


BMJ Open Association between engagement in COVID-19-related work and depressive symptoms among hospital workers in a designated COVID-19 hospital in Japan: a cross-sectional study

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ABSTRACT

Objectives To examine whether engagement in COVID-19-related work was associated with an increased prevalence of depressive symptoms among the staff members working in a designated medical institution for COVID-19 in Tokyo, Japan.

Design A cross-sectional study.

Setting Data were obtained from a health survey conducted in July 2020 among the staff members of a designated medical institution for COVID-19 in Tokyo, Japan.

Participants A total of 1228 hospital workers.

Exposure of interest Engagement in COVID-19-related work (qualitatively (ie, the risk of SARS-CoV-2 infection at work or affiliation to related departments) as well as quantitatively (ie, working hours)) and job categories.

Outcome measures Depressive symptoms.

Results There was no significant association between depressive symptoms and engagement in work with potential exposure to SARS-CoV-2 or affiliation to COVID-19-related departments. However, working for longer hours in March/April, when Japan witnessed a large number of infected cases, was significantly associated with depressive symptoms (≥ 11 hours/day: prevalence ratio (PR)=1.45, 95% CI=1.06 to 1.99, compared with ≤ 8 hours/day). Nurses were more likely to exhibit depressive symptoms than did doctors (PR=1.70, 95% CI=1.14 to 2.54).

Conclusions This study suggests that the risk of SARS-CoV-2 infection at work or having an affiliation to related departments might not be linked with a higher prevalence of depressive symptoms among Japanese hospital workers; contrarily, long working hours appeared to increase the prevalence of depressive symptoms.

INTRODUCTION

COVID-19, a respiratory illness caused by SARS-CoV-2, has imposed a huge burden on medical and public health systems worldwide.¹ Besides its enormous direct health consequences (ie, more than 51 million

Strengths and limitations of this study

- We examined if engaging in COVID-19-related work was linked with depressive symptoms among the staff members of one medical institute that was designated for the treatment of serious infectious diseases in Japan.
- As we did not assess information on depressive symptoms before the outbreak, we were unable to judge to what extent the prevalence reported in this study was attributable to the outbreak.
- As the survey was conducted in a designated COVID-19 hospital, the present findings might not be applicable to other hospitals in Japan.

cases with 1.26 million deaths globally as of November 10, 2020), the changes and restrictions in social and economic activities following the spread of COVID-19 have also been linked with worsening of mental health among the general population.²⁻⁴

To ensure the sustainability of medical and public health systems to contain the outbreak, more attention should be paid to the health conditions of healthcare providers engaging in COVID-19-related work.⁴⁻⁷ A meta-analysis by Pappa *et al*⁶ reported the prevalence of anxiety and depression to be 23.2% and 22.5%, respectively, among medical workers engaging in COVID-19-related work. Notably, a wide range of psychological and physiological stressors, including the risk of nosocomial infections, shortage of personal protective equipment, increased workload and social stigma, may place them at a higher risk of negative mental health outcomes.^{5 8 9}

This study extends these previous studies by examining whether the COVID-19-related work was associated with depressive

symptoms in Japan. Although the number of COVID-19-related deaths remains smaller in Japan than those reported in the more severely affected countries, yet the Japanese medical and public health resources have been overwhelmed by the screening and treatment of patients with COVID-19.¹⁰ In addition, there have been numerous reports of healthcare workers facing discrimination and harassment in Japan (eg, their children refused access to nursery school).¹¹ It is possible that work–family conflicts may have emerged due to increased workload, affecting the mental health of healthcare providers.⁸

Therefore, this study aimed to examine whether engaging in COVID-19-related work (qualitatively (ie, the risk of SARS-CoV-2 infection at work or affiliation to related departments) as well as quantitatively (ie, working hours)) and job categories were linked with an increased prevalence of depressive symptoms among the staff members working in a designated medical institution for COVID-19 in Tokyo, Japan. To inform better efforts to reduce psychological burden among staff members, we also conducted subgroup analyses among doctors and nurses (ie, the two largest job categories in this analytic sample).

METHODS

Study participants

A health survey was conducted in July 2020 among the staff members of National Center for Global Health and Medicine, Japan (NCGM), in which we analysed COVID-19 antibodies and collected questionnaire-based information on lifestyles and depressive symptoms.¹² As one of the designated medical institutions in Tokyo for the Category II infectious diseases (eg, tuberculosis, Middle East respiratory syndrome and COVID-19) under the Infectious Diseases Control Law, the NCGM conducted screening and treatment of COVID-19 since the beginning of epidemic in Japan. As of July 2020, no staff members died of COVID-19-related illness and no cluster of nosocomial infections were reported.

