ORIGINAL RESEARCH

COVID-19 risk management at the workplace, fear of infection and fear of transmission of infection among frontline employees

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ABSTRACT

Objectives We compared COVID-19 risk management, fear of infection and fear of transmission of infection among frontline employees working within eldercare, hospital/rehabilitation, psychiatry, childcare and ambulance service and explored if group differences in fear of infection and transmission could be explained by differences in risk management. We also investigated the association of risk management with fear of infection and fear of transmission of infection among eldercare personnel.

Methods We used cross-sectional questionnaire data collected by the Danish labour union, FOA . Data were collected 5½ weeks after the first case of COVID-19 was registered in Denmark. Data for the first aim included 2623 participants. Data for the second aim included 1680 participants. All independent variables were mutually adjusted and also adjusted for sex, age, job title and region.

Results Fear of infection (49%) and fear of transmitting infection from work to the private sphere (68%) was most frequent in ambulance service. Fear of transmitting infection during work was most frequent in the eldercare (55%). Not all differences in fear of infection and transmission between the five areas of work were explained by differences in risk management. Among eldercare personnel, self-reported exposure to infection and lack of access to test was most consistently associated with fear of infection and fear of transmission, whereas lack of access to personal protective equipment was solely associated with fear of transmission.

Conclusion We have illustrated differences and similarities in COVID-19 risk management within five areas of work and provide new insights into factors associated with eldercare workers' fear of infection and fear of transmission of infection.

Key messages

What is already known about this subject?

- Fear of infection and fear of transmitting infection between work and family influence healthcare workers' willingness to work during epidemics. Yet, there is a lack of knowledge about COVID-19 risk management, fear of infection and fear of transmission among other groups of frontline employees, particularly outside the hospital sector.

What are the new findings?

- COVID-19 risk management, fear of infection and fear of transmission of infection vary between different groups of frontline employees inside and outside of the hospital sector, for example, in eldercare, childcare and ambulance service. These differences are partly explained by differences in risk management. Among eldercare personnel, exposure to infection and lack of access to test was most consistently associated with fear of infection and transmission of infection. However, feeling secure and trusting that the workplace is well prepared to perform work tasks during the epidemic may counteract these negative emotions.

How might this impact on policy or clinical practice in the foreseeable future?

- We suggest that COVID-19 risk management outside the hospital sector is addressed and prioritised as part of the societal strategy of handling this and future pandemics.

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INTRODUCTION

The COVID-19 pandemic has profound implications for frontline employees,[1 2] and a high proportion of healthcare workers experience anxiety, depression and insomnia.[3] Working in the frontline during the previous influenza A/H1N1 pandemic was associated with psychological distress, for example, worries about the pandemic.[4] Balancing the duty to work with the fear of being infected and transmitting infection from work to home or vice versa is a core issue for frontline employees during a pandemic.[5 6]

The feeling of insecurity among employees and the fear of becoming infected or transmitting infection is aggravated by insufficient information, lacking access to personal protective equipment (PPE) and test and suboptimal management of the workplace's response to the crisis.[7] The majority of occupational health research during pandemics is conducted among employees within hospitals. Yet, frontline employees also encompass other occupational groups in contact with clients during work, for example, in eldercare or childcare.

In Denmark, there was a shortage of PPE during the early phase of COVID-19, which potentially

compromised the feeling of a safe working environment. Furthermore, while some frontline employees are accustomed to using PPE and hindering spread of infection as part of their everyday practices, other occupational groups may be less used to such routines.[8] Understanding group differences is necessary to respond to their specific challenges now and during future pandemics, and a recent mapping of COVID-19 literature documents the knowledge gap regarding the effects of the pandemic on frontline employees' working environment and emotional responses to the crisis.[9]

Therefore, we investigated COVID-19 risk management among frontline employees working within eldercare, hospital/rehabilitation, psychiatry, childcare and ambulance service. First, we compared insecurity about guidelines, exposure to infection, access to PPE and test, communication and trust in the workplace, fear of infection and fear of transmission of infection across the five areas of work and explored if differences in fear of infection and transmission between groups could be explained by differences in COVID-19 risk management. Second, in the largest group of participants—eldercare personnel—we investigated how COVID-19 risk management was associated with fear of infection and fear of transmission of infection.

