



Original Article

Traditional Chinese medicine for COVID-19 pandemic and emerging challenges: An online cross-sectional survey in China



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ABSTRACT

Background: We aimed to investigate use of infection control behaviours, preventative and therapeutic interventions, and outcomes among respondents to an online survey during the COVID-19 pandemic in China.

Methods: The survey was designed by an international team, translated and adapted to simplified Chinese, including 132 kinds of traditional Chinese medicine (TCM) preparation recommended by guidelines. It was distributed and collected from February to May 2021, with data analysed by WPS spreadsheet and *wjx.cn*. Descriptive statistics were used to describe demographics and clinical characteristics, diagnosis, treatments, preventative behaviours and interventions, and their associated outcomes.

Results: The survey was accessed 503 times with 341 (67.8%) completions covering 23 provinces and four municipalities in China. Most (282/341, 82.7%) respondents reported no symptoms during the pandemic and the majority (290/341, 85.0%) reported having a SARS-CoV-2 PCR test at some point. Forty-five (13.2%) reported having a respiratory infection, among which 19 (42.2%) took one or more categories of modern medicine, e.g. painkillers, antibiotics; 16 (35.6%) used TCM interventions(s); while seven respondents combined TCM with modern medicine. All respondents reported using at least one behavioural or medical approach to prevention, with 22.3% taking TCM and 5.3% taking modern medicines. No respondents reported having a critical condition related to COVID-19.

Conclusion: We found evidence of widespread use of infection control behaviours, modern medicines and TCM for treatment and prevention of COVID-19 and other respiratory symptoms. Larger scale studies are warranted, including a more representative sample exploring TCM preparations recommended in clinical guidelines.

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1. Introduction

Coronavirus disease (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Until September 13th 2021, there have been more than 224 million confirmed cases, including 3 million deaths reported on the World Health Organisation website¹. Most people diagnosed with COVID-19 experienced mild to moderate respiratory illness and the most common symptoms include fever, dry cough and tiredness²⁻⁷.

As for current treatments of COVID-19 patients with mild symptoms, WHO guidelines recommend that they should be isolated and given symptomatic treatment including antipyretics for fever and pain, adequate nutrition and appropriate rehydration⁸. Differing from WHO guidelines, Chinese guidelines recommend not only symptomatic and anti-viral treatments, but also traditional Chinese medicine (TCM) such as Qingfeipaidu Decoction and Hanshiyi Decoction⁶⁻⁷. For people with severe or critical COVID-19⁹, current evidence indicates that corticosteroids, remdesivir, hydroxychloroquine, lopinavir/ritonavir and interferon may have some effects on overall mortality, initiation of ventilation and duration of hospital stay^{8,10-13}.

For public health and suspected cases, quarantine is an effective way to reduce the transmission of COVID-19 and other pandemics¹⁴. Other behavioural control methods, such as physical distancing, wearing a mask, hand washing, keeping rooms well ventilated, avoiding crowds, and coughing into a bent elbow or tissue could also be effective¹⁵. At the same time, nearly 300 vaccines are being developed, among which eight have been used worldwide¹⁶. In China, there are mainly three categories of vaccines with completion of over two billion doses of vaccination¹⁷, including inactivated SARS-CoV-2 vaccine (Vero cell)¹⁸⁻²¹, recombinant SARS-CoV-2 vaccine (Type 5 adenovirus vector)²², and recombinant SARS-CoV-2 vaccine (CHO cell)²³. However, the evaluation of effectiveness and safety of these vaccines are still ongoing, and their impact on mutated virus variants remains to be seen²⁴⁻²⁶. TCM has been proved to help enhance the body's resistance (Zheng qi) to infectious diseases based on clinical studies and experiments²⁷⁻²⁹.

Therefore, considering the need for more evidence, we collaborated with international researchers to investigate behavioural changes, preventative and therapeutic interventions, their occurrence and outcomes among the Chinese population during the COVID-19 pandemic. We aimed to conduct this online cross-sectional survey to show the general situation during the pandemic in China and to indicate the further challenges to fight COVID-19.

2. Methods

The content of this study is reported following the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement³⁰, and the findings are reported following the Checklist for Reporting Results of Internet E-surveys checklist (CHERRIES)³¹. The study design and data management method are as follows.

2.1. Study design of the survey

An international retrospective survey of prevention, treatment, occurrence and outcomes of COVID-19 in the community (RTO-COVID-19) involving 14 countries was led by researchers at the University of Southampton (UoS) and the University of Geneva. The original survey questions in the English version (available at: <https://www.rtocovid19.com>) were translated and adapted by authors at Beijing University of Chinese medicine since 10th May, 2020. Localisation was made to reflect the tendency of Chinese people to prevent and cope with diseases, and to adapt to China's anti-epidemic policies and vaccine market. After gaining contact information from the respondents, we also conducted a three-month follow-up questionnaire to acquire more information on peoples' changes based on this cohort baseline.

2.1.1. Participants

All potential participants were able to access the website of this survey. In those cases where participants were unable to answer the questions themselves, their family members or friends were

also invited to help them complete the survey. There was no selective bias on participants. The questionnaire was disseminated by authors and other academic research groups.

Inclusion criteria: 1) Any person who could access the questionnaire online; 2) Any person who can read and understand the questionnaire; 3) Person checked "agree" on the informed consent page, to present information on preventive behaviours, treatments taken, symptoms of respiratory illness and their clinical outcomes. 4) There was no restriction on gender. 5) For children (<16 years old), their parents were invited to complete the questionnaire.

Exclusion criteria: Persons lacking mental capacity to understand the questionnaire were excluded.

2.1.2. Ethics approval and informed consent

This study received ethical approval from BUCM (2020BZYLL0501, Sep 2020) and from UoS (ERGO 56975, May 2020). All participants were invited to read the overview of the survey. Only those who confirmed consent, by clicking the button "I agree" at the beginning, proceeded to the questions. Participants' contact information was collect. All data collected were managed by the Chinese team.

2.2. Development of the survey

2.2.1. Adaptation for Simplified Chinese version

Questions in simplified Chinese version were adjusted to fit the context in China, especially adding more information on TCM. Firstly, machine translation was applied for the original English version questionnaire. Secondly, four authors edited the questionnaire word by word to improve readability. Thirdly, the questionnaire was designed on *wjx.cn*. Fourthly, all authors piloted the survey with different test scenarios, to improve the logic and wording. This was repeated seven times before the questionnaire was finalized.

Questions or answers were changed according to the habits and situation in China, for example, replacing proprietary names of medications (such as "Dafalgan®" to "Tylenol®, "Cetallerg®" to "Zyrtec®") or medical system e.g. Ayurvedic interventions were removed because they are rarely used in China. The content of Chinese patent medicine was expended because of the common use of TCM in China. The Chinese medicines were identified from both national and provincial TCM guidelines to alleviate symptoms of COVID-19, including three versions of national guidelines, Beijing version, three versions of Hunan province, two versions of Guangdong province, Shaanxi province version, Jiangxi province version, Liaoning province version, Sichuan province version, Hebei province version, Gansu province version, Guizhou province version³²⁻⁴⁸. To reduce the difficulty and time cost of filling the questionnaire, we categorized 132 recommended TCM preparations according to their dosage forms, details in supplementary table 1. With the development of the COVID-19 vaccine, we also added the latest information regarding vaccination.

2.2.2. Pre-test for Simplified Chinese version

The survey was issued on a survey platform *wjx.cn*. Each person had only one account to answer the questions. The questionnaire was tested by all Chinese authors before dissemination, and considering the different logical relationships between questions. All authors also piloted the questionnaire using different scenarios.

2.3. Recruitment process

2.3.1. Disseminating and advertising

The open questionnaire was released on *wjx.cn* from February 6 to May 19, 2021. The authors forwarded the WeChat post (designed with QR code) to their friends as snowball sampling. The authors

contacted five academic organisations to help disseminate the post to more possible respondents.

The survey advertisement attached the questionnaire link and the main content of the survey was posted on WeChat subscription account (ebcm2016). People could access from WeChat and Weibo (social platform). Participants who agreed to give their contact details were asked to complete the follow-up questionnaire after three months.

