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WORKING CONDITIONS DURING THE COVID-19 PANDEMIC IN PRIMARY AND TERTIARY HEALTHCARE: A COMPARATIVE CROSS-SECTIONAL STUDY

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Abstract

Objectives: The COVID-19 pandemic has globally affected healthcare workers' (HCWs) health and wellbeing. Most studies on COVID-19 have focused on tertiary healthcare. The aim of this study was to increase the knowledge on the effects of the pandemic on working conditions in tertiary and primary healthcare. **Material and Methods:** The comparative cross-sectional study consisted of an online questionnaire sent to HCWs of the City of Helsinki (primary healthcare) and Helsinki University Hospital (tertiary healthcare). Altogether 1580 HCWs with direct patient contact participated in the study: 895 from tertiary and 685 from primary healthcare. Statistical analysis used SPSS 25 from IBM. The tests used were the χ^2 test, Fisher's exact test, and binary logistic regression analysis. **Results:** Primary HCWs were less likely to treat COVID-19 patients (OR = 0.45, 95% CI: 0.37–0.56). However, both groups reported a similar number of COVID-19 infections, primary HCWs 4.9% and tertiary HCWs 5.0%, and work-related quarantine was significantly more prevalent (OR = 1.96, 95% CI: 1.38–2.79) among primary HCWs. In addition, work-related wellbeing was poorer among primary HCWs than tertiary HCWs in terms of feeling more stressed at work (OR = 3.20, 95% CI: 2.55–4.02), not recovering from work (OR = 0.49, 95% CI: 0.39–0.62), reported mental wellbeing below normal levels (OR: 1.59, 95% CI: 1.26–2.00), and increased working hours (OR = 1.63, 95% CI: 1.25–2.12). **Conclusions:** The study demonstrates how the pandemic has affected the wellbeing and working conditions of not only tertiary but also less studied primary HCWs. The authors' findings suggest that the challenges identified during the COVID-19 pandemic in the health and wellbeing of healthcare workers are even greater in primary care than in tertiary care. Int J Occup Med Environ Health. 2023;36(1):139–50

Key words:
COVID-19, SARS-CoV-2, pandemics, health personnel, surveys and questionnaires, cross-sectional studies

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INTRODUCTION

Since its onset in March 2020, the COVID-19 pandemic [1] has dramatically affected millions of people's lives. Healthcare workers (HCWs) form one of the most affected groups. Not only are HCWs at greater risk of COVID-19 infection [2,3], also experience increased stress, anxiety, and depression due to the pandemic [4,5].

Because their work involves a great deal of daily human contact, including possible direct contacts with people with infectious diseases such as COVID-19, HCWs are possibly at a greater risk of becoming infected and transmitting the virus to other people [6]. Therefore, HCW infection control measures are vital for controlling the pandemic. HCW infections and quarantines endanger countries' abilities to provide sufficient healthcare resources to meet the needs caused by the pandemic, not to mention the acute medical needs of patients other than those with COVID-19. To prevent the spread of COVID-19 in healthcare facilities, personal protective equipment (PPE), including facemasks, goggles, gowns, respirators, face shields and aprons, has been adopted in everyday practice. Additional measures for controlling the pandemic have been globally imposed, such as maintaining social distance, avoiding large gatherings, testing, isolating/quarantining, and vaccinating.

A solid body of literature describes the challenges faced by HCWs in terms of their mental and physical health during the COVID-19 pandemic [2–5,7]. However, the focus of these studies and resources have been on tertiary care [3–5,8]. The authors hypothesize that the COVID-19 pandemic has had a negative impact on primary HCWs and their working conditions. According to EurWORK [9], working conditions include factors such as training, skills, health, safety, wellbeing, working time and work-life balance.

The aim of this multicenter, comparative, cross-sectional study, was to compare public HCWs' working conditions and the effects of the pandemic in primary and tertiary healthcare during the COVID-19 pandemic. By the April 5, 2021, there had been 82 891 COVID-19 cases in Finland, of which 48 680 were in the Uusimaa region [10].

