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Evaluation of Healthcare Workers Presenting to the Outpatient Clinic for COVID-19 Exposure at a University Hospital During Pandemic in Turkey

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Abstract

Objective: This study aimed to evaluate the exposure status of the healthcare workers in our hospital and to evaluate the factors affecting the exposure levels. In this direction, it is aimed to contribute to the planning of measures that can be taken to reduce the risk exposure rate of healthcare workers. In our hospital, the "Outpatient Clinic for Healthcare Personnel with COVID-19 Exposure" was established in order to monitor the coronavirus disease 2019 exposure risks of healthcare workers.

Methods: The data of our study, designed as a retrospective cohort study, were obtained from the follow-up records of 1646 healthcare workers presenting with risk exposure for COVID-19 between March 24, 2020, and January 15, 2021. Risk assessment in healthcare workers according to the "Algorithm for Evaluation of Healthcare Professionals with COVID-19 Exposure" of the Ministry of Health was classified as no risk and low-, medium-, and high-risk exposure. The relationship between the risk levels of the participants, demographic, workplace characteristics, and personal protective equipment use was evaluated.

Results: A total of 1646 personnel were applied to our coronavirus disease 2019 exposure personnel outpatient clinic. The majority (90%) of the applicants were not employed in a coronavirus disease 2019-related unit. While 43 (2.6%) personnel were evaluated as risk free, 233 (14.2%) personnel were classified as high-risk exposures, 1012 (61.8%) as medium-risk exposures, and 349 (21.3%) as low-risk exposures. During the follow-up period, 201 (12.2%) of the applicants were found to be coronavirus disease 2019 positive. More coronavirus disease 2019 positivity was seen in personnel with high-risk exposures ($P = .003$).

Conclusion: In our study, hospital-based exposure constitutes the most important source of exposure for healthcare workers. It has been observed that the number of coronavirus disease 2019 exposures and disease development in healthcare workers who do not work in coronavirus disease 2019 units is high. High-risk exposure increases the likelihood of developing coronavirus disease 2019 in healthcare workers.

Keywords: COVID-19, contact tracing, healthcare workers

Introduction

Coronavirus disease 2019 (COVID-19) disease, caused by a new type of coronavirus which started to appear for the first time in China at the end of 2019, spread all over the world in 2020, leading to a pandemic. The first case in Turkey was detected on March 11, 2020, and as of November 19, 2021, it resulted in over 8 million cases and more than 74 000 deaths.[1] The illness is primarily transmitted through respiratory droplets. Healthcare personnel is considered to be among the high-risk occupational groups in terms of acquiring and spreading the disease because they take care of sick individuals as well as being in exposure with numerous people during the day.[2]

In comparison to the general population, healthcare workers are observed to be 11 times more at risk with respect to COVID-19 positivity.[3] Whilst the deaths of health personnel reported in the models created by the World Health Organization (WHO) are far below the truth, it is estimated that 180 000 health workers may have died due to the disease between the onset of the pandemic and May 2021.[4]

Not everyone exposed to the virus through droplets is considered equally at risk. The transmission risk of each exposure is different; hence, determining the characteristics of exposure is important to prevent the spread within the hospital. In a systematic review, the seroprevalence of COVID-19 among healthcare workers was revealed to vary between 1.1% and 35.4%.[5] As for another study, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) seropositivity has been reported to be 2.02 times higher in personnel working at the departments reserved for COVID-19 compared to other health workers.[6] The duration, intensity, type of exposure, the phase of illness an individual is in, safety measures used by the exposed person, and characteristics of the environment where exposure takes place are among the influential factors, leading to differences with regard to the risk of transmission and seroprevalence. While preventing disease transmission by screening after identification of exposure risk levels along with a determination of isolation status for people with high-risk exposure, supportive treatment was initiated for cases diagnosed early through testing. Isolation based on risk level also ensures that excessive loss of workforce is avoided.[7]

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The procedures to be adhered to regarding exposure follow-up have been published with the guidelines prepared by the Ministry of Health in Turkey and updated according to the results of international research since the beginning of the pandemic. In these guidelines, healthcare workers with COVID-19 exposure are evaluated with a different algorithm following division into risk-free, low-, medium-, and high-risk groups based on the degree of exposure and risk management provided.[7]