METHODS

Context, study design, data collection and study population

Cross-sectional data were collected by the labour union, FOA. FOA is the third largest labour union in Denmark, organising approximately 175 000 members primarily in the public sector.

In Denmark, the first confirmed case of COVID-19 was identified on 26 February 2020, and on 11 March 2020, a total close-down of all public workplaces apart from critical functions was announced. Data were collected from the 3 April to 5 April 2020. National data show that at the time of the initiation of the data collection, there had been 4313 confirmed COVID-19 cases, and 170 cases had died out of a population of 5.8 million people. The number of daily fatal cases occurring in the spring peaked during the data collection (20 cases). The majority of the infected and fatal cases were observed in the capital region. At the time of the data collection, only employees in 'critical functions' (eg, within healthcare/eldercare or who were working with particularly vulnerable groups) were offered COVID-19 test.

FOA invited 10 519 individuals from their voluntary member panel to respond to an electronic questionnaire. Responses were treated confidentially. The questionnaire was distributed through email, and no reminders were sent (response rate 35%). Among invited individuals, 3719 individuals (35%) responded to the questionnaire (figure 1). The analytical sample for the first study aim consisted of 2623 participants. For the second study aim, we only included the largest group of social and healthcare helpers, social and healthcare assistants and similar job groups working within eldercare, and the analytical sample for these analyses consisted of 1680 participants.

Risk management at the workplace

Insecurity about guidelines

Participants were asked if they, in relation to their work, had experienced insecurity regarding specific guidelines concerning contact with clients/patients that: (1) were infected with COVID-19; (2) might be infected/show symptoms of COVID-19 infection; and (3) were not infected (response options and dichotomisation: yes, but problem solved/no/do not know (*reference*) vs yes, problem not solved).

Exposure to infection, access to test and PPE

Participants were asked to indicate if they had been in contact with clients/patients with a known COVID-19 infection (response options: no (*reference*) vs yes and do not know).

Participants were asked if personnel employed at their workplace had access to COVID-19 test if they showed symptoms of a cold or influenza. This question was introduced with an explanatory text describing that employees working in critical functions could be directly referred to test for COVID-19 by their leader (response options: yes (*reference*) vs no, do not know and I do not take care of critical functions).

Participants were also asked if they had experienced lack of access to PPE (response options and dichotomisation: yes, but problem solved/no/do not know (*reference*) vs yes, problem not solved).

Communication and trust in the workplace

Participants were asked to indicate if they agreed or disagreed with the following statements: (1) management has communicated clear guidelines regarding how employees should act at the workplace during the COVID-19 epidemic; (2) I feel secure regarding how my workplace organises and plan the work during the COVID-19 epidemic; and (3) my workplace is well prepared to perform work tasks during the COVID-19 epidemic (response options and dichotomisation: totally disagree/partly disagree/do not know (*reference*) vs totally agree/partly agree).

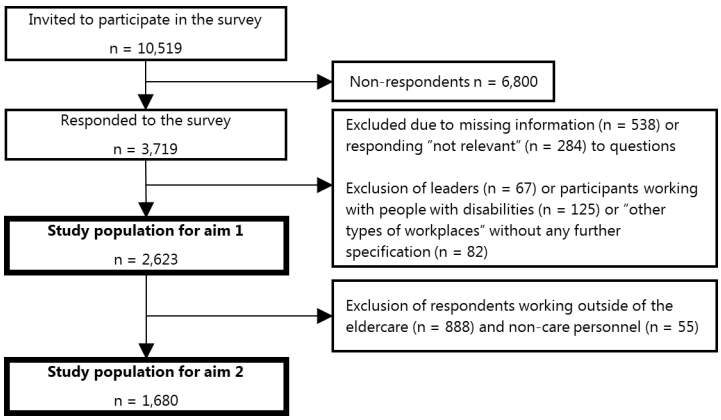

Figure 1 Flow chart of the selection of study participants for the first and the second aim of the study.

