

## Coronavirus Pandemic

# Experiences of patients who retest positive for SARS-CoV-2 Omicron variant after discharge: a qualitative study

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### Abstract

**Introduction:** In this study, we analyzed the psychological aspects of coronavirus disease 2019 (COVID-19) patients who were discharged from the hospitals in Shanghai, China, and later had positive nucleic acid retest results for the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) Omicron variant infection (re-positive COVID-19). The purpose was to gain clarity on the patients' needs and to provide evidence for the medical staff to deliver scientific and targeted health care to the patients.

**Methodology:** We screened patients who tested positive for SARS-CoV-2 Omicron variant infection by nucleic acid testing after having previously recovered from a COVID-19 infection and being discharged from Shanghai shelter hospitals or COVID-19-designated hospitals from April 3, 2022, to May 10, 2022. Purposive sampling and snowball sampling methods were applied. Semi-structured one-on-one interviews were performed online to collect the data, and the transcripts of the interviews were analyzed using Colaizzi's seven-step analytical method.

**Results:** Fifteen patients were interviewed to reach saturation in this study. Four themes were generated, including negative emotions, positive emotions and self-growth, apparent effects on family life, and apparent effects on the social level. In addition, a lack of knowledge regarding re-positive COVID-19 was found.

**Conclusions:** This study analyzed the psychological experiences of re-positive COVID-19 patients. Lack of knowledge of patients and the public about re-positive COVID-19 and irregular epidemic prevention measures in some communities were the leading causes of psychological stress in the patients. These findings can be used to optimize the management of patients in this setting.

**Key words:** COVID-19; Omicron; retesting; experience; qualitative; phenomenology.

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### Introduction

The coronavirus disease 2019 (COVID-19) pandemic has become a global public health safety issue [1]. On November 26, 2021, the World Health Organization (WHO) listed the B.1.1.529 variant of COVID-19 as a “variant of concern”. This variant was denoted by the Greek letter Omicron and was called the Omicron variant [2]. Since then, this variant has shown highly pathogenic characteristics and has spread rapidly worldwide, posing a severe threat to patients' lives [3].

Since the onset of the pandemic, Shanghai, China has taken effective preventive and control measures and has established several shelter hospitals to treat mild and asymptomatic infections. Therefore, the number of cured patients has been increasing, and the epidemic has been effectively controlled [4]. However, it has been reported that the rate of positive nucleic acid retests in patients discharged from hospitals in Wuhan, Tianjin, Sichuan, and Guangdong provinces ranged from 7.34% to 17.42% [5–8]. Re-positive COVID-19

refers to the recovered (discharged) COVID-19 patients who retest positive by reverse transcription–polymerase chain reaction (RT-PCR) [9]. As the number of patients discharged from Shanghai shelter hospitals increased, re-positive COVID-19 patients gradually appeared in the city.

According to the requirements of epidemic prevention and control in China, patients with a re-positive cycle threshold (Ct) value of < 35 by RT-PCR needed to be treated in medical isolation again. Therefore, patients who had just experienced the stress of having a highly infectious disease and undergoing isolation treatment, were going to have more significant adverse psychological effects than after the first diagnosis [10]. In addition, as their physical and psychological recoveries were not yet complete, acute psychological stress reactions would be quickly triggered if appropriate interventions were not made. This can significantly decrease the patient's quality of life and make them potentially less compliant with

isolation procedures. However, to date, no study has provided any evidence of the psychological experience of patients in this setting.

In this study, we analyzed the feelings and psychological status of patients discharged from Shanghai hospitals who retested positive for Omicron variant infection by RT-PCR with the objective of clarifying the patients' needs and providing evidence for medical staff to deliver scientific and targeted health care to re-positive COVID-19 patients.

## Methodology

### *Qualitative approach and researchers' characteristics*

In this qualitative study, we employed Colaizzi's phenomenological approach according to the patient's perspective [11]. Colaizzi's approach focuses on the experience and feelings of the informants and generates shared patterns rather than individual characteristics of the informants. We report the present study according to the standards for reporting qualitative research [12].

The interviewer served as the team leader in the Shanghai Shelter Hospital and had experience in epidemic prevention and control. In addition, three nurses in the team who had work experience in isolation wards provided epidemic guidance for this project. The senior author held a master's degree in nursing and had 13 years of experience in clinical nursing, teaching, and scientific research. He had also participated in the hospital's specialized training in spiritual care. Furthermore, one of the team members had access to

national second-level psychological consultants for professional guidance. All team members had participated in professional training in qualitative research. They also had conducted several qualitative research projects and had experience with qualitative interviews.