In consideration of both the risk entailed compared to the normal population and its association with work, WHO recommends that the case of healthcare personnel contracting COVID-19 disease due to their work should be accepted as an occupational disease or work accident according to national laws, and as a result, necessary rights should be given.[8] While COVID-19 has been recognized as an occupational disease or work accident in some countries, it is not yet regarded to be an occupational illness for healthcare workers in Turkey.[9]

In our study, the aim is to assess the factors influencing the degree of exposure by reviewing the exposure status of healthcare workers at our hospital. Hence, it is designed to contribute to the planning of protective measures directed toward the reduction of risk exposure rates for health personnel.

Methods

This study was carried out in one of the most important reference university hospitals in our country with a bed capacity of 960. Our hospital is one of the largest and tertiary-level hospitals in Turkey and has taken an active role in the COVID-19 pandemic. A total of 3937 personnel including 384 (9.8%) academic personnel (professor, associate professor, and physicians), 506 (12.9%) residence doctors, 946 (24%) nurses, 553 (14%) administrative staff, and 1548 (39.3) other health personnel (health technicians, pharmacists, patient attendants, and cleaning staff) are employed in this university hospital.

In order to monitor COVID-19 exposure risks of healthcare workers at our hospital, the "Outpatient Clinic for Healthcare Personnel with COVID-19 Exposure" was established on March 23, 2020, in which physicians from the Department of Public Health were employed. Questionnaires containing data related to demographic and exposure characteristics were completed for each health worker who presented to the outpatient clinic. Risk assessment was carried out by evaluating the use of personal protective equipment (PPE) and the level of contact with the patient, according to the algorithm of Turkish Ministry of Health. Risk assessment in healthcare workers was classified as no risk and low-, medium-, and high-risk exposure according to the Ministry of Health's "Algorithm for Evaluating Health Workers with COVID-19 Exposure."[7]

The data of our study, designed as a retrospective cohort study, were obtained from the follow-up records of 1646 healthcare workers presenting with risk exposure for COVID-19 between March 24, 2020, and January 15, 2021, and missing data were excluded from the evaluation. The relationship between the risk levels of participants and their demographic and workplace characteristics, and PPE use was assessed. Personnel working at our university were categorized as academic staff, resident doctors, nurses/midwives, other health personnel (health technicians, pharmacists, patient attendants, and cleaning staff), administrative staff, and students (medical faculty students). According to the COVID-19 guidelines of the Turkish Ministry of Health, the polymerase chain reaction (PCR) was applied to healthcare personnel with symptoms, regardless of the level of contact, and healthcare personnel with high-risk contact within the stated periods. The degree of exposure for those with positive PCR test results during the follow-up period of health workers was evaluated.

Statistical Analysis

For assessment of data, Statistical Package for Social Sciences version 21.0 was used (IBM Corp.; Armonk, NY, USA). In descriptive analyses, categorical variables were represented by number and percentage while numerical variables, based on distribution, by mean ± SD, median, and 25th-75th percentile values. Normality of continuous variables was analyzed with the Kolmogorov–Smirnov test, coefficient of variation, histogram, and Q–Q plot. Comparisons between groups were carried out with the Mann–Whitney *U*-test for continuous variables and with the Chi-squared test or Fisher's exact test for categorical variables. In categorical variables, for correlations demonstrated to be significant between more than 2 groups, Bonferroni post hoc test was utilized to

