

MENTAL WELL-BEING OF HEALTHCARE WORKERS IN 2 HOSPITAL DISTRICTS DURING THE FIRST WAVE OF THE COVID-19 PANDEMIC IN FINLAND: A CROSS-SECTIONAL STUDY

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Abstract

Objectives: The COVID-19 pandemic has caused unseen pressure on healthcare systems in many countries, jeopardizing the mental well-being of healthcare workers. The authors aimed to assess the mental well-being of Finnish healthcare workers from 2 hospital districts (Helsinki University Hospital [HUS] and Social and Health Services in Kymenlaakso [Kymsote]) with differing COVID-19 incidence rates during the first wave of the COVID-19 pandemic in spring 2020. **Material and Methods:** A total number of 996 healthcare workers (HUS N = 862, Kymsote N = 134) participated in this prospectively conducted survey study during summer 2020. Symptom criteria of self-reported mental health symptoms followed ICD-10 classification, excluding duration criteria. Participants were divided into symptom categories “often/sometimes”, and “rarely/never”. These groups were compared to sociodemographic factors and factors related to work, workload, and well-being. **Results:** The degree of mental health symptoms did not differ between the 2 healthcare districts despite differing COVID-19 incidences ($p = 1$). The authors observed a significant relationship between self-reported diagnostic mental health symptoms and experiences of insufficient instructions for protection against COVID-19 (in HUS cohort $p < 0.001$), insufficient recovery from work ($p < 0.001$), and subjective increased workload ($p < 0.001$). **Conclusions:** The authors’ results show the importance of well-planned and sufficient instructions for protection from SARS-CoV-2 for healthcare workers, indicating their need to feel safe and protected at work. The workload of healthcare workers should be carefully monitored to keep it moderate and ensure sufficient

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Key words:

major depressive disorder, workload, post-traumatic stress disorder, COVID-19, mental health, health personnel

INTRODUCTION

The COVID-19 pandemic has led to enormous and unseen pressure on healthcare systems and healthcare workers (HCWs) in many countries. Previous studies have shown that the mental health of HCWs is more affected by the COVID-19 pandemic when compared to other non-medical workers [1,2]. Furthermore, HCWs who have a higher risk of contact with COVID-19 patients have more mental health-related symptoms than HCWs with a lower risk of COVID-19 patient contact [3]. Work in the healthcare sector is often characterized by high job demands, high workload, physical and emotional strain, and irregular work schedules. Work-related psychosocial risk factors, such as workload and emotional demands, are related to adverse mental health outcomes in nurses [4] and stressful situations at work increase susceptibility to depression and anxiety [5]. Accordingly, work-related factors may as such predispose HCWs to mental health disorders even in regular, non-pandemic settings.

Several earlier studies in different countries have assessed the effect of the COVID-19 pandemic on the mental health of HCWs since the beginning of the pandemic. Adverse mental health outcomes, such as stress, symptoms of depression and anxiety, insomnia, and post-traumatic stress symptoms have been observed among HCWs during the COVID-19 pandemic, at least in areas with a high patient load and high pressure on hospitals [6–8]. However, HCWs in Finland have also reported potentially traumatic COVID-19 pandemic-related events, insomnia and symptoms of depression and anxiety [9]. Regarding COVID-19, the post-pandemic findings are yet unknown, but a study from the previous SARS epidemic showed that 10% of hospital employees who worked in a hospital affected by

the 2003 SARS epidemic, had experienced post-traumatic stress symptoms related to the SARS epidemic during 3 years period that followed the outbreak [10].

Although during the first year of the pandemic the number of COVID-19 cases and deaths has been relatively low in Finland when compared to several other countries [11], there are significant regional differences. The Hospital District of Helsinki and Uusimaa (Helsinki University Hospital – HUS) had the heaviest burden during the COVID-19 outbreak in spring 2020. In contrast, in Kymenlaakso province where Social and Health Services in Kymenlaakso (Kymsote) is the healthcare service provider, the number of COVID-19 cases remained low during the first wave of the epidemic. The incidence between the beginning of March 2020 and mid-June 2020 was approx. 309 cases/100 000 residents in the HUS region and approx. 29 cases/100 000 residents in the Kymsote region [12]. The HUS region is also more densely populated than the Kymsote region [13], presumably at least partly explaining the difference between regional incidences.

