


Health Workers' Mindfulness-Based Stress Reduction and Resilience During COVID-19 Pandemic

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Background: Research indicates that a significant number of healthcare workers accounted for all confirmed Coronavirus disease 2019 (COVID-19) cases, and many of the infected healthcare workers were asymptomatic. During the COVID-19 outbreak, a considerable number of people in Taiwan contracted the disease. Therefore, health workers in Taiwan often experienced lack of medical resources, and this problem is worse for outer island areas. In terms of stress and mental health, this study investigated the effect of poor healthcare capacity and high workload on health workers during the COVID-19 pandemic. This study also explored mindfulness-based stress reduction and resilience in health workers.

Methods: This study conducted an in-depth interview to investigate stress perceived by health workers in a hospital located on an outer island of Taiwan as well as their mental health and stress relieving strategies.

Results: It was found that during the COVID-19 outbreak, some common sources of stress for health workers included exposure to infectious diseases, heavy workloads, facing ethical dilemma in clinical decision-making, and unfamiliar problems from the pandemic. These types of stress cause worries, anxiety, and depression in health workers, which affects their mental and physical health as well as their patient-care performance.

Conclusion: This study proposed that mindfulness-based stress reduction and protecting mental health are important for health workers.

Keywords: health workers, stress and mental health, mindfulness-based stress reduction and resilience, COVID-19 pandemic

Introduction

Ever since humans started to migrate, there have been recurrence of pandemics, and it has become a regular part rather than an oddity of human history.¹ In December, 2019, Dr. Li Wenliang, a Wuhan-based ophthalmologist, noticed an outbreak of new influenza infections locally. Different from the already known types of influenza viruses, this new type of influenza virus attacks the respiratory tract to as far as the lung alveoli, where gas exchange takes place. As the epidemic worsened, health authorities recognized that the epidemic was caused by a new virus variant. Initially, scientists named the viruses COVID-19 for Corona Virus Disease and the year it was discovered. Later, the World Health Organization renamed the viruses to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).²

Apart from eliciting fear, anxiety, and mass hysteria, infectious diseases also pose a challenge to social cohesion and people's crisis management skills. Infectious diseases can lead to social cleavages and personal trauma.^{3,4} For years, mental illnesses seemed to have become global. In the case of the COVID-19 pandemic, it has traumatized many people both psychologically and emotionally. The endless reports on the daily counts of COVID-19 cases and deaths and the striking photographs that go with these news reports made us worry about our family's as well as our own safety and health. Our mental health has been significantly affected by our fears about COVID-19.⁵ Apart from facing our beloved

family or friends getting sick or dying because of COVID-19, we also had to deal with unemployment, self-health management, the stay at home order, and other preventive measure.⁶

During the COVID-19 outbreak, health workers shouldered a lot of responsibilities, were exposed to great danger and as a result, many of them became worried about causing their families pain, if they showed negative emotions and frustration.^{7,8} Contrary to people with physical illnesses, those suffering from mental illnesses often bury and hide their trauma. Over the past decade, there has been a substantial increase in the prevalence of mental disorders.⁹ Companies have come to realize the importance of workplace mental health because work-related stress, depression and anxiety have become more prevalent and serious. For example, almost 50% of work days lost due to health issues are caused by stress, depression and anxiety.¹⁰

Health workers in the scenario described above often experience panic attacks, lose their temper, and become impatient with their patients or colleagues.¹¹ Complaints from patients often make them feel bad.¹² These psychological responses make health workers reluctant to cooperate, which could compromise their work efficiency.^{13,14} It is therefore important for health workers to have access to counseling and assistance. For communities, hospitals, and individuals, preventive measures should be taken to protect mental health and to develop mental flexibility, in order to fight against the pandemic while preventing mental trauma or post-traumatic stress disorder. Psychologists have also suggested that if people who suffer can recognize their mental health issues, admit and express that they are in distress, then they might be able to overcome the situation or even exercise psychological resilience by focusing on the present and things under control and getting connected to others.^{15,16}

Studies have shown that health workers accounted for about 10% of all confirmed cases of COVID-19,¹⁷ and many COVID-19 infected health workers are asymptomatic. Worried about transmitting the COVID-19 virus to their family members, many health workers felt isolated and emotionally distressed.¹⁸ In addition, health workers also needed to cope with their patients' anxiety or non-cooperation. When working with critically ill patients, health workers were faced with lack of protective equipment, which made them feel helpless. They experienced both physical and mental fatigue and were overwhelmed by feelings of helplessness, anxiety, and fear.^{19,20} On the other hand, the study also mentioned that adopting proactive coping strategies can reduce fear and stress in order to promote mental health. For example, the study results of Francis et al²¹ indicated that religious coping strategies are desirable and lead to superior mental health outcomes. The study also found that healthcare workers used positive religious coping strategies more frequently than negative religious coping strategies, and this was more common among women. The study concluded that female healthcare workers, non-physicians, and those in the lowest socioeconomic groups were more likely to adopt positive coping strategies. This is a very interesting and important finding.

As at September 16, 2022, there had been 5,891,355 local COVID-19 confirmed cases (25% of the total population). Since the first confirmed case of Omicron was detected in this study area (Kinmen) at the end of March 2022, a total of 14,583 people have been confirmed with COVID-19 since September 16, 2022, and more than 10% of the population has been infected in no more than five months. By March 21, 2023, a total of 27,035 people has been diagnosed in the study area, with a cumulative diagnosis rate of 18.94%.²² For the medic capacity in 2022, there was an average of 73.03 hospital beds for every ten thousand people in Taiwan, but in Kinmen County, an outer island, only 24.16 hospital beds, about one-third of Taiwan's overall average was available. Moreover, Taiwan has 148.68 medical workers per 10,000 people, while Kinmen County has only 41.68 medical personnel, which is less than one-third of the average of the whole Taiwan.²³ Furthermore, Kinmen Hospital can only accommodate 60 patients at a time. If there are more than 500 cases per day in the region or the number of moderate to severe patients increases, the overall medical capacity of the region will be compromised.²⁴ Based on the foregoing, healthcare workers in the Kinmen area have been under significant pressure during the COVID-19 pandemic. This is also the main reason for this study to explore the problems related to stress of healthcare workers in Kinmen County.

Regarding stress and mental health, this study examined the effect of poor healthcare capacity and high workload on health workers, during the COVID-19 pandemic. This study also explored mindfulness-based stress reduction and resilience in health workers. The findings here can be useful for developing strategies which will help health workers cope with stress and other challenges associated with the COVID-19 pandemic.

Materials and Methods

Material

Stress and Mental Health

Stress is a negative feeling or belief which arises when a person feels incapable of coping with environmental demands.²⁵ Stress is a critical health issue because it can cause mental distress and compromise one's health.²⁶ Stress is subjective, and is apparently a mental process, and therefore, negative, uncontrollable, obscure, or unsolvable matters are often perceived as stressful.²⁷ Mental stress is viewed as the physical, psychological, and behavioral response of an individual after that individual perceives and analyzes a harmful stimulus or threat from the environment. When environmental changes exceed what an individual is capable of adapting to, mental stress could arise, and the individual may experience anxiety, depression, acute stress disorder, post-traumatic stress disorder.²⁸ Mental stress may still exist even after a traumatic event, and if the condition is not properly handled, it may affect the individual's immunity, cause cardiovascular disease or cancer, and create a vicious cycle.²⁹ However, an individual may feel unmotivated and lose creativity in the absence of stress.^{30,31}

Stress exists at all times and is like a double-edged sword; while stress in moderation may elicit our full potential, too much of it can compromise our well-being.³² Being under chronic stress without releasing or relieving it, can increase the physical or mental burdens affecting one's work, family, and relationship with others.³³

Previously, an individual's mental health is diagnosed by mental illness symptoms, and being mentally healthy is regarded as having no illness.³⁴ However, in recent years, positive psychology has suggested that both positive and negative factors could affect one's mental health.^{35,36} For example, Keyes³⁵ pointed out that mental health is a complete mental and physical state, and in addition to being free from mental disorders, it is important to take other mental health conditions related to the society, emotion, and well-being into consideration because they are associated with depression, anxiety, panic, and other mental disorders. It is important to note that preventing mental disorders may not promote positive mental health,³⁷ but improving one's mental health can reduce the risk of mental disorders while jeopardizing one's mental health could increase the risk of mental illness.³⁸