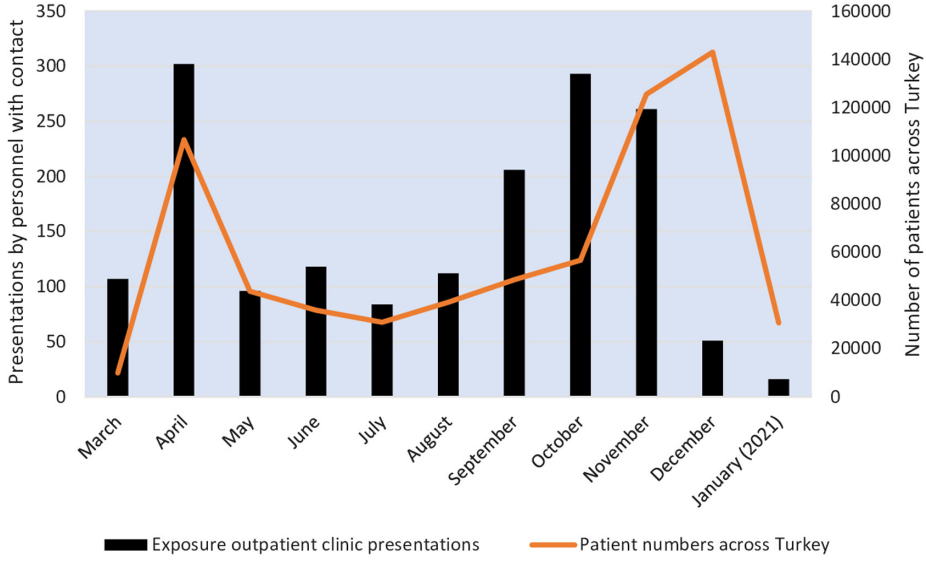

Figure 1. Distribution of coronavirus disease 2019 outpatient clinic presentations of personnel with exposure by month and monthly distribution of patient numbers across the country.

determine between which groups the significance existed. All tests were 2-tailed, and $P < .05$ was considered significant.

Approval for the study was obtained from the Republic of Turkey Ministry of Health and İstanbul University-Cerrahpaşa Faculty of Medicine Clinical Research Ethics Committee (Date: 08.04.2021, Number: 70432). An informed consent form was signed by the participants.

Results

Between March 2020 and January 2021, a total of 1646 personnel presented to our outpatient clinic for staff with COVID-19 exposure. The average age of health workers assessed at the clinic was 35.6 ± 10.1 years. Nine hundred seventy (58.9%) of those applying to the outpatient clinic were women. The largest number of outpatient clinic presentations was by other health personnel with 571 participants (35%). The highest number of applicants was from internal medical sciences with 853 individuals (52%). The majority (90%) of the participants presenting to the clinic were not employed in a COVID-19 unit. When the outpatient clinic presentations were reviewed based on months, the highest number of applications were respectively as follows: 302 (18.3%) in April 2020, 293 (17.8%) in October 2020, and 261 (15.9%) in November 2020; peaks in the spring and autumn periods of 2020 were observed, and these months corresponded to the time intervals in which the number of COVID-19 patients increased throughout the country (Figure 1). Exposure history was observed to be hospital acquired at most (85.5%), and 741 (45.3%) of them had exposure through work colleagues and 658 (40.2%) people through patients (Table 1).

While 233 (14.2%) of the personnel had high-risk exposure, 1012 (61.8%) had medium-risk exposure and 349 (21.3%) had low-risk exposure; 43 (2.6%) individuals were considered risk free (Table 2). The distribution of exposure risks by month has been shown in Figure 2. In March 2020, healthcare workers seen at the clinic with low-risk exposure accounted for the highest proportion of participants, whereas in all other months, there were more presentations by those with medium-risk exposures (Figure 2).

On examination of the personnel's exposure histories, while patient-related exposure (96.3%) was observed in the first months and exposure through patients decreased in the following months, the rate of colleague-related exposure increased and became the highest exposure source as of June 2020 (Figure 3).

The median age of the group recognized as low risk was higher than that of the intermediate-risk group ($P = .011$). Although there was a difference identified between gender and exposure risk ($P = .042$), no difference was demonstrated between exposure risks in post hoc tests. Exposure risk classification in terms of occupational groups, personnel units, the COVID-19 unit of employment, and the source of exposure was found to be statistically significant. It was determined that other health workers and nurses had more high-risk exposures than administrative staff and students. The rate of personnel with high-risk exposure in internal medical units and surgical departments was greater than that of administrative units ($P = .002$). It was observed that the high-risk exposure of staff working in a COVID-19 unit was higher than those not employed at COVID-19 units (Figure 4). Compared to other sources of exposure, the rate of high-risk exposure was shown to be greater through household interactions, while the rate of low-risk exposure was revealed to be higher in patient-related exposure ($P < .001$) (Table 3) (Figure 5).

