ORIGINAL ARTICLE

The path of depression among frontline nurses during COVID-19 pandemic: A fuzzy-set qualitative comparative analysis

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ABSTRACT: *This study aimed to explore the combination of different conditional variables that led to depressive symptoms among frontline nurses who were fought against COVID-19 during the outbreak in Wuhan City, Hubei Province of China. The study was conducted in August 2020, which included 331 frontline clinical nurses who supported Wuhan's fight against COVID-19. The age range was 21–57 years and included 315 female nurses and 16 male nurses. This study used the fuzzy-set qualitative comparative analysis research method to explore the path of depression among frontline nurses. This study generated nine different configurations for the path of depression among frontline nurses, and had a detailed demonstration for each configuration. Each configuration distinguishes the different effects of influencing factors. For example, in the first configuration, gender, sleep disorder and PTSD exist as core conditions, while social support exists as a core condition lack. This study was presented results which was different what linear regression model reports. It takes into consideration the combined effect of each conditional variable on the development of depression. Nurse managers should pay attention to the combination of multiple influencing factors, instead of focus on single factors.*

KEY WORDS: *configuration, COVID-19, depression, fuzzy-set qualitative comparative analysis.*

INTRODUCTION

The COVID-19 pandemic is a continuous life-changing event that is affecting every region in the world in a subtle way. At the beginning of the COVID-19

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pandemic, the Chinese government sent 42 000 health-care workers to assist Wuhan city, the epicentre of the outbreak in China, to contain the spread of the disease and treat infected patients (Zhang *et al*. 2021a). However, due to the increase in workload, the shortage of specific drugs, the unknown of COVID-19 infection and the shortage of protective equipment, medical staffs were facing tremendous mental stress (Lai *et al*. 2020). Especially the clinical nurses who needed to carry out daily care for patients infected with novel coronavirus (Perez-Raya *et al*. 2021). Nurses constantly in contact with COVID-19 patients, which made them the most exposed group to the novel coronavirus (Gül & Kılıç 2021). Some studies conducted during the COVID-19 pandemic indicated that frontline clinical nurses suffer from mental health conditions such as depression, anxiety, stress and PTSD (Liu *et al*. 2020b;

Shanafelt *et al*. 2020). During the COVID-19 pandemic, the prevalence of depression among frontline clinical nurses who went to assisted Wuhan City was 20–47.1% (Dong *et al*. 2021; Zheng *et al*. 2021). Such high prevalence rate suggested that more attentions were needed to pay to the mental health status of those nurses.

Depression is a common mental disorder in the world, which defined as a mood disorder in which the manifestation of symptoms is combined with emotional symptoms (sadness, desperation, anhedonia and subjective sensation of discomfort), and causing a marked decreased interest in daily life activities (Salari *et al*. 2020; Tay *et al*. 2015). At present, relevant researches on the depression status of frontline nurses in the context of the COVID-19 pandemic mainly focus on: (i) to explore the influencing factors of depression of frontline nurses based on linear regression equation (Li *et al*. 2021a); (ii) exploring the path relationship between depression and other factors based on structural equation model (Abid *et al*. 2021); and (iii) based on small sample qualitative studies or longitudinal data to explore (Tsubono & Ikeda 2022; Zhang *et al*. 2021b). These studies have examined various mental health conditions such as depression among frontline nurses in the context of the COVID-19 pandemic from different perspectives. However, these factors are rarely investigated from a holistic perspective. This study aimed to explore the causes of depression among frontline nurses through a new perspective—qualitative comparative analysis (QCA), which is a set-theoretic analytic method that uses Boolean algebra to compare combinations of causal and outcome conditions between cases. QCA has two notable features, one is 'equifinality', meaning the combination of different condition variables can produce the same result, which is also a significant difference compared with regression analysis (Giménez-Espert *et al*. 2019). It focuses on the configuration effect between condition variables, which can help this study to reveal and understand the causal mechanism of depression among frontline nurses in detail. The second feature is 'asymmetry', that is, the conditions that lead to the results are asymmetric, which is also different from the traditional linear regression equation. Because the regression equation is concerned with a linear symmetric relationship, it is an interpretation of the results based on the individual contributions of each variable studied (Navarro-Mateu *et al*. 2020; Ragin 2008). However, both present different perspectives, far from being superior to one over the other.