2.4. Survey administration

As a public survey platform, *wjx.cn* is openly accessible in China. When the respondents submitted their answers, they could get a lottery supported by *wjx.cn* without any conflict of interest. To prevent bias, answers to the questions were arranged in random order. We designed 39 sections including 226 question-items per page, and also added one page of welcome and one page of thanks. Respondents could skip some questions due to the logic and their conditions. Considering the possible multiple options, we only set the informed consent as the mandatory item. Each respondent could review the answers but could not change any content once they submitted.

2.5. Data collection and analysis

2.5.1. Summary of data collected

The primary outcomes included a summary of:

- (1) response rates
- (2) basic characteristics (physical and mental conditions, COVID-19 impact on social situation)
- (3) diagnosis (detection of COVID-19 and related respiratory symptoms)
- (4) treatments and outcomes (for the respiratory symptoms during first and second week)
- (5) preventive measures

The secondary outcomes were similar items from the follow-up questionnaire after three-months, including the response rates, basic characteristics, treatments and outcomes and preventive measures.

2.5.2. Response rates

wjx.cn supported the identification of unique visitors who visited the webpage multiple times with the same IP addresses. *wjx.cn* could calculate the unique first survey page visitors, participant rate and completion rate. The participants could only be withdrawn by contacting the investigators and asking to be removed from the study. All participants were free to stop at any time and not to complete the survey.

2.5.3. Data analysis

Data were managed in WPS spreadsheet and analysed with *wjx.cn* (<https://www.wjx.cn/>). Descriptive analysis was used for basic physical and mental conditions, detection of COVID-19 and related symptoms, treatment for respiratory symptoms, measures to prevent the spread, testing and vaccination of COVID-19, general social information, and the follow-up questionnaire, presented as numbers and percentages. If a questionnaire was collected successfully, we regarded this answer as a complete respondent. Missing data in the analysed items were presented as non-values.

3. Results

3.1. Response rates

The survey was available online from Feb. 6, 2021 to May 19, 2021 and collected a total of 503 visit times, among which 341

(67.8%) submitted their answers. The basic information of the respondents is provided in [Table 1](#). The data were collected from 23 provinces and four municipalities in China (including Taiwan and Hong Kong, no sample from Macao), and we removed the data when the participants were not living in main land China, and distribution map covering 316 respondents' report is shown in [Figure 1](#), the detailed numbers in supplementary table 2.

As for the follow-up survey after three-months, we sent the questionnaire also via *wjx.cn* to 155 respondents separately who were willing to be followed up and provided their contact information on July 2, 2021. Finally, 23 respondents answered the follow-up questionnaire.

3.2. Basic characteristics of 341 respondents

3.2.1. Basic characteristics of physical and mental conditions from 341 respondents

This section of the questionnaire mainly involved chronic diseases, pregnancy, regular medications, and mental health. 82.7% respondents had no chronic diseases or mental illness, and 17 respondents reported mental health conditions, details in [Table 1](#) and supplementary table 3. In terms of the 23 respondents from the follow-up questionnaire after three-month, their mental conditions were shown in supplementary table 4.

The majority of the respondents (291/341, 85.4%) did not take any medication during COVID-19, and the others took some medicine such as anti-hypertensive drugs, statins, thyroxine, immunosuppressor, anti-allergic agent and traditional Chinese medicine due to their long-standing chronic diseases.

3.2.2. COVID-19 impact on social situation

Regarding the economic situation, only a few (12/341, 3.5%) participants did not provide an answer. Among those who did respond, 38.9% (128/329) believed that COVID-19 influenced their lives, and more than half (201/329, 61.1%) did not think COVID-19 has impact. 138 respondents were health care workers and the rest of other people's working status and occupations during the epidemic were shown in [Table 1](#).

Twenty-eight respondents reported their behaviours changed due to COVID-19, details in [Table 2](#). As for the 23 respondents from the follow-up questionnaire after three-month, their behavioural changes were also shown in [Table 2](#).

3.3. Diagnosis (detection of COVID-19 and related symptoms)

Up to the time of responding to the questionnaire, 85.0% respondents had completed a PCR test for COVID-19. Six respondents had been infected with SARS-COV-2 and the others (284/290, 97.9%) had a negative result, details in [Table 1](#).

86.8% (296/341) respondents had not developed any respiratory symptoms since the beginning of the COVID-19 outbreak. 13.2% (45/341) respondents had experienced respiratory symptoms and their common symptoms are shown in [Figure 2](#). The respiratory symptoms restricted the patient's normal activities for a maximum of 28 days, with an average of 5.95 days. These 45 respondents reported that their symptoms caused varying degrees of discomfort as the average of the symptom severity score was 4.17 (Score of 0 is the best and 10 is the worst). The average score for concern about their illness was 3.29 (Score of 0 is no concerns and 10 is extremely concerned). 60.0% (27/45) of them recovered completely with symptoms disappeared after one and two weeks. Others outcomes including improvement, no improvement, and deterioration are in [Table 6](#).

Table 1
The basic information of 341 respondents

Items	Summary data (Number, % / mean difference, range)
Age	341 (100.00)
Mean age	33.02±10.25 years (18-70)
<18 years old	0 (0.00)
18-60 years old	326 (95.60)
>60 years old	8 (2.35)
Not reported	7 (2.05)
Gender	341 (100.00)
Men	117 (34.31)
Women	224 (65.69)
Weight	341 (100.00)
Mean weight	64.63±19.75 kg (41-105)
Normal range (Self-cognition)	209 (61.29)
Underweight (Self-cognition)	24 (7.04)
Overweight (Self-cognition)	84 (24.63)
Unknown (Self-cognition)	24 (7.04)
Height	341 (100.00)
Mean height	165.53±8.55 cm (120-198)
Smoking	341 (100.00)
No smoking	316 (92.67)
Artificial cigarettes	24 (7.04)
Hand-rolled cigarettes	1 (0.29)
Mean smoking amount	10.92±6.64 per day (0.5-20)
Drinking	341 (100.00)
No drinking	159 (46.63)
Once a month	98 (28.74)
2 to 4 times a month	36 (10.56)
Unknown	48 (14.08)
Eating habits	341 (100.00)
Chinese food	208 (61.00)
Low-glycemic load diet	40 (11.73)
Low carbohydrates	34 (9.97)
Vegetarians	29 (8.50)
No special	93 (27.27)
Survey accessed channels	341 (100)
Friends and families	196 (57.48)
Social media (via WeChat platform)	97 (28.45)
E-mail	15 (4.40)
Working organization	2 (0.59)
Unknown	31 (9.09)
Pregnant	9 (4.02)
Physical / mental conditions (Details in supplementary table 3)	341 (100.00)
Healthy	282 (82.70)
Mental health problems (e.g. Anxiety, depression)	17 (4.99)
Other chronic disease	40 (11.73)
Sub-healthy state	1 (0.29)
Not reported	12 (3.52)
Completed the SARS-CoV-2 nucleic acid test	290 (85.04)
Negative	284 (97.93)
Positive	6 (2.07)
with COVID-19 symptoms	4 (1.38)
asymptomatic carrier	2 (0.69)
Duration of respiratory symptoms when testing	290 (85.04)
With symptoms lasting for <7 days	12 (4.14)
With symptoms lasting for 7~14 days	6 (2.07)
With symptoms lasting for >14 days	4 (1.38)
No symptoms	245 (84.49)
Not reported	23 (6.74)
Antibody testing of COVID-19	341 (100.00)
Did not have antibody testing of COVID-19	201 (58.94)
Did antibody testing of COVID-19	132 (38.71)
Negative	126 (36.95)
Positive	6 (1.76)
Not reported whether have antibody testing of COVID-19	8 (2.35)
Vaccination	341 (100.00)
Flu vaccination in the past two years	20 (5.86)
The first dose of COVID-19 vaccination from Nov 2020 to May 2021	71 (20.82)
Sinopharm Group	25 (35.21)
Beijing Sinovac	22 (30.99)
Beijing Institute of Biological Products	13 (18.31)
Pfizer/BioNTech	5 (7.04)
Oxford/AstraZeneca	5 (7.04)
Modena	1 (1.41)
The second dose of COVID-19 vaccination from Dec 2020 to May 2021	48 (14.08)
Sinopharm Group	15 (31.25)
Beijing Sinovac	14 (29.17)
Beijing Institute of Biological Products	8 (16.67)