MATERIAL AND METHODS

An online questionnaire survey was distributed to the tertiary HCWs of Helsinki University Hospital (HUS) and the primary HCWs of the City of Helsinki (CH), Finland. Both HUS and CH operate in the Uusimaa region, which is a region in the South of Finland, populated by as many as 1.7 million of Finland's 5.5 million inhabitants. The study was announced through mass e-mails and messages posted on the intranets by the HUS and CH communication teams, asking for voluntary participants. The responses to the questionnaire were collected between June 12, 2020 and April 5, 2021. Both groups were asked to evaluate working conditions from March 16, 2020, when the first COVID-19 restrictions were announced in Finland. The questionnaire was available to tertiary HCWs 6 months earlier, before its availability to primary HCWs, as the primary healthcare sector had a longer study approval process. As the tertiary HCWs received the questionnaire before the primary HCWs, the authors sent out a follow-up questionnaire between June 12, 2020 and February 28, 2021 for tertiary HCWs to update their answers and allow them a similar reference period. As a result, 765 (85.5%) of the 895 tertiary HCWs respondents updated their answers.

Participants included in the study were over 18 years old, worked in healthcare facilities and had direct patient contact. Of the 32 730 healthcare and social workers of tertiary and primary healthcare, 2835 (8.6%) participated in the study. Of the participants, 1580 (55.7%) HCWs with direct patient contact answered the questionnaire thoroughly. Figure 1 shows a flowchart of the enrolment process.

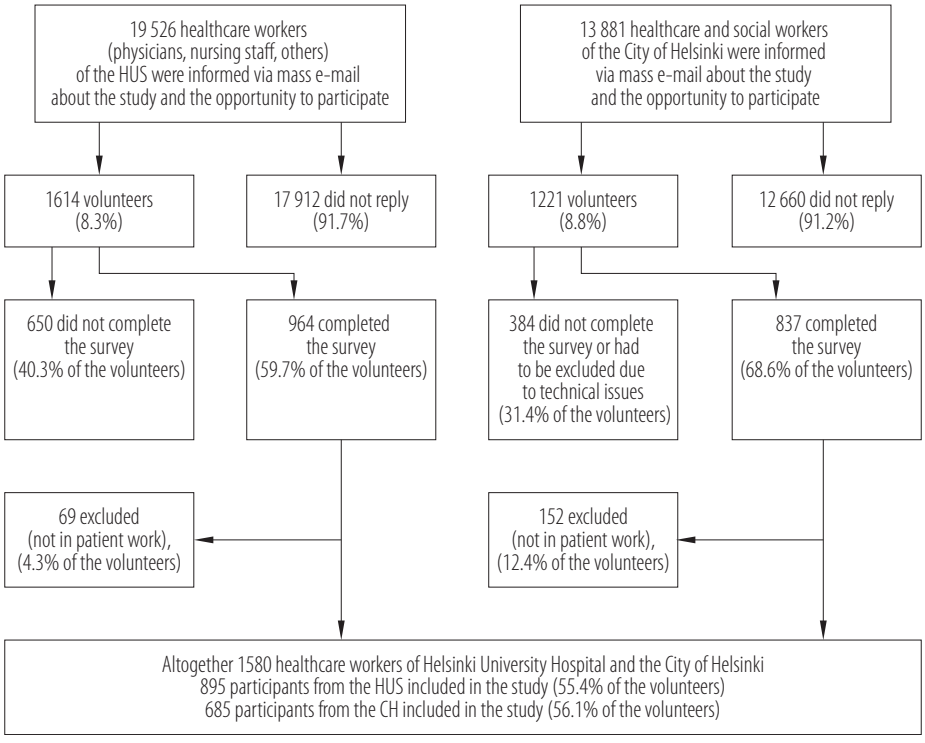

Figure 1. Participant flowchart of the study in Helsinki University Hospital (HUS, tertiary healthcare) and the City of Helsinki (CH, primary healthcare), Finland, June 12, 2020 –April 5, 2021

The questionnaire was constructed-for-purpose and consisted of 28 questions, including applied forced-choice (yes/no), multiple-choice, and a limited number of open-ended questions. The number of answers varied from question to question, as answering all questions was not mandatory. The questionnaire collected information about the HCWs' working conditions, including PPE availability and guidance, workload, recovery from work and COVID-19-related aspects, such as infection with the virus, quarantines, and mental wellbeing. The questionnaire was based on ICD-10 classification criteria, the published literature on COVID-19 and the Finnish Current Care Guidelines.

