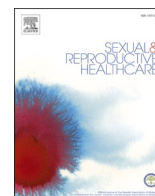




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Working conditions for hospital-based maternity and neonatal health care workers during extraordinary situations – A pre-/post COVID-19 pandemic analysis and lessons learned

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ABSTRACT

Objective: The aim of this study was to investigate how the changed work routines during the COVID-19 pandemic has been affecting the working environment for hospital-based maternity and neonatal health care workers, and to identify preventive measures to be used in future situations when health care organizations are under pressure.

Methods: All maternity and neonatal health care workers in a Swedish university hospital were surveyed during October 2019 and September 2020. The data was analyzed by document analysis of implemented changes in working routines, a quantitative analysis of the overall effects on the working conditions, and a qualitative analysis of open-ended responses.

Results: A total of 660 maternity and neonatal health care workers completed the pre-COVID-19 survey (74% response rate) and 382 the COVID-19 survey (35% response rate). Lack of personal protective equipment, worry about becoming infected, uncertainty whether implemented changes were enough, and challenges in communicating updated routines had negative effects on maternity and neonatal health care workers' working conditions. Team spirit and feeling valued by peers had a positive effect.

Conclusions: Results suggest that negative effects on maternity and neonatal health care workers' health can partly be prevented in future critical situations by creating a work climate that acknowledges the employees' worry about being infected, securing adequate pre-conditions for managers, creating a strong psychosocial safety climate and systematically improving the working conditions for the maternity and neonatal health care workers, as well as maintaining the positive perceived effects of increased team spirit and feeling valued by peers.

Abbreviations: COVID-19, Coronavirus disease 2019; HCW, health care workers; PPE, personal protective equipment.

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Introduction

The COVID-19 pandemic has challenged health care workers (HCWs) in an unprecedented way and will most likely affect their wellbeing and mental health for a long time after the pandemic has ended [1–2]. Understandably, research has focused on the effects of the pandemic on frontline HCWs, reporting high workload and effects on their mental health [3–6]. But it is important to raise awareness that also HCWs from other departments have been considerably affected by the situation and therefore might need increased support. Hospital-based maternity and neonatal HCWs need to take care of women even if they contract COVID-19 as there are no other facilities or health care providers who can assist during birth or care for severely ill infants. Therefore, they are unique examples of HCWs working at hospital departments that cannot withhold or delay care, and that need to maintain a functioning service at all times [1,7–9]. Consequently, changes in work routines to decrease the risk of spreading the infection, and shortages of staff due to quarantine regulations will affect these specialties to a great extent [10].

To date, there is limited knowledge about how the COVID-19 pandemic has affected the working conditions for HCWs working in hospital-based maternity and neonatal health care [7,11]. Since the beginning of the pandemic, a few cross-sectional studies have been performed, consistently reporting both affected work routines and increased levels of stress and worry among HCWs working in hospital-based maternity and neonatal health care [7,11–15]. However, these studies do not provide in-depth discussion regarding plausible mechanisms, nor do they give suggestions regarding preventive measures that could reduce the negative effect of the pandemic on HCWs' working conditions and health [7,11]. By including questions regarding work environment factors in a before/after study design, the present study investigates both the positive and the negative effects of the pandemic on the HCWs' working conditions. The results from this study can be used to design preventive measures aiming to improve HCWs' working conditions.

The study objectives were to investigate how the working environment and the possibility for recovery for hospital-based maternity and neonatal HCWs was affected by the COVID-19 pandemic and to identify preventive measures that could improve working conditions and be utilized when staff and the health care system are particularly exposed.

Methods

Study setting

This study was part of a large-scale survey study conducted at Sahlgrenska University Hospital in Gothenburg, Sweden, one of the major university hospitals in Northern Europe. Approximately 10 000 children are born at the hospital each year. In addition, the hospital is also a referral center for extremely preterm born children and children with known congenital malformations, including severe heart malformations.

