Ann Med Res

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Annals of Medical Research

journal page: www.annalsmedres.org

The frequency of sarcopenia in the post-COVID period and its relationship with the clinical course of the COVID-19

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ARTICLE INFO

Keywords:
COVID-19
Muscle pain
Sarcopenia

Received: Jul 07, 2022
Accepted: Sep 29, 2022
Available Online: 23.12.2022

DOI:
10.5455/annalsmedres.2022.07.207

Abstract

Aim: We designed this study with the intention of determining the prevalence of sarcopenia and the association between sarcopenia findings and the severity of COVID-19 disease in COVID-19 patients.

Materials and Methods: As the study group, 92 patients aged 50 and over years old and whose PCR test results were positive and 45 days passed after the test result and recovered, 92 healthy individuals over 50 years of age, who were not infected with COVID-19, were included in the study group.

Results: While 33.7% of the patient group had severe sarcopenia, 7.61% sarcopenia, 30.43% probable sarcopenia, 28.26% did not have sarcopenia. While 3.26% severe sarcopenia and 10.87% probable sarcopenia were observed in the control group, 85.87% sarcopenia was not observed. The incidence of sarcopenia in the patient group was significantly higher than in the control group ($p<0.001$).When all participants were divided into 2 groups as 50-65 years old and over 65 years old, sarcopenia was observed at a rate of 32.65% in the 50-65 age group patient group, while sarcopenia was observed at a rate of 1.39% in the control group. While sarcopenia was observed, 10% of the control group had sarcopenia.

Conclusion: The findings of this study show that people with the COVID-19 infection had an increased frequency of sarcopenia.

Introduction

COVID-19 is a common fatal disease ll over the world, caused by a member of coronavirus family named as SARS-CoV-2 virus, which can cause mild upper respiratory tract infection, severe pneumonia, mechanical ventilation requirement, and sepsis. Common clinical findings during the course of COVID-19 disease include; fever (88.7%), cough (67.8%), fatigue (38.1%), sputum (33.4%), shortness of breath (18.6%), sore throat (13.9%), and headache (13.6%). In addition, diarrhea (3.8%), vomiting (5.0%) and some neurological symptoms can be seen in some of the patients [1].

To stop the pathogen from spreading during the COVID-19 pandemic, strict measures must be adopted. Mandatory measures were implemented, including travel limitations, extended home time isolation, and gym closures [2,3]. The elderly population in our nation was subjected to these procedures with more rigor and for a longer period of time. In older people who are more susceptible to sarcopenia, the decline in physical activity could hasten the progression of the disease [4]. People with COVID-19 infections also had to stay in bed for a long time at the hospital or at home. The average hospital stay was 8 to 12 days, according to reports. An elevated risk of sarcopenia should be anticipated given that the length of hospitalization due to COVID-19 infection may be prolonged in people over the age of 65. High metabolic stress and muscle breakdown can be brought on by a severe inflammatory response brought on by a COVID-19 infection, particularly the cytokine storm produced by interferon-, interferon-, IL-6, IL-12, tumor necrosis factor-, C-reactive protein, and monocyte chemotactic protein-1 [5]. The link between sarcopenia and COVID-19 has the potential to be reciprocal and to spiral out of control [6]. However, sarcopenia therapies show promise in ending this cycle and may be helpful in the management of both disorders. Sarcopenia is thought to affect 5–13% of elderly persons between the ages of 60 and 70. On the other hand, it is well known that for those 80 years of age or older, the frequency of disease rises to 50% [7]. Sarcopenia during the COVID-19 pandemic, however, would be more likely

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to arise among elderly people with sedentary lifestyles and chronic illnesses.

The incidence of sarcopenia in the elderly and/or people with various conditions is the subject of numerous researches in the literature. The frequency of sarcopenia in elderly people who have had a Covid 19 infection and the connection between sarcopenia with the clinical manifestation of infection are both unknowns, though. On the basis of this concept, we designed this study with the goal of determining the association between sarcopenia findings and COVID-19 disease severity.

