Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
The disaster resilience trajectory of the first batch front-line nurses at fighting the Novel Coronavirus Disease 2019 in Wuhan: A qualitative study

Chun Ming Yuan a,b,1, Xin Chen b,1, Xia Zeng b, Xiao Rong Mao c,*

a Department of Nursing, Affiliated Sport Hospital of Chengdu Sport University, Chengdu Sport University, 2#, Tiyuan Road, Wuhou District, Chengdu, Sichuan, 610041, China
b Department of Nursing, Sichuan Provincial People’s Hospital, University of Electronic Science and Technology of China, 32# West Section 2, 1st Ring Road, Qingyang District, Chengdu, Sichuan, 610072, China
c Nursing Research Center, Sichuan Provincial People’s Hospital, University of Electronic Science and Technology of China, 32# West Section 2, 1st Ring Road, Qingyang District, Chengdu, Sichuan, 610072, China

ARTICLE INFO

Keywords:
COVID-19
Front-line nurses
Wuhan
Colaizzi phenomenological approach
Disaster resilience trajectory

ABSTRACT

Aim: It is widely accepted that resilience is an essential solution to the challenges caused by disasters or crisis. The resilient individual can actively cope with challenges and maintain a good performance in facing of disastrous events. After the outbreak of Novel Coronavirus Disease 2019 (COVID-19) in Wuhan, China, numerous researchers have engaged in studying the experiences of front-line nurses in Wuhan from different perspectives. However, little is known on how the first batch front-line nurses developed their resilience trajectories during the disastrous events. The purpose of the present study is to explore the disaster resilience trajectory of the first batch front-line nurses at the early-stage of COVID-19 outbreak in Wuhan, Hubei province.

Method: Qualitative research method was employed using purposive sampling. Nurses from Sichuan who had anti-epidemic experiences in Wuhan were selected to be conducted in-depth phone interviews. The interviews were transcribed verbatim, and data was analysed by adopting Colaizzi phenomenological approach.

Results: Three theme categories emerged through the data analysis: (1) Challenges and difficulties; (2) Overcoming difficulties; (3) and Personal growth.

Conclusion: Nurses have accumulated relevant experiences in dealing with sudden public health events after the rescue task, which can provide psychological and material supports for coping with similar situation in the future. Additionally, multiple support systems were critical elements for front-line nurses to recover from the disaster. Through uncovering front-line nurses’ disaster resilience trajectories, it is significant for health care organizations and managers to establish more comprehensive system in handling with public health emergency events.

1. What is already known about the topic?

• At the early stage of Novel Coronavirus Disease 2019, the severity of the disease was far beyond imagination.
• The World Health Organization announced the COVID-19 outbreak is a pandemic at the early stage of 2020 and listed it as a major disaster.
• Due to the lack of the full understanding about the virus, the front-line nurses who helped in fighting against the pandemic in Wuhan faced multiple challenges.
• Although the studies in association with the front-line nurses’ working experiences in Wuhan is widely discussed in the literature, how they achieved their disaster resilience trajectories are poorly introduced and explored.

2. What this paper adds?
• This paper records how the first batch front-line nurses achieved their resilience when fighting against the pandemic.
• This paper provides information on what are the challenges and difficulties that front-line nurses encountered, which will help inform health care organizations in order to make better policy decisions in dealing with public health emergency events.
• This paper displayed the concept of disaster resilience trajectory among nurses, on which further conceptual work in this field can be carried out.

3. Introduction
3.1. The significance of disaster resilience of nurses to fight against COVID-19

Novel Coronavirus disease 2019 (COVID-19) refers to one type of pneumonia caused by a new type virus which is not completely understood by human being [1]. The World Health Organization (WHO) named it as COVID-19 on February 11, 2020 and announced the COVID-19 outbreak is a pandemic and listed it as a major disaster [2].

The first COVID-19 case in China was initially diagnosed in Wuhan, and the infection quickly spread inside and outside of the city (Cucinotta & Vanelli, 2020); [1]. The city was overwhelmed within a short time. Chinese government took a quick response and organized medical professionals from all over the country in assisting people in Wuhan to combat the disaster [3]. Particularly, nurses were the main forces at front-line in combating the disaster [4].

The pandemic has put great pressure to the whole Chinese health-care system [5]. Nurses are indispensable for every health-care system. Their wellbeing is essential not only for sustained and safe patient care, but also for the control of the pandemic [6,7]. As a consequence, it is crucial for front-line nurses to be resilient post disaster to ensure their stability and to minimise the disruptions to routine work. To understand the disaster resilience trajectory of front-line nurses, it is necessary to uncover the challenges and difficulties that front-line nurses encountered and learnt on how they dealt with those after disaster to reduce the risk for suffering from psychological problems and keep healthy.

The psychological impacts on front-line nurses followed by the disaster, such as anxiety, mental distress, emotional disturbance and depression were reported [8–10]. However, not all disaster rescuers would suffer from the negative psychological problems [11]. It has been discovered that the disaster rescue activity made some positive impacts on disaster healthcare rescuers [12], such as find meaning from rescue tasks and personal growth after the disaster.

3.2. Conceptualizing the disaster resilience trajectory of front-line nurses

There was a few empirical research on the disaster resilience trajectory of front-line nurses. Many researchers were engaged in study the experiences and views of front-line nurses in Wuhan [5,13–15]. In order to define disaster resilience trajectory of front-line nurses, we intended to make a definition on disaster resilience and trajectory respectively.

