Araştırma Makalesi / Research Article

Investigation of the effect of low back pain on the musculoskeletal system in individuals with COVID-19 infection

COVID-19 enfeksiyonu geçiren bireylerde görülen bel ağrısının kas iskelet sistemi üzerine olan etkisinin incelenmesi

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ABSTRACT

Background: Our study was conducted to find out the effects of low back pain, which is one of the most common symptoms of COVID-19, on the musculoskeletal system.

Materials and Methods: Individuals who were diagnosed with COVID-19 positive at least once in the last 2 months were included in the study. The participants were reached through Whatsapp application with the survey prepared in Google Forms format. 230 individuals between the ages of 18 and 57 who had been diagnosed with COVID-19 participated in the study. The survey form included Oswerty Disability Index, Visual Analogue Scale and Cornell Musculoskeletal Discomfort Questionnaire and the participants were asked to answer the questions in the form. The participants were grouped in three different categories. Group 1 consisted of individuals between the ages of 18 and 26, Group 2 consisted of individuals between the ages of 27 and 35 and Group 3 consisted of individuals aged 36 and older. IBM SPSS Statistics 22.0 package program was used in analyses.

Results: As a result of the study, it was found that Oswerty Disability Index results were statistically significantly different in both male and female; Cornell Questionnaire results in Group 1 and Oswestry and Cornell Questionnaire results in Group 3 were statistically significantly different between male and female and there was a positive and weak correlation between age and Oswestry and VAS results.

Conclusions: The present study showed that low back pain remains with individuals after COVID-19 infection and had negative effects on their lives.

Keywords: COVID-19, Backache, Cornell musculoskeletal discomfort questionnaire, Visual analogue scale, Oswerty disability index

ÖZET

Amaç: Çalışmamız, COVID-19 pandemisi sebebiyle artan vaka sayılarında meydana gelen, hastalık belirti ve bulgularından biri olan bel ağrısının kas iskelet sistemi üzerinde nasıl bir etki oluşturduğunu saptamak amacıyla yapıldı.

Materyal ve Metot: Çalışmaya son 2 ay içerisinde en az bir kez COVID-19 pozitif teşhisi konulmuş bireyler dahil edildi. Hazırlanan Google Forms formatındaki anket ile Whatsapp uygulaması ile kişilere ulaşıldı. Çalışmaya 18-57 yaş arası COVID-19 geçirmiş 230 birey katıldı. Anket içeriğinde Oswerty Özürlülük İndeksi, Vizüel Analog Skala ve Cornell Kas İskelet Sistemi Anketi yer aldı ve katılımcılardan bu anketleri cevaplamaları istenildi. Çalışmaya katılan kişiler üç farklı kategoriye ayrıldı. Grup 1'i 18-26 yaş aralığında bireyler, Grup 2'yi 27-35 yaş arası bireyler, Grup 3'ü 36 yaş ve üstü bireyler oluşturdu. Analizlerde IBM SPSS Statistics 22.0 paket programı kullanıldı.

Bulgular: Çalışma sonucunda gruplar arasında Oswestry anket sonuçlarının hem erkeklerde hem kadınlarda istatistiksel olarak anlamlı farka sahip olduğu, Grup 1'de Cornell anket sonuçları, Grup 3'te Oswestry ve Cornell anket sonuçlarının erkek ve kadınlar arasında istatistiksel olarak anlamlı farka sahip olduğu, yaş ile Oswestry ve VAS sonuçları arasında pozitif yönlü zayıf kuvvetli bir korelasyon olduğu belirlendi.

Sonuç: Yapılan çalışma COVID-19 sonrası kişilerde bel ağrısının devam ettiğini ve kişinin yaşantısını olumsuz yönde etkilediğini ortaya koydu.

Anahtar Kelimeler: COVID-19, Bel ağrısı, Cornell kas iskelet sistemi anketi, Vizüel analog skala, Oswestry özürlülük indeksi

INTRODUCTION

The disease which originated in December 2019 in Wuhan City of China and which caused respiratory tract infection due to coronavirus was called COVID-19 in February 2020 by World Health Organization (Arslan & Karagül, 2020). COVID-19 caused many deaths by spreading all over the world in a short time and the first case in Turkey was announced on March 11, 2020 (WHO, 2019). Due to the rapid spread of COVID-19 virus and the fact that large-scaled measures could not be provided by the authorities, the disease was declared as pandemic on March 12, 2020 (Wu et al., 2020).