A total of 1579 staff members were invited for the survey, of which 1228 agreed to participate (353 men and 875 women; participation rate: 77.8%). The questionnaire was administered and the information was collected online using Microsoft Forms. The participants took approximately 16 min to complete the questionnaire.

Informed consent was obtained from all included study participants.

Outcomes

Depressive symptoms were assessed using the following two questions that were employed in the Two-Question case-finding Instrument (TQI)¹³: ‘During the past month, have you often been bothered by feeling down or depressed?’; and ‘During the past month, have you often been bothered by little interest or pleasure in doing things?’. In the original TQI, which was developed to have high sensitivity for a screening purpose (pooled

sensitivity: 95%; pooled specificity: 65%),¹⁴ depressive symptoms were defined when respondents answered ‘yes’ to either of the questions (ie, TQI score of ≥ 1). However, to reduce the proportion of false negative in this study, we defined depressive symptoms only when participants answered in the affirmative to both questions (ie, TQI score of 2). A previous study in non-COVID-19-related subjects in Japan reported a sensitivity and specificity of 87.9% and 81.4%¹⁵ at the TQI score of 2; while another Japanese study reported those as 75% and 88.2%.¹⁶

Exposures

The following two self-reported questions were used to assess the extent to which participants were possibly exposed to SARS-CoV-2: ‘Have you ever engaged in COVID-19-related work?’ and ‘Did you engage in any work in which you were heavily exposed to SARS-CoV-2?’. Participants were categorised into three groups as follows: low (ie, those who did not engage in COVID-19-related work), middle (ie, those who engaged in COVID-19-related work without heavy exposure to the virus) and high risk of SARS-CoV-2 infection at work (ie, those who were heavily exposed to SARS-CoV-2). Those who reported to engaged in the related work but were not involved in patient care or specimen management were classified into the low-exposure group.

To assess the association in relation to the quantitative aspect of COVID-19-related work, we also collected self-reported information on working hours from late March to mid-April 2020 during the first wave of the outbreak in Japan. Response options included ≤ 6 , 7, 8, 9, 10, 11, 12, 13 and ≥ 14 hours/day, which were categorised into the following three groups: ≤ 8 , 9–10 or ≥ 11 hours/day.

We also obtained information on job type (doctors, nurses, allied healthcare professionals, administrative staffs, researchers and management) and department from the labour management office of NCGM. As for the former, we combined administrative staffs, researchers and management into one category ‘others’ due to their small individual sample size. Regarding the latter, the department was used to categorise participants into three groups: those working for COVID-19-related medical departments, the other medical departments; and non-medical departments.

Covariates

Information on the following covariates was collected via the questionnaire: age (in years), sex (male, female), current smoking status, daily alcohol consumption, physical activity, co-morbid conditions and sleep duration (in hours).

Smoking status was defined when participants smoked cigarettes or heat-not-burn cigarettes (never/current/former smoker). Daily alcohol consumption was estimated based on questionnaire information; we followed the lead of previous epidemiological studies¹⁷ and assigned the following values to each response options for consumption frequency (do not drink=0, quit drinking=0, 1–3 days/month=0.5, 1–2 days/week=1.5, 3–4 days/week=3.5,

5–6 days/week=5.5 and everyday drinking=7), which were then multiplied with the amount consumed per day (ie, 0.5; 1; 1.5; 2; 2.5; 3; 3.5 and ≥ 4 drinks (calculated as four drinks); one drink is equivalent to 1 go, a Japanese traditional unit, which contains approximately 23 g of ethanol). We then grouped the participants into the following four categories based on their daily consumption: do not drink; <1 ; 1–1.9 and ≥ 2 drinks/day. Leisure-time physical activity was assessed with three questions regarding time spent per week in indoor physical activity, outdoor physical activity during daytime and outdoor physical activity during night-time. Response options included: never; <30 min; 30–59 min; 1–1.9 hours; 2–2.9 hours; 3–3.9 hours and ≥ 4 hours; following the lead of a previous study,¹⁸ in which the midpoint of range was used as a proxy score of each frequency category, we assigned the values of 0, 15, 45, 90, 150, 210 and 270 min/week to each category, respectively. We calculated the total time spent in physical activity and categorised participants into the following categories (none, <60 , 60–119, 120–179 or ≥ 180 min/week).

