

## SPECIAL ISSUE ARTICLE

# Insomnia, fatigue and psychosocial well-being during COVID-19 pandemic: A cross-sectional survey of hospital nursing staff in the United States

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**Abstract**

**Aims and objectives:** To describe the levels of insomnia, fatigue and intershift recovery, and psychological well-being (burnout, post-traumatic stress and psychological distress), and to examine differences in these measures based on work-related characteristics among nursing staff during COVID-19 pandemic in the United States.

**Background:** The COVID-19 pandemic has created a major physical and psychological burden on nursing staff in the United States and worldwide. A better understanding of these conditions will lead to tailored support and resources for nursing staff during and after the pandemic.

**Design:** Cross-sectional study.

**Methods:** Hospital nurses and nursing assistants ( $N = 587$ ) were recruited online between May–June 2020. The survey included measures on insomnia (Insomnia Severity Index) fatigue and intershift recovery (Occupational Fatigue and Exhaustion Recovery-15), burnout (Maslach Burnout Inventory-Human Services Survey), post-traumatic stress (Short Post-Traumatic Stress Disorder Rating Interview) and psychological distress (Patient Health Questionnaire-4), and questions on work and demographics. The STROBE checklist was followed for reporting.

**Results:** The sample had subthreshold insomnia, moderate-to-high chronic fatigue, high acute fatigue and low-to-moderate intershift recovery. The sample experienced increased emotional exhaustion and depersonalisation, increased personal accomplishment, moderate psychological distress and high post-traumatic stress. Nurses who cared for COVID-19 patients had significantly scored worse on almost all measures than their co-workers. Certain factors such as working hours per week and the frequency of 30-min breaks were significant.

**Conclusion:** Nursing staff experienced poor sleep, fatigue and multiple psychological problems during the COVID-19 pandemic. Moreover, staff who were involved in the care of COVID-19 patients, worked more than 40 h per week and skipped 30-min breaks showed generally worse self-reported outcomes.

**Relevance to clinical practice:** Nursing administration is recommended to monitor for fatigue and distress on nursing units, re-visit current scheduling practices, reinforce rest breaks and provide access to mental health and sleep wellness resources with additional support for their front-line nursing groups.

**KEYWORDS**

burnout, COVID-19, distress, fatigue, insomnia, nursing, PTSD

## 1 | INTRODUCTION

On 11 March 2020, the World Health Organization declared the spread of Coronavirus disease (COVID-19) a pandemic (World Health Organization, 2020). Widespread COVID-19 infection is currently a global problem. Infectious disease outbreaks, as seen during severe acute respiratory syndrome, Middle East respiratory syndrome and Ebola virus, can cause psychological disturbances for nurses who provide direct patient care in the most extreme of circumstances and endure potential exposure to infected patients (Chen et al., 2005; Ji et al., 2017; Jung et al., 2020). Given the uncertain and highly infectious nature of this virus, the COVID-19 outbreak may cause even greater physical and psychological difficulties for hospital nurses than other public health events.

## 2 | BACKGROUND

The nursing workforce in the United States (US) and worldwide has been strained (International Council of Nurses, 2020). Pre-COVID-19, hospital nurses reported relatively high levels of fatigue, poor sleep and burnout (Barker & Nussbaum, 2011; Dall'Ora et al., 2015; Geiger-Brown et al., 2012). Shiftwork, such as night shifts, extended and/or rotating shifts, and multiple consecutive work shifts, restricts sleep opportunity for nurses, which results in fewer sleep hours and poor sleep quality (Geiger-Brown et al., 2011, 2012; Hirsch Allen et al., 2014). This leads to fatigue, excessive daytime sleepiness and reduced performance (Dorrian et al., 2008; Johnson et al., 2010). Nurses are exposed to high stressors during work with limited recovery, which contributes to increased fatigue and decreased psychological well-being (Han et al., 2014; Pisanti et al., 2011). Nurses' fatigue, sleep and burnout levels have all been associated with negative consequences for safe and quality patient care (Barker & Nussbaum, 2011), personal health and well-being (Kim et al., 2019), sickness absences (Sagherian et al., 2017) and intent to leave the profession (Dall'Ora et al., 2015).

The COVID-19 pandemic has exacerbated already demanding and stressful working conditions in US hospital nurses (Jackson et al., 2020). Longer work shifts may carry even greater hazards than before for poor physical and mental health outcomes. Nursing staff face increased demands, such as providing direct nursing care under strict isolation, being trained on the job to safely care for patients with COVID-19, new information about disease management,

### What does this paper contribute to the wider global clinical community?

- The study reports for the first time on the poor sleep, elevated fatigue and psychological problems of hospital nurses during the COVID-19 pandemic in the United States. The levels of post-traumatic stress, depression and anxiety are worrisome.
- Nursing staff who cared for patients with confirmed COVID-19 had more insomnia, chronic and acute fatigue, feelings of depersonalisation, psychological distress and post-traumatic stress illness severity than co-workers who cared for hospitalised patients for other reasons.
- Nurse leaders need to attend to these high levels and facilitate mental health and sleep wellness services, re-visit scheduling practices and reinforce unit breaks.

prognosis and mortality rates, shortages in staff and protective garments in states where outbreaks are particularly high, emotional provision to sick patients and colleagues, and personal worry and fear of contracting and spreading the virus among others (Fernandez et al., 2020; Shechter et al. 2020). Therefore, working during the pandemic may increase already high levels of fatigue, poor sleep and burnout and associated risks to patient, nurse and organisational outcomes.

During the COVID-19 outbreak, studies have already examined insomnia and psychological well-being (e.g. depressive and anxiety symptoms and psychological distress) among Chinese health-care workers (Lai et al., 2020; Zhang, Yang, et al., 2020). Insomnia prevalence ranged between 34.0%–36.1%. Front-line workers were at increased odds to have depressive and anxiety symptoms, insomnia and distress when compared with second-line workers (Lai et al., 2020). Also, healthcare workers who worked in isolation units were worried about being infected and had strong feelings of uncertainty about effective disease control were at increased odds to have insomnia symptoms (Zhang, Yang, et al., 2020). In Italy, health-care workers expressed substantial mental health issues including stress-related symptoms and symptoms of depression, anxiety and insomnia during the COVID-19 pandemic (Rossi et al., 2020).