Although a body of research has explored the underlying risking factors of depression in nurses, these studies have focused on the individual's internal characteristics, sociodemographic factors and external environmental factors from a microscopic perspective. Internal traits are often associated with factors such as stress, sleep, post-traumatic stress disorder and compassion fatigue. Studies regarding the COVID-19 pandemic have shown that sleep-related problems (such as sleep duration and time to fall asleep), as well as increased acute stress, are significantly associated with depression (Diaz *et al*. 2022). Furthermore, the alarming infection rate and mortality of the COVID-19 pandemic traumatized many individuals and caused them to exhibit PTSD-related symptoms (Arble *et al*. 2021). Many of frontline nurses who worked closely with COVID-19 patients have showed signs of compassion fatigue due to repeated depletion of empathy while caring for patients, which made them more vulnerable to depression (Figley 2002). Sociodemographic factors like age and gender, as well as environmental factors like social support, which were also closely associated with the prevalence of depression among frontline nurses. Therefore, in this study, the internal psychological characteristics of frontline nurses and external social support were configured differently to identify the explanation of the depressive outcome by the presence or absence of these conditions. Thus, the main aims of this study are as follows: (i) to explore the different combinations that cause depression among frontline nurses during the COVID-19 pandemic. (ii) identify the different effects of each influencing factor in the configuration. (iii) propose corresponding intervention measures according to different configurations.

METHODS

Participants and procedures

This study was conducted in August 2020, participants were frontline nurses from a northeastern Chinese province supporting Wuhan in the fight against the COVID-19 pandemic. The study applied the method of convenience sampling. The inclusion criteria were: (i) nurses being dispatched to Wuhan to fight the COVID-19 pandemic; (ii) nurses who were on the frontlines during the support period. The exclusion criteria were as follows: (i) incomplete questionnaires or questionnaires with logical errors; (ii) participants who were unable to participate due to physical or work reasons. Prior to this survey, researchers contacted the executive of each hospital where nurses are currently employed and stated the

purpose of this survey. To avoid the potential risk of infection, researchers issued an 'electronic version' of the questionnaire through the Questionnaire Star platform (similar to SurveyMonkey). In the end, 350 frontline nurses responded positively. After excluded questionnaires with obvious logic errors and too many missing items, a total of 331 valid questionnaires were obtained, and the effective recovery rate of the questionnaire was 94.6%. This study has received approved approval from the Research Ethical Committee of the authors' institution and before starting the investigation, the participants' verbal informed consent was obtained for this study.

MEASURES

PTSD checklist-civilian version

PTSD was assessed using the 17-item PTSD Check List-Civilian Version (PCL-C) (Weathers et al. 1993), which was used to assess the degree of distress caused by stressful events over the past few months. It used a five-point Likert-type scale for evaluation, with the higher the score, the higher the level of PTSD. In the current study, Cronbach's alpha coefficient for the PTSD was 0.908.

Patient health questionnaire-9 scale

This study used the Patient Health Questionnaire Depression Scale to measure the depression status of the participants (Kroenke et al. 2001). The scale consists of nine items, four-point Likert scale, and the total score ranges from 0 to 27. The higher the scores reported by the participants, the more severe their depressive symptoms. Cronbach's alpha coefficient for the PHQ-9 was 0.887 in this study.

Perceived stress scale

This study used the Perceived Stress Scale to assess the stress level experienced by participants over the past month (Cohen et al. 1983). Perceived stress was a self-report questionnaire with 10 items, and each item was rated on a five-point Likert scale. And with the higher the total score, the greater the pressure felt by the individual. In the current study, Cronbach's alpha coefficient for the PS was 0.717.

Insomnia severity index

In this study, the severity of insomnia severity index was used to measure the severity of sleep-related conditions in the participants (Morin et al. 2011). ISI was a self-report questionnaire containing seven items, which mainly used to assess the severity and impact of ISI. It used five-point Likert-type scale, with a total score ranged between 0 and 28 points and shown good reliability and validity in this study, and the Cronbach's alpha coefficient for ISI was 0.922.

Compassionate fatigue short scale

This study used the CF-Short Scale to measure the degree of compassionate fatigue of participants (Adams et al. 2006). The scale consists of 13 items in total, each with a score of 1 (rarely) to 10 (very frequent). It includes two dimensions: job burnout and secondary traumatic stress, which with higher the score, the more severe the symptoms of compassionate fatigue. In the current study, Cronbach's alpha coefficient for the CF was 0.897.

