

## ORIGINAL ARTICLE

# A year after COVID-19: Its impact on nurses' psychological well-being

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## Abstract

**Background:** Nurses' burnout and psychological well-being are a significant concern during the pandemic.

**Aims:** The aim of this study is to (i) examine the level of burnout, anxiety, depression, perceived stress and self-rated health for nurses at two time-points, 2020 and 2021, and (ii) examine the socio-demographic characteristics, work-related factors and perceived workplace support factors in relation to the level of burnout.

**Methods:** This is a cross-sectional study with a longitudinal approach. A convenience sample of registered nurses who worked in an acute care tertiary hospital in Singapore were surveyed during two time-points. Participants' health, socio-demographic characteristics, work-related factors and perceived workplace support factors were collected.

**Results:** Among the 179 nurses, there was a significant increase in burnout level, poorer self-rated health and reduced job dedication. A decrease in the percentage of nurses who *felt appreciated at work* was reported in 2021 ( $p = 0.04$ ). Nurses who felt their team was not working well together were 3.30 times more likely to experience burnout (95% CI 1.12 to 9.69;  $p = 0.03$ ). Nurses who reported that they *never felt appreciated* by their department/hospital were 8.84 times more likely to experience burnout (95% CI 2.67 to 29.21;  $p < 0.001$ ). Nurses with poorer self-rated health were more likely to report burnout (95% CI: 1.32–6.03;  $p = 0.008$ ).

**Conclusion:** Nurses had an increased experience of burnout, reduced job dedication and poorer self-rated health after the outbreak.

**Implications for Nursing Management:** Interventions at the departmental and organizational levels are needed to improve the workplace support. Strategies to support nurses' psychological well-being during the aftermath of COVID-19 are vital to managing nurses' burnout and improving job dedication and self-rated health.

## KEYWORDS

anxiety, burnout, job dedication, nurses, pandemic, perceived stress

## 1 | BACKGROUND

Working in health care during the Coronavirus disease-2019 (COVID-19) pandemic has been arduous. Nurses at the frontline of the health care crises experienced significant challenges. They faced the risk of exposure to the virus, fears about transmitting the disease to their families, took on longer work hours and were deployed to a new working environment, which required the care for suspected or confirmed COVID-19 patients. They had to adjust to the constant changes in the work environment with shortages of resources and staffing (Azoulay et al., 2020; Bell & Sheridan, 2020). As nurses struggled to manage the high workload in times of uncertainty, they became psychologically affected during the pandemic and reported experiencing increased stress and burnout, leading to experiencing depressive and anxiety symptoms (Li et al., 2021; Murat et al., 2021; Pappa et al., 2020).

COVID-19 is now recognized as a global health issue as it affects one's physical and mental well-being worldwide (Flesia et al., 2020). Nurses' psychological well-being is a significant concern in the nursing workforce. Growing evidence has shown that nurses experienced a high level of burnout during the pandemic. Recent findings from a review that included studies conducted over 14 countries in Asia, Europe and North America reported the prevalence of (i) emotional exhaustion 34.1%, (ii) depersonalization 12.6% and (iii) lack of personal accomplishment was 15.2% (Galanis et al., 2021). Burnout is a significant concern among nurses as it is strongly associated with adverse outcomes, including patient safety (Dewa et al., 2014).

Apart from burnout, nurses also experienced other negative psychological effects during the pandemic, including stress, depression, anxiety, psychological distress, post-traumatic disorder and insomnia (Badahdah et al., 2020; Badu et al., 2020; Galanis et al., 2021; Murat et al., 2021). Studies have reported a high prevalence of anxiety and depressive symptoms among front-line nurses due to the COVID-19 pandemic (Lai et al., 2020; Li et al., 2021). The levels of stress has been reported to increase over time among the nurses, leading to depressive symptoms and the experience of insomnia (Badahdah et al., 2020; Pappa et al., 2020). In Turkey, nurses working in the emergency department reported high perceived stress due to the lack of staffing, resources and transmitting the virus (Çınar et al., 2021). Similarly, in South-East Asia, health care workers reported moderate anxiety, moderately severe depression and job burnout (Teo et al., 2022). Findings highlighted that working longer hours than usual perceived high job risk and inadequate personal protective equipment were associated with anxiety and job burnout, while working night shifts was associated with an increased risk of depression (Teo et al., 2022). It has also been reported that nurses who worked in the intensive care unit settings with higher risk of transmission of COVID-19 due to the need for more invasive procedures including suctioning of airway secretions may experience higher level of health anxiety (Jamshidian et al., 2018; Mokhtari et al., 2020). Health anxiety is more commonly experienced in the younger nurses with fewer years of experience, which may result in depressive and suicidal thoughts (Janzen Claude et al., 2014). The

high rate of health care worker infection is one of the most reported reason for health anxiety in the health care workers, especially among the nurses (Mokhtari et al., 2020).