Co-morbid conditions were assessed by enumerating the total number of the following conditions, which were known to increase the risk of developing severe COVID-19 cases, that is, diabetes, hypertension, chronic obstructive pulmonary disease, heart disease, cerebrovascular disease, cancer, other chronic diseases and obesity (defined as BMI ≥ 30 kg/m² based on self-reported weight and height), which was categorised into three groups (0, 1 and ≥ 2). Response options for sleeping hours in the previous 1 month were: <4 ; 4–4.9; 5–5.9; 6–6.9; 7–7.9; ≥ 8 hours, which were categorised into three groups (<6 ; 6–6.9 and ≥ 7 hours).

Statistical analysis

A Poisson regression analysis with a robust variance estimator^{19 20} was used to investigate the association between exposure variables (ie, the risk of SARS-CoV-2 infection at work, affiliation to COVID-19-related departments, job categories and working hours in March and April 2020) and depressive symptoms. Model 1 was adjusted for age, sex, current smoking status, daily alcohol consumption, physical activity and co-morbid conditions, while model 2 was additionally adjusted for sleep duration. The exposure variables were mutually adjusted in the models. We calculated the p value for trend in relation to the degree of potential exposure to SARS-CoV-2; department affiliation and working hours, using the ‘contrast’ command in Stata.

To examine if the abovementioned associations are similar across different job categories, we also conducted a set of analysis while confining the analytic sample to (1) doctors or (2) nurses (ie, the two largest job categories in this analytic sample).

Results are presented in the form of prevalence ratios (PRs) with corresponding 95% CIs. All the analyses were conducted using Stata V. 16.1 (StataCorp). The level of significance was set at $p < 0.05$ (two-sided).

Patients and public involvement

Patients and the public were not involved in this study.

RESULTS

Among the 1228 participants, 268 (21.8%) reported depressive symptoms. Table 1 shows the basic characteristics of study participants. The mean age was 36.0 (SD=11.0) years and 71.3% of participants were woman. Doctors, nurses and allied healthcare professionals comprised 20.4%, 49.6%, and 12.7% of study participants, respectively.

Table 2 shows the results of the Poisson regression model examining the association between engagement in COVID-19-related work and depressive symptoms. There was no statistically significant association between depressive symptoms and the risk of SARS-CoV-2 infection at work or department affiliation. For example, compared with those in the lowest risk category, the PRs of depressive symptoms were 0.87 (95% CI=0.68 to 1.11) and 0.97 (95% CI=0.73 to 1.29) for those in the middle and highest categories, respectively. Conversely, working for longer hours in March and April 2020 was statistically associated with an increased prevalence of depressive symptoms (≥ 11 hours/day: PR=1.45, 95% CI=1.06 to 1.99, compared with ≤ 8 hours/day). Additionally, nurses were more likely to have depressive symptoms (PR=1.70, 95% CI=1.14 to 2.54) than did doctors. Furthermore, these results did not change when the model was further adjusted for sleep duration.

Table 3 shows subgroup analyses in which we confined our analytic sample to only doctors or nurses. It was revealed that longer working hours were linked with a higher prevalence of depressive symptoms among nurses (PR=1.77, 95% CI=1.21 to 2.59) but not among doctors (PR=1.20, 95% CI=0.51 to 2.83). In contrast, the risk of SARS-CoV-2 infection at work tended to increase the prevalence of depressive symptoms among doctors (model 1: PR=2.69, 95% CI=0.97 to 7.51; $p_{\text{trend}}=0.048$) but not among nurses (PR=0.91, 95% CI=0.63 to 1.32). While it did not reach statistical significance, the affiliation to COVID-19-related department was rather linked with a lower prevalence of depressive symptoms among doctors (PR=0.34, 95% CI=0.09 to 1.25).

DISCUSSION

In this survey on 1228 hospital workers in a designated COVID-19 hospital in Japan, we did not find any evidence of statistically significant association between engagement in COVID-19-related work and depressive symptoms. However, we found a statistically significant association of depressive symptoms with working hours in late March to mid-April 2020. Additionally, a higher prevalence of depressive symptoms was observed in nurses versus doctors.

