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Does perceived organization support moderates the relationships between work frustration and burnout among intensive care unit nurses? A cross-sectional survey

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Abstract

Background Intensive care unit (ICU) nurses are at high risk of burnout and warranting attention. Existing literature found that work frustration was related to burnout, whilst perceived organization support influenced the association of work frustration with burnout. The purpose of this study was to investigate the relationship of work frustration and burnout among ICU nurses, and to examine the moderating effect of perceived organization support in their relationship.

Methods The cross-sectional study was conducted with a convenience sample of 479 ICU nurses from several 3 tertiary hospitals during December 2021 to May 2022. The Maslach Burnout Inventory-Human services survey (MBI-HSS), National Aeronautics and Space Administration Task Load Index (NASA-TLX) and perceived organization support Scale (POSS) were used to collect data. The PROCESS macro was performed to test the moderation effect of perceived organization support.

Results The total score of burnouts was (55.79 ± 17.20), the total score of work frustration was (7.44 ± 1.86). Burnout was positively correlated with work frustration ($r = 0.301$, $P < 0.001$) and negatively correlated with perceived organizational support ($r = -0.430$, $P < 0.001$). The moderation model analysis showed that perceived organizational support could moderate the relationship between work frustration and burnout ($\beta = -0.111$, $\Delta R2 = 0.011$, $P = 0.007$).

Conclusions The findings highlight the moderating role of perceived organizational support in the relationship between work frustration and burnout. Hence, interventions to reduce burnout among ICU nurses should consider targeting organizational support and work frustration.

Keywords Burnout, Work frustration, Perceived organizational support, ICU nurses, Moderating

Introduction

Burnout is generally described as a long-term response to unmanageable work stress and a syndrome of cynicism and professional ineffectiveness, characterized by high sense of emotional exhaustion and depersonalization and low sense of personal accomplishment [1]. Although nurses in different units generally reported various levels of burnout, nurses working in intensive care unit (ICU) always experienced it more remarkably. ICU nurses

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were often reported to be at high risk of burnout due to high-stress work environment, including heavy workload, insufficient nursing in workplace, disproportionate care, facing the continuous suffering of patients, and observing end-of-life and death [2, 3]. Empirical Studies have reported that the overall prevalence of burnout risk among ICU nurses was as high as 68% [4, 5]. Meanwhile, a systematic review also reported that the prevalence rate was highest among ICU nurses [6]. Moreover, long-term and serious burnout in nurses had been reported to be associated with job performance, physical and mental health and well-being, eventually contributing to decreased quality of care and increased turnover rate and exacerbating the shortage of nursing staff [7–9].

Previous studies have revealed several demographic and work-related variables linked to burnout among ICU nurses, such as age, gender, marital status, income satisfaction, work experience, professional title, and night shift [3–5]. For instance, older nurses were shown to experience less burnout [3], and male nurses reported a higher prevalence of burnout than did female nurses [3, 4]. ICU nurses that work in night shifts have reported higher levels of burnout [5]. However, there are not always consistent results on the associations of demographic and work-related variables with burnout among nurses [10]. For example, Bruyneel and colleagues found that older nurses were shown to experience more emotional exhaustion [4]. Given the high prevalence and negative effects of burnout among ICU nurses, in order to properly address the problem of burnout among ICU nurses, it is a crucial first step to fully understand the related factors of burnout among ICU nurses so that effective interventions can be developed to improve the motivations of nurses for working and the quality of health care.