(continued on next page)

Table 1 (continued)

Items	Summary data (Number, % / mean difference, range)
Pfizer/BioNTech	5 (10.42)
Wuhan Institute of Biological Products	4 (8.33)
Oxford/AstraZeneca	2 (4.17)
Not reported whether have any vaccination	224 (65.69)
Different working status during COVID-19 since 2020	341 (100.00)
Working outside	105 (30.79)
Full-time student	77 (22.58)
Some work at home and some work outside	61 (17.89)
Working at home	43 (12.61)
Having a holiday	12 (3.52)
Retirement	10 (2.93)
Unemployment	7 (2.05)
Preparing for the examination	1 (0.29)
Not reported	25 (7.33)
Occupations during COVID-19 since 2020	341 (100.00)
Reported	155 (45.45)
Resident medical staff	107 (69.03)
Nursing staff	19 (12.26)
Community health worker	9 (5.81)
Shop/supermarket worker	5 (3.23)
Office clerk	5 (3.23)
Teacher	3 (1.94)
Medical researchers	3 (1.94)
Civil servants	1 (0.65)
Cook	1 (0.65)
Delivery person	1 (0.65)
Engineer	1 (0.65)
Not reported	186 (54.55)
COVID-19 Impact on economic situation	341 (100.00)
Great problems	14 (4.10)
Little problems	114 (32.84)
No problems	201 (58.94)
Not reported	12 (3.52)

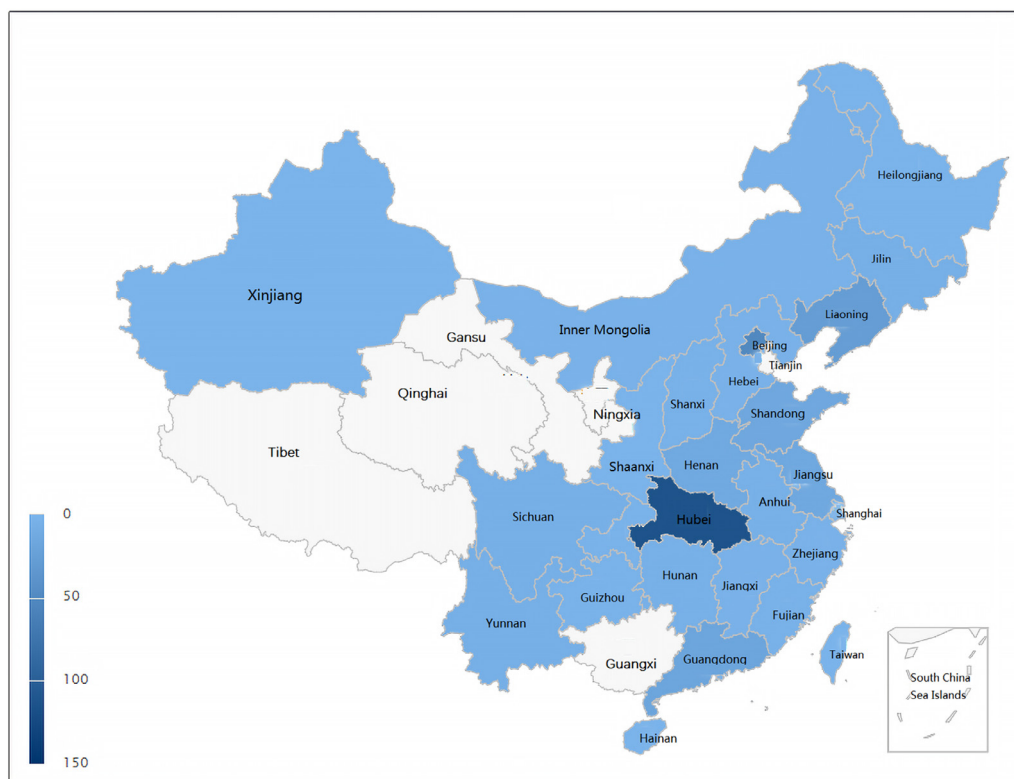


Fig. 1. Respondents distribution map in China according to different provinces.

Table 2
Behavioural changes caused by COVID-19 of 28 respondents since 2020 and 23 respondents in the follow-up questionnaire after three months

Items from questionnaires	Never (or almost) Respondents, Number (%)	Sometimes (%)	Quite often	Very often	Always (or almost)	Not applicable
Avoid touching other's pets	1 RS [#] / 7 (25.00) / 5 (21.74) [*]	2 (7.14) / 3 (13.04)	1 RS / 5 (17.86) / 1 (4.35)	1 RS / 10 (35.71) / 9 (39.13)	3 (10.71) / 5 (21.74)	1 RS / 1 (3.57) / NI
Wash your hands with soap or alcohol gel before eating?	NI / NI	1 (3.57) / 6 (26.09)	2 RS / 4 (14.29) / 3 (13.04)	12 (42.86) / 5 (21.74)	1 RS / 11 (39.29) / 7 (30.43)	1 RS / NI / 2 (8.70)
Wash your hands with soap or alcohol gel after you had been close to the person who was unwell?	NI / NI	1 RS / 1 (3.57) / 6 (26.09)	2 RS / 3 (10.71) / 4 (17.39)	1 RS / 13 (46.43) / 8 (34.78)	11 (39.29) / 5 (21.74)	1 RS / 1 (3.57) / NI
Feel that you were able to maintain social distancing (staying 2m from the person who was ill)?	NI / 3 (13.04)	1 RS / 3 (10.71) / 7 (30.43)	1 RS / 7 (25.00) / 6 (26.09)	1 RS / 14 (50.00) / 3 (13.04)	4 (14.29) / 2 (8.70)	1 RS / NI / 2 (8.70)
Consciously avoid touching your eyes, mouth or nose?	2 (7.14) / NI	2 RS / 6 (21.43) / 9 (39.13)	4 (14.29) / 1(4.35)	1 RS / 9 (32.14) / 8 (34.78)	7 (25.00) / 5 (21.74)	1 RS / NI / NI
Clean things that might have viruses on them (eg. doors, taps, kitchens, bathrooms)?	NI / 3 (13.04)	1 RS / 2 (7.14) / 7 (30.43)	1 RS / 6(21.43) / 3 (13.04)	15 (53.57) / 3 (13.04)	1 RS / 5 (17.86) / 5 (21.74)	1 RS / NI / 2 (8.70)
Wear a mask or face covering (such as a scarf over your mouth)?	1 RS / NI / 1 (4.35)	NI / 3 (13.04)	5 (17.86) / 1 (4.35)	1 RS / 8 (28.57) / 8 (34.78)	1 RS / 15 (53.57) / 10 (43.48)	1 RS / NI / NI
Use any other method to try and protect yourself from covid-19 infection? (eg. Diet, vitamins, nasal sprays, herbs or other medications)	1 RS / 3 (10.71) / 11 (47.83)	1 RS / 3 (10.71) / 4 (17.39)	7 (25.00) / 2 (8.70)	1 RS / 8 (28.57) / 6 (26.09)	7 (25.00) / NI	1 RS / NI / NI

NI: No information

* The former was obtained from 28 respondents in the formal questionnaire, while the latter numbers were obtained from 23 respondents in the follow-up questionnaire.

1 RS means the behavioural change results of one respondent with respiratory symptoms reported.

3.4. Treatments and outcomes (from 45 respondents for their respiratory symptoms during the first and second weeks)

Forty-five respondents with respiratory symptoms reported their therapeutic treatments and thirty respondents reported the source of treatments during the first week of their illness, detailed in Table 4 and Table 5, including mainly four types, such as modern medicine, TCM, other treatment and no treatment. Most commonly, they practiced selfcare/self-medication (17/45, 37.8%). Seven respondents combined Chinese herbal preparation or acupuncture together with modern medicine. TCM included seven kinds of Chinese herbal preparation, acupuncture and moxibustion. In terms of access to antibiotics, 66.7% (6/9) obtained by prescription from a professional, 22.2% (2/9) used what was left over from the past and 11.1% (1/9) bought it on the Internet. The treatments were used after an average of 2.66 (1-7) days of symptoms (available data from 30 respondents).