### *Participants and recruitment*

We screened patients infected with the Omicron variant who were cured and discharged from Shanghai shelter hospitals or COVID-19-designated hospitals from April 3, 2022, to May 10, 2022. A purposive sampling of patients who were confirmed to have retested positive for the Omicron variant by RT-PCR was conducted by initially recruiting the patients through a WeChat group set up for in-patients with COVID-19. The research interview was conducted after the informed consent was signed. Snowball sampling was then used through the interview of participants. The initial set of patients were asked to help contact other patients to determine whether they would also like to participate in the study.

The sample size was based on the fact that data saturation was reached, and no new topics were generated during the interview process [13]. The inclusion criteria were (1) age  $\geq$  18 years, (2) being stable and fully cooperative, (3) able to understand the interview content and communicate well, and (4) signing the consent form to participate in this study. The exclusion criteria were (1) cognitive impairment or mental illness, (2) being critically ill and unable to cooperate, and/or (3) having a severe audiovisual impairment that prevented an interview from being conducted.

### *Interview guide and data collection*

An interview guide was developed after expert discussion based on a literature search and the purpose of the study. Furthermore, pre-interviews were conducted with two participants to adjust and refine the final version (Table 1).

Due to pandemic prevention and control requirements, the face-to-face WeChat video interview method was applied to collect data. The interview time was scheduled at the participants' convenience. The in-depth one-on-one interviews were conducted in a quiet and undisturbed manner. We used an app called "questionnaire star" to collect general information of the patients (Supplementary Figure 1).

The interview was recorded from the beginning, and the time was controlled to last between 15 and 20 minutes. Each interview was attended by two

**Table 1.** Interview guide.

| Questions   |
|---|
| 1 Do you have any knowledge about re-positive coronavirus disease 2019 (COVID-19)?<br>Probe: If yes, what do you know?  |
| 2 What uncomfortable symptoms did you have after the re-positive COVID-19 test result?<br>Probe: What are the symptoms that bothered you most?                            |
| 3 What are your feelings and thoughts after retesting positive for COVID-19?<br>Probe (if any): Can you supply more details of the feeling?                               |
| 4 How did having re-positive COVID-19 affect you (i.e., family life, work, and social life)?<br>Probe: How do you feel about these effects and how do you cope with them? |
| 5 What changes have occurred in your intimate relationship with your lover after recovery?<br>Probe: How do you see and respond to these changes?                         |
| 6 What is the biggest change in your life compared to after the initial diagnosis?<br>Probe (if any): Can you supply any details of the change?                           |
| 7 What are you most worried about after having re-positive COVID-19?<br>Probe (if any): Can you supply any possible reasons for the worry?                                |
| 8 What kind of help do you need the most after having re-positive COVID-19?<br>Probe (if any): Would you please share the details?  |
| 9 In addition to the questions covered in this interview, is there anything else you would like to add?   |

professionally trained research members. One member interviewed, and the other member was responsible for objectively recording the interview content, including the interviewee’s tone of voice, movement, and expression. Interview techniques such as listening and interaction were used at the appropriate times during the interview, and inducing language was avoided.

The first author, who was both the lead researcher and one of the researchers responsible for conducting the interviews, received specialized training in spiritual care and was therefore available to provide support to the patients during the interview process. Another team member served as a level 2 national mental health consultant. In case the patient became severely distressed, the team planned to refer the patient to her to receive professional mental health guidance.

*Data processing and analysis*

All interview recordings were transcribed into transcripts within 24 hours, by consolidating all the information and creating separate files. The confidentiality principle was followed, including anonymizing the informants by coding each of them using an identity document number. The transcripts were analyzed using Colaizzi’s seven-step analytical method [11,14]. Two researchers independently reviewed the transcripts. Meaningful statements were extracted for coding, and the final themes were

determined by repeated comparisons and synthesis. The results were returned to the interviewees for validation.

*Researcher responsibilities*

The researchers involved in this study were each responsible for different parts of the process. The first and second author conducted the patient interviews. The second author was responsible for recording the interviews. The third author was responsible for transcribing the audio recordings of the interviews. Lastly, the first author was responsible for following up with patients to confirm the validity of the contents of the interview.

