ORIGINAL ARTICLE
KLİNİK ARAŞTIRMA

Clinical, laboratory and imaging findings of healthcare workers infected with COVID-19 in a single tertiary healthcare centre

Üçüncü basamak bir sağlık kuruluşunda COVID-19 tanılı sağlık çalışanlarında klinik, laboratuvar ve görüntüleme bulguları

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SUMMARY

Aim: To analyze physical examination, laboratory and imaging findings of COVID-19 positive healthcare workers at a single tertiary healthcare centre in a metropolitan area of Turkey.

Material and Methods: Collected data was retrospectively analysed from patient files. Physical examination, laboratory and imaging findings were collected.

Results: Despite being under the highest risk and during the beginning of the pandemic, only 5% of healthcare workers were found to be COVID-19 positive. All positive COVID-19 healthcare workers had mild symptoms. Laboratory findings were within the normal range and only two healthcare workers had mild positive thoracic computerized tomography findings. All COVID-19 healthcare workers completely recovered with no sequela after close observation and follow up.

Conclusion: It is encouraging that our findings suggest although under high risk, healthcare workers in our institution did not have any serious complication from COVID-19. However, extreme vigilance should always be taken as the pandemic is continuing and there is still many aspects of COVID-19 that is unknown.

Keywords: COVID-19, health care workers, laboratory results, SARS-CoV-2

ÖZET

Amaç: Türkiye'de metropol bölgesindeki bir üçüncü basamak sağlık kuruluşunda, COVID-19 tanısı olan sağlık çalışanlarında, fizik muayane, laboratuar ve görüntüleme bulgularının değerlendirilmesi amaçlanmıştır.

Materyal ve Metodlar: Hasta dosyalarından retrospektif olarak toplanan veriler değerlendirilmiştir. Fizik muayene, laboratuar ve görüntüleme verileri toplanmıştır.

Bulgular: Pandeminin başlangıcından beri en yüksek risk altında olmasına rağmen, sağlık çalışanlarının yalnızca % 5'inin COVID-19 pozitif olduğu tespit edildi. Tüm COVID-19 pozitif sağlık çalışanlarının hafif semptomları vardı. Laboratuvar bulguları normal sınırlardaydı ve sadece iki sağlık çalışanında bilgisayarlı tomografide hafif akciğer tutulum bulguları vardı. Tüm COVID-19 pozitif sağlık çalışanları, yakın gözlem ve takip sonrasında, hiçbir sekel olmaksızın tamamen iyileştiler.

Sonuç: Yüksek risk altında olmasına rağmen kurumumuzdaki sağlık çalışanlarının COVID-19'dan ciddi bir komplikasyon yaşamadığını destekleyen bulgularımız cesaret vericidir. Bununla birlikte, pandemi devam ederken ve COVID-19'un hala bilinmeyen pek çok yönü olduğu için her zaman dikkatli olunmalıdır.

Anahtar sözcükler: COVID-19, laboratuar sonuçları, sağlık çalışanları, SARS-CoV-2

INTRODUCTION

COVID-19 is an infectious disease caused by a previously unknown coronavirus (Severe Acute Respiratory Syndrome Coronavirus 2, SARS-CoV-2,) and first reported December 2019 in Wuhan, China. COVID-19 spreads with droplets and close person-to-person contact. The World Health Organization declared a pandemic for COVID-19 in March 2020 (1).

As with other infectious diseases, healthcare workers are at the forefront of the battle against COVID-19. In Italy the rate of healthcare workers that have been infected with COVID-19 is reported to be 20%, whereas the same rate is reported to be 12% in Spain). A study conducted in England of 1029 staff reported three groups: directly patient facing, non-patient facing but potentially at higher risk of nosocomial exposure and non-clinical staff with their COVID-19 positivity reported as being %15, %16 and %18 respectively (3).

The burden caused by the pandemic and the risk of infection has a negative effect on healthcare workers. Although the risk of infection is considered normal for healthcare workers, the risk to healthcare workers or their families who are of an advanced age, have weak immunity or other chronic medical conditions is of concern. The Centers for Disease Prevention (CDC) proposes the use of personal protective equipment when in contact with COVID-19 patients in order to minimize the risk of infection (4). It is important to prevent infection in healthcare workers in order to decrease morbidity and potential mortality, to maintain the capacity of healthcare systems and to decrease secondary transmission (5).