Although fatigue and poor sleep have been studied in hospital nurses, there is a paucity of evidence to how these conditions will

change, and most likely exacerbate physical and psychological health outcomes after exposure to the pandemic. Outside the workplace, the pandemic has imposed continuous stressors of social isolation, economic instability and family responsibilities that may interfere with nurses' recovery from work. Thus, traditional fatigue countermeasures such as adequate sleep and leisure activities may not be as effective as before COVID-19. Moreover, there is existing literature that certain work-related characteristics (work schedule, type of work setting and years of experience) impact nurses' levels of poor sleep, fatigue, intershift recovery and burnout (Dall'Ora et al., 2015; Han et al., 2014; Hirsch Allen et al., 2014; Sagherian et al., 2016).

To better understand how the nursing workforce has been impacted by the COVID-19 pandemic and guide evidence-based interventions to support nurses practically and psychologically, it is important to investigate the prevalence of insomnia, fatigue and psychological disorders and to understand how they are different across certain work-related characteristics. Identifying whether there are subgroups of nurses who are more vulnerable could facilitate implementation of evidence-based strategies to protect them. This cross-sectional exploratory study aimed to describe and quantify levels of insomnia, fatigue and intershift recovery, and psychological well-being (burnout, post-traumatic stress and psychological distress) among hospital nursing staff during the COVID-19 pandemic in the United States, and to examine differences in these measures based on work-related characteristics, including whether or not nursing staff cared for patients with confirmed COVID-19.

### 3 | METHODS

The study followed the STrengthening the Reporting of Observational studies in Epidemiology (STROBE) checklist for cross-sectional studies (Appendix S1).

#### 3.1 | Design and participants

The study used an observational cross-sectional design. A convenience sample of registered nurses and nursing assistants who worked in hospitals and provided direct patient care were invited to participate in our anonymous online survey. The exclusion criteria were nurses and nursing assistants who were on vacation and maternity leaves, nursing administration and leadership, and those who did not work in a hospital setting. Participants were recruited from social media outlets (Twitter, Facebook and LinkedIn). Study postings included an overview of the study aim, and the survey Qualtrics<sup>XM</sup> link and a Quick Response code. Recruitment emails were also sent to colleagues in the nursing profession to share with others. Data collection took place over 1 month between May 27–June 25, 2020. Two reminders about the study were posted on social media during this period.

The recommended sample size was 400, estimated based on the formula:  $[Z^2 * p * (1 - p)]/e^2$ , where  $Z = 1.96$  for 95% CI and

margin of error 5%, and an added 10% increase to further allow for subgroup analyses. The sample proportion ( $p$ ) with insomnia and psychological distress was estimated at 38.0%. This proportion was based on the few published COVID-19 studies at the time, in which the prevalence of insomnia ranged from 38.2%–40.1% and moderate-to-severe psychological distress from 12.7%–15.5% (Lai et al., 2020; Zhang, Yang, et al., 2020). The final analytic sample had 587 participants.

#### 3.2 | Measures

The survey named 'Sleep And Fatigue during COVID-19 in health CARE' (SAFE-CARE) had two parts: instruments that measured insomnia, fatigue and intershift recovery, burnout, post-traumatic stress and psychological distress with recall in the past month, and questions on work-related and demographic characteristics.

**Insomnia:** The Insomnia severity Index (ISI) measured type and severity of three insomnia symptoms, sleep satisfaction, noticeability of sleep problems by other people and degree of distress and interference with daily functioning because of sleep problems (Morin et al., 2011). The ISI has seven items with responses from 0 (no problem)–4 (very severe problem). Summative scores range from 0–28 and are interpreted as no insomnia (0–7), sub-threshold (8–14), moderate (15–21) and severe (22–28) form of insomnia. The ISI has good reliability and validity in general and clinical populations (Morin et al., 2011). Cronbach's alpha in our sample was 0.86.

**Fatigue and intershift recovery:** The Occupational Fatigue and Exhaustion Recovery (OFER-15) measured chronic fatigue (CF), acute fatigue (AF) and intershift recovery (IR) (Winwood et al., 2006). The scale has 15 items divided into three subscales. Item responses were from 0 (strongly disagree)–6 (strongly agree). Scores range from 0–100 and are interpreted as low (0–25), low–moderate (26–50), moderate–high (51–75) and high (76–100). The OFER-15 has good psychometric properties in nurses (Winwood et al., 2006). Cronbach's alphas for CF, AF and IR were 0.88, 0.83 and 0.86, respectively, indicating good internal consistency.

**Burnout:** The multidimensional concept of burnout was measured by the Maslach Burnout Inventory-Human Services Survey (MBI-HSS) (Maslach & Jackson, 1981). The scale consists of 22 items distributed into three subscales: emotional exhaustion (EE), depersonalisation (DP) and personal accomplishment (PA). Item responses are from 0 (never)–(6) every day. Higher summative scores indicate more of the measured construct. Scores were interpreted on a continuum since cut-off scores are not endorsed by the MBI developers because of no criterion-related diagnostic validity (Maslach et al., 2016). Since its development in 1981 (Maslach & Jackson, 1981), the MBI-HSS has a long history of reliability and validity testing in human services workers (Schaufeli et al., 1996) and in nurses from Europe and the United States (Poghosyan et al., 2009). The reliability coefficients in our sample were 0.91 for EE (excellent), 0.78 for DP (acceptable), and 0.81 for PA (good).

*Post-traumatic stress:* The Short Post-Traumatic Stress Disorder Rating Interview (SPRINT) assessed for post-traumatic stress disorder (PTSD) illness severity. It consists of eight items that addresses four-core symptoms of PTSD, somatic malaise, stress vulnerability, and impairment in role and social functioning. Item responses are from 0 (not at all)–4 (very much). A total score of  $\geq 14$  is considered high on symptom severity, a positive indication for PTSD and calls for further clinical evaluation. The SPRINT is considered reliable and valid and has shown diagnostic accuracy of 96.0% for PTSD based on a cut-off score  $\geq 14$  in individuals with sustained trauma (Conner & Davidson, 2001; Davidson & Colket, 1997). The SPRINT in our sample had good internal consistency with Cronbach's alpha of 0.89.

*Psychological distress:* The Patient Health Questionnaire-4 (PHQ-4) is a widely used screening tool that has two items each for depression and anxiety. Item responses are from 0 (not at all)–3 (nearly every day). The item responses for depression and anxiety can be summed separately ( $\geq 3$  suggests depression or anxiety) or as a total score. The scores are interpreted as normal (0–2), mild (3–5), moderate (6–8) and severe (9–12) severe psychological distress. The psychometric properties of the PHQ-4 have been demonstrated in the general and clinical populations (Kroenke et al., 2009; Löwe et al., 2010). Cronbach's alpha in our sample was 0.87.