The primary goal of this study was to quantify the prevalence of sarcopenia in patients who had Covid-19. Patients with Covid-19 were shown to have a frequency of sarcopenia of 32.65%, compared to 1.39% in the control group in the same age range.

Materials and Methods

As the study group, since this study was conducted in the first months of the COVID-19 pandemic and the number of patients could not be predicted, all patients who applied to our hospital who had COVID-19 and met our study criteria over the age of 50 were included in the study. 92 patients aged 50 and over who applied to patients between November 2020 and January and whose PCR test results were positive and 45 days passed after the test result and recovered, 92 healthy individuals over 50 years of age, who were not infected with COVID-19, were included in the study group. As a group, a total of 184 patients were included in the study. Exclusion criteria include; a psychiatric disease which can disrupt communication, pacemaker, inability to walk, edema in extremities, severe heart and kidney failure, inflammatory disease, any infection other than COVID-19, and diagnosis of a malignant disease. Written informed consent was obtained from all participants (or their legal representatives). Clinical evaluations were performed by an experienced physiotherapist. The study protocol was approved by Gaziantep University Research Ethics Committee (Date:30.12.20 Protocol:394).The study was conducted in accordance with Helsinki declaration.

Demographic information such as age, sex, occupation, education level, smoking and exercise habits, and regularly used medications of included patients were recorded. Information about the clinical course of COVID-19 infection was also recorded in all patients.

The European Working Group on Sarcopenia in Older People (EWGSOP2) revised criteria, which were released in 2019, were used to make the clinical diagnosis of sarcopenia. The SARC-F questionnaire should be used, according to the EWGSOP2, to assess sarcopenia's characteristics while screening patients. The SARC-F is a questionnaire that assesses the strength, assistance needed to walk, ability to get out of a chair, ability to climb stairs, and history of falling. Scores can vary from 0 to 10, and 4 was chosen as the cutoff point for sarcopenia [8]. The SARC-F questionnaire's Turkish translation underwent a validity and reliability testing [9].

Body weight and body composition of the participants were measured using a bioelectric impedance analyzer. The bioelectric impedance analyzer's basic operation is to measure the various resistance levels of tissues by exposing them to a tiny quantity of electric current without causing damage. A Tanita Segmental Body Composition (Monitor Tanita BC-545N) device was used in this study. Body weight, Body Mass Index (BMI), body fat ratio, body fluid ratio, muscle mass, bone mineral weight, basal metabolic rate, and body fat data were measured. FFMI (fat free mass index) was calculated. The cut-off value for appendicular skeletal muscle mass was considered as 15 kg for women and 20 kg for men according to EWGSOP2 [10].

Gait speed

Using the 4-metergait speed test, physical performance was assessed. A simple, quick, and reliable way for assessing sarcopenia is gait speed. In cases of severe sarcopenia, a gait speed cutoff of 0.8 m/sec for a distance of 4 meters has been established [10]. The test was applied for twice and the best score was recorded. The subjects underwent a second evaluation for sarcopenia after being screened with SARC-F. Patients with a SARC-F score of four or above had their muscle mass, gait speed, and strength reevaluated for signs of sarcopenia. Patients were divided into three groups based on the results of this assessment: non-sarcopenic, probably sarcopenic, and sarcopenic [10,11,12].

Comorbidity assessment

Comorbidity was evaluated using the Charlson Comorbidity Index (CCI). The CCI is frequently used to categorize coexisting conditions. CCI is a scale that aims to predict the effect of various diseases on mortality and morbidity. In this index, 1 point was assigned for a history of myocardial Infarction, congestive heart failure, peripheral vascular diseases, cerebrovascular diseases, dementia, chronic pulmonary disease, connective tissue disease, ulcer disease, mild liver disease, and diabetes mellitus. Two points were assigned for hemiplegia, moderate or severe renal disease, diabetes mellitus with end-organ damage, presence of malignancy, leukemia, and malignant lymphoma. Three points were given for moderate or severe liver disease and 6 points were assigned for metastatic solid malignancy and AIDS. Information about comorbid diseases of patients were recorded. Charlson Comorbidity Index (CCI) was used in the evaluation of comorbid diseases. CCI is a scale which aims to predict the effect of disease on mortality and morbidity of the patient. The risk of mortality and morbidity is increased in patients with CCI score more than [13].