Study design

The study was based on two web-based surveys, a pre-COVID-19 survey, and a COVID-19 survey. The pre-COVID-19 survey was distributed to all HCWs at the maternity and neonatal departments, including physicians, midwives, registered and assistant nurses, administrative personnel and other occupations, in October 2019 (660 HCWs completed the survey, response rate 74%). The result of the pre-COVID-19 survey was compared with a COVID-19 survey distributed to the same study population (n = 1188) in the first week of September 2020, i. e. after the first COVID-19 wave in Sweden. After excluding HCWs not working or being absent from work during this period (n = 106), 1082 HCWs were eligible for study participation and a total of 382 gave their informed consent and completed the survey, with a response rate of 35

%.

The surveys have been described in detail elsewhere [16] but briefly, the pre-COVID-19 survey contained demographic items including age, gender, and professional role (See Table 1). Additionally, eleven items regarding working conditions were included, addressing job demands, job resources, recovery, and motivation according to the Job Demands–Resources (JD-R) model [17] (see Table 2). The COVID-19 survey contained the same demographic items and the eleven items regarding the working conditions described for the pre-COVID-19 survey above. In addition, items about work placement during the pandemic, worries about getting infected, access to personal protective equipment (PPE) and one open-ended question regarding positive and negative experiences were included. When responding to items about working conditions, the participants were asked to recollect how they had perceived the situation during the first wave of the pandemic, in the spring of 2020.

Analyzing the effect of the COVID-19 pandemic

A mixed-method approach was used, and the analyses were performed in three different steps, consisting of a document analysis of implemented changes in work routines during the COVID-19 pandemic, a quantitative analysis of the pre-COVID-19 survey compared with the COVID-19 survey, and a qualitative analysis of answers to the open-

Table 1

Background characteristics and COVID-19 specific survey items.

Survey items	Pre-COVID-19 n (%)	COVID-19 n (%)
Participating employees	660 (100)	382 (100)
Professional role		
Physicians	76 (12)	27 (7)
Midwives	175 (27)	96 (25)
Registered nurses	129 (20)	82 (21)
Assistant nurses	198 (30)	113 (30)
Administrative personnel and others ^a	82 (12)	64 (17)
Age (in years)		
<30	75 (12)	40 (10)
30–39	172 (27)	88 (23)
40–49	149 (23)	87 (23)
50–59	161 (25)	104 (27)
>59	91 (14)	63 (16)
Gender		
Women	603 (92)	350 (92)
Men	33 (5)	28 (7)
Other / do not want to reply	17 (3)	1 (0.3)
Being in contact with COVID-19 infected women		
Yes		238 (62)
No		143 (38)
Being transferred to another department		
No		310 (81)
Occasionally		41 (11)
Most of the time		13 (3)
Other ^b		18 (5)
Strong worry for being infected		
Many times per day		33 (9)
Daily		71 (19)
Occasionally		87 (23)
Rarely		121 (32)
Never		63 (17)
Enough access to personal protection equipment when caring for COVID-19 infected women		
Always or most often		201 (53)
Often		48 (13)
Occasionally		15 (4)
Rarely		9 (2)
Rarely or never		9 (2)
Did not care for COVID-19 infected women		97 (26)

^aAdministrative personnel, managers, kitchen assistants and welfare officers,

^bOther changes due to restrictions or personal reasons.

Table 2

Overall effects of the COVID-19 pandemic on working conditions for maternity and neonatal health care workers and their possibility for recovery, compared with the situation before the pandemic.

Survey item	Estimate ^a (95 % CI ^b)	P-value
I know what is expected of me in my work	-0.45 (-0.56 – -0.35)	<0.001
The quantity of my work seems reasonable	0.27 (0.12 – 0.42)	<0.001
I am able to take part in planning how my work is to be performed	-0.34 (-0.48 – -0.19)	<0.001
In my work, my skills and abilities are used in the right way	0.22 (0.10 – 0.35)	<0.001
My line manager helps me prioritise my work tasks as needed	-0.16 (-0.31 – -0.008)	0.04
I can get help and support if emotionally stressful situations arise in my work	-0.58 (-0.73 – -0.44)	<0.001
I have scope for recovery during the work session through breaks and/or rests	0.15 (-0.01 – 0.30)	0.07
I look forward to going to work	-0.62 (-0.75 – -0.50)	<0.001
I can set thoughts about work aside in my free time	-0.26 (-0.41 – -0.10)	0.001
I have enough energy to do other things after the end of my shift	-0.10 (-0.26 – 0.05)	0.2
I feel rested and recovered after a couple of days off	-0.20 (-0.35 – -0.04)	0.02

^a Estimated in mixed-effect models with time as fixed effect (2019 or 2020, nested within departments) and departments as random effects. A positive estimate represents a perception of improved working conditions and possibility for recovery in 2020 compared to 2019, and vice versa.