*Work-related variables:* These variables characterise the work environment and work-related practices. They include years of work experience ( $\leq 2$ , 3–8, 9–14,  $\geq 15$  years), employment status (full time or part time), having a second job (yes or no), unit of practice, shift type and shift length (traditional 8–9 and extended  $\geq 10$  work hours), average worked hours per week in the past month ( $\leq 40$  h and  $> 40$  h) and frequency of 30-min relieved breaks (always often, sometimes, rarely never).

*Health and demographic characteristics:* Subjective health status was rated as follows: poor–fair, good and very good–excellent. Sleep hours for work and non-workdays were categorised into two groups:  $\geq 7$  h and  $< 7$  h that indicate short sleep duration. The demographic variables were age ( $\leq 30$ , 31–40, 41–50,  $\geq 51$  years), sex (male and female), race (White and others), marital status (not married and married/with partner), nurse education (associate/diploma, bachelor's degree and graduate student or degree), nursing assistant education (high school/GED, some college, and non-nursing bachelor's or nursing student), dependents—children (yes and no), dependents—elderly (yes and no) and census region (North-east, Midwest, South and West).

### 3.3 | Ethical considerations

Ethics committee approvals were obtained from two universities. The study was deemed as exempt. Information about the study purpose and any potential risks was provided at the start of the survey. Participants were asked to click to consent and then move forward with the survey.

### 3.4 | Data analysis

Data management and analysis were conducted in STATA version 15.1 software. After screening for possible errors, descriptive statistics such as means ( $M$ ), standard deviations ( $SD$ ), frequencies ( $n$ ) and percentages (%) were used for continuous and categorical variables. The continuous variables were examined for normality through skewness and graphic representations (histograms and box plots). All skewness values were below  $\pm 1.5$  (acceptable range  $\pm 1.5$ ). The few identified outliers were not removed as they did not introduce bias and influence the analysis outcomes. The study variables had missing data primarily related to premature exit of participants from the survey (Table S2). However, missing data handling techniques were not used because of the descriptive nature of the study.

Inferential statistics, independent-samples  $t$  tests and one-way ANOVAs, were used to examine differences in the mean scores of insomnia, fatigue, IR, post-traumatic stress and psychological distress based on delivery of care to patients with COVID-19 (yes and no) and work-related characteristics. The parametric assumptions of equal variance of scores between the groups were checked by variance ratio tests and Levene's tests. When ANOVA models were significant, post hoc comparisons using Tukey's HSD test were used to identify further the differences in mean scores between the groups. Pearson's chi-squared test of independence or Fisher's exact test when needed was used to test for proportional differences between the categorical variables. Significance was set at .05 level.

## 4 | RESULTS

Of the 587 participants who completed different parts of the online survey, 286 had no missing data on all variables and were complete cases. Of the 587 participants, 166 had exited the survey before providing any responses to demographics and work-related questions, and the remaining 421 had partial responses.

Of the 420 participants who reported their work type, 384 (91.43%) were registered nurses and 36 (8.57%) were nursing assistants. Nurses ranged in age from 22–67 years ( $n = 358$ ,  $M = 38.44$ ,  $SD = 10.77$ ) and nursing assistants from 19–61 years ( $n = 34$ ,  $M = 29.44$ ,  $SD = 10.78$ ). The sample was predominantly female ( $n = 396$ , 94.06%), White ( $n = 372$ , 88.78%) and married/living with a partner ( $n = 292$ , 69.36%) (see Table 1). The participants reported sleeping on average 5.62 ( $n = 402$ ,  $SD = 1.22$ ) hours during workdays and 8.40 ( $n = 402$ ;  $SD = 2.30$ ) during off days.

The majority of nursing staff worked extended shifts ( $n = 352$ , 84.82%), and one third worked  $> 40$  h per week (see Table 2). A total of 277 out of 406 (68.23%) participants who responded to this item reported providing nursing care to patients with COVID-19. Tables 1 and 2 present group differences by care delivery to patients with COVID-19. Therefore, these group comparisons were based on the subsample of 406 participants. As seen in Table 2, there were significant differences between work-related variables (i.e. unit of practice, work status, having a second job, hours worked per week, shift

TABLE 1 Demographic and health-related characteristics by total sample and care delivery to patients with COVID-19

Study variables	Total N (%)	Cared for COVID-19 patients		$\chi^2$	p
		Yes (n = 277) n (%)	No (n = 129) n (%)		
Age group <sup>†</sup> (n = 395)				1.71	.636
≤30 years	127 (32.15)	85 (32.69)	39 (32.23)		
31–40 years	127 (32.15)	88 (33.85)	35 (28.93)		
41–50 years	79 (20.00)	47 (18.08)	28 (23.14)		
≥51 years	62 (15.70)	40 (15.38)	19 (15.70)		
Sex (n = 421)				1.15	.283
Female	396 (94.06)	263 (94.95)	119 (92.25)		
Male	25 (5.94)	14 (5.05)	10 (7.75)		
Race <sup>†</sup> (n = 419)				1.92	.165
White	372 (88.78)	241 (87.64)	119 (92.25)		
Others	47 (11.22)	34 (12.36)	10 (7.75)		
Nurse education (n = 382)				0.90	.639
Associate or diploma	97 (25.39)	66 (26.40)	27 (21.95)		
Bachelor's degree	230 (60.21)	149 (59.60)	77 (62.60)		
Graduate student/degree	55 (14.40)	35 (14.00)	19 (15.45)		
CNA education (n = 35)					1.000 <sup>*</sup>
High school or GED	8 (22.86)	6 (22.22)	1 (16.67)		
Some college	21 (60.00)	16 (59.26)	4 (66.67)		
Bachelors or RN student	6 (17.14)	5 (18.52)	1 (16.67)		
Marital status (n = 421)				0.22	.639
Not married	129 (30.64)	88 (31.77)	38 (29.46)		
Married or with partner	292 (69.36)	189 (68.23)	91 (70.54)		
Living arrangements (n = 421)				4.71	.095
Lives alone	59 (14.01)	39 (14.08)	17 (13.18)		
Lives with spouse or partner	129 (30.64)	94 (33.94)	31 (24.03)		
Lives with household members	233 (55.34)	144 (51.99)	81 (62.79)		
Dependents, children <sup>†</sup> (n = 420)				5.33	.021
Yes	196 (46.67)	118 (42.75)	71 (55.04)		
No	224 (53.33)	158 (57.25)	58 (44.96)		
Dependents, elderly <sup>†</sup> (n = 420)				0.11	.735
Yes	72 (17.14)	46 (16.61)	23 (17.97)		
No	348 (82.86)	231 (83.39)	105 (82.03)		
Subjective health status <sup>†</sup> (n = 422)				1.87	.392
Poor–fair	74 (17.54)	50 (18.12)	19 (14.73)		
Good	186 (44.08)	127 (46.01)	55 (42.64)		
Very good–excellent	162 (38.39)	99 (35.87)	55 (42.64)		
Sleep during workdays <sup>†</sup> (n = 402)				0.50	.478
<7 h	332 (82.59)	222 (81.62)	109 (84.50)		
≥7 h	70 (17.41)	50 (18.38)	20 (15.50)		
Sleep during off days <sup>†</sup> (n = 402)				0.13	.718
<7 h	74 (18.41)	47 (17.41)	24 (18.90)		
≥7 h	328 (81.59)	223 (82.59)	103 (81.10)		
Census regions <sup>†</sup> (n = 420)					<.001 <sup>*</sup>