Before data collection, a power analysis was conducted to estimate the sufficiency of the sample size and was found to be 374 and 377 for primary and tertiary healthcare, respectively. The data were analyzed using SPSS 25 from IBM. The tests used were the χ^2 test, Fisher's exact test and binary logistic regression analysis, with a $p < 0.05$ significance level.

Primary analyses were conducted to compare primary and tertiary HCWs' results using binary logistic regression. In secondary analyses, primary and tertiary HCWs were combined to determine the factors affecting both groups' wellbeing and COVID-19 infections/quarantines. All procedures involving 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 amendments or comparable ethical standards. The Ethics Committee of Helsinki University Hospital (HUS/1450/2020), and the City of Helsinki (HEL 2020-007596 T 13 02 01) approved the study protocol. Participation was voluntary, and all participants signed their informed consent by strong electronic identification prior to answering the survey. All the data were anonymized for analysis.

RESULTS

Characteristics of the participants

A total of 895 and 685 HCWs from tertiary and primary healthcare, respectively, were included in the study. The primary and tertiary groups were mainly similar and comparable. The groups significantly differed in terms of the following factors: age distribution, occupational distribution, smoking status, pregnancy status, heavy alcohol usage, and living conditions. The demographic data of the participants are shown in detail in Table 1.

Work-related wellbeing

Primary HCWs' odds of below normal mental wellbeing were 1.59 times higher than those of tertiary HCWs' (95% CI: 1.26–2.00). Increased working hours (OR = 1.63, 95% CI: 1.25–2.12) and feeling more stressed at work (OR = 3.20, 95% CI: 2.55–4.02) were also more prevalent among primary HCWs. Recovering normally from work was less likely for primary HCWs (OR = 0.49, 95% CI: 0.39–0.62). Table 2 shows the results regarding work-related wellbeing.

PPE instructions and availability

The primary HCWs found instructions to be more uniform; but, were more likely to report receiving no instructions for using PPE (OR = 2.03, 95% CI: 1.36–3.02). Table 2 displays the results regarding working conditions, including PPE instructions and availability.

COVID-19 infections, quarantines, and disease outcome

A total of 4.9% of the primary and 5.0% of the tertiary HCWs reported positive PCR tests. Primary HCWs were less likely to treat COVID-19 patients (OR = 0.45, 95% CI: 0.37–0.56); but, work-related quarantine was still significantly more prevalent (OR = 1.96, 95% CI: 1.38–2.79) among them. Work-related COVID-19 infection was reported by 2.9% (26/895) HCWs from tertiary and 3.1% (21/685) HCWs from primary healthcare. Smoking was associated with an elevated risk of work-related quarantine in primary healthcare (OR = 5.37, 95% CI: 1.80–15.96). Table 2 displays the results regarding working conditions, including COVID-19 infections and quarantines.

Sick leave due to COVID-19-like symptoms was more common among primary HCWs, as 73% of them reported taking sick leave in comparison to 47% of tertiary healthcare HCWs. The factors associated with sick leave prevalence are displayed in Table 2.

Hospitalization and treatment in an intensive care unit (ICU) due to COVID-19-related symptoms were rare among the participating HCWs. Altogether 0.5% of the participants (8/1580) were hospitalized (4 from each tertiary and primary healthcare group), of whom 0.3% (2/1580) were treated in an ICU (2 from primary healthcare).

Secondary analyses – factors associated with both groups

In both groups combined, low mental wellbeing was associated with suboptimal recovery from work (OR = 15.87, 95% CI: 11.44–22.02, $p < 0.001$). There was no significant association between low mental wellbeing and a positive PCR test (OR = 0.89, 95% CI: 0.56–1.44, $p = 0.643$), treating COVID-19 patients (OR = 0.98, 95% CI: 0.79–1.22, $p = 0.877$), guided PPE training (OR = 1.20, 95% CI: 0.96–1.49, $p = 0.104$), re-usage of PPE (OR = 0.80, 95% CI: 0.49–1.33, $p = 0.392$) or leisure-time-related quarantine (OR = 0.79, 95% CI: 0.42–1.48, $p = 0.460$). A close to significant association was found between low mental wellbeing and work-related quarantine (OR = 0.71, 95% CI: 0.52–1.00, $p = 0.053$).