^b CI = confidence interval.

ended question, as discussed below.

Document analysis of implemented changes in work routines

All implemented changes in work routines were documented in department-specific COVID-19 pandemic plans which were updated when new decisions were made. A document analysis of key concepts in the COVID-19 pandemic plans was conducted in accordance with Bowen [18]. All versions of the COVID-19 pandemic plans between 20 March 2020 and the closing of the survey in September 2020 were collected and systematically reviewed by researchers with good knowledge of the obstetrics and neonatal departments (VS YC, AE).

Quantitative analysis of the COVID-19 survey compared with the pre-COVID-19 survey

Based on the Shapiro–Wilk test and visual inspection of histograms, normality was assumed, and parametric methods were used on untransformed data.

To assess the overall effect, mixed-effects models (Proc Mixed in SAS, version 9.4; SAS Institute, Cary, NC, USA) were used, with time as fixed effect (2019 or 2020, nested within departments) and departments as random effects [16,19]. Hypothesis testing for fixed and random effects was performed using Wald and likelihood ratio tests, respectively.

The effects of department (maternity care vs neonatal care) and professional role (physicians, midwives, registered and assistant nurses, and other, e.g., managers, kitchen assistants, welfare officers) were investigated by adding interaction terms between the time variable and these variables, and/or by stratifying the analyses.

Factors affecting the effect of the pandemic were investigated using mixed-effects models with the effect modifiers (working with COVID-19 infected women, being transferred to another department, feeling intense worry about being infected, having access to adequate PPE while working with COVID-19 infected women, as well as gender, and age) added as a fix effect and department as random effect. For later analyses, five items were selected from the survey representing work conditions, such as job demands (one item covering quantitative demands), job

resources (two items covering competence and support), motivation (one item) and recovery (one item).

Qualitative analyses of answers to open-ended questions

An open-ended question was posed in the COVID-19 survey: “What positive and negative effects have you experienced during the first COVID-19 wave during spring 2020?”, with a total of 91 responses. The responses were coded and grouped into categories in accordance with content analysis inspired by Elo & Kyngäs [20].

Results

Background characteristics and results on COVID-19 specific survey items have been summarized in Table 1.

Implementation of new ways of working due to the COVID-19 pandemic

All changes implemented at the maternity and neonatal departments were documented in COVID-19 pandemic plans which were updated seven times during the first wave. The changes in work routines to decrease the risk of spreading the infection and to protect both the women and HCWs are summarized in Fig. 1.

The implementation of isolation rooms resulted in work performed in new settings that were differently or inadequately equipped. Changes were also made to medical routines, where some well-established routines were removed completely, e.g., the first trimester ultrasound scan for pregnant women, or modified, e.g., management of decreased fetal movements.

The criteria for suspected COVID-19 cases varied during the first wave. In March 2020, women with one single pre-specified infectious symptom (fever, cough, difficulties breathing or a cold) were tested, while in April 2020 only women with two or more symptoms were tested. In November 2020, two months after this study ended, all admitted women were finally screened for COVID-19.

Additionally, the recommendations for HCWs using PPE varied. At the maternity department between March and August 2020, PPE was only used when caring for confirmed contagious pregnant women with COVID-19. From August 2020 all HCWs were instructed to always wear PPE when in contact with women, regardless of COVID-19 status.