*Techniques to enhance trustworthiness*

We applied four criteria – credibility, dependability, confirmability, and transferability – to ensure the study’s robustness [15,16]. The details of the techniques that were applied to enhance trustworthiness are described in Table 2.

*Ethical considerations*

The study protocol was approved by the Research Ethics Committee of the Cancer Hospital Affiliated to Shandong First Medical University (approval #: SDTHEC2022004014). All participants e-signed informed consent before their interviews and were allowed to withdraw consent or withdraw from the interview at any time. In addition, all interviews were recorded with prior permission from the participants, and the privacy of the participants was protected.

*Bias reduction*

When summarizing the extracted themes, a team review and participant feedback approach was used to avoid bias and subjective factors affecting the findings. The members of the interview team were invited to review and discuss the generalized themes together to ensure that the data were understood and interpreted from different perspectives. The summarized themes were relayed back to the participants to verify the validity and accuracy of the summarization to ensure that the themes reflected their experiences and perspectives.

**Results**

*Participants*

We screened a total of 18 patients discharged from the hospital who were confirmed to have re-positive COVID-19. Three patients refused to participate, and finally 15 patients were interviewed to reach saturation in this study. The general information of the

**Table 2.** Techniques applied to ensure the trustworthiness of this study.

| Rigor criteria  | Strategies applied in our study to achieve rigor  |
|-----------------|---|
| Credibility     | The interview instructions were tested and revised accordingly using 1–2 pilot interviews.<br>We ensured that the investigators had the required knowledge and research skills to perform a qualitative study.<br>Field notes were collected and analyzed on time.<br>Peer debriefing was performed by regular debriefing discussions after each interview with key research members. |
| Dependability   | A detailed protocol of the study was applied. We followed a standard procedure to track and record the data collection process.   |
| Confirmability  | We applied triangulation techniques, including methodological and data source triangulation.<br>Reflection was applied among the researchers through weekly investigator meetings.  |
| Transferability | We quantified data saturation.<br>We applied both purposive sampling and snowball sampling to recruit participants.   |

interviewees is summarized in Table 3. Five of the 15 interviewed patients developed physical symptoms of COVID-19 after discharge from the hospital. Two of them had nasal congestion, and the other three patients had a sore throat, cough, weakness, mild chest tightness, and/or foreign body sensation in the throat. Symptomatic patients accounted for 33.3% of the total, and the average duration of symptoms was four days.

Based to our survey, we found that the re-positive COVID-19 patients lacked knowledge of their condition. Awareness of re-positive COVID-19 was divided into three categories: familiar knowledge, little knowledge, and no knowledge. The survey results showed that 61.5% of the respondents did not know, 23.1% had little knowledge, and 15.4% knew well that it is possible to retest positive for COVID-19. The awareness rate of the patients on COVID-19 recovery knowledge was low. In addition, we explored the psychological experience of all included informants, and four themes were generated, which are summarized below.

*Theme 1. Negative emotions (13 patients)*

Frustration and sadness. The pandemic developed quickly in Shanghai, and the public was generally panicked. Some communities were reluctant to receive patients discharged from shelter hospitals, resulting in psychological harm of patients who could not return to their communities. One of the informants (P1) complained, “After being discharged from the shelter hospital, neither the neighborhood committee nor the landlord allowed me back. Then, the other day I felt cold after rain, and the next day I was confirmed to have re-positive COVID-19. I am so sad that many people like me who cannot return home are on the streets.”

Astonishment. The lack of knowledge of patients about re-positive COVID-19 and the high expectation for the prognosis of the disease made it difficult to accept the truth of retesting positive for COVID-19. Patients described their first reaction as follows: “Is there a mistake? I have been out of the shelter hospital for so long, and I do not have any uncomfortable symptoms, and everything is normal. How can it be positive?” (P2); and “I cannot believe that re-positive COVID-19 happened to me! With such a low probability, I still cannot believe it. At that time, I had heard of no one with re-positive COVID-19, and I was the only one!” (P5).

Stress and depression. After being discharged from a shelter hospital following a long stay, the patients believed that the disease would be aggravated when they were diagnosed with re-positive COVID-19. In addition, some community staff members had insufficient understanding of re-positive COVID-19. As a result, their handling methods for re-positive COVID-19 patients were not standardized, which caused panic among the residents and verbal confrontations. As some of the informants described, “I stayed in the shelter hospital for 20 days and was the only one left of a group of 40 people in our company. I was very broken at that moment. After leaving the shelter hospital, I stayed home for a week and did not go out. However, it still didn’t work (I still retested positive) even after seven days. At that time, I thought that my condition had worsened” (P9). “After reporting my condition of re-positive COVID-19, the neighborhood committee put a notice out describing that the community inside our building had inhabitants with re-positive COVID-19, which may affect the whole community. The chat group was immediately on the deep fryer. They kept asking me why I came back.

