Work stress and professional quality of life among Chinese nurses during the COVID-19 pandemic: the chain mediating role of self-compassion and benefit finding

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Abstract

Background Since the outbreak of the Coronavirus Disease 2019 (COVID-19), front-line nurses have faced not only daily work stress but also a high risk of infection and excessive workload, leading to unsatisfactory professional quality of life (ProQOL). This study aimed to explore whether self-compassion (SC) and benefit finding (BF) play a chain mediating role between work stress and ProQOL among Chinese nurses during the COVID-19 pandemic.

Methods From March to April 2022, a sample of 13,936 Chinese nurses was recruited through snowball sampling. Demographic information, work stress, SC, BF, and ProQOL were assessed. The SPSS 25.0 software and Amos 24.0 software were used for statistical analysis. The bootstrap method was employed to construct and examine the chain mediating structural equation model.

Results The ProQOL level of Chinese nurses during the COVID-19 pandemic was moderate. The overall fit indices for the compassion satisfaction (CS), burnout (BO), and secondary traumatic stress (STS) models were satisfactory (χ^2/df = 2.486, 3.256, 2.553, RMSEA = 0.011, 0.014, 0.011, the GFI, AGFI, NFI, and CFI values were all above 0.90). Work stress had direct effects on CS, BO, and STS (β=−0.171, 0.334, 0.222, P < 0.001), and also indirectly affected these outcomes through SC (point estimate=−0.010, 0.021, 0.024, P < 0.001), BF (point estimate=−0.033, 0.015, −0.011, P < 0.001), as well as their chain mediating effect (point estimate=−0.015, 0.006, −0.005, P < 0.001).

Conclusions Our study suggests that SC and BF partially mediated the association between work stress and ProQOL in Chinese nurses during the COVID-19 pandemic. Training on SC and BF may be crucial components of interventions aimed at improving ProQOL.

Keywords Work stress, Professional quality of life, Chinese nurses, Chain mediation model

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Introduction

Since the outbreak of Coronavirus Disease 2019 (COVID-19), front-line nurses have inevitably faced greater pressure, including a high risk of infection, excessive workloads due to the increasing number of confirmed and suspected patients, frequent exposure to patient suffering and death [1–3]. This heightened anxiety and work stress can result in chronic fatigue, low job satisfaction, secondary traumatic stress (STS), and high turnover rates [4, 5], further exacerbating labor shortages and poor nursing quality in the healthcare industry [6, 7]. Given that work stress is a variable that cannot be easily altered in the short term, it is essential to explore mediating factors that influence the relationship between work stress and nurses' professional well-being to address this issue effectively.

Professional quality of life (ProQOL) is an index used to evaluate the quality one feels in relation to his/her work [8], which incorporates compassion satisfaction (CS), burnout (BO), and STS [8, 9]. CS reflects the positive aspect of one's job, while BO and STS denote the negative aspects. The ProQOL of nurses has been reported at a low to medium level [10, 11], primarily due to their long-term exposure to patients' pain and suffering [12] and the excessive workloads during the COVID-19 pandemic [2, 3, 13]. It is estimated that 38.2% of front-line nurses exposed to COVID-19 experienced CS, while 19.6% and 69.6% suffered from BO and STS, respectively [14]. Nurses with reduced ProQOL are more likely to experience physical and psychological symptoms [15], lose compassion for patients [16], and exhibit increased turnover intention [17], which can lead to severe consequences for nurses themselves, patients, and medical institutions [18, 19]. In this context, understanding the predictors of nurses' ProQOL and potential mechanisms is critically important.

A medium to high level of work stress is prevalent in clinical nursing [20–22] and has been identified as a key predictor of nurses' ProQOL [11, 23]. Specifically, work stress is positively associated with BO and STS but is inversely related to nurses' job satisfaction and CS [5, 23, 24]. This suggests that efforts to reduce work stress could be beneficial for improving nurses' ProQOL. Given the ongoing shortage of nurses [25], it is challenging to mitigate work stress by directly reducing the workload of nurses. Fortunately, studies have shown that effective coping strategies can enhance the ProQOL of nurses [26–28], indicating a potential avenue to alleviate the negative effects of work stress on their ProQOL during the COVID-19 pandemic.

