

Back Pain and Related Factors in Patients with COVID-19

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Ankara Dışkapı Yıldırım Beyazıt Eğitim ve Araştırma Hastanesi: Ankara Diskapi Yıldırım Beyazıt Eğitim ve Arastirma Hastanesi

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Research

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Abstract

Background: The aim of the study was to determine whether back pain is a clinical manifestation in patients with COVID-19, and to decide whether any demographic and disease characteristics might act as an effective indicator of back pain.

Material and methods: Patients with COVID-19 (N: 99) were recruited from the infectious diseases department of a secondary care hospital and divided into two groups according to the presence or absence of back pain. The main outcomes included were demographic and disease characteristics, and the Nord-Trøndelag Health Study Physical Activity Level for Work (HUNT) 6-minute walking test (6MWT).

Results: The most common symptoms were fatigue (n = 63, 63.6%), followed by back pain (n = 50, 50.5%). A sedentary lifestyle, oxygen requirement, the presence of pneumonia and typical pneumonia pattern were significantly higher (p = 0.009, p = 0.026, p = 0.001, p = 0.001, respectively), and aerobic capacity was lower (p = 0.001) in patients with back pain. The presence of back pain continued to be associated with the presence of pneumonia and reduced aerobic capacity in multivariate analysis.

Conclusions: Back pain may be associated with the presence and severity of COVID-19 pneumonia.

Introduction

Coronavirus disease 19 (COVID-19) is a disease caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which continues to spread increasingly worldwide (1). This virus is new and presents many uncertainties for the whole world. Studies have been carried out all over the world to shed light on the unknown details of COVID-19 and researchers are one step closer to better diagnoses and treatment options for those with the disease.

SARS-CoV-2 virus is mainly transmitted by droplets and studies have found clear evidence of human-to-human transmission but SARS-CoV-2 remains viable in aerosols for 3 hours in the absence of any ventilation. Moreover traces of SARS-CoV-2 virus have been detected on plastic and stainless steel for up to 72 hours (2). Since SARS-CoV-2 virus is resistant and highly contagious, the number of confirmed COVID-19 infection cases in the world has exceeded 20 million since the beginning of the pandemic and continues to spread increasingly. However, the real prevalence of COVID-19 is still unknown due to the large presence of asymptomatic and mild symptomatic patients. The clinical characteristics of the disease may vary from asymptomatic infection to respiratory failure (3).

Another feature of the disease is that although the symptoms begin mildly, it can progress and lead to mortality, especially among the elderly and patients with comorbidity. An increase in the number of new hospitalizations due to COVID-19 progression to severe stages may put enormous strain on health systems and indeed may even lead to their collapse (4). It will therefore be necessary to have early diagnostic and treatment plans in place to mitigate any challenges this would present.

The most common distinctive symptoms of COVID-19 are fever, dry cough and difficulty in breathing. Less commonly, conjunctivitis, dermatitis, diarrhea, and stroke may be present(5–8). However, to the best of our knowledge, there is no study about back pain as a symptom of COVID-19, despite being frequently reported by COVID-19 patients in clinical practice.

Therefore, in the present study, it was aimed to determine whether back pain is a clinical manifestation in patients with COVID-19, and to investigate a certain number of demographic and disease characteristics among these patients, as well as to determine whether any of these measures could act as an effective indicator of back pain.

Materials And Methods

The present study was a prospective, single-center cross-sectional analysis conducted on 128 PCR positive symptomatic patients who were followed up in our COVID-19 clinic between August 1st and November 30th 2020. There was no lockdown in the country at the time of our study.

Prior to the evaluation, patients were given verbal and written information on the nature of the study. Informed consent forms were signed upon admission to the study. All procedures were conducted according to the relevant principles of the Helsinki Declaration. The study was approved by the Ethics and Research Committee of the Ankara City Hospital (Protocol E1-20-1121). All patients enrolled in the study signed a consent form.

In accordance with the principles of the local committee, all PCR positive symptomatic patients were hospitalized until their tests showed negative and their symptoms had been resolved by the time of the study.