This study aimed to prospectively assess the association of the COVID-19 pandemic on HCWs' mental well-being in HUS and Kymsote cohorts during the pandemic from the beginning of the first wave in spring 2020. The primary research hypothesis was that the mental well-being measured with self-reported mental health symptoms would be worse in HCWs working in a higher-incidence district (HUS) compared to HCWs from low-incidence district (Kymsote). In addition, to achieve a better understanding of the factors that may be related to the studied adverse mental health outcomes, the authors determined if sociodemographic factors, work-

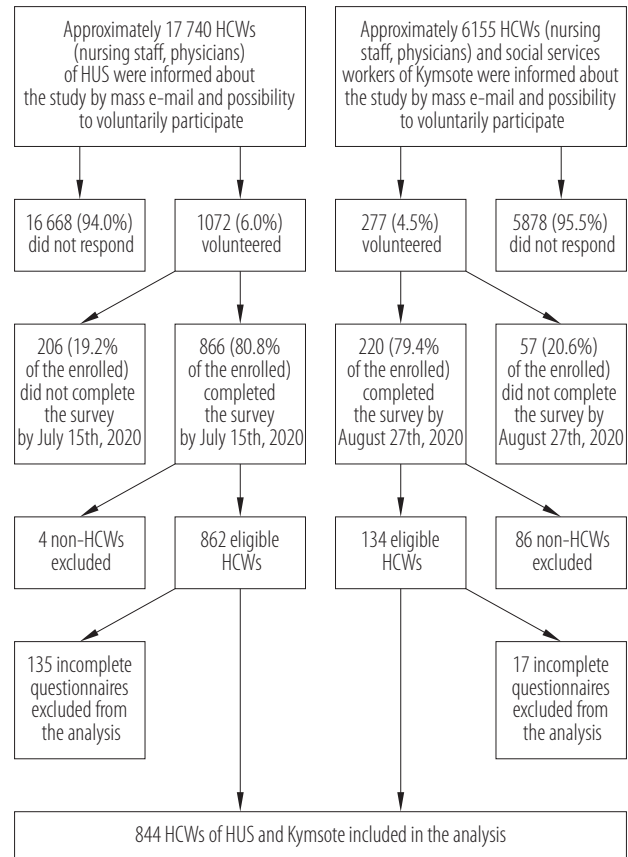
related factors, and safety instructions provided regarding protection from SARS-CoV-2 are associated with mental health morbidity of HCWs.

MATERIAL AND METHODS

Design and study population

In this cross-sectional study, the authors examined the mental well-being of HCWs by analyzing their self-reported mental health symptoms in 2 hospital districts with differing COVID-19 incidences. The survey study was conducted in the HUS and Kymnote hospital districts in Finland. The study data were collected between June 12–July 15, 2020 (HUS) and July 7–August 27, 2020 (Kymnote), soon after the first wave of the pandemic. Details of the survey are described later under data and statistical analysis. Due to permission-related reasons, it was not possible to conduct the survey in both districts completely simultaneously.

The survey assessed the period from March 1, 2020 until the date a participant completed the survey. A statistical power calculation was used to count the minimum study size and resulted in 366 using the following settings: 5% margin of error, 95% confidence interval (CI), 17 740 participants, and 50% prevalence. Mass e-mail about the study was sent to all existing e-mail addresses of HCWs from studied healthcare districts via HR department. There was no possibility to limit the target population to only those who were at the moment actually employed and actively working, and therefore unknown amount of non-active HCWs may have been included in the mass email count. Some non-target employees may also have received the mass email due to technical reasons, but only respondents fulfilling the inclusion criteria were accepted in the study. A total of approx. 17 740 healthcare professionals in HUS were informed about the study; 862 eligible HCWs were included in this study. Inclusion criteria were being a healthcare professional (nurses, physicians, midwives, laboratory technicians, radiographers, practical nurses, or



HCW – healthcare worker; HUS – Helsinki University Hospital; Kymnote – Social and Health Services in Kymenlaakso.

Figure 1. Flow chart of study enrolment and response rates in the study conducted in the HUS and Kymnote hospital districts, Finland, June 12–August 27, 2020

paramedics), age ≥18 years, and being employed in HUS in March–July 2020. From Kymnote, out of approx. 6155 healthcare and social services workers who were informed about the study by mass email, 134 eligible HCWs were included in this study. Inclusion criteria were the same as in the HUS survey. Study enrolment is presented in Figure 1.

Data and statistical analysis

The online survey consisted of a questionnaire with 150 questions covering sociodemographic information, participant’s common health risks, mental health symptoms, leisure time, working environment, including protection and safety mea-

asures in hospitals, and other COVID-19-related questions. The mental well-being of HCWs in this study was measured with ICD-10 classification-based, customized scale, in which mental health symptoms followed symptom listings of major depressive disorder (MDD) and post-traumatic stress disorder (PTSD) in ICD-10, including questions about frequency of possible symptoms. Both MDD and PTSD have been widely reported during the COVID-19 pandemic. Post-traumatic stress disorder is the most common mental health concern following disasters [14,15], and from the perspective of HCWs, COVID-19 can be considered as a mentally and physically demanding, continuous disaster-like event. MDD, as the most common comorbidity of PTSD [16], was also included in this study.