Self-compassion (SC) refers to being supportive toward oneself when experiencing suffering or pain caused by personal mistakes or external life challenges [29] and has been extensively reported as a protective factor for various well-being indicators [30, 31]. Studies indicate that SC is an effective factor for regulating stress [29, 32] and can protect healthcare staff from work stress [33, 34]. It has been reported that SC training not only helps nurses cope with work-related stress but also enhances their mental health and well-being [35–37]. Additionally, all dimensions of SC are significantly related to the subscale scores of ProQOL among nurses during the COVID-19 crisis [38–40]. However, few studies have investigated whether SC mediates the relationship between work stress and the three facets of ProQOL among nurses.

In addition, benefit finding (BF), defined as the process of deriving positive growth from adversity [41], has garnered significant interest among scholars in recent years. A systematic review has shown that BF is a protective factor for the mental health of patients with cancer, particularly regarding anxiety and depression [42]. A recent randomized controlled trial also found that BF interventions are effective in improving the quality of life among stroke survivors and their family caregivers [43]. Moreover, previous studies have verified that BF plays a mediating or moderating role in the associations between stress and mental health among patients with chronic diseases and their family caregivers [44–46]. Nevertheless, research on BF has primarily focused on patients with chronic diseases and/or their family caregivers, and no studies to date have explored the relationship between BF and ProQOL among registered nurses.

According to cognitive appraisal theory [47], the effect of stressors on individuals mainly depends on the psychological process of individuals' cognitive evaluation and coping. As positive psychological factors for re-evaluating and recognizing negative life events [48, 49], the favorable effects of SC and BF on promoting mental health have been reported in various studies [42, 50]. Meanwhile, many recent studies have demonstrated a positive correlation between SC and levels of post-traumatic growth (PTG) [51, 52]. Since BF and PTG both represent positive changes following stressful events [48], the present study hypothesized that SC, BF, and their chain relationship mediate the association between work stress and ProQOL among Chinese nurses during the COVID-19 pandemic. Therefore, this study aimed to construct a chain mediation model to explore whether and to what extent SC and BF mediate the association between work stress and ProQOL. The hypothetical model of the study is presented in Fig. 1.

Methods

Participants

This study was approved by the Biomedical Ethics Committee of Xi'an Jiaotong University Health Science Center (2022-0005). From March to April 2022, a sample
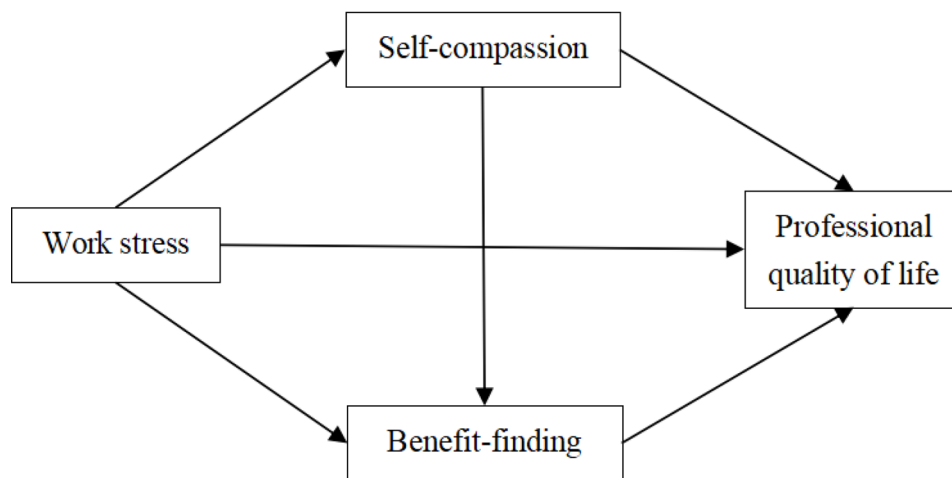
Fig. 1 Hypothetical model of the present study

of 13,936 Chinese nurses was recruited using a snowball sampling method. Participants were contacted via WeChat, the most popular social media platform in mainland China. Online questionnaires were distributed to participants through Sojump, a service provider specializing in online surveys. Nurses who met the following criteria were eligible for this study: (a) being a registered nurse; (b) having a minimum of 12 months of nursing experience; (c) having internet access; and (d) being on duty within the last three months. Those who did not voluntarily participate in the survey were excluded from this study. Before data collection, informed consent was obtained from each participant. Only after completing all items in the questionnaires could participants successfully submit their surveys. Only one entry was allowed per IP address to prevent multiple entries from the same individual.