Qualitative findings from a study conducted in Singapore highlighted the physical and psychological challenges associated with the intensive workload and work environment during the pandemic period (Goh et al., 2021). Systematic reviews have also identified increased workload, role ambiguity, longer work hours in high-risk environments, lack of training on COVID-19 and insufficient supplies and human resources as the primary stressors that advanced the nurses' burnout (Badu et al., 2020; Galanis et al., 2021). These stressors may result from various factors, including organizational (e.g., workplace or environment factors) and individual factors (e.g., innate personal characteristics). When nurses face prolonged stressful situations in the workplace while managing patients with complex needs, it causes nurses to experience burnout more rapidly (Drennan & Ross, 2019; Murat et al., 2021). There was also growing evidence that nurses who were involved in a stressful working environment with a lack of support may result in reduced job dedication and increased intention to leave their job (Joshua et al., 2021; Kim et al., 2020; Said & El-Shafei, 2021; Zhang et al., 2021).

This is an important study to undertake as burnout among nurses is a critical issue to tackle during the pandemic. Identification of risk factors for burnout enables the nurses and the health care system to better respond to any pandemic crisis in the future. Despite the growing number of literature surrounding psychological stress during the COVID-19 pandemic, very few studies have yet to examine the impact of COVID-19 a year following its outbreak. Therefore, this paper seeks to fill that knowledge gap by examining the factors associated with burnout in the same cohort of nurses in an acute care setting in Singapore.

## 2 | STUDY AIMS

This study aimed to examine the level of burnout, anxiety, depression, perceived stress and self-rated health for nurses at two-time points, 2020 and 2021, and to examine the socio-demographic characteristics, work-related factors (*years of experience, having a managerial role, work location, working night shifts, worked longer than usual hours and perceived risk of getting COVID-19*) and perceived workplace support factors (communication, teamwork and perceived appreciation at work) in relation to the level of burnout among the nurses during the pandemic.

## 3 | METHODS

### 3.1 | Study design

This is a cross-sectional study with a longitudinal approach. Data were collected in 2020 and 2021 from the same participants.

## 3.2 | Sample and setting

A convenience sample of registered nurses (assistant nurse clinicians, senior staff nurses and staff nurses) who worked in an acute care tertiary hospital in Singapore were invited via their corporate email account to participate in the survey. The inclusion criteria were nurses who provided direct patient care during the pandemic. Nurses on long-term study leave or maternity leave during the survey period, and nursing students were excluded.

## 3.3 | Sample size

To generate a representative sample of the population with an error margin of 5% around the 95% confidence interval, a minimum sample size of 1200 was required. This would provide a precision of  $\pm 0.06$  SD in the estimation of scores on psychological outcome assessment at each assessment time-point. At the same time, this would provide a 90% power, at two-sided 5% type 1 error rate, to detect a correlation coefficient of at least 0.1 between psychometric outcomes and their determinants or time-points (The Research Advisors, 2006).

## 3.4 | Data collection method

The survey was administered via the online survey platform, Qualtrics. It was first sent out in March 2020 and again in July 2021 (two-time points). A reminder email was sent to the participants at 3-week intervals to maximize the response rate. The participants had a month to complete the survey at each time point.

## 3.5 | Ethical considerations

The study was approved by the SingHealth Centralized Institutional Review Board (2020/2160). A short paragraph at the beginning of the online survey specified that their participation is voluntary and that completing the questionnaire provides their implied consent to participate. The participant was free to cease the survey completion at any time. The responses entered by the participants were anonymous, and access to the data was available only to the study team members.

## 3.6 | Outcome measurement

### 3.6.1 | Burnout

Job burnout was measured using the one-item burnout question from the Physician Work-Life Scale, where a score  $\geq 3$  indicated the presence of job exhaustion (Dolan et al., 2015). The higher scores indicated greater severity of burnout. The single-item measure demonstrated satisfactory reliability with a good correlation of 0.79 and high sensitivity of 83.2% and a specificity of 87.4%.

### 3.6.2 | Anxiety and depression

The Generalized Anxiety Disorder (GAD-7) scale is a widely used screening tool with seven items to screen for anxiety (Spitzer et al., 2006). Item responses are from 0 (not at all) to 3 (nearly every day). The item responses for anxiety will generate a summed score ranging from 0 to 21. The scores of 5, 10 and 15 are interpreted as mild, moderate and severe anxiety, respectively. Further evaluation will be recommended with a threshold score of  $\geq 10$ . The validated GAD-7 reported high sensitivity of 89.0% and specificity of 82.0% for identifying anxiety.