Resilience was identified as one type of trajectories with a relatively stable symptom [16–18], which includes both positive and negative responses to an event. According to the literature, resilience could be “recovery” or “post-traumatic growth”; recovery means that individuals can restore normal psychosocial functioning following a short period of impairment immediately after the disaster; post-traumatic growth indicates a positive adaptation to a disaster, individuals cannot only ensue from recovery, but also develop personal and social resources [16]. Disaster resilience was defined as the personal ability and preparedness of rescue workers in response to disastrous events in an effective manner, as well as their state of adaptation after deployment [19–21]. Trajectory refers to a developmental pathway that follows changes over period of time [16]. Therefore, we defined the disaster resilience trajectory as the development pathway of individual positive and negative responses to the high stress caused by disasters.

According to the literature, a resilient person will keep a relatively good performance even when external pressure increases, threats and uncertainty appear [22]. In facing of COVID-19, how did the front-line nurses achieve resilience during the pandemic? Why could they maintain a relatively good performance while the pandemic continues? What have they learnt from the anti-epidemic experience after they finished the rescue task? Before we conducted the study, we did not know the real answer for the questions raised above. Therefore, we were first committed to clarifying the concept of disaster resilience trajectory. Then, we make clear on the performance of disaster resilience. We hold the view that if a front-line nurses can maintain a good performance in the COVID-19 designated hospitals without obviously psychological problems, they are resilient. Conversely, they were not.

This paper presents the results of a deep exploration on the disaster resilience trajectory of 12 front-line nurses from Sichuan following the deployment in Wuhan after the COVID-19 outbreak. Besides, it examines the demographic information that may contribute to front-line nurses’ resilience, and also pinpoints the challenges and difficulties, factors contributing to overcome difficulties and the subsequent effects after the disaster. Due to the different background and their capacity in withstanding stress, the psychological impacts for each front-line nurse may be varied from person to person. Analysing the psychological impacts, support and post-disaster response from the perspectives of front-line nurses is of great importance to the implementation of a strategical resilience
4. Method

4.1. Sampling
Participants were recruited by adopting purposive sampling method. They are from one general hospital in Sichuan Province and were deployed at Wuhan COVID-19 designated hospitals at the early stage of the COVID-19 outbreak from January 2020 to March 2020. Inclusion criteria: (1) First-batch front-line nurses who were ever deployed to Wuhan, Hubei Province at least one week during the time of the COVID-19 outbreak; (2) First-batch front-line nurses who volunteered to participate in this study and signed the informed consent. Exclusion criteria: those who were diagnosed with mental illness and consciousness disorders.

The final sample size was determined by data saturation—i.e., at the point where no new information obtained from participants. A total of 91 clinical front-line nurses met the inclusion criteria; data was saturated with the twelfth interviewer. All of them ever worked 57–59 days in Wuhan. To maintain the anonymity, all the participants were named with N1 ~ N12.

4.2. Ethic consideration
The study was approved by the Human Subjects Ethics Committee of the Hospital. The approval number is 2,020,132. Besides, the participants were informed that they were voluntary to join the study and could withdraw from the interview at any time. Apart from that, they can freely ask for psychological counseling when necessary, no matter during and after the interview.

4.3. Method

4.3.1. Determination of interview schedule
The interview schedule was developed according to literature review and in combination with the obtained results of pilot study. In order to better understand the first batch front-line nurses’ disaster resilience trajectories, the interview schedule was designed based on the following order: before the recruitment, after arriving in Wuhan, after the rescue task. Examples of interview guide were presented as the following: ①Have you ever participated in large-scale rescue before? ②Why did you sign up for Wuhan? ③How do you feel? ④What was the biggest difficulty in Wuhan? ⑤How did you handle the difficulties? ⑥What did support you? and ⑦How did you release the pressure?

4.3.2. Data collection
Semi-structured interview was employed for data collection. For the sake of the COVID-19, the data was collected via telephone at the participants’ convenient time. One researcher sent an e-mail to the participants and obtained their approvals, and a reply of the consent was required before conducting the study, in which the purpose and guarantee of confidentiality were outlined in the consent. Subsequently, appointments were arranged with participants via telephone. In order to obtain the participants’ trust and make them feel relaxed, the researchers started phone interview with a normal question, for example, “Which department were you in before going to Wuhan?” For obtaining more comprehensive and in-depth information about the researchers’ interested phenomenon, probing questions were then proposed during the interview. The interviews lasted for 40–60 min each time and audio-records were made throughout the process. After the completion of data collection, the raw data was typed into computer verbatim and stored in a U-Disc.

4.3.3. Data analysis
Data analysis occurred concurrently with data collection. Colaizzi phenomenological analysis method was adopted for analyzing the interview data [23]. It includes: ①repeatedly reading and understanding the interview record; ② selecting and identifying the meaningful statements; ③ coding the repeated meaningful opinions; ④ summarizing the views after coding; ⑤ writing a detailed and complete description; ⑥ distinguishing the similar views and sublimating the theme concept; and ⑦ returning the feedback to the interviewee for confirmation. In order to ensure the authenticity and credibility, the researchers transcribed the interview recordings into texts within 24 h, and research team members were invited to participate in the data analysis, coding and formation of themes. Objections were solved by iteratively listening to the recordings and reading records.

4.3.4. Rigor
For the sake of rigor, the following strategies were used in the study. Firstly, a complete audit trail was created with the study. Secondly, member checking was initiated among some of the interviewers in order to ensure the data credibility. Member checking is a technique which occurs in the process of data collection by purposely asking participants questions to verify the researchers’ understanding in regard to participants’ expression [24]. The third strategy was peer debriefing, in which the researchers consulted with one another to resolve any ambiguity or disagreement in methodological issues or data analysis until a consensus was reached.