The concept of mental well-being in this study means not meeting the diagnostic criteria of MDD or PTSD. To meet diagnostic criteria of MDD or PTSD, participants had to report at least the minimum of required symptoms for these diagnoses according to the ICD-10 classification criteria. Frequency of symptoms since March 2020 was measured with following answer options: “rarely or never,” “sometimes,” “relatively often,” and “almost all the time.” Category “sometimes” was used as cutoff point, and the categories “sometimes,” “relatively often” and “almost all the time” are combined as 1 category, “often/sometimes” (i.e., those who met the diagnostic criteria and reported experiencing either MDD or PTSD symptoms often or sometimes), for the statistical analysis in the current study. Participants in the category “rarely/never” did not meet the diagnostic criteria (i.e., reported not experiencing or rarely experiencing these symptoms).

As particularly PTSD symptoms were rarely reported (especially among Kymsote HCWs), the authors combined MDD and PTSD for the statistical analysis. In this article, when referring to the group of HCWs with mental health symptoms, the authors always mean participants who met the diagnostic criteria of either MDD or PTSD. More accurate duration criteria of MDD and PTSD were

not used because of the cross-sectional methodology and the relatively short duration of the pandemic when this study was performed. All mental health symptoms in the current study were self-reported.

Incomplete questionnaires (regarding questions about mental health) were excluded from the statistical analysis, and final numbers of included questionnaires were 727 from HUS and 117 from Kymsote. The authors then compared the “often/sometimes,” and “rarely/never” groups with respect to sociodemographic factors, participation in treating COVID-19 patients, experiences with COVID-19-related safety instructions, and factors related to workload and well-being. R v. 3.6.1 was used for statistical analyses. Categorical data were compared with χ^2 tests and Fisher’s exact tests and continuous data with ANOVA and t-tests. The authors used the false discovery rate (FDR) correction to control for false positives in the analyses.

Ethical considerations

All procedures that involved human participants were conducted in accordance with the ethical standards of the institutional or national research committee and the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. The Ethical Committee of Helsinki University Hospital approved the study protocol (HUS/1450/2020). All study participants were volunteers and signed informed consent prior to answering the survey.

RESULTS

Demographic data and prevalence of self-reported symptoms

After excluding 152 incomplete questionnaires, the studied population consisted of 844 HCWs from the HUS and Kymsote districts. To account for potential selection bias, the authors tested differences in demographic variables between those HCWs of the HUS and Kymsote sample who completed (vs. did not complete, $N = 152$) the questionnaire. In both samples, there were no differences with

Table 1. Characteristics of healthcare workers of Helsinki University Hospital (HUS) and Social and Health Services in Kymenlaakso (Kymsote) participating in the study June 12–August 27, 2020

Variable	Participants (N = 844)		p
	HUS (N = 727)	Kymsote (N = 117)	
Age [years] (M±SD)	42.7±11.0	44.4±10.0	0.107
Females [n (%)]	644 (88.6)	104 (88.9)	1
COVID-19 risk group [n (%)]	41 (5.6)	12 (10.3)	0.056
BMI (M±SD)	26.5±5.4	28.5±5.8	<0.001
Smoking [n (%)]			<0.001
yes	66 (9.1)	24 (20.5)	
no	544 (74.8)	71 (60.7)	
quit	117 (16.1)	21 (17.9)	
Physicians [n (%)]	148 (20.4)	8 (6.8)	<0.001
Working place [n (%)]			<0.017
COVID-19 cohort	65 (8.9)	6 (5.1)	
emergency	80 (11.0)	7 (6.0)	
intensive care unit	78 (10.7)	10 (8.5)	
inpatient ward	148 (20.4)	17 (14.5)	
other	356 (49.0)	77 (65.8)	
Lives alone [n (%)]	133 (18.3)	20 (17.1)	0.754
Daycare or primary school [n (%)] ^a	133 (18.3)	16 (13.7)	0.224

Bolded are statistically significant p values (<0.05).

^a Has a person who goes to daycare or primary school living in the same household.

respect to age, gender, profession, being at-risk group for COVID-19 infection, BMI, smoking status, or place of employment between participants who completed vs. did not complete the questionnaire regarding mental health symptoms (all p-values >0.05).

For sociodemographic and work-related factors, a statistical difference between the 2 cohorts was found in belonging to a COVID-19 risk group, mean BMI, smoking, proportion of attending physicians, and working place of the respondents. Demographic data of the participants is shown in Table 1. In the HUS cohort, 22.8% of all HCWs reported MDD and 10.6% had PTSD symptoms meeting diagnostic criteria, either sometimes or often. A similar find-

ing was seen in the Kymsote cohort, as 23.1% of all HCWs reported MDD and 9.4% had PTSD symptoms sometimes or often. The degree of self-reported mental health symptoms did not differ between HUS and Kymsote healthcare districts ($\chi^2 < 0.001$, $p = 1$). The prevalences of 5 individual mental health symptoms that were most common among those who had symptoms often, are presented in Figure 2.