The job demands–resources (JD-R) model proposes two relatively independent processes that job demands and resources may evoke health impairment and employee motivation, respectively [11]. This model suggests that a high level of job demands may result in employee experiencing physical and mental workloads and burnout, while job resources initiate a motivational process leading to positive organizational outcomes, including enhanced performance and work engagement [12]. Nursing is a stressful and challenging occupation [13]. Challenges encountered by nurses working in ICU were not only related to high prevalence of burnout risk, but also identified as the leading causes of work frustration for nurses [14–16]. Work frustration refers to a negative work affect generated by exhausted motivation and unsatisfied needs resulting from the obstacles and interference encountered by individuals in the workplace, which had been conceptualized as one of job demands [17, 18] and considered as the precursor to burnout [19, 20]. Previous studies have reported that work frustration was commonly in nurses due to a sense of being disrespected, long work hours, effort–reward imbalance, and issues in team cooperation, which were identified as the mainly factors causing work frustration for nurses [14, 21, 22]. Meanwhile, such negative emotion reaction has been reported to be positive correlation with nursing personnel's emotional depletion, turnover intention, and professional commitment [19, 21, 22]. However, the association of work frustration with burnout has seldom been investigated among ICU nurse. Given the high risk and adverse effect of work frustration, the association between work frustration and burnout among ICU nurses requires thorough analysis.

Perceived organizational support, as a valued job resource, refers to employees' evaluation of the extent to which the organization help, affirmation and concern about their presence in the organization. According to theoretical and empirical evidence, perceived organizational support can produce a sense of responsibility and obligation to help the organization achieve goals, foster employee's enthusiastic and positive work attitude [23, 24]. Moreover, perceived organizational support acts as an effectively contextual resource had been confirmed that could influence the effects of emotional labor, work strain and workplace ostracism on job-related outcomes [25, 26]. Previous studies had demonstrated that the moderating impact of perceived organizational support on the relationship between job stress and job-related outcomes based on surveys of non-nurses [27, 28]. Subsequent researches based on nurses have also found that perceived organizational support could moderate the relationships between emotional labor and work attitudes [29] and the association of resilience with fatigue [30]. Accordingly, perceived organization support could act as a moderator on the association of work frustration with burnout among ICU nurses, which has not been reported and needs further verification.

In light of the conceptual frameworks and practical concerns, the present study aimed to examine two hypotheses in Chinese nurses: (1) work frustration could be positively associated with burnout, and (2) perceived organization support could moderate the direct association between work frustration and burnout.

Method

Participants

This study was a cross-sectional design and adhered to the STROBE statement. A convenience sample of ICU nurses was recruited from several tertiary hospitals in urban areas of Jinan, China between December 2021 and May 2022. The sample size was calculated as 462 based

on the formula: $N=(Z_{\alpha/2})^2P(1\text{-}P)/\delta^2$ and a twenty percent attrition rate [31]. The assumptions were that $\alpha=0.05$, $Z_{\alpha/2}=1.96$, and $\delta=0.05$, whereas P was set as 0.5 due to large differences in the prevalence of burnout in nurses reported in previous studies and availability of maximum sample size. All ICU nurses who had obtained professional certificates and were independently responsible for clinical work. The exclusion criteria were as follows: (1) ICU nurses in departments with fewer than eight beds, (2) nurses who had worked less than one year, (3) nurses who were on vacation or going on leave to study, and (4) nurses who worked in both the ICU and the wards at the same time. ICU that had less than eight critical care beds typically do not care for ventilated patients for more than 24 h. Besides, according to guidelines for intensive care unit (ICU) construction and management in China 2006 edition [32], the recommended number of ICU beds for a tertiary hospital is no less than 8. Hence, ICU nurses in departments with fewer than eight beds were excluded. Ethical approval was obtained from the Research Ethics Committee of Qilu Hospital of Shandong University (KYLL-202107–031). Written informed consent was obtained from all participants. The procedures were conducted per the ethical standards of the 1964 Declaration of Helsinki. A total of 490 ICU nurses who met the inclusion criteria and were invited to participate in this study. After eliminating incomplete questionnaires, 479 ICU nurses remained for analysis. A comparison of the 11 excluded nurses with the 479 included participants found no significant differences in the socio-demographic variables.

Measures

A self-administered, structured questionnaire including instruments for assessing socio-demographic variables, work frustration, perceived organization support and burnout was used to collect data.

Demography

The socio-demographic questionnaire was designed by the authors and included participant's age, gender, marital status, educational, income satisfaction, work experience, professional title, and night shift.