5. Results

5.1. Demographic information of participants
The final sample consists of 12 nurses recruited from two COVID-19-designated hospitals in Wuhan, Hubei province. All participants nursed patients with the COVID-19 in the hospitals where they were deployed. They worked at the COVID-19- designated wards from end of January to early February 2020 with the working time ranging from 57 to 59 days. 4 of the participants had rescue experiences before, and they ever joined in earthquake, influenza A and H7N9 avian influenza rescue tasks; 6 of the participants had ICU
working experiences; 1 of the participants worked in the infectious disease department and 1 was from the geriatric respiratory department. At the time of the phone interview, they had returned from Wuhan and were in isolation (Table 1). Data saturation was achieved with the 12 interviews.

5.2. Themes
Three theme categories emerged from analysis of the interviews (panel): (1) Challenges and difficulties; (2) Overcoming difficulties; (3) and Personal growth.

Panel.
Theme categories and sub-themes.

(1) Challenges and difficulties
A. Insufficient nursing resources
B. Overwhelmed by unusual festive atmosphere and full Personal Protective Equipment (PPE)
C. The uncertainty and fear of being infected

(2) Overcoming difficulties
A. Motivation to deploy
B. Multiple support systems to help cope with the situation
C. The leading role of Communist Party of China (CPC)
D. Professional identity

(3) Personal growth

5.2.1. Challenges and difficulties
Data analysis demonstrated that front-line nurses in Wuhan experienced great challenges and difficulties. Insufficient nursing resources were one of those and listed as the first sub-theme within the first theme category. The number of newly diagnosed patients

Table 1
Characteristics of participants (N = 12).

| Participant number | Age | Gender | Marital status | Original department | Date starting work in Wuhan | Duration (days) | Designated hospital | Spouse a medical worker? | Working years | Rescue experience |
|--------------------|-----|--------|----------------|---------------------|-----------------------------|----------------|---------------------|------------------------|---------------|------------------|
| N1                 | 29  | Female | Unmarried      | Infectious Disease Department | February 2, 2020            | 59             | East Hospital of Affiliated Hospital of Wuhan University | No         | 8               | None             |
| N2                 | 30  | Male   | Unmarried      | Surgical ICU         | January 25, 2020           | 57             | Wuhan Red Cross Hospital | No         | 7               | None             |
| N3                 | 36  | Female | Married        | Neurology ICU        | January 25, 2020           | 57             | Wuhan Red Cross Hospital | No         | 13              | None             |
| N4                 | 31  | Female | Married        | Emergency ICU        | January 25, 2020           | 57             | Wuhan Red Cross Hospital | No         | 14              | None             |
| N5                 | 31  | Female | Married        | Surgical ICU         | January 25, 2020           | 57             | Wuhan Red Cross Hospital | No         | 10              | None             |
| N6                 | 30  | Male   | Married        | Geriatric Respiratory Department | February 2, 2020          | 59             | East Hospital of Affiliated Hospital of Wuhan University | Yes        | 8               | None             |
| N7                 | 30  | Female | Unmarried      | Neurology ICU        | January 25, 2020           | 57             | Wuhan Red Cross Hospital | No         | 7               | None             |
| N8                 | 30  | Female | Married        | Emergency ICU        | January 25, 2020           | 57             | Wuhan Red Cross Hospital | No         | 7               | Yes (Earthquake and Influenza A) |
| N9                 | 36  | Female | Married        | Infectious Disease Department | January 25, 2020          | 57             | Wuhan Red Cross Hospital | No         | 17              | Yes (Earthquake) |
| N10                | 33  | Female | Married        | Internal Medicine ICU | January 25, 2020           | 57             | Wuhan Red Cross Hospital | Yes        | 14              | None             |
| N11                | 35  | Female | Married        | Surgical ICU         | January 25, 2020           | 57             | Wuhan Red Cross Hospital | No         | 11              | Yes (H7N9 Avian Influenza) |
| N12                | 36  | Female | Married        | Surgical ICU         | January 25, 2020           | 57             | Wuhan Red Cross Hospital | No         | 14              | Yes (H7N9 Avian Influenza) |

N, Nurse.
has increased sharply, resulting in a relative shortage of front-line medical staff initially, and the nurse-patient ratio is seriously unbalanced. Front-line nurses were overloaded due to the insufficient nursing staff.

N1: “At the beginning of the epidemic, there were insufficient nurses, and I was in charge of several critical ill patients. I felt tired both physically and mentally after work.”

The second sub-theme identified as “overwhelmed by unusual festive atmosphere and full Personal Protective Equipment (PPE)”, the COVID-19 outbreak in China was just before the Chinese traditional festival “Spring Festival”. The front-line nurses were deployed during the festival, they sensed an unusual festive atmosphere and patients’ suffering made them feel sad and frustrated. Additionally, front-line nurses had to wear PPE to deliver bedside care to critical ill patient, which added more difficulties to nurses.

N10: “On the way from airport to hotel, I didn’t see any cars and but only the colorful lights of “Come on Wuhan, Come on China” were constantly flashing. It was a sharp contrast to the lively atmosphere of the Spring Festival in past years. I felt very sad.” “…The oxygen supply was completely insufficient. I felt very frustrated while seeing the patient suffering from hypoxia. As a medical professional, I found it unacceptable to see the patient suffer but I could do nothing to help it.”

N1: “Wearing protective gown, two-layer masks, glasses and goggles also increased difficulties at work. Sometimes I cannot see clearly when glasses and goggles became foggy. I couldn’t sleep from time to time due to irregular work schedule and loss of appetite.”

In the interview, the nurses admitted that they were scared when they learned that other medical staffs were infected with the COVID-19 virus before they reached to Wuhan. Furthermore, shortage of protective materials and no remedy for the virus challenged front-line nurses from many aspects. The “uncertainty and fear of being infected” were challenges among their works.

