Research Article

Impact of Exercise on Covid-19 Patients in Saudi Arabia

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ABSTRACT

BACKGROUND: The importance of exercise is improving the human body in different ways. Studies have shown that physical activity has a relationship with the enhancement of the immune system and maintains the body in a fit state, which explains the positive results of exposure to infection.

Aim of the study: To measure the effectiveness of moderate exercise concerning symptoms, severity, and the recovery rate in COVID-19 patients

METHODS: This is a cross-sectional study conducted in main cities in the Qassim region of Saudi Arabia. This investigation was undertaken during the pandemic of COVID-19, targeting individuals diagnosed with COVID-19. The final sample size was 385 individuals out of the 1,450,000 million Saudi Arabia population in Al-Qassim. The data was collected using a Self-administered online questionnaire and analyzed using statistical software SPSS.

RESULTS: A total of 186 participants were included in this study. The majority of respondents were female (68.8%), most of the respondents (47.3%) were normal weight, and 35.5% were overweight. Regarding the medical history of COVID19 infection (75.8%), they are infected with COVID19. A statistically significant association was found between exercise practice and the disappearance of symptoms *(p<0.01)*. It disappeared early during exercise. In addition, normal-weight respondents resolved their symptoms faster than other respondents *(p <0.05)*. The results show that the most common and less common symptoms of COVID-19 were most frequently reported among normal weight respondents, and the most severe symptoms were most frequently reported among overweight respondents *(p<0.01)*.

CONCLUSION: The present study results show that moderate exercise in patients with COVID-19 can be a valuable tool to improve symptoms, severity, and the recovery rate in COVID-19 patients. Moreover, our results showed that overweight patients were correlated with a severe clinical course of COVID-19.

1. INTRODUCTION

Coronavirus disease (COVID)-19 is an infectious coronavirus disease caused by a coronavirus, a newly discovered type (1). A new coronavirus was the cause of a disease outbreak identified In December 2019. That originated in Wuhan, the capital of Hubei, China, and spread worldwide. The disease comes with upper respiratory illness and symptoms like fever, dry cough, headache, loss of taste and smell, and diarrhea (1). Cytotoxic T-cells (CTLs) and Natural Killer (NK) cells are required to generate an effective immune response against viruses (2). The immune system is very responsive to exercise; however, moderate exercise improves the recirculation of immunoglobulin, neutrophils, and natural killer cells (3). During times of Corona disease outbreak, there was an increase in sedentary life and weight gain in addition to the quarantine. There is strong evidence indicating that in obese individuals, excess adiposity impairs immune function and host defense. Additionally, obesity increase infection susceptibility and complications; several epidemiological investigations have reported. Numerous studies have reported obesity as an independent risk

factor for increased morbidity and mortality following infection with the 2009 pandemic influenza A (H1N1) virus (4). As of August 22, 2020, World Health Organization (WHO) reported 306,370 confirmed cases in Saudi Arabia; 24,310 are active, while 1652 of these are critical. The main strategies for reducing its spread include hygiene and social distancing, isolation, and boosting the immunity of individuals and the public (6). The immune response to the virus varies depending on genetics, age, and physical state. Studies indicate that physical exercise significantly alters the immune system (5). Most sedentary countries in recent years have undergone a significant increase in pandemic proportions which have likely further accelerated due to the COVID-19 pandemic (6). On the other hand, after infection with SARS-CoV, physical activity and health are impaired, which can continue for up to 1 to 2 years (7). Accordingly, we aim in our study to focus on the best ways to minimize the severity of the symptoms of COVID-19, to find out the main connection between the intensity of the exercises and the body's immunity against the virus, and to improve the function of the body immune system against the COVID-19 infection. Furthermore, to reduce the deadly complications of COVID-19. Previous studies showed that moderate exercise improves the immune system and reduces the incidence and severity of infection. Hence, we hypothesize that COVID-19 patients who do moderate exercise will have reduced symptoms severity and a fast recovery rate instead of those who do not practice any physical activity. Therefore, in this study, we determined the effect of exercise on COVID-19 patients, investigated the relationship between exercise and the immune system, and determined the role of obesity in COVID-19 disease.