World Health Organization (WHO)³⁹ listed out some key concepts of mental health, including subjective well-being, intergenerational dependence, autonomy, competence, perceived self-efficacy, and self-actualization of one's intellectual and emotional potential. From a cross-cultural perspective, mental health cannot be defined solely by the presence or absence of mental disorders. Three more factors should be taken into consideration: 1) the psychological function, 2) the physiological foundation, and 3) the social environment.⁴⁰ WHO³⁹ has also suggested that our health is ultimately related to the psychological function, the physiological foundation, and the social environment. Consequently, behavioral or mental disorders can be viewed as a combination of the three factors above. It is impossible to clarify psychological distress or disorders if the physiological, social, and psychological components are examined separately.⁴¹

Csikszentmihalyi et al⁴² stated that to stay healthy mentally, it is important to prevent mental disorders and to help people without mental disorders by eliciting their full potential. They later showed that many human traits such as courage, morality, ideas about future, hope, faith, optimism, and interpersonal skills are a good buffer against mental disorders.⁴³ Healthy people who have no mental disorders can lead a more complete, enriched, and happy life.⁴⁴ Therefore, mental health has both negative and positive components. The negative component of mental health is the presence of mental disorders.⁴⁵ As for the positive component of mental health, aside from the absence of mental disorders, it is important to take positive emotional experiences and positive mental qualities into consideration.⁴⁶

Chang⁴⁷ pointed out that being mentally healthy implies the following conditions have been met: 1) staying emotionally stable, 2) enjoying one's work and proving one's worth, 3) enjoying interacting with others and maintaining good relationships, 4) accepting oneself and knowing one's strengths, and 5) solving problems instead of avoiding them. According to the above study, mental health has five dimensions, namely: emotion, work, people, self, and problem-solving ability.⁴⁸ Chen⁴⁹ indicated that an individual's mental health is affected by his or her internal qualities as well as the external environment. Moreover, a person's internal qualities are influenced by others.⁵⁰ One example is the sense of security. Those with a good sense of security are more likely to trust people, and they tackle problems more optimistically. When people feel secured, they are also more emotionally stable and have a sense of control and confidence. Hu and Chen⁵¹ examined the concept of mental health in China, Hong Kong, Mao Cao, and Taiwan and found that although people in those areas viewed mental health differently, they all considered good

adaptability to the environment and to one's living critical. In fact, Chinese researchers suggested that mental health should comprise two components: 1) adaptability and 2) development.

As for studies on stress and mental health, Grant et al⁵² showed that more than 20 studies on the relationship between stress, psychopathology, and mental health all indicated the inter-relatedness between stress and mental health. In addition, the source of stress can predict psychopathological symptoms.⁵³ Stress can increase the risk of depression, and one's vulnerability to depression would make the person more sensitive to a stressful event. As a result, stress is a critical factor for predicting depression.^{54,55} Several studies have emphasized the relationship between stress and one's well-being. For example, Shankar and Park⁵⁶ revealed that stress affects our physical health both directly (eg, psychoneuroimmunological, endocrine) and indirectly (eg, healthy behavior). Meanwhile, stress could also affect one's mental health. For example, during the COVID-19 outbreak, a study on the effect of the long-term use of certain medical equipment on physical health showed that long working hours could induce a sense of stress, thereby increasing the risk of muscle pain, severe headaches, occupational fatigue, and poor sleep quality. The study above demonstrated the effect of stress on people's well-being.⁵⁷

Overall, stress is closely related to mental health. The aforementioned literature indicates that health workers must be aware of changes in the external environment at all time and respond appropriately to relieve stress and maintain mental health.

Mindfulness-Based Stress Reduction and Resilience

Stress and resilience are important topics in modern psychology. At work and in life, health workers often need to cope with stress and emotional distress.⁵⁸ In this case, developing and practicing positive mindfulness can be helpful. Practicing positive mindfulness is good for improving one's concentration, activating thinking, encouraging critical thinking, and for emotional stability.⁵⁹ Lastly, positive mindfulness is helpful for eliminating negative energy from stress and emotional distress, and at the same time, it can boost self-motivation and enhance learning effectiveness.⁶⁰ Currently, mindfulness-based stress reduction is applied clinically to relieve pain. Studies have shown that mindfulness-based stress reduction is helpful for everyone and can be practiced at any time.⁶¹

Mindfulness is an exercise of the mind. It is about learning to observe oneself, so in the face of adversity at anytime, an individual will be able to balance the mind by self observation. Once the mind is balanced, the individual can then determine actions to be taken. This kind of action would be positive and beneficial to oneself as well as to others.⁶² Crane et al⁶³ defined mindfulness as an awareness generated by intentionally paying attention to the body, the mind or the environment at the very moment and staying non-judgmental. Some studies have considered mindfulness under two main concepts: 1) awareness and 2) acceptance of the very moment.⁶⁴ Awareness at the moment is about clearly understanding the internal and the external conditions at the moment, responding to the situation appropriately, and living at the moment instead of worrying about the past or the future.⁶⁵ On the other hand, acceptance is about accepting facts with a non-judgmental and unresponsive attitude once being clearly aware of the condition at the moment. By doing so, one can avoid possible conflicts and harms from the external environment.⁶⁶ Therefore, we can say that mindfulness is the state of consciousness of an individual who is consciously aware of his or her internal and external experience. Concretely speaking, mindfulness consists of the following three elements: 1) A trait: It is also known as trait mindfulness. It refers to a person making long-lasting changes in mindfulness, especially in terms of awareness and observation and becoming non-judgmental and non-voluntary. Trait mindfulness exists naturally in individuals; 2) A state of being: It is also called state mindfulness. It is about changes between individuals about feeling, perception, and self-reflection during the process of mindfulness. Some examples are physical mindfulness and mindfulness of the state of mind after exercising mindfulness; 3) A skill: Everyone can practice mindful skills.^{60,67} From the above concepts and connotations, mindfulness is not only a process but also a result. It is a spiritual state as well as the actual performance.⁶⁸ This study considered mindfulness as purposive, non-judgmental, constant awareness of the moment.

Resilience comes from the Latin word *resilience*, meaning bouncing back or recovery. Resilience now means a person's or a thing's flexibility, toughness, or stress-resistance. It is a strength or trait enabling a person or a thing to quickly recover after encountering an external force.⁶⁹ Resilience is a person's adaptability to overcome hardship and to return to normal. It is an individual's ability to stay healthy or to recover by behaving differently at different stages.⁷⁰ Resilience can be viewed as a main force enabling an individual to develop and to grow in hardship.⁷⁰ Resilience can be boosted through cognitive education and training or environmental change, and it is viewed as a mental health indicator.⁷¹

Resilience enables an individual to acquire protective or any required skills and knowledge in a perplexing condition.^{72,73} Jackson and Watkin⁷⁴ stated that an individual's resilience has emotion regulation, impulse control, causal analysis, self-efficacy, realistic optimism, empathy, and encompasses these seven abilities. When challenged or feeling frustrated, resilience enables an individual to overcome and recover.⁷⁵ During the process of resilience, people will not only recover but also develop stronger resilience.^{76,77} Studies on resilience have also explored resilience in groups. For example, a resilient community can develop its resilience by focusing on care, high-expectation, meaningful support and participation.⁷⁸ In addition to focusing on an individual's resilience, studies have shown that a leader's resilience can promote the organization's resilience.⁷⁹ Studies on children's and adolescents' resilience found that the internal resilience of children and adolescents comprises high self-esteem and self-approval, capability, self-survival, thinking, independence, and their problem-solving ability. It is also important to have the right attitude, to interact with and influence others, and to get involved in all kinds of activities.⁸⁰

Like other psychology concepts, resilience is a quality formed by a circle made of stimulation, the subject, and response. Resilience is closely related to the subject and the external environment of the subject. Therefore, an individual's resilience is affected by his interaction with the environment, while an individual's resilience can be extended to and reflected onto his or her organization.⁸¹

In summary, through the practice of positive mindfulness, one's mental activities can be enhanced, one's thinking can be activated, and emotional stability can be promoted. Therefore, a mindfulness-based approach to stress reduction will be of great help to everyone, allowing health workers to maintain their mental health.