Treating COVID-19 patients and protection against COVID-19

The HUS HCWs treated COVID-19 patients more frequently than Kymsote HCWs ($\chi^2 = 27.05$, $p < 0.001$). No associations were found between treating COVID-19

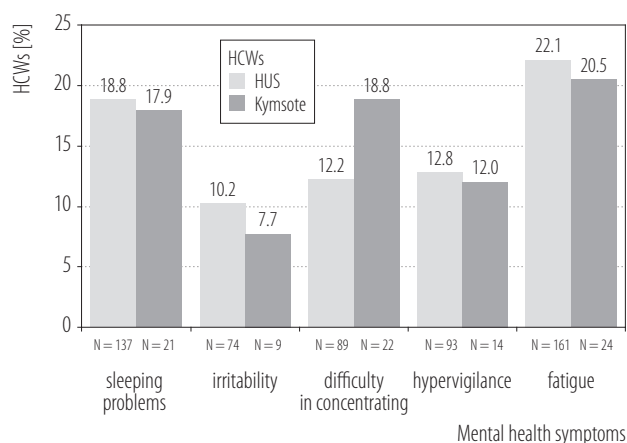


Figure 2. Prevalence of 5 self-reported mental health symptoms that were most commonly reported among those who had symptoms often, in all Helsinki University Hospital (HUS) and Social and Health Services in Kymenlaakso (Kymssote) healthcare workers (HCWs)

patients and mental health symptoms. A positive relationship between the experiences of insufficient instructions for protection against COVID-19 and self-reported mental health symptoms was observed in the HUS cohort (Table 2). There was a similar trend in the Kymssote sample (uncorrected *p*-value 0.0497), but the FDR-corrected *p*-value was not significant (Table 2).

Sociodemographic and work-related factors

Out of the sociodemographic factors, a statistically significant relationship was found between female gender and mental health symptoms in HUS HCWs but not in Kymssote HCWs. Insufficient recovery from work, subjective increased workload, and willingness to have more help for mental health issues were all related to mental health symptoms in both cohorts (Table 2). There was also a statistically significant relationship between not benefiting from the provided mental healthcare help and the degree of mental health symptoms in HUS HCWs.

DISCUSSION

Surprisingly, despite regional differences in COVID-19 incidence, HCWs of the HUS district did not have a higher

rate of mental health symptoms than HCWs of the Kymssote district. However, the overall share of HCWs experiencing mental health symptoms was worryingly high in both districts. Treating patients with COVID-19 infection appeared not to be related to mental health symptoms in HCWs. Instead, the authors found a relationship between mental health symptoms and experiences of insufficient instructions for protection against SARS-CoV-2 in HUS cohort, indicating HCWs' need for better instructions and feeling of safety at work. Furthermore, the authors' findings of HCWs' insufficient recovery and subjective increased workload suggest that excessive workload experienced by HCWs during the COVID-19 pandemic appears to have an association with mental health symptoms.

The authors' findings contrast in part to major findings in recent international publications. Studies have reported more adverse mental health outcomes or being at higher risk for them in HCWs who treat COVID-19 patients [3,17]. Results from another study performed in the HUS district in early summer of 2020 [9] also showed that HCWs who had direct contacts with COVID-19 patients had more psychological distress than those without direct COVID-19 patient contact. However, the controversial findings between the current study and that of Haravuori et al. [9] may be explained by methodological differences, as well as possible differences in the study population. Firstly, although both studies were conducted in the HUS hospital district, the participants in the current study may be partially or completely different individuals than the participants in the Haravuori et al. [9] study, and this study population comprised only HCWs. Secondly, the authors used self-reported symptom rating scale based on ICD-10 diagnosis classification, whereas Haravuori et al. [9] used other symptom rating scales. Different symptom rating scales have also been widely used in previous international studies, explaining at least part of the differences with these findings. Additionally, other possible factors that may explain the differences could be

Table 2. Associations of sociodemographic and work-related factors on prevalence of mental health symptoms (according to self-reported diagnostic symptoms) in Helsinki University Hospital (HUS) and Social and Health Services in Kymenlaakso (Kymsote) healthcare workers