**Table 3.** Characteristics of the included patients (n = 15).

| Informant | Gender | Age (yrs.) | Occupation    | Marial status | Education                  | No. of hospitalizations for COVID-19 | Days between discharge and re-infection* |
|-----------|--------|------------|---------------|---------------|----------------------------|--------------------------------------|--|
| P1        | Male   | 37         | Company staff | Married       | College diploma            | 2                                    | 3  |
| P2        | Male   | 23         | Student       | Unmarried     | Master’s degree            | 1                                    | 7  |
| P3        | Female | 30         | Worker        | Married       | Junior high school diploma | 2                                    | 7  |
| P4        | Male   | 26         | Company staff | Unmarried     | College diploma            | 1                                    | 7  |
| P5        | Female | 27         | Technician    | Unmarried     | High school diploma        | 1                                    | 7  |
| P6        | Male   | 47         | Worker        | Unmarried     | Junior high school diploma | 1                                    | 8  |
| P7        | Male   | 28         | Engineer      | Unmarried     | Junior high school diploma | 2                                    | 13                                       |
| P8        | Male   | 22         | Worker        | Unmarried     | Bachelor’s degree          | 1                                    | 7  |
| P9        | Male   | 33         | Engineer      | Married       | Bachelor’s degree          | 2                                    | 8  |
| P10       | Female | 44         | Company staff | Married       | High school diploma        | 2                                    | 5  |
| P11       | Female | 32         | Unemployed    | Unmarried     | High school diploma        | 2                                    | 7  |
| P12       | Male   | 34         | Teacher       | Unmarried     | Bachelor’s degree          | 1                                    | 8  |
| P13       | Male   | 49         | Civil servant | Married       | Bachelor’s degree          | 1                                    | 7  |
| P14       | Female | 60         | Retired       | Married       | High school diploma        | 1                                    | 8  |
| P15       | Male   | 35         | Self-employed | Married       | High school diploma        | 2                                    | 10                                       |

No.: number; COVID-19: coronavirus disease 2019; \* confirmed by positive results in COVID-19 tests.

They complained that my coming back with re-positive COVID-19 can affect them. I was under a lot of psychological pressure at that time. You kept explaining in the chat group, but no one believed or understood you. I was close to depression during that period” (P8).

Anxiety. Some patients were anxious because they had re-positive COVID-19 test results several times or were eager to re-examine the infection status by RT-PCR as soon as possible. One of the patients said, “It is okay to retest positive for the first time, and I was able to tolerate it for the second time. However, after the third time, I gradually became very anxious. The mentality cannot be the same as before. It was not very pleasant, and I could not sleep at night. I was told that I did not need to take any medicine because I had no symptoms. What I could do was wait for the next PCR examination, which was not offered every day. I could do nothing but wait every day” (P3). Patient 5 also expressed similar concerns.

Worries and fears. Patients had different worries or fears about their disease, prognosis, family, and work due to their own condition of re-positive COVID-19. “I had no symptoms at the time (after confirmation of re-positive COVID-19). However, I was distraught that I may be required to return to the shelter hospital for two more days. I believed (if I go back) that the disease would become serious, and I would get infected again” (P2). Patients 7, 8, 9, 11, and 14, all expressed similar concerns.

Guilt. One patient felt guilty due to the re-isolation of his peers because of his re-positive COVID-19 test result. “I rented a place in a group. After my discharge, I was confirmed with re-positive COVID-19. Everyone in my place was then quarantined in a hotel for another seven days. I felt like I came back to harm people and am so sorry for them” (P4).

Stigma. The lockdown measures for COVID-19 in China meant that one person’s positive retest could have a real and tangible impact on others who live in the same apartment building as them. One positive test in a building could mean that all residents were then required to self-quarantine and be tested for the virus. In these situations, the patient’s neighbors may direct their frustrations with their circumstances towards the patient. This may involve placing all responsibility on the patient, isolating them socially, as well as harassing them on social media. Some patients felt stigma and self-blame after retesting positive because of these misunderstandings. One of the patients described, “The chat group of the building kept talking about my re-positive thing. No good words at all. I even had suicidal

thoughts at that time. I preferred to move out and give others peace of mind. I did not want to stay a minute in that building anymore” (P8).