Evaluation of dyspnea

The modified Borg Dyspnea scale is a 0-10 rated numerical score used to measure dyspnea. The Modified Borg scales (MBS), scored between zero and 10, was used to evaluatethe dyspnea. The severity of dyspnea is determined by this scale, which has 10 items. [14].

Evaluation of fatigue

The Visual Analogue Scale was used to evaluate fatigue severity. The participants were asked to rate their level of fatigue in the last week and a scale was used including

Table 1. Clinical course of COVID-19 infection in patients with sarcopenia.

	Age		
	50-65	>65	Total
Non-sarcopenia	33 (67.3%)	21 (48.8%)	54 (58.7%)
Sarcopenia	16 (32.7%)	22 (51.2%)	38 (41.3%)
Total	49 (100.0%)	43 (100.0%)	92 (100.0%)

Table 2. Comparison of the sarcopenic and non-sarcopenic group.

	NS/S	n	Mean±SD	p
Age	Non-sarcopenic	54	61.02 ±8.85	0.026*
	Sarcopenic	38	65.47±9.51	
SARC-F	Non-sarcopenic	54	3.04±2.35	0.002*
	Sarcopenic	38	4.39±1.42	
	Sarcopenic	38	16.95±7.93	
	Sarcopenic	38	16.13±6.92	
BMI	Non-sarcopenic	54	31.113.93	0.010*
	Sarcopenic	38	28.67±4.88	
FFMI	Non-sarcopenic	54	19.71±1.92	0.001*
	Sarcopenic	38	16.58±2.39	
Speed of Walking	Non-sarcopenic	54	1.14.45	0.033*
	Sarcopenic	38	1.38±0.62	
VAS- Fatigue	Non-sarcopenic	54	4.61±2.76	0.049*
	Sarcopenic	38	5.74±2.51	
	Sarcopenic	38	2.67±2.05	
CCI	Non-sarcopenic	54	2.042.11	0.003*
	Sarcopenic	38	3.45±2.30	

*: statistical significance.

scores ranging from zero to 10. The score of "0" indicated the absence of fatigue, while the score of "10" indicated the most severe fatigue that has ever been experienced [15].

Statistical analysis

The data obtained from the study are shown as mean, standard deviation, broad for categoricals, and percentages for appropriate models. Numericals were tested with the Shaphiro Wilk test, which is normally applied. The Mann U test was applied to the students who were not taken to a two-person exam in the normally distributed education. The Kruskal Wallis test was used to apply the untaught dimensions of ANOVA to redesign the normally distributed ones. We tested with Spearman rank content. Additionally, the chi-square analysis of the relationship between categorical fits was tested. Analyzes were performed using SPSS 22.0 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.). It is close to the $p<0.05$

Results

The mean age of the patient group was 62.8, and the mean age of the control group was 61.7. In terms of sex distribution, the patient groups were given respectively; 43 (46.7%) women, 49 (53.2%) men, 46 (50%) women and 46 (50%) men in the control group. The course of infection in the patient group was mild, severe, and critical in 60.87%, 33.70%, and 5.43% of patients, respectively. In the patient group, 48.91% of the participants received inpatient treatment and 51.09% outpatient treatment. The mean hospital stay was 9.53 days. Muscle pain was present in 67.39% of the patient group. None of the patients included in the study were intubated during the course of infection.

While 33.7% of the patient group had severe sarcopenia, 7.61% sarcopenia, 30.43% probable sarcopenia, 28.26% did not have sarcopenia. While 3.26% severe sarcopenia and 10.87% probable sarcopenia were observed in the control group, 85.87% sarcopenia was not observed. The incidence of sarcopenia in the error group was significantly higher than in the control group ($p<0.001$).

When all participants were divided into 2 groups as 50-65 years old and over 65 years old, sarcopenia was observed at a rate of 32.65% in the 50-65 age group patient group, while sarcopenia was observed at a rate of 1.39% in the control group. While sarcopenia was observed, 10% of the control group had sarcopenia.