In addition to direct transmission from person to person, COVID-19 can also be transmitted indirectly from the air and from items contaminated with the virus (Lotfi et al., 2020). The disease is mainly transmitted directly through droplets from a distance of 1,8 meters (Lauxmann et al., 2020). Healthy individuals' taking their hands to organs such as mouth, nose and eye after their hands touch the droplets scattered around by coughing and sneezing of individuals with COVID-19 disease increases the transmission risk of the disease (Türken & Köse, 2020). Symptoms of the disease are fatigue and weakness, headache, sore throat, fever, joint pain, myalgia, back pain, cough and gastrointestinal complaints (Abus & Kapici, 2022). In addition to these symptoms, nausea, vomiting and diarrhoea have also been reported in some cases (Pascarella et al., 2020). People have chronic diseases, respiratory diseases and healthcare workers are the most affected group by the COVID-19 infection (T.C. Sağlık Bakanlığı COVID-19 Bilgilendirme Platformu, 2022). According to studies conducted in China, the mortality rate is 10.5% in people with cardiovascular disease, 7.3% in people with diabetes mellitus, and 6.3% in people with chronic respiratory failure. In a study conducted in China, 3.8% of COVID-19 cases were identified as healthcare workers (Wu & McGoogan, 2020). In Turkey, 601 (3.8%) of the cases diagnosed with COVID-19 so far are healthcare professionals. These symptoms persist after illness even if individuals no longer have COVID-19 (Independent Turkish, 2020).

Luttmann et al. define musculoskeletal diseases as "health problems in systems that provide movement such as muscles, tendons, skeleton, cartilage, ligament and nerves" (Luttmann et al., 2003). It has been found that 25% of symptomatic patients with COVID-19 disease have myalgia and muscle weakness. Although some data indicate that myalgia is not directly proportional to COVID-19 severity, myalgia has been an important predictor for the severity of the disease for individuals with abnormal CT or radiological image of the lungs (Zhang et al.,2020). A study was conducted with 214 patients hospitalized for COVID-19 in the People's Republic of China Wuhan City. As a result of the study, COVID-19 was found to have effects on the functions of the musculoskeletal system (Fang, 2003). In moderate and severe COVID-19 cases, loss of function has been found in the evaluation of musculoskeletal system functions in patients 2 months after the disease (Lau et al., 2005a). It has been found that COVID-19 infection has negative effects on both muscle strength and endurance. The decrease in the functional capacity of individuals with COVID-19 corresponds to a decrease in the quality of life. 40% of these patients were able to return to work only 2-3 months after the treatment (Lau et al., 2005b). COVID-19 causes short and long term musculoskeletal system complications (Gumucio et al., 2019).

Low back pain, which is another musculoskeletal system disease, is a health problem that concerns societies in all countries, causes loss of work force and impairs the life quality of individuals. 80% of people have experienced low back pain at least once in some part of their lives. The severity of acute low back pain is directly proportional to the level of damaged tissue (Wheeler & Han1ey, 1995; Öztürk, 1997; Sarıdoğan, 2000; Kanbir, 2004; Saunders,1992). While 90-95% of back pain recovers in 6 weeks, about 5% becomes chronic. Chronic back pain causes decreased physical efficiency in patients (Kanbir, 2004; Saunders,1992; Beyazova, 2016). One of the specific symptoms after COVID-19 infection is low back pain. It has been reported that the complaints of low back pain are still effective in patients who have had COVID-19 and whose tests have turned from positive to negative and that this clinical picture affects individuals' social and work life negatively (Karaarslan et al., 2021).

This study was conducted to find out whether low back pain in individuals who have had COVID-19 affects life standards of these individuals positively or negatively and to find out to what extent low back pain limits their social and work life.