Participants were also asked to what degree their workplace pays attention to employees that are particularly vulnerable (eg, pregnant women or special risk groups) towards infection with COVID-19 (response options and dichotomisation: to some degree/to a small degree/not at all/do not know (*reference*) vs to a very high degree/to a high degree).

Fear of infection and transmission

Participants were asked to what degree they feared to (1) be infected with COVID-19 during work, (2) transmit infection from the workplace to their home and to other relatives and (3) transmit infection to clients/patients during work (response options and dichotomisation: to some degree/to a small degree/not at all/do not know (*reference*) vs to a very high degree/to a high degree.

Covariates

Area of work was self-reported. Information about sex, age, job title and region in Denmark was obtained from the member's register. Table 1 presents the distribution of the study variables.

Statistical analyses

We analysed the distribution of the indicators of COVID-19 risk management at the workplace, and fear of infection and fear of transmission of infection within the five areas of work (table 1). We additionally analysed if differences between areas of work in terms of fear of infection and transmission of infection were explained by differences in risk management using the largest group of eldercare personnel as reference (table 2).

Among eldercare personnel, we analysed if fear of infection, fear of transmission from work to the private sphere or fear of transmitting infection to clients during work were associated with indicators of COVID-19 risk management (table 3). In these analyses, all independent variables were entered simultaneously into the model with adjustment for sex, age, job title and region.

All associations are expressed as prevalence ratios (PRs) with their 95% CIs.

RESULTS

Differences between employees within different areas of work

In this sample, 6%–16% reported that they were currently insecure about guidelines, with no significant group differences (table 1). Participants differed significantly regarding exposure to infection, lack of PPE and access to test. For instance, in ambulance service, 71% of the participants reported exposure to infection. Lack of PPE was most frequent among employees in ambulance service (29%) and in eldercare (21%). In childcare, 2% had access to test, while this number was 32%–45% in the remaining areas of work.

The majority of participants within all areas of work reported that they experienced a clear communication of guidelines, that they felt secure regarding the organisation and planning of their work and that the workplace was well prepared to perform work tasks during the epidemic (70%–88%). Participants within eldercare and ambulance service less frequently reported that their workplace was paying attention to vulnerable employees (45% and 39%, respectively).

Between 30% and 49% reported that they feared being infected during work, with the highest percentages among employees in ambulance service and eldercare and the lowest among employees in psychiatry (table 1). Fear of infection in ambulance personnel appeared to be explained by COVID-19 risk management (table 2). We found the highest frequency of fear of transmission in ambulance service, as 68% reported fear of transmission of infection from work to the private sphere (table 1), which was not fully explained by COVID-19 risk management (table 2). Eldercare personnel were most concerned about transmitting infection to their clients during work (55%) (table 1), which was not explained by differences in COVID-19 risk management (table 2).

The association between risk management and fear of infection in eldercare

Self-reported exposure to infection and lack of access to test were associated with a higher prevalence of fear of infection, which was also observed for participants reporting that management communicated clear guidelines regarding how employees should act at the workplace during the COVID-19 epidemic. Feeling secure regarding the organisation and planning of work and responding that the workplace was well prepared to perform work tasks were associated with a lower prevalence of fear of infection (table 3).

The association between risk management and fear of transmission in eldercare

We found different results for fear of transmitting infection from work to the private sphere and fear of transmitting infection to clients during work (table 3). Insecurity about guidelines concerning contact with clients, who were infected or not infected, exposure to infection, lack of PPE and lack of access to test were associated with a higher prevalence of fear of transmitting infection from work to the private sphere. Reporting that the workplace was well prepared to perform work tasks during COVID-19 was associated with a lower prevalence of fear of transmission from work to the private sphere.