(Continues)

TABLE 1 (Continued)

Study variables	Total N (%)	Cared for COVID-19 patients		$\chi^2$	<i>p</i>
		Yes ( <i>n</i> = 277) <i>n</i> (%)	No ( <i>n</i> = 129) <i>n</i> (%)		
North-east	38 (9.05)	33 (11.96)	4 (3.10)		
Midwest	162 (38.57)	89 (32.25)	69 (53.49)		
South	179 (42.62)	124 (44.93)	46 (35.66)		
West	41 (9.76)	30 (10.87)	10 (7.75)		

Note: Group comparisons are based on the subsample 'cared for COVID-19 patients' (*n* = 406).

†indicates missing observations in the subsample. The variables dependents (children, elderly), health status and region had 1 missing, race had 2 missing, sleep hours had 5 missing and age had 25 missing observations.

\*indicates Fisher's exact test otherwise it is a chi-squared statistics. CNA = certified nursing assistant. The category 'not married' under marital status included single, widowed, separated and divorced. The 'others' category under race included Blacks, Asians, Hispanics, American Indian/Alaskan Native and more than one race. Sig. is set at .05 level.

length and 30-min breaks) and whether or not nursing staff cared for patients with COVID-19 in the past month. For example, participants who worked >40 h per week were more likely to care for patients with COVID-19 than participants who worked ≤40-h per week ( $p < .001$ ).

Table 3 presents a descriptive summary of the nurse-reported outcomes in the overall sample. The ISI mean score was 13.50 ( $n = 564$ ,  $SD = 5.29$ ), which indicated a subthreshold insomnia. For descriptive purposes, 13.12% ( $n = 74$ ), 41.49% ( $n = 234$ ), 39.72% ( $n = 224$ ) and 5.67% ( $n = 32$ ) of the sample had no insomnia, subthreshold, moderate and severe forms of insomnia, respectively. The sample on average had moderate-to-high CF ( $n = 535$ ,  $M = 60.39$ ,  $SD = 24.06$ ), high AF ( $n = 536$ ,  $M = 77.06$ ,  $SD = 17.62$ ) and low-to-moderate IR ( $n = 536$ ,  $M = 31.93$ ,  $SD = 19.58$ ). Regarding burnout, participants overall reported increased EE ( $n = 451$ ,  $M = 32.21$ ,  $SD = 12.01$ ) and PA ( $n = 450$ ,  $M = 32.95$ ,  $SD = 8.00$ ) and some feelings of DP ( $n = 452$ ,  $M = 11.13$ ,  $SD = 6.99$ ). The mean SPRINT score was 15.32 ( $n = 502$ ,  $SD = 7.00$ ) that indicated high PTSD symptom severity. Based on the cut-off score, 55.38% ( $n = 278$ ) of the sample scored positive for PTSD cases that calls for further clinical assessment. For the PHQ-4, the sample had a mean score of 6.10 ( $n = 422$ ,  $SD = 3.30$ ) that indicated moderate levels of psychological distress. For descriptive purposes, 47.39% ( $n = 200$ ) and 62.32% ( $n = 263$ ) of the sample had possible depression and anxiety, respectively.

Group differences in nurse outcomes by care delivery to patients with COVID-19 are presented in Table 3. These group comparisons were also based on the subsample of 406 participants who responded to the item asking whether or not they cared for a patient with COVID-19. There were significant differences in insomnia, CF, AF, IR, DP, post-traumatic stress and psychological distress based on whether or not nursing staff had cared for patients with COVID-19. For example, nursing staff who cared for patients with COVID-19 had significantly higher insomnia [ $t(388) = -2.064$ ,  $p = .040$ ] and post-traumatic stress [ $t(402) = -3.276$ ,  $p = .001$ ] compared with co-workers who did not care for patients with COVID-19. Nursing staff who cared for patients with COVID-19 also had significantly more feelings of DP [ $t(400) = -2.750$ ,  $p = .006$ ].

Tables 4 and 5 present the relationships between nurse-reported outcomes and work-related variables (years of experience, work status, hours worked per week, shift length, shift type and 30-min breaks). There were no significant relationships between having a second job and the nurse-reported outcomes, and thus, data were not reported. As seen in Table 4 for example, for insomnia, significant differences in scores were related to 30-min breaks:  $F(2, 386) = 7.94$ ,  $p < .001$ . Post hoc comparisons showed that participants who rarely/never took 30-min breaks had significantly higher insomnia scores than participants who took 30-min breaks sometimes or often/regularly.

For AF, CF and IR, there were significant differences in worked hours per week, shift type and work status ( $p < .05$ ). Moreover, all three measures were significantly related to 30-min breaks:  $F(2, 402) = 9.31$ ,  $p < .001$  for AF;  $F(2, 401) = 9.38$ ,  $p < .001$  for CF; and  $F(2, 403) = 5.97$ ,  $p = .003$  for IR. Post hoc comparisons showed that participants who skipped 30-min breaks had significantly higher AF than participants who only took 30-min breaks often/regularly. Participants who skipped 30-min breaks had significantly higher CF and lower IR than participants who took 30-min breaks sometimes or often/regularly.

As shown in Table 5, EE was related to worked hours per week ( $p = .050$ ) and 30-min breaks:  $F(2, 398) = 5.37$ ,  $p = .005$ . For example, participants who skipped 30-min breaks had more EE than co-workers who only took 30-min breaks often/regularly. Depersonalisation was related to work status ( $p = .037$ ), shift length ( $p = .019$ ) and years of experience where the main difference was between 3–8–≥15 years of experience categories ( $p = .002$ ). The relationship between PA and hours worked per week was also significant ( $p = .004$ ).

