

Stress among healthcare workers during the COVID-19 pandemic and the determinant factors: a cross-sectional study

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ABSTRACT

BACKGROUND During the COVID-19 pandemic, there has been an increase in workload, as well as greater vigilance and compliance at work. Healthcare workers must perform their duties while facing the fear of COVID-19, which can trigger and/or aggravate stress. This study aimed to obtain the determinant factors of stress among healthcare workers during the pandemic by emphasizing the change in the psychosocial situation at the hospital.

METHODS This cross-sectional study was conducted from January to March 2021 using an online questionnaire consisting of personal and occupational questionnaires, as well as the validated stressor and stress questionnaires using validity and reliability tests (Cronbach's alpha 0.8 and 0.9). For the multivariate analysis, multiple logistic regression was used to identify the determinant factors ($p < 0.05$). Data were analyzed using SPSS software version 20 (IBM Corp., USA).

RESULTS Determinant factors of the occurrence of moderate–severe stress were the alteration of stressors including age (aOR = 1.9), working hours (aOR = 1.9), work zone (aOR = 2.7), limited facilities and resources (aOR = 6.2), risk of disease transmission (aOR = 0.3), and personal work demands (aOR = 2.1).

CONCLUSIONS In addition to the younger age, the determinant factors of the incidence of moderate–severe stress in healthcare workers during the COVID-19 pandemic at the hospitals were work-related conditions. However, they remained controllable to prevent stress among healthcare workers in the peak load work situations such as a pandemic.

KEYWORDS COVID-19 pandemic, healthcare workers, hospital, stress

Stress among healthcare workers is important to note because it is one of the fundamentals to implementing optimal service facilities, i.e. hospitals.¹ The coronavirus disease 2019 (COVID-19) pandemic has brought certain stressors due to increased workload, as well as greater vigilance and adherence to work. However, healthcare workers are still obliged to perform their duties amidst fear of being infected with COVID-19, which can trigger and/or aggravate stress.^{2–5} In Indonesia, 55% of healthcare workers experienced

stress, 65.8% anxiety, and 23.5% depression during the COVID-19 pandemic.⁶ According to a study in Jordan, 35% of healthcare workers experienced severe stress during the COVID-19 pandemic.⁷ Previous studies have only assessed stressful conditions in healthcare workers without exploring the stressors; thus, this study used a stressor questionnaire to identify the alteration of stressors among healthcare workers associated with the stress condition during the COVID-19 pandemic.

Stressful conditions at work may affect healthcare workers' mental health, including stress, depression, anxiety, and fatigue. This condition can also affect employers through absenteeism, presenteeism, and loss of work motivation, thereby reducing company productivity. Patients are also affected by substandard performance and hospital care.^{8,9} This study aimed to determine the determinant factors of stress among healthcare workers during the pandemic by emphasizing changes in the psychosocial situation at the hospital.

METHODS

Study population and design

This was a cross-sectional study conducted online from January to March 2021 among health workers at COVID-19 referral hospitals in Indonesia. The rule of thumb formula was used to determine the estimated number of samples because a multivariate test was recommended.¹⁰ It was based on the prevalence of stress at 55% in Indonesia (55 cases for every 100 respondents). Each risk factor in this study (12 risk factors) was expected to have 10 cases (a total of 120 cases); thus, the number of samples needed was 240 respondents.¹¹

Selection criteria and sampling technique

Inclusion criteria for respondents in this study were healthcare workers, including medical specialists, general physicians, residency doctors, nurses, and laboratory analysts in 1,133 national and district public COVID-19 referral hospitals according to the decree of the Indonesian Ministry of Health and governor's regulation. Respondents who had provided informed consent through an online form, filled out the questionnaire, and worked from at least 1 month before the COVID-19 pandemic to the data collection period were also included. Exclusion criteria were healthcare workers who had been diagnosed or treated with mental disorders.