Social support rating scale

Social support was measured by the Social Support Rating Scale, which was a scale with 10 items (Xiao 1994). It has shown good reliability and validity in the Chinese population, and has been widely used in related studies (Li et al. 2021b). The higher the score obtained by the participant, the more social support they received. In the current study, Cronbach's alpha coefficient for the SSRS was 0.821.

Data analysis

The QCA was a research method between qualitative and quantitative proposed by Ragin in 1987. It is an asymmetric research method and different from traditional linear-based research methods, which can identify the possible asymmetric relationship between antecedents and results. In fact, not all studies support the positive or negative relationship between the independent variable and the dependent variable, which suggested that researchers can increase their contribution to the research by reporting the combination of conditions under which conditional variables have a positive effect on the outcome variables, instead of showing a limited number of models (Woodside 2013). For example, the depression of frontline nurses with different psychological characteristics may not be expressed in traditional regression-based models. Thus, this study was based on complexity and configuration theories to study the formation mechanism of

depression among frontline nurses (Woodside 2014). A result may be equally explained by alternative sets of causal conditions, because the relationship between factors is complex, the combination of different factors will be combined into enough configurations to explain the results (Fiss 2011).

This research method can explore the logical relationship between multiple causes and a specific result, because it is based on Boolean Algebra and fuzzy-set theory, which was good at cross-case comparative analysis of small and medium-sized samples (Ragin 1987). This study used fuzzy-set Qualitative Comparative Analysis (FsQCA) for analysis, which was the combination of fuzzy sets and logic principles with QCA (Ragin 2000). Fuzzy sets mainly include continuous, ordered and ratio data, and results in cases being partially in or out of sets. The difference with crisp set QCA (CsQCA) is that FsQCA applies the fuzzy-set method by using a fuzzy set scale (continuous from full non-membership (0) to full membership (1) or discrete number). FsQCA has a broader scope of application in research fields, and the research cases are not simply classified as 'affiliated' or 'non-affiliated', thus solving the problems of the mutual independence between independent variables and causal symmetry existing in traditional research methods. Thus, When the research data are a continuous variable, FsQCA is a more ideal methodology. This study used FsQCA software, for the analysis.

RESULTS

Sample characteristic

The study included 331 frontline clinical nurses who supported Wuhan's fight against COVID-19, which including 16 male nurses (4.8%) and 315 female nurses (95.2%). And with ages ranging from 21 to 57 (Mean = 34.69 years, SD = 7.15). These included 107 single nurses, 208 married and 16 divorced/widowed. Among them, 190, 97, 41 and 3 participants were junior, intermediate titles, senior titles and others, respectively.

Calibration

The first step in applying FsQCA method was to convert the raw score of the variable into a fuzzy membership between 0.0 and 1.0. This study used the direct calibration method, three qualitative breakpoints for full membership (1.0), full non-membership (0.0), and

crossover (0.5) points should be established first. This study used the three thresholds baseded on the previous study (Woodside 2013): the first threshold (0) was that the observed value completely exceeds the 10% setting range, the second threshold (0.5) puts the observed value at an intermediate level, neither inside nor outside the set and the last threshold (1) suggests that the observation was totally inside the set 90% percentile (Giménez-Espert & Prado-Gascó 2018). Thus, this study re-encodes the data: Gender (female = 1; male = 0), and the variables such as age, PS, depression, CF, ISI, PTSD and social support were recoded according to the three thresholds determined above. The descriptive statistics and calibration of variables were shown in Table 1.

Necessity analysis

After calibrating the variables under study, we need to carry out the necessary consistency of the score. Generally speaking, if the consistency score of a variable exceeds the threshold of 0.9, then this variable was considered to be a necessary condition (Schneider *et al*. 2010). The study conducted an analysis on the necessary conditions for whether the frontline nurses were diagnosed with depressive symptoms. The results showed that the gender of the frontline nurses was a necessary condition. More information saw Table 2.

Sufficiency analysis

Configuration thinking focuses on the complexity of causality, which requires the construction of truth tables to systematically analyse the complexity of causal (Ragin 1987). The truth table contains all the logically possible combinations of conditional variables, which

TABLE 1 *Main descriptions and calibration values*

	Age	PS	Depression	SSRS	CF	ISI	PTSD
M	34.69	17.70	7.42	38.63	31.84	8.31	27.72
SD	7.15	5.37	5.17	8.36	18.30	5.97	8.73
Min	21	0.00	0.00	15.00	13.00	0.00	17.00
Max	57	30.00	25.00	60.00	108.00	28.00	66.00
Calibration values							
P10	25.20	11.20	1.00	27.20	14.00	1.00	19.00
P50	34.00	19.00	7.00	39.00	26.00	8.00	26.00
P90	45.00	23.00	14.00	49.00	60.80	17.00	40.00

CF, compassion fatigue; ISI, insomnia severity index; PS, perceived stress; PTSD, post-traumatic stress disorder; SSRS, social support rating scale.