N9: “Because I knew that many medical staffs were infected before I went there, hospitals in Wuhan were overcrowded, and medical treatment order was poor too. And the worst thing was the lack of protective materials. However, there was no effective medicine to kill the virus and the transmission route remained unclear, either.”

5.3. Overcoming difficulties

Data analysis showed that front-line nurses actively took measures to overcome difficulties and strengthen disaster resilience. The first sub-theme for the theme category was “motivation to deploy”, the COVID-19 is a major disaster in human history, the motivation of front-line nurses played an important role in helping them overcome difficulties. The sudden and increasingly severe epidemic situation made many nurses realize their personal responsibilities. Therefore, they actively responded to the recruitment without hesitation. Front-line nurses believed that, as one of the medical staff, they should give hope to patients, and what they did at hospitals in Wuhan was their responsibility.

N3: “I still remember, during the time of earthquake, my teacher ever said that when you put on your hospital uniform, it means that you give others hope; on the other hand, if you feel helpless, the patient will have no one to rely on. This is our job, and what you do now is just your duty.”

Participants from the emergency department and Intensive Care Unit (ICU) expressed that they should take the leading role in the fight against the pandemic. They never regretted going to the front line during the epidemic outbreak.

N4: “It is my duty. As a medical staff working in the emergency department, I even feel that I should bear more responsibilities at this moment. I should rush to the front line and make a contribution, and even if I may die in line of duty, I will have no regrets. If I am given the chance to make a decision again, I will still take the initiative to the front line without hesitation.”

Moreover, the influence from others was also important motivator for some of nurses to respond to the disaster. One of nurses were influenced by her husband; the other one took his colleague place to go to the front line; one of them did not think too much while signing up for the anti-epidemic task.

N10: “Maybe I was influenced by my husband, because he also volunteered to sign up for the rescue task on the same day.”

N1: “Before departure, a colleague who was recruited to Wuhan was exposed to the suspicious cases and required medical observation, and then I volunteered to take his place to go to the front line.”

N6: “At the moment of registration, my brain was totally blank.”

The second sub-theme within the theme category was “multiple support systems to help cope with the situation”, many support sources were identified by front-line nurses, including self-adjustment, peer support, support from team leaders and their hospitals, and social support.

N7: “I wrote a song to praise the medical staffs who were fighting against the COVID-19, and it was very popular. I made friends with many medical staffs from other hospitals and learned from them on how to care for patient with ECMO. The people in Wuhan were very grateful to us and the folks in our hometown cared about and supported us so much. Many people donate food, fruits and medical supplies to us.”

N11: “In order to avoid cross infection, we were not allowed to gather together after work, so we held a small meeting via Wechat Application (APP) instead, or played games and did exercises in our own rooms. One of the patients even chatted with me via Wechat APP, and we encouraged each other.”
C.M. Yuan et al.

N1: “I have never worked in the intensive care unit before. Colleagues taught me on drawing blood gas, using micro-pump and ventilator, performing closed-system sputum suction, etc. The logistic work of my hospital was very good, and my families were well supported. Colleagues and leaders all cared about us much. In particular, several colleagues took the initiative to take over our shift when we were depressed and tired.”

N8: “There were two team leaders. One was in charge of our daily livings, and he not only helped solve our daily needs, but also told us jokes every day. Another team leader dealt with professional issues. He was so responsible and often worked late in the department. He was dedicated to the patients.”

The leading role of CPC had profound meaning in helping front-line nurses overcome difficulties, the CPC members immensely influenced people around them, and the spirit of the CPC representatives attracted many health-care professionals to devote themselves to the front line.

N8: “As a CPC member, I should be a role model and take the lead in fighting against the pandemic.”
N1: “I have witnessed many people join the CPC, and we were infected by the spirit of the CPC representatives, and hence, we also wanted to become one of them.”
N3: “… When I was young and inexperienced at college, I loved our country, but I always thought that the CPC was not worth trust. I totally changed my views towards the CPC now. Hence, I applied to join the CPC just one week after my arrival in Wuhan. It was actually a little bit old to be a CPC colleague in my age.”
N4: “On the second day when I arrived Wuhan, I submitted application to a temporary CPC branch here. The CPC colleagues were impressed me. They were also good examples for us to learn from. I felt that the CPC members were pure pioneers at any time.”

The professional identity of front-line nurses enhanced their confidence in overcoming difficulties, they became to love their nursing career more than ever before owning to people’s views change on them, and they even risked their own lives to serve the lives of patient with COVID-19.

N10: “After the COVID-19 outbreak, people have more understanding of the medical staff, which makes me love this profession more.”
N7: “Our duty is to rescue the dying, heal the wounded and keep people stay health. I will try my best to serve patient’s life. If I did sacrifice, it would be worth it.”

5.3.1. Personal growth

Front-line nurses found meaning through their anti-epidemic experiences, and they had a different understanding of work, study, family, friends and life. They were proud of their profession; meanwhile, they learnt that medicine needs to constantly be developed, and they also need to constantly learn new knowledge and skills in order to keep up with the development of medicine; they were aware of that they should cherish the time with family and friends; they think they should cherish the present life.

N8: “I think I really should cherish every day. I am proud of being a nurse. The complexity of the COVID-19 has put forward higher requirements on medicine and nursing, and it also makes me realize that I should constantly get my skills updated.”
N10: “I think I should get along with everyone around me and spend more time with my families.”
N7: “Life is changeable and we must enjoy ourselves. It also reminds us that more efforts need to be made in the development of medical science, so that the pandemic can be eventually eliminated.”

6. Discussion

Nurses were the dominant forces in fighting against the COVID-19. Among the 42,600 medical staff recruited to Hubei across China during the COVID-19 outbreak, 70% were nurses, most of them were from ICU, respiratory department and infection unit. Among these front-line nurses, 90% were female [25,26]. The finding of our study is in consistence with the report.