Treating patients with COVID-19 was an independent risk factor for COVID-19 infection (OR 1.59, 95% CI: 1.01–2.52, $p = 0.047$), and quarantine periods were more likely for both groups when treating COVID-19 patients

Table 1. Healthcare workers of the City of Helsinki (primary healthcare) and Helsinki University Hospital (tertiary healthcare), June 12, 2020 and April 5, 2021, Uusimaa, Finland

Variable	Participants (N = 1580)				p
	tertiary healthcare (N = 895)		primary healthcare (N = 685)		
	n	%	n	%	
Demographic factor					
gender (N = 1580)					0.261
women	797	89.1	611	89.2	
men	98	10.9	72	10.5	
occupation (N = 1485)					<0.001
doctors/dentists	149	18.4	84	12.5	
nursing staff	559	68.9	465	69.0	
others	103	12.7	125	18.5	
age (N = 1566)					0.017
18–29 years	143	16.0	104	15.5	
30–39 years	264	29.5	190	28.3	
40–49 years	243	27.2	145	21.6	
50–59 years	195	21.8	178	26.5	
60–69 years	50	5.6	54	8.0	
Comorbidities (N = 1569)					
age (>70 years)	0	0	1	0.1	0.437
severe heart disease	2	0.2	2	0.3	1.000
lung disease, not clinically stabilized	24	2.7	9	1.3	0.075
diabetes involving organ injury	2	0.2	2	0.3	1.000
chronic liver/kidney failure	0	0	3	0.4	0.083
disease that weakens the immune system	8	0.9	9	1.3	0.469
immunosuppressive medication	11	1.2	10	1.5	0.826
no listed comorbidities	844	95.5	653	95.3	0.904
Regular medication (N = 1579)	435	48.7	325	47.4	0.648
Smoking (N = 1580)	86	9.6	94	13.7	0.013
Pregnancy (N = 1575)	23	2.6	5	0.7	<0.001
Obesity (BMI >30) (N = 1571)	184	20.7	151	22.1	0.535
Heavy alcohol usage (N = 1050)	27	5.1	13	2.5	0.035
Living conditions (N = 1576)					0.006
lives alone	175	19.6	168	24.6	
with 1 person	323	36.2	255	37.3	
with 2 people	124	13.9	102	14.9	
with ≥3 people	271	30.3	158	23.1	

The number of answers varied from question to question, as answering all questions was not mandatory.

Table 2. Work-related well-being, working conditions and sick leave due to COVID-19-like symptoms of healthcare workers (HCWs) in Helsinki University Hospital (tertiary healthcare) and the City of Helsinki (primary healthcare), Finland, June 12, 2020 –April 5, 2021