Theoretical Model of the Relationship between Mindfulness, Resilience, Stress, and Mental Health

Bajaj et al (pp. 2–3)⁸² indicated that mindfulness has the potential to cultivate resilience. The study suggests that individuals with a high level of mindfulness can enhance their ability to cope with a variety of situations and respond appropriately when faced with challenging circumstances.⁸³ Therefore, mindfulness training can be considered an effective method to improve resilience, and the relationship between the two has been confirmed in many empirical studies.⁸⁴ Resilience plays an important role in improving positive mental health outcomes and reducing negative outcomes, as well as increasing overall stress resistance.⁸⁵ Furthermore, Bajaj et al (p. 3)⁸² also pointed out in their study that individuals with resilience are more resilient in adverse circumstances, better equipped to cope with daily challenges, and possess greater capacity to handle various stressors.⁸⁶ Character strengths such as hope, enthusiasm, and courage play a crucial role in resilience-related factors, such as optimism and positive emotions.⁸⁷ Ultimately, these strengths help resilient individuals to face stressors in a positive way. When facing stressors, these individuals experience more positive emotions and are able to recover quickly from stress.⁸⁸ Therefore, individuals with higher resilience can maintain their mental health by absorbing the negative consequences of difficult times.⁸² Existing research also indicates that mindfulness has the potential to reduce mental health issues such as stress⁸⁹ and is negatively correlated with stress.⁹⁰ Mindfulness improves an individual's ability to cope with stressors by reducing the propensity to perceive situations in ways that stress.⁹¹ People with higher levels of mindfulness may experience lower levels of stress due to reduced negative cognitive assessments of threatening events and experiences. Individuals with a high level of mindfulness are less likely to perceive their daily experiences as stressful.⁹² Since their behavior is consistent with values, their ability to regulate their emotions may make them more attuned to various stressors in their environment.⁸² It is commonly believed that stress can hinder psychological health, and chronic stressors can have a significantly negative impact on the development of emotional responses, leading to reduce mental health.^{93,94} This suggests that individuals with lower stress levels may have higher levels of mental health. Furthermore, effective stress management may lead to a reduction in worrisome habits, which could further enhance their mental health.⁹⁵ Based on the foregoing, mindfulness plays a significant role in reducing stress and enhancing mental health. On the other hand, resilience is a coping resource for stress, and it can mitigate the negative effects of stress for individuals who experience highly stressful work or environments for individuals who experience highly stressful work or environments.⁸² The concept of resilience explains why some individuals, despite facing high levels of stress, can still thrive and develop stronger abilities to cope with future challenges.⁹⁶ In a review on resilience and stress, Durden et al⁸⁵ point out that resilience has the potential to reduce the effects of stress. Research also suggests that enhancing resilience may help mitigate the negative effects of occupational stress factors.^{82,97} Therefore, in the four research variables of mindfulness, resilience, stress, and mental health, mindfulness strengthens resilience and mitigates stress, which in turn promotes the mental health of individuals. At the same time, resilience can reduce stress and promote mental health, and stress can negatively affect mental health.

Overall, this theoretical model is illustrated in [Figure 1](#).

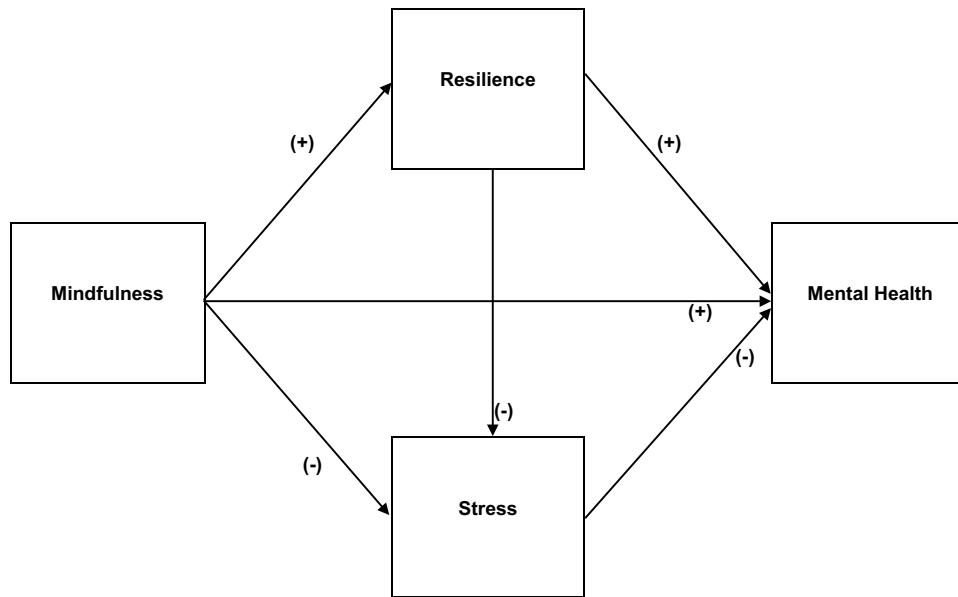


Figure 1 Theoretical Model of the Relationship between Mindfulness, Resilience, Stress, and Mental Health.

Methods

This study conducted an in-depth interview to investigate stress perceived by health workers in a hospital on an outer island of Taiwan as well as their mental health and stress relieving strategies.

The Theoretical Framework of This Research

Based on the comprehensive review, analysis, and induction of the literature, this study concludes that during the COVID-19 pandemic, healthcare professionals in Taiwan’s outlying island region (Kinmen) are more likely to encounter inadequate medical resources and an exceptionally heavy workload. As a result, it can lead to a significant increase in their work stress and have an impact on psychological well-being. However, if healthcare workers can use mindfulness to reduce stress and have the strength or trait of resilience, as well as various coping strategies in the face of difficult challenges, they will be able to alleviate stress and restore their psychological well-being. Based on the above, the theoretical framework of this research is depicted in [Figure 2](#).

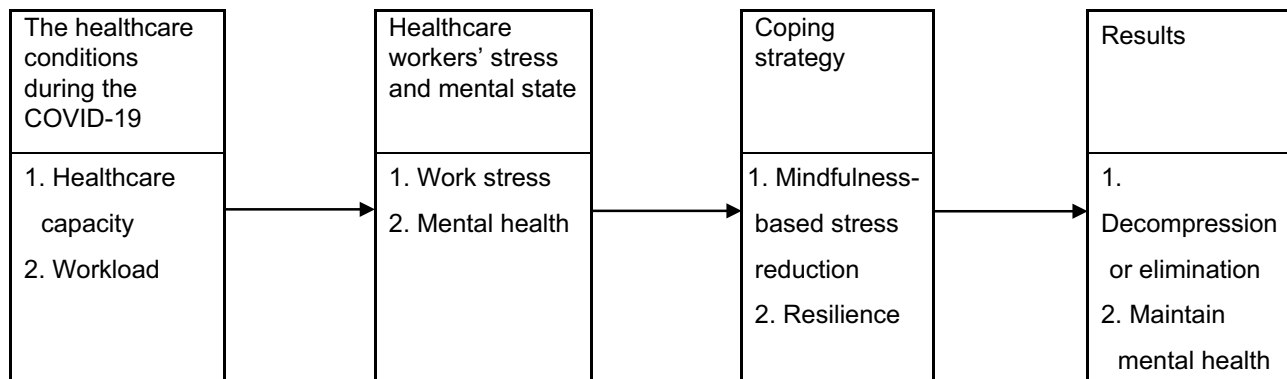


Figure 2 The Theoretical Framework of This Research.
Abbreviation: COVID-19, coronavirus disease 2019.