Measurements

Basic characteristics

The basic data questionnaire was designed to collect socio-demographic and work-related characteristics, such as age, gender, marital status, educational attainment, professional title, hospital, job position, years of work experience, involvement in supporting other hospitals or institutions, and whether participants cared for COVID-19 patients.

Work stress

Work stress was evaluated by the Chinese Nurses Stressor Scale (CNSS) [53], which consists of 35 items and five dimensions. Participants responded to each item on a four-point Likert scale from 1 (no pressure) to 4 (severe pressure). The total score ranges from 35 to 140 points, with higher scores indicating greater levels of work stress. In this study, the Cronbach's α coefficient

ranged from 0.826 to 0.922 for each dimension of the CNSS and was 0.958 for the overall scale, indicating an adequate internal consistency.

SC

The Self-Compassion Scale-Short Form (SCS-SF) [54] was used to measure how participant usually acts towards themselves in difficult times. The SCS-SF consists of 12 items and six subscales: self-kindness, common humanity, mindfulness, self-judgment, isolation, and over-identification. Participants responded to each item on a five-point Likert scale from 1 (almost never) to 5 (almost always). Responses to the negative subscale items were reversed to calculate an overall scale score, which ranges from 12 to 60 points, with higher scores indicating greater levels of SC. In this study, the SCS-SF demonstrated satisfactory internal consistency, with a Cronbach's α of 0.856.

BF

The General Benefit Finding Scale (GBFS) [41] was used to evaluate BF of participants. It consists of 28 items with six dimensions: acceptance (items 1–5), family bonds (items 6–9), growth (items 10–15), relationships (items 16–19), empathy (items 20–24), and reprioritization (items 25–28). Nurses were asked to reflect on difficult times they had experienced at work and to respond to each item on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). The total score of the GBFS was obtained by summing up the responses to all items (ranges: 28–140). A higher score indicates a greater level of BF. In this study, the GBFS demonstrated sound internal consistency, with a Cronbach's α of 0.979.

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ProQOL

The Professional Quality of Life Scale [8] was used to measure the frequency of positive and negative aspects of participants' working experiences in helping patients over the past 30 days. It comprises 30 items and three subscales, namely CS, BO, and STS. This instrument employs a five-point Likert scale ranging from 1 (never) to 5 (very often). Total scores for each subscale range from 10 to 50, with higher scores indicating greater levels of CS, BO, and STS. Scores of 22 or less, 23 to 41, and 42 or more indicate low, average, and high levels, respectively. In this study, the Cronbach's α coefficients were 0.920, 0.749, and 0.879 for CS, BO, and STS, respectively.

Statistical analyses

Data analyses were performed using SPSS 25.0 for Windows (IBM Corp., Armonk, NY, USA), with statistical significance set at 0.05 (two-tailed). Descriptive analyses summarized the study variables, and Cronbach's α coefficients were calculated for the measurement tools. The t-test and one-way ANOVA were employed to compare the means of CS, BO, and STS across different groups. Pearson correlation analyses were conducted to examine the bivariate relationship between the study variables (i.e., work stress, SC, BF, and ProQOL). Amos 24.0 (IBM Corp., Armonk, NY, USA) was employed to construct a chain mediating structural equation model, and the bootstrap method was used to estimate the mediating effects of both SC and BF in the association between work stress and ProQOL.

Results

Characteristics of the participants

A total of 13,936 questionnaires were returned from 215 hospitals across 29 provinces in China. Among them, 11,924 (85.5%) questionnaires were deemed valid (excluding those completed in less than 2 s per item) and used for final analyses. Most of the participants were female (97.2%), married (74.6%), and worked in tertiary hospitals (77.7%). Those aged 40–59 years old, who were married, held a master's degree or higher, had a professional title of co-chief nurse or above, worked as head nurses, worked in a tertiary hospital, and had more than 10 years of experience were more likely to report a higher level of CS ($P < 0.05$). Statistically significant differences in BO and STS were observed concerning marital status, education attainment, professional title, hospital level, and job position during the COVID-19 pandemic ($P < 0.001$) (see Table 1).