Participants had a higher prevalence of fear of transmitting infection to clients during work, when reporting insecurity about guidelines concerning contact with clients, who were potentially infected, exposure to infection, lack of PPE, no access to test and clear communication of guidelines. They had lower prevalence fear of transmitting infection to clients during work if they felt secure regarding the organisation and planning of work.

DISCUSSION

Main findings

We observed substantial differences between the different areas of work in terms of COVID-19 risk management, fear of infection and fear of transmission of infection. When using the largest group of eldercare personnel as reference, the differences in fear of infection and fear of transmission were partly explained by COVID-19 risk management.

Exposure to infection, lack of access to test and—surprisingly—also the reporting of clear communication of guidelines were associated with fear of infection and transmission of infection. Regarding the latter, we speculate that although the communication of guidelines was clear, the guidelines were maybe insufficient, and they underwent frequent changes. Lack of PPE was associated with fear of transmission. Insecurity about guidelines was not associated with fear of infection, but solely with fear of transmission, although the pattern seemed somewhat inconsistent. Finally, the prevalence of fear of infection and transmission were lower among participants, who felt secure regarding the organisation and planning of work and/or

Table 1 Description of the study population within five areas of work, including background characteristics, COVID-19-risk management at the workplace and fear of infection and transmission

	Eldercare n=1735	Hospital/rehabilitation n=340	Psychiatry n=247	Childcare n=161	Ambulance n=140	
	Percentage (%)	Percentage (%)	Percentage (%)	Percentage (%)	Percentage (%)	P value
Covariates						
Sex (women)	95	81	81	89	10	<0.001
Age (years)						<0.001
≤39	14	10	13	11	42	
40–49	23	19	22	24	36	
50–59	39	40	40	55	17	
≥60	23	31	24	10	4	
Job title						<0.001
Social and healthcare assistants and similar	54	69	79	0	0	
Social and healthcare helpers and similar	43	1	8	0	0	
Ambulance personnel	0	0	0	0	100	
Kitchen and cleaning personnel, and janitors	3	30	0	3	0	
Pedagogical helpers and assistants	0.4	0	14	60	0	
Childminder	0	0	0	37	0	
Region						<0.001
Capital region of Denmark	22	34	22	26	21	
Region Zealand and Region of Southern Denmark	42	39	44	38	67	
North Denmark Region and Central Denmark Region	37	28	34	36	12	
Insecurity about guidelines concerning contact with clients/patients who are…						
Infected	12	12	11	10	16	0.511
Potentially infected	15	14	13	14	14	0.937
Not infected	9	6	8	10	9	0.648
Exposure to infection, access to test and personal protective equipment (PPE)						
Exposure to infection						<0.001
No	7	47	69	65	7	
Yes	6	34	6	0	71	
Do not know	21	19	25	35	22	
Lack of PPE	21	13	15	8	29	<0.001
Access to test						<0.001
Yes	32	45	34	2	44	
No	23	22	24	24	25	
Do not know	44	28	39	44	3	
I do not take care of critical functions	1	4	3	30	0	
Communication and trust in workplace						
Clear communication of guidelines	86	88	86	84	78	0.073
Feel secure regarding organisation and planning of my work	76	79	79	83	71	0.074
My workplace is well prepared to perform work tasks	70	79	70	77	78	0.003
The workplace pays attention to vulnerable employees	45	50	56	63	39	<0.001
Fear of infection and transmission						
Fear of being infection during work	40	38	30	37	49	0.003
Fear of transmitting infection from work to private the sphere	52	51	45	53	68	0.001
Fear of transmitting infection to clients during work	55	41	38	30	41	<0.001

reported that the workplace was well prepared to perform work tasks during the COVID-19 epidemic.