Inclusion criteria required that patients were aged between 18 and 65 years, not bedridden, cognitively intact, cooperative, not on a mechanical ventilator, and ambulatory with or without support.

Since back pain symptoms were extremely common among many COVID-19 patients prior to the study, we excluded any patients with a history of chronic back pain (more than 3 months), pre-diagnosed (clinical record review) cervical/thoracal disc herniation / spondylosis / osteoarthritis, scoliosis, kyphosis, being either bedridden or using a wheelchair, patients using a mechanical ventilator, dependent, unable to cooperate, with known progressive / non-progressive neurological disease, with previously diagnosed pulmonary disease, previous surgery and a trauma history of the lower extremities and vertebrae, as well as those with a history of malignancy and inflammatory disease.

All symptomatic patients who tested positive and hospitalized in a COVID-19 clinic were asked an open question about their acute symptoms on their first day in the clinic. Answers were only considered positive if the patient was currently experiencing the acute symptom.

The demographic characteristics of the patients including their age, gender, body mass index (BMI), presence of comorbidity, smoking status and occupation were all recorded. In addition, pre-illness activity

levels were scored using the Nord-Trøndelag Health Study Physical Activity Level for Work (HUNT) (9).

The HUNT staging scale scores an individual's physical activity level at work. According to this, patients were grouped according to their work status and physical activity level. The stages were defined as; Level 1: sedentary workers, Level 2: work involving walking but no heavy lifting, Level 3: work predominantly involving walking, Level 4: work involving heavy lifting and especially tasks requiring heavy physical activity.

The type of treatments used, the presence of pneumonia (all patients were screened with CT on the first day and repeated if necessary), whether oxygen was required at any time, and the pattern and stage of pneumonia findings in computerized chest tomography (CT) were all recorded during the hospitalization period.

As suggested by a partnership between the Radiological Society of North America, the Society of Thoracic Radiology and the American College of Radiology (10–12), the pneumonia pattern was grouped as negative, typical, indeterminate and atypical (10–11).

The 6-minute walking test (6MWT) was conducted with two cones placed 30 meters apart on a flat hard walking surface to assess the patients' current aerobic capacity on the first or second day of hospitalization according to the work schedule. After the patient had had 2 trial walks and rested for 30 minutes, the longest distance he had covered was recorded in meters.

After all the patients had been questioned about their symptoms, the patients were divided into two groups as patients with and without back pain, and their demographic and disease characteristics were compared. In addition, we investigated whether back pain was related to these demographic and disease characteristics.

Demographic data and disease characteristics were collected by the same physician for all patients included in the study. 6MWT was applied by another physician and CT findings were evaluated by an infectious diseases specialist. All three physicians were blinded to group assignments and to all other patient information.

Statistical Analysis

All statistical analyses were carried out using SPSS 20.0 for windows statistical package. The variables were investigated using Kolmogorov-Smirnov test to assess whether or not they were normally distributed. Descriptive statistics were demonstrated as mean \pm standard deviation (SD) for continuous variables and as a percentage (%) for nominal variables. T test and χ^2 test were performed for any comparison between the groups. Pearson's correlation test and univariate regression analysis were performed for the relationship between back pain and their demographic and disease characteristics. For statistical significant correlations, multivariate logistic regression analysis was used. A p value of < 0.05 was considered significant.

Results

Twenty-nine patients were excluded because of chronic back pain (n:23), pre-diagnosed cervical/thoracic deformities including scoliosis (n:2), kyphosis (n:1) and spondylosis/osteoarthritis (n:3) which may cause back pain, and the remaining 99 patients were included in the study.

Ninety-nine PCR positive symptomatic patients who had been followed up in our inpatient clinic were enrolled in this study. The mean age of the patients (53 male, 46 female) was 48.80 ± 14.64 years. There was at least one comorbidity in 59 (60%) of the patients. The majority of the patients (n = 41, 41.4%) were blue-collar and the physical activity level at work of most patients was of a mild level. The most common symptoms were fatigue (n = 63, 63.6%), followed by back pain (n = 50, 50.5%). In 41 (41.4%) of the patients, there was evidence of pneumonia on their CT. The demographic and disease characteristics of the patients are presented in Tables 1 and 2.