Research Design

The methodology adopted in the research will directly affect the theoretical framework, sample extraction, data collection and other aspects of the research task.⁹⁸ Therefore, the choice of research method is a problem that every researcher who wants to obtain reliable and effective results must seriously consider.⁹⁹ Qualitative research generally refers to an in-depth and detailed investigation of social phenomena using methods such as field experiences, open-ended interviews, participatory and non-participatory observations, literature analysis, and case studies. The analysis method of qualitative research is inductive, collecting first-hand data from the local context, understanding the meaning of human behavior and perception of things from the perspective of the respondent, and then establishing a theoretical model and exploring it. Indeed, the theory developed through qualitative research methods emerges from the interconnections between many different pieces of evidence collected. It is a bottom-up process, where the theory comes from the data itself, not imposed on it.^{98,99}

Qualitative research can be defined as an empirical investigation that utilizes rich data from a bounded real-life context to explore a specific phenomenon of interest.¹⁰⁰ In this type of research, researchers would delimit the scope of the study and gather in-depth data from real-life situations to conduct a thorough exploration of a specific phenomenon.¹⁰¹ Therefore, through this approach, researchers can gain a better understanding of the content and context of events or phenomena, and obtain valuable qualitative insights from them. Indeed, qualitative research methods can enable the research team to gain a better and more in-depth understanding of the relevant issues concerning healthcare workers during the pandemic. This is the primary reason for adopting qualitative research in this study. Through approaches such as field experiences, open-ended interviews, and case studies, the research team can explore the experiences, perspectives, and challenges faced by healthcare professionals more comprehensively. The qualitative approach allows for a rich exploration of the complexities and nuances of the subject matter, providing valuable insights that can contribute to a deeper understanding of the topic at hand.

Interviews are one of the most crucial methods for collecting qualitative data.¹⁰² This study utilized semi-structured interviews as the primary data collection method. Semi-structured interviews involve pre-prepared questions guided by a thematic framework. This method is effective and flexible, capable of highlighting important and often hidden aspects of human behavior.¹⁰² Therefore, through this interviewing approach, researchers can gain deeper insights into the functioning of the organization and discover crucial features that might be challenging to observe under normal circumstances.¹⁰³ Moreover, due to the pre-prepared questions while maintaining flexibility, semi-structured interviews enable researchers to utilize their thematic framework effectively, while also granting interviewees more freedom to express themselves. This enriches the research outcomes, providing a more comprehensive and in-depth understanding of the subject matter. This study reviewed media, literature and government reports on stress, mental health, mindfulness-based stress reduction, and resilience and conducted an in-depth interview with health workers.

In-depth interviews aim to go deep into people's hearts, explore the real thoughts of the interviewees, and get more real information. Focus group interviews are conducted to collect group members' thoughts, opinions, perceptions, attitudes, and beliefs on specific topics through group interactions. The purpose of this study is to explore the mindfulness-based stress reduction and resilience of healthcare workers in Taiwan during the COVID-19. Therefore, it is more appropriate to use the in-depth interviews that can provide a deeper understanding of individual healthcare workers' inner world and true feelings. This approach compensates for the inability to delve deeply into the individual interviewee's inner world in focus group interviews.¹⁰⁴

Interview Design

Health workers from national hospital on an outer island of Taiwan were the subjects of the study. It is the only large hospital in the area, making the hospital a good representative of subject sampling. The Study has pointed out that in-depth interviews generally adopt purposive sampling,¹⁰³ which was also adopted by many studies.^{105,106} The purposive sampling design procedure of this study is: 1) to confirm the population of the study; 2) select the purposive sampling standard; and 3) prioritize the sampling standard. Based on this sampling procedure, the purposive sampling was adopted to select one doctor or nurse from each selected medical specialty, and the subjects had to have worked in that hospital

for more than one year. The participants came from obstetrics and Gynecology, Nephrology, Hepatobiliary Gastroenterology, ENT, Psychiatry, Cardiology, Pediatrics and Emergency departments. A total of eight health workers were selected.

To facilitate smooth interviews, this study established a protocol with the participants. That is, before the interviews, the researcher informed the interviewees about the purpose of the research and obtained informed consent. This measure enhanced the reliability and validity of the data obtained from the interview by preventing the interviewees from concealing information because of time or personal considerations. Furthermore, this study conducted semi-structured interviews. A semi-structured interview was conducted, and to avoid bias, the outline of the interview was sent to the interviewees a week before the interview. To avoid incomplete information from the interviewees, the researcher acquired the interviewees' consent for live recording. Through the above-mentioned research protocol, the trust between the researchers and the participants is established, creating a conducive interview atmosphere that achieved more accurate interview information.

In addition, since the interviewees in this study are all health workers, the interviewer and the interviewee do not know each other, and the interaction between the two parties was like a "stranger interaction".¹⁰⁷ However, this kind of interview situation may cause the interviewees' answers to be mixed with social desirability factors, resulting in biased content of the answers, which in turn affects the validity of the interview.¹⁰⁷ Based on this, this study first avoids threatening questions during interview; The second is to change an indirect tone of inquiry; The third is to avoid the existence of a third party, as the presence of third parties also encourages the respondents to show "responses that meet social desirability".^{108–110}

According to the purpose of the interview, the content of the interview was the quality of medical care in the outer islands, the workload of medical staff, the sense of achievement in supporting the front line, hardship, and the resilience factors of medical staff. The objective was to add more information to the literature on mental health of healthcare workers.

Reliability and Validity

The reliability and validity of a study are important considerations in qualitative research. To enhance the reliability and validity of this study and to avoid researcher bias, the following measures have been taken:

Reliability

In qualitative research, reliability refers to the consistency of the researcher's interactions, data recording, data analysis, and the interpretation of participants' meanings within the data.¹¹¹

To enhance reliability, the specific measures taken in this study are as follows: First, by positioning the researcher as a frontline healthcare worker, the researcher's identity and stance are established, allowing for a thorough understanding of the actual situation. Secondly, the interviewees were selected based on their status as healthcare workers with relevant practical experience. Their opinions and suggestions were cross-referenced to verify their credibility and thoroughly validate the situation during the pandemic. Furthermore, this study focuses on the variables of stress, mindfulness, resilience, and mental health to examine the difficulties faced by Taiwanese healthcare workers in maintaining overall medical quality during the COVID-19 pandemic. It explores their workload, the achievements and challenges in supporting frontline healthcare workers, the stress and difficulties they encounter, and the processes and factors involved in building resilience. Data was collected through these lenses, and relevant existing literature was reviewed to ensure the credibility of the research data.

Finally, the interview transcripts and a summary of the research conclusions were sent to the interviewees for their feedback. This was done to determine if they agreed with the findings or had any additional comments or corrections. The research steps and processes were thoroughly implemented, and research tools were effectively utilized to ensure accurate execution.

Validity

Validity refers to the accuracy of the research findings and is closely related to reliability. This study employs the following strategies to enhance internal validity: Firstly, multiple data collection strategies such as literature review, interviews, interview notes, and feedback forms are utilized to cross-validate data accuracy. This helps to mitigate the influence of researcher bias on the study results, thereby enhancing the validity of interpreting the research findings. Secondly, the researcher continuously engages in self-reflection and adjusts their perspectives, objectively questioning, evaluating, and improving each stage of the research process. Third, the research team members are all related to the research topic, including 3 male and female researchers with Ph.D. degrees, who have the academic title of professor or associate professor, and have extensive experience in conducting in-depth interviews. The research team also conducted the research process according to the “Consolidated Criteria for Reporting Qualitative Research (COREQ)” proposed by Tong et al.¹¹² This paper should have high research validity.

Outline of the Interview

The COVID-19 pandemic started from 2020, and the studied area had zero-confirmed cases for a long time. As more and more types of COVID-19 viruses emerged, the first confirmed case of Omicron was found in this area in the end of March, 2022. Since September 16, 2022, a total of 14,583 people have tested positive to COVID-19, and in no more than five months, more than 10% of the population was infected.¹¹³ During this emergency period, both health workers and the general public got a sense of crisis, either physically or mentally, and as a result, caring for each other and having professionals offering mental care became necessary. Table 1 presents an outline of the interview.