Importantly, the null finding in relation to the association between COVID-19-related work (ie, the risk of SARS-CoV-2 infection at work and affiliation to related

Table 1 Basic characteristics of study participants in a designated COVID-19 hospital in Tokyo, Japan (2020)

	Overall participants	Participants stratified according to the risk of SARS-CoV-2 infection at work		
		Low (n=408)	Middle (n=478)	High (n=342)
Age, mean (SD)	36.0 (11.0)	35.8 (11.8)	36.7 (11.5)	35.4 (9.1)
Female, n (%)	875 (71.3)	339 (83.1)	328 (68.6)	208 (60.8)
Job categories, n (%)				
Doctors	250 (20.4)	72 (17.6)	90 (18.8)	88 (25.7)
Nurses	609 (49.6)	211 (51.7)	225 (47.1)	173 (50.6)
Allied healthcare professionals	156 (12.7)	21 (5.1)	73 (15.3)	62 (18.1)
Others	213 (17.3)	104 (25.5)	90 (18.8)	19 (5.6)
Affiliated departments, n (%)				
COVID-19-related departments	128 (10.4)	27 (6.6)	16 (3.3)	85 (24.9)
Other medical departments	967 (78.7)	344 (84.3)	382 (79.9)	241 (70.5)
Non-medical departments	133 (10.8)	37 (9.1)	80 (16.7)	16 (4.7)
Working hours in March and April 2020, n (%)				
≤8 hours/day	663 (54.0)	210 (51.5)	261 (54.6)	192 (56.1)
9–10 hours/day	420 (34.2)	154 (37.7)	167 (34.9)	99 (29.0)
≥11 hours/day	145 (11.8)	44 (10.8)	50 (10.5)	51 (14.9)
Smoking status, n (%)				
Never	1061 (86.4)	371 (90.9)	394 (82.4)	296 (86.5)
Former	101 (8.2)	21 (5.1)	52 (10.9)	28 (8.2)
Current	66 (5.4)	16 (3.9)	32 (6.7)	18 (5.3)
Alcohol consumption, n (%)				
Do not drink	362 (29.5)	138 (33.8)	132 (27.6)	92 (26.9)
<1 drink*	724 (59.0)	225 (55.1)	290 (60.7)	209 (61.1)
1–1.9 drink	102 (8.3)	32 (7.8)	41 (8.6)	29 (8.5)
≥2 drinks	40 (3.3)	13 (3.2)	15 (3.1)	12 (3.5)
Physical activity, n (%)				
None	343 (27.9)	122 (29.9)	123 (25.7)	98 (28.7)
<60 min/week	379 (30.9)	126 (30.9)	156 (32.6)	97 (28.4)
60–119 min/week	202 (16.4)	78 (19.1)	80 (16.7)	44 (12.9)
120–179 min/week	71 (5.8)	23 (5.6)	21 (4.4)	27 (7.9)
≥180 min/week	233 (19.0)	59 (14.5)	98 (20.5)	76 (22.2)
Sleeping hours, n (%)				
<6 hours/day	544 (44.3)	170 (41.7)	218 (45.6)	156 (45.6)
6–6.9 hours/day	491 (40.0)	171 (41.9)	194 (40.6)	126 (36.8)
≥7 hours/day	193 (15.7)	67 (16.4)	66 (13.8)	60 (17.5)
The number of co-morbid conditions, n (%)				
0	1007 (82.0)	342 (83.8)	389 (81.4)	276 (80.7)
1	168 (13.7)	53 (13.0)	65 (13.6)	50 (14.6)
≥2	53 (4.3)	13 (3.2)	24 (5.0)	16 (4.7)

*One drink is equivalent to 1 go, that is, a Japanese traditional unit containing approximately 23 g of ethanol.

department) and depressive symptoms in this study was inconsistent with a series of studies that reported increased odds/prevalence of depressive symptoms among hospital workers with versus without direct exposure to the virus.^{21–26} However, it is in line with a few other studies.^{27,28} In addition, although for a different outcome

(ie, post-traumatic stress symptoms), there was one study in Japan that did not find the evidence of a statistically significant association in relation to contact with a patient with COVID-19 among 331 members of the Disaster Medical Assistance Team engaging in quarantine and treatment of COVID-19.²⁹

Table 2 Results of a Poisson regression model with a robust variance estimator examining the association between engagement in COVID-19-related work and depressive symptoms among study participants working at a designated COVID-19 hospital in Tokyo, Japan (2020)