Irritability. The excessive worry about the prognosis and difficulty in meeting their needs after being confirmed with re-positive COVID-19 caused emotional instability in the patients. “I was too anxious after being confirmed to have re-positive COVID-19. Therefore, I got angry easily, and my boyfriend was not around. I wanted to drop something, and I slammed my pillow hard. I was annoyed when my boyfriend called me and wanted to get angry” (P10).

Obsessive-compulsive behavior. The patient’s overprotective behavior was out of fear of a roommate being infected and a desire to recover as soon as possible. “I’m about to suffer from obsessive-compulsive disorder after being confirmed with re-positive COVID-19 because my roommate and I share the bathroom and kitchen. I kept wiping and cleaning the bathroom and the toilet seat repeatedly. I kept rubbing my hands; my hands were peeling a little, and I always wanted to change the mask; maybe I wanted to get better sooner” (P9).

Self-blame. The patient thought that he and his family were infected due to a lack of self-protection knowledge during their volunteer service, and they blamed themselves. “I was infected as a volunteer. After I came out of the shelter hospital, I was found to have re-positive COVID-19. I do not have much psychological pressure on the positive retest result itself, but I have more reflections on myself, and analyze why the infection occurred, or I do not understand many things, I’m too careless, and I have not perfected every detail well” (P13).

## *Theme 2. Positive emotions and growth under pressure (6 patients)*

Calmness and optimism. Some patients had knowledge of the disease and the condition of re-positive COVID-19. Therefore, their mindset was relatively stable, and they accepted the positive retest result calmly. “The Shandong medical team has preached to us that personnel who retest positive are not contagious or have very low infectivity, and the recovery rate is very high. This psychological expectation is still there. I was also a volunteer in the shelter before, and I am very experienced when I go there again” (P8). “I just think it’s just like being sick. It’s just like a cold because there were no symptoms then and no psychological burden” (P10).

Self-confidence. Some patients were optimistic about their physical fitness, cooperated with the

treatment, and were more confident about the prognosis. “I usually insist on exercising. Therefore, I still believe in my physical fitness. Although I didn’t expect to retest positive, I learned about the situation. We can do what we can do to cooperate actively. I am still relatively confident that I can recover” (P11).

Gratitude. The patients were full of gratitude after recovering from re-positive COVID-19 and felt the warmth of their neighbors and the care provided by the medical staff. “I think I am very lucky. The neighbors in the building were very nice. I really thank my neighbors” (P12). “Thank you very much for taking such good care of us in the shelter hospital. Even though we came back from the shelter hospital, you still care so much for us. Thank you very much” (P5).

Growth under pressure. The patients reported that they had become inspired by their personal experiences and were hopeful for their future, both in work and in life. “Because many of our colleagues were infected in the company, it was very interesting to chat with them when they had nothing to do. I felt that there was another bright spot in life. It was a very ordinary day, and an unforgettable experience suddenly appeared. After the incident, everyone is safe and sound, and we cherished each other even more. No matter what you are, humans are insignificant in the face of this epidemic” (P8). “I feel it is a great honor to serve as a volunteer during this epidemic. Although I also got sick with COVID-19 in the end, I have never regretted it. Medical workers from all over the country worked to support us in Shanghai. As a Shanghainese, I felt compelled to contribute to the fight against the virus. This experience has taught me what national pride really means. After this epidemic, I have to do more for society” (P13).

### *Theme 3. Apparent effects on family life (7 patients)*

Impact on family life. The implementation of the community quarantine and the centralized isolation of positive patients caused the patients to be unable to assume family roles, which greatly impacted their lives. “My house was sealed because of my disease, and, as a result, the whole family could not go out. After being discharged from the shelter hospital, an electronic access control was installed on my door. That is, we must report as soon as we open the door. It was too inconvenient” (P8). “I undertake the preparations for home meals and material purchases at home. However, after retesting positive, I went to the shelter hospital again, which had been more than a month. They (my wife and daughter) even had problems regularly eating without me, but I cannot help it” (P13).

Lack of family support. Some patients lacked family support. “I am in Shanghai by myself, and I have no family here. In addition, I never dared to speak to my family for fear that they would be worried. As a result, I did not know who to ask or who to talk to after being confirmed with re-positive COVID-19” (P9).