Only three respondents reported that they were in the hospital for 5.5 (1-10) days on average, and they had been discharged at the time of filling out the questionnaire. Only one respondent reported confirmed as COVID-19 by SARS-CoV-2 PCR tests, the other

two did not reported other chronic diseases or any reasons for being in the hospital. No one was in intensive care, and no one was on a ventilator. All respondents had improved and recovered after one or two weeks, details in Table 6.

In terms of the 23 respondents from the follow-up questionnaire after three-month, two respondents reported that they had new respiratory symptoms, and their treatment and prevention were shown in supplementary table 5.

Among these 45 respondents, they failed to get SARS-CoV-2 PCR test when they had respiratory symptoms in 2020, so seven respondents suspected to be infected with COVID-19 and they made possible behavioural changes to prevent the potential spread since 2020, details in Table 2. However, up to the time of responding to the questionnaire in 2021, 28.9% (13/45) respondents reported as both negative SARS-CoV-2 nucleic acid test and negative antibody testing of COVID-19, and only one respondent reported as both positive. Two respondents reported as positive SARS-CoV-2 nucleic acid test but negative antibody testing of COVID-19, and one respondent reported as negative SARS-CoV-2 nucleic acid test but positive antibody testing of COVID-19. Others (28/45, 62.2%) did not have any test for COVID-19.

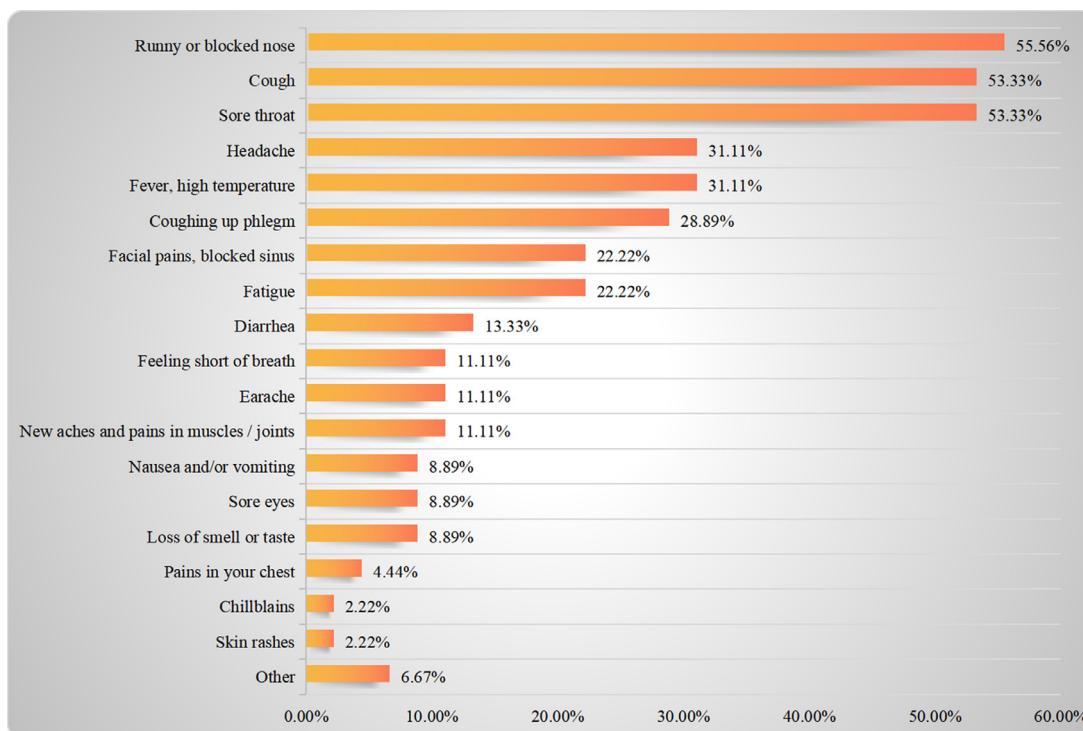


Fig. 2. Symptoms occurred from 45 respondents during COVID-19.

Table 3

Behavioural changes of 149 respondents received COVID-19 vaccines and 21 respondents in the follow-up questionnaire after three-month

Items from questionnaires	More Respondents, Number (%)	A little bit more	Same as before	Slightly Less	Less	Never	Not applicable
In close contact with people you don't live with	5 (3.36) / 1 (4.76)*	7 (4.70) / 2 (9.52)	68 (45.64) / 18 (85.71)	10 (6.71) / 0 (0.00)	20 (13.42) / 0 (0.00)	24 (16.11) / 0 (0.00)	15 (10.07) / 0 (0.00)
The number of times masks have been used in public places	22 (14.77) / 1 (4.76)	5 (3.36) / 1 (4.76)	97 (65.1) / 17 (80.95)	4 (2.68) / 2 (9.52)	1 (0.67) / 0 (0.00)	3 (2.01) / 0 (0.00)	17 (11.41) / 0 (0.00)
Hand washing rates	20 (13.42) / 0 (0.00)	10 (6.71) / 0 (0.00)	94 (63.09) / 20 (95.24)	6 (4.03) / 0 (0.00)	0 (0.00) / 1 (4.76)	0 (0.00) / 0 (0.00)	19 (12.75) / 0 (0.00)

NI: No information

* The former data was obtained from 149 respondents in the formal questionnaire, while the latter numbers were obtained from 21 respondents in the follow-up questionnaire after three-month

3.5. Preventive measures to prevent the spread from 341 respondents

We collected all respondents' treatments and behaviours to prevent COVID-19. 22.3% (76/341) chose TCM as a means of prevention. Lianhua Qingwen Granule [莲花清瘟颗粒] was the most commonly used (13/76, 65.0%). 18.5% (63/341) chose other preventive measures such as exercise, food supplements, special foods, and home remedies, detailed in Table 7.

As for vaccination against COVID-19, 20.8% (71/341) respondents had received the COVID-19 vaccine since November 27, 2020. The percentages of different brands of received first-dose and second-dose vaccines are shown in Table 1. People' opinions and behaviours were influenced when the various COVID-19 vaccines are available, the results from 149 respondents was shown in Table 3. 35.6% (53/149) respondents were still worried and 46.6% (159/341) were vaccinated to prevent COVID-19. 30.8% (105/341) were vaccinated because they worked in hospitals, and 3.5% (12/341) had a need to go abroad.

With regard to the results of the follow-up questionnaire from 23 respondents, 91.3% (21/23) respondents had received the first dose of COVID-19, and 82.6% (19/23) had received the second

dose. The majority of respondents kept their behaviours the same as before receiving vaccines, such as hand washing rates (20/23, 95.2%), social distancing (18/23, 85.7%), and wearing masks in public places (17/23, 81.0%), details in Table 3. In addition, considering anxiety about COVID, 47.6% (10/21) respondents were much more reassured after the vaccination; 14.3% (3/21) were relieved a little, and 38.1% (8/21) had no change.

4. Discussion

Since 2020, COVID-19 is still currently one of the most important public health challenges to populations worldwide⁴⁹. Numerous studies have focused on hospitalized patients infected with novel coronavirus⁵⁰⁻⁵², but there have been fewer studies on the general population in the community. Therefore, our survey has provided data from the general population in China, so as to explore and understand changes in behavioural habits and conditions of the general population during the COVID-19 pandemic in China.