Interview Process and Data Analysis

After obtaining their consent, the researcher made an appointment with each interviewee based on their preference. The researcher also emailed the outline of the interview to them. Prior to the interview, the researcher first introduced himself to enable the interviewees understand the role of the researcher and his function in this study. The researcher explained the objectives, the motivation, and issues to be explored in this study. The researcher also mentioned the research method

Table 1 Outline of the Interview

Interviewees	A hospital on the outer island of Taiwan
1. Background	Name, age, job title, years of working experience, roles and responsibility
2. Difficulties related to the overall medical quality of the hospital during the COVID-19 pandemic.	<p>A. This area has had insufficient medical resources for long. As the pandemic worsened in this area, has the hospital you work for experienced any difficulties in terms of accepting or seeing patients because of a lack of hospital beds or medical staff?</p> <p>B. According to the above condition, what is the problem that needs to be fixed immediately?</p> <p>C. In terms of the policy of rapid tests counted as confirmed cases, will your hospital be able to cope with a huge number of confirmed cases in the future during the peak of the outbreak?</p> <p>D. In terms of antiviral drugs for confirmed cases, do you think your hospital has enough drugs for immediate drug administration?</p>
3. Workloads of health workers during the COVID-19 outbreak	<p>A. Do you find the number of times a week seeing outpatients and the workload reasonable?</p> <p>B. Do you find the work arduous?</p> <p>C. Do you often work more than eight hours a day?</p> <p>D. Does frequent shift-work have any impact on you?</p>

(Continued)

Table I (Continued).

Interviewees	A hospital on the outer island of Taiwan
4. Achievement and challenges for health workers supporting the frontline during the COVID-19 outbreak	A. When you provide medical services at the forefront, do you have enough personal protective equipment? Are they adequately safe? B. Any suggestion for the above condition? C. How do you feel when you are under the risk of COVID-19 infection when offering medical services at the forefront? D. Have you encountered any hardship when offering medical services at the forefront? E. How did you solve the problem above? F. From offering medical service at the forefront, what is your greatest achievement? G. Continue from the above question. If you have an option, would you like to offer medical service at the forefront?
5. Stress and difficulties faced by health workers offering medical services at the forefront during the COVID-19 outbreak	A. What is the greatest source of stress you are experiencing at work right now? B. How do you cope with the stress mentioned above? C. For health workers who want to quit their jobs because of stress, do you have any suggestions for them?
6. Factors affecting the process of resilience of health workers working on an outer island in Taiwan	A. Can you tell us about your recovery process? B. Continue from the above question. How do you switch the mood and remove yourself from stress at that moment? C. What factors affect your recovery and prompt you for change? D. How well have you adapted since the beginning of the outbreak to now?
7. Any other ideas or feelings that you would like to share with us?	

Abbreviation: COVID-19, coronavirus disease 2019.

and the directions of the interview. The interviewees were informed that because of the need of this study, their conversation will be recorded.

The content of each interview was recorded and summarized. Each interview record was labeled with the code of the interviewee, the job title of the interviewee, and the date and time of the interview. Questions raised by the research were labeled with letter Q, and the interviewees were labeled with A, B, C, and so forth. As for answers from the interviewees, they were labeled with 01, 02, 03, and so forth. The numbers denoted the part and question number. For example, A-01-01 means it is the answer for the first question from Part 1 given by Interviewee A.

In terms of data analysis, this study adopted the open coding, axial coding, and selective coding proposed by Strauss¹¹⁴ to code the original data three times. First, the interview transcript was converted into attribute data. Next, independent events with a similar attribute were clustered to form a systemic sub-category. Lastly, selective coding was performed to integrate and refine the content of the overall interview.

Summarizing the procedures and practices carried out in this module (Research Methods), it is in line with the “COREQ” proposed by Tong et al¹¹² “COREQ” consists of three domains: research team and reflexivity, study design, and data analysis and reporting. These are divided into 8 subdomains, comprising a total of 32 checklist items. As described in this section, the research procedures, methods for conducting in-depth interviews, and the analysis of their contents, including the personal characteristics of the researchers, the relationship between the researcher and the participants, the theoretical framework, the selection of participants, the venues, the collection of data, the analysis of data, and the report are fully described and explained.

Informed Consent and Ethical Consideration

A statement of informed consent from respondents for this study, as follows: I, the undersigned, hereby accept the interview and record by the researcher for “Health workers’ mindfulness-based stress reduction and resilience during

COVID-19 pandemic". I also allow the researcher to legally use such completed records, photographs or tape-recording. While realizing that I still retain the intellectual rights of my presentations, I grant the researcher the right to exhibit my interview content on its webpage for their academic publication. Informed consent was acquired from each participant before conducting the in-depth interview. The questionnaire survey for this study were conducted from Jan 8rd and 23th, 2023.

This study was conducted in accordance with the principles outlined in the Declaration of Helsinki and relevant Taiwan regulations, under the supervision and inspection of the Ethics Committee. Written informed consent was obtained from all participants prior to their participation. The participants' informed consent included the publication of anonymized responses in a peer-reviewed publication (not just on the authors' website). The study was approved by the Ethics Committee of National Quemoy University (Approval Number: NQU-CHSS-111-0630). All data collected were anonymized and managed in strict compliance with data privacy and confidentiality guidelines. All efforts were made to protect the dignity, autonomy, and privacy of the research participants.

Results

Background Analysis

In this study, eight health workers working in a hospital on an outer island of Taiwan were interviewed. These health workers were specialty doctors or nurses, and they were responsible for treating and caring for COVID-19 patients. These interviewees were coded from A to H, and their departments, job titles, and responsibilities are summarized in [Table 2](#).

Interview Data Analysis

The interview content was converted into transcripts. Next, a qualitative coding approach consisting of open coding, axial coding, and selective coding proposed by Strauss¹¹⁵ was adopted to code the original data for data analysis. Using the above-mentioned coding method and procedure, in this study, a total of 35 open codes were generated, which were summarized into 10 axial codes, finally 5 selective codes were formed as showed in [Table 3](#), which is based on the

Table 2 Background of the Interviewees

Code	Gender	Age (Year)	Education	Department	Job title	Years Worked in the Hospital on the Outer Island of Taiwan	Main Duties
A	Male	42	Master's degrees	Obstetrics and Gynecology	Attending physician	4	Obstetrics and Gynecology outpatient clinic; the physician in charge of the COVID-19 ward; offering medical service to COVID-19 patients staying in a specialized quarantine hotel; tracking patients under home care.
B	Female	38	Bachelor's degrees	Nephrology	Attending physician	3	Nephrology outpatient clinic
C	Male	40	Master's degrees	Gastroenterology	Attending physician	4	Gastroenterology-related duties
D	Male	45	Master's degrees	ENT	Practicing physician	5	ENT
E	Male	39	Bachelor's degrees	Psychiatry	Attending physician	3	Psychiatric outpatient clinic
F	Male	50	Master's degrees	Cardiology	Attending physician	5	Cardiology outpatient clinic
G	Female	30	Bachelor's degrees	Pediatrics	Nurse	4	Pediatrics and COVID-19 related duties
H	Female	39	Bachelor's degrees	Emergency Medicine	Nurse	6	Emergency and COVID-19 related duties

Abbreviation: COVID-19, coronavirus disease 2019.

Table 3 Selective Codes and Axial Codes

Selective Codes	Axial Codes
1. Difficulties and the overall medical quality during the COVID-19 outbreak	1. Overall healthcare quality 2. The hospital has adequate SOPs to handle the COVID-19 testing volume
2. Workloads of health workers during the COVID-19 outbreak	1. Healthcare capacity 2. Workload
3. Achievements and challenges for health workers offering medical services at the forefront during the COVID-19 outbreak	1. Work stress 2. Mental health
4. Stress and hardships experienced by health workers during the COVID-19 outbreak	1. Stress from both patients and the healthcare system 2. Coping with stress
5. Factors affecting the resilience of health workers	1. Mindfulness-based stress reduction 2. Resilience

Abbreviations: COVID-19, coronavirus disease 2019; SOPs, standard operating processes.

coding rule of grounded theory. The texts were modified, and axial codes that were much closer to the original ideas of the interviewees were obtained. Last, the strategies for mental health, mindfulness-based stress reduction, resilience, and improving the overall medical quality of Taiwan's outer island areas were summarized.