2. METHODS

2.1 Study Design, Study Area, Study Population & Sampling

This is a cross-sectional study conducted in the Qassim region of Saudi Arabia. An online questionnaire was sent to the involved individuals, and the goal is to investigate the relationship between exercise and COVID-19 symptoms. This investigation was conducted during the pandemic of COVID-19 in 2020; it includes the population of Qassim in a cross-sectional study. Online questioners were sent through social media to investigate the relationship between exercise and COVID-19 symptoms in diagnosed COVID-19 patients. Particular criteria included individuals between 20 and 50 years old and excluded individuals less than 20 and more than 50. In addition, it was required for all participants to be free from a chronic illness like diabetic mellitus and hypertensive and not smoke.

2.2 Sample Size and Selection of Sample

According to Raosoft online sample size calculator, we sample 385 individuals who had been infected with COVID-19 out of 1,450,000 million of Saudi Arabia's population in Qassim. In this study, the confidence level is 95%, the margin error is 5%, and 50% is the response distribution.

2.3 Data Collection and List of Variables

We used an online self-administrated questionnaire to preserve social distancing, and the primary data was collected from participants who had COVID 19 in Qassim. This study was conducted on people who had COVID-19 considering their backgrounds (Age, weight, height, and region of living) and specifically their variables in exercise such as frequency (sessions per week), the intensity (training load expressed as resistance). Also, type (activity) and time (repetitions).

2.4 Research Instrument and Data Management

The questionnaire aimed to determine their ages, gender, weights, and height and know their living area inside Qassim. In addition, there were direct questions about whether they caught the virus and what the symptoms they had and the duration, and other questions focused on the quality of their lives, like if they exercise and if they have a healthy, well state free of any chronic diseases. We used electronic archives. Data was stored in a widely available spreadsheet format (SPSS). The information was preserved and was not shared; research members only accessed it.

2.5 Participants in the Study and Data Analysis Plan

The participants were volunteers, unpaid, and anonymous from main Qassim regions by online questionnaire was targeted whom Covid 19 infected. The analysis was based on the types of variables and described statistics in tables and graphs and differential statistics in the form of a chi-square test. The p-value was represented by using the standard o 0.05 cutoff of statistically significant, and we calculated a 95% confidence interval. The null hypothesis is rejected when $p<0.05$ and not rejected when $p>0.05$.

3. RESULTS

A total of 186 respondents were included in the current study, most of them were females (68.8%), and 31.2% were males. The distribution of their age was as follows: 20 to 25 years (29%), 26 to 30 years (18.8%), 31 to 35 years (12.4%), 36 to 40 years (18.8%), 41 to 45 years (9.1%) and 46-50 years (11.8%). The majority of the respondents (37.6%) were from Unayzah city. Most of the respondents (47.3%) had normal weight, and 35.5% had overweight. More information is presented in **Table 1**.

Regarding respondents' quality of life, 11 (5.9%) were smokers, and no one had chronic diseases. 45.7% of the respondents do exercises, and about the kind of exercise they do, half of the respondents do moderate aerobic, and 21.2% do strength training. Regarding the frequency of exercise, most (61.2%) exercise 3 times or less per week, and only 12.9% exercise daily. The most-reported exercise duration was 20 to 39 minutes per day, followed by less than 20 minutes per day and 40 to 60 minutes per day, representing 27.1% of the respondents (**Table 2**). Regarding the history of COVID-19 infection, 141 (75.8%) had been infected by COVID-19, and when they

Table 1: Socio-demographic characteristics of study Respondents (n=186)

Variable	Category	Frequency	Percent
Age (Years)	20-25	54	29%
	26-30	35	18.8%
	31-35	23	12.4%
	36-40	35	18.8%
	41-45	17	9.1%
	46-50	22	11.8%
Gender	Male	58	31.2%
	Female	128	68.8%
Qassim region	Buraydah	25	13.4%
	Unayzah	70	37.6%
	Al Rass	39	21%
	Albukayriyah	37	19.9%
	Others	15	8.1%
Body Mass Index (BMI)	Underweight	11	5.9%
	Normal	88	47.3%
	Overweight	66	35.5%
	Obese	13	7%
	Extremely obese	8	4.3%