MATERIALS AND METHODS

Ethics board approval of the study was obtained from Duzce University Faculty of Medicine Ethics Committee. Our study was designed as a cross-sectional study and it was conducted between September and December 2021. Before the study, the sample size was calculated with the G Power Version 3.1.9.2 program. It was found that the required sample size for the study was at 80% test power, and at 95% confidence level, at least 39 people in each group and a total of 117 people should be included in the study. Individuals who had been diagnosed COVID-19 positive at least once within the last two months and who had become negative

after treatment were included in the study. Participants were asked whether they had any musculoskeletal disease. Patients with musculoskeletal disease and chronic low back pain were excluded from the study. People with musculoskeletal pain and low back pain after COVID-19 were included in the study. Participants in the study were not asked any questions about the COVID-19 vaccine. The study was carried out by using Whatsapp application with a survey prepared in Google Forms format. The individuals who participated in the study were informed about the study with an explanation text at the beginning of the survey and it was stated in writing that individuals must have had COVID-19 in order to participate in the study. In order for the patients to be included in the study, COVID-19 positive/negative test results were requested with the survey. 230 individuals between the ages of 18 and 57 who had been diagnosed with COVID-19 participated in the study. Individuals from different age groups were included. Group 1 consisted of individuals between the ages of 18 and 26, Group 2 consisted of individuals between the ages of 27 and 35 and Group 3 consisted of individuals aged 36 and older. 3 different questionnaires were included in the survey. Oswerty Disability Index (ODI) was used to evaluate loss of function due to low back pain, Visual Analogue Scale (VAS) was used to evaluate the level of pain and Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) was used to evaluate musculoskeletal system diseases.

Oswerty Disability Index

Oswerty Disability Index is a test created to determine loss of function in individuals with low back pain. Its Turkish validity and reliability study was conducted in Turkey by Yakut et al. in 2004. It consists of 10 questions related with daily life activities (Yakut et al., 2004).

The questions are on pain intensity, personal care, lifting, walking, sitting, standing, sleeping, degree of change in pain and social life. There are 6 options under each question. The first option is scored as "0", while the sixth option is scored as "5", total score is calculated, multiplied with two and expressed in percentage. Minimum score is 0 and maximum score is 100. The level of disability increases as total score increases (Fairbank & Pynsent, 2000).

Visual Analogue Scale

It is a scale used to determine individuals' level of pain. In order to determine the level of pain, individuals are asked to give a value between 0 and 10 according to the severity of pain. On the pain scale, 0 indicates no pain and 10 indicates the most severe pain encountered in lifetime. Increased score means increased severity of pain (Revill et al., 1976; Ohnhaus & Adler, 1975).

Cornell Musculoskeletal Discomfort Questionnaire

It is a questionnaire used to determine the frequency and severity of musculoskeletal problems in 19 different body parts of individuals and to find out whether these problems interfere with their ability to work. The questionnaire measures the pain in the body parts within the last week with 5-Likert scale (1-Never, 2-1-2 times/week, 3- 3-4 times/week, 4-Every day, 5- Several times every day), pain severity with 3-Likert scale (1-Mild, 2-Moderate, 3-Severe) and interference with 3-Likert scale (1-None, 2-Some, 3-A lot). As a result of the questionnaire, a value between 0 and 90 points is found for each region. Musculoskeletal system problem increases as the result increases. Turkish validity and reliability study was conducted by Erdinc et al (Erdinc et al., 2011).

Statistical Analysis

Normality distribution of the study was conducted with Kolmogorov Smirnov test and it was found that the data were not normally distributed. Minimum (min) and maximum (max) values were given with median for the data which were not normally distributed. Kruskal Wallis H test was used to compare the survey results of different groups. According to the result of Kruskal Wallis H test, Mann Whitney U test was applied to the data as Post Hoc test to find out which group the significant difference resulted from. Pairwise Comparison results were given according to the analysis. Spearman's Rho correlation analysis was applied to the data. $p<0.05$ value was considered as statistically significant. IBM SPSS Statistics 22.0 package program was used in analyses.

RESULTS

There are 105 individuals, 50 male and 55 female, between the ages of 18 and 26 in Group 1. There are 91 individuals, 31 male and 60 female, between the ages of 27 and 35 in Group 2. There are 44 individuals, 13 male and 31 female, aged 36 and older in Group 3.