In this study we report the clinical, laboratory and imaging findings of COVID-19 infected healthcare workers in a single tertiary healthcare centre in a metropolitan area of Turkey in order to help better understand and prepare for future COVID-19 waves and other similar pandemics.

MATERIAL AND METHODS

Participants

Thirty one healthcare workers who had COVID-19 infections confirmed with PCR during 11 March-11 June 2020 were included in this study. Prospectively collected data was retrospectively reviewed. Symptom questioning was performed by the same physician.

Laboratory and imaging analysis

Unless an emergent state, following 12 hours of overnight fasting, peripheral venous blood samples were taken for complete blood count, immunoassay and biochemical analysis, either on the day of diagnosis or the following day. For complete blood count: erythrocytes count, hemoglobin, hematocrit, thrombocyte count, mean cell volume, mean platelet volume, leukocyte count, neutrophil percentage, lymphocyte percentage, monocyte percentage, eosinophils percentage, basophils percentage were evaluated by Sysmex XT 2000®. Analysed routine biochemical (measured by Siemens Dimension RxL®) and immunoassay (measured by Abbot Architect i1000®) markers included: ferritin, C reactive protein, blood urea nitrogen, creatinine, alanine aminotransferase, aspartate aminotransferase, sodium, potassium, calcium, chloride, troponin I, creatine kinase-MB, d-dimer and lactate dehydrogenase. Thoracic computerized tomography (Toshiba Aquiliam64®) findings were also noted in patients where CT was indicated.

Statistical Analyses

Collected data was analysed using SPSS 24 statistical software. Descriptive statistics are reported as count (n), percentage (%), arithmetic mean and standard deviation. Continuous variables were tested for normal distribution using the Kolmogorov Smirnov test. Results were evaluated using 95% confidence interval and $p<0.05$ was accepted as statistically significant.

Scientific research study permits from Republic of Turkey Ministry of Health (2020-05-04T11_11_23) and from TC Maltepe University Clinical Research Ethics Committee (2020/900/27) were obtained for the current study.

RESULTS

During the study time, 31 healthcare workers out of a total 610 (5,1%) were infected with COVID-19. All 31 healthcare workers' data was included in the study. Of those healthcare workers infected with COVID-19, the average age was 33±10 years, 64,5% were female and 35,5% were male. Healthcare workers infected with COVID-19 were doctors (22,5%), nurses (32,2%) and auxiliary healthcare workers (45,1%). While 54,8% of healthcare workers were of normal weight (18-25 kg/m2), 25,8% were overweight (25-30 kg/m2) and 19,4% were obese (30-40 kg/m2). Demographic and anthropometric information of those included in the study are shown in Figure 1.

While 9 healthcare workers were asymptomatic, most healthcare workers (71,0%) had mild symptoms. The overall ratio of healthcare professionals working in high-risk units such as emergency outpatient clinics, COVID-19 inpatient service and intensive care was 29%. Symptoms developed an average of 1,4±3,6 days before or after the first positive PCR test. At least one comorbidity such as obesity, hypothyroidism and hypertension were seen in seven (22,5%) of healthcare workers. No COVID-19 healthcare worker had more than one comorbidity, as due to national guidelines such workers were given

administrative leave during the pandemic period. Of the seven healthcare workers with comorbidities, five had mild symptoms and two had no symptoms. In those who had normal weight or were overweight or obese, no symptoms were seen in six, two and one healthcare worker respectively. Symptom distribution, average timing of symptoms, and average period of PCR positivity are shown in Figure 2. Table 1 demonstrates complete blood count parameters of healthcare workers included in this study. Average of parameters were all within normal reference range limits. Of the 22 healthcare workers, nine had indications for Thoracic Computerized Tomography (CT) due to physical examination findings (Figure 3). Of those who underwent CT imaging, two had mild positive COVID-19 findings (ground glass appearance). These two patients had mild symptoms throughout their followup, recovered completely and no control CT was deemed necessary. No sequelae was observed in any healthcare workers.