Table 2: The quality of life of the study respondents

Variable	Frequency	Percent
Do you smoke?		
Yes	11	5.9%
No	175	94.1%
Do you suffer from any chronic diseases?		
Yes	0	0
No	186	100%
Do you do exercises?		
Yes	85	45.7%
No	101	54.3%
Which kind of exercise do you do? (n=85)		
Moderate aerobic (e.g.: brisk walking, swimming)	43	50.6%
Vigorous aerobic (e.g.: running)	16	18.8%
Strength training like the use of weight machines, your own body weight	18	21.2%
None of the above	8	9.4%
How many times do you exercise per week? (n=85)		
3 times or less/week	52	61.2%
4-6 times/week	22	25.9%
Everyday	11	12.9%
For how long do you do exercise? (n=85)		
< 20 min./day	23	27.1%
20-39 min./day	30	35.3%
40-60 min./day	23	27.1%
> 60 min./day	5	5.9%
I do not know exactly	4	4.7%

were tested for COVID-19, 141 (75.8%) were positive, and 45 (24.2%) were negative. Out of 141 respondents, 26 (18.4%) needed special medical attention, while 115 (81.6%) did not need it because their symptoms were mild. Regarding the reported symptoms of COVID-19, most of the respondents (50.4%) experienced the most common symptoms, and 39 (27.7%) experienced both the most common and less common symptoms of COVID-19 (**Figure 1**). Symptoms disappeared after 7 to 9 days in 59 (41.8%) of the respondents and after 4 to 6 days in 52 (36.9%) of the respondents (**Figure 2**).

We conducted a chi-square test to explore the relationship between exercise and symptoms, severity, and the recovery rate in COVID-19 patients. A statistically significant association *(p < 0.01)* was found with the disappearance of the symptom; symptoms disappear faster in respondents doing exercise than in those who do not.

Furthermore, the higher percentages of quick disappearance of symptoms (2 to 6 days) were observed among respondents doing exercise, while the higher percentages of the slow disappearance of symptoms (7 to ≥ 10 days) were observed among respondents who did not exercise. More information is provided in **Table 3**.

The Chi-square test explored the relationship between the Body Mass Index (BMI) concerning symptoms, severity, and recovery rate in COVID-19 patients. A statistically significant association (p < 0.05) was found

Table 3: Effectiveness of exercise concerning symptoms, severity, and the recovery rate in COVID-19 patients

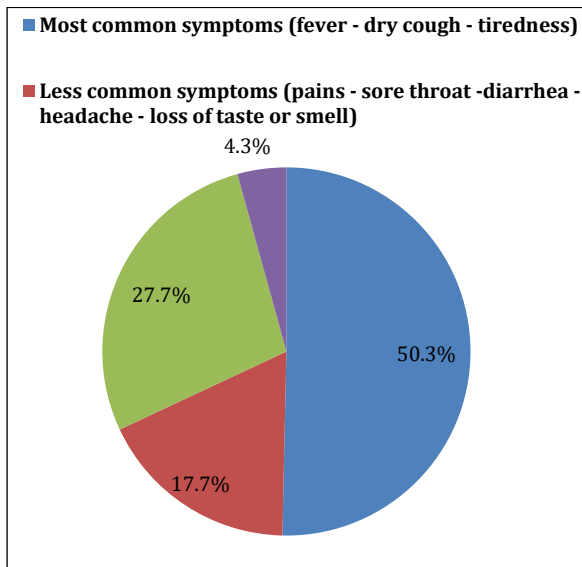| Variable	Category	Doing Exercise		P value
		Yes	No	
Symptoms	Most common	36 (50.7)	35 (49.3)	*0.074*
	Less common	14 (56)	11 (44)	
	Serious	2 (33.3)	4 (66.7)	
	Most & Less	11 (28.2)	28 (71.8)	
Need of special medical attention	Yes	13 (50)	13 (50)	*0.546*
	No	50 (43.5)	65 (56.5)	
Symptoms disappearance	2-3 days	4 (100)	0 (0)	*0.001*
	4-6 days	32 (61.5)	20 (38.5)	
	7-9 days	20 (33.9)	39 (66.1)	
	≥ 10 days	7 (26.9)	19 (73.1)	

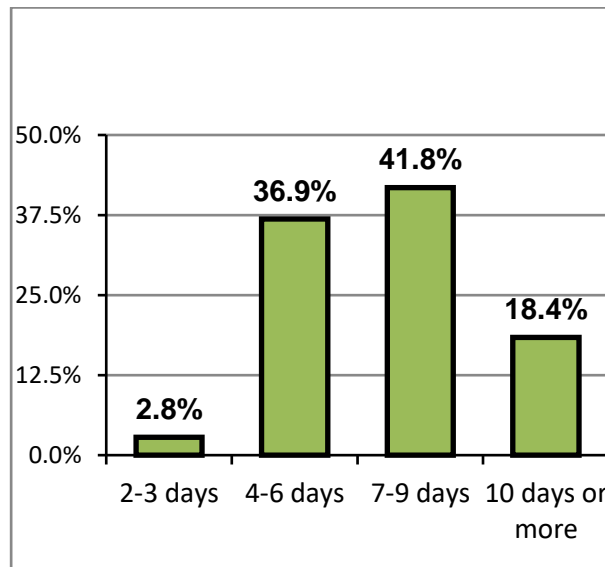*Figure 1: What are the symptoms did you feel? (n=141)*