Interview Result and Analysis

Difficulties and the overall medical quality during the COVID-19 outbreak.

Overall Healthcare Quality

The interview result showed the poor overall medical quality of the studied outer island area of Taiwan, and medical shortage was especially apparent during the COVID-19 outbreak. The interviewees mentioned the medical manpower issues of this area, including the number of health workers, and a lack of medical doctors for certain specialties. Furthermore, because the hospital is on an outer island of Taiwan, specialty doctors there are unlikely to stay for a long time; a medical doctor staying there for more than five years is often considered as a senior doctor.

Kinmen 's medical shortage is not only a problem of hardware, but also a problem of software and manpower. (A01-01)

The most important thing to treat COVID-19 is the physician, but they also have outpatients, plus COVID-19 patients simply can't cope with it. Usually it is like this, but now it is even worse, doctors often can't stay for more than five years. (B01-02)

The Hospital Has Adequate SOPs to Handle the COVID-19 Testing Volume

Second, this area can cope with many confirmed positive cases. In June, 2022, it was stipulated in Taiwan that people who tested positive using a home coronavirus nucleic acid detection kit and have the test result verified by a physician shall be regarded as confirmed cases. Consequently, there was no need to perform the polymerase chain reaction (PCR) test. Lastly, this area had enough antiviral drugs, and the number of confirmed cases requiring antiviral drugs was less than 50%.

At present, the policy of the central government is to say that quick screening is positive, then everyone may do their own quick screening at home, then the diagnosis can be prescribed here, and further PCR testing is not necessarily required. (D02-01)

If the infected person is mildly ill or asymptomatic, it is actually enough to isolate at home, so that the number of confirmed cases requiring antiviral drugs is reduced to less than half. (C02-01)

Workloads of Health Workers During the COVID-19 Outbreak Healthcare Capacity

The interview result revealed that the number of times medical doctors of different specialties worked in the outpatient clinic each week was different, this was also true for nurses. Some interviewees believed that doctors working in this outer island area had a reasonable workload, but their workload was lower compared to those working on the main island. Other interviewees believed that their workload was heavier because they had to see outpatients and performed ultrasonic examinations. There were interviewees who pointed out that because of the pandemic, their outpatient and examination workload dropped substantially, making it possible for them to support the frontline. Summarily, the researcher considered doctors working in internal medicine to have a heavier workload than those working in other specialties, and because internal medicine is a major hospital department, its doctors were at the forefront fighting against the COVID-19 outbreak.

The current workload is affordable, not too tiring, because the outpatient volume here on the island is still slightly lighter. (E02-02)

Workload

This study found no definite answer in terms of whether doctors and nurses of different specialties consider their workloads too heavy. In general, the workloads of health workers became heavier as a result of the pandemic because they started working in the rapid COVID-19 test clinic.

Basically, in addition to the need for duty during the new crown epidemic, the ward of our own internal medicine also needs to be on duty. If we take internal medicine as an example, we need to work seven or eight shifts a month, which means that there will be seven to eight days a month when we need to work more than 8 hours continuously. (F02-02)

My job requires 24-hour attendance, and I have to assist with patients in the emergency department, and with rapid COVID-19 testing and clinic work, the workload has increased during the pandemic. (H02-03)

Achievements and challenges for health workers offering medical services at the forefront during the COVID-19 outbreak.

Work Stress

According to the interview, the interviewees stated that their hospital provided them with enough personal protective equipment to ensure their safety. Most frontline health workers stated that they were unworried about getting infected, but they were worried about infecting their family members, especially those at high risk, such as old people, pregnant women, and children. It was also required for frontline doctors to take turns working at the rapid COVID-19 clinic and seeing patients in the negative pressure isolation ward.

Sometimes medical staff are blamed for not being able to help patients in a timely manner. (F03-01)

To be honest, this is also related to one's own family. If you have elderly people, children, or pregnant women at home, you would naturally be concerned about their well-being. (C03-02)

Mental Health

Some interviewees said that they were anxious about lacking relevant knowledge or skills of areas outside their specialties. Some interviewees said that their major achievement came from helping patients recover or appreciation from the family of a patient. The interviewees expressed willingness to provide medical service at the forefront.

Furthermore, can firefighters say they are unwilling to respond to a fire scene? So, I can compare this problem to the fact that doctors do not choose to refuse to treat patients. (A03-04)

When I brought them back, when I saw how grateful the family was to you, in fact, you must have a great sense of accomplishment in your heart. (D03-03)

Stress and hardships experienced by health workers during the COVID-19 outbreak.

Stress from Both Patients and the Healthcare System

The interviewees had different sources of stress, and not all health workers were stressed. Others thought they were stressed by worrying about the outbreak or if their medical judgment was affected by the outbreak. There were interviewees who felt that they were being blamed by the family members of patients who died. It is wrong to fault doctors for failing to save a patient; it can place health workers under pressure. There were also interviewees who mentioned that their pressure came from patients or their family members' irrational communication and unreasonable complaints. One interviewee indicated that internal medicine was not his specialty, so he felt stressed when providing frontline medical service. The nurse interviewed pointed out that his/her stress came from hospital administrators because they tend to do things from the political stance, which can be stressful.

Currently, there is not much pressure on the work due to the fact of that the main thing is to do some proper treatment of the patient. (G04-01)

I'm not experiencing any particular stress at the moment. If someone is concerned about the risk of infection and does not wish to continue working, we should respect their choice if they decide to resign. (H04-01)

I understand that you may feel a bit stressed because you're not familiar with the internal medicine treatment methods, which are not within your area of expertise. It's natural to feel more pressure when dealing with unfamiliar tasks. (B04-01)

Their stress is stemming from unreasonable communication and unwarranted complaints from patients or their families. (F04-01)

Coping with Stress

In addition, each interviewee has his or her own way of coping and responding to stress. For example, one interviewee relieved stress by adjusting his or her attitude and looking for resources. Another interviewee suggested that his/her approach to stress is to avoid bringing emotion from work back home. There were also interviewees who said that communicating rationally, seeing things from a different perspective, and engaging oneself in sports or watching sports are good stress busters. The reasons why health workers quit their jobs include the following, the COVID-19 outbreak, family issues, workplace bullying, and personal career planning. As for mental issues, it is important to care about these people, counsel them, and give them time to overcome their challenges. As for workplace bullying, one should report the case for the manager to handle. If anyone experiences insomnia or if his or her mood or family is affected by work stress, then he or she should tell the manager and take some time off.

Addressing the situation with appropriate medical knowledge and tailored treatments. (E04-02)

I've also seen many healthcare professionals who consider resigning due to stress, and in most cases, it's a result of their inability to manage stress effectively. Of course, sometimes the stress may also be influenced by personal or family issues, which can be more challenging to address. (E04-03)

Probably you can only find someone to complain to reduce stress. It's essential to prioritize patient safety. (C04-02)

No matter what job you have, there will always be stress, but if it seriously affects your sleep and family life, it is recommended to report to your superiors for timely breaks. (F04-03)

Healthcare professionals also talk to each other about the difficulties encountered, including the bitterness of work, or what happened, how to solve them together? Also, sometimes I watch sporting events. (D04-03)

If the pressure comes from the psychological level, give him timely guidance or timely encouragement to help him change his mind, and the only thing the person next to him can really do is to encourage him to put down the work first, or seek help from colleagues. (A04-03)

Factors Affecting the Resilience of Health Workers Mindfulness-Based Stress Reduction

The results of the interview suggested that the factors of resilience differed among the interviewees. Some interviewees said feedbacks from the patients' family was a good factor of resilience for doctors. One interviewee thought that time was a factor, and how fast an individual recovers was related to his or her personality. In addition, family support, both spiritually and verbally, is critical. The nurse interviewee stated that maintaining both physical and mental balance and staying optimistic was helpful for alleviating stress. For example, one can have dinner and chat with colleagues.