TABLE 2 *Summary of necessary conditions*

Condition variable	Depression	~Depression
Gender	**0.97**	**0.94**
~Gender	0.03	0.06
Age	0.66	0.58
~Age	0.60	0.67
PTSD	0.77	0.42
~PTSD	0.51	0.84
PS	0.77	0.52
~PS	0.51	0.75
ISI	0.78	0.45
~ISI	0.51	0.83
CF	0.75	0.46
~CF	0.52	0.80
SSRS	0.53	0.69
~SSRS	0.70	0.53

CF, compassion fatigue; ISI, insomnia severity index; PS, perceived stress; PTSD, post-traumatic stress disorder; SSRS, social support rating scale; The bold values, necessary condition.

can be used to perform combinatorial analysis on variables. Regarding the setting of the original consistency threshold. Ragin (2008) recommended that the consistency threshold should be set equal or >0.8, because any value lower than 0.80 has no actual basis to support the existence of the set relationship. Therefore, this study sets the consistency threshold at 0.8 and meet the PRI consistency if the value was >0.75. Consider the limited number of cases, the study set the case threshold to 1.0. The qualitative comparative analysis results of fuzzy sets, complex solutions, parsimonious solutions and intermediate solutions were obtained. The complex solution only analyses observed cases without using logical remainder, on the other hand, the parsimonious solution incorporates all possible logical remainders, and the intermediate solutions conform to theories and realities base on logical remainders. In most studies, scholars were more inclined to draw conclusions from intermediate solutions and combine parsimonious solutions to determine core and peripheral conditions, and they can also combine parsimonious solutions to determine core and peripheral conditions. If an antecedent condition appears in both the parsimonious solution and the intermediate solution, it was defined as the core condition which has an important influence on the result. If this antecedent condition only appears in the intermediate solution, then it was an peripheral condition which assist the result.

This research used the QCA graphical method proposed by Fiss (2011), which can reflect the relative importance of each factor in the conditional configuration. In this study, "●" was used to represent the conditional variable appears, and "⊗" means that the conditional variable does not appear. In addition, "●" was defined as the existence of a core condition, "⊗" was defined as the core condition does not exist and the blank cell suggests the conditional variable was irrelevant. Through FsQCA analysis, the model provides 10 different pathways that lead to the development of depression among frontline nurses. Furthermore, according to Ragin (2008), the consistency coefficient of the result should be >0.75 and the coverage rate should be >0.25. Thus, we delete the last configuration and finally got nine different combinations that lead to the development of depressive symptoms among frontline nurses. All nine configurations showed consistency scores exceeding 0.89, suggested that they were sufficient to produce convincing conclusions. The overall coverage of solutions was 0.75, which means all nine configurations can use to explain the path of depression for 75% of all cases. See Table 3.

DISCUSSION

Nine different pathways of depression path for frontline nurses were identified using FsQCA analysis, and complexity and configuration theories were used to analyse these pathways. The main difference between FsQCA and path analysis (eg. structural equation modelling) is that they are working based on different principles and different focus. Structural equation modelling is a variable-based statistical method that focuses on the net effect of an independent variable on a dependent variable. On the other hand, the fsQCA is a case-oriented technique focuses on combinatorial effects. It assumes an asymmetric relationship between the independent variable and the dependent variable, and multiple different combinations of conditional variables can lead to the same outcome (Rihoux & Ragin 2009; Woodside 2013). By comparing nine different configurations of depression, the present study found that the conditional variable of gender appeared in eight out of nine configurations considered in the study, indicating gender is a very influential factor of depression among frontline nurses during the COVID-19 pandemic. Because frontline nurses have frequent and close contact with patients and work more hours than usual, they may face a higher risk of infection. Most of them are female, and may face more mental health problems than male medical staff (Lai *et al.* 2020). In addition, some scholars proposed the need to focus on the impact of the