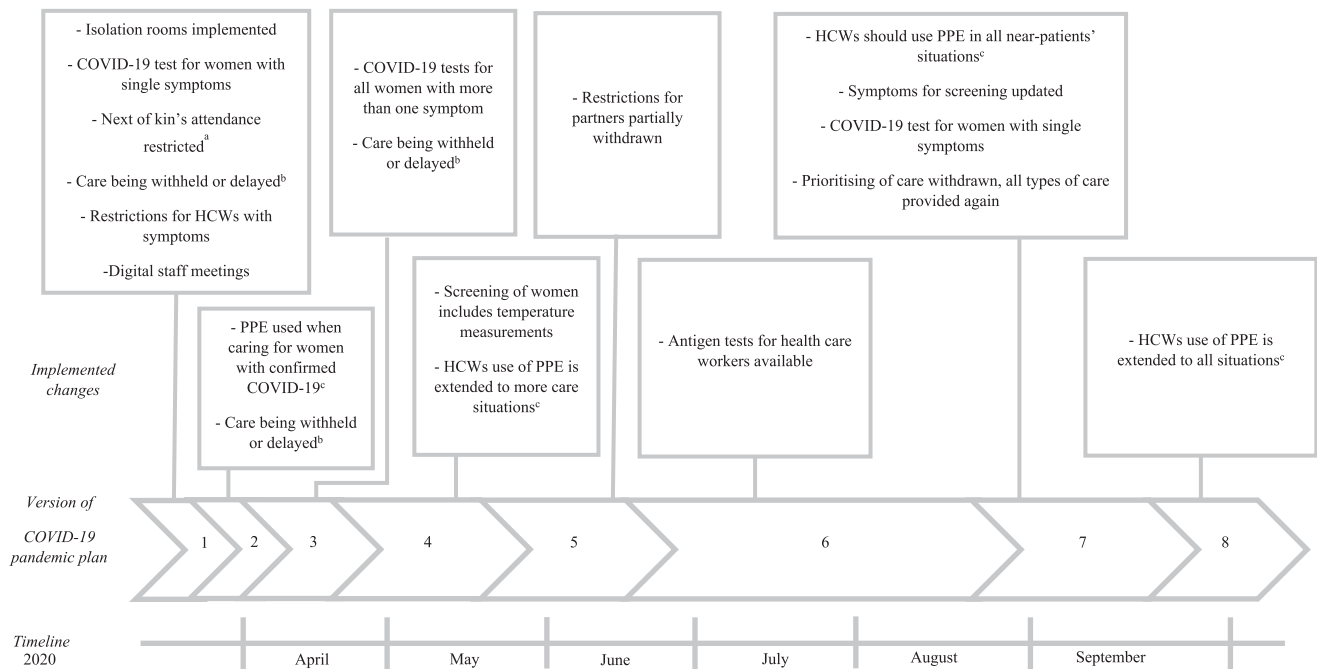
Overall effects of the COVID-19 pandemic on the health care workers' working conditions and possibility for recovery

The percentage of respondents reporting a negative response (strongly disagree or disagree) to the 11 work environment items in the pre-COVID-19 survey and the COVID-19 survey is reported in Fig. 2.

Nine of the eleven investigated working conditions had been significantly affected by the COVID-19 pandemic compared with the pre-pandemic situation. Of these, two working conditions had improved while the remaining seven had deteriorated (Table 2). There were no significant differences in the overall effect between the maternity and the neonatology department (data not shown) except for the response to two items: “The quantity of my work seems reasonable” ($\beta = 0.41$, $P < 0.001$, compared with $\beta = 0.14$, $P = 0.2$) and “I can set thoughts about work aside in my free time” ($\beta = -0.16$, $P = 0.01$, compared with $\beta = -0.36$, $P = 0.001$). Furthermore, there was no overall difference in how the different professional roles (physicians, midwives, registered nurses, assistant nurses, and “other”) had been affected by the COVID-19 pandemic (data not shown).

Factors affecting the effect of the pandemic on working conditions and the possibility for recovery

Being transferred to another department did not affect the HCWs' perception of their working conditions. However, caring for COVID-19-infected women and feeling intense worry about being infected had a



^aMaternity department: partners only allowed at birth, neonatal department: only one next of kin allowed to visit at a time. ^bAssessments on care that could be withheld or delayed were carried out in several steps and well-established routines were removed, eg the first trimester ultrasound scan for all pregnant women, or modified, e.g. management of decreased foetal movements. ^cOnly for the maternity department; HCWs in the neonatal department had access to PPE for all situations. PPE = personal protection equipment.

Fig. 1. Summary of implemented changes in work routines until the closing of the survey in September 2020.