Our study shows that front-line nurses are resilient to the disastrous COVID-19. At the early stage of the COVID-19, there were not enough nursing forces in front-line, as the first batch of deployed nurses, they faced lots of challenges and difficulties, such as uncertainty of the disease, risks of being infected and unfamiliar working environment. The strategies that assisting front-line nurses achieve the resilience including their motivation for the deployment, multiple support systems, the leading role of CPC as well as their professional identity.

Front-line nurses’ motivations and “professional identity” were internal factors that assist them in combatting pandemic, it implies that they were aware of their legal and professional responsibility. It was in line with the experiences of health-care providers during the COVID-19 in Wuhan, Hubei, and those health-care providers were aware of their responsibility for patients’ wellbeing [5]. The skill in building resilience here is front-line nurses’ cognition between their responsibilities and disasters. First, they understood that “alleviating suffering is one of fundamental responsibilities for nurses” (International Council of Nurses, 2012), so the majority of nurses actively responded to the recruitment during the COVID-19 outbreak, and they threw themselves into the task of saving lives and healing the wounded at the COVID-19 designated hospitals in Wuhan [27]. Secondly, nurses might have a good recognition to the impending dangers of the pandemic, therefore they could orderly carry out the routines. They calmly consoled patients who were suffering from COVID-19, providing psychological support and helped patients release pressure at bedside. We assume that the cognition is the key for resilience, as it suggested that impaired cognition is a sign of survival trajectory rather than resilience [16].

The multiple support resources have significant meaning for front-line nurses achieving resilience. The findings showed that the
first batch front-line nurses actively dealt with the physical and mental challenges, such as self-support and venting, as well as the peer and social support system. The research results of Guo X [28] and Wang Y [29] confirmed that medical personnel took effective measures for self-regulation at the early stage of the epidemic, it is the key for resilience and maintaining mental health. Front-line nurses played vital roles in the treatment and care of patient with the COVID-19. In addition, building good relationship with patient can enhance nurses’ confidence at work. The participants in the study worked hard on building the spiritual connection with those patients who were suffering from COVID-19 and they could therefore find their own value through ordinary work. However, similar study on the experiences of health-care providers during the COVID-19 outbreak in Wuhan, the health-care providers expressed that they felt hard to establish good relationships with patients due to the external barriers, such as oxygen mask or ventilator [5]. Fail to effective communication, it may lead to frustration among nurses. Thus, the clear awareness of building the spiritual connection with patients is one of factors that contributing to the resilience of front-line nurses in our study.

The strong leadership is one of inseparable strategies for front-line nurses building their disaster resilience. At early era of the COVID-19 outbreak, the CPC played its organizational and coordinating role as a leader, also dispatching totally 42,000 medical staff to Hubei to joint with local medical professionals [25,26]. The people of the whole country united as one, and the majority of medical staff joined hands together, thus enhancing front-line nurses’ confidence in overcoming difficulties. In Chinese history, the CPC colleagues were the examples of Chinese people. The spirit of sacrificing for the motherland among them has inspired generations of Chinese people, including a lot of medical professionals. They thought that they were glorious if they really lose their lives for the interest of motherland and people [30,31]. In addition, it was reported that many young medical personnel joined the party at fighting against the epidemic [25,26]. People can live with hope and face the challenges and have the belief to overcome all the difficulties [32]. Moreover, the strong faith toward the CPC leaders helps front-line nurses develop their disaster resilience.

The organization leadership has the equal role with the CPC in building front-line nurses’ resilience. Most of front-line nurses in the study are married. They (those who are parental) were worried about their children and families during the pandemic. Nurse leaders who still worked at back line visited their families and helped solve problems, which has enabled them to work at the front line at ease and enhanced their disaster resilience. Besides, it is suggested that nurse leaders should make necessary conversations with front-line nurses in order to learn about their real needs and worries [32]. Apart from that, front-line nurses felt helpless while seeing patients dying. Since the COVID-19 is a fatal disease [33], it is essential for nurse leaders to foster training programs in relation to end-of-life-care for front-line nurse.

It was evidenced that the higher pressure could weaken medical staffs’ willingness to actively care for patients [27,34]. By contrast, our finding suggests that the willingness of front-line nurses to care for patients has not been weakened, personal growth was identified. After the rescue task, they showed pride in their profession and found meaning and values. Finding the meaning is necessary for front-line nurses to well adapt the difficult working mode. The meaning of front-line nurses to patients, is that they treated COVID-19 patients as their relatives. Other researchers believed that finding meaning when we could not control the results was the key for resilience [35]. The phenomena called post-traumatic growth is also sign of resilience trajectory, reflecting the ability to depend on and further develop personal and social resources after the disaster, aiming to lead in positive adaptation [20,21,36]. The front-line nurses in our study have reached another stage of resilience, which is post-traumatic growth [16], we named it as personal growth.

We made an in-depth exploration on the disaster resilience trajectory of front-line nurses, but the psychological impact of COVID-19 on them also needs to be seriously considered. Nurses who were working at first-line undertook heavy work load, cared critical ill patients, being in the situation of short medical supplies, especially with insufficient protective equipment. However, the shortage of PPE may contribute to the medical staffs’ fear of being infection, and thus it might lead them to refuse to provide nursing care for patients [5,31]. As a result, it might cause conflicts to the front-line nurses. Apart from that, front-line nurses saw patients’ suffering while they could do nothing about it, which can thereby increase their psychological burden. The results of the study demonstrated that patients’ suffering and death caused front-line nurses’ sadness and had a strong sense of powerlessness. Similarly, another study also revealed that inadequate medical supplies indirectly led medical professionals’ failure of providing necessary treatment or nursing care to patients, making medical staff feel guilty and helpless [15]. Other studies suggested that excessive workload and psychological anxiety made health care providers physically and mentally exhausted [37–39].