The eight-item Patient Health Questionnaire depression scale (PHQ-8) is a valid diagnostic tool for assessing depressive disorders (Kroenke et al., 2009). Item responses are from 0 (not at all) to 3 (nearly every day). The item responses for anxiety will generate a summed score ranging from 0 to 24. A total score of 0 to 4, 5 to 9, 10 to 14 and 15 to 19 indicated no significant depressive symptoms, mild depressive symptoms, moderately severe and severe, respectively. The recommended cut-off point  $\geq 10$  indicates current depression, which requires further evaluation. The PHQ-8 showed satisfactory reliability and validity with a high internal consistency of 0.86 to 0.89 Cronbach alphas.

### 3.6.3 | Perceived stress

Stress levels were measured by the Short Form 4-item Perceived Stress Scale (PSS-4), a stress assessment instrument to help measure individual stress levels (Cohen et al., 1983). PSS-4 displayed established acceptable psychometric properties with internal consistency (Cronbach's  $\alpha = 0.77$ ) (Lee, 2012), which asked the participants to rate how often they experienced stressful situations in the previous month using a 5-point Likert scale, ranging from 0 (never) to 4 (very often). Higher PSS-4 scores represent a higher level of stress. A summed score ranging from 0 to 16 was calculated, and a median score threshold of 8 was used.

### 3.6.4 | Job dedication

Job dedication was measured using three items from the Utrecht Work Engagement Scale-9 (UWES) (Schaufeli et al., 2006). All items are scored on a 7-point rating scale ranging from 0 (never) to 6 (always). Higher scores represent high job dedication. The Cronbach's alpha for the UWES was reported satisfactory with a range from 0.85 to 0.92.

### 3.6.5 | Health and demographic characteristics

Subjective health status was rated using the validated, one-item general self-rated health question general self-rated health question (DeSalvo et al., 2006). It was rated on a Likert scale from 1 to 5, with

higher scores indicating poorer perceived health. Other demographic variables collected included age, gender, race, marital status, dependent in the household (young or elderly) and chronic medical history. Participants were also asked if they had previous experience working during the Severe Acute Respiratory Syndrome (SARS) outbreak.

### 3.6.6 | Work-related factors

These factors represented the nurses' work environment and work-related practices. They include years of experience (<5, 5–9, 10–14 and  $\geq 15$  years), having a managerial role, work location (including emergency department, isolation wards, inpatient wards, outpatient area and community services), and working the night shift in the last month and worked longer than usual hours.

Individual perceived risk of getting COVID-19 was assessed by the item "I feel that my job puts me at great risk of exposure to COVID-19," whereby the responses ranged from "strongly agree" to "strongly disagree" on a 6-point Likert scale, which was subsequently recoded into either "agree" or "disagree" (Koh et al., 2005). This item was adopted from the eight-item COVID-19 perceived risk scale, which reported reliability ranging from 0.70 to 0.74, indicating satisfactory internal consistency (Yıldırım & Güler, 2022).

### 3.6.7 | Perceived workplace support

Participants were asked about their perception of the current workplace support, which included items relating to communication, teamwork and appreciation by the organization. The workplace communication comprised three items: availability and timely updates provided, the trustworthiness of information and clarity of work protocols. Teamwork was assessed using the statement, "My work team has been working well together." These two items used the response options of "yes," "neutral" and "no," which the "neutral" and "no" responses were subsequently combined. Perceived appreciation was assessed with the statement "I feel appreciated by my department/hospital/employer," with responses "sometimes"/"always" recoded as "yes" and "never"/"rarely" recoded as "no." These workplace support questions were adapted from a previous study with established face validity (Shiao et al., 2007). Previous principal component analysis was conducted to determine the factors utilized in the survey questions had an eigenvalue of 1 or greater.

## 3.7 | Data analysis

Data were exported using SPSS version 26.0 (SPSS Inc., Chicago, IL, USA) for analysis. Descriptive statistics were used to describe the nurses' cohort during 2020 and 2021 using means and standard deviations for continuous data and frequencies and percentages for categorical data. Differences between the work-related health

variables and outcomes interest were determined with independent sample *t* tests for normal continuous variables. Pearson chi-square tests were used to examine and identify existing associations of characteristics between categorical data. Logistic regression and odds ratio estimates were generated to demonstrate the relationship between outcomes and factors of interest and risk of burnout. The level of significance was set at  $p < 0.05$ .

## 4 | RESULTS

Approximately 3600 received the invitation for the baseline survey, of whom 1638 replied, resulting in a response rate of 45.5%. The follow-up survey was sent to the 1638 nurses who completed the baseline survey, of whom 300 replied, leading to a response rate of 18.0%. There were 179 nurses who responded to the surveys at the two-time points and were included in the data analysis.