	Patients Results
Age (mean ± SD)	33 ± 10
Gender	11 Male, 20 Female
Weight kilogram (mean ± SD)	71 ± 14
Height cm (mean ± SD)	167 ± 8
BMI (mean ± SD)	25 ± 4,6

Figure 1. Results of demographic and anthropometric values of patients

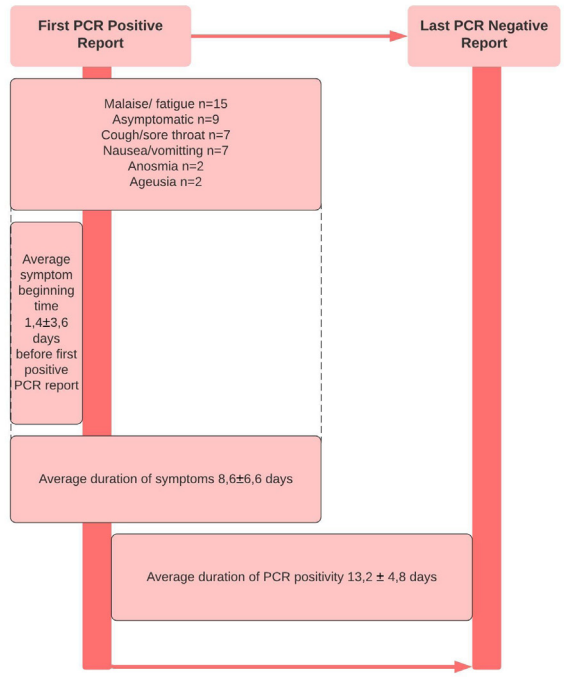

Figure 2. Symptom process timing and variety of symptoms according to patients' first positive and last negative PCR tests.

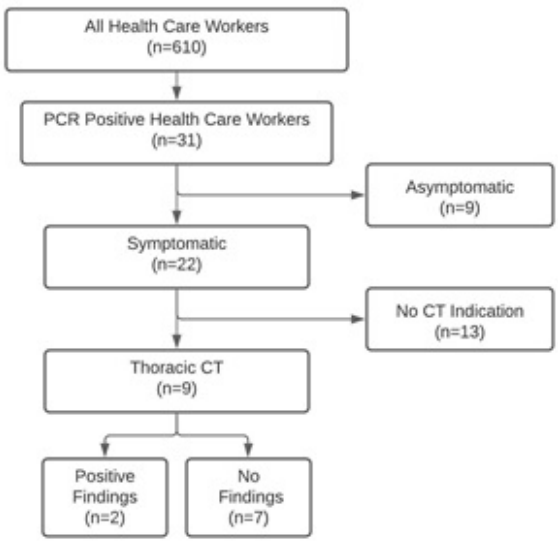

Figure 3. Computerized tomography imaging modality for the patients and general findings

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Table 1. Patients' complete blood count, immunoassay and routine biochemistry parameters results

Test Parameter	Group I (< 65 years of age)	Group II (> 65 years of age)	p Value
ProCT mean ± SD (ng/mL)	20,1 ± 32,8	12,9 ± 23,4	p<0.05*
CRP mean ± SD (mg/L)	15,1 ± 8,6	12,6 ± 13,1	Not statistically significant
Leukocyte count mean ± SD (per µL)	9376 ± 6592	11615 ± 6915	p<0.05*
Neutrophil count mean ± SD (per µL)	7380 ± 5593	9414 ± 6492	p<0.05*
Lymphocytes count mean ± SD (per µL)	1379 ± 2333	1297 ± 955	Not statistically significant
Thrombocyte count mean ± SD (per µL)	183742 ± 141465	201959 ± 118813	Not statistically significant
BUN mean ± SD (mg/dL)	30,1 ± 24,8	45,6 ± 34,3	p<0.01**
Creatinine mean ± SD (mg/dL)	2,1 ± 4,9	1,7 ± 1,8	Not statistically significant
AST mean ± SD (IU/L)	75 ± 97	129 ± 434	Not statistically significant
ALT mean ± SD (IU/L)	71 ± 106	82 ± 181	Not statistically significant
Albumin mean ± SD (g/dL)	2,54 ± 0,52	2,53 ± 0,54	Not statistically significant
CRP/Albumin ratio mean ± SD	6,4 ± 4,3	5,3 ± 4,8	Not statistically significant

Table 1 ProCT (Procalcitonin), CRP (C reactive protein), leukocyte count, neutrophil count, lymphocytecount,thrombocyte count, BUN (Blood Urea Nitrogen), creatinine, AST (Aspartate Amino transferase), ALT (Alanine amino transferase), albumin and CRP/albumin ratio results of all patients.