The literature tells the front-line nurses presented higher levels of depression, higher rate of insomnia and generalized anxiety compared with other staffs [40]. Female nurses felt anxious, due to the worries about being infected or infecting others [40]. Although front-line nurses in this study showed relative stable adaptation to disaster, the negative consequences of deployment still identified with the interview, some of them expressed that they ever had episode of insomnia and fear of the COVID-19. Nurses’ health is related to the quality of care and patient outcomes, and even for the control of the pandemic. Therefore, the disaster resilience of front-line nurses was of great significance to resist physical and mental challenges (Sheng et al., 2019). It was believed that investment on resilience is expected to be a more effective strategy than the allocation of scarce resources aimed at controlling the environment and resisting specific risks [41].

As the first batch rescue team members, front-line nurses are resilient to the pandemic. Most of participants volunteered to join the anti-epidemic battel. It implied that they were prepared psychologically before the rescue task. Additionally, the ability and professional quality of nurses also help to enhance resilience. In recent years, Chinese large hospitals put training of nurses’ professional ability and first aid skills at the very important place. Through rotation at different departments, regular assessment, drill and competition as well as other measures, their professional ability and first aid skills are constantly updated and enhanced. The working years of participants in the study ranged from 7 to 17 years. All of them had completed up to 2 years rotation at different departments and mastered first aid skills. The above-mentioned factors may contribute to the development of disaster resilience trajectory and lead them well adaptation at the front line. The training programme and rotation plan are vital in helping front-line nurses aware of what is the urgent skills and knowledge they need to master in a new clinical setting. It is suggested that the sense of identifying the differences
from the previous experience in every new experience is beneficial for individual with the purpose of forming a health adjustment to a sudden event [17].

The majority of nurses in the study are very experienced and have been worked at ICU for years. The rest are either from Infectious Disease Department or Respiratory Department. Moreover, they have been trained with the COVID-19 related first-aid skills and protective techniques before departure. They were technically well-prepared before the rescue task. In addition, the availability of resources is essential for the development of front-line nurses’ resilience. Obtaining supports from Colleagues’ and knowledge update are the vital resources for front-line nurses meeting the changes. All nurses in the study were deployed at the same hospital. They can get support and share new information from team members quickly. New information concerning the COVID-19 can help front-line nursing staff build confidence in delivering nursing care [42]. When health care organizations recruit nursing staff during public health events such as the COVID-19, aiming to ensure better quality of care, it is essential for nurse leaders to make a prior assessment for the capacity of every nurse while facing the public health events, estimate the possible impacts to front-line nurses as well as investigate what factors make them vulnerable to a decline in resilience [43].

7. Implications/limitation

Our study mainly focused on exploring the disaster resilience of the first batch front-line nurses at the COVID-19 outbreak in Wuhan. As pioneers, they engaged in saving patients with COVID-19 from the beginning of the epidemic for approximately two months. Although other researchers had undertaken the similar studies to either first-line health-care providers or nurses [5,10,14,15], most of the studies were conducted during the process of disaster rescue task. Therefore, it is hard to gain the deep insight on the disaster resilience trajectories of first-line nurses from the very beginning. The results of our study identified that the subtle psychological changes already took place by the time when nurses volunteered to respond to the anti-epidemic task. One participant felt that brain was totally blank while registered to Wuhan and another perceived unusual festival atmosphere on the way in Wuhan city. It implies that nurses’ psychological health needs to pay high attention at the beginning of the rescue task. Our study endeavored to explore the hiding meaning on the experience of first-line nurses from the beginning to the end of the rescue task where the disaster resilience trajectories can be completely understood.

While organizations paid much attention to the psychological wellbeing of patients undergoing the COVID-19, it is of importance for authorities to look out for the psychological health of front-line nurses. Study suggested that nurses may have anxiety, fear and losing control at early exposure of pandemic environment, after continuous exposure in a pandemic environment, the negative impacts could reach a peak, and the long-term effects of exposure of pandemic were also reported [44]. The findings of the study aligned to the findings in our study. To lower front-line nurses’ anxiety and fear, health care organizations should make efforts in updating their knowledge on infection control and personal protection techniques, ensuring a safe working environment and enough protective supplies [5]. In addition, continuous training, monitoring, and supervision of infection control were also vital in lowering front-line nurses’ fear of the COVID-19 [5], which was a vital element of disaster resilience for healthcare rescuers [20,21]. In order to enhance front-line nurses’ psychological tolerance, it is of necessary for authorities to consider in providing psychological counseling and support services to them.

Our study offers a detailed clue on how nurses build their resilience while deploying in Wuhan COVID-19 designated hospitals, on which their disaster resilience trajectories were also conceptualized. The findings of the study have significant meaning in enhancing psychological wellbeing of those who had low level of disaster resilience in the future [20,21].

However, there are still several limitations in the present study. Initially, all the participants were interviewed via telephone due to that Wuhan was lockdown and interviewers could not go to the hospitals. As a result, non-verbal responses of participants were absent. Secondly, all the participants were from the same hospital. The findings of this study might not be suitable for nurses who went to Wuhan, Hubei Province from other hospitals. Finally, this study is aimed to deeply explore the first batch front-line nurse’s disaster resilience trajectory from their perspective. Thus, there are no quantified figures on the degree of resilience.