Rest breaks was the only variable related to psychological distress:  $F(2, 403) = 3.88$ ,  $p = .022$ . Specifically, significant differences occurred between participants who took often/regularly 30-min breaks and those who skipped them (see Table 5). Finally, post-traumatic stress was related to work hours per week ( $p = .026$ ) and 30-min breaks:  $F(2, 401) = 7.91$ ,  $p < .001$ . Participants who skipped 30-min breaks scored significantly higher on post-traumatic stress compared with co-workers who took 30-min breaks sometimes or often/regularly.

TABLE 2 Work-related characteristics by total sample and care delivery to patients with COVID-19

Study variables	Total N (%)	Cared for COVID-19 patients		$\chi^2$	p
		Yes (n = 277) n (%)	No (n = 129) n (%)		
Years of experience <sup>†</sup> (n = 413)				1.94	.584
≤2	60 (14.53)	37 (13.55)	23 (17.83)		
3–8	163 (39.47)	113 (41.39)	47 (36.43)		
9–14	71 (17.19)	47 (17.22)	20 (15.50)		
≥15	119 (28.81)	76 (27.84)	39 (30.23)		
Work status (n = 413)				12.42	<.001
Full time	354 (85.71)	249 (89.89)	99 (76.74)		
Part time	59 (14.29)	28 (10.11)	30 (23.26)		
Second job <sup>†</sup> (n = 409)				4.30	.038
Yes	74 (18.09)	58 (21.09)	16 (12.50)		
No	335 (81.91)	217 (78.91)	112 (87.50)		
Unit of practice (n = 408)				21.53	<.001
Emergency department	46 (11.27)	44 (15.88)	2 (1.55)		
Intensive care unit	117 (28.68)	85 (30.69)	32 (24.81)		
Medical surgical unit	113 (27.70)	74 (26.71)	39 (30.23)		
Specialty areas	113 (27.70)	66 (23.83)	45 (34.88)		
Labour and delivery	19 (4.66)	8 (2.89)	11 (8.53)		
Shift length (n = 415)					.005 <sup>*</sup>
Extended shifts (≥10 h)	352 (84.82)	244 (88.73)	99 (76.74)		
Traditional shifts (8–9 h)	56 (13.49)	28 (10.18)	26 (20.16)		
Others	7 (1.69)	3 (1.09)	4 (3.10)		
Shift type (n = 417)					.248 <sup>*</sup>
Day	221 (53.00)	139 (50.18)	74 (57.36)		
Evening	13 (3.12)	11 (3.97)	2 (1.55)		
Night	142 (34.05)	102 (36.82)	37 (28.68)		
Rotating	35 (8.39)	21 (7.58)	14 (10.85)		
Others, unspecified	6 (1.44)	4 (1.44)	2 (1.55)		
Avg. work h/week <sup>†</sup> (n = 403)				11.11	.001
≤40 h	270 (67.00)	168 (61.54)	101 (78.29)		
>40 h	133 (33.00)	105 (38.46)	28 (21.71)		
30-min. breaks <sup>†</sup> (n = 406)				9.48	.009
Rarely or never	124 (30.54)	93 (33.70)	31 (24.03)		
Sometimes	106 (26.11)	78 (28.26)	28 (21.71)		
Often or always	176 (43.35)	105 (38.04)	70 (54.26)		

Note: Group comparisons are based on the subsample 'cared for COVID-19 patients' (n = 406).

<sup>†</sup>Indicates missing observations in the subsample. The variables years of experience had 4 missing, second job had 3 missing, avg. work hours/week had 4 missing and 30-min breaks had 1 missing observations.

\*Indicates Fisher's exact test otherwise it is a chi-squared statistics. Sig. is set at .05 level.

## 5 | DISCUSSION

Our findings provide evidence on poor sleep, fatigue and adverse psychological impacts during the COVID-19 pandemic among nursing staff in the United States. The sample overall had a subthreshold

level of insomnia, moderate-to-high CF, high AF, low-to-moderate IR, increased feelings of EE and DP, and increased PA. Nursing staff had increased PTSD symptom severity and moderate psychological distress. A growing body of literature, primarily from China, has shown the adverse psychological impacts of the COVID-19 pandemic in

TABLE 3 Summary of insomnia, fatigue, burnout and psychological well-being by total sample and care delivery to patients with COVID-19

Characteristics	Total N	M (SD)	Cared for COVID-19 patients				t	p
			n	Yes (n = 277) M (SD)	n	No (n = 129) M (SD)		
ISI								
Insomnia	564	13.50 (5.29)	266	13.98 (4.97)	124	12.81 (5.62)	-2.06	.040
OFER-15								
Chronic fatigue	535	60.39 (24.06)	276	63.60 (22.76)	128	54.27 (25.38)	-3.69	<.001
Acute fatigue	536	77.06 (17.62)	276	79.60 (15.73)	129	73.70 (19.57)	-3.00	.003
Intershift recovery	536	31.93 (19.58)	277	29.19 (18.12)	129	34.78 (21.28)	2.58	.011
MBI-HSS								
Emotional exhaustion	451	32.21 (12.01)	275	33.36 (11.39)	126	31.13 (12.77)	-1.76	.080
Depersonalisation	452	11.13 (6.99)	274	11.98 (7.05)	128	9.91 (6.93)	-2.75	.006
Personal accomplishment	450	32.95 (8.00)	274	32.95 (7.90)	126	33.34 (7.70)	0.47	.639
SPRINT								
Post-traumatic stress	502	15.32 (7.00)	277	16.11 (6.87)	127	13.67 (7.15)	-3.28	.001
PHQ-4								
Psychological distress	422	6.10 (3.30)	276	6.35 (3.28)	129	5.41 (3.18)	-2.70	.007

Note: Group comparisons are based on the subsample 'cared for COVID-19 patients' (n = 406) that has missing observations. t = value for independent-samples t test. M = mean, SD = standard deviation, COVID-19 = coronavirus 2019, Insomnia Severity Index = ISI, Occupational Fatigue Exhaustion Recovery-15 = OFER-15, Maslach Burnout Inventory-Human Services Survey = MBI-HSS, Short Post-Traumatic Stress Disorder Rating Interview = SPRINT, Patient Health Questionnaire-4 = PHQ-4. Sig. is set at .05 level.

healthcare workers (Lai et al., 2020; Rossi et al., 2020; Zhang, Yang, et al., 2020). Nursing staff who cared for patients with COVID-19 had significantly worse conditions when compared to co-workers who solely cared for patients admitted for other reasons. Despite some differences in measurement, our findings are similar to the COVID-19 literature that has demonstrated worse sleep problems and psychological outcomes in front-line healthcare workers and nurses (Lai et al., 2020; Rossi et al., 2020). Probably, factors such as being worried about personal health and the safety and well-being of their families, and being faced with a moral responsibility to work long hours (Sun et al., 2020) have contributed to nurses' psychological vulnerability during the pandemic.