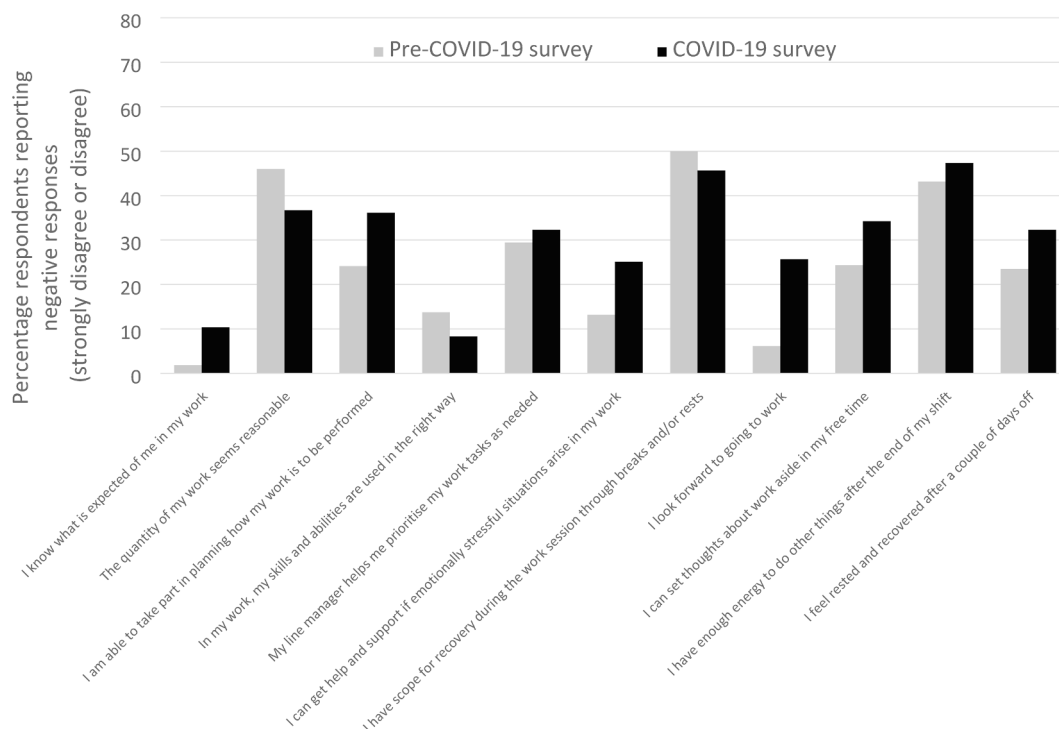


Fig. 2. The percentage of negative responses (strongly disagree or disagree) to statements regarding work environment and possibility for recovery before and during the first wave of the COVID-19 pandemic.

negative effect on their perception of their working conditions and possibility of recovery (Fig. 3). Health care workers reporting that they rarely or never had access to adequate PPE when caring for COVID-19 infected women reported less emotional support and to a lesser extent

considered that their skills and abilities were used in the right way. Age affected the experience of the working conditions significantly for all five items investigated and employees aged 30–39 and 40–49 reported worse working conditions compared with the other groups (Fig. 3).