Variable	Participants (N = 1580)				p	Adjusted OR (95% CI)
	tertiary healthcare (N = 895)		primary healthcare (N = 685)			
	n	%	n	%		
Work-related well-being[a]						
mental wellbeing below normal (N = 1555)	259	29.9	260	38.3	<0.001	1.59 (1.26–2.00)[b]
doctors (N = 255)	32	22.1	27	32.1	0.117	1.69 (0.88–3.26)
nursing staff (N = 992)	169	30.8	192	41.6	<0.001	1.64 (1.25–2.15
others (N = 217)	26	25.7	36	29.3	0.393	1.33 (0.69–2.54)
increased working hours (N = 1559)	155	17.4	171	25.6	<0.001	1.63 (1.25–2.12)[b]
doctors (N = 226)	34	22.8	23	28.0	0.263	1.47 (0.75–2.90)
nursing staff (N = 993)	98	17.6	127	27.9	<0.001	1.76 (1.29–2.41)
others (N = 216)	13	12.6	19	15.8	0.312	1.54 (0.67–3.53)
feeling more stressed at work (N = 1563)	338	38.0	422	64.9	<0.001	3.20 (2.55–4.02)
doctors (N = 220)	45	30.2	38	50.0	0.002	2.58 (1.40–4.77)
nurses (N = 983)	227	40.9	316	70.9	<0.001	3.73 (2.82–4.93)
others (N = 215)	35	34.0	62	52.5	0.004	2.37 (1.32–4.27)
recovers normally from work (N = 1580)	448	50.2	239	34.9	<0.001	0.49 (0.39–0.62)[b]
doctors (N = 228)	92	61.7	34	40.5	0.001	0.36 (0.20–0.66)
nursing staff (N = 1004)	267	47.9	154	33.1	<0.001	0.51 (0.39–0.66)
others (N = 221)	53	51.5	48	38.4	0.015	0.49 (0.27–0.87)
Working conditions[a]						
treated COVID-19 patients (N = 1560)	424	47.6	196	29.3	<0.001	0.45 (0.37–0.56)[c]
COVID-19 laboratory test						
positive PCR-test (N = 1574)	44	4.9	34	5.0	0.900	0.97 (0.59–1.60)
positive antibody test (N = 225)	46/171	26.9	10/54	18.5	0.147	0.49 (0.19–1.28)
quarantines (N = 1574)						
work-related quarantine	73	8.2	94	13.7	<0.001	1.96 (1.38–2.79)[d]
smokers	5	5.8	22	23.4	0.003	5.37 (1.80–15.96)
non-smokers	68	8.5	72	12.2	0.006	1.70 (1.16–2.50)
leisure-time related quarantine	22	2.5	27	3.9	0.293	1.39 (0.75–2.58)[e]
personal protective equipment (PPE) training						
non-uniform instructions (N = 1574)	500	56.4	264	34.6	<0.001	0.52 (0.42–0.64)[f]
no instructions (N = 1562)	50	5.6	77	11.3	<0.001	2.03 (1.36–3.02)[d]
guided training (N = 1571)	362	40.6	235	34.6	0.227	0.87 (0.69–1.09)[d]
doctors	48	32.4	34	40.5	0.117	1.67 (0.88–3.16)
nurses	247	44.3	176	38.2	0.388	0.89 (0.68–1.16)
others	38	37.3	22	17.6	0.001	0.31 (0.15–0.60)

Table 2. Work-related well-being, working conditions and sick leave due to COVID-19-like symptoms of healthcare workers (HCWs) in Helsinki University Hospital (tertiary healthcare) and the City of Helsinki (primary healthcare), Finland, June 12, 2020 –April 5, 2021 – cont.

Variable	Participants (N = 1580)				p	Adjusted OR (95% CI)
	tertiary healthcare (N = 895)		primary healthcare (N = 685)			
	n	%	n	%		
Working conditions[a] – cont.						
personal protective equipment (PPE) training – cont.						
knows how to don/doff PPE (N = 1568)	810	91.3	626	91.9	0.176	1.31 (0.89–1.95)[d]
treated COVID-19 patients	417	98.8	190	96.9	0.091	0.32 (0.08–1.20)
did not treat COVID-19 patients	388	84.3	422	89.8	0.045	1.53 (1.01–2.31)
PPE (N = 1547)						
nonsufficient PPE	254	29.5	147	21.5	0.033	0.76 (0.59–0.98)[d]
worked without PPE	25	1.6	18	1.2	0.840	1.07 (0.54–2.13)
re-usage of facemask at work	43	5.0	26	3.8	0.606	0.87 (0.50–1.49)
Sick leave due to COVID-19-like symptoms[a]						
sick leaves (N = 1330)	401	47.1	351	73.1	<0.001	3.22 (2.47–4.21)
doctors	48	33.8	43	75.4	<0.001	6.12 (2.90–12.93)
nursing staff	267	50.5	243	78.6	<0.001	3.61 (2.57–5.06)
others	47	47.5	61	57.5	0.136	1.56 (0.87–2.81)
age						
18–29 years	72	52.9	69	83.1	<0.001	4.60 (2.21–9.57)
30–39 years	129	51.8	88	71.0	0.001	2.35 (1.42–3.89)
40–49 years	112	47.9	73	70.9	<0.001	2.69 (1.57–4.61)
50–59 years	76	41.1	86	71.1	<0.001	3.09 (1.81–5.26)
60–69 years	12	25.0	30	76.9	<0.001	19.48 (5.18–73.26)
living conditions						
lives alone	71	42.8	83	76.9	<0.001	5.20 (2.80–9.67)
with 1 person	137	44.2	134	73.2	<0.001	3.95 (2.54–6.15)
with 2 people	53	45.3	52	70.3	0.005	2.59 (1.34–5.01)
with ≥3 people	140	54.5	80	72.1	0.018	1.89 (1.11–3.20)

If interactions are significant sub-group analysis is presented.