Table 1 shows the median, min-max values of the scores calculated according to the answers given to the survey. Kruskall Wallis H test was used to compare the age, Oswestry, VAS, and Cornell Questionnaire results between the groups. According to the analysis results, statistically significant difference was found in Oswestry Index results in both male and female between the groups ($p<0.05$), (Table 1).

Table 1. Comparison of Oswestry, VAS, Cornell survey results between groups.

Gender	Group	Oswestry	VAS	Cornell
Male	1	16(0-72)	4 (0-10)	18 (0-87)
	2	20(0-64)	5 (0-8)	18 (0-84)
	3	20(0-54)	4 (1-9)	20 (0-78)
	p value	**.017**	.072	.399
Female	1	18(0-70)	4 (0-10)	18 (0-80)
	2	22(0-66)	4 (0-8)	20 (0-86)
	3	20(0-56)	4 (1-10)	18 (0-80)
	p value	**0.033**	0.118	0.214

(Cornell: Cornell Musculoskeletal Questionnaire, p<0.05, Oswestry: Oswestry Disability Index, VAS: Visual Analog Scale)

As a result of the Kruskall Wallis H Test, Mann Whitney U analysis was applied to the data as Post Hoc test to determine which group caused the different Oswestry Index results. As a result of the analysis, it was found that the difference was due to the difference between Group 1 and Group 2 (Table 2).

Questionnaire results in Group 1 and Oswestry and

Table 2. Post hoc analysis results

Pairwise comparison	Male	Female
Group 1- Group 3	.125	.139
Group 1- Group 2	**.025**	**.032**
Group 3- Group 2	1.000	1.000

Cornell Questionnaire results in Group 3 were statistically significantly different between male and female (Table 3).

(Cornell: Cornell Musculoskeletal Questionnaire, Oswestry: Oswestry Disability Index, VAS: Visual

Table 3. Comparison results in terms of gender within groups

Group	Age	Oswestry	VAS	Cornell
1	.052	.335	.633	**.031**
2	.567	.863	.150	.999
3	.825	**.016**	.171	**.036**

Analog Scale)

Mann Whitney U test was applied to the data to compare the age, Oswestry, VAS, Cornell Index results of the male and female in groups in terms of age. According to the analysis results, Cornell Spearman Rho correlation analysis was applied to data to find out how Oswestry, VAS and Cornell results differed with age. According to the results of the analysis, it was determined that there was no correlation between age and Oswestry, VAS and CMDQ (Table 4).

Table 4. Spearman Rho correlation analysis results.

Parameter	Test	Age	ODI	VAS	CMDQ
Age	r	1.000	.164	.132	.090
	p	-	.013	.045	.175
ODI	r	.164	1.000	.780	.650
	p	.013	-	.000	.000
VAS	r	.132	.780	1.000	.635
	p	.045	.000	-	.000
CMDQ	r	.090	.650	.635	1.000
	p	.175	.000	.000	-

(Cornell: Cornell Musculoskeletal Questionnaire, Oswestry: Oswestry Disability Index, VAS: Visual Analog Scale)

DISCUSSION

The aim of this study was to examine the effect of low back pain on the musculoskeletal system in individuals with COVID-19 infection. As a result of the study, it was found that Oswerty Disability Index results were statistically significantly different in both male and female; Cornell Questionnaire results in Group 1 and Oswestry and Cornell Questionnaire results in Group 3 were statistically significantly different between male and female and it was determined that there was no correlation with age. We also found that musculoskeletal discomfort occurred in individuals who had COVID-19 and remains after the disease and according to Cornell Questionnaire data, low back pain was marked as the most common musculoskeletal discomfort.

COVID-19 disease was indicated as a viral respiratory disease defined by high fever and shortness of breath in Wuhan city of China in December 2019 (T.C. Sağlık Bakanlığı COVID-19 Bilgilendirme Platformu, 2022). COVID-19 disease continues to show symptoms in individuals' lives even after the disease. Our study focused on low back pain, which is one of the most common effects of COVID-19. Low back pain ranks the second in the world among diseases that cause loss of work force. It is a disease which causes incapacity to work and frequent referral to health centres (Kabataş et al., 2012).