### 4.1 | Participants characteristic

The majority were female ( $n = 153$ , 85.5%), with a mean age of 35.1 (SD = 10.4) (Table 1). Nearly half of the nurses were Chinese ( $n = 105$ , 58.7%), were currently married ( $n = 87$ , 48.6%) and had dependent (either young or elderly) in the household ( $n = 91$ , 50.8%).

### 4.2 | Burnout

It was found that the level of burnout had significantly increased between the two time-points (2020: mean 2.19, SD 0.90 vs. 2021: mean 2.54, SD 1.08) ( $p < 0.001$ ) (Figure 1). Nurses in the 2021 cohort reported a higher overall mean burnout score of 2.54 (SD 1.08) as compared with those in 2020, with a mean score of 2.19 (SD 0.90) ( $p = 0.001$ ). There was a higher number of nurses reporting a score  $\geq 3$  on the Physician Work-Life Scale in the year 2021 ( $n = 67$ , 37.5%), indicating higher job exhaustion as compared to the year 2020 ( $n = 46$ , 25.7%).

### 4.3 | Anxiety, depression and perceived stress

Although the 2021 cohort of nurses displayed higher anxiety, depression and perceived stress mean scores, there were no significant differences when compared to the 2020 cohort (Table 2).

### 4.4 | Self-rated health

Self-rated health was found to have significantly worsened in the 2021 cohort (mean 3.07, SD 1.29) as compared with those in the 2020 cohort (mean 4.07, SD 1.29) ( $p = 0.006$ ) (Table 2).

**TABLE 1** Socio-demographic information ( $n = 179$ )

	Mean (SD)/count (%)
<b>Demographics</b>	
Age	35.11 (10.40)
Gender	
Female	153 (85.5%)
Male	26 (14.5%)
Race	
Chinese	105 (58.7%)
Indian	15 (8.4%)
Malay	34 (19.0%)
Others	25 (14.0%)
Marital status	
Single	87 (48.6%)
Married	89 (49.7%)
Divorced/separated/widowed	3 (1.7%)
Have a dependent in the household (young or elderly)	91 (50.8%)
<b>Job factors</b>	
Work experience as HCW <sup>a</sup>	
<5 years	28 (38.3%)
5–9 years	46 (25.7%)
10–14 years	49 (27.4%)
15+ years	55 (30.7%)
Managerial/supervisory role	
Yes	47 (26.3%)
Work location <sup>a</sup>	
ED	23 (9.5%)
Isolation wards/COVID-19 or pneumonia wards	15 (6.4%)
Inpatient (clean wards)	63 (35.2%)
Outpatient area	44 (24.6%)
Non-patient fronting area	3 (1.7%)
Others <sup>b</sup>	31 (17.3%)

<sup>a</sup>Frequencies may not add up to the total sample size due to missing responses.

<sup>b</sup>Includes community nursing and services.

#### 4.5 | Job dedication

There was also a reduced score on the UWED dedication sub-scale in 2021 (mean 3.71, SD 3.39) as compared with 2021 (mean 4.07, SD 1.29) ( $p = 0.04$ ) (Table 2).

#### 4.6 | Socio-demographic characteristics and work-related factors

Half of the nurses have working experience of more than 10 years ( $n = 104$ , 58.1%). Only 47 (26.3%) of them have managerial roles. The

nurses were working in the emergency department ( $n = 17$ , 9.5%), isolation wards (COVID-19) ( $n = 15$ , 6.4%), inpatient wards ( $n = 63$ , 35.2%), outpatient areas ( $n = 44$ , 24.6%) and community setting ( $n = 31$ , 17.3%).

A description of the cohort of the nurses' health characteristics, including their previous experience working during the SARS, suffering from any significant impact from the SARS, diagnosis with a chronic medical history and self-rated health status was reported in Table 2.

#### 4.7 | Perception of workplace support

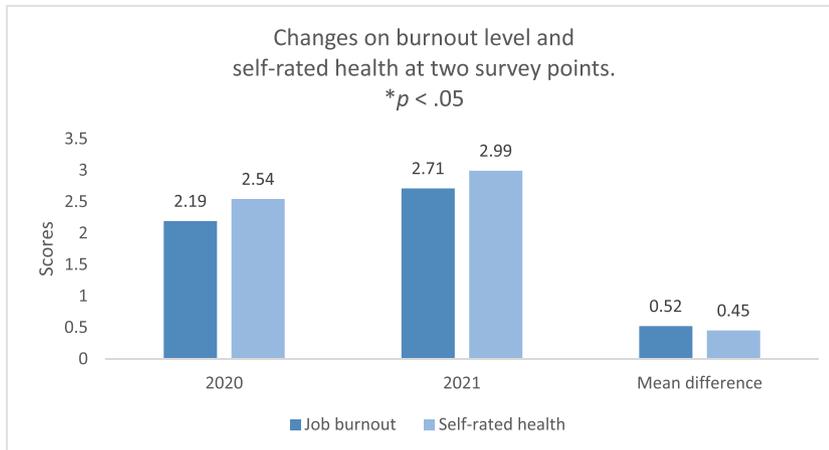
There were no significant differences in the work-related factors between the two cohorts, except for working the night shift in the previous month with 101 nurses (56.4%) in 2020 and 77 nurses (43.0%) in 2021 ( $p = 0.02$ ). There were no significant differences in nurses' perceptions of workplace support in 2020 and 2021.