During the follow-up period of individuals presenting to the outpatient clinic, 201 (12.2%) were found to have positive COVID-19

Table 1. Characteristics of Personnel Applying to the COVID-19 Exposure Personnel Polyclinic

Age, mean ± SD	**35.6 ± 10.1**
Sex, n (%)	
Female	970 (58.9)
Male	676 (41.1)
Profession, n (%)	
Academic staff	68 (4)
Resident doctor	264 (16)
Nurse/midwife	442 (27)
Other health personnel	571 (35)
Administrative staff	194 (12)
Student	105 (6)
Personnel units, n (%)	
Internal medical unit	853 (52)
Surgical unit	498 (30)
Basic sciences unit	43 (3)
Administrative units	178 (11)
Auxiliary personnel unit	71 (4)
Staff in the COVID-19 unit, n (%)	
Yes	165 (10)
No	1481 (90)
Polyclinic application period, n (%)	
March 2020	107 (6.5)
April 2020	302 (18.3)
May 2020	96 (5.8)
June 2020	118 (7.2)
July 2020	84 (5.1)
August 2020	112 (6.8)
September 2020	206 (12.5)
October 2020	293 (17.8)
November 2020	261 (15.9)
December 2020	51 (3.1)
January 2021	16 (1)
COVID-19 exposure source, n (%)	
Hospital—patients	658 (40.2)
Hospital—colleagues	741 (45.3)
Household	137 (8.4)
Social environment	99 (6.1)

COVID-19, coronavirus disease 2019.

Table 2. Exposure Classification by Application Period

Application Period	Risk Free, n (%)	Low risk, n (%)	Medium risk, n (%)	High risk, n (%)	Total, n (%)
March 2020	0 (0%)	55 (51.4%)	26 (24.3%)	26 (24.3%)	107 (6.5%)
April 2020	17 (5.6%)	80 (26.5%)	170 (56.3%)	35 (11.6%)	302 (18.4%)
May 2020	6 (6.2%)	28 (29.2%)	58 (60.4%)	4 (4.2%)	96 (5.9%)
June 2020	1 (0.8%)	23 (19.5%)	91 (77.1%)	3 (2.5%)	118 (7.2%)
July 2020	3 (3.6%)	14 (16.7%)	62 (73.8%)	5 (6%)	84 (5.1%)
August 2020	5 (4.5%)	15 (13.4%)	80 (71.4%)	12 (10.7%)	112 (6.8%)
September 2020	0 (0%)	38 (18.4%)	144 (69.9%)	24 (11.7%)	206 (12.6%)
October 2020	0 (0%)	51 (17.5%)	212 (72.6%)	29 (9.9%)	292 (17.8%)
November 2020	10 (3.8%)	34 (13%)	142 (54.4%)	75 (28.7%)	261 (15.9%)
December 2020	1 (2.0%)	10 (19.6%)	21 (41.2%)	19 (37.3%)	51 (3.1%)
January 2021	0 (0%)	1 (12.5%)	6 (75%)	1 (12.5%)	8 (0.5%)
Total	43 (2.6%)	349 (21.3%)	1012 (61.8%)	233 (14.2)	1637 (100%)

PCR results. In a comparison of the personnel with positive COVID-19 PCR results to the ones with negative results, no statistically significant difference was identified among them in terms of age, gender, work unit, and COVID-19-related employment. Students were detected to have higher rates of negative COVID-19 PCR results than other occupational groups ($P < .001$). The rate of positive COVID-19 PCR test results for household exposure was more than for other exposure sources ($P = .001$). In personnel with high-risk exposure, greater COVID-19 PCR positivity was observed ($P = .003$) (Table 4).

Discussion

In this cohort study conducted between the dates of March 11, 2020, and January 15, 2021, 1646 healthcare professionals were included. The number of presentations to our outpatient clinic has been observed to be identical to the epidemic curve of Turkey during the same time interval.[10] While the source of exposure at our hospital was via hospital—patient within the first months, the number of hospital—colleague-related exposure increased in the following time period.

Hospital-based exposure constitutes the most important source of exposure among healthcare personnel. It has been established that the number of COVID-19 exposures and cases acquiring the disease among health workers who do not work in COVID-19 units is high. High-risk exposure increases the likelihood of contracting COVID-19 in healthcare personnel.