Work frustration

One item selected from the National Aeronautics and Space Administration Task Load Index (NASA-TLX) was used to assess nurses' perception of work frustration. The NASA-TLX is primarily a measure of how an individual experiences the situational demands of work [33, 34]. It consists of 6 items that evaluates six dimensions regarding different aspects of workload, including mental demands, physical demands, temporal demands, performance, effort and frustration. Scores for each item ranged from 0 (low) to 10 (high), and with higher scores indicating more workload. The validity and reliability of NASA-TLX have been confirmed in previous studies [35, 36]. In this study, only one item was adopted for the survey and results analysis. The translated item as follows: "How insecure, discouraged, irritated, stressed and annoyed versus secure, gratified, content, relaxed and complacent did you feel during your work?". Responses are rated from 0 (low) to 10 (high), and with higher scores indicating more work frustration.

Perceived organization support

The 8-item Chinese vision of the Survey of perceived organization support [37, 38] was used to assess nurses' perception that the organization valued their contribution and cared about their well-being. Respondents indicated the extent of their agreement with each item on a 7-point Likert-type scale (1 = strongly agree, 7 = strongly disagree), and with higher scores indicating high perception of organizational support. The validity and reliability have been confirmed among Chinese occupational groups in previous studies [39, 40]. In this study, the Cronbach's alpha for this scale was 0.887.

Burnout

The Chinese version of Maslach Burnout Inventory-Human services survey (MBI-HSS) was used to measure nurse's burnout [41, 42]. The MBI-HSS consists of 22 items that evaluates the three components of the burnout syndrome: emotional exhaustion (9 items), depersonalization (5 items), and personal accomplishment (8 items). The respondents were asked to indicate their frequency of experience on a 7-point Likert scale (0 = feeling has never been experienced, 6 = feeling is experienced daily). The items score of personal accomplishment have been reverse coded so that higher scores represent diminished personal accomplishment. The higher total scores of the three subscales means high level of burnout [43, 44], and the distribution data in each subscale were also provided. The validity and reliability have been confirmed among nurses in Chinese [45, 46]. In this study, the Cronbach's alpha for of the total and its three sub-dimensions were 0.878, 0.883, 0.801 and 0.862, respectively. Permission to use the MBI-HSS which is copyrighted was obtained from Mind Garden.

Data analysis

Data analysis was conducted by SPSS version 26.0 (IBM Corp., 2019). Mean, standard deviations or frequency, percentages were used to describe the characteristics of participants. Independent t test and analysis of variance analysis (ANOVA) were used to examine the differences

in burnout and work frustration between sample characteristics. Pearson's correlations were used to examine the associations among burnout, work frustration and perceived organizational support.

The moderation model was conducted using the SPSS PROCESS V3.5 macro developed by Hayes. Model 1 was used to examine the moderation role of organizational support on the effect of frustration on burnout [47]. The simple slope test by both pick-a-point method and the Johnson-Neyman method using the PROCESS macro were performed to test the significance of the moderation effect [48]. The covariates that were significantly associated with burnout in the univariate analyses had been adjusted for moderation model analyses. To avoid multicollinearity effects, burnout, frustration and organizational support were standardized. *P* values reported were two tailed, and P value less than 0.05 was considered significant.

Results

Sociodemographic characteristics and Univariate analyses

The demographic characteristics of ICU nurses were presented in Table 1. The mean age of ICU nurses was (29.67 ± 4.76) years, and the mean working experience were (7.01 ± 5.56) years. The scores of work frustration was (7.44 ± 1.86), and the total scores of burnout was (55.79 ± 17.20), including emotional exhaustion score was (28.94 ± 10.32), depersonalization score was (10.15 ± 6.65) and diminished personal accomplishment score was (16.70 ± 8.58). There were significant differences in work frustration between income satisfaction groups. In addition, there were significant differences in burnout between groups in term of age, marital status, income satisfaction, working experiences and professional title.