As for factors affecting one's resilience and causing an individual to change, the interviewees suggested that moderate stress or changing one's attitude can affect recovery. One interviewee said that improving one's positive attitude makes recovery easier. During the COVID-19 pandemic, working as a "frontline" health caregiver can face many stresses. Through the interview analysis of this study, it can be found that patient feedback, family support, optimistic attitude, and stable personality are the sources of mindfulness of this study subjects during the COVID-19, and these factors contribute to their good resilience.

I think the two words, "time" and "personality", are closely related. Some people just come and go fast, and some people will drill into their hearts. Personally, after work, I still engage in activities similar to going out for exercise. So, it's about finding a way to find meaning in life. I believe this is a way to bypass the environment and focus on one thing, without getting caught up in trivial matters. (C05-01)

Patient feedback is the greatest support and encouragement given to physicians. (A05-02)

Once we understand the enemy, we understand this virus, we are no longer afraid of it. Stress needs to be adjusted, because unfamiliarity leads to stress when you are familiar with it, after getting used to it, you will not find it so difficult. (D05-02)

So, I believe that having meals and conversations with colleagues is better off. As I mentioned earlier, the mutual influence of peers and coworkers is actually a significant factor for change. (F05-02)

Resilience

Lastly, the interviewees mentioned that in Taiwan, as well as worldwide, we have to learn to co-exist with the virus, and getting vaccinated may become a routine. One interviewee, an ENT doctor, suggested that we should not panic about COVID-19. By staying healthy mentally and physically, we will get positive feedbacks even if we get infected with COVID-19. A comment from the psychiatrist in the interview is that people should not be embarrassed if they feel depressed by the pandemic. They can visit the psychiatric clinic and discuss their worries with the doctor. In the interview, a nurse said that during the outbreak, she/he had experienced many non-medical issues that were hard to anticipate based on his/her medical background. One example is the various side-effects people may experience after their vaccination.

The epidemic is not terrible, as long as we do a good job of physical hygiene and mental hygiene at any time, strengthen it, and then treat it as if we are really infected, or that there are people around us who are infected, how to encourage him, how to accompany him through the isolation stage after the epidemic? In this way, people will also get a lot of impressions, which is also positive feedback. (E05-03)

I believe people have adapted well, because the pandemic has made people more aware of hygiene and cleanliness, and the concept of epidemic prevention has also reached a higher level. (H05-03)

If people are frustrated that their lives have changed because of the severity of the pandemic, everything seems to have changed, then they should not feel embarrassed or embarrassed. People should be brave enough to come to psychiatric clinics and discuss their concerns with their doctors. (G05-03)

The Empirical Result Model

The comprehensive analysis of in-depth interviews in this study reveals that during the COVID-19 period, the medical capacity in Taiwan's outlying island (Kinmen) area was insufficient. This includes resource shortages and insufficient healthcare worker, particularly a severe shortage of physicians related to the pandemic. In addition, since Kinmen is an outlying island of Taiwan, most of its doctors are supported by Taiwan medical institutions, so doctors usually work in Kinmen Hospital for a short term, and almost none of them has worked for more than five years. As a result, healthcare workers faced heavy workloads during the COVID-19 period. With an overwhelming number of confirmed cases and a shortage of physicians, doctors from all specialties had to support the epidemic prevention efforts, leading to excessively long working hours. Based on the aforementioned findings, healthcare workers in the research area experienced significant work-related stress. At the same time, their mental health was affected. They felt anxious about the risk of their family members contracting the virus, and anxiety due to a lack of knowledge or skills in areas other than your specialty, and fear that you may experience various side effects after vaccination. Fortunately, the majority of healthcare workers were able to utilize mindfulness and resilience to cope with and alleviate stress, thus maintaining their mental health. They actively adjusted their attitudes towards the pandemic and work-related stress, sought resources to alleviate pressure, and avoided bringing work-related emotions back home. These coping strategies helped them effectively manage and reduce stress during the challenging COVID-19 period. In addition, healthcare workers also found restoration in the sense of achievement from patients and their families' appreciation. They regained their well-being by engaging in rational communication with patients and their families, as well as by adopting a different perspective when facing challenges. The positive feedback and recognition from patients and their loved ones contributed to the healthcare workers' resilience and played a significant role in their overall recovery and mental health. Based on the above, the empirical result model constructed in this study is shown in [Figure 3](#).

Discussion

From the interview results, it can be found that COVID-19 case in the study area emerged in late March, 2022. The local government tried its best and integrated all available resources, but there was only a capacity of 60 patients in Kinmen County. Compared with other outlying counties and cities in Taiwan, the study area had the least number of health workers and hospital beds. If the number of cases in the region exceeds 500 per day, or if the number of patients with moderate or severe disease increases, the overall medical capacity of the region will suffer.²³

In addition, for health workers, studies have shown that the most common sources of stress they have are risks to infection, heavy workloads, ethical dilemma when making clinical decisions, and unfamiliar issues derived from newly emerged infectious diseases. The results of this study are similar to existing studies. For example, Zheng's¹¹⁶ study found that the risk of infection and excessive workload among healthcare workers can cause health workers to worry, anxiety or depression, affecting not only their physical and mental health, but also the quality of care for their patients. Furthermore, this study also found that during the COVID-19 pandemic, health workers were exposed to various hazards: a high infection risk, long working hours, psychological distress, fatigue, and job burnout. As some studies (e. g.),¹¹⁷ have pointed out health workers were also at risk of transmitting the viruses to their family members, and experienced a high level of fear and sometimes discrimination, stigmatization, harassment, personal attack, insults, or even life-threatening physical assaults. The finding of this study confirmed that the nurses are an important medical team member, and they face similar mental and physical problems. For example, with their heavy workloads and stress, their mental health is often at great risk.¹¹⁸ Moreover, the results of this study are consistent with the findings of Pan et al,¹¹⁹ who pointed out that health workers often encounter mental health-related problems as a result of the intensive, stressful and risky health work. Internal and external pressure from the workplace may frequently cause mental health problems in health workers.¹¹⁶ All these problems and factors work together to increase the risk of mental disorders in some health workers. The stress and symptoms experienced by the participants in this study were similar to those mentioned in other studies.

Since the outbreak of COVID-19, lack of manpower has been the greatest problem faced by the study area. A surge in the number of confirmed cases means that the health workers there are more likely to be infected, which in turn would

