, active relaxation and post-pandemic recovery occurred across the region. As the epidemic situation changed, vaccination spread, and experience in prevention and control accumulated, China began to relax its strict epidemic control strategy. The "10 New Measures" and "20 New Rules" were launched to optimize COVID-19 response, and on December 26, 2022, the national implementation of COVID-19 downgraded from the current top-level Category A to the less stringent Category B. This marked a new stage in the prevention and control of the epidemic in China.

THE IMPACT OF THE COVID-19 EPIDEMIC ON THE HEALTH OF OLDER PEOPLE IN CHINA

Overall, older individuals are at a higher risk of mortality due to COVID-19, particularly those aged 80 or older (*2*). A study published in February 2020 analyzed data from over 44,000 confirmed cases of COVID-19 in China and found that the overall case fatality rate was 2.3%. However, the fatality rate was much higher for individuals aged 70–79 (8.0%) and those aged 80 or older (14.8%) (*3*). Additionally, comorbidities such as hypertension and diabetes were also found to be significant risk factors for COVID-19 mortality (*4*).

Following the relaxation of epidemiological policies, the impact of the COVID-19 pandemic on the health of elderly individuals in China has been substantial. Between December 2022 and January 2023, approximately 90% of the reported 59,938 COVID-19-related deaths occurred in individuals aged 65 years and older, with more than half of these deaths occurring in those aged 80 years and older (*5*).

MAJOR CHALLENGES FACING OLDER PEOPLE WITH COVID-19 INFECTIONS IN NEW ERA

Despite the reduced pathogenicity and virulence of the Omicron variant compared to the Delta or original strains, studies from both China and other countries indicate that older adults remain a high-risk group for COVID-19 infections. Given China's large elderly population, safeguarding their health is of paramount importance during the peak of the epidemic.

China faces a shortage of medical resources, particularly critical care resources, which is exacerbated by an uneven distribution of resources in rural areas, disproportionately impacting elderly individuals. To address outbreaks in these areas, the government has placed a strong emphasis on epidemic prevention and control. To effectively mitigate the impact of limited medical resources in rural areas and improve health outcomes for vulnerable populations, it is essential to ensure timely access to medical supplies, including medications and vaccines, and to refer severe cases to higher-level hospitals and well-equipped medical facilities.

Early research has revealed that the sequelae of COVID-19 include prolonged immunosuppression, pulmonary, cardiac, and vascular fibrosis, pathological fibrosis of organs and arteries, increased mortality, and severe impairment in quality of life (*6*). However, further investigation is needed to understand the growth of COVID-19 after the acute period. According to research from King's College London, Omicron is half as likely as Delta to cause a "long COVID" at 4.5%. As the number of people infected with Omicron increases, so will the absolute number of people with "long COVID". Currently, 2 million people in the UK have Neonic pneumonia sequelae, 31% of whom were reported during the Omicron pandemic (*7*). Special attention should be given to the mental health of the elderly following infection (*8*).

The available vaccine against COVID-19 has had a profoundly positive impact during the epidemic, reducing the number of hospitalizations and deaths

(*9*). However, those at risk of the serious consequences of COVID-19, particularly the elderly, require ongoing booster vaccination to maintain this level of protection. Additionally, the emergence of a new dominant SARS-CoV-2 variant approximately every 3 to 4 months presents a public health dilemma and uncertainty about the future (*10*). There is a risk that eventually, a variant will emerge and evade the protection against severe disease offered by the current generation of vaccines. Therefore, it is essential to consider the development of an improved SARS-CoV-2 vaccine that offers longer-lasting protection and broader coverage, given the need to maintain effective disease control measures.

RECOMMENDATIONS FOR DEVELOPING AN EPIDEMIC PREVENTION AND CONTROL STRATEGY THAT PLACES PRIORITY ON THE ELDERLY POPULATION

Chronic health conditions, such as hypertension, cardiovascular disease, chronic kidney disease, and diabetes, as well as advanced age, have been identified as risk factors for severe COVID-19 and mortality. The management of chronic diseases has been greatly affected during the COVID-19 pandemic, with many countries experiencing disruptions, particularly when in-person consultations with physicians are required (*11*). This has been exacerbated by the shift of medical resources from regular services to COVID-19-related care and treatment, leading to a substantial backlog of cases. As a result, the management of chronic diseases has become even more complex during the pandemic, and the issue of "long COVID" is a concern for patients even after the pandemic has subsided (*12*). It is essential to reinforce primary care capacity, policies, and environmental support to ensure the sustainable management of chronic diseases now and in the future, particularly considering the pandemic's long-term impact on population health services.

Real-world data demonstrate that vaccination is effective in reducing hospitalization and rates of severe illness in older people following infection. However, the elderly population, who are at risk of severe outcomes from COVID-19, require booster vaccinations to maintain this level of protection, as well as repeated vaccinations for those at risk. The emergence of a new dominant SARS-CoV-2 variant approximately every 3 to 4 months poses a public health dilemma (*13*). With the massive spread of COVID-19 in China, it is necessary to continue to monitor the outbreak closely for early detection of any new variants that may emerge. There is also a risk that a variant will eventually emerge that can evade protection against serious diseases from the current generation of vaccines (*9*). Therefore, it is essential to accelerate the development of a significantly improved SARS-CoV-2 vaccine that will provide longer and wider protection for the older population.

China's successful implementation of the "dynamic zero policy" in combating COVID-19 is largely attributed to its robust capacity for social mobilization. To further improve the response to the pandemic, there is a need to reinforce social mobilization efforts and augment reserves of medical resources, such as drugs and vaccines. This can be achieved through measures like establishing specialized channels, setting up temporary vaccination sites, and deploying mobile vaccination vehicles to reach elderly individuals, as well as providing active door-to-door follow-up and vaccination services for elderly individuals who are disabled or semi-disabled. Additionally, it is crucial to prioritize the medical needs of non-COVID patients, particularly those requiring intensive care, while simultaneously maintaining ongoing medical treatment for elderly patients requiring procedures like dialysis and oncology chemotherapy. Many experiences in epidemic prevention abroad are also worth drawing upon. For instance, the UK government established an elderly assistance plan to provide emergency assistance and support (*14*), and the Japanese government implemented similar measures, such as providing home meal delivery service, increasing medical assistance resources, and offering up-to-date epidemic prevention information to the elderly through official websites (*15*). To establish a proactive, methodical, and aging-first strategy for resource deployment and social mobilization, it is necessary to overcome the "last mile" of vaccination and ensure maximum convenience for the elderly.

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Corresponding author: Xiaoying Zheng, zhengxiaoying@sph.pumc.edu.cn.

[1] School of Population Medicine and Public Health, Chinese Academy of Medical Sciences/Peking Union Medical College, Beijing, China; [2] Department of Global Health, School of Public Health, Peking University, Beijing, China; [3] Ministry of Education Key Laboratory of Environment and Health, and State Key Laboratory of Environmental Health (Incubating), School of Public Health, Tongji Medical College, Wuhan City, Hubei Province, China.
[&] Joint first authors.

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