Further analysis of differences in three subscales of burnout between sociodemographic characteristics

Table1 Sociodemographic characteristics and Univariate analyses ($n = 479$)

Variable	n (%)	work frustration (M ± SD)	*t/ F (P)*	job burnout (M ± SD)	*t/ F (P)*
Age	29.67 ± 4.76		$F = 1.026$		$F = 1.934$
≤ 25 [a]	80(16.7)	7.68 ± 1.90	(0.381)	58.51 ± 16.48	(0.123)
26–30 [b]	226(47.2)	7.45 ± 1.84		56.34 ± 17.44	a > d
31–35 [c]	134(28.0)	7.25 ± 1.90		54.60 ± 16.32	
> 35 [d]	39(8.1)	7.62 ± 1.80		51.10 ± 19.41	
Gender			$t = 0.358$		$t = 0.705$
male	97(20.3)	7.51 ± 1.94	(0.721)	56.49 ± 18.05	(0.651)
female	382(79.7)	7.43 ± 1.84		55.61 ± 16.99	
Marital status			$t = 0.165$		$t = 2.185$
married	344(71.8)	7.45 ± 1.85	(0.869)	54.72 ± 17.10	(0.029)
single or others	135(28.2)	7.42 ± 1.91		58.52 ± 17.21	
Education			$t = 1.446$		$t = 0.931$
College and below	115(24.0)	7.23 ± 1.80	(0.149)	54.49 ± 16.53	(0.352)
Undergraduate and above	364(76.0)	7.51 ± 1.88		56.20 ± 17.40	
Income satisfaction			$F = 11.006$		$F = 20.794$
Satisfaction [a]	73(15.2)	7.05 ± 1.91 [a]	(< 0.001)	47.32 ± 16.76	(< 0.001)
General [b]	257(53.7)	7.22 ± 1.78 [b]	a/b < c	54.60 ± 17.41	a < b < c
Dissatisfaction [c]	149(31.1)	8.02 ± 1.87 [c]		62.00 ± 14.75	
Work Experience(years)	7.01 ± 5.56		$F = 1.388$		$F = 1.813$
≤ 2 [a]	82(17.1)	7.57 ± 1.91	(0.246)	59.37 ± 16.21	(0.144)
2–5 [b]	143(29.9)	7.43 ± 1.83		56.08 ± 17.22	a > d/c
5–10 [c]	186(38.8)	7.27 ± 1.85		54.85 ± 16.81	
> 10 [d]	68(14.2)	7.78 ± 1.88		53.44 ± 18.96	
Professional title			$t = 0.438$		$t = 2.441$
Nurse practitioner	389(81.2)	7.43 ± 1.83	(0.661)	56.71 ± 16.90[b]	(0.015)
Nurse-in-charge	83(18.8)	7.52 ± 1.99		51.82 ± 17.99 [c]	
Night shift			$t = 0.034$		$t = 1.369$
yes	449(93.7)	7.45 ± 1.87	(0.973)	56.07 ± 17.06	(0.172)
no	30(6.3)	7.43 ± 1.83		51.53 ± 18.89	

M mean, *SD* standard deviation, *t* independent t-test, *F* analysis of variance

Table 2 Inter-correlations of main study variables ($n=479$)

Variable	Rate range	M ± SD	1	1.1	1.2	1.3	2
1. Burnout	9–97	55.79 ± 17.20	1				
1.1 emotional exhaustion	6–53	28.94 ± 10.32	0.767***	1			
1.2 depersonalization	0–30	10.15 ± 6.65	0.794***	0.591***	1		
1.3 diminished personal accomplishment	0–40	16.70 ± 8.58	0.466***	0.223***	0.206***	1	
2. Work frustration	3–10	7.44 ± 1.86	0.301***	0.406***	0.224***	0.158**	1
3. POS	8–56	37.04 ± 7.88	-0.430***	-0.413***	-0.254***	-0.170***	-0.281***

M mean, *SD* standard deviation, *POS* Perceived organizational support

* $P<0.05$

** $P<0.01$

*** $P<0.001$

showed in Supplementary Table S1. The results revealed that there were significant differences in depersonalization between groups in term of age, marital status, income satisfaction, working experiences and professional title. In addition, there were also significant differences in emotional exhaustion and diminished personal accomplishment between income satisfaction groups.