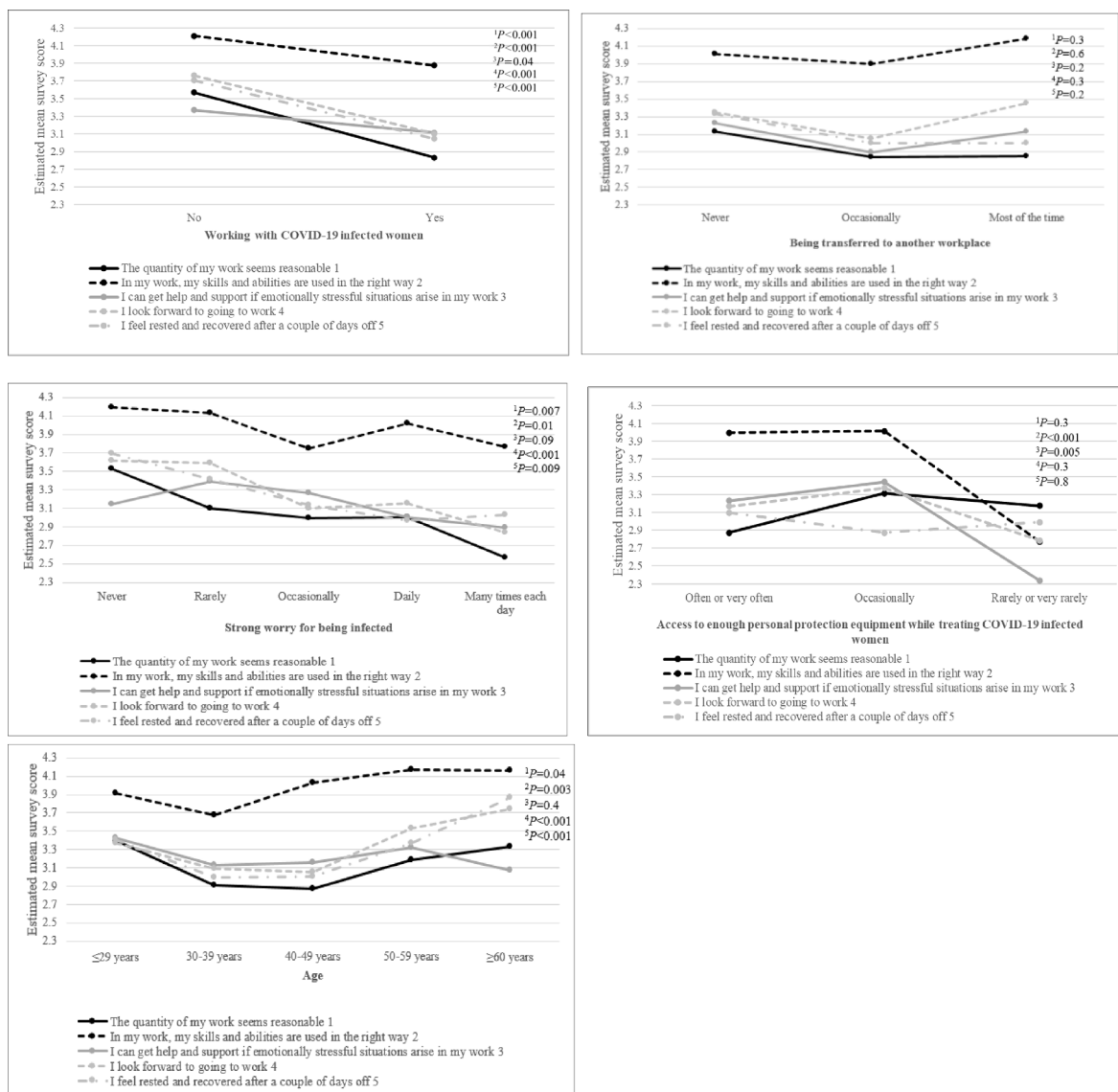


Fig. 3. Association between statements of work environment and the possibility for recovery, and COVID-19 specific survey items and age.

Qualitative analyses of health care workers' perceptions of working during the pandemic

The qualitative analysis of the 91 responses to the open-ended question from the COVID-19 survey resulted in five categories; Experiences of safety and security, Emotional responses, Physical work environment, Possibility for recovery and rest, and Organizational work environment, categories are presented more in detail below.

Experiences of safety and security

The HCWs reported widespread worry regarding being infected at work. Especially employees with administrative tasks expressed frustration about a perceived under-use of PPE and reported feeling worried about being infected while performing administrative tasks or when triaging women.

“Us, administrative staff, were asked to gate keep the door of the locked reception without access to protective equipment [against infection] and without information about what to do or who to call if someone tried to enter the ward without permission. We were exposed.”

In addition, the HCWs were worried that a lack of standardization of routines between different departments could lead to confusion and

errors in woman care. The introduction of digital meetings between staff and with women was considered positive.

Emotional responses

The majority of the HCWs reported a strengthened working morale, sense of belonging and team spirit, and a sense that their colleagues cared about their wellbeing.

“[I am] impressed of the team spirit that we developed. Every-one really stepped up and helped each other.”

Health care workers in management positions mentioned improved collaboration between different wards and work units. However, the perceived risk of becoming infected or of unknowingly spreading the virus to others left many feeling emotionally drained.