First and foremost, we used wjx.cn platform to support the identification of unique visitor by IP addresses, it helped to calculate the respondent rate. The response rate was only 67.8%, which

Table 4
Treatments from 45 respondents for their respiratory symptoms during the first week

Treatment	Respondents, Number (%)
<i>Modern medicine</i>	19 (42.22)
Painkillers, anti-inflammatories or cough and cold medicines	10 (52.63)
Acetaminophen	5 (50.00)
Compound aminophenolidine tablets	3 (30.00)
Aspirin	3 (30.00)
Ibuprofen	2 (20.00)
Other	4 (40.00)
Antibiotics	9 (47.37)
-floxacin	5 (55.56)
Cephalosporin	4 (44.44)
-cillin	4 (44.44)
-mycins	3 (33.33)
Doxycycline	1 (11.11)
Corticosteroids	4 (21.05)
Nasal spray	4 (21.05)
Hypertonic water spray	1 (25.00)
Nasal decongestant	1 (25.00)
Isotonic water spray	1 (25.00)
Unknown	3 (75.00)
Chloroquine	3 (15.79)
Antihistamine and antiallergic drugs	2 (10.53)
Inhalant	2 (10.53)
Antiasthmatic drugs in combination with corticosteroids	1 (50.00)
Bronchodilators	1 (50.00)
corticosteroids	1 (50.00)
Syrup and drops	2 (10.53)
<i>Traditional Chinese Medicine</i>	16 (35.56)
Chinese herbal preparation	16 (100.00)
Granules	5 (31.25)
Banlangen granules	1 (20.00)
Lianhua Qingwen Granule	1 (20.00)
Shuanghuanglian granules	1 (20.00)
Xiao Chaihu Granula	1 (20.00)
Yinqiao Jiedu granules	1 (20.00)
Hospital preparations	1 (20.00)
Oral liquid	5 (31.25)
Andrographis oral liquid	1 (20.00)
Ganmaoling oral liquid	1 (20.00)
Huoxiang Zhengqi Oral Liquid	1 (20.00)
Shuanghuanglian oral liquid	1 (20.00)
Decoction	4 (25.00)
Gegen decoction	1 (25.00)
Guizhi decoction	1 (25.00)
Shegan Mahuang decoction	1 (25.00)
Unknown	1 (25.00)
Tablet	2 (12.50)
Pudilan Tablets	1 (50.00)
Vitamin C Yinqiao tablets	1 (50.00)
Oral liquid	2 (12.50)
Compound Bamboo Water	1 (50.00)
Hospital preparations	1 (50.00)
Capsule	2 (12.50)
Four seasons antiviral mixture	1 (50.00)
Zhike Capsules	1 (50.00)
Individualized treatment	2 (12.50)
Acupuncture	3 (18.75)
Moxibustion	1 (6.25)
<i>Other treatment</i>	6 (13.33)
Food supplements	3 (50.00)
Vitamin	2 (66.67)
Vitamin B12	2 (100.00)
Vitamin C	2 (100.00)
Vitamin D	1 (50.00)
Vitamin E	1 (50.00)
Omega-3 fatty acids	1 (33.33)
Mineral supplement	1 (33.33)
Calcium	1 (100.00)
Zinc	1 (100.00)
Unknown	2 (66.67)
Exercises or activities	2 (33.33)
Massage	2 (100.00)
Sauna	1 (50.00)

(continued on next page)

Table 4 (continued)

Treatment	Respondents, Number (%)
Special foods and diets	4 (66.67)
Fruits and vegetables	3 (75.00)
Orange	2 (66.67)
Ginger	1 (33.33)
Pepper	1 (33.33)
Fasting	1 (25.00)
Home remedies	4 (66.67)
Nasal irrigation	2 (50.00)
Sleep	1 (25.00)
Attack a vital point	1 (25.00)
No special treatment	13 (28.89)

Table 5

Source of Treatments used by respondents for their respiratory symptoms during the first week

Treatments prescription method	Number (percentage among 45 respondents, %)
Respondents themselves	17 (37.78)
TCM practitioners	7 (15.56)
Modern-medicinal doctors	5 (11.11)
Pharmacist	4 (8.89)
Families and friends	3 (6.67)
Internet searching	1 (2.22)
Not reported	15 (33.33)

Table 6

Outcomes from 45 respondents for their respiratory symptoms after one and two weeks

Outcomes	After 1-week treatment (n=45)Number (%)	After 2-week treatment (n=17)Number (%)
Recovered	18 (40.00)	9 (52.94)
Improved	11 (24.44)	4 (23.53)
Not improved	3 (8.57)	2 (11.76)
Deteriorated	1 (6.66)	1 (5.88)
Unknown course of disease	2 (4.44)	-
Not reported	10 (22.22)	1 (5.88)

seemed to be low. As the results of a meta-analysis study showed that there was a greater chance of response when patients were presented with a comparatively shorter questionnaire⁵³. This is a comprehensive survey covering diagnosis, treatment, outcome for one week and two weeks, and preventive measure. However, it takes more than 30 minutes which might be a challenge with behaviour fatigue and people reluctant to complete more surveys. People faced increasing COVID-19 questionnaires since 2020, so they may have experienced behaviour fatigue and were reluctant to complete more surveys. Furthermore, considering the online questionnaire, the respondents were particularly easily distracted during the answering process, so they could not concentrate on for a long time.

For geographical distribution of respondents, we tried to include people from as many provinces and municipalities in China as possible, so only several areas were missing. Considering the interpersonal relationship of all authors and our dissemination strategy, the respondents from different geographic areas were nearly correlated to the prevalence rate of COVID-19 in various areas in 2020. The total number of respondents varied between different regions, and among them, Hubei province was the highest. This could be due to the tendency of people in Hubei province who suffered most in COVID-19 and were willing to make a contribution to scientific research.

Our findings indicated that 86.8% respondents did not have any respiratory symptoms since the beginning of the COVID-19 outbreak. As China has benefited from the effective implementation of epidemic prevention and control policies⁵⁴, there were few cases of COVID-19 and so data collected on treatment, prevention and treatment outcomes were limited.

Referring to respiratory symptoms, common clinical features of COVID-19 include fever, fatigue, cough, shortness of breath, and pneumonia⁵⁵. Patients with mild COVID-19 had similar symptoms to those with the common cold and required a PCR test for a definitive diagnosis. A study in the Shanghai city of China indicated that during the COVID-19 pandemic, personal protection and reduction of human gathering can also effectively reduce the infection of influenza in the population⁵⁶. Therefore, the above strict prevention and control measures may have a potential positive effect on both COVID-19 and influenza.

Additionally, in terms of routes of transmission of COVID-19, coughing, sneezing, and touching could transmit the virus⁵⁷. The behavioural changes including keeping hands clean, wearing a mask and social distancing reflected that people were influenced by COVID-19 and kept away from the virus in different methods as the [Table 2](#) and [Table 3](#) listed.

Based on the results, 45 respondents with respiratory symptoms had a good outcome. COVID-19 clinical guidelines recommended to use TCM for treatment and prevention³². At the very beginning of 2020, evidence proved that TCM played an important role in improving self-resistance, regulating immunity and preventing virus, maybe including COVID-19²⁷. The main prevention principles of TCM were to tonify Qi to protect from external pathogens, disperse wind and discharge heat, and resolve dampness, by prescribing the modalities of decoction, patent remedies, acupuncture and Qigong^{27, 58}. Although we failed to collect enough data about TCM usage, we listed all possible TCM modalities and patent remedies recommended by clinical guidelines in supplementary table 1 and showed usage frequency.