Variables were compared between the nurses who reported burnout in 2002 and 2021 (Table 3). There were no significant differences in health characteristics, work-related variables, and most perceptions of workplace support, except for perceived appreciation at work. The percentage of nurses who felt appreciated at work dropped from 56.5% in 2020 to 35.8% in 2021 ( $p = 0.04$ ).

In the logistic regression, it was found that nurses who felt that their team were not working well together were 3.30 times more likely to experience burnout (95% CI 1.12 to 9.69;  $p = 0.03$ ) than those who had good teamwork (Table 4). Meanwhile, nurses who reported they *never felt appreciated* by their department/hospital were 8.84 times more likely to experience burnout (95% CI 2.67 to 29.21;  $p < 0.001$ ) than those who reported feeling *always appreciated* at work. In addition, nurses with poorer self-rated health were more likely to report burnout, with every point increase resulting in about 2.82 times more likely to report burnout (95% CI: 1.32–6.03;  $p = 0.008$ ).

## 5 | DISCUSSION

The COVID-19 pandemic has affected more than 50 million people worldwide and had a significant impact on their stress and well-being due to the prolonged period of battling the pandemic (World Health Organization., 2022). This study evaluated the nurses' psychological well-being by comparing the burnout, anxiety, depression, perceived stress and self-rated health of nurses at two-time points, 2020 and 2021, during the pandemic. In addition, we also examined the socio-demographic characteristics, work-related factors (*years of experience, having a managerial role, work location, working night shifts, working longer than usual hours and perceived risk of getting COVID-19*) and perceived workplace support factors (*communication, teamwork and perceived appreciation at work*) in relation to risk of burnout among the nurses during the pandemic.



**FIGURE 1** Changes on burnout level and self-rated health at two survey points. \* $p < 0.05$

### 5.1 | Overall increase in burnout, poorer self-rated health and reduced job dedication

Compared with 2020, there was an increase in burnout, poorer self-rated health and reduced job dedication among the nurses 2021. Similar longitudinal analysis studies, albeit conducted among doctors in the United Kingdom and Ireland (Roberts et al., 2021) and Singapore (Th'ng et al., 2021), reported an increase in the prevalence of psychological distress (44.7%) and trauma (23.7%) (Roberts et al., 2021) during the COVID-19 pandemic. Similarly, a study conducted in an emergency department in Singapore reported a significant worsening of the depression level reported among the doctors (Th'ng et al., 2021). Similar findings in other cross-sectional studies reported the adverse psychological outcomes experienced by the nurses during the pandemic period with increased anxiety, depression, stress and burnout (Bruyneel et al., 2021; Chen et al., 2021; Galanis et al., 2021; Işık et al., 2021; Murat et al., 2021). The negative psychological responses usually peak during and between repeated pandemic outbreaks (Sasaki et al., 2021). Among the literature surrounding the psychological impact of COVID-19, nurses are among the highest population that reported experiencing the worst psychological outcomes than other health care workers (De Kock et al., 2021; Rao et al., 2021; Shaikat et al., 2020). This is expected due to the nature of their job, having more and prolonged patient contact and extended working hours (Fteropoulli et al., 2021; Pappa et al., 2021).

With the increased report of burnout and poorer self-rated health, it was natural for the job dedication among the nurses in 2021 to reduce compared with 2020. Job dedication determines nurses' job performance, which may be affected by stressful work conditions and heavy workload (Zhang et al., 2022). This was especially so in the uncertain and challenging clinical environment during the pandemic, whereby nurses bravely coped with the increased workload and stressful environment (Zhang et al., 2021).