Comparison with previous findings

Previous studies among frontline employees primarily included healthcare workers in hospitals. Healthcare workers face a high risk of infection, particularly if risk management is insufficient. Yet, also other groups of frontline employees in close contact with other individuals are at risk of being infected during work.[10–12] We observed substantial differences in the self-reported exposure to infection (from 6% to 71%) between the five areas of work. Direct contact with infected patients during virus outbreaks is associated with psychological distress.[13]

Within eldercare and ambulance service, less than half of the participants reported that the workplace paid attention to vulnerable employees. Insecurity about guidelines was

Table 2 Associations of fear of infection and fear of transmission within five areas of work

	Adjustment for sex, age, job title and region					
	Fear of infection		Fear of transmission from work to the privates sphere		Fear of transmitting infections to clients during work	
	PR	95% CI	PR	95% CI	PR	95% CI
Eldercare	1.00		1.00		1.00	
Hospital/rehabilitation	1.03	0.88 to 1.21	1.06	0.94 to 1.20	0.83	0.72 to 0.96
Psychiatry	0.77	0.62 to 0.95	0.92	0.79 to 1.07	0.73	0.61 to 0.86
Childcare	0.81	0.49 to 1.34	1.15	0.77 to 1.71	0.55	0.32 to 0.95
Ambulance	1.34	1.04 to 1.72	1.40	1.17 to 1.67	0.78	0.61 to 0.998
	Adjustment for sex, age, job title, region and all COVID-19 risk management variables					
	Fear of infection		Fear of transmission from work to the privates sphere		Fear of transmission to clients during work	
	PR	95% CI	PR	95% CI	PR	95% CI
Eldercare	1.00		1.00		1.00	
Hospital/rehabilitation	1.04	0.89 to 1.22	1.09	0.96 to 1.22	0.84	0.73 to 0.97
Psychiatry	0.79	0.65 to 0.96	0.93	0.81 to 1.07	0.74	0.63 to 0.88
Childcare	0.86	0.53 to 1.38	1.19	0.81 to 1.74	0.59	0.34 to 1.02
Ambulance	1.14	0.87 to 1.50	1.31	1.09 to 1.59	0.74	0.57 to 0.96

All associations are expressed as prevalence ratios (PRs) with their 95% CIs.

infrequent, however, and, in general, management's communication of guidelines was clear, participants felt secure regarding the organisation and planning of work and the workplaces were well prepared to perform work tasks during the epidemic. Clear communication and support is among the protective factors against psychological distress during a virus outbreak.[13] A recent UK study among doctors, nurses and advanced clinical practitioners found that the majority of the participants felt at least somewhat confident in their knowledge on COVID-19, where to go for guidance on COVID-19 and regarding the use of PPE.[14]

As a society, we rely heavily on frontline personnel managing different care and service functions. Yet, fear and insecurity about how to act and perceived risk of transmission of infection may affect their willingness to work. During pandemics, perceived personal safety, awareness of pandemic risk and clinical knowledge of influenza pandemics, role-specific knowledge, pandemic response training and confidence in personal skills are associated with increased willingness to work among healthcare workers.[15] Specifically related to COVID-19, training, experience and knowledge among medical staff at psychiatric hospitals

Table 3 Associations of knowledge, access to protective equipment and test, exposure to test, work organisation and management with fear of transmitting infection from work to the private sphere or to clients during work among eldercare personnel*