In our study, the average age of the person presenting to the outpatient clinic was 35.6 ± 10.1 years. For a similar study conducted in Turkey, the mean age of 773 health personnel with COVID-19 exposure was found to be 34.4 ± 7.6 years.[11] The average age of the participants with low-risk exposure was higher. Contrasting health workers with positive COVID-19 PCR results to the ones with negative results, there was no significant difference in terms of age.

It was demonstrated in a study conducted in India that women were more exposed to the risk of COVID-19, but there was no difference with regard to exposure risk and having positive COVID-19 PCR results among genders.[12] Similar to these studies, it was

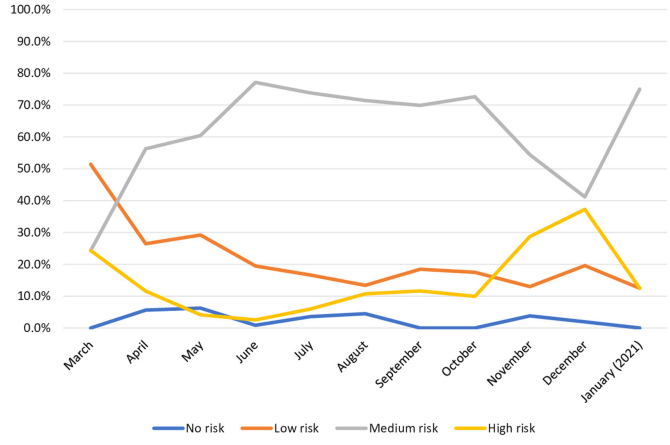

Figure 2. Monthly distribution percentages for contact risk of outpatient clinic presentations by personnel with coronavirus disease 2019 exposure.

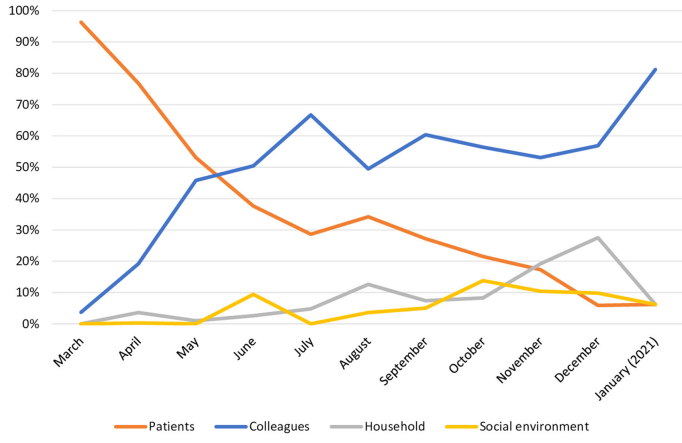

Figure 3. Monthly distribution percentages for contact source of outpatient clinic presentations by personnel with coronavirus disease 2019 exposure.

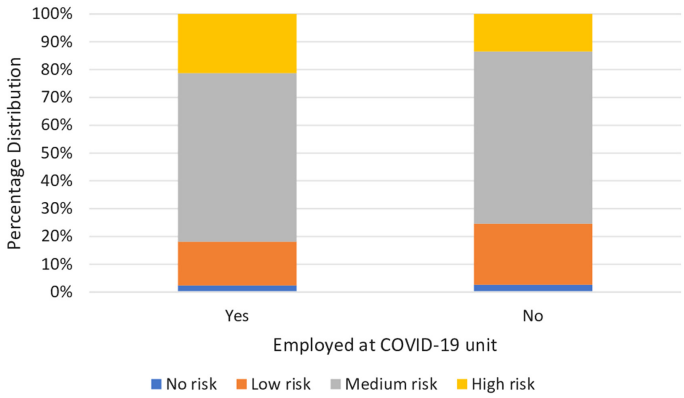

Figure 4. Percentage distribution for contact risk based on the status of being employed at coronavirus disease 2019 (COVID-19) unit in personnel presenting to the contact outpatient clinic.

also shown in our study that women had more exposure, but there was no gender difference in relation to COVID-19 risk and PCR positivity.