### 5.2 | Anxiety, depression and perceived stress

The comparison between the 2020 and 2021 cohort of nurses demonstrated higher anxiety, depression and perceived stress levels,

however the differences were found insignificant. This finding was inconsistent with previous findings (Lai et al., 2020; Li et al., 2021; Murat et al., 2021). The study by Murat et al. evaluated the stress, depression and burnout levels of a group of nurses who were mostly single and had work experiences less than 10 years (2021). The findings showed that those nurses who were younger with fewer years of work experience reported higher levels of stress and burnout (Murat et al., 2021). Similarly, another study reported that working experience of nurses significantly contributed to the changes in their stress level during the pandemic, with those who were less experienced experiencing increased stress level (Li et al., 2021). Our results showed a vast difference in the participants profile with half of the group married and had more than 10 years work experience.

### 5.3 | Factors associated with nurses' psychological well-being

Results from previous studies highlighted that workload during the pandemic was positively correlated with the negative psychological outcomes in the nurses (Bruyneel et al., 2021; Işık et al., 2021; Roberts et al., 2021; Th'ng et al., 2021; Wang et al., 2022). Those nurses who perceived a higher risk of acquiring infection risk to themselves and family due to work had higher odds of developing negative psychological symptoms. However, our study did not resonate with those findings in the literature. We found teamwork, feelings of appreciation by the department/hospital and individual self-rated health to be significant risk factors contributing to burnout among the nurses. Our findings also reported a higher proportion of nurses felt unappreciated at work in 2021 compared with 2020.

They need to feel appreciated and have good collaboration with team members is closely relevant to the aspect of belongingness in Maslow's hierarchy theory (Maslow, 1943). It has been recognized that acknowledging health care workers' feelings of contribution through the demonstration of appreciation and providing positive feedback can aid in the improvement of their functioning at work (Baldwin & George, 2021; Melnikov et al., 2022; Wald, 2020). Expressing gratitude to the employees has improved self-esteem, work productivity and overall resilience (Wald, 2020). These needs can be

**TABLE 2** Descriptive data of the 2020 and 2021 cohort of nurses

Variable	2020 cohort n = 179	2021 cohort n = 179	p value <sup>1</sup>
Worked in health care during SARS?			
No	138 (77.1%)	138 (77.1%)	1.00
Yes	41 (22.9%)	41 (22.9%)	
Significant impact of SARS			
No	154 (86%)	154 (86%)	1.00
Yes	25 (14.0%)	25 (14.0%)	
Diagnosed having a chronic history			
No	127 (70.9%)	127 (70.9%)	1.00
Yes	52 (29.1%)	52 (29.1%)	
Night shift in last month			
No	78 (43.6%)	102 (57.0%)	0.02*
Yes	101 (56.4%)	77 (43.0%)	
Worked longer than usual hours			
No	103 (57.5%)	99 (55.3%)	0.52
Yes	76 (42.5%)	80 (44.7%)	
Perceived job risk			
No	45 (25.1%)	46 (25.7%)	0.19
Yes	130 (72.6%)	125 (69.8%)	
Updates are readily available and timely			
Yes	144 (80.4%)	137 (76.5%)	0.74
No	35 (19.6%)	42 (23.5%)	
Information is trustworthy			
Yes	130 (72.6%)	126 (70.4%)	0.37
No	49 (27.4%)	53 (29.6%)	
Clear work protocols			
Yes	109 (60.9%)	106 (59.2%)	1.00
No	70 (39.1%)	73 (40.8%)	
Good teamwork			
Yes	112 (62.6%)	97 (54.2%)	0.35
No	67 (37.4%)	82 (45.8%)	
Feel appreciated at work			
Yes	133 (74.3%)	112 (62.5%)	0.21
No	46 (25.7%)	67 (37.5%)	
Job burnout (physician work life scale), mean (SD)	2.19 (0.90)	2.54 (1.08)	0.001*
Score $\geq 3^a$	46 (25.70%)	67 (37.43%)	
Anxiety (GAD-7), mean (SD)	5.38 (5.20)	6.23 (5.36)	0.14
Score $\geq 10^b$	30 (16.8%)	31 (17.3%)	
Depression (PHQ-8), mean (SD)	1.27 (1.56)	1.54 (1.70)	0.07
Score $\geq 10^c$	9 (5.0%)	34 (19.0%)	
Perceived stress (PSS-4), mean (SD)	6.28 (2.80)	6.6 (6.69)	0.28
Score $\geq 13^d$	3 (1.7%)	3 (1.7%)	
Self-rated health (1 item VAS), mean (SD)	2.71 (0.93)	2.99 (0.91)	0.006*
Score $\geq 4^e$	35 (19.6%)	47 (26.3%)	
UWES dedication subscale, mean (SD)	4.07 (1.29)	3.71 (3.39)	0.04*

Note: Frequencies may not add up to the total sample size due to missing responses.

<sup>1</sup>Chi-squared and t tests were used for categorical and continuous variables, respectively.

<sup>a</sup>Score  $\geq 3$  indicated presence of job exhaustion.