	Number of participants with/without depressive symptoms	Model 1	Model 2
		PR (95% CI)	PR (95% CI)
Job categories			
Doctors	31/219	1.00 (ref)	1.00 (ref)
Nurses	163/446	1.70 (1.14 to 2.54)	1.68 (1.13 to 2.50)
Allied healthcare professionals	24/132	1.31 (0.79 to 2.16)	1.23 (0.73 to 2.04)
Others	50/163	1.65 (0.97 to 2.80)	1.55 (0.92 to 2.63)
The risk of SARS-CoV-2 infection at work			
Low	101/307	1.00 (ref)	1.00 (ref)
Middle	96/382	0.87 (0.68 to 1.11)	0.86 (0.67 to 1.10)
High	71/271	0.97 (0.73 to 1.29)	0.95 (0.71 to 1.27)
		$p_{\text{trend}}=0.77$	$p_{\text{trend}}=0.68$
Department			
Non-medical departments	31/102	1.00 (ref)	1.00 (ref)
COVID-19-unrelated medical departments	210/757	0.86 (0.53 to 1.41)	0.83 (0.51 to 1.35)
COVID-19-related medical departments	27/101	0.88 (0.51 to 1.51)	0.88 (0.51 to 1.52)
		$p_{\text{trend}}=0.64$	$p_{\text{trend}}=0.64$
Working hours in March–April 2020			
≤8 hours	133/530	1.00 (ref)	1.00 (ref)
9–10 hours	98/322	1.23 (0.97 to 1.56)	1.19 (0.94 to 1.51)
≥11 hours	37/108	1.45 (1.06 to 1.99)	1.40 (1.02 to 1.92)
		$p_{\text{trend}}=0.013$	$p_{\text{trend}}=0.028$

Results are shown in the form of prevalence ratios (PRs) with corresponding 95% confidence intervals (CIs).

Model 1 was adjusted for age, sex, smoking status, alcohol consumption, physical activity and co-morbid conditions. Model 2 was further adjusted for sleep duration. The exposure variables were mutually adjusted in the models.

Several interpretations are possible for the null finding observed in our study. First, it is possible that the situation regarding COVID-19 was not as severe as in China^{21–24} or Italy,²⁵ where increased risk of depressive symptoms associated with the COVID-19-related work was reported. As described earlier, there were no COVID-19-related mortality cases among staff members or cluster of nosocomial infection in the NCGM hospital. Second, given the widespread effects of COVID-19, even those who did not engage in COVID-19-related work might have also felt stressed/depressed via sources other than work at hospital, which could have blurred the differences between those who engaged in COVID-19-related work and those who did not. This might also explain the findings of Wang *et al.*²⁸ who reported that depression was prevalent in both frontline (36.6%) and non-frontline (35.6%) medical workers in Hubei, China ($p=0.70$). Third, since the hospital was designated to provide special care for the infectious diseases, the staff members might have been well prepared to this kind of emergency and thus, might not have been affected by the work.

While working hours have not been widely used as a predictor of negative mental health outcomes in previous

studies conducted among healthcare workers in the midst of epidemic outbreaks,⁷ the significant association between working hours and depressive symptoms observed in our study was in line with a broader body of existing literature on the association between working hours and depressive symptoms in general.³⁰ It is possible that stressors with quantitative nature might have affected the psychological well-being more than the stressors with qualitative nature in this specific context, which was more pronounced among nurses, according to the subgroup analysis.

Compared with doctors, nurses had a higher prevalence of depressive symptoms in our study. Previous studies have reported that doctors/physicians are less affected by epidemic outbreak⁷ but with some exceptions.³¹ Possible interpretations for our findings that nurses experienced more depressive symptoms than doctors include: less job control (high job strain), engaging in night shift work more frequently³² and more time and contact with infected patients. It is also possible that given that female workers comprised mostly nurses in this study sample, as a result of gender role expectations placed on females in Japan,⁸ female nurses might have struggled more frequently with work–life balance than male workers (ie, residual confounding).

Table 3 Subgroup analyses confining study participants to doctors or nurses working in a designated COVID-19 hospital in Tokyo, Japan (2020)