Correlations analysis of SC, BF, and ProQOL

The results of correlation analysis indicated that work stress was significantly positively correlated with BO ($r = 0.488$, $P < 0.001$) and STS ($r = 0.242$, $P < 0.001$), but negatively correlated with SC ($r = -0.297$, $P < 0.001$), BF ($r = -0.260$, $P < 0.001$), and CS ($r = -0.330$, $P < 0.001$). A positive association between SC and BF ($r = 0.325$, $P < 0.001$) and CS ($r = 0.317$, $P < 0.001$) was observed, alongside a negative association between SC and BO ($r = -0.466$, $P < 0.001$) and STS ($r = -0.246$, $P < 0.001$). Additionally, BF was positively associated with CS ($r = 0.592$, $P < 0.001$) and STS ($r = 0.041$, $P < 0.001$), but negatively associated with BO ($r = -0.479$, $P < 0.001$) (see Table 2). Correlation analysis revealed that all variables were significantly correlated with each other, satisfying the statistical requirements for further mediating effect analysis of work stress and ProQOL.

Analysis of the mediating effects of CS and BF in the relationship between work stress and ProQOL

The model fit indicators were within the ideal range (Model A: $\chi^2/df = 2.486$, RMSEA = 0.011; Model B: $\chi^2/df = 3.256$, RMSEA = 0.014; Model C: $\chi^2/df = 2.553$, RMSEA = 0.011; the GFI, AGFI, NFI, CFI values for all three models exceeded 0.90). The direct effects of work stress on CS, BO, and STS were statistically significant ($\beta = -0.171$, 0.334, and 0.222, $P < 0.001$). As assumed, SC and BF not only had significant independent mediating effects but also demonstrated a chain mediating effect on the relationship between work stress and ProQOL of nurses (see Fig. 2). Specifically, both the direct effects of work stress on SC ($\beta = -0.298$, $P < 0.001$) and BF ($\beta = -0.183$, $P < 0.001$) were statistically significant. The direct effect of SC on BF was also significant ($\beta = 0.271$, $P < 0.001$). Additionally, the direct effects of SC on CS, BO, and STS were statistically significant ($\beta = 0.097$, -0.263, and -0.233, $P < 0.001$), as were the direct effects of BF on CS, BO, and STS ($\beta = 0.505$, -0.293, and 0.180, $P < 0.001$).

The mediation analysis results indicated that the direct effect of work stress on CS (point estimate = -0.061, 95% CI: -0.067, -0.055), BO (point estimate = 0.091, 95% CI: 0.087, 0.095) and STS (point estimate = 0.077, 95% CI: 0.070, 0.084) were all statistically significant ($P < 0.001$). The mediating effect comprised three indirect pathways: (1) work stress → SC → CS/BO/STS, (2) work stress → BF → CS/BO/STS, and (3) work stress → SC → BF → CS/BO/STS. All three indirect effects were statistically significant ($P < 0.001$). The total effects of work stress on CS (point estimate = -0.119, 95% CI: -0.125, -0.112), BO (point estimate = 0.133, 95% CI: 0.128, 0.138), and STS (point estimate = 0.085, 95% CI: 0.078, 0.092) were also statistically significant ($P < 0.001$) (See Table 3).

Discussion

As far as we know, this is the first large-scale study investigating the mechanisms through which work stress affects the three facets of ProQOL among Chinese nurses

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Table 1 Basic characteristics of the participants in this study ($n = 11,924$)