<sup>b</sup>Score  $\geq 10$  indicated moderate level of anxiety.

<sup>c</sup>Score  $\geq 10$  indicated moderate level of depression.

<sup>d</sup>Score  $\geq 8$  indicated high level of stress.

<sup>e</sup>Score  $\geq 4$  indicated fair to poor self-rated health.

\* $p < 0.05$ .

**TABLE 3** Comparison of variables between nurses who reported burnout in 2020 and 2021

Variable	Burnout <sup>a</sup> 2020 n (%)	Burnout <sup>a</sup> 2021 n (%)	p value <sup>c</sup>
Sample size	46	67	
Working location			
Low risk <sup>b</sup>	10 (21.7%)	19 (28.4%)	0.73
High risk	36 (78.3%)	48 (71.6%)	
Worked in health care during SARS?			
No	40 (87.0%)	59 (88.1%)	0.86
Yes	6 (13.0%)	8 (11.9%)	
Significant impact of SARS			
No	40 (87.0%)	61 (91.0%)	0.41
Yes	6 (13.0%)	6 (9.0%)	
Diagnosed having a chronic history			
No	29 (63.0%)	44 (65.7%)	0.79
Yes	17 (37.0%)	23 (34.3%)	
Night shift in last month			
No	17 (37.0%)	30 (44.8%)	0.44
Yes	29 (63.0%)	37 (55.2%)	
Worked longer than usual hours			
No	16 (33.3%)	26 (38.8%)	0.69
Yes	30 (66.7%)	41 (61.2%)	
Perceived job risk			
No	12 (26.1%)	17 (25.4%)	0.93
Yes	34 (73.9%)	50 (74.6%)	
Updates are readily available and timely			
Yes	34 (73.9%)	48 (71.6%)	0.65
No	12 (26.1%)	19 (28.4%)	
Information is trustworthy			
Yes	28 (60.9%)	41 (61.2%)	0.34
No	18 (39.1%)	26 (38.8%)	
Clear work protocols			
Yes	21 (46.7%)	34 (40.3%)	0.44
No	25 (33.0%)	33 (59.7%)	
Good teamwork			
Yes	19 (42.2%)	22 (32.8%)	0.29
No	27 (57.8%)	45 (67.2%)	
Feel appreciated at work			
Yes	26 (56.5%)	24 (35.8%)	0.04*
No	20 (43.5%)	43 (64.2%)	
Anxiety (GAD-7), mean (SD)	10.46 (4.40)	10.01 (5.57)	0.68
Score ≥10	24 (52.2%)	28 (41.8%)	
Depression (PHQ-8), mean (SD)	11.79 (6.31)	10.78 (7.19)	0.58
Score ≥10	7 (15.2%)	31 (46.3%)	
Perceived stress (PSS-4), mean (SD)	8.57 (2.20)	8.13 (2.34)	0.33
Score ≥13	3 (6.5%)	3 (4.5%)	
Self-rated health (1 item VAS), mean (SD)	3.30 (0.87)	3.57 (0.76)	0.09
Score ≥4	17 (37.0%)	33 (49.3%)	
UWES dedication subscale, mean (SD)	3.76 (1.40)	3.39 (1.06)	0.10

Note: Frequencies may not add up to the total sample size due to missing responses.

<sup>a</sup>High burnout is defined as the those choosing option 3 and above on the burnout symptom question.

<sup>b</sup>Low risk locations are defined as work locations with low chances of being in contact with COVID-19 patients in their work environment.

<sup>c</sup>Chi-squared and t tests were used for categorical and continuous variables, respectively.

\*p < 0.05.

**TABLE 4** Logit regression with burnout in 2020 and 2021 as an outcome

Variables	Burnout 2020 odds ratio (95% CI)	p value	Burnout 2021 odds ratio (95% CI)	p value
Perceived job risk (of COVID-19) (ref = no) Yes	0.77 (0.08–7.51)	0.82	0.61 (0.20–1.86)	0.39
The official COVID-19 updates are readily available and timely (ref = yes) No	3.77 (0.11–124.21)	0.46	0.77 (0.14–4.34)	0.77
The information shared is trustworthy (ref = yes) No	0.21 (0.01–3.58)	0.28	2.51 (0.50–12.53)	0.26
The policies and protocols have been clear and easy to follow (ref = yes) No	3.75 (0.45–31.17)	0.22	0.25 (0.06–1.01)	0.05
My team has been working well together. (ref = yes) No	2.79 (0.34–23.23)	0.34	3.30 (1.12–9.69)	0.03*
I feel appreciated by my department/hospital. (ref = yes) No	1.38 (0.11–16.84)	0.80	8.84 (2.67–29.21)	<0.001*
Anxiety (GAD-7) (continuous)	1.23 (0.69–2.21)	0.48	1.11 (0.89–1.38)	0.37
Depression (PHQ-8) (continuous)	1.27 (0.89–1.81)	0.18	1.12 (0.92–1.36)	0.27
Perceived stress (PSS-4) (continuous)	1.25 (0.44–3.55)	0.68	1.05 (0.79–1.41)	0.72
Self-rated health (continuous)	2.34 (0.62–8.93)	0.21	2.82 (1.32–6.03)	0.008*
UWES dedication subscale (continuous)	0.70 (0.23–2.16)	0.53	0.91 (0.52–1.59)	0.74