	Number of participants with/without depressive symptoms	Model 1 PR (95% CI)	Model 2 PR (95% CI)
Doctors (n=250)			
The risk of SARS-CoV-2 infection at work			
Low	7/65	1.00 (ref)	1.00 (ref)
Middle	10/80	1.16 (0.43 to 3.12)	1.19 (0.43 to 3.27)
High	14/74	2.69 (0.97 to 7.51)	2.89 (1.00 to 8.39)
		$p_{\text{trend}}=0.048$	$p_{\text{trend}}=0.042$
Department affiliation			
COVID-19-unrelated departments	29/189	1.00 (ref)	1.00 (ref)
COVID-19-related medical departments	2/30	0.34 (0.09 to 1.25)	0.32 (0.09 to 1.18)
Working hours in March–April 2020			
≤8 hours	10/75	1.00 (ref)	1.00 (ref)
9–10 hours	13/96	1.31 (0.60 to 2.87)	1.20 (0.55 to 2.62)
≥11 hours	8/48	1.20 (0.51 to 2.83)	1.06 (0.43 to 2.60)
		$p_{\text{trend}}=0.63$	$p_{\text{trend}}=0.85$
Nurses (n=609)			
The risk of SARS-CoV-2 infection at work			
Low	63/148	1.00 (ref)	1.00 (ref)
Middle	51/174	0.80 (0.57 to 1.11)	0.83 (0.59 to 1.15)
High	49/124	0.91 (0.63 to 1.32)	0.92 (0.64 to 1.34)
		$p_{\text{trend}}=0.57$	$p_{\text{trend}}=0.63$
Department affiliation			
COVID-19-unrelated departments	144/409	1.00 (ref)	1.00 (ref)
COVID-19-related medical departments	19/37	1.35 (0.85 to 2.13)	1.35 (0.85 to 2.14)
Working hours in March–April 2020			
≤8 hours	77/253	1.00 (ref)	1.00 (ref)
9–10 hours	64/161	1.23 (0.91 to 1.66)	1.17 (0.86 to 1.57)
≥11 hours	22/32	1.77 (1.21 to 2.59)	1.65 (1.12 to 2.42)
		$p_{\text{trend}}=0.010$	$p_{\text{trend}}=0.033$

Results are shown in the form of prevalence ratios (PRs) with corresponding 95% confidence intervals (CIs).

Model 1 was adjusted for age, sex, smoking status, alcohol consumption, physical activity and co-morbid conditions. Model 2 was further adjusted for sleeping hours. The exposure variables were mutually adjusted in the models.

Categories of department affiliation were combined to form COVID-19-related department and COVID-19-unrelated departments (ie, non-COVID-19-related medical departments and non-medical departments) due to small sample size.

Interestingly, the subgroup analyses suggested that doctors and nurses were psychologically affected by different determinants. More specifically, long working hours, and not the risk of SARS-CoV-2 infection at work, were linked with a higher prevalence of depressive symptoms among nurses, while the opposite was observed among doctors. This difference could be the focus of future studies as such differences should be considered when implementing programmes to mitigate the psychological burden among hospital workers working in the midst of epidemiologic outbreaks.

Limitations

There are several limitations that should be addressed. First, depressive symptoms were assessed via two questions^{15 16} and were not based on diagnoses by psychiatrists. Second, as we did not assess information on depressive symptoms before the outbreak, we were unable to judge to what extent the prevalence reported in this study was attributable to the outbreak or increased associated burden. Third, the survey was conducted in July 2020, when the situation was settled, which might be different from the association that would have been reported in

March/April. For example, it is possible that those who were depressed due to COVID-19-related work had recovered. Fourth, there are several variables that could have explained the association between engaging in COVID-19-related work and depressive symptoms (eg, social support, job control, availability of protective equipment and socioeconomic status). Sixth, some questionnaire information was subject to misclassification bias. Lastly, the survey was conducted in one medical institute that was designated for the treatment of serious infectious diseases. Thus, the present findings might not be applicable to other hospitals in Japan.

CONCLUSION

This study suggests that the risk of SARS-CoV-2 infection at work or having an affiliation to related departments might not have necessarily been linked with a higher prevalence of depressive symptoms among hospital workers in Japan. Our results contradict similar reports on hospital workers from the more severely affected countries although they are consistent with those reported in another Japanese study in the midst of the COVID-19 pandemic. This highlights that the medical professionals in different countries may have different mental health needs according to the local situation and preparedness.

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Contributors All the authors contributed to the conception, design and interpretation of data. YI, SY and AF contributed to data analysis. KM, MI, HI and MK contributed to the acquisition of data. DVH, TM, ZI, NO and TM contributed to critical revision of the manuscript.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not required.

Ethics approval The study procedure was in accordance with the 1964 Helsinki declaration and its later amendments and was approved by the NCGM Ethics Committee (approval number: NCGM-G-003598-00).

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No data are available. The dataset has ethical restrictions for public deposition but is available from the corresponding author on reasonable request.

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