Correlational analyses

Mean and standard deviations for the variables and correlations between the variables were shown in Table 2. Burnout was positively associated with work frustration among ($r=0.301$, $P<0.001$) and negatively associated with perceived organizational support ($r=$-0.430, $P<0.001$). Besides, work frustration was negatively associated with perceived organizational support ($r=$-0.281, $P<0.001$).

Moderation analyses

The moderation analysis established whether perceived organizational support moderated the relationship between work frustration and burnout. The results presented in Table 3 and indicated that the interaction term of work frustration with perceived organizational support ($\beta=$-0.152, $P=0.007$) significantly accounted for 1.1% variance of burnout with a small effect size ($f^2=0.015$). The pick-a-point method (Table 4) indicated that the negative effects of work frustration on burnout decreased as perceived organizational support increased under three different levels. The results of the Johnson-Neyman method (Fig. 1) demonstrated that significant conditional effect of work frustration on burnout was found when perceived organizational support was lower than 43.10.

Similarly, moderation analysis examined whether perceived organizational support moderated the relationships between work frustration and three subscales of burnout. The results showed that moderating effect of perceived organizational support was only found in relationship between work frustration and emotional exhaustion. The results of moderation model were also presented in Supplementary Table S2. The interaction term of work frustration with perceived organizational support ($\beta=-0.170$, $P=0.002$) significantly accounted for 1.8% variance of emotional exhaustion with a small effect size ($f^2=0.03$). The pick-a-point method (Supplementary Table S3) indicated that the positive effects of work frustration on emotional exhaustion decreased as perceived organizational support increased under

Table 3 Moderation model ($n=479$)

Variable	β	SE	t	P	95%CI
Age	0.018	0.023	0.782	0.435	-0.027 to 0.062
Marital status	-0.155	0.104	-1.492	0.136	-0.359 to 0.049
Satisfaction of income	0.172	0.064	2.660	0.008	0.045 to 0.298
Years of working	-0.043	0.021	-2.075	0.039	-0.083 to -0.002
Professional title	0.109	0.087	1.257	0.210	-0.062 to 0.281
Work frustration	0.194	0.042	4.667	< 0.001	0.113 to 0.276
POS	-0.305	0.046	-6.697	< 0.001	-0.394 to -0.215
Interaction term	-0.111	0.041	-2.695	0.007	-0.193 to -0.030

Interaction term means the interaction of work frustration and perceived organizational support

SE standard error, *CI* confidence interval, *POS* Perceived organizational support

Table 4 Conditional effects of work frustration on job burnout at different levels of organizational support ($n=479$)

Conditional Of POS	Effect	SE	t	p	95%CI
M-1SD	0.306	0.061	5.041	< 0.001	0.187 to 0.425
M	0.194	0.042	4.667	< 0.001	0.113 to 0.276
M + 1SD	0.083	0.057	1.466	0.144	-0.028 to 0.194

POS Perceived organizational support, *SE* standard error, *CI* confidence interval, *M* mean, *SD* standard deviation