All respondents were collected using a snowball sampling technique. Brief information and questionnaires were distributed via WhatsApp, Instagram, or the hospital's person in charge through several health worker associations such as the Association of Indonesian Health Laboratory Technology Experts (PATELKI) and the Indonesian National Nurses Association (PPNI), etc. Information

about the study was restated in the informed consent to ensure the criteria of the eligible respondents.

Study instrument

This research used primary data from an online questionnaire provided by Google forms (Google LLC, USA). A personal data questionnaire and two other questionnaires (stressor and stress questionnaires) were constructed by the research team at Universitas Indonesia and Cipto Mangunkusumo Hospital, including occupational health experts, post-graduated epidemiologists, an internist, and a psychiatry expert. The stressor questionnaire contained statements about five aspects of stressors: biosecurity of feeling dehydration due to personal protective equipment (PEE) and physical isolation (four statements), risk of disease transmission (two statements), limited facilities and resources (three statements), personal and work demands (four statements), and internal and external stigma (two statements). The questionnaire was constructed based on several sources including the national center of post-traumatic stress disorder,² Sasangohar et al,³ Shacham et al,³ and Walton et al⁴. It was considered valid and reliable, with a Cronbach's alpha of 0.8 after being conducted on 57 respondents.

The stressor questionnaire consisted of 15 statements about stressors, modified following the condition of each respondent while working at the hospital 1 month before the pandemic (categorized before the pandemic) and the last 1 month during the data collection (categorized during the pandemic). The statements were rated on a Likert scale from "very unsuitable" (point 1) to "very suitable" (point 5). The results of "during the pandemic" were then subtracted from "before the pandemic". Furthermore, the numbers obtained indicated an increase in the status of the stressor, which was the outcome of the stressor questionnaire.

The stress questionnaire consisted of statements about stress perception in a psychological reaction of "feeling uncomfortable"¹¹ with the stressor condition at work, as stated in the stressor questionnaire. This questionnaire had a Cronbach's alpha of 0.9. A 5-point Likert scale was also used in this questionnaire, similar to the stressor questionnaire.

Study variables

The alteration of stressors among healthcare workers consisted of biosecurity for healthcare

workers, risk of disease transmission, personal and work demands, internal and external stigma, limited preparation and resources, gender, age, length of employment, and work location (the red zone is an area with a high level of exposure to COVID-19 transmission where the site has provided health services to confirmed COVID-19 patients, i.e. observation/quarantine/isolation rooms, the yellow zone is an area with a medium level of exposure to COVID-19 transmission from probable COVID-19 patients, i.e. the pre-examination room [triage/screening], and the green zone for areas with a low level of exposure to COVID-19 transmission, i.e. administrative/office rooms, archives/medical records, etc.).¹² History of comorbid illness and COVID-19 case were the independent variables in this study. The stress level of healthcare workers was the study's dependent variable.

Data analysis

Univariate analysis was applied to all variables. Data in the categorical form were provided as frequency, whereas the data on age in numerical form were shown as mean and standard deviation or median and quartiles, depending on the normality of the data. Furthermore, before the bivariate test, the data on age were transformed into categorical data and analyzed using chi-square test. Bivariate analysis was used to screen the variables using the criteria of $p < 0.25$ before going on to multivariate analysis. Multiple logistic regression analysis was used to identify the determinant factors that affected the occurrence of stress in healthcare workers and was presented with the adjusted odds ratio (aOR) and its 95% confidence interval. In bivariate and multivariate analyses, the outcomes were re-categorized into mild and moderate–severe stress. Data were analyzed using SPSS software version 20 (IBM Corp., USA).

Ethical considerations

This study was completed after the respondents had agreed to participate in the study voluntarily and had given informed consent. Their data were kept confidential. The study was carried out after receiving ethical approval from the Ethics Committee of the Faculty of Medicine, Universitas Indonesia – Cipto Mangunkusumo Hospital (No: KET.1496/UN2.F1/ETIK/PPM.00.02/202).

RESULTS

Of 506 respondents who completed the survey, 15 were excluded for not working in COVID-19 referral hospitals, and 17 had only been working since the World Health Organization (WHO) declared the pandemic. Therefore, a total of 474 eligible respondents were included.