## 5.1 | Insomnia and associated risks

A 2019 online survey of 1165 hospital nurses found that 31.0% had chronic insomnia (Christian et al., 2019). Although insomnia in our sample was at subthreshold level, 490 out of 564 participants had symptoms of insomnia that varied in severity. Our results show a higher prevalence than what was reported in earlier Chinese samples. Lai et al. (2020) found that the prevalence of insomnia ISI was 38.2% (29.2% subthreshold and 9.0% moderate-severe) among hospital nurses in China. Another study found that the prevalence of insomnia ISI in hospital nurses was 40.1% (Zhang, Yang, et al., 2020). In Italy, Rossi et al. (2020) found the prevalence of severe insomnia ISI was 8.3% among healthcare staff, higher than the number in our sample

(5.7%). Also, Italian hospital nurses were twice as likely to experience severe insomnia compared with other hospital workers. These differences between countries may be potentially attributed to differences in the severity of the pandemic at the time of data collection.

In our sample, nursing staff who cared for patients with COVID-19 had worse insomnia. Similarly, in China, front-line healthcare workers who cared for patients with suspected or positive COVID-19 had higher insomnia symptoms than second-line healthcare workers (Lai et al., 2020). Interestingly, 30-min breaks had a protective role on nurses' insomnia (see Table 4). Breaks, micro-recovery strategies that help mitigate cognitive overload and tiredness during extended shifts (Kim et al., 2017), might have addressed the hyperarousal state associated with acute insomnia, though more research is recommended. Although our study does not differentiate between acute and chronic insomnia, it is unlikely that nurses will resume normal sleep patterns after the pandemic because of persisting shiftwork demands. However, individuals can incorporate insomnia management techniques such as stimulus control, relaxation and sleep hygiene to better manage insomnia (Järnefelt et al., 2014) in the early stages and seek professional help.

## 5.2 | Fatigue and associated risks

Our study is the first to describe the levels of occupational fatigue among nursing staff during the pandemic. An earlier qualitative study identified feelings of fatigue, discomfort and helplessness



TABLE 4 Differences in insomnia, fatigue types and intershift recovery by work-related characteristics

	ISI		OFER-15					
	Insomnia		Acute fatigue		Chronic fatigue		Intershift recovery	
	n	M (SD)	n	M (SD)	n	M (SD)	n	M (SD)
Years of experience								
≤2	56	12.98 (4.22)	60	76.72 (16.64)	60	60.67 (24.88)	60	31.11 (19.23)
3–8	155	13.96 (5.38)	163	80.00 (16.72)	163	61.00 (24.07)	163	29.49 (18.22)
9–14	69	13.43 (5.46)	71	79.11 (15.94)	70	62.62 (24.38)	71	30.56 (17.99)
≥15	115	13.79 (5.20)	118	74.75 (19.46)	118	59.38 (23.76)	119	32.97 (21.21)
F (p)		0.56 (.643)		2.29 (.078)		0.27 (.845)		0.76 (.517)
Work status								
Full time	338	13.76 (5.12)	353	78.18 (16.97)	352	61.70 (21.01)	354	29.79 (18.36)
Part time	57	12.82 (5.50)	59	74.46 (19.69)	59	53.45 (24.04)	59	38.93 (23.09)
t (p)		1.26 (.207)		1.52 (.130)		2.44 (.015)		−2.89 (.005)
Avg. work hours per week								
≤40 h	260	13.33 (5.19)	269	76.12 (17.47)	268	58.51 (24.10)	270	32.65 (19.95)
>40 h	126	14.18 (5.17)	133	81.33 (16.20)	133	65.74 (22.99)	133	27.22 (17.46)
t (p)		−1.52 (.129)		−2.88 (.004)		−2.87 (.004)		2.68 (.008)
Shift length								
Extended	336	13.73 (5.10)	351	78.06 (17.26)	350	60.69 (23.69)	352	30.32 (17.77)
Traditional	54	13.89 (5.63)	56	78.04 (16.50)	56	61.90 (26.98)	56	33.27 (20.73)
t (p)		−0.21 (.830)		0.01 (.991)		−0.35 (.726)		−1.08 (.282)
Shift type								
Day	209	13.02 (5.11)	221	80.17 (15.14)	219	62.77 (22.69)	221	31.06 (19.26)
Night	137	14.61 (5.07)	141	76.69 (16.64)	142	58.43 (23.38)	142	29.55 (17.64)
t (p)		−2.83 (.005)		2.05 (.041)		1.76 (.080)		0.75 (.454)
30-min. breaks								
Rarely/never	119	15.16 (5.20)	124	82.69 (15.94)	124	68.23 (21.43)	124	26.05 (18.81)
Sometimes	101	13.25 (4.97)	105	77.90 (16.34)	106	59.12 (24.13)	106	32.52 (18.51)
Often/always	169	12.79 (5.09)	176	74.15 (17.84)	174	56.53 (24.38)	176	33.47 (19.62)
F (p)		7.94 (<.001)		9.31 (<.001)		9.38 (<.001)		5.97 (.003)

Note: *t* = value for independent-samples *t* test, *F* = *F* ratio for ANOVA, *M* = mean, *SD* = standard deviation, ISI = Insomnia Severity Index, OFER-15 = Occupational Fatigue and Exhaustion Recovery Scale-15. Sig. is set at .05 level.

present among Chinese nurses (Sun et al., 2020). From Singapore and India, Chew et al. (2020) found that the prevalence of tiredness or lethargy was 26.6% in healthcare workers. Although it is expected to have increased AF during crises such as the COVID-19 pandemic, both AF and CF states have shifted to higher quartiles. For almost a decade, US nursing studies have reported low-to-moderate CF and moderate-to-high AF (Barker & Nussbaum, 2011; J. Chen et al., 2014; Drake & Steege, 2016; Geiger-Brown et al., 2012; Ungard et al., 2019). Intershift recovery, which reflects rest and sleep during consecutive work shifts, has decreased from a moderate-to-high (Barker & Nussbaum, 2011; J. Chen et al., 2014; Drake & Steege, 2016; Geiger-Brown et al., 2012) to low-to-moderate level.