	Participants (N = 844)					
	HUS HCWs (N = 727)			Kymsote HCWs (N = 117)		
	MHS often/ sometimes (N = 174)	MHS rarely/ never (N = 553)	p*	MHS often/ sometimes (N = 28)	MHS rarely/ never (N = 89)	p*
Female [n (%)]	166 (95.4)	478 (86.4)	0.0017^a	3 (89.3)	79 (88.8)	1 ^a
Age (M±SD)	41.7±10.7	43.1±11.1	0.18 ^b	41.6±10.4	45.3±9.8	0.20 ^c
Staff [n (%)]			0.063 ^d			0.78 ^a
nursing staff	148 (85.1)	431 (77.9)		27 (96.4)	82 (92.1)	
physicians	26 (15.0)	122 (22.1)		1 (3.6)	7 (7.9)	
Treated COVID-19 patients [n (%)]	86 (49.4)	242 (43.8)	0.21 ^d	9 (30.4)	15 (16.9)	0.20 ^d
Did not receive sufficient instructions for protection against COVID-19 [n (%)]	118 (67.8)	284 (51.4)	<0.001^d	19 (67.9)	39 (43.8)	0.12 ^d
Did not receive sufficient instructions for hygiene [n (%)]	16 (9.2)	36 (6.5)	0.23 ^d	3 (10.7)	1 (1.1)	0.12 ^a
Belongs to COVID-19 risk group [n (%)]	10 (7.3)	26 (4.7)	0.069 ^d	23 (82.1)	82 (92.1)	0.23 ^a
Has household member in daycare or primary school [n (%)]	30 (17.2)	74 (13.4)	0.22 ^a	4 (14.2)	12 (13.5)	1 ^a
Living alone [n (%)]	41 (23.6)	92 (16.6)	0.063 ^d	7 (25.0)	13 (14.6)	0.31 ^a
Subjective well-being** (M±SD)	4.74±0.82	3.33±1.38	<0.001^b	4.93±0.94	3.46±1.29	<0.001^c
Insufficient recovery from work [n (%)]	73 (42.0)	37 (6.7)	<0.001^d	15 (53.6)	6 (6.7)	<0.001^a
Subjective increased workload [n (%)]	130 (74.5)	226 (40.9)	<0.001^d	24 (85.7)	40 (44.9)	<0.001^d
Not benefiting from the provided mental health care help [n (%)]	133 (76.4)	277 (50.1)	<0.001^d	23 (82.1)	82 (92.1)	0.23 ^a
Would like more help for mental health issues [n (%)]	114 (65.5)	83 (15.0)	<0.001^d	23 (82.1)	17 (19.1)	<0.001^d
Sick leaves [n (%)]	107 (61.5)	215 (38.9)	<0.001^d	14 (50.0)	32 (36.0)	0.25 ^d

FDR – false discovery rate; HCW – healthcare worker; MHS - mental health symptom.

The frequency of symptoms is divided into 2 categories: often/sometimes or rarely/never. In some of the items reported in the table, missing values occurred.

Bolded are statistically significant p values (<0.05).

* FDR-corrected.

** The higher the mean, the worse the subjective well-being.

^a Fisher's exact test.

^b T-test.

^c ANOVA.

^d c²-test.

incidentally higher resilience of the respondents in this study or a lower burden on Finnish HCWs due to a less severe COVID-19 outbreak. During the first wave, the case numbers and death rate in Finland were substantially lower than in the worst affected countries [18]. Besides, the situation was generally under control even in regions

of higher incidence, such as the HUS district. As the death rate remained relatively low in Finland and thus far there has not been a need to limit the care of COVID-19 patients to preserve hospital capacity, the burden related to treating COVID-19 patients may also remain lower in these circumstances. Thus, sufficient control of the epidemic to

keep the burden of the healthcare system as low as possible is important for the mental well-being of HCWs. A well-functioning healthcare system is necessary to ensure adequate healthcare services for all members of society, contributing to the maintenance and promotion of public health. Work of HCWs is inevitable for healthcare systems to function properly, in both pandemic and normal circumstances. HCWs cannot choose working remotely from home, and therefore during a pandemic they are one of the groups standing in a very unequal position compared to many other working sectors, where employees have an option of remote work. Compared to general population, HCWs are at higher risk for SARS-CoV-2 infection [19,20]. In addition to often heavy workload and possibility of being exposed to SARS-CoV-2, lack of control as an inability to choose remote work or avoid close contacts may increase the load experienced by HCWs. The authors found that a worryingly large proportion of HCWs have enough self-reported symptoms for the diagnosis of MDD or PTSD either sometimes or often in both studied districts. In a previous Finnish population study, 13% of women and 9% of men reported symptoms of depression [21], and the yearly incidence of PTSD in Finland is estimated to be approximately 0.5% [22]. As the rates for MDD and PTSD in HCWs were 22.8% and 10.6% in HUS and 23.1% and 9.4% in Kymssote, respectively, the difference is substantial when compared to the rates of the general population measured or estimated in non-pandemic conditions. Previous evidence supports the authors' findings, as high rates of mental distress have been observed in HCWs during the early stage of the COVID-19 pandemic [23]. However, a later meta-analysis revealed that the prevalence of mental health symptoms is not only high among HCWs but also among the general population during the pandemic [24]. Nevertheless, the authors' results suggest that a significant proportion of healthcare staff may be at risk of developing mental health disorders. This may result in long-term incapacity for work,

sick leaves, and a need to reduce the employee's workload, which thus affects both the employee and the employer. These consequences may be fatal for healthcare systems, in particular due to the burden of the pandemic and the consequent medical debt.