Table 7
Preventive measures from 341 respondents during COVID-19

Treatment category	Respondents, Number (%)
<i>Modern medicine</i>	18 (5.28)
Painkillers, anti-inflammatories or cough and cold medicines	6 (33.33)
Acetaminophen	1 (16.67)
Compound aminophenolidine tablets	1 (16.67)
Aspirin	3 (50.00)
Ibuprofen	2 (33.33)
Corticosteroids	1 (5.56)
Nasal spray	4 (22.22)
Nasal decongestant	1 (25.00)
Unknown	3 (75.00)
Antihistamine and antiallergic drugs	2 (11.11)
Inhalant	2 (11.11)
Antiasthmatic drugs in combination with corticosteroids	1 (50.00)
corticosteroids	1 (50.00)
Antivirotic	2 (11.11)
Syrup and drops	2 (11.11)
<i>Traditional Chinese Medicine</i>	76 (22.29)
Chinese herbal preparation	58 (76.32)
Granules	20 (34.48)
Lianhua Qingwen Granule	13 (65.00)
Banlangen granules	4 (20.00)
Shuanghuanglian granules	3 (15.00)
Ganmao Qingre granules	2 (10.00)
Yinqiao Jiedu granules	2 (10.00)
Yupingfeng granules	2 (10.00)
Ganmaoling granules	1 (5.00)
Huangqi granules	1 (5.00)
Jinhua Qinggan granules	1 (5.00)
Qingre Jiedu granules	1 (5.00)
Xiao Chaihu Granula	1 (5.00)
Xinxue granules	1 (5.00)
Toujie Quwen granules	1 (5.00)
Hospital preparations	2 (10.00)
Oral liquid	4 (6.90)
Huoxiang Zhengqi Oral Liquid	3 (75.00)
Unknown	1 (25.00)
Decoction	26 (44.83)
Qingfei Paidu decoction	3 (11.54)
Guizhi decoction	2 (7.69)
Huangqi Liujunzi decoction	1 (3.85)
Huopo Xialing decoction	1 (3.85)
Liujunzi decoction	1 (3.85)
Maiwei Buzhongyiqi decoction	1 (3.85)
Xiaochaihu decoction	1 (3.85)
Yinqiao Powder and Sanren decoction	1 (3.85)
Jiang Liangduo's preventive prescription	2 (7.69)
Unknown	11 (42.31)
Not reported	2 (7.69)
Tablet	1 (1.72)
Vitamin C Yinqiao tablets	1 (100.00)
Oral liquid	3 (5.17)
Hospital preparations	1 (33.33)
Not reported	2 (66.67)
Capsule	11 (18.97)
Lianhua Qingwen Capsules	8 (72.73)
Four seasons antiviral mixture	2 (18.18)
Huoxiang Zhengqi Capsule	2 (18.18)
Jinhua Qinggan Capsule	2 (18.18)
Loquat Zhike Capsules	2 (18.18)
Compound Houttuynia cordata mixture	1 (9.09)
Jinye Baidu Capsules	1 (9.09)
Qingkailing Capsules	1 (9.09)
Reyanning mixture	1 (9.09)
Tanreqing Capsules	1 (9.09)
Individualized treatment	5 (8.62)
Pills	2 (3.45)
Baohu pills	1 (50.00)
Huoxiang Zhengqi pills	1 (50.00)
Xuanbai Chengqi Soup and Ganlu Disinfectant Pills	1 (50.00)
Powder	2 (3.45)
Zhuju Baihe powder	1 (50.00)
Not reported	1 (50.00)
TCM herbal tea	1 (1.72)
Acupuncture	3 (3.95)
Moxibustion	21 (27.63)
Tuina	7 (9.21)

(continued on next page)

Table 7 (continued)

Treatment category	Respondents, Number (%)
Qigong	14 (18.42)
Taichi	6 (7.89)
Cupping	2 (2.63)
Others (not reported)	3 (3.95)
<i>Other treatment</i>	63 (18.48)
Food supplements	26 (41.27)
Vitamin	22 (84.62)
Vitamin C	13 (59.09)
Vitamin B12	7 (31.82)
Vitamin D	6 (27.27)
Vitamin E	3 (13.64)
Vitamin A	2 (9.09)
Multivitamin	4 (18.18)
Omega-3 fatty acids	4 (15.38)
Mineral supplement	2 (7.69)
Calcium	2 (100.00)
Zinc	2 (100.00)
Magnesium	1 (50.00)
Enzyme supplements	2 (7.69)
Probiotics	6 (23.08)
Unknown	13 (50.00)
Exercises or activities	56 (88.89)
Sauna	9 (16.07)
Reflexology Western Massage	8 (14.29)
Walk or hike	32 (57.14)
Sports	38 (67.86)
Sunbathing	5 (8.93)
Mindfulness Meditation	8 (14.29)
Others	4 (7.14)
Special foods and diets	42 (66.67)
Fruits and vegetables	37 (88.10)
Orange	20 (54.05)
Ginger	17 (45.95)
Garlic	15 (40.54)
Carrot	10 (27.03)
Green onion	10 (27.03)
Lemon	8 (21.62)
Onion	7 (18.92)
White radish	2 (5.41)
Apple	1 (2.70)
Soup	12 (28.57)
Bee products	10 (23.81)
Honey	10 (100.00)
Bee milk	1 (10.00)
Propolis	1 (10.00)
Spice	2 (4.76)
Seaweeds	2 (4.76)
Kombucha and KEFIR	2 (4.76)
High-calorie food	1 (2.38)
Home remedies	23 (36.51)
Nasal irrigation	8 (34.78)
Inhalation of vapor	6 (26.09)
Lemon and Honey	6 (26.09)
Apple vinegar	5 (21.74)
Inhalation of essential oils	3 (13.04)
Lemon juice	2 (8.70)
Wash hands regularly	2 (8.70)
Drink more water	1 (4.35)
Essential oils	2 (3.17)
Lemon	1 (50.00)
Mint	1 (50.00)
Eucalyptus	1 (50.00)
<i>No special treatment</i>	229 (87.68)

When we released the questionnaire, there were main six brands of vaccines. We found that 20.53% respondents received a COVID-19 vaccine. It would be necessary to focus on vaccine application in the future to figure more information about the common population's attitude and feedback on it⁵⁹.

Mental health problems have been addressed from the results, as 17 respondents reported their mental health problems (supplementary table 3). A recent living systematic review of the psycho-

logical disorders in people suffering from COVID-19 showed that a high proportion of COVID-19 patients manifested psychological problems such as anxiety, depression, post-traumatic stress disorder (PTSD), insomnia, somatization, and fear⁶⁰. In addition to the patients with COVID-19, another study has shown that the epidemic has also caused adverse mental health consequences on the general population⁶¹. Thus, further studies should not only focus on treatment of COVID-19, but also involve the negative impact on

general population's mental condition. Effective psychological intervention and support are needed during the post COVID-19 epidemic.

For the special population, due to limited data from nine pregnant women among our respondents, we cannot find any special treatment or prevention from them. However, the safety of pregnant women and fetuses should still be noticed, including susceptibility and prognoses and the effects of the infection on the fetuses. Previous studies have shown that the severity of the disease in pregnant women was not yet apparent, and COVID-19 did not increase the rate of miscarriage, stillbirth, preterm labor or teratogenicity, and no unequivocal evidence support the fetal infection by intrauterine vertical transmission of SARS-CoV-2⁶²⁻⁶⁵, but there are still more and more reports of maternal deaths due to COVID-19^{63, 66-67}. Consequently, we still need to keep in mind that pregnant women and neonates require special attention regarding the prevention, diagnosis and management of COVID-19 to achieve health equity.

Differing from a large number of previous clinical studies focusing on patients⁴⁸⁻⁵⁰, we aimed at a wide range of situations by following the general population in the community, so we can explore the issues from a multi-dimensional perspective. Besides, in the process of adaptation of the questionnaire, we fully considered China's national conditions, added various complementary and alternative medicines recommended according to COVID-19 clinical guidelines in the questionnaires as the options. As the TCM clinical guidelines recommended in different areas of China varied, we collected different principles of treatments according to syndrome differentiation based on TCM theories as much as possible, in order to present much potential TCM evidence.

However, there were also several limitations in our study. The questionnaire sample was not as large as we had planned and the respondent rate was low. If questionnaires could have been distributed in the early stage of the outbreak, the information obtained would have been richer. Considering the majority (89.0%, 138/155) of participants who responded to the question about their occupations were healthcare workers and nearly a half of participants did not respond, we failed to recruit a representative sample of the population. If we could disseminate the survey via communities and primary care, the results and sample may be different. The primary healthcare providers could be a good way to recruit more participants. In addition, longitudinal associations can be studied in future in order to have a more comprehensive understanding of the issue, such as the association between preventative behaviour and subsequent illness, the association between treatments taken and illness outcomes, the association between disease course and mental statement, and so forth. Further exploratory analyses can inspire creative topics for future public health developments, as well as further pre-clinical and clinical research.

In summary, we found evidence of widespread use of infection control behaviours and modern medicines and TCM for treatment and prevention of COVID-19 and respiratory symptoms, especially many TCM preparations recommended in Chinese clinical guidelines. The efficacy of TCM still needs to be evaluated in further robust studies. Larger scale studies including a more representative sample are needed to confirm our findings.

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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Ethical statement

This study was approved by the Research Ethics Board at Beijing University of Chinese Medicine, Beijing, China (No. 2020BZYLL0501).

Data availability

The data will be made available upon request.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.imr.2021.100798](https://doi.org/10.1016/j.imr.2021.100798).