Increased psychological stress on family members. The patient’s family was afraid that the patient may conceal their true condition to them. Their psychological pressure increased because they worried about the patient’s physical condition. “My family can’t feel whether my physical condition is good or not. I feel fine, but they are very worried that I will not tell them about my physical condition” (P1).

Some patients believed that their condition (re-positive COVID-19) meant that they were getting worse. They were worried that they may not be able to meet with their family anymore, which increased the pressure on their family. “At that time, I knew I was positive again. I was very scared, and I didn’t know what re-positive COVID-19 was. I was afraid that my condition was very serious, and then I kept reporting it to my family. I was afraid that there would be some complications because of chest discomfort. Therefore, my family was very worried about me” (P5).

Family separation. During the epidemic, Shanghai implemented lockdown management, separating patients and their families due to uncontrollable factors. “My husband has never been by my side. At the time, I was quarantined at the company, and he drove to deliver me a change of clothes. That day, Shanghai was suddenly sealed up, and he could not return home. He had no choice and went to stay at a friend’s house. Now the policy has not crossed the region; he has never come back” (P12).

Change in intimacy between husband and wife. “My partner is not infected, so I am very careful. I live alone, do not eat together, afraid to pass it onto him. After being confirmed with re-positive COVID-19, I was more worried. I can’t even think about sex. Just get rid of the disease” (P4).

### *Theme 4. Apparent effects on social life (5 patients)*

Social avoidance. Some patients avoided interacting with others even after they recovered because they were afraid of infecting others and/or being infected again. “I don’t dare to talk to others after I have recovered because I am afraid that others will be afraid of me, and I will also be scared of infecting others” (P3). “I am going downstairs now, but I naturally avoid others. Although I feel better now, I also avoid them. As long as there are people, I will be far

and far away. I don't know what's wrong, and maybe I'm afraid of infecting others. I am also afraid that others will infect me again" (P9).

Being discriminated against. Some people had a wrong perception of re-positive COVID-19. They believed that people who retest positive are more seriously infected than others, and they rejected and refused to accept those who retested positive, which considerably impacted their work. "Everyone fears us (COVID-19-infected people), especially those with re-positive COVID-19. Therefore, they don't feel like they dare to talk to us. That day, the company leader heard that I had re-positive COVID-19 and made a phone call. It felt like he thought I could be contagious on the phone" (P1). "After I got infected, my company didn't want me anymore. I had to look for a new job again. Yesterday, there were still people who were recruiting, and it was specially stated that those who were positive were not wanted. It is unfair!" (P2). Patients 3 and 5 expressed similar concerns.

Lack of medical insurance and drugs. Due to the centralized isolation and closed management measures of COVID-19, the way patients obtained medicines had changed, and some medications could not be purchased. "Compared with the harm caused by the disease, I think the lack of purchasing medicine is more serious. Because I have an autoimmune disease and I need oral hormone drugs. However, I need to continue to isolate after being confirmed with re-positive COVID-19. The purchase of drugs will have a great impact. I can only rely on my stock. If there is no way for me to buy medicine, I will feel very uncomfortable. I can endure it for a while, but I can't forever. The establishment of the shelter hospitals under the special major epidemic situation is relatively hasty, and the medical equipment in the early stage is relatively insufficient" (P10). "Because I am not in good health, I pay more attention to observation. I found that our shelter hospital's first aid facilities are insufficient" (P11).

#### *Patient's expectations*

Nucleic acid test. More polymerase chain reaction (PCR) tests were expected. "Please inform us of the Ct values and conduct a nucleic acid review to confirm whether it is still positive or not" (P8). "We hope that nucleic acid detection can be performed twice a week, and the interval of once a week is too long" (P3).

Medicine for discharge. A larger medicine supply was needed. "I hope I can bring enough medicine for seven days when I am discharged from the hospital. As a result, I can get treatment after returning home and

feel at ease. In this way, we can reduce the occurrence of re-positive COVID-19 as much as possible."

Medical notification. Formal explanation and notification from the medical staff to the community or peers were required. "After testing positive, I hope the Center for Disease Control and Prevention can explain to the community and people around me. No matter how I explain it, people will not believe me. After all, people have not experienced these things. So, to give people around me comfort, reduce panic" (P7). "I hope the hospital can tell the community that I can enter the community after being discharged from the hospital. Nevertheless, unfortunately, the neighborhood committee and the landlord will not let me go home" (P1).