\* $p < 0.05$ .

fulfilled by creating a collaborative work atmosphere with adequate support from the leaders and the organization (Van Bogaert et al., 2013). Organizational support is also vital to mitigate the effect of a stressful work environment (Zhang et al., 2022). This resonates with the findings from a qualitative study which explored how health care workers would like to be supported in relating to their physical and mental well-being (Baldwin & George, 2021). Nurses expressed in another local study that support from the organization leaders was vital to support them by motivating them to persevere in the midst of the challenges experienced during the pandemic (Goh et al., 2021). Health care workers valued good leadership and management, as well as the availability of a wide range of support services provided by the organization. The team's camaraderie was also key in promoting their overall well-being (Baldwin & George, 2021). These findings provided some insights to inform health care organizations of the impact of the workplace support factors on the psychological outcomes among the nurses during the pandemic.

Nurses' participation in the policy planning process will be beneficial in developing and implementing effective programs and strategies tailored to address the prevalence of burnout among nurses in

Singapore. Organization initiatives and policies to mitigate and address the frontline nurses' psychological well-being and target determinants of adverse mental health exacerbated by the pandemic are critical to prevent further burnout and prepare the nurses for future pandemics.

## 5.4 | Limitations

There are some limitations in this study that need to be acknowledged. First, we do not have the baseline data on the prevalence of psychological symptoms before COVID-19; therefore, we were unable to draw comparisons to the pre-pandemic situation, which could be a potential confounding factor. Second, self-reported health status could not be verified by a medical record of the participant's actual health condition, which subjects to self-reporting bias. Third, the response rate of our participants who completed the follow-up surveys was approximately 18.0%, which was relatively low for a longitudinal study. There is a tendency for burnout studies to experience a bias known as the "healthy worker effect," where employees with burnout are less likely to

respond to the surveys (Kok et al., 2021). Therefore, follow-up studies are needed to evaluate the progression of the psychological impact on nurses during the aftermath of the COVID-19 pandemic. There may be the 'rebound effect' whereby frontline nurses may experience various neuro-psychiatric symptoms once the peak of the threat of the disease subsides, which may reduce their protective factors relating to collegiality and bravery (Mauder et al., 2006).

## 6 | CONCLUSION

With the tremendous stress from the COVID-19 pandemic, nurses' psychological well-being is affected for a prolonged period of time. This longitudinal study showed a significant overall increase in nurses who reported higher burnout and lower job dedication in 2021 compared to the previous year. There was also a significantly reduced number of nurses who reported feeling appreciated by their department/hospital. Workplace support, including teamwork and appreciation by the organization and individual self-rated health, are significant factors contributing to the risk of experiencing burnout among nurses.

Future interventions at the departmental and organizational levels are needed to improve the workplace support provided to the nurses. These targeted interventions are recommended to enhance the psychological well-being of frontline nurses during the pandemic. In addition, strategies to support nurses' psychological well-being during the aftermath of COVID-19 are also vital to managing burnout and improving job dedication and self-rated health.

### 6.1 | Implications for nursing management

This study provided some insights to inform health care organizations of the impact of the workplace support factors on the psychological outcomes among the nurses during the pandemic. Future interventions at the departmental and organizational levels are needed to improve the workplace support provided to the nurses, especially in the acknowledgment of their feelings of contribution. In addition, creating a collaborative work atmosphere can potentially aid in the functioning of the nurses. These targeted interventions are recommended to enhance the psychological well-being of frontline nurses during the pandemic and mitigate the effect of a stressful work environment. In addition, strategies to support nurses' psychological well-being during the aftermath of COVID-19 are also vital to managing burnout and improving job dedication and self-rated health.

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### CONFLICT OF INTEREST

The authors have no conflict of interest to disclose.

### ETHICS STATEMENT

This study was approved by the Centralised Institutional Review Board in Singapore (Ref no: 2020/2160).

### DATA AVAILABILITY STATEMENT

Due to the sensitive nature of the questions asked in this study, survey respondents were assured raw data would remain confidential and would not be shared. Data not available / The data that has been used is confidential

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