There was no discernible difference in the clinical course of COVID-19 between the sarcopenic and non-sarcopenic patients in the patient group ($p>0.05$) (Table 1). There was no correlation between the frequency of sarcopenia and the severity of infection in the patient group ($p = 0.189$). In the patient group, sarcopenia was observed in 33.9% of patients with mild clinical course, 51.6% of patients with severe disease and 60% of patients with severe disease.

There was a positive correlation between the rate of smoking and the frequency of sarcopenia in the patient group ($p=0.027$). As a result, smoking is more prevalent in sarcopenic individuals. The rate of muscle pain during COVID-19 disease was 53.2% and 46.8% in patients with and without sarcopenia, respectively. This difference was statistically significant ($p<0.05$). There was no significant difference in sarcopenia between outpatients and inpatients during the COVID-19 disease process ($p>0.05$). Despite the fact that the sarcopenic group's hospital stay was longer than the non-sarcopenic group's, there was no statistically significant difference. ($p>0.05$).

Sarcopenia was shown to occur more frequently in patients who were older and had a higher comorbidity index ($p<0.05$). Comparison of clinical parameters of patients with and without sarcopenia is shown in Table 2.

Discussion

It is well recognized that as people age, sarcopenia occurs more frequently. The frequency of sarcopenia varies between 1-29 % in different age groups. Our investigation revealed that the prevalence of sarcopenia was higher than rates reported in the literature for the same age group. We thought that this increase might be related with a history of COVID-19 infection. Our findings indicated that sarcopenia occurs more frequently when COVID-19 is infected. With advancing age, sarcopenia occurs more frequently. The obesity prevalence of patients in this study was higher than the average of Turkey and World [16].

Contrary to predictions, no substantial correlation between sarcopenia and obesity was discovered. It is possible that people with morbid obesity, which causes higher sarcopenia results, may experience a more severe clinical course of COVID-19.

The clinical course of the COVID-19 infection also exhibits elements known to be linked to sarcopenia, such as decreased physical activity, inflammation, and oxidative stress. The COVID-19 infection progresses with diffuse intravascular coagulopathy, sepsis, and reduced oxygen transport to tissues [17]. Lower oxygen levels and more free radicals in the circulation led to less efficient energy production. It was shown that the ratio of oxidative stress /antioxidant capacity increases in the body during both sarcopenia and the COVID-19 infection [18]. As a result, it is possible that the damaging process brought on by the infection and inflammation in COVID-19-infected people will also result in sarcopenia.

According to their comorbidity index scores, our patients have a mild comorbidity. It can be inferred that sarcopenia and COVID-19 have a closed association because the comorbidity level is not very high.

The VAS fatigue scale of our patients was at moderate level. Presence of fatigue at a moderate level can be associated with advanced age, post-COVID 19 infection, obesity, and sarcopenia.

The rate of smoking was higher in the patients with sarcopenia when compared to patients without sarcopenia [19]. This suggests that smoking may facilitate the development of sarcopenia.

When individuals with or without sarcopenia were compared, those with sarcopenia had a higher incidence of myalgia symptoms during the infection. According to reports, 25% of patients who contracted COVID-19 may have experienced myalgia, and levels of creatinine kinase rose to various degrees. It was reported that myalgia could be considered as a predictor of severity of COVID-19 infection [20]. In other words, it can be said that sarcopenia is more common in those who have experienced COVID-19 infection more severely.

The findings of this study show that patients with the COVID-19 infection have an increased prevalence of sarcopenia. Although there is a chance of dying from a COVID-19 infection, it is also necessary to consider any potential aftereffects, and long-term monitoring will be helpful. Given that the COVID-19 pandemic is still ongoing and that people of all ages could become infected at this time, it is possible to hypothesize that sarcopenia will become a significant and widespread health issue. To assess the causation association between the COVID-19 infection and sarcopenia, additional population-based research with bigger study populations are needed.

Limitations

The present study had several limitations, including a relatively small study population, monitoring participants according to various clinical findings in terms of the COVID-19 infection, the presence of BMI levels above Turkey's average level, the use of a cross-sectional study design, and the inability to generalize the findings.