Isolation management. Some patients expected a better isolation medical environment in the future. "We hope to arrange relatively ventilated and sparsely staffed space for our re-entry personnel in shelter hospitals to reduce cross-infection" (P4).

Medical and prevention knowledge. Education was urgently needed for volunteers and patients. "The community needs a large number of volunteers. However, like this type of major pandemic disease, demand prevention, and control is rigorous. Therefore, volunteers literally cannot do it. Because if the volunteers do not even have the basics like wearing and taking off protective clothing, it is difficult for them to protect themselves. Therefore, I want to give our community volunteers basic training before they begin their jobs as medical workers. They should increase their knowledge and skills to protect themselves and provide services to others" (P13). "What I need most is to consult a doctor. Why did I retest positive? Is there a source of infection in this development, and can I infect others?" (P9).

## **Discussion**

In this qualitative study, we used a thematic analysis to analyze patients who experienced re-positive COVID-19 in Shanghai, China. We found four themes related to their psychological experience, including negative emotions, positive emotions and self-growth, apparent effects on family, and apparent effects on social life. In addition, we determined that the patients with re-positive COVID-19 lacked knowledge of the condition.

It has been confirmed that COVID-19 has an enormous effect on the psychological health at both the individual and community levels [17–20]. Furthermore, with the globalization of COVID-19 in the past three years, there has been an increase in the number of re-

positive COVID-19 cases [21–24]. According to the findings of the present study, the patients who retested positive experienced many negative emotions and were burdened with both family and social effects. As such, there is an urgent need to enhance the psychological care of patients with re-positive COVID-19 [25].

In this study, 15 patients with re-positive COVID-19 were interviewed, and it was found that 61.5% did not have relevant knowledge of their condition. In addition, after retesting positive, they worried that the disease would aggravate or infect others, and they experienced a series of negative emotions such as depression, anxiety, fear, and stigma, which seriously affected the physical and mental health of the patient and their healing from the disease [25]. One of the authors was employed at a shelter hospital in Shanghai and noted that while the medical staff educated the patients on relevant areas of COVID-19, they neglected to educate the patients regarding re-positive COVID-19 after discharge. Although there is still insufficient evidence that educating patients can improve their clinical outcomes, the appropriate education regarding relaxation and compliance with medications can improve the quality of life of patients [26,27]. The experiences of some of the interviewed patients reflected this, because the testimonies of some patients cited their lack of understanding of the disease as the cause of their anxiety, worries, and fears. Therefore, to improve a patient's readiness for discharge from the hospital and to effectively reduce the occurrence of acute psychological stress and negative emotions caused by the lack of knowledge, it is recommended that patients are routinely educated when they are discharged from the hospital.

Epidemic prevention policies in China stipulate that COVID-19 patients must do nucleic acid retesting on the seventh day after discharge. In addition, if the Ct value is  $< 35$ , they need to be transferred to a shelter hospital again for isolation management [28]. Patients who have just undergone centralized isolation treatment in a shelter hospital, have not fully recovered physically or psychologically. Therefore, re-positive patients are very likely to experience secondary trauma due to various factors such as prejudice and rejection by the surrounding community after retesting positive, and they are highly susceptible to acute psychological stress reactions [25]. Furthermore, it has been reported that the acute psychological stress reactions of individuals can evolve into group stress reactions, which significantly impact group psychology [29]. Therefore, the hospital should establish a discharge follow-up system and select nurses with solid communication

skills or qualified psychological counselors to regularly follow up with discharged patients and effectively implement continuous care. In the case patients who are admitted to the shelter hospital for a second time, healthcare providers should pay extra attention to them, be aware of their acute psychological stress reactions, avoid group stress reactions, and ensure the safety of patients and other people in the hospital.

It has been reported that no live virus can be isolated from patients with convalescent COVID-19 pneumonia with a Ct value of nucleic acid detection of  $\geq 35$ ; this means that these patients are not infectious [30]. However, this study found that due to the lack of knowledge about re-positive COVID-19 and extreme panic, some community workers and residents believed that re-positive COVID-19 was the manifestation of disease aggravation, which led to discrimination and exclusion of those with re-positive COVID-19. It caused tremendous psychological pressure on patients, which directly led to their anxiety, depression, and stigma, and also greatly affected the family life of the patients and other residents [31]. Therefore, public education is required to optimize the management of those with re-positive COVID 19.