According to our study, mostly other health personnel (35%) and nurses/midwives (27%) and academic staff at least presented to the outpatient clinic. This may be due to the fact that other healthcare workers are in closer exposure with patients at the hospital, and the close follow-up of patients with COVID-19 is carried out by nurses. In addition, the increase in the number of presentations to the clinic by other health personnel and nurses may result from their long-term exposure working in COVID-19 units.

It was identified in our study that rates of high-risk exposure for other healthcare personnel were greater than that of the administrative staff; the reason for this may be the fact that they take part in jobs requiring close exposure with patients such as transporting patients and cleaning their personal belongings and rooms. The lower rates of high-risk exposure among administrative staff

Table 3. Comparison of Personnel Characteristics by Exposure Classification

Personnel Characteristics	Risk Free	Low Risk	Medium Risk	High Risk	Total	*P*
Age (n = 1637), median (25th-75th percentile)	35 (29-47)	36 (28-46)	34 (27-42)	33 (27-43)	34 (27-43)	.011*
Sex, n (%) (n = 1637)						
Female	19 (1.9)[a]	213 (22.1)[a]	582 (60.4)[a]	150 (15.6)[a]	964 (100)	.042**
Male	24 (3.6)[a]	136 (20.2)[a]	430 (63.9)[a]	83 (12.3)[a]	673 (100)	
Profession, n (%) (n = 1635)						
Academic staff	1 (1.5)[a]	13 (19.4)[a]	46 (68.7)[a]	7 (10.4)[a]	67 (100)	<.001**
Resident doctor	9 (3.4)[a]	44 (16.9)[a]	169 (64.8)[a]	39 (14.9)[a]	261 (100)	
Nurse/midwife	8 (1.8)[a]	88 (20.1)[a]	274 (62.4)[a]	69 (15.7)[a]	439 (100)	
Other health personnel	14 (2.5)[a,b]	154 (27)[b]	311 (54.6)[a]	91 (15.9)[a,b]	570 (100)	
Administrative staff	3 (1.5)[a,b]	33 (17.1)[a,b]	144 (74.2)[b]	14 (7.2)[a]	194 (100)	
Student	8 (7.7)[a]	16 (15.4)[b]	68 (65.4)[b]	12 (11.5)[b]	104 (100)	
Personnel units, n (%) (n = 1634)						
Internal medical unit	27 (3.2)[a]	194 (23)[a]	492 (58.2)[a]	132 (15.6)[a]	845 (100)	.002**
Surgical unit	11 (2.2)[a]	106 (21.3)[a]	305 (61.4)[a]	75 (15.1)[a]	497 (100)	
Basic sciences unit	3 (7)[a]	9 (20.9)[a]	27 (62.8)[a]	4 (9.3)[a]	43 (100)	
Administrative units	2 (1.1)[a,b,c]	26 (14.6)[c]	138 (77.6)[b]	12 (6.7)[a,c]	178 (100)	
Auxiliary personnel unit	0 (0)[a]	13 (18.3)[a]	48 (67.6)[a]	10 (14.1)[a]	71 (100)	
Staff in the COVID-19 unit, n (%) (n = 1637)						
Yes	4 (2.4)[a,b]	26 (15.8)[b]	100 (60.6)[a,b]	35 (21.2)[a]	165 (100)	.033***
No	39 (2.6)[a,b]	323 (21.9)[b]	912 (62)[a,b]	198 (13.5)[a]	1472 (100)	
COVID-19 exposure source, n (%) (n = 1626)						
Hospital—colleagues	8 (1.1)[a,b]	122 (16.7)[b]	563 (76.9)[c]	39 (5.3)[a]	732 (100)	<.001**
Hospital—patients	33 (5)[a]	209 (31.8)[a]	360 (54.7)[b]	56 (8.5)[c]	658 (100)	
Household	2 (1.5)[a]	1 (0.7)[b]	22 (16.1)[a,b]	112 (81.7)[c]	137 (100)	
Social environment	0 (0)[a,b]	16 (16.2)[b]	59 (59.6)[a,b]	24 (24.2)[a]	99 (100)	

Each subscript letter denotes a subset of categories whose column proportions do not differ significantly from each other at the .05 level.
**Mann–Whitney *U*-test.
**Pearson Chi-square test.
***Fisher's exact test.
COVID-19, coronavirus disease 2019.