The primary characteristics of this study explained nearly equal percentages of male and female respondents, consisting of 217 men and 257 women. The median age of respondents in this study was 30; thus, respondents were divided into two groups: 210 respondents for the <30 years old group and 264 respondents for the ≥30 years old group. A total of 135 healthcare workers worked for ≤40 hours a week, and the rest worked >40 hours a week.

The description of the alteration of stressors from before to during the pandemic in this study was quite varied. Most stressors experienced a mild increase of almost 60%, followed by a moderate increase. Regarding biosecurity, most respondents reported an average increase in stressors, while the other four elements (limited facilities and resources, risk of disease transmission, personal and work demands, and stigma) showed a similar condition between before and during the pandemic. For stress perception, 56%

Table 1. Determinant factors of stress among healthcare workers at the hospital during the COVID-19 pandemic

Variables	Total (N = 474)	Stress, n (%)		<i>p</i> *	aOR [†]
		Mild (N = 79)	Moderate–severe (N = 395)		
Male gender	217 (45.8)	37 (17.1)	180 (82.9)	0.84	-
<30 years	210 (44.3)	26 (12.4)	184 (87.6)	0.03	1.9 (1.2–3.4)
History of COVID-19	393 (82.9)	69 (17.6)	324 (82.5)	0.25	-
No comorbidity	425 (89.7)	74 (17.4)	351 (82.6)	0.20	0.52 (0.2–1.5)
>40-hour workweek	339 (71.5)	50 (14.7)	289 (85.3)	0.08	1.9 (1.1–3.2)

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Table 1. (continued)

Variables	Total (N = 474)	Stress, n (%)		p*	aOR†
		Mild (N = 79)	Moderate–severe (N = 395)		
Work zone				0.03	
Green	43 (9.1)	12 (27.9)	31 (72.1)		1.00
Yellow	152 (32.1)	30 (19.7)	122 (80.3)		1.6 (0.7–3.9)
Red	279 (58.9)	37 (13.3)	242 (86.7)		2.7 (1.2–6.1)
Alteration of stressors				<0.001	
Decrease	16 (3.4)	7 (43.8)	9 (56.2)		-
No change	53 (11.2)	8 (15.1)	45 (84.9)		-
Mild increase	283 (59.7)	59 (20.8)	224 (79.2)		-
Moderate–severe increase	122 (25.7)	5 (4.1)	117 (95.9)		-
Biosecurity				0.29	
Decrease	12 (2.5)	4 (33.3)	8 (66.7)		-
No change	78 (16.5)	13 (16.7)	65 (83.3)		-
Mild increase	36 (7.6)	7 (19.4)	29 (80.6)		-
Moderate increase	263 (55.5)	46 (17.5)	217 (82.5)		-
Severe increase	85 (17.9)	9 (10.6)	76 (89.4)		-
Limited facilities and resources				0.004	
Decrease	83 (17.5)	16 (19.3)	67 (80.7)		2.2 (0.9–5.1)
No change	170 (35.9)	39 (22.9)	131 (77.1)		1.00
Mild increase	72 (15.2)	13 (18.1)	59 (81.9)		1.3 (0.6–2.9)
Moderate increase	84 (17.7)	4 (4.8)	80 (95.2)		6.2 (1.9–19)
Severe increase	65 (13.7)	7 (10.8)	58 (89.2)		1.2 (0.4–3.5)
Risk of disease transmission				<0.001	
Decrease	17 (3.6)	7 (41.2)	10 (58.8)		0.3 (0.07–0.9)
No change	204 (43)	45 (22.1)	159 (77.9)		1.00
Mild increase	79 (16.7)	11 (13.9)	68 (86.1)		0.9 (0.41–2.2)
Moderate increase	107 (22.6)	13 (12.1)	94 (87.9)		1.2 (0.5–2.8)
Severe increase	67 (14.1)	3 (4.5)	64 (95.5)		5.7 (1.4–23.7)
Personal and work demands				<0.001	
Decrease	14 (3)	7 (50)	7 (50)		0.2 (0.03–0.8)
No change	151 (31.9)	35 (23.2)	116 (76.8)		1.00
Mild increase	80 (16.9)	9 (11.3)	71 (88.7)		2.5 (1.01–6.3)
Moderate increase	149 (31.4)	23 (15.4)	126 (84.6)		1.4 (0.5–3.3)
Severe increase	80 (16.9)	5 (6.3)	75 (93.7)		2.1 (0.5–7.8)
Internal and external stigma				0.03	
Decrease	6 (1.3)	3 (50)	3 (50)		0.92 (0.1–8.1)
No change	172 (36.3)	35 (20.3)	137 (79.7)		1.00
Mild increase	78 (16.5)	11 (14.1)	67 (85.9)		1.3 (0.53–3.3)
Moderate increase	142 (30)	24 (16.9)	118 (83.1)		0.63 (0.28–1.4)
Severe increase	76 (16)	6 (7.9)	70 (92.1)		0.89 (0.26–3.1)