TABLE 3 *Depression-related configuration*

Condition variable	Depression									
	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
Gender	●	●	●	●	●	●	●	●		⊗
Age				●		⊗		●	⊗	⊗
ISI	●	•	●	●			●	●	●	⊗
PS		•			●	●	●	●	●	⊗
CF			●	●	●	•	●	•	●	⊗
SSRS	⊗			⊗	⊗		⊗		⊗	⊗
PTSD	●	•	●		●	●			•	•
Consistency	0.91	0.93	0.92	0.96	0.94	0.94	0.95	0.96	0.96	0.90
Raw coverage	0.49	0.57	0.54	0.36	0.41	0.36	0.41	0.44	0.30	0.01
Unique coverage	0.03	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Solution consistency	0.89									
Solution coverage	0.75									

"●", core condition; "•", peripheral condition; "⊗", absent as a core condition; "⊗", absent as a peripheral condition; Blank cells represent ambiguous condition; CF, compassion fatigue; ISI, insomnia severity index; PS, perceived stress; PTSD, post-traumatic stress disorder; SSRS, social support rating scale.

COVID-19 pandemic from a gender perspective, as this is crucial to the structure of the entire health system (Regenold & Vindrola-Padros 2021). Through the comparison, the study also found sleep disorders appeared in six configurations. Because high-quality sleep played an important role in relieving work fatigue, and improving physical functions and mental health status (Wu & Wei 2020). However, the COVID-19 pandemic is depleting the role of sleep, causing frontline nurses to exhibit various sleep disturbances that can cause them more vulnerable depressive symptoms. Next, this study will elaborate on each configuration that contributes to depression in frontline nurses.

In configuration 1, the combination of gender, ISI, PTSD and lack of social support led to depression in frontline nurses. Because during COVID-19 pandemic, female nurses were more likely to report depression than male nurses (Lai *et al*. 2020). As these nurses were the first batch of medical staff to be stationed in Wuhan to fight COVID-19, they have experienced heavy workloads and their working hours have been extended indefinitely, which could impair nurses' abilities to sleep, result in ISI, severe sleep deprivation and deficiency. Furthermore, ISI was one of the core symptoms of PTSD and the overlapping symptoms between two problems further aggravated the depressive symptoms in frontline nurses. It is important for frontline nurses to regulate their emotions and ensure flexibility, which are efficient strategies for them to relief their psychological distress and restore their abilities to sleep (Htay *et al*. 2021).

In configuration 2, gender was the core condition that affects the frontline nurses' depression. ISI, PS

and PTSD exist as peripheral condition. It was consistent with previous research results, because most of the participants in this study were female nurses, this may be due to differences in sampling (Denning *et al*. 2021). Furthermore, previous studies suggested that women tend to use emotion-focused coping strategies when encounter troubles. Therefore, when they were present in a critical and dangerous situation like COVID-19 pandemic, their emotional resources will be quickly exhausted. Without effective coping method, female nurses were at greater risk of developing depressive symptoms (Saeed *et al*. 2021).

In configuration 3, gender, ISI, CF and PTSD all exist as core conditions. During the COVID-19 pandemic, frontline nurses have the most frequent contact with COVID-19 patients. When they were taking care of patients, they witnessed their pain and struggles, which will induce negative emotions in nurses themselves. This will lead to feelings of burnout and secondary traumatic experiences, and show symptoms of CF and PTSD (Dosil *et al*. 2020). Some studies have found that poor mental health status could weaken people's immune system, and poor physical condition will also increase the psychological distress experience by individuals (Mahmoudi *et al*. 2021).

In configuration 4, gender, age, ISI and CF are the core conditions, while social support was the missing core condition. In this configuration, age was included as a core condition. Younger nurses were more likely to show psychological problems, which may be related to lack of social and work experience. Because they have limited professional knowledge, skills and self-

regulation ability compared with older nurses, especially in response to public health emergencies like COVID-19 (Tang *et al*. 2017). In addition, women pay more attention to their inner feelings and psychological state, they have invested a lot of energy and empathy in the process of caring for COVID-19 patients for a long time, which could exhaust nurses' emotional resources and lead to CF (Neitzke 2016; Perez-Chacon *et al*. 2021). CF was composed of job burnout and secondary trauma, and sleep quality directly affects burnout and traumatic stress, which makes frontline nurses face psychological problems (Xie *et al*. 2020).

In configuration 5, gender, PS, CF and PTSD exist as core conditions. In the context of the COVID-19 pandemic, frontline nurses were facing new working environment, heavy workload and fear of infection, which greatly increase the pressure experienced by them (Liu *et al*. 2020a). Based on the conservation of resources theory proposed by Hobfoll (2001), if individuals do not have enough resources to measure the needs of the internal and external environment, they will face tremendous pressure. Due to the critical situation during the pandemic, frontline nurses could not find enough resources (social support from family and friends) to adjust their inner pressure, and this kind of stress is usually trauma-related stress. Furthermore, CF is a result of secondary traumatic stress (Figley 1995). The combination of these conditional variables led to depression in frontline nurses.