In the literature review, research articles were found on psychological state after COVID-19, vaccines and drugs (Ren et al., 2020; Lu et al., 2021; Yang et al., 2020). We could not find any information in the literature on low back pain seen in individuals with COVID-19. This study will be a pioneer for future studies in the field.

Three different measurement tools were chosen in the study. Oswerty Disability Index was first published in 1980 (Fairbank & Pynsent, 2000). The index includes 10 topics related to pain intensity, lifting, personal care, walking, sitting, sexual functioning, standing, social life, sleeping and

travelling. Each question has 6 options and respondents choose the option that describes them. The first option is calculated as 0 points, while the sixth option is calculated as 5 points. Maximum possible score is 100, while the minimum possible score is 0. 0 shows minimum disability, while 100 shows maximum disability. A score between 0% and 20% is evaluated as minimal disability, a score between 21% and 40% is evaluated as moderate disability, score between 41% and 60% is evaluated as severe disability, a score between 61% and 80% is evaluated as crippled and a score between 81% and 100% is evaluated as either bed-bound or exaggerated symptoms. ODI was chosen to find out to what extend low back pain affected individuals' lives (Fairbank & Pynsent, 2000).

VAS is a reliable test that has proven itself and has been accepted in the whole world for a long time. It was included in our survey due to its easy application and high reliability (Revill et al., 1976; Ohnhaus & Adler, 1975).

Human body has lots of pain related to musculoskeletal system that occur after COVID-19. infection Cornell Musculoskeletal Discomfort Questionnaire was used to determine which body part has more pain and in which body part the pain is more severe. In the questionnaire, the level and frequency of discomfort in 19 different body parts is presented in options and the individuals are asked to choose the options suitable for them (Erdinc et al., 2011; Taşpınar et al., 2014).

In Cornell Musculoskeletal Discomfort Questionnaire, the option chosen with the highest rate was the low back region. The second region was the neck region and the back region. CMDI was conducted to find out the pain on which region affected the musculoskeletal system more.

When the survey data were examined, it was found that 63.48% of the participants were female. Female were found to have higher level of pain. 49.6% of the individuals in the study were working in the public sector. The individuals working in the public sector were found to have more low back pain than the individuals in the other sectors. The age range of the participants was determined as minimum 18 and maximum 57. In Oswestry Disability Index, score range of the participants was minimum 0 and maximum 72. Cornell Musculoskeletal Discomfort Questionnaire results were minimum 0 and maximum 87. Visual Analogue Scale minimum score was 0 and maximum score is 10.

No correlation was found between the age, which is one of the descriptive data of the study, and the questionnaires. It was determined that there was a strong positive correlation between ODI and VAS. It was determined that there was a positive, moderately strong correlation between ODI and CMDQ.

The number of the individuals who participated in the study and the content of the survey were consistent with the study. The results obtained were consistent with the survey results.

The fact that no similar studies were found with the present study and the fact that the survey was applied after COVID-19 transmission are limitations of the study. Presenting the surveys to the participants in two forms as before COVID-19 transmission and after COVID-19 transmission can provide more effective and more valid data. The data when individuals had COVID-19 can be included in the evaluation as a different parameter.

As a result of the study conducted, it was found that post- COVID-19 symptoms continued and these symptoms had a negative effect on the musculoskeletal system. The region which was most affected was the low back region. This effect was found to be negative and it was found to affect life standards negatively.

CONCLUSION

The present study showed that low back pain remains in individuals after COVID-19 infection and had negative effects on their lives.

Conflict of Interest: The authors declare that they have no competing interest.

Author Contributions:

Idea/Concept: Demet SENCAN; **Design:** Demet SENCAN, Deniz SENOL; **Supervision/Consulting:** Demet SENCAN; **Data Collection and/or Processing:** Demet SENCAN, Deniz SENOL, Furkan BODUR; **Analysis and/or Interpretation:** Demet SENCAN, Deniz SENOL, Furkan BODUR; **Literature Review:** Demet SENCAN, Deniz SENOL, Furkan BODUR; **Writing of the Article:** Demet SENCAN; **Critical Review:** Demet SENCAN, Deniz SENOL, Furkan BODUR; **Resources and Funding:** None

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