Variables		n (%)	CS			BO			STS		
			Mean	SD	t/F (P)	Mean	SD	t/F (P)	Mean	SD	t/F (P)
Age (years)	20–39	10,158 (85.2)	32.4	6.7	−11.4 (<0.001)	27.6	5.1	12.2 (<0.001)	28.5	6.7	0.6 (0.523)
	40–59	1,766 (14.8)	34.5	7.0		25.9	5.5		28.4	6.7	
Gender	Male	330 (2.8)	32.2	7.8	−1.3 (0.189)	27.2	5.6	−0.6 (0.553)	27.9	7.4	−1.5 (0.147)
	Female	11,594 (97.2)	32.7	6.8		27.4	5.2		28.5	6.6	
Marital status	Single/Divorced/Widowed	3,024 (25.4)	31.5	6.7	−11.4 (<0.001)	27.8	5.2	5.6 (<0.001)	28.0	6.4	−4.4 (<0.001)
	Married	8,900 (74.6)	33.1	6.8		27.2	5.2		28.6	6.8	
Education attainment	Junior college	2,587 (21.7)	32.4	6.8	4.9 (0.007)	27.9	5.1	19.9 (<0.001)	29.3	6.9	26.5 (<0.001)
	Bachelor	9,195 (77.1)	32.8	6.8		27.3	5.2		28.2	6.6	
	Master or above	142 (1.2)	33.9	7.1		26.0	5.0		27.4	6.6	
Professional title	Junior nurse	1,936 (16.2)	32.1	6.9	59.6 (<0.001)	27.9	5.0	73.6 (<0.001)	29.0	7.0	9.3 (<0.001)
	Senior nurse	5,199 (43.6)	32.3	6.6		27.8	5.0		28.6	6.7	
	Nurse-in-charge	4,209 (35.3)	33.1	6.8		27.0	5.3		28.1	6.5	
	Co-chief nurse or above	580 (4.9)	35.8	6.8		24.8	5.7		27.8	6.6	
Hospital level	Primary	347 (2.9)	32.1	8.0	11.0 (<0.001)	27.1	6.1	26.1 (<0.001)	26.8	6.4	32.7 (<0.001)
	Secondary	2,311 (19.4)	32.2	6.7		28.1	4.9		29.3	6.8	
	Tertiary	9,266 (77.7)	32.9	6.8		27.2	5.2		28.3	6.6	
Job position	General nurse	10,354 (86.8)	32.4	6.8	66.1 (<0.001)	27.6	5.1	77.2 (<0.001)	28.5	6.7	9.2 (<0.001)
	Head nurse	1,231 (10.3)	34.7	6.7		26.0	5.5		28.2	6.6	
	Others	339 (2.8)	34.1	6.9		25.5	5.8		27.1	6.3	
Working experience	1–3 years	1,938 (16.3)	31.8	6.7	48.6 (<0.001)	27.7	5.1	32.2 (<0.001)	28.3	6.6	1.1 (0.357)
	4–5 years	1,439 (12.1)	31.9	6.6		27.9	5.2		28.4	6.7	
	6–10 years	3,217 (27.0)	32.3	6.5		27.8	4.9		28.6	6.6	
	>10 years	5,330 (44.7)	33.5	7.0		26.9	5.4		28.4	6.8	
Backup personnel	No	9,201 (77.2)	32.6	6.7	−2.4 (0.014)	27.38	5.2	−0.1 (0.914)	28.4	6.6	−2.6 (0.008)
	Yes	2,723 (22.8)	33.0	7.1		27.39	5.3		28.8	6.9	
Care for COVID–19 patients	No	11,580 (97.1)	32.7	6.8	−2.0 (0.044)	27.4	5.2	−0.8 (0.409)	28.4	6.7	−3.2 (0.001)
	Yes	344 (2.9)	33.4	7.2		27.6	5.4		29.6	7.2	

Notes CS = compassion satisfaction, BO = burnout, STS = secondary traumatic stress

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Table 2 Correlations of work stress, SC, BF, and ProQOL

Variables	1	2	3	4	5	6
1 Work stress	1					
Nursing professional work	0.817***	−0.233***	−0.227	−0.302***	0.417***	0.176***
Time allocation and workload	0.823***	−0.209***	−0.198	−0.285***	0.406***	0.160***
Working environment and instrumentation	0.728***	−0.174***	−0.185	−0.220***	0.322***	0.161***
Patient care	0.887***	−0.280***	−0.207	−0.267***	0.403***	0.227***
Management and interpersonal relationship	0.876***	−0.290***	−0.260	−0.293***	0.458***	0.246***
2 Self–compassion	−0.297***	1				
Mindfulness	−0.383***	0.355***	0.050***	0.117***	−0.253***	−0.192***
Common humanity	−0.385***	0.466***	0.126***	0.175***	−0.342***	−0.237***
Self kindness	−0.328***	0.327***	0.028***	0.086***	−0.223***	−0.193***
Self judgment	−0.369***	0.497***	0.118***	0.187***	−0.332***	−0.210***
Isolation	−0.297***	0.374***	0.008	0.050***	−0.193***	−0.203***
Over identification	−0.335***	0.445***	0.074***	0.083***	−0.274***	−0.265***
3 Benefit finding	−0.260***	0.325***	1			
Acceptance	−0.236***	0.309***	0.841	0.493***	−0.420***	0.011***
Family bonds	−0.208***	0.272***	0.871	0.506***	−0.409***	0.040***
Growth	−0.248***	0.320***	0.940	0.546***	−0.456***	0.012***
Relationships	−0.242***	0.292***	0.928	0.553***	−0.442***	0.044***
Empathy	−0.227***	0.261***	0.923	0.541***	−0.415***	0.064***
Re–prioritization	−0.246***	0.292***	0.880	0.533***	−0.435***	0.064***
4 CS	−0.330***	0.317***	0.592***	1		
5 BO	0.488***	−0.466***	−0.479***	−0.644***	1	
6 STS	0.242***	−0.246***	0.041***	0.123***	0.488***	1