Consistent with previous findings on protective measures being a risk factor for depression [8], this data showed that insufficient instructions for protection against SARS-CoV-2 are related to mental health symptoms. This relationship was strong in the HUS cohort, and in Kymssote cohort a similar trend was observed. It underlines the importance of well-planned and sufficient instructions for HCWs during a pandemic or otherwise stressful situation, and highlights their need to feel that they are safe and protected at work. Decent and clear instructions play an important role in the everyday work of healthcare professionals, as healthcare and all its processes and operations follow strict guidelines and instructions, including safety measures and infection control. However, the outbreak of the COVID-19 pandemic led to rapid and recurrent changes to work routines and instructions in the healthcare sector.

In the current study, recovery from work and subjective workload are the factors describing the workload experienced by HCWs. Associations between workload and mental well-being of HCWs have been previously identified. Burnout is a common condition among HCWs [25–27], and work-related stressors, such as excessive workload, are associated with HCW burnout [26,28]. Burnout may result in negative physical or mental health outcomes, including development of depressive symptoms [29]. Additionally, Virtanen et al. [30] showed that hospital ward overcrowding, indicating a high workload of HCWs, predicted antidepressant treatment among HCWs. Consistent with previous knowledge, the authors' study showed that insufficient recovery and subjective increased workload were associated with mental health symptoms. These associations were found in both cohorts, suggesting that local disease burden is not nec-

essarily one of the contributing factors to HCWs' workload-related mental morbidity during the pandemic. Therefore, the workload of HCWs should be carefully monitored to keep it moderate and to ensure that there is sufficient time for recovery between work shifts or periods in all regions regardless of the local disease burden. It is necessary to study HCWs' well-being and its possible changes throughout the pandemic and afterwards to assess possible long-term effects and factors associated with adverse mental health outcomes. This information is essential for developing support systems and strategies to promote the well-being of HCWs during the current pandemic and also for epidemics and pandemics to come.

A major strength of this study was the possibility to compare the mental well-being of HCWs between 2 regions with significantly different COVID-19 burdens, therefore providing a wider perspective of HCWs well-being in Finland during the first wave. To the authors' knowledge, this is the first study to specifically focus on and compare the mental well-being of HCWs working in regions with clearly differing COVID-19 incidences. The timing of the survey made it possible to evaluate the total burden of the first wave of the pandemic prospectively. Other strengths of the study included accurately charted and analyzed information about sociodemographic factors, working environment, and instructions concerning protection against SARS-CoV-2. Population of this study is a rather small sample of Finnish HCWs or even HCWs of HUS and Kymssote, but it is a moderately representative sample of HCWs working in the studied districts. Out of all HCWs in the study, physicians accounted for 20.4% in HUS and 6.8% in Kymssote, while in healthcare districts the actual proportions were 19.3% and 8.6%, respectively. In addition, mean age and gender distribution of the respondents were consistent with all HUS HCWs and Kymssote staff. The rate of smokers was higher in Kymssote cohort and lower in HUS cohort, when compared to general population.

The cross-sectional design is one of this study's limitations. While a survey study has limitations, such a study is necessary to assess the burden caused by the pandemic at an early stage to find answers and solutions to emerging issues. In the absence of pre-pandemic reference data, the authors cannot conclude whether there have been any pandemic-related changes in the mental well-being of HCWs. Additionally, it must be considered that all mental health symptoms in this study were self-reported. The rate of non-responders in the study was relatively high. This may be attributed to the timing of research being during the summer holiday season and the fact that mass mailing included those who were on leave. The mail was disregarded by many busy HCWs specially as it was not personalized to ensure freedom of participation in the research. In addition, it can be attributed to the mail containing only concise information about the study and requiring HCWs to follow a link to access full study information. Lastly, several other COVID-related studies were launched during the same period, which certainly contributed to how many studies HCWs were willing to participate in. The possibility of selection bias inevitably arises from a voluntary recruitment plan. Participant drop-out rate after registration to the study, or only partial completion of the questionnaire may be related to studied outcomes; therefore, it is possible that the study may underestimate the burden of measured mental health symptoms due to potential selection bias. However, selection bias was tested and proved as non-significant for demographic variables between completed and incomplete questionnaires. Nevertheless, as the authors' sample corresponds moderately well to the HCWs of the studied districts, with HUS being the largest hospital district in Finland and Kymssote representing a typical smaller hospital district, the results may be generalisable to Finnish HCWs working in the public sector, with consideration of aforementioned limitations.