Conclusion

Sarcopenia, which is more frequently seen in older people in the literature, was seen in our study at a substantially higher rate, even in the middle-aged group of patients having Covid-19, who were between the ages of 50 and 65.

Ethics approval

The study protocol was approved by Gaziantep University Research Ethics Committee (Protocol no:394).

References

1. Singhal T. A Review of Coronavirus Disease-2019 (COVID-19). Indian J Pediatr. 2020;87:281-286.
2. Rothe C, Schunk M, Sothmann P, et al. Transmission of 2019-nCoV Infection from an Asymptomatic Contact in Germany. N Engl J Med. 2020;382:970-971.
3. Li Q, Guan X, Wu P, et al.Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus-Infected Pneumonia. N Engl J Med. 2020;382:1199-1207.
4. Patel HP, Syddall HE, Jameson K,et al. Prevalence of sarcopenia in community-dwelling older people in the UK using the European Working Group on Sarcopenia in Older People (EWGSOP) definition: findings from the Hertfordshire Cohort Study (HCS). Age Ageing. 2013;42:378-84.
5. Filgueira TO, Castoldi A, Santos LER,et al.The Relevance of a Physical Active Lifestyle and Physical Fitness on Immune Defense: Mitigating Disease Burden, With Focus on COVID-19 Consequences. Front Immunol. 2021;12:587146.
6. Costela-Ruiz VJ, Illescas-Montes R, Puerta-Puerta JM, Ruiz C, Melguizo-Rodríguez L. SARS-CoV-2 infection: The role of cytokines in COVID-19 disease. Cytokine Growth Factor Rev. 2020;54:62-75.
7. Morley JE. Sarcopenia: diagnosis and treatment. The Journal of Nutrition Health and Aging. 2008; 12: 452-456.
8. Malmstrom TK, Morley JE. SARC-F: a simple questionnaire to rapidly diagnose sarcopenia. J Am Med Dir Assoc. 2013;14:531-2.
9. Bahat G, Yilmaz O, Kılıç C, Oren MM, Karan MA. Performance of SARC-F in Regard to Sarcopenia Definitions, Muscle Mass and Functional Measures. J Nutr Health Aging. 2018;22:898-903.
10. Cruz-Jentoft AJ, Bahat G, Bauer J,et al. Writing Group for the European Working Group on Sarcopenia in Older People 2 (EWGSOP2), and the Extended Group for EWGSOP2. Sarcopenia: revised European consensus on definition and diagnosis. Age Ageing. 2019;48:16-31.
11. Walrand S, Guillet C, Salles J, Cano N, Boirie Y. Physiopathological mechanism of sarcopenia. Clin Geriatr Med. 2011;27:365-85.
12. Studenski S, Perera S, Patel K, et al. Gait speed and survival in older adults. JAMA. 2011;305:50-8.
13. Ng AC, Chow V, Yong AS, Chung T, Kritharides L. Prognostic impact of the Charlson comorbidity index on mortality following acute pulmonary embolism. Respiration. 2013;85:408-16.
14. Ries AL, Bauldoff GS, Carlin BW, et al. Pulmonary Rehabilitation: Joint ACCP/AACVPR Evidence-Based Clinical Practice Guidelines. Chest. 2007;131:4-42.
15. Lee KA, Hicks G, Nino-Murcia G. Validity and reliability of a scale to assess fatigue. Psychiatry Res. 1991;36:291-8.
16. Ozcirpici B, Coskun F, Sahınoz S, Ozgur S, Bozkurt AI. Obesity prevalence in gaziantep, Turkey. Indian J Community Med. 2009;34:29-34.
17. Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet. 2020;395:497-506.
18. Laforge M, Elbim C, Frère C, et al.Tissue damage from neutrophil-induced oxidative stress in COVID-19. Nat Rev Immunol. 2020;20:515-516.
19. Vardavas C I, Nikitara K. COVID-19 and smoking: A systematic review of the evidence. Tobacco İnduced Diseases. 2020; 18:20.
20. Morley JE,Vellas B. Covid-19 and older adult. The Journal Of Nutrition, Health & Aging. 2020; 24: 364-365.