	Fear of infection		Fear of transmission from work to the private sphere		Fear of transmitting infections to clients during work	
	PR	95% CI	PR	95% CI	PR	95% CI
Insecurity about guidelines concerning contact with clients/patients who are…						
Infected†	0.96	0.81 to 1.13	1.14	1.01 to 1.28	0.93	0.82 to 1.06
Potentially infected†	1.12	0.96 to 1.31	0.96	0.85 to 1.08	1.14	1.01 to 1.28
Not infected†	1.14	0.97 to 1.35	1.19	1.07 to 1.32	1.09	0.97 to 1.23
Exposure to infection, access to test and personal protective equipment (PPE)						
Exposure to infection						
No	1.00		1.00		1.00	
Yes	1.61	1.33 to 1.94	1.40	1.22 to 1.61	1.30	1.13 to 1.49
Do not know	1.43	1.26 to 1.61	1.28	1.16 to 1.40	1.23	1.12 to 1.34
Lack of PPE†	1.09	0.96 to 1.24	1.67	1.06 to 1.28	1.17	1.07 to 1.29
Access to test						
Yes	1.00		1.00		1.00	
No	1.20	1.03 to 1.42	1.20	1.07 to 1.36	1.19	1.06 to 1.34
Do not know	1.18	1.03 to 1.38	1.12	0.997 to 1.25	1.10	0.99 to 1.22
I do not take care of a critical function	1.00	0.42 to 2.37	1.22	0.73 to 2.03	1.11	0.66 to 1.89
Communication and trust in workplace						
Clear communication of guidelines‡	1.18	1.02 to 1.36	1.08	0.97 to 1.21	1.21	1.08 to 1.36
Feel secure regarding organisation and planning of my work‡	0.74	0.63 to 0.86	0.90	0.79 to 1.01	0.81	0.72 to 0.91
My workplace is well prepared to perform work tasks‡	0.73	0.63 to 0.85	0.76	0.68 to 0.86	0.91	0.81 to 1.03
The workplace pays attention to vulnerable employees§	0.95	0.83 to 1.09	1.05	0.95 to 1.16	1.03	0.94 to 1.14

All associations are expressed as prevalence ratios (PRs) with their 95% CIs.
*Adjusted for sociodemographic factors (sex, age, job title and region) and all other independent variables related to COVID-19 risk management.
†Reference group consisted of 'Yes, but the problem is solved', 'No' and 'Do not know'.
‡Reference group consisted of 'Totally/partly disagree' and 'Do not know'.
§Reference group consisted of 'To some degree', 'To a small degree', 'Not at all' and 'Do not know'.

were associated with willingness to work.[16] In addition, non-clinical staff were found to be more stressed than clinical staff due to lack of access to PPE,[17] and hence, lack of knowledge and awareness towards pandemic influenza among non-clinical staff is critical during the handling of influenza pandemics.[18] Thus, also non-clinical staff should be addressed when implementing guidelines aiming at controlling a virus outbreak.[7]

We observed some variation in the access to PPE, with the most frequent lack of PPE in eldercare and ambulance service. Not surprisingly, previous studies have shown that nurses were less likely to work during a virus outbreak if they did not have access to adequate PPE[19] and that wearing masks as well as intensive training in the use of PPE were associated with better mental health among healthcare workers.[20 21] In our study, we did not investigate if participants actually *used* the PPE. Yet, a recent Cochrane review demonstrated that adherence to guidelines was influenced by level of support from management, clarity of communication, training, for example, in the use of PPE, accessibility and quality of PPE, workplace culture, sense of responsibility for patients and fear of infection.[7]

Regardless of actual exposure, fear of infection and the risk of transmitting infection between family and work play an important role in previous research. We found considerable differences between the different areas of work. Employees in ambulance service were most concerned about transmitting infection from work to family, which has been related to higher levels of psychological distress.[13] In addition, fearing that family members might die in the pandemic was associated with lower willingness to work during the 2009-influenza A (H1N1) pandemic.[19] Eldercare personnel were more concerned about transmitting infection during work. This finding is perhaps not surprising, as people receiving eldercare are typically frail and with multiple morbidities, which makes them particularly vulnerable to adverse consequences of COVID-19.[22]

The public discourse may also influence the feeling of insecurity while at work. Denoting the virus a *killer virus* at social media yields a sense of danger and uncertainty in the public and among frontline employees.[23] Occupational health physicians are therefore recommended to provide frontline employees with accurate information and training to ensure an adequate risk perception.[8 24] Apart from working during a virus outbreak with increased work stress and workload, frontline employees also run the risk of social stigmatisation and being avoided by other people because of family members' fear of infection.[6 10 25]

Strengths and limitations

The strength of the current study is the timing of the data collection at the end of the sixth week within the COVID-19 pandemic that had resulted in a major lockdown of the Danish society. Labour unions have a direct and unhindered access to their members, and their legitimacy is high. Therefore, partnerships between researchers and labour unions provide a unique opportunity for an agile data collection within extraordinary situations like the COVID-19 pandemic.