“I am very concerned about becoming infected and [I] get poor support from my manager.”

Being assigned to wards the HCWs were not familiar with led to an increased fear of making mistakes. Working from home was considered isolating and lonely.

Physical work environment

Lack of isolation rooms for COVID-19 infected women led to frustration about time being wasted moving women around. A general perception of the hospital not being constructed for care during a pandemic was expressed. Some HCWs caring for non-COVID-19 infected women felt abandoned when colleagues were restricted to the isolation rooms for entire shifts and therefore were out of sight. Personal protective equipment was considered heavy, and masks were perceived to hinder care.

“Lack of beds for patients [due to] insufficient isolation rooms...the [personal] protective equipment has been difficult to use.”

Possibility for recovery and rest

In general, HCWs from all professional groups reported a lack of recovery during their free time. Some had to change schedule, with more frequent work during the weekends, and some were constantly worried about being ordered to work on their days off. Many participants reported an involuntary shortening of their summer vacation.

“[It is] stressful with the constant lack of staff and all the text messages when we are off requesting us to come in and cover for sick colleagues.”

Organizational work environment

Frustration about personal financial loss due to forced days of sick leave for minor symptoms without proper economic compensation was voiced by several participants, as well as a lack of trust in the organization after decisions were made that only staff directly involved in the care of severely ill COVID-19 infected women would get extra financial compensation.

“We were promised compensation since we cared for COVID-19 infected women. After several weeks, it turned out that we did not get it.”

There was a wide variety of opinions regarding information about new routines. Some considered the information clear and easy to follow, but others struggled to keep up with the many changes. Especially administrators worried about missing new information, and this fear was shared with HCWs in management positions, who worried about not being able to reach all the employees working under them.

“All meetings were abruptly cancelled. This at a time when the need for information and the possibility to ask questions to managers were more important than ever.”

In addition, shortage of staff due to the restrictions was widely reported by all professional groups. Partners of mothers at the postpartum ward being absent left some staff feeling relieved about having fewer people to take care of, while others perceived that this absence led to an increased workload.

Discussion

This study shows that to cope with the first wave of the COVID-19 pandemic, a series of organizational-level changes had to be made within the maternity and neonatal health care departments. These changes included physically separating COVID-19 infected women, and the HCWs providing care for them, from other women, as well as introducing triaging and screening procedures to identify infected cases, restricting the possibility for partners or next of kin to stay at the wards, implementing routines for PPE use, withholding or delaying care, and changing to digital meetings with the women where possible. Comparable organizational-level changes have been reported for similar health organizations internationally [8,10,13,21–22]. Furthermore, these changes were implemented at a time point when staff meetings were kept to a minimum and/or performed digitally, which further complicated the implementation process.

To understand how these organizational-level changes affected the

employees in maternity and neonatal health care, we found it important to go beyond measures of stress or overall workload and investigate the effect on individual working conditions and possibility for recovery, i.e., looking at job demands and job resources. In doing so, we found both positive and negative effects on the employees' perception of working conditions and possibility for recovery. Effects seen for these two departments were similar to the ones that have been reported for the entire hospital [16].

Among the positive effects, the HCWs expressed a more reasonable quantity of work and that their skills and abilities were used in the right way to a higher degree. This could be a result of the perception of improved collaboration between wards, strengthened working morale and an enhanced sense of belonging, togetherness and team spirit as expressed in the open-ended question. Previously, the main focus was on negative aspects of the pandemic; therefore, these positive effects are an under-utilized resource for improving the overall working conditions by providing lessons learned on beneficial changes.

The implemented changes in working routines resulted also in negative effects on the employees' working conditions, which could explain the adverse effects on health described by others [7,11–15]. Important factors from the qualitative analyses, which could help to understand these negative effects, were worry about being infected and uncertainty whether the implemented changes were sufficient to protect the employees and women from getting COVID-19, as well as shortfalls in the physical care environment, staff shortages, challenges in communicating the rapid changes in work routines, lack of recovery due to extra shifts, and a fear of making mistakes when being transferred to another department. Furthermore, insufficient access to PPE, caring for COVID-19 infected women, and being under 50 years of age were all identified as factors negatively affecting the COVID-19 pandemic's effect on the HCWs' perception of working conditions and possibility for recovery. These findings have also been reported by others [7,13,23–24].