Table 1
Demographic characteristics

	n=99
Age (year) <i>mean±SD</i>	48.80 ±14.64
Gender n(%)	
Female	46 (46,5)
Male	53 (53,5)
BMI (%) <i>mean±SD</i>	27.67±3.99
Comorbidity n(%)	40 (40,4)
Comorbidities, n(%)	
DM	20 (20,2)
HT	24 (24,2)
CHF	4 (4,1)
CAD	11 (11,1)
Gastritis	1 (1)
Smoking n(%)	
Yes	19 (19,2)
No	71 (72,7)
Quited	9 (9,1)
Job n(%)	
Housewife	27 (27,3)
White-collar	14 (14,1)
Blue-collar	41 (41,4)
Retired	12 (12,1)
Unemployed	5 (5,1)
HUNT staging n(%)	
Level 1	36 (36,4)
Level 2	42 (42,4)
Level 3	16 (16,2)
Level 4	5 (5,1)

SD: Standard deviation, BMI: body mass index, HUNT: (Nord-Trøndelag Health Study Physical Activity Level for Work), DM: (Diabetes Mellitus), HT: (Hypertension), CHF (Congestive Heart Failure), CAD: (Coronary Artery Disease)

Table 2
Disease characteristics

	n=99
Treatment duration (day) <i>mean±SD</i>	4.70±2.91
Treatment <i>n</i> (%)	
HCQ	99 (100)
CLX	99 (100)
AZT	18 (18,2)
FVP	3 (3)
MOK	1 (1)
Symptoms <i>n</i> (%)	
Fatigue	63 (63,6)
Back pain	50 (50,5)
Fever	35 (35,5)
Sore throat	10 (10,1)
Arthralgia	34 (34,3)
Myalgia	14 (14,1)
Cough	15 (15,2)
Shortness of breath	38 (38,4)
Diarrhea	9 (9,1)
Loss of smell/taste	11 (11,1)
Nausea/vomiting	33 (33,3)
Asthenia	7 (7,1)
Oxygen requirement <i>n</i> (%)	12 (12,1)
Pneumonia <i>n</i> (%)	41 (41,4)
Pneumonia pattern	
Typical	31 (31,3)
Indetermine	1 (1)
Atypical	8 (8,1)
Negative	1 (1)

6MWT (meter)	428.42±247.15
HCQ: hydroxychloroquine, CLX: clexane, AZT: azithromycin, FVP: favipiravir, MOK: moxifloxacin, 6MWT: (6-minute walking test)	

The patients were divided into two groups based on whether they had back pain (n = 50, 50.5%) or were without back pain (n = 49, 49.5%). The comparison of the demographic and disease characteristics of the two groups is shown in Table 3.

Table 3

Comparison of demographic and disease characteristics of patients with and without back pain

	Back pain (+) n=50	Back pain (-) n=49	p
Age (year) <i>mean±SD</i>	51.32±14.59	46.40±14.29	0.085
Gender			
Female	23 (46)	23 (46.9)	0.926
Male	27 (54)	26 (53.1)	
BMI (%) <i>mean±SD</i>	27.65±3.37	28.09±5.33	0.960
Comorbidity n(%)	18 (36)	22 (44.9)	0.327
Smoking			
Yes	8 (16)	11 (22.4)	0.435
No	37 (74)	34 (69.4)	
Quited	5 (10)	4 (8.2)	
HUNT level n(%)			
Level 1	25 (50)	11 (22.4)	0.009
Level 2	18 (36)	24 (49.1)	
Level 3	5 (10)	11 (22.4)	
Level 4	2 (4)	3 (6.1)	
Oxygen requirement n(%)	9 (18)	3 (6.1)	0.026
Pneumonia n(%)	33 (66)	8 (16.3)	0.001
Pneumonia pattern			
Typical	27 (54)	4 (8.2)	0.001
Indetermine	0	1 (2)	
Atypical	6 (12)	2 (4.1)	
Negative	0	1 (2)	
6MWT (meter) <i>mean±SD</i>	338.67±191.73	520.01±365.02	0.001
SD: Standard deviation, HUNT: (Nord-Trøndelag Health Study Physical Activity Level for Work), 6MWT: (6-minute walking test)			

When comparing the two groups, it was noticed that the number of patients with a sedentary lifestyle, oxygen requirement, a presence of pneumonia and pneumonia pattern including typical findings was significantly higher ($p = 0.009$, $p = 0.026$, $p = 0.001$, $p = 0.001$, respectively), and aerobic capacity was lower ($p = 0.001$) in the group with back pain (Table 4).