A limitation of the study is that data were not collected with a research purpose. Thus, the applied questions were not derived from validated questionnaires, such as a the newly published *Fear-of-COVID-19 scale*.[26] Nevertheless, our data cover core emotional aspects of working during a pandemic.[5]

Additionally, more detailed information on whether the participant or his or her family belonged to a high-risk group or other work-related factors would have been relevant to include in the analyses. Particularly, more detailed information about the psychosocial working environment and about the physical working conditions and facilities (eg, sufficient space to keep required distances) would have been informative. To reduce the risk of bias due to unmeasured confounding, we restricted the sample for the second aim to eldercare personnel in order to obtain a relatively homogeneous study population. Finally, we did not have information about the participants' mental health, despite that the mental health, particularly of employees within healthcare, has been a major concern during virus outbreaks.[3 4 13 23]

Between 51% and 92% of the job groups that are covered in the present study are organised in FOA. Remaining employees are either organised in other labour unions or not organised. Regardless of union membership, employees in Denmark have the same salary levels and rights, and they will also benefit equally from any improvements resulting from research based on the current dataset. Our analytical sample was representative of FOA's members in terms of sex. Yet, younger members and members from the capital region were under-represented, and participants were more frequently being union representatives and employed in the social and healthcare sector. We cannot rule out that the participants' experience of the COVID-19 related working environment differ from the experiences of those who were not included in the member panel and those who did not respond to the questionnaire. However, we do not have data to illustrate whether selection has biased our results in a more positive or negative direction.

We expect that differences between different areas of work, as well as the findings of associations of indicators of COVID-19 risk management with eldercare personnel's fear of infection and transmission, can be generalised to other countries. Yet, we assume that knowledge about contextual factors, such as the phase of the virus outbreak, the number of infected individuals, the healthcare system's capacity to treat infected patients and the trust in the health authorities' guidelines and advice are important modifying factors that influence the interpretation of study results.

CONCLUSION

Our data provide timely knowledge about COVID-19 risk management for groups of frontline employees working in close contacts with clients (elderly people, children and patients) inside and outside of hospital settings. We found that among all groups of participants, between 30% and 49% reported fear of infection and 30%–68% reported fear of transmission of infection. This knowledge is important, as these emotional responses are associated with poor mental health and willingness to work during a pandemic.

Among eldercare personnel, self-reported exposure to infection and access to test seemed to be most consistently associated with fear of infection and fear of transmission, whereas lack of PPE was solely associated with fear of transmission. Also indicators related to knowledge, communication and trust in the workplace's risk management were associated with fear of infection and fear of transmission, although not consistently across all three outcomes.

Our findings illustrate the need for paying attention not only to health professionals in hospital settings but also to other groups of frontline employees, as the latter group may encounter similar challenges in terms of the need for protecting themselves, their family and their clients from infection. Results from the present study can foster a dialogue between labour and employer organisations about challenges in specific job groups and sectors,

which needs to be addressed in order to improve the response to the current and future pandemics. Particularly, the involvement of a union in the research process enhances the possibilities for communicating study results directly to the target population.

Contributors The collaboration between the University of Copenhagen and the labor union, FOA, was initiated by KN-N. The aim of the study was proposed by KN-N and CJN, and it was discussed and agreed on among all authors. KN-N drafted the manuscript. CJN and ÅMH critically revised the first version of the manuscript. Data were collected by MJ-M, CB and LOPH. MJ-M conducted all statistical analyses after agreement on the procedures among all authors. The final version was critically revised and approved by all authors.

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Competing interests MJ-M, CB and LOPH are employed by the labor union, FOA, which works for the promotion of its members' salary level and working conditions.

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