8. Conclusion

Nurses as the main forces in combating COVID-19 in Wuhan, they displayed great dedications when facing the pandemic and even risked their own lives. Through exploration of disaster resilience trajectory of front-line nurses, we became understood how front-line nurses achieved resilience during the pandemic. The skills related to resilience of nurses are their motivations and professional identity, multiple support systems and leadership; and resilience is the most important strategy for front-line nurses maintaining a relatively good performance at combatting COVID-19 in Wuhan. The major accomplishment that front-line achieved was personal growth, they had different understanding to work, study, life and families. In addition, the in-depth exploration of the disaster resilience trajectory of the front-line nurses is of great significance for continuously guiding the nurses to handle the epidemic situation that may recur at any time. At the same time, it also provides clues for formulating more effective and comprehensive anti-epidemic guidance scheme.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.
Acknowledgments

The funder of our research is Department of Physical and Social Security of Sichuan Province, and the fund ID is 30320200061.

References

[1] Y.H. Jin, L. Cai, Z.S. Cheng, H. Cheng, T. Deng, Y.P. Fan, C. Fang, D. Huang, L.Q. Huang, Q. Huang, Y. Han, B. Hu, F. Hu, B.H. Li, Y.R. Li, K. Liang, L.K. Lin, L.S. Luo, J. Ma, L.L. Ma, for the Zhongnan Hospital of Wuhan University Novel Coronavirus Management and Research Team, Evidence-Based Medicine Chapter of China International Exchange and Promotive Association for Medical and Health Care (CPAM), A rapid advice guideline for the diagnosis and treatment of 2019 novel coronavirus (2019-nCoV) infected pneumonia (standard version), Milit. Med. Res. 7 (1) (2020) 4, https://doi.org/10.1186/s40779-020-0233-6.

[2] World Health Organization, Retrieved from, https://covid19.who.int., 2020.

[3] P. Sun, X. Lu, C. Xu, W. Sun, B. Pan, Understanding of COVID-19 based on current evidence, J. Med. Virol. 92 (6) (2020) 548–551, https://doi.org/10.1002/jmv.25722.

[4] X. Zhang, Q. Sheng, X. Wang, C. Cai, The experience of frontline nurses for four months after COVID-19 rescue task in China: a qualitative study, Arch. Psychiatr. Nurs. 35 (4) (2021) 255–263, https://doi.org/10.1097/PSY.0000000000001057.

[5] Q. Liu, D. Luo, J.E. Haase, Q. Guo, X.Q. Wang, S. Liu, L. Xiao, Z. Liu, J. Yang, B.X. Yang, The experiences of health-care providers during the COVID-19 crisis in China: a qualitative study, Lancet Global Health 8 (6) (2020) e790–e798, https://doi.org/10.1016/S2214-109X(20)30204-7.

[6] D. Chang, H. Xu, A. Rebaza, L. Sharma, C.S. Dela Cruz, Protecting health-care workers from subclinical coronavirus infection, Lancet Respir. Med. 8 (3) (2020) e13, https://doi.org/10.1016/S2214-109X(20)30066-7.

[7] O. Horvath, V. Valkangas, The impact of the pandemic on the nursing workforce, Nurs. Bus. Rev. 8 (9) (2003) 52–131.

[8] R. Zheng, Y. Zhou, Y. Fu, Q. Xiang, F. Cheng, H. Chen, H. Xu, L. Fu, C. Wu, M. Feng, L. Ye, Y. Tian, R. Deng, S. Liu, Y. Jiang, C. Yu, J. Li, Prevalence and associated factors of depression and anxiety among nurses during the outbreak of COVID-19 in China: a cross-sectional study, Int. J. Nurs. Stud. 114 (2021) 103809, https://doi.org/10.1016/j.ijnurstu.2020.103809.

[9] M. Leng, L. Wei, X. Shi, G. Cao, Y. Wei, H. Hu, X. Xue, W. Zhang, S. Xing, H. Wei, Mental distress and influencing factors in nurses caring for patients with COVID-19, J. Nurs. Crit. Care 26 (2) (2021) 94–101, https://doi.org/10.1111/nicc.12528.

[10] Q. Wang, J.Y. Fan, H.M. Zhao, Y.T. Liu, X.X. Xi, L.L. Kong, J. Li, J. Mao, A large scale of nurses participated in beat down COVID-19 in China: the physical and psychological distress, Curr. Med. Sci. 41 (1) (2021) 31–38, https://doi.org/10.1016/j.msci.2021.04.014.

[11] X. Mao, O. Fung, X. Hu, A.Y. Loke, Psychological impacts of disaster on rescue workers: a review of the literature, Int. J. Disaster Risk Reduc. 27 (2018) 602–617, https://doi.org/10.1016/j.ijdrr.2017.10.020.

[12] X. Mao, A.Y. Loke, O. Fung, X. Hu, What it takes to be resilient: the views of disaster healthcare resuers, Int. J. Disaster Risk Reduc. 36 (2019) 1–8, https://doi.org/10.1016/j.ijdrr.2019.101112.

[13] J. Fan, K. Hu, X. Li, Y. Jiang, X. Zhou, X. Gou, X. Li, A qualitative study of the vocational and psychological perceptions and issues of transdisciplinary nurses during the COVID-19 outbreak, Aging 12 (3) (2020) 12479–12492, https://doi.org/10.18632/aging.105333.

[14] A.O. Bozin, J. Michel, G. van Eeten, Resilient Opioid-Poly. Manag. Rev. 15 (3) (2013) 429–445, https://doi.org/10.1080/14719037.2013.769856.

[15] P.F. Colaizzi, Psychological research as the phenomenologist views it, in: R.S. Valle, M. King (Eds.), Existential-phenomenological Alternatives for Psychology, Oxford University Press, New York, NY, 1978, pp. 48–51.