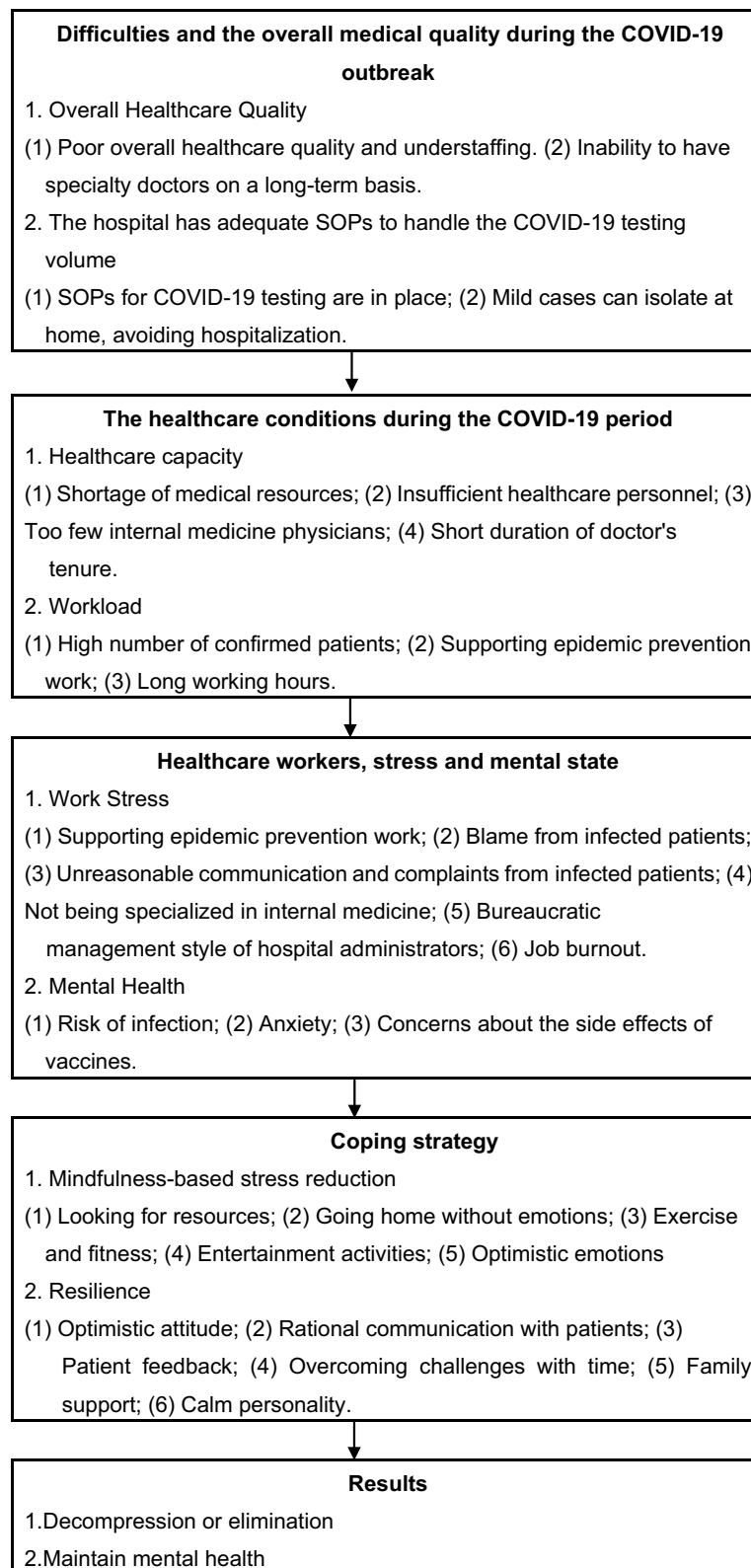


Figure 3 The Model of the Empirical Results of This Study.

Abbreviations: COVID-19, coronavirus disease 2019; SOPs, standard operating processes.

further reduce the region's medical workforce. Therefore, this study considers that healthcare providers should use various strategies (interventions) to support the resilience and mental health of these frontline health workers. A study by Patwekar et al¹²⁰ pointed that possible measures include job-based interventions such as changing the work routine, improving the equipment, and providing psychological support counseling.

Long ago, in the face of insufficient resources, the hospital investigated in this study was established to meet the basic medical needs of residents of the outer island. Gradually, people started to care about quality of life and other rights, so the hospital began to work on preventive healthcare, etc. Nevertheless, the operation of the hospital is still limited by its small market scale and difficulties in recruiting professionals.

Furthermore, battling against COVID-19 at the forefront, the health workers who participated in this study had experienced a tremendous amount of stress. Since the outbreak of COVID-19, most frontline medical issues have been centered around an imbalance between medical quality and patients' needs. For example, inadequate hospital beds, poor workforce allocation, and vaccine shortages make it difficult to achieve zero COVID. It is difficult for health workers to imagine when all the stress and trauma will end. Two key symptoms experienced by health workers are insomnia and anxiety, and when the symptoms are serious, their job performance would be compromised. As Baalbaki et al¹²¹ pointed out it is therefore critical to reduce the pressure on medical staff to prevent clinical negligence. Many studies are working on developing stress-relieving training or activities to help health workers reduce stress and fatigue. Romani and Ashkar,¹²² and Sierakowska and Doroszkiewicz¹²³ study pointed that hospitals must change their work environment, organize recreational activities, and provide various stress reduction courses such as meditation and mindfulness to reduce stress and improve the health of healthcare workers. Franco and Christie¹²⁴ study also pointed that health workers should participate mindfulness-based stress reduction training to develop their mindfulness ability and learn to care for themselves to reduce stress and fatigue while improving their resilience and well-being. It is good for preventing clinical negligence, promoting doctor-patient communication, and attaining the goal of patient-centered healthcare.¹²⁵ Consequently, mindfulness training is useful for enhancing health workers' work quality, which will improve healthcare quality for patients. Therefore, mindfulness-based stress reduction training can be viewed as a critical stress-reduction approach for health workers during the COVID-19 outbreak.

From this study's findings and discussions with the above, this study recommends the following: Firstly, it was considered that during the COVID-19 outbreak, in addition to taking precautionary measures, hospitals in the outer islands also need to ensure that medical staff can easily and truthfully implement these measures. It is also important to help health workers develop mental adaptability to reduce their work stress and risk of infection. Secondly, another good idea is to organize recreational activities and vaccination training from time to time to promote teamwork and educate health workers. These measures can reduce the negative emotions of healthcare workers at work and improve their mental health, leading to better care for patients. Thirdly, hospitals should limit the working hours of medical staff and find solutions in case of understaffing to avoid overworking or stressing medical staff. Last, in view of the shortage of medical equipment and manpower in the outer islands, the government should focus on improving the training system for public medical personnel and the promotion system for medical personnel on the outer islands, so as to ensure the income of public doctors, so as to reduce the turnover rate of medical personnel and maintain the medical quality for local residents.

Conclusion

This study found that during the COVID-19 outbreak, some common sources of stress for health workers included exposure to infectious diseases, heavy workloads, facing ethical dilemma in clinical decision-making, and unfamiliar problems from the pandemic. These types of stress cause worries, anxiety, and depression in health workers, which in turn can affect their mental and physical health as well as their patient-care performance. Therefore, improving health workers' adaptability to stress and providing stress-reducing strategies are crucial. This study proposed that mindfulness-based stress reduction and protecting mental health are important for health workers.

Suggestions for Future Researchers

It is a qualitative study, using grounded theory as the main method. Observation and interviews are commonly used methods for collecting data.^{126,127} To analyze and integrate the information on mental health, mindfulness stress reduction and resilience of medical staff in Taiwan's outlying islands based on the analysis method of grounded theory, and propose coping strategies for the overall medical capacity of Taiwan's outlying islands. Although the research method of this paper has a methodological basis, it may be that the sample is too small, and the dataset is limited, and the widely supported conclusions cannot be obtained.¹²⁸ Creswell and Tashakkori¹²⁹ proposed "Differing perspectives on mixed methods research", which considered that "the methodological perspective on mixed methods holds that one cannot separate methods from the larger process of research of which it is a part and that discussions of mixed methods should focus on the entire process of research, from the philosophical assumptions, through the questions, data collection, data analysis, and on to the interpretation of findings. This approach explicitly or implicitly ties the methods to philosophical assumptions".¹²⁹ (p. 305)

It suggests that future researchers can use other methods or theories as a guide to collect a wider range of information to obtain higher supporting conclusions. For example, future researchers can use "dialectical materialism" to discover things that have not been discovered in the past. Dialectical materialism is a philosophy of science, philosophy of history, and philosophy of nature developed in Europe based on the works of Karl Marx and Friedrich Engels.¹³⁰

In addition, social desirability bias refers to the tendency of subjects to choose answers in a way that meets social expectations and hide their true answers. When there are threatening questions, it is easy to arouse a defensive response from the interviewee so that it will not be negatively affected after telling the real answer.^{131,132} Studies have pointed out that The Social Desirability Scale has been used in psychology for decades. It is designed to measure whether individuals tend to choose false intentions that conform to social and cultural value in order to give a good impression on the public, replacing the psychological tendency of true will. Therefore, it is recommended that future researchers use the Social Desirability Scale to test whether the respondents have social desirability bias.¹³³

Furthermore, this study uses grounded theory as the methodology and in-depth interviews as the method of data collection, and extracts the opinions of the respondents through the processes of open coding, axial coding, and selective coding. However, qualitative research methods still have their shortcomings, such as insufficient sample size and social desirability bias. Therefore, in order to be able to explain the specific meaning of the respondents' answers to the research questions, it is recommended that future researchers in addition to qualitative research based on specific sampling procedures. For example, case studies on the most or least likely case selection (see),¹²⁸ can also add quantitative methods, and then conduct appropriate content analysis on the qualitative data collected through interviews (see),^{129,134,135} to compensate for qualitative research deficiencies.

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