DISCUSSION

SARS-CoV-2 is a virus that threatens the whole world and can spread very quickly. It leads to COVID-19 which can lead to serious pathologies in many systems, particularly the respiratory system, leading to multiple organ failure or other systemic complications. While COVID-19 may be asymptomatic it may also lead to serious pathologies such as acute respiratory distress syndrome (ARDS), respiratory failure, disseminated intravascular coagulation, extensive thromboemboli and death.

Healthcare workers are at the forefront of the war against COVID-19 and are therefore at an increased risk. Since 11 March 2020, when the first COVID-19 case was seen in our country, all healthcare workers who had a fever, respiratory symptoms, or contact with a COVID-19 patient without wearing the appropriate personal protective equipment (PPE), and those whose close family members were diagnosed with COVID-19, tested with PCR for SARS-CoV-2. All healthcare workers were given regular training on the proper use of PPE during the pandemic. The hospital infectious diseases committee routinely controlled the correct use of PPE. This study was conducted with the aim of better preparing for possible further waves of COVID-19.

Kluytmans-van den Bergh et al. reported the prevalence of COVID-19 in healthcare workers presenting with fever and respiratory problems in two Dutch hospitals (6). In a total of 9705 healthcare workers, fever and respiratory problems were seen in 1353 and of these 86 tested positive for COVID-19. Of these 14% were doctors and 28% were nurses. Of those diagnosed with COVID-19, 24% reported no known contact with COVID-19 pozitive patients. The most frequently observed symptoms were cough (77%), general malaise (76%), severe myalgia (63%) and fever (53%). We report a lower rate of symptoms in our group of healthcare workers as we screened healthcare workers that had contact with a known COVID-19 patient.

In a retrospective study of doctors and nurses aged 18 years and older Ran et al. divided healthcare workers into those that were exposed to medical or surgical procedures that lead to aerosol production (higher risk) and those who were not (low risk) (7). Of 72 healthcare workers included in the study, 33 were grouped as being high risk and of these heathcare workers 28 tested positive for COVID-19, 2,13 times higher than those in the low risk group. The most common symptoms were reported as fever and cough (85,7% and 60,7% respectively.) In our study most healthcare workers were asymptomatic. In those who were symptomatic the most common two symptoms were malaise and fatigue.

In a cohort of 9648 healthcare workers, Lai et al. reported COVID-19 positive test in 110 (1,1%) (8). Of those 71,8% were female, 23,6% were doctors, 56,4% were nurses and 20% were other health care assistants. The most frequently observed symptoms were reported as fever (60,9%), myalgia (60,0%), cough (56,4%) and sore throat (50,0%). Similar to our findings, the authors reported all laboratory tests within the normal reference ranges.

We reported COVID-19 positivity in mostly female healthcare workers, most probably due to the majority of our healthcare workers being female. As those aged above 65 years of age and those with multiple comorbidities were given administrative leave, the average age of our COVID-19 positive healthcare workers and the number with comorbidities was low. No sequelae was observed in

any healthcare worker. All COVID-19 positive healthcare workers were isolated from their families/co-inhabitants and were allowed to return to work after two negative PCR results. Government policy for administrative leave and guidelines for COVID-19 positive healthcare workers led to a small number of participants in this study and a larger than reported rate of asymptomatic healthcare workers. Although this may be considered a limitation of our study it also demonstrates that similar preventative measures should be taken if necessary in the future.

Conclusion and Future Directions

Institutional precautions, routine training, correct use of PPE, early intervention and close clinical observation lead to favourable clinical outcome in healthcare workers infected with COVID-19 at our institute. However, health professionals working in high-risk areas such as emergency room, intensive care, pulmonary diseases and infection services within hospitals should not be complacent and continue to show maximum sensitivity in case of a possible second wave of the current pandemic or in any future pandemics.

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