aOR=adjusted odds ratio; COVID-19=coronavirus disease 2019

*Chi-square test; †logistic regression with 95% confidence interval (CI). Alteration of the whole stressors was excluded in the logistic regression to avoid collinearity with specific stressor variable

of healthcare workers experienced moderate stress, followed by severe and mild stress, with 27% and 17%, respectively (data were not presented).

According to Table 1, a chi-square test was conducted, and eight risk factors met the criteria ($p < 0.25$) for the multiple logistic regression analysis. The determinant factors of moderate–severe stress were age (aOR = 1.9), working hours in a week (aOR = 1.9), working zone (aOR = 2.7), limited facilities and resources (aOR = 6.2), risk of disease transmission (aOR = 0.3), and personal work demands (aOR = 2.1).

DISCUSSION

In this study, most healthcare workers experienced moderate stress, followed by severe and mild stress. The results of this study are quite different from Nasrullah et al⁶ who found mild stress in most healthcare workers. This difference may be due to different data collection times. Nasrullah et al⁶ conducted the study in April 2020, which was only less than a month after the first confirmed COVID-19 case was discovered. During that period, the cases were relatively low and still concentrated in Greater Jakarta, which was slightly different from this study's sampling period. These differences in sampling timeframes may cause different stressful conditions for healthcare workers.

According to another study in Jordan, healthcare workers had a relatively high level of stress during the COVID-19 pandemic based on assessments in the depression, anxiety, and stress scale questionnaire.⁷ This study was conducted at the beginning of the worsening period of the COVID-19 pandemic but with low hospitalizations. Furthermore, this study did not only include healthcare workers in the hospital but also in primary care, which can lead to different stressor and stress conditions.

In the bivariate and multivariate analyses, the outcomes of mild, moderate, and severe stress were re-categorized into mild and moderate–severe stress. The moderate and severe stress data were combined with the importance of determining risk factors for stress conditions earlier (the mild stress phase); therefore, interventions can be carried out earlier to prevent more severe conditions.

Changes in stressors (limited facilities and resources, work and personal demands, and risk of disease transmission) exposed among healthcare

workers at the hospitals during the COVID-19 pandemic were the determinant factors in the occurrence of moderate–severe stress. Changes in stress levels from before and during the pandemic identified in this study indicated the actual stressors impacted by the COVID-19 pandemic situation.

Limited facilities and resources, as well as work and personal demands, had a significant relationship with the incidence of stress in healthcare workers. In line with a study in America that stated adequate PPE was a factor that reduced the risk of stress, this study used burnout to define chronic stress.¹³ Limited human resources and work as well as personal demands are also related to the increased workload among healthcare workers. As stated by Roslan et al,¹⁴ excessive workload was also a risk factor for stress among healthcare workers. Another study in Iran stated that reducing the workload, either by adding human resources or in other ways, could reduce stress among healthcare workers. Employers in this situation should be aware of the inequality number of healthcare workers and COVID-19 patients and are expected to decide either to increase the number of healthcare workers or to reduce the number of patients to fulfill the healthcare worker's needs.