[16] S. Luo, J. Ma, L.L. Ma, for the Zhongnan Hospital of Wuhan University Novel Coronavirus Management and Research Team, Evidence-Based Medicine Chapter of China International Exchange and Promotive Association for Medical and Health Care (CPAM), A rapid advice guideline for the diagnosis and treatment of 2019 novel coronavirus (2019-nCoV) infected pneumonia (standard version), Milit. Med. Res. 7 (1) (2020) 4, https://doi.org/10.1186/s40779-020-0233-6.

[17] M. Leng, L. Wei, X. Shi, G. Cao, Y. Wei, H. Hu, X. Xue, W. Zhang, S. Xing, H. Wei, Mental distress and influencing factors in nurses caring for patients with COVID-19, J. Nurs. Crit. Care 26 (2) (2021) 94–101, https://doi.org/10.1111/nicc.12528.

[18] Xinhuanet, The Team Leader of the Medical Expert Group in Shanghai: Chinese Communists Go First!, 2020. Retrieved from, http://www.xinhuanet.com/2020-01/30/c_1125512477.htm.

[19] Y. Zhang, C. Wang, W. Pan, J. Zheng, J. Gao, X. Huang, S. Cai, Y. Zhai, J.M. Latour, C. Zhu, Stress, burnout, and coping strategies of frontline nurses during the COVID-19 epidemic in wuhan and shanghai, China, Front. Psychol. 11 (2020) 1551, https://doi.org/10.3389/fpsyg.2020.01551.

[20] A. Jia, X. Gao, J. Cheng, S. Zhi, L. Zeng, C. Sun, Q. Bao, A qualitative study on the experience of Balit group against New Coronavirus pneumonia, J. Nurs. 35 (16) (2020) 84–86, https://doi.org/10.1080/14719037.2013.769856.

[21] P.F. Colaizzi, Psychological research as the phenomenologist views it, in: R.S. Valle, M. King (Eds.), Existential-phenomenological Alternatives for Psychology, Oxford University Press, New York, NY, 1978, pp. 48–51.

[22] D.F. Politi, C.T. Beck, Nursing Research: Generating and Assessing Evidence for Nursing Practice, eighth ed., Wolters Kluwer, London, 2008.

[23] National Health Commission of the People’s Republic of China, 2020. http://www.nhc.gov.cn/wzwb/webcontroller.do?titleSeq=112899&gectype=1, (Accessed 20 June 2021).

[24] National Health Commission of the People’s Republic of China, 2020. National Health Commission of the People’s Republic of China, Press Conference of the Joint Prevention and Control Mechanism of the State Council on April 7, 2020, 2020. http://www.nhc.gov.cn/wzwb/webcontroller.do?titleSeq=112899&gectype=1.

[25] Y. Zhang, C. Wang, W. Pan, J. Zheng, J. Gao, X. Huang, S. Cai, Y. Zhai, J.M. Latour, C. Zhu, Stress, burnout, and coping strategies of frontline nurses during the COVID-19 epidemic in wuhan and shanghai, China, Front. Psychol. 11 (2020) 5565520, https://doi.org/10.3389/fpsyg.2020.5565520.

[26] K. Dimino, K.M. Horan, C. Stephenson, Leading our frontline HEROES through times of crisis with a sense of hope, efficacy, resilience, and optimism, Nurse Leader 18 (6) (2020) 592–596, https://doi.org/10.1016/j.nrleader.2020.05.011.

[27] J.C. Kuntz, Resilience in times of global pandemic: steering recovery and thriving trajectories, Appl. Psychol. Psychol. Appl. 10 (2020) 1111, https://doi.org/10.1002/apps.12296. appts.12296. Advance online publication.

[28] S.Q. Fu, X.L. Liu, R.H. Fang, Correlation analysis between work stress and sleep quality of community nurses in Sichuan Province, South China Prevent. Med. 44 (6) (2018) 523–527.
[38] A.G. Harvey, A cognitive model of insomnia, Behav. Res. Ther. 40 (8) (2002) 869–893.
[39] F.F. Huang, M.H. Deng, X.Q. Zhu, W. Feng, Study on the correlation between sleep quality, social support and stress load of nurses in the oncology department of Beijing third class hospital, Armed Pol. Med. 30 (3) (2019) 209–214.
[40] E. Collantoni, A.M. Saieva, V. Meregalli, C. Girotto, G. Carretta, D.G. Boemo, G. Bordignon, A. Capizzi, C. Contessa, M.V. Nesoti, D. Donato, L. Flesia, A. Favaro, Psychological distress, fear of COVID-19, and resilient coping abilities among healthcare workers in a tertiary first-line hospital during the coronavirus pandemic, J. Clin. Med. 10 (7) (2021) 1465, https://doi.org/10.3390/jcm10071465.
[41] A. Wildavsky, Searching for Safety, Transaction Books, New Brunswick, NJ, 1988.
[42] Y.H. Zhang, L. Tang, Q. Jiang, C.F. Zhou, W.F. Lin, Y.Y. Wei, X.L. Chen, Emergency investigation of early mental distress of nurses who fight new coronavirus pneumonia, J. Nurs. 35 (5) (2020) 5–8.
[43] Z. Whitman, J. Stevenson, H. Kachali, E. Seville, J. Vargo, T. Wilson, Organisational resilience following the Darfield earthquake of 2010, Disasters 38 (1) (2014) 148–177, https://doi.org/10.1111/disa.12036.
[44] M. EftekharArdebili, M. Naserbakht, C. Bernstein, F. Alazmani-Noodeh, H. Hakimi, H. Ranjbar, Healthcare providers experience of working during the COVID-19 pandemic: a qualitative study, Am. J. Infect. Control 49 (5) (2021) 547–554, https://doi.org/10.1016/j.ajic.2020.10.001.