When evaluating the potential relationship between back pain and demographic and disease characteristics, it was found that back pain was associated with their occupational activity level, oxygen requirement, the presence of pneumonia and aerobic capacity level ($p = 0.008$, $p = 0.022$, $p = 0.001$, $p = 0.009$, respectively) (Table 4).

Table 4
Univariate analysis

	B	SE	P value	95 CI (lower-upper bound)
Age	-0.012	0.004	0.126	-0.020_-0.003
Gender	0.020	0.100	0.843	-0.179_0.218
BMI	0.008	0.013	0.571	-0.019_0.034
Comorbidity	-0.280	0.123	0.058	-0.524_-0.035
Smoking	-0.045	0.101	0.654	-0.246_0.155
HUNT level	0.154	0.058	0.008	0.039_0.269
Oxygen requirement	-0.108	0.057	0.022	-0.221_0.006
Pneumonia	-0.239	0.063	0.001	-0.372_-0.106
6MWT (meter)	0.001	0.000	0.009	0.001_0.000
BMI: body mass index, HUNT: (Nord-Trøndelag Health Study Physical Activity Level for Work), 6MWT: (6-minute walking test), 95% CI: (95% confidence interval)				

In the multivariate regression analysis of these factors, it was observed that the presence of back pain continued to be associated with the presence of pneumonia and reduced aerobic capacity ($p = 0.008$, $p = 0.005$) (Table 5).

Table 5
Multivariate regression analysis

	β	SE	P value	95 CI (lower -upper bound)
HUNT level	-0.002	0.066	0.075	-0.134_0.130
Oxygen requirement	-0.057	0.162	0.124	-0.379_0.264
Pneumonia	-0.174	0.081	0.008	-0.334_-0.014
6MWT (meter)	0.001	0.000	0.005	0.000_0.001
95% CI: 95% confidence interval; SE: standard error,BMI: body mass index, HUNT: (Nord-Trøndelag Health Study Physical Activity Level for Work), 6MWT: (6-minute walking test), 95% CI: (95% confidence interval)				

Discussion

In this study, it was aimed to determine the frequency of back pain symptoms alongside more generally known symptoms in COVID-19 patients and to investigate the factors associated with this. As a result of the study, it was observed that half of the patients (50.5%) had symptoms of back pain, and it was found that especially the presence of pneumonia and lack of aerobic capacity as well as the previous activity level of the patient and oxygen requirement, were correlated with the presence of back pain.

SARS-CoV-2 replicates efficiently in respiratory epithelial cells throughout the respiratory tract with replication in the lower respiratory tract fitting with the development of lung disease (12). Thus, COVID cases may progress to severe pneumonia, and may end with acute respiratory distress syndrome, septic shock and multiple organ failure. (5, 13). The most common symptoms reported include; fever (44-88.9%), cough (68-76.5%), fatigue (32.5%), and shortness of breath (13.3–22.1%). Interestingly, in the present study, the highest symptom was fatigue (63.6%), followed by back pain (50.5%). Although the comorbidity rates and the mean age of patients in the present study are similar to patients in other studies, fever and cough were observed in only 35 to 38% of our patients. The reason for this may be due to genetic and sociocultural differences between countries, as well as a possible mutation of the virus. Furthermore, at the time of our study all symptomatic and PCR positive patients were hospitalized, and all patients had mild disease or pneumonia, no patients had severe pneumonia or ARDS requiring respiratory support other than oxygen.

The typical pulmonary findings associated with COVID-19 are bilateral, peripheral, and basal predominant ground-glass opacities, consolidation, or both. When peripheral involvement extends to the parietal pleura

and stimulates the intercostal nerve, it can cause pleuritic chest pain which is therefore referred to their respective dermatomes on one or both sides of the chest, the shoulders, and the back (14).