Additionally, our results show that employees in maternity and neonatal health care had faced a challenging situation even before the pandemic, with a large percentage reporting insufficient working conditions and possibility for recovery. This highlights the importance of a pre-measurement when assessing the effect of the pandemic.

Consequently, our result suggests that even during a pandemic or at other times when the organization is under pressure, there are still possibilities to implement measures for reducing adverse health effects among the employees. In this study, we show that worry about becoming infected, uncertainty whether implemented changes were sufficient to protect the employees, and communication regarding updated routines are factors that affect HCWs. Therefore, by introducing targeted measures, it may be possible to decrease the total workload of the employees, even during extraordinary situations. In a short-term approach, this could be done by acknowledging the worry about becoming infected and ensuring an efficient communication and dialogue at the workplace. However, these work tasks will typically be performed by the first-line manager, and it requires sufficient organizational pre-conditions for the managers to give managerial support, which is especially important during a pandemic [25–27]. Creating good working conditions for managers will consequently affect the work environment for both managers and their subordinates [28]. This can be done by ensuring an adequate span of control, a reasonable balance between demands and control, and reasonable administrative support [29–30].

To achieve long-term positive effects, the organization should create a strong psychosocial safety climate [31], including shared perceptions about policies, practices, and procedures for the protection of HCWs' health and safety, to enhance the preparation for future extraordinary events [32]. Additionally, by systematically working to improve the working conditions for the maternity and neonatal HCWs in a long-term perspective, the ability of an organization to cope with future extraordinary events will be further increased, and adverse health effects

among its employees may be reduced.

Lastly, the changes in work routines also resulted in an increased collaboration between wards, and a strengthened working morale and sense of belonging, togetherness, and team spirit, which the employees experienced as positive. In addition, they also perceived that their professional skills and abilities were used in the right way to a larger extent than before. This is of particular interest, and organizations should aim to actively implement permanent changes in work routines to maintain these positive effects. Hence, factors such as engagement, motivation and increased performance have been associated with sustainable working conditions. [17,33].

A major strength of this study is the before/after design, with a pre- and post-measurement for the first wave of the COVID-19 pandemic as well as data on implemented changes in work routines, quantitative data on working conditions and possibility for recovery, and qualitative data on how the HCWs perceived the situation. A limitation is the low response rate for the COVID-19 survey. Low response rates are a common problem in research in general and in this study the response rate may also reflect the strained working conditions for HCW's under the COVID-19 pandemic. However, the respondents in the COVID-19 survey reflected the responders in the pre-COVID-19 survey well with regard to gender, age and professional role distribution.

As we used data collected by the employer, we were unfortunately unable to pair the responses in the two surveys on an individual level; for this reason, we could not adjust for employee turnover. However, the working conditions investigated are related to the organizational conditions rather than personal preferences although they could potentially have been affected by employee turnover.

Conclusion

The working conditions for maternity and neonatal HCWs have been affected both negatively and positively by the implemented organizational changes made to maintain a fully operational health care service during the COVID-19 pandemic. To reduce the negative effect on HCWs' health in future situations when the health care sector is under pressure, the following aspects should be focused on: creating a work climate that acknowledges and handles the employees' worry about being infected; securing adequate pre-conditions for the managers, i.e. ensuring an adequate span of control, a reasonable balance between demands and control, and reasonable administrative support; creating a strong psychosocial safety climate and systematically improving the working conditions for the HCWs; making more adequate use of employees' professional skills and abilities; and maintaining the positive effects of the increased collaboration, and the improved social working environment identified in this study.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Ethics approval and consent to participate

The study was approved by the Swedish Ethical Review Authority

(ref. No. 2020-04771) and the participants provided informed consent. The study was conducted in compliance with the Helsinki Declaration and the General Data Protection Regulation (EU) 2016/679.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Authors' contributions

All authors contributed to the conception and planning of the study and contributed to and approved the final draft of the manuscript. MA, YC, VS, AE, MV and KL performed the analyses and interpretation of data. MA and KL were responsible for writing the initial draft of the manuscript.

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