[a] Odds ratios adjusted for age, occupation, living conditions, pregnancy, smoking and treating COVID-19-positive patients.

[b] Tested for non-significant interaction between background factor age and group.

[c] Non-adjusted OR.

[d] Tested for significant interaction between background factor treating COVID-19 patients and with group.

[e] Tested for significant interaction between background factor smoking and with group.

[f] Tested for significant interaction between background factor occupation and with group. The number of answers varied from question to question, as answering all questions was not mandatory.

(OR = 1.88, 95% CI: 1.36–2.59, p < 0.001). In addition, insufficient availability of PPE was associated with increased stress at work (OR = 1.49, 95% CI: 1.18–1.88, p = 0.001). Other factors associated with PPE training or availability had no significant impact on work-related stress.

DISCUSSION

As most COVID-19 studies have focused on tertiary healthcare, this study aimed to increase the knowledge on the effects of the pandemic on primary healthcare. This study made interesting findings among primary HCWs:

- poor mental wellbeing, work-related stress, poor recovery from work, sick leave and quarantine were more prevalent in primary healthcare;
- HCWs in primary healthcare were less likely to receive instructions for PPE;
- a similar number of COVID-19 infections occurred among both groups of HCWs, although treating patients with COVID-19 was less likely in primary healthcare.

Strengths and limitations

Healthcare workers working and living in the same area, in the Uusimaa Region, enabled reliable statistical analysis of the differences between working conditions in primary and tertiary healthcare, which can be regarded as a strength of this study. As the living environment is similar, both groups were at equal risk of infections, quarantines, and emotional burden during leisure time. This enabled a reliable assessment of working conditions. This study offers valuable insight into primary healthcare, whereas earlier publications have principally concerned tertiary healthcare. To the authors' knowledge, no previous study has compared primary and tertiary HCW working conditions during the COVID-19 pandemic. The participants' occupational, age and gender profiles were also consistent with primary and tertiary healthcare providers' personnel profiles [11,12], which means the sample was representative.

A limitation of this study was the different time points of participation among the primary and tertiary HCWs. To minimize bias, the authors collected follow-up data on tertiary healthcare HCWs and updated the responses to ensure comparability over time. The original questionnaire had a 5.6% response rate in tertiary and 8.8% in primary healthcare. This low number of volunteers may be explained by the distribution being a non-personal mass e-mail, which may have been overlooked by some recipients. Nevertheless, up to 55.7% of the interested volunteers completed the survey, which can be considered sufficiently representative for a survey-based study.

One possible concern in surveys is that participants with negative experiences, infections or exposures are more likely to participate. However, in a comparison set-up, this concern applied to both groups, and is thus unlikely to have affected one group more than the other.

The results of this study are not generally applicable to all health care systems, as they vary greatly from one country to another, as did the pandemic situations globally. Thus, only trends can be generalized.

Findings in relation to other studies

Work-related wellbeing

The authors' found that recovery from work was significantly poorer in primary healthcare than with tertiary healthcare, and only 30% felt they recovered properly. Mental wellbeing was also poorer than in tertiary healthcare, and almost 40% reported lower than normal mental wellbeing. One reason for this may be increased working hours, which were more prevalent in primary healthcare and applied to 26% of primary and 17% of tertiary HCWs. These results are in line with the previous studies that have showed that epidemics and pandemics increase the stress and workload of HCWs [7,8,13]. A limited number of studies have described circumstances in primary healthcare: 2 Australian studies have shown increased stress and insecurity among primary HCWs

due to the pandemic [14,15]. However, to the authors' knowledge, no previous studies have compared primary and tertiary healthcare.

The distribution of resources favours tertiary care, as does preparedness for treating patients with COVID-19 [16]. The state of primary care in Finland was already a public concern before the COVID-19 pandemic [16], and may possibly have affected the wellbeing and work-related stress of primary HCWs. Another factor that may partly explain the better work-related wellbeing outcomes of tertiary HCWs is that tertiary HCWs are used to treating sicker patients and dealing with unexpected, stressful situations. Thus, primary HCWs were outside their comfort zone during the COVID-19 pandemic.