CONCLUSIONS

The results suggest, that the local COVID-19 incidence or treating COVID-19 patients in the hospital or health-care environment are not necessarily related to mental morbidity of HCWs, particularly if the in-country epidemic is mostly under control. An association was found between insufficient instructions for protection from SARS-CoV-2 and mental health symptoms, indicating the importance of well-planned, sufficient instructions for HCWs and their need to feel safe and protected at work. The authors' findings also suggest that workload of HCWs should be carefully monitored during a pandemic to keep it moderate and ensure sufficient recovery in all regions, regardless of the local disease burden. In conclusion, sufficient control of the epidemic to keep the burden of the healthcare system as low as possible is vital for HCWs' well-being.

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REFERENCES

1. García-Fernández L, Romero-Ferreiro V, López-Roldán PD, Padilla S, Calero-Sierra I, Monzó-García M, et al. Mental health impact of COVID-19 pandemic on Spanish healthcare workers. *Psychol Med* 2020;1-3. <https://doi.org/10.1017/S0033291720002019>.
2. Maciaszek J, Ciulkowicz M, Misiak B, Szczesniak D, Luc D, Wieczorek T, et al. Mental Health of Medical and Non-Medical Professionals during the Peak of the COVID-19 Pandemic: A Cross-Sectional Nationwide Study. *J Clin Med* 2020;9:2527. <https://doi.org/10.1521/psyc.65.3.207.20173>.
3. Wańkiewicz P, Szylińska A, Rotter I. Assessment of Mental Health Factors among Health Professionals Depending on Their Contact with COVID-19 Patients. *Int J Environ Res Public Health* 2020;17:5849. <https://doi.org/10.3390/ijerph17165849>.
4. Freimann T, Merisalu E. Work-related psychosocial risk factors and mental health problems amongst nurses at a university hospital in Estonia: A cross-sectional study. *Scand J Public Health* 2015;43:447-452. <https://doi.org/10.1177/1403494815579477>.
5. Weinberg A, Creed F. Stress and psychiatric disorder in healthcare professionals and hospital staff. *Lancet* 2000;355:533-537. [https://doi.org/10.1016/S0140-6736\(99\)07366-3](https://doi.org/10.1016/S0140-6736(99)07366-3).
6. Que J, Shi L, Deng J, Liu J, Zhang L, Wu S, et al. Psychological impact of the COVID-19 pandemic on healthcare workers: a cross-sectional study in China. *Gen Psychiatr* 2020;33:1-12. <https://doi.org/10.1136/gpsych-2020-100259>.
7. Rossi R, Soggi V, Pacitti F, Di Lorenzo G, Di Marco A, Siracusano A, et al. Mental Health Outcomes Among Frontline and Second-Line Health Care Workers During the Coronavirus Disease 2019 (COVID-19) Pandemic in Italy. *JAMA Netw Open Psychiatry* 2020;3:1-4. <https://doi.org/10.1001/jamanetworkopen.2020.10185>.
8. Xiao X, Zhu X, Fu S, Hu Y, Li X, Xiao J. Psychological impact of healthcare workers in China during COVID-19 pneumonia epidemic: A multi-center cross-sectional survey investigation. *J Affect Disord* 2020;274:405-410. <https://doi.org/10.1016/j.jad.2020.05.081>.
9. Haravuori H, Junttila K, Haapa T, Tuisku K, Kujala A, Rosenström T, et al. Personnel Well-Being in the Helsinki University Hospital during the COVID-19 Pandemic – A Prospective Cohort Study. *Int J Environ Res Public Health* 2020;17:7905. <https://doi.org/10.3390/ijerph17217905>.
10. Wu P, Fang Y, Guan Z, Fan B, Kong J, Yao Z, et al. The Psychological Impact of the SARS Epidemic on Hospital Employees in China: Exposure, Risk Perception, and Altruistic Acceptance of Risk. *Can J Psychiatry* 2009;54:302-311. <https://doi.org/10.1177/070674370905400504>.
11. World Health Organization [Internet]. Geneva: The Organization; 2021 [cited 2021 June 15]. Coronavirus Disease 2019 (COVID-19). Weekly Epidemiological Update Edition 41, 25 May 2021. Available from: <https://www.who.int/>