References

1. World Health Organization. *COVID-19 Dashboard*. Geneva: World Health Organization; 2020 <https://www.ncmi.cn/covid-19/visualization.html>. Published 2020. Accessed August 10, 2021.
2. National Health Commission of the People's Republic of China. *Medical correspondence [2020]No. 66: Diagnosis and Treatment Practice Guidelines for COVID-19 (3rd version)*. Beijing, China: National Health Commission of the People's Republic of China, National Administration of Traditional Chinese Medicine; 2020.
3. National Health Commission of the People's Republic of China. *Medical correspondence [2020]No. 77: Diagnosis and Treatment Practice Guidelines for COVID-19 (4th version)*. Beijing, China: National Health Commission of the People's Republic of China, National Administration of Traditional Chinese Medicine; 2020.

4. National Health Commission of the People's Republic of China. *Medical correspondence [2020]No. 103: Diagnosis and Treatment Practice Guidelines for COVID-19 (5th version)*. Beijing, China: National Health Commission of the People's Republic of China, National Administration of Traditional Chinese Medicine; 2020.
5. National Health Commission of the People's Republic of China. *Medical correspondence [2020]No. 45: Diagnosis and Treatment Practice Guidelines for COVID-19 (6th version)*. Beijing, China: National Health Commission of the People's Republic of China, National Administration of Traditional Chinese Medicine; 2020.
6. National Health Commission of the People's Republic of China. *Medical correspondence [2020]No. 184: Diagnosis and Treatment Practice Guidelines for COVID-19 (7th version)*. Beijing, China: National Health Commission of the People's Republic of China, National Administration of Traditional Chinese Medicine; 2020.
7. National Health Commission of the People's Republic of China. *Medical correspondence [2020]No. 680: Diagnosis and Treatment Practice Guidelines for COVID-19 (8th version)*. Beijing, China: National Health Commission of the People's Republic of China, National Administration of Traditional Chinese Medicine; 2020.
8. World Health Organization. *Clinical management of COVID-19: living guidance 25 January 2021*. Geneva: World Health Organization; 2021.
9. Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, et al. Clinical characteristics of Coronavirus Disease 2019 in China. *N Engl J Med*. 2020;382(18):1708–1720.
10. WHO Solidarity Trial Consortium. Repurposed antiviral drugs for COVID-19 - Interim WHO solidarity trial results. *N Engl J Med*. 2021;384(6):497–511.
11. Mehra MR, Ruschitzka F, Patel AN. Retraction- Hydroxychloroquine or Chloroquine with or without a macrolide for treatment of COVID-19: A multinational registry analysis. *Lancet*. 2020;395(10240):1820.
12. Singh B, Ryan H, Kredt T, Chaplin M, Fletcher T. Chloroquine or Hydroxychloroquine for prevention and treatment of COVID-19. *Cochrane Database Syst Rev*. 2021;2(2).
13. Singh S, Khera D, Chugh A, Khera PS, Chugh VK. Efficacy and safety of Remdesivir in COVID-19 caused by SARS-CoV-2: A systematic review and meta-analysis. *BMJ Open*. 2021;11(6).
14. Nussbaumer-Streit B, Mayr V, Dobrescu AI, Chapman A, Persad E, Klerings I, Wagner G, Siebert U, Ledinger D, Zachariah C, Gartlehner G. Quarantine alone or in combination with other public health measures to control COVID-19: A rapid review. *Cochrane Database Syst Rev*. 2020 Sep 15;9(9).
15. World Health Organization. *Preventing and mitigating COVID-19 at Work: Policy Brief 19 May 2021*. Geneva: World Health Organization; 2021.
16. World Health Organization. *R&D Blue Print. The COVID-19 Vaccine Tracker and Landscape Compiles Detailed Information of each COVID-19 Vaccine Candidate in Development by Closely Monitoring their Progress Through the Pipeline*. Geneva: World Health Organization; 2021.
17. National Health Commission of the People's Republic of China. *Novel Coronavirus Vaccine Technical Guide (First edition)*, 2020. <http://www.nhc.gov.cn/jkj/s3582/202103/c2febf04fc5498f916b1be080905771.shtml> Published 2021. Accessed September 27, 2021.
18. Xia S, Zhang Y, Wang Y, et al. Safety and immunogenicity of an inactivated SARS-CoV-2 vaccine, BBIBP-CorV: A randomised, double-blind, placebo-controlled, phase 1/2 trial. *Lancet Infect Dis*. 2021;21(1):39–51.
19. Xia S, Duan K, Zhang Y, et al. Effect of an inactivated vaccine against SARS-CoV-2 on safety and immunogenicity outcomes: Interim analysis of 2 randomized clinical trials. *JAMA*. 2020;324(10):951–960. doi:10.1001/jama.2020.15543.
20. Zhang Y, Zeng G, Pan H, et al. Safety, tolerability, and immunogenicity of an inactivated SARS-CoV-2 vaccine in healthy adults aged 18–59 years: A randomised, double-blind, placebo-controlled, phase 1/2 clinical trial. *Lancet Infect Dis*. 2021;21(2):181–192.
21. Wu Z, Hu Y, Xu M, et al. Safety, tolerability, and immunogenicity of an inactivated SARS-CoV-2 vaccine (CoronaVac) in healthy adults aged 60 years and older: a randomised, double-blind, placebo-controlled, phase 1/2 clinical trial. *Lancet Infect Dis*. 2021;21(6):803–812.
22. Zhu FC, Li YH, Guan XH, et al. Safety, tolerability, and immunogenicity of a recombinant adenovirus type-5 vectored COVID-19 vaccine: A dose-escalation, open-label, non-randomised, first-in-human trial. *Lancet*. 2020;395(10240):1845–1854.
23. Yang S, Li Y, Dai L, et al. Safety and immunogenicity of a recombinant tandem-repeat dimeric RBD protein vaccine against COVID-19 in adults: Pooled analysis of two randomized, double-blind, placebo-controlled, phase 1 and 2 trials. *medRxiv*. 2020: 2020.12.20.20248602
24. Wu Q, Dudley MZ, Chen X, et al. Evaluation of the safety profile of COVID-19 vaccines: A rapid review. *BMC Med*. 2021;19(1):173.
25. Krause PR, Fleming TR, Peto R, et al. Considerations in boosting COVID-19 vaccine immune responses [published online ahead of print, 2021 Sep 14]. *Lancet*. 2021 S0140-6736(21)02046-8.
26. Ali K, Berman G, Zhou H, et al. Evaluation of mRNA-1273 SARS-CoV-2 vaccine in adolescents [published online ahead of print, 2021 Aug 11]. *N Engl J Med*. 2021.
27. Luo H, Tang QL, Shang YX, Liang SB, Yang M, Robinson N, Liu JP. Can Chinese medicine be used for prevention of Corona Virus Disease 2019 (COVID-19)? A review of historical classics, research evidence and current prevention programs. *Chin J Integr Med*. 2020 Apr;26(4):243–250.
28. Wang H, Xu B, Zhang Y, Duan Y, Gao R, He H, Li X, Li J. Efficacy and safety of traditional Chinese medicine in Coronavirus Disease 2019 (COVID-19): A systematic review and meta-analysis. *Frontiers in pharmacology*. 2021;12.
29. Huang K, Zhang P, Zhang Z, Youn JY, Wang C, Zhang H, Cai H. Traditional Chinese Medicine (TCM) in the treatment of COVID-19 and other viral infections: Efficacies and mechanisms. *Pharmacol therapeutics*. 2021;225.
30. Von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Lancet*. 2007;370(9596):1453–1457.
31. Eysenbach G. Improving the quality of Web surveys: the Checklist for Reporting Results of Internet E-Surveys (CHERRIES). *J Med Internet Res*. 2004;6(3):e34.
32. National Health Commission of the People's Republic of China. *Diagnosis and Treatment Plan for COVID-19 (Trial Version 3)*. *Tianjin J Traditional Chin Med*. 2020;37(01):1–3.
33. National Health Commission of the People's Republic of China. *Diagnosis and Treatment Plan for COVID-19 (Trial Version 7)*. *Clin Education of General Practice*. 2020;18(02):100–105.
34. National Health Commission of the People's Republic of China. *Diagnosis and Treatment Plan for COVID-19 (Trial Version 8)*. *Chin J Viral Dis*. 2020;10(05):321–328.
35. Beijing Administration of Traditional Chinese Medicine. *Traditional Chinese medicine prevention and treatment plan for COVID-19 of Beijing (Trial Version 5)*. *Beijing J Traditional Chin Med*. 2020;39(07):655–656.
36. Traditional Chinese Medicine Bureau of Guangdong Province. *Traditional Chinese Medicine Treatment Plan for COVID-19 of Guangdong (Trial Version 1)*. http://szyyj.gd.gov.cn/zwgk/gsgg/content/post_2879085.html . Published: 2020. Accessed July 9, 2021.
37. Traditional Chinese Medicine Bureau of Guangdong Province. *Traditional Chinese Medicine Treatment Plan for COVID-19 of Guangdong (Trial Version 2)*. http://szyyj.gd.gov.cn/zwgk/gsgg/content/post_2902010.html . Published: 2020. Accessed July 9, 2021.
38. Shanghai Municipal Health Commission. *Traditional Chinese Medicine Diagnosis and Treatment Plan for COVID-19 of Shanghai (Trial Version 2)*. <http://wsjkw.sh.gov.cn/zyygz2/20200224/a1f1aab9745e4490867cb4aaf40eaad0.html> . Published: 2020. Accessed July 3, 2021.
39. Shanxi Municipal Health Commission. *Traditional Chinese Medicine Treatment Plan for COVID-19 of Shanxi (Trial Version 2)*. http://sxwjw.shaanxi.gov.cn/sy/tzgg/202002/t20200202_1833323.html . Published: 2020. Accessed July 9, 2021.
40. Jiangxi Municipal Health Commission. *Traditional Chinese Medicine Prevention and Treatment Plan for COVID-19 of Jiangxi (Trial Version 2)*. http://www.jiangxi.gov.cn/art/2020/2/11/art_21200_1503801.html . Published: 2020. Accessed July 3, 2021.
41. Hunan Municipal Health Commission. *Traditional Chinese Medicine Diagnosis and Treatment Plan for COVID-19 Rehabilitation Stage of Hunan (Trial)*. http://tcm.hunan.gov.cn/tcm/xxgk/tzgg/202003/t20200306_11801809.html . Published: 2020. Accessed July 3, 2021.
42. Hunan Municipal Health Commission. *Traditional Chinese Medicine Diagnosis and Treatment Plan for COVID-19 of Hunan (Trial Version 2)*. http://tcm.hunan.gov.cn/tcm/xxgk/tzgg/202001/t20200126_11164462.html . Published: 2020. Accessed July 10, 2021.
43. Hunan Municipal Health Commission. *Traditional Chinese Medicine Diagnosis and Treatment Plan for COVID-19 of Hunan (Trial Version 3)*. http://tcm.hunan.gov.cn/tcm/xxgk/tzgg/202002/t20200203_11168981.html . Published: 2020. Accessed July 10, 2021.
44. Liaoning Municipal Health Commission. *Traditional Chinese Medicine Diagnosis and Treatment Plan for COVID-19 of Liaoning (Trial Version 2)*. http://wsjkw.ln.gov.cn/wst_xxgk/wst_ywpd/wst_zygl/202004/t20200426_3840388.html . Published: 2020. Accessed July 3, 2021.
45. Sichuan Municipal Health Commission. *Suggested prescriptions for Traditional Chinese Medicine intervention for COVID-19 of Sichuan (Trial Version 1)*. <http://www.sc.gov.cn/10462/12771/2020/1/25/0d37953ca2534d5382ba744e81725469.shtml> . Published: 2020. Accessed July 3, 2021.
46. Hebei Municipal Health Commission. *Diagnosis and Treatment Plan for COVID-19 of Hebei (Trial Version 2)*, 2020. <http://wsjkw.hebei.gov.cn/tzgg/361730.jhtml> . Accessed July 3, 2021.
47. Gansu Municipal Health Commission. *Traditional Chinese Medicine Prevention and Treatment Plan for COVID-19 of Gansu (Trial)*. <http://wsjkw.gansu.gov.cn/file.jsp?contentId=83008>. Published: 2020. Accessed July 3, 2021.
48. Guizhou Administration of Traditional Chinese Medicine. *Traditional Chinese Medicine Prevention and Treatment Plan for COVID-19 of Guizhou (Version 2)*. http://atcm.guizhou.gov.cn/xwxz/tzgg/202002/t20200219_50073831.html . Published: 2020. Accessed July 3, 2021.
49. Dhabaan G, Chahin A, Buhaish A, Shorman M. COVID-19 pandemic in Yemen: A questionnaire based survey, what do we know? *J Infect Dev Ctries*. 2020;14(12):1374–1379.
50. Hur K, Price C, Gray EL, Gulati RK, Maksimoski M, Racette SD, et al. Factors associated with intubation and prolonged intubation in hospitalized patients with COVID-19. *Official J Am Acad Otolaryngol-Head and Neck Surgery*. 2020;163(1):170–178.
51. Li T, Zhang Y, Gong C, Wang J, Liu B, Shi L, et al. Prevalence of malnutrition and analysis of related factors in elderly patients with COVID-19 in Wuhan, China. *Eur J Clin Nutr*. 2020;74(6):871–875.
52. Hao F, Tam W, Hu X, Tan W, Jiang L, Jiang X, et al. A quantitative and qualitative study on the neuropsychiatric sequelae of acutely ill COVID-19 inpatients in isolation facilities. *Transl Psychiatry*. 2020;10(1):355.
53. Rolstad S, Adler J, Rydén A. Response burden and questionnaire length: is shorter better? A review and meta-analysis. *Value Health*. 2011;14(8):1101–1108.