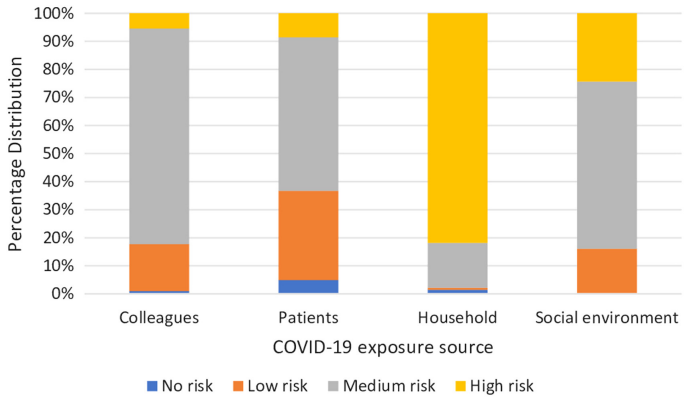

Figure 5. Percentage distribution for contact risk based on coronavirus disease 2019 (COVID-19) contact source in personnel presenting to the contact outpatient clinic.

compared to other healthcare workers may be explained by the fact that they do not work in COVID-19 units or within other departments providing patient care, hence having no patient exposure, and also by the practice of remote work program.

In our study, individuals working in internal medicine units (51.7%) have presented to the outpatient clinic at most, whilst those employed in basic science departments (2.6%) applied less frequently. This may be accounted for by the greater risk of exposure to contagious material and infected persons (patients and colleagues) in some departments. Moreover, the fact that the number of personnel working in internal medical sciences is larger than that of basic sciences may also be a factor. Also, in a study conducted in Turkey, the health worker has been found to be mostly working in internal medicine/surgical wards during risk exposure.[11] As to a study done in Germany, healthcare personnel reporting frequent exposure with confirmed or suspected COVID-19 cases during their work have demonstrated a higher burden of infection than staff in other employment units.[13]

Polymerase chain reaction positivity rate was identified to be greater in other health personnel, nurses, and resident doctors in contrast to other occupational groups. The reasons for high PCR positivity in these occupational groups may be providing care to patients with or without a diagnosis of COVID-19, long-term exposures as a result of close follow-up of COVID-19 cases in the ward or intensive care units, and exposure of many healthcare workers with the same case due to shifting work schedule. At a tertiary hospital in India, it was observed that the majority of healthcare workers directly or indirectly involved in the management of a confirmed or suspected COVID-19 case were nurses (45%), followed by hospital/sanitation/technical staff (30%) and doctors (24%).[14] In a study evaluating the prevalence of SARS-CoV-2 infection among healthcare workers, it was reported that the most frequently affected personnel group was nurses (48%), and most of the COVID-19-positive healthcare workers were employed in non-emergency wards of hospitals during screening.[15] In our study, there was no difference detected between the positive PCR status of the personnel and their work units. It was established that the risk of exposure with COVID-19 existed in all units.

In a study conducted within the first 6-month period of the COVID-19 pandemic in India, it was observed that higher exposure rates occurred in the COVID-19 units, and exposure within these units led to more positive test results.[16] As for our study, the number of personnel with exposure from COVID-19 units presenting to the outpatient clinic during the first few months was greater, but then increased exposure rates were detected within non-COVID-19 units. We were unable to identify any difference between the PCR positivity rates of personnel with exposure working in and outside the COVID-19 units.