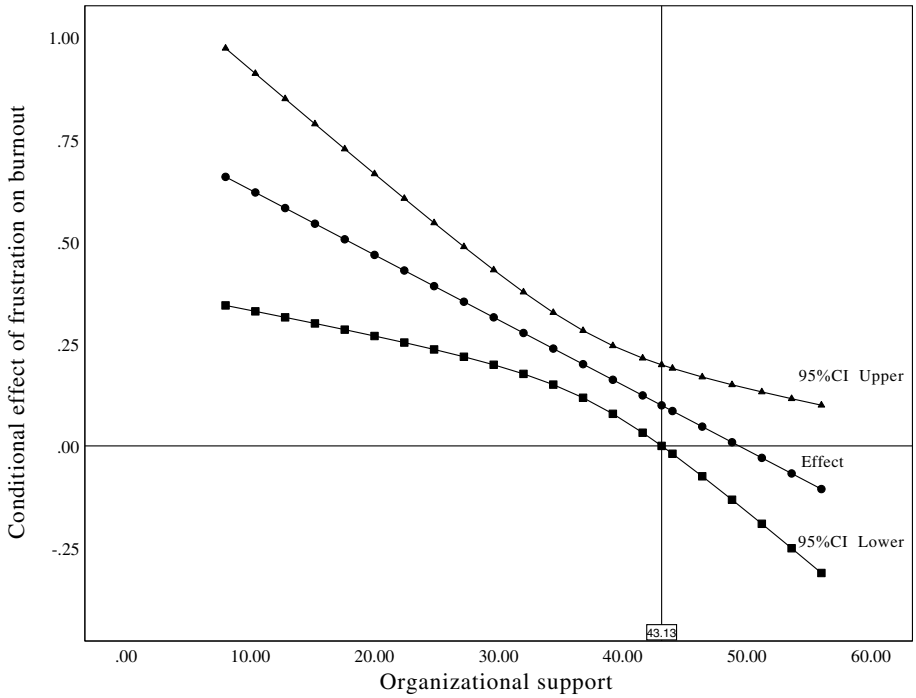

Fig. 1 The conditional effect of work frustration on burnout at the values of perceived organizational support

three different levels. The results of the Johnson-Neyman method (Supplementary Fig. S1) demonstrated that significant conditional effect of work frustration on emotional exhaustion was found when perceived organizational support was lower than 47.66.

Discussion

This is the first study to explore the associations between work frustration and burnout, and examine the moderating role of perceived organization support between them among ICU nurses. The results indicated that ICU nurses with high work frustration and low perceived organization support had more burnout. Moreover, the results from the moderation analysis showed that perceived organization support moderated the associations between work frustration and burnout as well as emotional exhaustion among ICU nurses.

In the present study, 46.2% of ICU nurses with work frustration scores greater than 7 can be considered to have high level of work frustration, which was higher than Wang et al. survey of senior nurses in Taiwan [22]. The mean score of burnout was similar to previous studies conducted in ICU nurses [49, 50]. The results might indicate that the high level of work frustration could be significant factor of higher risk of burnout among ICU nurses [6]. In addition, ICU nurses who had lower income satisfaction were more likely to report higher level of work frustration and burnout, which were in line with previous findings [51, 52]. The lower income satisfaction might reflect work with imbalanced extrinsic effort and reward, which signifies a failed social reciprocity that elicits work stress [30, 53]. Furthermore, ICU nurses who had shorter work experience were more likely to report high level of burnout, as well as higher depersonalization. In accordance with prior studies, increasing work experience gradually increases more professional maturity, which in turn may keep control during times of stress [54, 55].

As hypothesized, ICU nurses who had perceived higher level of work frustration and lower level of organizational support experienced higher level of burnout, which were similar to previous studies [20, 56]. As one of job demands, work frustration refers to the situational feeling of disappointment and dissatisfaction toward work. For ICU nurses, work frustration may derive from various challenges, including heavy workload, insufficient nursing in workplace, disproportionate care, facing the continuous suffering of patients, and observing end-of-life and death [2, 3]. It was plausible that ICU nurses who had perceived higher level of work frustration could feel blockage the opportunity of achieving valued goals and needs in job, which could lead to emotional drain and burnout [57]. There were many reports on relationships between perceived organization support and burnout. A prior systematic review by Almudena et al. concluded that perceived organization support, as

an external source of work, could help reduce job stress and burnout among nurses [58]. ICU nurses who perceived low perceived organization support might often receive insufficient material and emotional support from the organization and then lead to unmet socioemotional needs and stressful work environment [59], which might increase nurses' burnout.