- publications/m/item/weekly-epidemiological-update-on-covid-19---25-may-2021.
12. Finnish Institute for Health and Welfare [Internet]. 2021 [cited 2021 March 26]. THL open data: COVID-19 cases in infectious disease registry. Available from: https://sampo.thl.fi/pivot/prod/en/epirapo/covid19case/fact_epirapo_covid19case.
 13. Statistics Finland [Internet]. 2021 [cited 2021 April 6]. Free-of-charge statistical databases: Key figures on population by region, 1990–2020. Available from: https://pxnet2.stat.fi/PXWeb/pxweb/en/StatFin/StatFin__vrm__vaerak/statfin_vaerak_pxt_11ra.px.
 14. Norris FH, Friedman MJ, Watson PJ, Byrne CM, Diaz E, Kaniasty K. 60,000 disaster victims speak: Part I. An empirical review of the empirical literature, 1981–20. *Psychiatry* 2002;65:207–239. <https://doi.org/10.1521/psyc.65.3.207.20173>.
 15. North CS, Nixon SJ, Shariat S, Mallonee S, McMillen JC, Spitznagel EL, et al. Psychiatric Disorders Among Survivors of the Oklahoma City Bombing. *JAMA* 1999;282:755–762. <https://doi.org/10.1001/jama.282.8.755>.
 16. Brady KT, Killeen TK, Brewerton T, Lucerini S. Comorbidity of Psychiatric Disorders and Posttraumatic Stress Disorder. *J Clin Psychiatry* 2000;61:22–32.
 17. Di Tella M, Romeo A, Benfante A, Castelli L. Mental health of healthcare workers during the COVID-19 pandemic in Italy. *J Eval Clin Pract* 2020;1–5. <https://doi.org/10.1111/jep.13444>.
 18. World Health Organization [Internet]. Geneva: The Organization; 2020 [cited 2020 Nov 20]. Coronavirus Disease 2019 (COVID-19). Weekly Epidemiological Update 31 August 2020. Available from: <https://apps.who.int/iris/bitstream/handle/10665/334169/nCoV-weekly-sitrep30Aug20-eng.pdf?sequence=1&isAllowed=y>.
 19. Kantele A, Lääveri T, Kareinen L, Pakkanen SH, Blomgren K, Mero S, et al. SARS-CoV-2 infections among healthcare workers at Helsinki University Hospital, Finland, spring 2020: Serosurvey, symptoms and risk factors. *Travel Med Infect Dis* 2021;39:1–7. <https://doi.org/10.1016/j.tmaid.2020.101949>.
 20. Oksanen L-MAH, Sanmark E, Oksanen SA, Anttila V-J, Parteno JJ, Lappalainen M, et al. Sources of healthcare workers' COVID 19 infections and related safety guidelines. *Int J Occup Med Environ Health* 2021;34:1–11. <https://doi.org/10.13075/ijomeh.1896.01741>.
 21. Suvisaari J, Viertiö S, Solin P, Partanen T. Mental Health. In Koponen P, Borodulin K, Lundqvist A, Sääksjärvi K, Koskinen S, editors. Health, functional capacity and welfare in Finland – FinHealth 2017 study. National Institute for Health and Welfare (THL), Report 4/2018. Finnish. Abstract available in English. <http://urn.fi/URN:ISBN:978-952-343-105-8>.
 22. Current Care Guidelines [Internet]. 2020 [cited 2021 May 12]. Post-traumatic stress Disorder. Available from: www.kaypahoito.fi.
 23. Pappa S, Ntella V, Giannakas T, Giannakoulis VG, Papoutsis E, Katsaounou P. Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis. *Brain Behav Immun* 2020;88:901–907. <https://doi.org/10.1016/j.bbi.2020.05.026>.
 24. Luo M, Guo L, Yu M, Jiang W, Wang H. The psychological and mental impact of coronavirus disease 2019 (COVID-19) on medical staff and general public – A systematic review and meta-analysis. *Psychiatry Res* 2020;291:1–9. <https://doi.org/10.1016/j.psychres.2020.113190>.
 25. Friganović A, Selić P, Ilić B, Sedić B. Stress and burnout syndrome and their associations with coping and job satisfaction in critical care nurses: a literature review. *Psychiatr Danub* 2019;31(Suppl. 1):21–31.
 26. West CP, Dyrbye LN and Shanafelt TD. Physician burnout: contributors, consequences and solutions. *J Intern Med* 2018;283:516–529. <https://doi.org/10.1111/joim.12752>.
 27. Woo T, Ho R, Tang A, Tam W. Global prevalence of burnout symptoms among nurses: A systematic review and meta-analysis. *J Psychiatr Res* 2020;123:9–20. <https://doi.org/10.1016/j.jpsychires.2019.12.015>.
 28. Pérez-Francisco DH, Duarte-Clíments G, Del Rosario-Melián JM, Gómez-Salgado J, Romero-Martín M,

- Sánchez-Gómez MB. Influence of Workload on Primary Care Nurses' Health and Burnout, Patients' Safety, and Quality of Care: Integrative Review. *Healthcare* 2020;8:1-14. <https://doi.org/10.3390/healthcare8010012>.
29. Salvagioni DAI, Melanda FN, Mesas AE, González AD, Gabani FL, de Andrade SM. Physical, psychological and occupational consequences of job burnout: A systematic review of prospective studies. *PLoS ONE* 2017;12:1-29. <https://doi.org/10.1371/journal.pone.0185781>.
30. Virtanen M, Pentti J, Vahtera J, Ferrie JE, Stansfeld SA, Helenius H, et al. Overcrowding in Hospital Wards as a Predictor of Antidepressant Treatment Among Hospital Staff. *Am J Psychiatry* 2008;165: 1482-1486. <https://doi.org/10.1176/appi.ajp.2008.07121929>.