The risk of disease transmission among healthcare workers is related to the incidence of stress in this study, where patients with COVID-19 vary widely from asymptomatic to symptomatic, concerning the healthcare workers transmitting it to their families at home. This is in line with research conducted by Wang et al¹⁵ in Canada, showing that the fear of being infected with COVID-19 and/or transmitting it to families at home was related to the incidence of stress in healthcare workers, especially when they had vulnerable family members, which can result in poor health conditions if being infected with COVID-19.

In correlation to the risk of disease transmission, the work zone is also associated with stressful conditions. In the multiple logistic regression test, it was found that most healthcare workers working in the red zone tended to experience 2.7 times moderate–severe stress compared with those who worked in the green zone. Apart from being linked to a higher risk of disease transmission, working in the red zone is also related to the PPE used by healthcare workers, where level 3 PPE is required. According to Hoedl et al,¹⁶ the level of PPE used by nurses at the hospitals was significantly correlated to their stress level at work.

The stigma received by workers was not the determinant factor in this study. This condition contradicts a research in Italy, which showed that the stigma experienced by healthcare workers during the COVID-19 pandemic was significantly related to the incidence of stress due to the worry of being excluded from society.¹⁷ However, different sampling periods can lead to these results. This study was conducted after the first wave of the COVID-19 pandemic; thus, the stigma might have been reduced.

Healthcare workers aged <30 years have a 1.9 times greater tendency to experience moderate–severe stress than aged ≥30 years. Carstensen et al¹⁸ explained that older people could control their emotions more generally than younger adults. Nieto et al¹⁹ also stated that older people had more experience and better problem solving skills than young people. Hence, they are wiser in managing emotions to be more positive or better in responding to stressors or problems.

The number of working hours is one of the determining factors for the occurrence of moderate–severe stress. Healthcare workers with longer working hours in a week had a 1.9 times higher tendency for the occurrence of moderate–severe stress. This condition is in line with the study of Teo et al,²⁰ which showed that working hours were related to the occurrence of stress in healthcare workers. This happens because of concerns about fatigue and being easily infected with COVID-19 due to decreased immunity.

The study used an online approach to reach a larger and more accessible population, ensuring that its findings better reflect the mental health condition of healthcare workers in Indonesia during the COVID-19 pandemic. The study focused on a specific timeframe in the first quarter of 2021. Therefore, the conditions faced by health professionals during data collection may be compared with the COVID-19 pandemic prevalence in Indonesia at the same period. Based on data from WHO,²¹ during that period, the first peak case phase had been passed, although there was still an increase in daily cases in early January 2021 or after the end of the 2020 holiday. The number of new cases had relatively decreased until the end of March. These results may be different if there are studies conducted during the peak daily COVID-19 case period because the stressor level experienced by healthcare workers will increase further.

This study had several limitations. Even though a questionnaire containing specific questions regarding

the stressor component during the COVID-19 pandemic was used, the cross-sectional research design was not an ideal method for determining causality. Furthermore, this study did not include physical factors at work, which may be another cause of stress at the workplace and the individual's capacity to cope with sources of stress. Overtime hours should be included in the working duration data because healthcare workers had heavier workloads and longer working hours during the pandemic.

It is necessary to conduct further research on work stress involving other factors such as environmental factors at work, factors associated with individual coping mechanisms among health workers during the pandemic, and intervention program research among healthcare workers. Hospital management can form a dedicated team focused on managing employees' physical problems and prevention programs through protocols developed by the experts.

In conclusion, the determinant factors for the moderate–severe stress among healthcare workers during the COVID-19 pandemic at the hospitals were the alteration of limited facilities and resources, risk of disease transmission, personal and occupational demands, age, working hours, and work zones. Other than age, the other determinant factors were still controllable to prevent stress among healthcare workers in facing a peak load working situation such as a pandemic.

Conflict of Interest

The authors affirm no conflict of interest in this study.

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