This study confirmed the moderating role of perceived organization support in the relationships between work frustration and burnout as well as emotional exhaustion, that is, organizational support could buffer the impact of work frustration on burnout. Specifically, the effect of work frustration on burnout as well as emotional exhaustion were increased among ICU nurses with lower perceived organization support and attenuated in those with higher perceived organization support. The possible explanation for this association might be that perceived organization support could influence individuals' stress appraisal and their perception of available stress-coping resources by its four typical functions [60], namely maintaining and promoting self-esteem, providing information, providing social companionship and providing material resources, and ultimately contributed to lower burnout among ICU nurses. Besides, according to the results of Johnson-Neyman test, the associations of work frustration and burnout as well as emotional exhaustion was not significant when perceived organization support increased to some extent, which might implicate the potential value of improving organizational support in reducing burnout among ICU nurses.

This study advances the current state of knowledge by examining the relationships between work frustration and burnout among ICU nurses. Most importantly, this study contributes to the evidence by testing the moderating effect of perceived organization support on the relationship between work frustration and burnout among ICU nurses. This study has important practical implications for reducing and prevent ICU nurses' burnout. Based on the findings of the present study, lower income satisfaction was most consistent factor related to high level of work frustration and burnout. Hence, it is recommended for nursing administrators that salary system reform could be made to improve income and benefits among ICU nurses. Besides, nursing administrators should consider providing effective and targeted strategies (e.g. ongoing training and psychological interventions) to improve the conditions of their working environments and decrease their work frustration among ICU nurses. Perceived organization support was not only related to low level of burnout, but could also buffer the negative effect of work frustration on burnout. Thus, it could reduce ICU nurses' burnout by providing nurses with organizational supports through demonstrating publicly to ICU nurse that the organization cares about their welfare, values their opinions, and is proud of their achievements [26].

Despite these Strengths, several limitations should be mentioned. First, due to the cross-sectional study design and small sample size, the causal inference among study variables and the generalizability of the results are limited. Hence, future research can be improved by longitudinal studies with larger multicenter sample size. Second, a single-item measurement was adopted to capture work frustration, which may limit the validity of the study findings. Future studies that employ a more comprehensive measurement of work frustration would further facilitate the understanding of the relationships addressed in this study. Third, the size of interaction effect detected is small ($f^2 = 0.015$) in this study. Further validation by large sample size is warranted. In addition, self-reported results might be subject to information bias.

Conclusion

The high level of work frustration and burnout were experienced among ICU nurses, especially who had lower income satisfaction and shorter work experience. Work frustration was found to be associated with increased burnout among ICU nurses. Moreover, perceived organization support played a mild moderating role in associations of work frustration with burnout in this group. Thus, future interventions seeking to reduce burnout in this group should be considered to decrease work frustration and tailored to ICU nurses with varying perceived organization support.

Abbreviations

ICU	Intensive care unit
MBI	Maslach burnout inventory
NASA-TLX	National aeronautics and space administration task load index
POSS	Perceived organization support Scale

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12912-023-01180-5.

Additional file 1: Table S1. Differences in emotional exhaustion, depersonalization,and diminished personal accomplishment among ICU nurses (n=479). **Table S2.** Moderation model (n=479). **Table S3.** Conditional effects of work frustration on emotional exhaustionat different levels of organizational support (n=479). **Fig.S1.** The conditional effect of work frustration on emotional exhaustion at thevalues of perceived organizational support.

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Authors' contributions
Study design: #RYB, #MDD, QFP*. Data collection: LY, WN. Data analysis: #RYB, #MDD, WN, QFP*. Manuscript writing: #RYB, #MDD, LY, QFP*. All authors read and approved the final manuscript.

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Availability of data and materials
The datasets analyzed during the current study are not publicly available due to them containing information that could compromise research participant consent but are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
The study was approved by the Research Ethics Committee of Qilu Hospital of Shandong University (KYLL-202107–031). Written informed consent was obtained from all participants. The procedures were conducted per the ethical standards of the 1964 Declaration of Helsinki.

Consent for publication
Not applicable.

Competing interests
There is no conflict of interest in this study.

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