The wellbeing of HCWs is not only an occupational healthcare concern; it also affects patient care and safety, as longer working hours and increased stress are linked to work performance, and overwork and fatigue correlate with injuries and patient care errors [17–19]. In addition, during the COVID-19 pandemic, longer working hours and suboptimal hand hygiene have also been associated with a higher risk of COVID-19 infections [18].

Personal protective equipment

According to this study, during the COVID-19 pandemic HCWs in primary care were more likely to be left without PPE instructions and guided training in the use of PPE. On the other hand, non-uniform PPE instructions were more common in tertiary care (56.4%) than in primary care (34.6%). Similar results have also been obtained in the United Kingdom, where a study described a reduced level of PPE training in primary care and outside the high-risk units [20], and only 50% of participating HCWs felt that the front-line workers had received adequate training in the use of PPE [21]. Incorrect use of PPE has been associated with an elevated risk of nosocomial infections [22], and non-uniform, unclear instructions may cause unnecessary stress and poorer performance among HCWs [23]. Previous studies have highlighted the importance of clear instructions, and found that frequently changing guidelines caused confusion and decreased trust in the reliability of guidelines [24,25]. In this study insufficient availability of PPE was reported more often by workers in tertiary healthcare than those in primary care: 30% and 21%, respectively. The authors' results are in line with previous findings, of widespread shortages and the use of single-use PPE during the COVID-19 pandemic [21,26]. Shortage of PPE and inadequate PPE have also been associated with a higher risk of COVID-19 infection [27,28].

During the first weeks of the pandemic, COVID-19 patients were referred to tertiary healthcare which suffered from a PPE shortage, as was the case worldwide. This may have highlighted the need for PPE among tertiary care HCWs.

Personal protective equipment shortages, changing and missing instructions, and emotional distress can be hard to avoid during an unexpected pandemic. However, during a pandemic lasting several years, these challenges should have been addressed from the perspectives of workers' safety and mental wellbeing. The authors' research shows that this aspect should also be borne in mind in primary healthcare. The future may hold a risk of similar pandemics, and for these we should be better prepared.

COVID-19 infections and quarantines

In primary healthcare, 29% of the participants reported having treated COVID-19 patients, whereas the respective number in tertiary care was 48%. Although primary HCWs were less likely to treat COVID-19 patients, work-related quarantine was more prevalent in this group. In addition, the number of work-related infections in the groups was similar, despite fewer workers being in contact with COVID-19 patients in primary healthcare. This study results indicate that the risk of infection in primary healthcare is possibly as high as it is in tertiary care, despite the former being considered a low-risk environ-

ment. Similar infection rates may result from the fact that, at least at the beginning, the infectious status of patients with mild symptoms was often unknown during the first days after contracting the virus, and HCWs possibly wore insufficient PPE when treating. Another explanation for the similar COVID-19 infection and quarantine rates among primary and tertiary HCWs is the clinical picture and infectiousness of COVID-19. The virus is most contagious during its early stages when the patient's symptoms are still mild [29]. Typically, patients are referred to tertiary healthcare when symptoms become more severe as the virus progresses, but by this stage, its infectivity is already lower [30,31]. Thus, the risk of infection in primary healthcare is obvious. In high prevalence areas, it is worth considering that all patients, including those who are asymptomatic or have mild symptoms, are a risk of COVID-19 infection or exposure.

To the authors' knowledge, no previous study has compared the infections and quarantines of primary and tertiary HCWs. However, such results are hard to compare to those in other countries due to the absence of previous studies and the differences in each country's regulations.

CONCLUSIONS

This study demonstrates how the pandemic has affected the wellbeing and working conditions of not only tertiary HCWs but also the less-studied primary HCWs. HCWs' stress at work and workload were significantly higher in primary than tertiary healthcare, along with poorer recovery from work and poorer mental wellbeing. The authors' findings suggest that although primary HCWs are less likely to treat confirmed COVID-19 patients, their work environment is even less safe in terms of infections, exposures, or stress. These results highlight the importance of allocating sufficient resources and guidance to primary healthcare during possible future epidemics and pandemics, as well as during the aftermaths of COVID-19. The results also underline the need for more research in primary care.

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