We found that nursing staff who cared for patients with COVID-19 had worse fatigue and poorer IR than the rest of the group. Although statistical differences are found in mean fatigue

and IR scores, the data show that participants on average experienced elevated fatigue and poor IR. These conditions are worrisome as they lead to decreased performance during work hours (Barker & Nussbaum, 2011; Sagherian et al., 2016) and on the road while driving (Scott et al., 2007), and poor health. There are a number of contributing factors that increase fatigue such as poor sleep, overtime and longer shifts (Barker & Nussbaum, 2011; Sagherian et al., 2016). Nursing staff who worked ≥40 h per week had significantly higher AF and CF, and lower IR than co-workers who worked fewer hours (see Table 4). The sample on average slept 5.6 h during workdays, a comparable finding to nurses' 5.5 h of short sleep recorded by actigraphy (Geiger-Brown et al., 2012). Besides macro-recovery sleep, brief breaks are critical to alleviate some fatigue and sensory overload that builds with the progression of a shift (Kim et al., 2017; Zhu et al., 2019). Nursing staff

TABLE 5 Differences in psychological well-being (burnout, post-traumatic stress and psychological distress) by work-related characteristics

	MBI-HSS						PHQ-4		SPRINT	
	Emotional exhaustion		Depersonalisation		Personal accomplishment		Psychological distress		Post-traumatic stress	
	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>
Years of experience										
≤2	59	33.02 (12.20)	59	11.68 (7.07)	59	33.00 (7.75)	60	6.30 (3.32)	60	14.75 (7.48)
3–8	162	33.55 (11.80)	162	12.28 (6.89)	161	32.94 (8.37)	163	6.45 (3.39)	162	15.96 (7.01)
9–14	71	31.89 (11.65)	69	11.70 (7.56)	71	34.01 (7.42)	71	6.18 (3.34)	71	14.90 (6.92)
≥15	115	31.03 (12.08)	118	9.08 (6.70)	115	32.81 (7.95)	119	5.51 (3.14)	118	15.60 (7.21)
<i>F (p)</i>		1.10 (.347)		5.11 (.002)		0.38 (.764)		1.97 (.119)		0.62 (.599)
Work status										
Full time	349	32.93 (11.97)	351	10.93 (6.93)	349	33.05 (8.14)	353	6.14 (3.27)	353	15.59 (6.97)
Part time	58	30.14 (11.56)	57	13.04 (7.78)	57	32.65 (7.05)	59	5.51 (3.30)	58	13.86 (7.47)
<i>t (p)</i>		1.65 (.099)		-2.09 (.037)		0.35 (.727)		1.38 (.168)		1.73 (.085)
Avg. work hours per week										
≤40 h	266	31.89 (12.14)	267	11.47 (7.23)	266	32.27 (7.76)	270	5.96 (3.26)	269	14.84 (7.28)
>40 h	132	34.38 (11.24)	132	10.94 (6.75)	131	34.66 (7.77)	133	6.36 (3.31)	132	16.43 (6.33)
<i>t (p)</i>		-1.97 (.050)		0.70 (.483)		-2.89 (.004)		-1.23 (.218)		-2.25 (.026)
Shift length										
Extended	348	32.34 (11.99)	347	11.55 (7.04)	346	32.96 (8.01)	351	6.11 (3.31)	351	15.58 (7.14)
Traditional	54	33.80 (11.60)	56	9.16 (6.94)	55	33.36 (7.68)	56	6.16 (3.33)	55	15.16 (6.95)
<i>t (p)</i>		-0.83 (.406)		2.36 (.019)		-0.35 (.729)		-0.12 (.908)		0.40 (.690)
Shift type										
Day	217	32.96 (11.55)	218	10.98 (7.11)	215	33.24 (8.18)	221	6.00 (3.24)	221	15.21 (7.17)
Night	140	31.56 (11.86)	140	11.66 (6.87)	142	32.71 (7.49)	142	6.23 (3.31)	140	15.64 (6.63)
<i>t (p)</i>		1.10 (.271)		-0.91 (.366)		0.61 (.539)		-0.65 (.514)		-0.57 (.568)
30-min breaks										
Rarely/never	122	35.05 (11.79)	123	11.73 (7.20)	121	32.91 (7.58)	124	6.69 (3.25)	124	17.43 (6.66)
Sometimes	105	33.36 (11.62)	106	11.68 (6.96)	105	33.32 (8.10)	106	6.03 (3.21)	106	14.42 (6.66)
Often/always	174	30.60 (11.80)	173	10.70 (7.05)	174	32.97 (7.93)	176	5.63 (3.27)	174	14.49 (7.22)
<i>F (p)</i>		5.37 (.005)		1.00 (.368)		0.09 (.913)		3.88 (.022)		7.91 (<.001)

Note: *t* = value for independent-samples *t* test, *F* = *F* ratio for ANOVA, *M* = mean, *SD* = standard deviation, MBI-HSS = Maslach Burnout Inventory-Human Services Survey, PHQ-4 = Patient Health Questionnaire-4, SPRINT = Short Post-Traumatic Stress Disorder Rating Interview. Sig. is set at .05 level.

who took rest breaks more frequently had less fatigue and better reports of IR (see Table 4). Nevertheless, nurses may have avoided breaks because of worry from handing off critical patients, the trouble of changing in and out of protective garments due to shortage or inconvenience, or inadequate staff.

### 5.3 | Burnout and associated risks

Three out of 10 US hospital nurses complain of burnout (McHugh et al., 2011). Feelings of burnout were present in our sample where nursing staff experienced higher levels of EE and some degree of DP. Contrary to these negative emotions, nursing staff had a

greater sense of PA. Compared with Poghosyan et al. (2010) study on nurse burnout across six countries (United States, Canada, United Kingdom, Germany, New Zealand and Japan), our sample had scored higher in EE and DP, and more similar in PA, except for Japan. From burnout dimensions, we only found that nursing staff who cared for patients with COVID-19 had increased sense of DP than those who cared for non-COVID-19 patients. To the best of our knowledge, these findings are unique among nurses during the COVID-19 pandemic. We found one Chinese study that had adopted a different MBI scoring and reported that front-line workers had significantly lower cases of burnout and higher cases of PA compared with healthcare workers from usual units (Wu et al., 2020). Working during the pandemic may allow for increased

feelings of personal accomplishment as nurses provide critical life-saving care in spite of challenging conditions.