Notes CS = compassion satisfaction, BO = burnout, STS = secondary traumatic stress. ***$p < 0.001$

during the COVID-19 pandemic. The present study demonstrated that the effects of work stress on CS, BO, and STS were partially mediated by SC and BF. Notably, a chain mediating effect of SC and BF was identified in the relationship between work stress and CS, BO, and STS.

This study showed that SC played a mediating role in the relationship between work stress and ProQOL of nurses during the COVID-19 pandemic, aligning with previous studies [55]. Specifically, some researchers have reported the mediating effect of SC on the relationship between stress and BO among nurses [38, 56, 57], as well as between stress and depression/anxiety in Japanese workers [55]. SC serves as a self-attitude and stress moderator that helps individuals adapt and cope with stress [29, 38], positively influencing well-being outcomes at work [58]. Therefore, nurses with higher SC tend to perceive less work stress. Moreover, SC significantly affects ProQOL of nurses, consistent with several previous studies indicating that SC is a protective factor for ProQOL [38–40, 59]. Nurses exhibiting higher levels of positive SC were more likely to understand and accept themselves during experiences of pain or failure [49], which fosters empathetic behaviors [60]. Thus, elevated levels of SC can alleviate nurses' negative emotions in stressful situations, enhance their CS, and reduce BO and STS.

The present study also found that BF mediated the association between work stress and ProQOL, which echoed previous studies on the mediating role of BF

in the relationship between burden and mental health among caregivers of patients with chronic disease [46, 61]. To our knowledge, while the role of BF in patients with chronic disease and their caregivers has been extensively reported, research exploring its effects on nursing staff remains limited. BF has been proven to be a cognitive evaluation strategy when confronting stressful life events [41], providing a protective barrier against work stress and helping nurses focus on positive aspects while mitigating negative thought patterns [42], thereby improving the levels of ProQOL. Interestingly, this study indicated that BF was positively correlated with STS in nurses, which was contrary to conventional understanding. A similar finding emerged in a study [62] of children with chronic pain, which also revealed a positive association between BF and post-traumatic stress disorder. This can be explained by the fact that traumatic events are the prerequisite for BF [63]. Nurses with higher BF levels may have encountered more severe traumatic events, therefore leading to higher levels of STS. The relationship between BF and STS is multifaceted and complex, suggesting that further longitudinal studies are needed to explore this dynamic in greater depth.