The testimonies from the studied patients suggest that multiple factors contribute to the experience of being re-diagnosed with COVID-19. These include their lack of understanding of the disease, a feeling of lack of control over their recovery, economic consequences (loss of job), social consequences (isolation and distain from their communities), as well as health-related consequences (potential long-term effects on health). This combination of factors made the experience much more difficult to navigate compared to other common illnesses, since these factors are usually not all present at once during other illnesses. As an example, a flu infection carries little to no economic consequences, has much less social stigma attached, and is well understood when it comes to its health consequences. While some patients were able to maintain a positive mindset during their recovery, it is still vital to address as many of these factors as possible when assisting re-positive patients to ensure that they can recover properly.

Our study analyzed the psychological experience of re-positive COVID-19 patients. The population of our study was recruited from re-positive patients during a period of rapid COVID-19 spread in Shanghai. It was found during our research that a combination of many factors (e.g., the new strains of the virus were more infectious, the spread of the virus was fast, the control measures were more stringent than before, and the



attitude of the public towards the virus was becoming fierce) contributed to the psychological experiences of these patients being notably different than those with a first diagnosis of COVID-19. In this study, it was found that this group of patients also ran into issues when interacting with their family and their wider communities. Various additional needs, beyond negative psychological emotions were also identified. Cheng *et al.* [32] studied the psychological condition of 60 firstly diagnosed COVID-19 patients who were hospitalized and isolated. It was found that the percentage of patients feeling anxiety/tension, loneliness, depression, and despair was significantly different compared to the general public. When we compared the results of Cheng *et al.* to those of the current study, we found that negative emotions were more prominent in the re-positive patients, since they also reported guilt, stigma, obsessive-compulsive behaviors, and self-blame. In addition, a study by Yu *et al.* [33] detailed the experience of 18 firstly diagnosed COVID-19 patients. Their study found that the patients experienced various family-related issues, such as a lack of familial support, changes in familial relationships, as well as a loss of family roles. These were similar to the problems reported by re-positive patients in the current study; however, repeated quarantines experienced by the re-positive patients exacerbated the problems at the family level, and re-positive patients also reported a new issue—changes in intimacy levels with their spouse/romantic partner. Thus, comparisons to past studies of firstly diagnosed COVID-19 patients suggest that the results from our study highlight a psychological experience unique to re-positive patients.

However, there is a limitation to our research. Only 15 participants from Shanghai were interviewed, which may not be adequate to explore the psychological experiences of patients in other geographic areas. Our findings may not be representative of other places in China or worldwide. Therefore, large-scale studies are still needed to confirm our findings.

As the pandemic is still going on worldwide, the findings of the present study can supply valuable evidence for healthcare providers to optimize the management of re-positive COVID-19 patients. The patients' expectations (e.g., improving volunteer training, medicine supply, and availability of nucleic acid testing) also provide helpful clues for clinical practice.

## Conclusions

This study found four themes of psychological experiences among re-positive COVID-19 patients: many negative emotions, some positive emotions and self-growth, apparent effects on family life, and apparent effects on social life. In addition, the lack of knowledge of patients and the public about re-positive COVID-19 and irregular epidemic prevention measures in some communities may be the leading causes of psychological burden among the patients. These findings can be used to optimize the management of patients in this setting.

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## Ethics approval

The protocol of this study was approved by the Research Ethics Committee of the Cancer Hospital Affiliated to Shandong First Medical University (approval #: SDTHEC2022004014).

## Patients' consent statement

All participants e-signed an informed consent before their interviews and were allowed to withdraw consent or withdraw from the interview at any time.

## Authors' contributions

XL, conceptualization, funding acquisition, investigation, methodology, project administration, data curation, and writing – original draft; TY, investigation, methodology, data curation, resources, software, validation, visual analysis, and formal analysis; MS, supervision, and writing – review and editing; RK, conceptualization and writing – review and editing; YM, conceptualization, supervision, and writing – review and editing.

## Data availability statement

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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**Conflict of interests:** No conflict of interests is declared.

## Annex – Supplementary Items

**Supplementary Figure 1.** Survey before the interview.

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### General information questionnaire

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1. Name
  2. Gender
    - Male
    - Female
  3. Age
  4. Occupation
  5. Marital status
    - Married
    - Unmarried
    - Divorced
    - Widowed
  6. Education
  7. Name of isolation shelter
  8. Number of days between discharge and nucleic acid revalidation
  9. Number of entries
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