## 5.4 | Post-traumatic stress, psychological distress and associated risks

A recent meta-analysis found that healthcare workers who treated or cared for patients with novel viruses during outbreaks had increased post-traumatic stress and psychological distress compared to healthcare workers with no direct contact (Kisely et al., 2020). Fifty-five per cent of our sample scored high on PTSD symptom severity. Moreover, nursing staff who cared for patients with COVID-19 had higher PTSD symptom severity scores above the threshold than those who cared for other hospitalised patients. Our prevalence data are alarming based on SPRINT's cut-off score  $\geq 14$  for possible PTSD. This cut-off score has shown a diagnostic accuracy of 96% among the general population with one or more traumatic events (Conner & Davidson, 2001). Our data also showed that nursing staff who worked  $>40$  h per week had higher PTSD symptom severity than their co-workers who worked fewer hours. Repeated exposure to trauma in the form of more time spent in the hospital either worried about contracting COVID-19 or delivering care to patients with COVID-19 may have potentially increased the risk for PTSD. Other studies from Singapore, India and Italy have used different PTSD scales so prevalence rates are not comparable (Chew et al., 2020; Rossi et al., 2020). However, the PTSD reports during the COVID-19 pandemic call for the attention of nursing staff and those who are at the front-line to self-monitor for symptom severity and seek clinical evaluation and treatment, where its long-term effects are detrimental to health (Ryder et al., 2018).

The pandemic has contributed to increased symptoms of anxiety and depression in health care. Two earlier studies reported 50.4%–50.7% probable depression and 44.6%–44.7% probable anxiety cases among Chinese healthcare workers (Lai et al., 2020; Zhang, Yang, et al., 2020). Our sample had on average moderate psychological distress; 43.4% had probable depression and 62.3% had probable anxiety. In contrast, an Iranian study using the PHQ-4 reported a lower prevalence for both probable depression (20.6%) and anxiety (28.0%) in healthcare workers (Zhang, Liu, et al., 2020). Although more comparable to the Chinese studies, our results indicated slightly lower depression and much higher anxiety, and more psychological distress present among nursing staff who cared for patients with COVID-19. Nursing staff in the United States may have had increased anxiety as they already witnessed peaks of COVID-19 in other countries, and therefore were more worried or concerned about what was to come. Additionally, differences in resources, such as availability of personal protective equipment, may help explain some of the differences between countries.

There was an inverse significant relationship between 30-min breaks and both PTSD symptom severity and psychological distress.

Nursing staff who took breaks more regularly had lower reports of PTSD symptoms and mild psychological distress compared with co-workers who skipped their breaks. A recent study from the Netherlands explored the relationships between patient-related stressful conditions (emotionally demanding situation, aggression/conflict and critical events) and stress-related outcomes (EE and post-traumatic stress symptoms) in emergency department nurses. Exposure to critical events significantly increased post-traumatic stress symptoms. Moreover, recovery at work and recovery during leisure time showed a buffering effect on the relationship between critical events and post-traumatic stress symptoms (Wijn & Doef, 2020). We interpret our findings related to the protective nature of 30-min recovery breaks at work on PTSD symptom severity and psychological distress scores with caution due to paucity of evidence and recommend further exploratory research. Potentially breaks may have partially contributed to the recovery of allostatic overload due to prolonged exposure to stressful conditions during extended work shifts.

## 6 | LIMITATIONS

The study carries limitations related to its cross-sectional design. Some concepts, such as AF and IR, are more dynamic and influenced by daily work schedules, work stressors and intershift sleep hours. Concepts such as CF or post-traumatic stress have cumulative properties particularly when countermeasures are ineffective with repeated stressful work conditions. Thus, longitudinal data may provide a better understanding of the impact of COVID-19 on nursing staff. Another limitation was related to convenience sampling that has self-selection bias and sampling bias. It is probable that the study aim may have attracted nurses who were eager to report about their experiences. Also, the recruitment strategy attracted nurses on social media, and those who spent more time on the internet during the months of May and June. However, our recruitment strategy was practical and allowed for rapid and timely data collection.

With regard to external validity, unfortunately, due to lack of available comparative data, we were unable to evaluate how representative the study sample was to the entire population of US hospital nurses and nursing assistants for all demographic, health and work-related characteristics (see Tables 1 and 2). Our sample had  $\geq 28.3\%$  missing data related to these characteristics. However, 64.3% of our sample was aged  $\leq 40$  years, which was younger than the national mean age of US registered nurses reported in the 2017 National Nursing Workforce Survey (Smiley et al., 2018), but fairly comparable to the mean age of 37.6 years ( $SD = 11.3$ ) reported in a recent large survey of 24,013 hospital RNs working in direct patient care (Ma & Stimpfel, 2018). Overall, our sample had fewer male participants (5.9%) compared with national data for male registered nurses across settings (9.1%) (Smiley et al., 2018) and data from a survey of hospital nurses (10.9%) (Ma & Stimpfel, 2018). Additionally, our sample was comprised of more White nurses (88.8%) than those

from nationally reported data (80.8%) (Smiley et al., 2018) and a survey of hospital nurses (68.6%) (Ma & Stimpfel, 2018). This coupled with the relatively fewer participants in our sample from West and North-east census regions may limit the generalisability of our results. In particular, these findings may not be representative of those groups where certain psychological experiences may differ due to personal, environmental or work-related risk factors.

## 7 | CONCLUSION

The COVID-19 pandemic has burdened our nursing workforce and exacerbated different psychological but interrelated problems such as psychological distress, post-traumatic stress and burnout. Hospital nurses and particularly those who are at the front line with COVID-19 patients need support. Future research needs to evaluate the impact of identified psychological problems on attendance behaviours and organisational outcomes, and explore the long-term psychological health effects of working during the COVID-19 pandemic.

## 8 | RELEVANCE TO CLINICAL PRACTICE

This study has multiple implications. One area is related to work scheduling practices during the pandemic. Although 12-h shifts are the norm in the United States and valued by hospital nurses, implementing 8-h shifts on COVID-19 units until the pandemic is over, decreasing overtime, and better monitoring for weekly work hours may improve overall physical and psychological states. Also, exploring different staffing models on COVID-19 units may help address the increased work demands particularly when results show high AF. Another area is to increase attention to fatigue countermeasures. Institutional policies allow for 30-min meal or coffee breaks. Nursing middle management should reinforce break practices, which are necessary for unwinding from cognitive overload and physical tiredness. Lastly, findings indicate a need for nursing staff to have access to mental health and sleep wellness resources.

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### CONFLICT OF INTEREST

No conflict of interest has been declared by the authors.

### AUTHOR CONTRIBUTIONS

All authors have made substantial contributions to the manuscript to meet criteria for authorship and have reviewed and agreed to the final version. KS and LS conceived the study and the design, led data collection and statistical analysis, contributed to the drafting of the manuscript and revising it for critically important intellectual content, and approved the final version for submission. SB and HC

facilitated data collection, and each made substantial contributions to drafting the manuscript and revising it for critically important intellectual content and approved the final version.

### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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## SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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