54. The State Council of the People's Republic of China. Notice on doing a good job in guaranteeing service for the people who staying in local region during Chinese New Year. http://www.gov.cn/xinwen/2021-01/25/content_5582497.htm . Published 2021. Accessed July 7, 2021.
55. Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, et al. Clinical Characteristics of 138 hospitalized patients with 2019 novel Coronavirus-infected Pneumonia in Wuhan. *China JAMA*. 2020;17(11):1061–1069 323.
56. Jiang CY, Cui P, Pan H, Wu HY, Zheng YX. Impact of COVID-19 control measures on the spread of influenza. *Shanghai J Prev Med*. 2021:1–7 [In Chinese, English abstract].
57. Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. Early transmission dynamics in Wuhan, China, of novel Coronavirus-infected Pneumonia. *N Engl J Med*. 2020;26(13):1199–1207 382.
58. Ren JL, Zhang AH, Wang XJ. Traditional Chinese medicine for COVID-19 treatment. *Pharmacol Res*. 2020;155.
59. Li YD, Chi WY, Su JH, Ferrall L, Hung CF, Wu TC. Coronavirus vaccine development: from SARS and MERS to COVID-19. *J Biomed Sci*. 2020 Dec 20;27(1):104.
60. Dong F, Liu HL, Dai N, Yang M, Liu JP. A living systematic review of the psychological problems in people suffering from COVID-19. *J Affect Disord*. 2021;292:172–188.
61. Rajkumar RP. COVID-19 and mental health: A review of the existing literature. *Asian J Psychiatr*. 2020;52.
62. Hayakawa S, Komine-Aizawa S, Mor GG. Covid-19 pandemic and pregnancy. *J Obstet Gynaecol Res*. 2020;46(10):1958–1966.
63. Wenling Y, Junchao Q, Xiao Z, Ouyang S. Pregnancy and COVID-19: Management and challenges. *Rev Inst Med Trop Sao Paulo*. 2020;62:e62.
64. Chen H, Guo J, Wang C, Luo F, Yu X, Zhang W, Li J, Zhao D, Xu D, Gong Q, Liao J, Yang H, Hou W, Zhang Y. Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records. *Lancet*. 2020 Mar 7;395(10226):809–815.
65. Zhu H, Wang L, Fang C, Peng S, Zhang L, Chang G, Xia S, Zhou W. Clinical analysis of 10 neonates born to mothers with 2019-nCoV pneumonia. *Transl Pediatr*. 2020 Feb;9(1):51–60.
66. Ahmed I, Azhar A, Eltaweel N, Tan BK. First COVID-19 maternal mortality in the UK associated with thrombotic complications. *Br J Haematol*. 2020 Jul;190(1):e37–e38.
67. Takemoto MLS, Menezes MO, Andreucci CB, Nakamura-Pereira M, Amorim MMR, Katz L, Knobel R. The tragedy of COVID-19 in Brazil: 124 maternal deaths and counting. *Int J Gynaecol Obstet*. 2020 Oct;151(1):154–156.