In configuration 6, gender, PS and PTSD exist as core conditions. The stress experienced by frontline nurses was trauma-related stress, which caused by their exposure to the COVID-19 pandemic, re-experience, and trauma-related hyperarousal (Dosil *et al*. 2020). Previous studies have shown that traumatic stress has no ultimate recovery ability and has a cumulative destructive effect on the mental health of the traumatized individuals. Once the individual cannot bear the pressure, they will develop PTSD (Neuner *et al*. 2004).

In configuration 7, gender, ISI, PS and CF exist as core conditions, while social support was a missing core condition. CF is a type of secondary post-traumatic stress disorder, which is caused by the exposure of other people's traumatic experiences. When frontline nurses see or hear the painful experiences of COVID-19 patients, they will have symptoms such as intrusive thoughts, sleeping problems, and nightmares (Figley 1995). Coupled with the tremendous pressure they endure, they are more prone to depressive symptoms.

In configuration 8, gender, age, PS and ISI all exist as core conditions, while CF exists as a marginal condition. Nurses fight against COVID-19 had to face high work demands, harsh working environment with limited medical resources, and being away from their home and loved ones. No doubt, they will experience tremendous pressure (Lai *et al*. 2020). Especially for younger female nurses, who lack work experience and strong mind to help them to get through hardships (Al & Al Khadhuri 2021). PS and ISI are cooccurrence psychological problems. In response to stress, cortisol levels may spike and disrupt the sleep–wake cycle, thereby increasing sleep fragmentation and ISI (Basta *et al*. 2007). This may be because the stress response and sleep problems have a common realization path-related to the change in the level of the hypothalamic–pituitary–adrenal axis. In this scenario, the mutual exacerbation of stress and the sleep disorder both has a huge impact on mental health status.

In configuration 9, gender factor does not appear as a necessary condition; ISI, PS and CF were identified as core conditions, and social support was a missing core condition. This is the first time that gender is not identified as a necessary condition in a configuration. This means that in a public health emergency such as COVID-19 pandemic, frontline medics were all facing serious psychological problems regardless of their genders. One study showed that individuals could maintain their emotional balance under stressful situations if they can get support from their colleagues, families and friends (Nowicki *et al*. 2020). This shows the necessity of providing social support for heroes fighting on the frontline during public health emergencies like COVID-19 pandemic.

LIMITATIONS OF THIS REVIEW

This research has several limitations. First of all, the data gathered for this research were based on a questionnaire survey, so the subjective bias was inevitable. Secondly, the conditional variables explored in this study were limited. In future studies, more variables that affect the path of depression should be take into account. Last, like all qualitative studies, the results would differ from sample to sample. The current research can only be applied to the sample of this research, other samples should be extrapolated cautiously. In future research, it should be considered to incorporate more condition variables into the configuration of depression. And then, the difference between

the linear regression model and the QCA model can also be compared using the research data.

CONCLUSIONS

This study used the qualitative comparative analysis to investigate the path of depression in nurses who went to Wuhan City to assist the fight against COVID-19. To our best knowledge, this is the first QCA analysis deployed to study the path of depression. Furthermore, it also considers the principle of equality, that is, different combinations of configurations that lead to the development of depression. In this study, nine different pathways with the combination of various conditional variables are explored, and different interpretations are conducted from the perspective of each pathway. This suggests that when formulating intervention measures, medical and health departments should take into account that the path of depression is not one way through, there are multiple pathways that could lead to the development of depression. It is not enough to just consider a single factor or causality. And combined with the different effects of each influencing factor in the configuration to take corresponding intervention measures, which is more conducive to improving the depression symptoms of first-line nurses.

IMPLICATIONS FOR CLINICAL PRACTICE

This study provided nursing management field with new insights. Instead of investigating influencing factors independently, relevant departments should pay more attention to the combined effects of multiple factors that lead to the development of depression, take corresponding interventions for different combinations of influencing factors. Especially in clinical research, it should be considered to formulate an intervention plan from a holistic perspective, comprehensively consider the role of each risk factor in the configuration and formulate a personalized plan.

DATA AVAILABILITY STATEMENT

The data of this study can be obtained from the author as required.

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