High-risk contact was found to be higher in social relations among employees in the study from Turkey. According to this study, the source of contact was a colleague in 73.2% of the employees.[11] While the number of participants presenting to the

Table 4. Comparison of the Characteristics of the Personnel Applying to the COVID-19 Exposure Personnel Polyclinic According to the COVID-19 Status

	COVID-19		
Characteristics	**Positive (n = 201)**	**Negative (n = 1444)**	***P***
Age, median (25th-75th percentile)	34 (28-43)	34 (27-43)	.339*
Sex, n (%)			.691**
Female	121 (12.5)	848 (87.5)	
Male	80 (11.8)	596 (88.2)	
Profession, n (%)			<.001**
Academic staff	6 (8.8)	62 (91.2)	
Resident doctor	41 (15.5)	223 (84.5)	
Nurse/midwife	65 (14.7)	376 (85.3)	
Other health personnel	72 (12.6)	499 (87.4)	
Administrative staff	17 (8.8)	177 (91.2)	
Student	0 (0)	105 (100)	
Personnel units, n (%)			.125**
Internal medical unit	97 (11.4)	755 (88.6)	
Surgical unit	74 (14.9)	424 (85.1)	
Basic sciences unit	4 (9.3)	39 (90.7)	
Administrative units	15 (8.4)	163 (91.6)	
Auxiliary personnel unit	11 (15.5)	60 (84.5)	
Staff in the COVID-19 unit, n (%)			.932**
Yes	21 (12.7)	144 (87.3)	
No	180 (12.2)	1300 (87.8)	
COVID-19 exposure source, n (%)			.001**
Hospital—patients	74 (11.3)	583 (88.7)	
Hospital—colleagues	81 (10.9)	660 (89.1)	
Household	31 (22.6)	106 (77.4)	
Social environment	14 (14.1)	85 (85.9)	
Exposure risk assessment, n (%)			.003**
Risk free	6 (14)	37 (86)	
Low risk	42 (12)	307 (88)	
Medium risk	107 (10.6)	904 (89.4)	
High risk	45 (19.3)	188 (80.7)	

*Mann–Whitney *U*-test.
**Pearson chi-square test.
COVID-19, coronavirus disease 2019.

outpatient clinic with hospital-acquired COVID-19 exposure was 1399 (85.5%) in our study, 236 (14.5%) presented with out-of-hospital exposure. Though patient-related exposure (96.3%) was greater at the beginning of the follow-up time interval, exposure via colleagues was higher as of June 2020. The reason for this may be the end of flexible working arrangements transitioning back to normal workplace schedule, higher attendance rates by staff, burn-out of the personnel, related decreased use of masks during the rest periods as well as the reduction in compliance of social distancing, and insufficient protective measures in rest areas. In a similar study conducted in Italy, it was observed that 49% of the healthcare workers diagnosed with COVID-19 had the disease through hospital—colleague exposure, 10% via hospital–patient interaction, and 11% from household exposure.[17] The source of exposure among personnel with positive PCR results during our follow-ups appeared to be mostly (77%) hospital (patients/colleague) related, hence supporting the view that exposure to COVID-19 infection should be accepted as an occupational disease.

One of the limitations of the study is that it is a single-center study. The study has been carried out only on personnel who presented to the exposure outpatient clinic, and those who did not present to the clinic after exposure were not included. Since the vaccination process for healthcare workers in our country started on January 15, 2021, our study was unable to evaluate the effect of the vaccine on COVID-19 exposure.

Conclusion

In this study, it was aimed to assess the risk after exposure to COVID-19 for healthcare workers at a university hospital and to determine the factors associated with their risk status. In our study, it has been observed that the exposure of healthcare personnel with COVID-19 was mostly hospital based. High-risk exposure increases the likelihood of developing COVID-19 infection among health workers. It has been shown in our study that exposure and disease development rates are greater in health workers not employed in COVID-19 units. Given that healthcare personnel are most frequently exposed to COVID-19 in a hospital environment, it is crucial that they take necessary measures like wearing PPE and practicing physical distancing when interacting with patients and colleagues in any part of the hospital, not just within COVID-19 units. In our study, it has been determined that the risk status varies according to the profession and work unit. Further prevention, control, and training programs should be organized for occupational groups and work units in addition to the general protection rules determined in the Turkish Ministry of Health and the current literature.

Taking necessary measures to reduce the COVID-19 exposure risk of healthcare personnel working on the frontline will ensure the protection of staff and prevent the loss of workforce.

Ethics Committee Approval: Ethics committee approval was received for this study from the the Clinical Research Ethics Committee of İstanbul University-Cerrahpaşa, Faculty of Medicine (Date: 08.04.2021, Number: 70432).

Informed Consent: Written informed consent was obtained from the participants who participated in this study.

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