In the present study, patients with back pain had significantly higher pneumonia rates compared to those without, and these data are concordant with the clinical data showing that 15% of patients with pneumonia had back pain (15).

In this study, 6MWT was used to evaluate patients' current aerobic capacity and HUNT staging was used to obtain information about the pre-illness activity levels of the patients. Accordingly, patients with back pain had significantly lower levels of pre-illness physical activity, and had lower current aerobic capacity than those without back pain.

Physical activity has therapeutic and protective effects on the cardiovascular, pulmonary, musculoskeletal, neurological, immune and endocrine systems. Lack of physical activity can cause problems such as muscle weakness, osteoarthritis, osteoporosis, hypertension, DM, venous thrombosis, stroke and immune system dysfunction (16). Studies have reported that physical inactivity can lead to respiratory dysfunction and decrease aerobic capacity even in patients without underlying pulmonary conditions (17). It has been stated in certain studies that a lack of physical activity due to quarantine practices to prevent the spread of the pandemic reduces the aerobic capacity of people and there is clearly a need to exercise at home during quarantine (18–20). Although COVID-19 typically presents respiratory manifestations, surely, there is an increased prevalence of thromboembolic disease and pulmonary embolism in critically ill patients with a lack of physical activity (21, 22). This explains that the increased risk of back pain may be due to lack of physical activity in both groups. Another important result of this study is that patients with back pain needed more oxygen, so it is important to evaluate the respiratory risks to which this population is exposed.

Limitations

This study has certain limitations. First, it was conducted at a single center in a secondary hospital with a unique national Covid-19 diagnosis, hospitalization and treatment algorithm. Therefore, the association of back pain and disease characteristics of hospitalized COVID-19 patients should be confirmed by a multicenter study. Nevertheless, this study had a prospective observational design, included symptomatic COVID-19 patients and excluded any patients with chronic back pain. Secondly, patients admitted to an intensive care unit were not included because of the difficulty of assessing severe patients. However, the criteria for ICU admission vary among different facilities and countries, according to the medical circumstances. Thirdly, no patient died or had to be transferred to an intensive care unit meaning that these patients had relatively mild/moderate disease and consequently the results should be considered with caution. Finally, although multivariate analysis can be adjusted for variables between the two groups, we could only adjust the included variables.

Conclusion

These findings were completed in two months under very difficult clinical conditions and the hope is that these and other findings yet to come will point the way to a more thorough understanding of COVID-19. All doctors, regardless of their branch or specialization, have some responsibilities in dealing with this serious illness. The good news about this situation is that COVID-19 disease can be viewed from a slightly different perspective – through the eyes of the physiatrist. Back pain, which is encountered on a daily basis by physiatrists, may be associated with the presence of pneumonia, and patients presenting symptoms of back pain should be questioned as a matter of routine in relation to their history of exposure to COVID-19.

Abbreviations

COVID-19: Coronavirus disease 2019; SARS-CoV-2: Severe acute respiratory syndrome coronavirus 2; 6MWT: 6-minute walking test; HUNT: Nord-Trøndelag Health Study Physical Activity Level for Work ; ARDS:Acute Respiratory Distress Syndrome

Declarations

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Authors' contributions

CU conceived and designed the study. All authors participated in the performance of the study. All of the authors conducted the study and performed data collection. CU, EU, and IG were involved in the analysis and interpretation of the data. All authors contributed to revising the draft, had full access to all the data, and read and approved the final version of the manuscript. All of the authors critically revised and completed the final draft of the manuscript.

Availability of data and materials

The data used to support the findings of this study are available from the corresponding author upon request.

Ethics approval and consent to participate

All procedures were conducted according to the relevant principles of the Helsinki Declaration. The study was approved by the Ethics and Research Committee of the Ankara City Hospital (Protocol E1-20-1121). All patients enrolled in the study signed a consent form.

Consent for publication

All authors agreed to this publication. Competing interests The authors have no conflicts of interest to declare.

Conflict of interest

The authors declare no conflict of interest.

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