This study was the first to examine the chain mediating effect of SC and BF on work stress and ProQOL among Chinese nurses. Based on the cognitive appraisal theory [47], the psychological processes of individual cognitive evaluation and coping determine how stressors impact
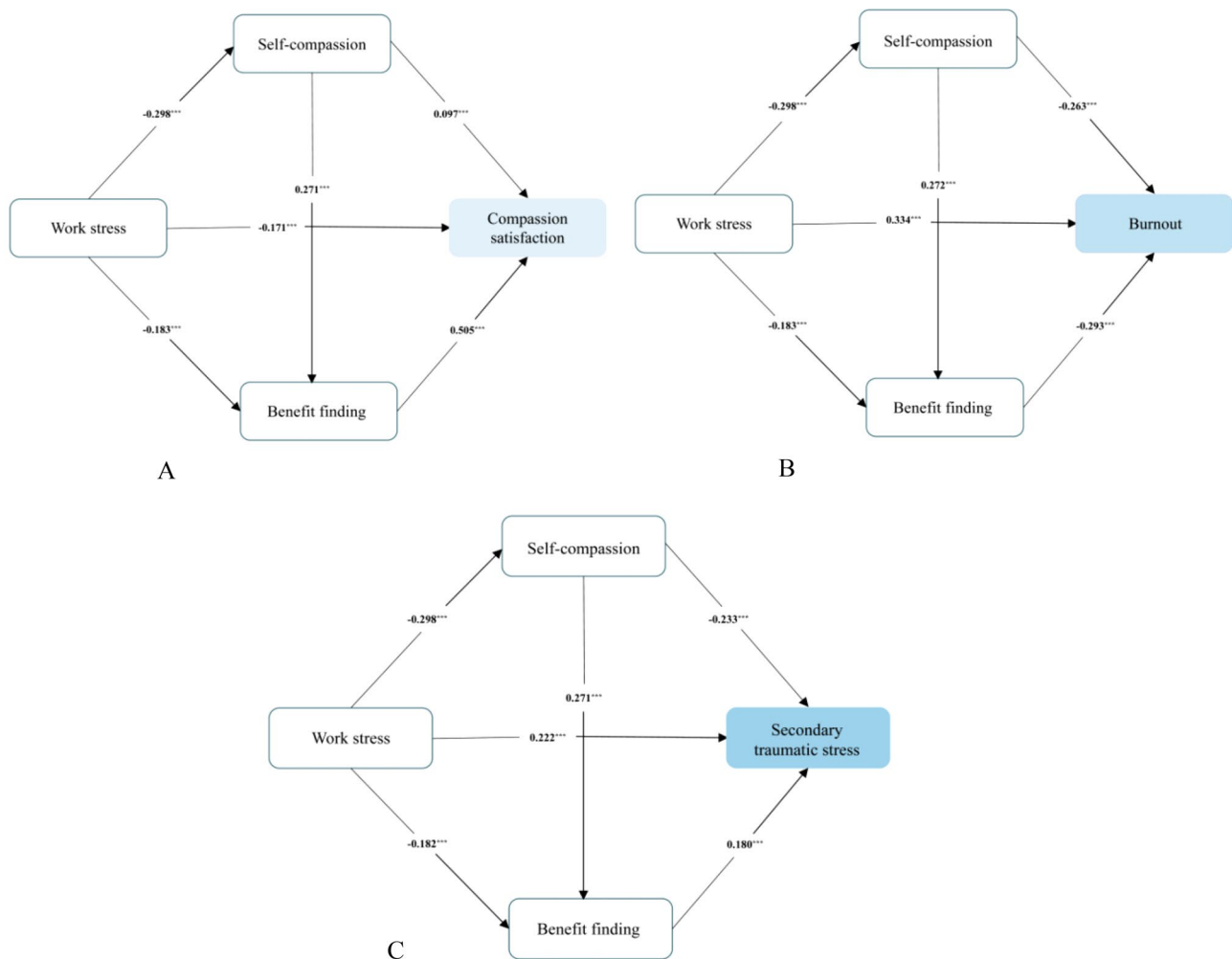
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Fig. 2 The chain mediation model of work stress and the three facets of professional quality of life. Model **A**: Compassion satisfaction. Model **B**: Burnout. Model **C**: Secondary traumatic stress. *Notes* *** $p < 0.001$. Age, marital status, hospital grade and duty were adjusted in model (**A**) Age, education attainment, professional title, job position and working experience were adjusted in model (**B**) Marital status, education attainment, professional title, COVID-19 support personnel, care for COVID-19 patients were adjusted in model **C**

individuals. The findings of the current study align with this theoretical model. First, SC, characterized by acceptance and kindness towards oneself, can effectively reduce the perceived intensity of stress events [39, 43, 64]. Then, nurses with higher SC levels may have higher levels of BF, as PTG (a positive change that overlaps significantly with BF [65]) can be fostered by enhancing SC among nurses [52] and predicted by SC in college students during the COVID-19 pandemic [66]. Finally, according to the cognitive adaptation theory [67], BF serves as a reappraisal strategy that helps individuals explore the meaning of events and rebuild self-esteem, enabling nurses to confront negative work-related emotions actively and, in turn, increase job satisfaction. In brief, SC should be viewed as the foundation for alleviating work stress in nurses, fostering the development of BF, and ultimately enhancing ProQoL.

The ProQoL of nurses has become an important issue in public health [9, 68, 69]. To address this, we can intervene in the pathway between work stress and ProQoL by targeting mediators to reduce BO and STS. It is recommended that departments actively develop the enhancement plans for SC and BF of hospital nurses, regularly conduct training sessions or seminars on SC and BF, and encourage nurses to share experiences and learn from one another to improve their levels of SC and BF [35–37]. In addition, head nurses and other management personnel should prioritize the physical and mental health of nurses, fostering a good team atmosphere through cultural and recreational activities to enhance nurses' sense of belonging and further reduce BO and STS [68].

Strengths and limitations

There are several strengths in our study. First, the sample was recruited from 215 hospitals in 29 provinces in

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Table 3 The chain mediating effect path

Path		Point of estimate	SE	Z	LLCI	ULCI	*P*
Model A							
Indirect effect	Work stress → SC → CS	−0.010	0.001	−10.000	−0.012	−0.008	< 0.001
	Work stress → BF → CS	−0.033	0.002	−16.500	−0.037	−0.029	< 0.001
	Work stress → SC → BF → CS	−0.015	0.001	−15.000	−0.016	−0.013	< 0.001
Direct effect	Work stress → CS	−0.061	0.003	−20.333	−0.067	−0.055	< 0.001
Total effect		−0.119	0.003	−39.667	−0.125	−0.112	< 0.001
Model B							
Indirect effect	Work stress → SC → BO	0.021	0.001	21.000	0.019	0.023	< 0.001
	Work stress → BF → BO	0.015	0.001	15.000	0.013	0.016	< 0.001
	Work stress → SC → BF → BO	0.006	< 0.001	6.000	0.006	0.007	< 0.001
Direct effect	Work stress → BO	0.091	0.002	45.500	0.087	0.095	< 0.001
Total effect		0.133	0.003	44.333	0.128	0.138	< 0.001
Model C							
Indirect effect	Work stress → SC → STS	0.024	0.001	24.000	0.022	0.027	< 0.001
	Work stress → BF → STS	−0.011	0.001	−11.000	−0.013	−0.010	< 0.001
	Work stress → SC → BF → STS	−0.005	< 0.001	−5.000	−0.006	−0.004	< 0.001
Direct effect	Work stress → STS	0.077	0.004	19.250	0.070	0.084	< 0.001
Total effect		0.085	0.004	21.250	0.078	0.092	< 0.001

Notes SC=self-compassion, CS=compassion satisfaction, BO=burnout, STS=secondary traumatic stress, BF=benefit-finding, SE=standard error, LLCI=lower limit confidence interval, ULCI=upper limit confidence interval

China, which was well-represented. Additionally, this research investigated the chain mediating role of SC and BF in the association between work stress and ProQOL, providing valuable evidence for future interventions. However, some limitations should also be acknowledged. First, the study employed a cross-sectional design, revealing correlations between variables but not causality; thus, longitudinal studies are needed to confirm these associations. Second, all variables were collected by self-report measures, which may introduce biases due to social desirability and self-defense effects, given the extensive range of work attitudes and mental health items included in the questionnaires. Thirdly, although several potential confounders were collected and adjusted in the models, we could not rule out the possibility that unmeasured confounders (e.g., hospital wards) may have influenced the results. Lastly, this study was conducted from March to April 2022, during which Omicron had rapidly replaced Delta as the dominant strain worldwide and caused an unprecedented outbreak peak in China [70]. Accordingly, the findings of this study should be cautiously interpreted.

Conclusions

Our study suggests that the association between work stress and ProQOL may be partially mediated by SC, BF, including a chain effect between these two variables. If these findings are validated in future research, they could highlight the potential benefits of enhancing SC and BF to reduce BO and STS among nurses. Hospital administrators, nurse leaders, and policymakers should recognize that increasing nurses' SC and BF may help diminish their perception of work stress, thereby improving their ProQOL.

Abbreviations

COVID-19	Coronavirus Disease 2019
STS	Secondary traumatic stress
ProQOL	Professional quality of life
CS	Compassion satisfaction
BO	Burnout
SC	Self-compassion
BF	Benefit finding
PTG	Post-traumatic growth
CNSS	Chinese Nurses Stressor Scale
SCS-SF	Self-Compassion Scale-Short Form
GBFS	General Benefit Finding Scale

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