Figure 2: For how long symptoms disappear totally? (n=141)

between the symptoms and symptoms disappearance. Our results revealed that the most common symptoms and less common symptoms of COVID-19 were most reported among respondents with normal weight, while the serious symptoms were most reported among respondents with overweight.

Also, we found that symptoms disappear faster in respondents with normal weight than others. The higher percentages of quick disappearance of symptoms (2 to 6 days) were observed among respondents with normal weight, while the higher percentages of the slow disappearance of symptoms (7 to ≥ 10 days) were observed among respondents with overweight. More information is provided in **Table 4**.

Table 4:Association between BMI and symptoms, severity, and the recovery rate in COVID-19 patients

Variable	Category	Body Mass Index (BMI)					P Value
		Under-weight	Normal	Over-weight	Obese	Extremely obese	
Symptoms	Most common	3 (4.2)	38 (53.5)	25 (35.2)	4 (5.6)	1 (1.4)	*0.008*
	Less common	0 (0)	11 (44)	8 (32)	4 (16)	2 (8)	
	Serious	0 (0)	1 (16.7)	3 (50)	0 (0)	2 (33.3)	
	Most & Less	3 (7.7)	17 (43.6)	16 (41)	3 (7.7)	0 (0)	
Special medical attention	Yes	0 (0)	10 (38.5)	11 (42.3)	3 (11.5)	2 (7.7)	*0.370*
	No	6 (5.2)	57 (49.6)	41 (35.7)	8 (7)	3 (2.6)	
Symptoms disappear	2-3 days	0 (0)	2 (50)	1 (25)	0 (0)	1 (25)	*0.021*
	4-6 days	2 (3.8)	34 (65.4)	14 (26.9)	2 (3.8)	0 (0)	
	7-9 days	3 (5.1)	24 (40.7)	25 (42.4)	6 (10.2)	1 (1.7)	
	≥10 days	1 (4.3)	7 (26.9)	12 (46.2)	3 (11.5)	3 (11.5)	

Table 5:Kind of exercise in relation to COVID-19 infection, symptoms, severity, and the recovery rate in COVID-19 patients

Variable	Category	Kind of exercise				P value
		Moderate aerobic	Vigorous aerobic	Strength training	None of the above	
COVID-19 infection	Yes	31 (49.2)	14 (22.2)	12 (19)	6 (9.5)	*0.550*
	No	12 (54.5)	2 (9.1)	6 (27.3)	2 (9.1)	
Symptoms	Most common	19 (52.8)	9 (25)	5 (13.9)	3 (8.3)	*0.377*
	Less common	6 (42.9)	2 (14.3)	4 (28.6)	2 (14.3)	
	Serious	0 (0)	0 (0)	1 (50)	1 (50)	
	Most & Less	7 (63.6)	2 (18.2)	2 (18.2)	0 (0)	
Special medical attention	Yes	4 (30.8)	2 (15.4)	4 (30.8)	3 (23.1)	*0.119*
	No	28 (56)	11 (22)	8 (16)	3 (6)	
Symptoms disappear	2-3 days	2 (50)	1 (25)	1 (25)	0 (0)	*0.659*
	4-6 days	18 (56.3)	6 (18.8)	6 (18.8)	2 (6.3)	
	7-9 days	9 (45)	6 (30)	3 (15)	2 (10)	
	≥ 10 days	3 (42.9)	0 (0)	2 (28.6)	2 (28.6)	

The relationship between the kind of exercise concerning COVID-19 infection, symptoms, severity, and recovery rate was assessed using the chi-square test. There was no statistically significant association *(p >0.05)* between the tested variables. Therefore, the exercise did not affect the infection, symptoms, severity, or recovery rate of COVID-19 infection. More information is provided in **Table 5**.

4. DISCUSSION

This study examined moderate exercise's effectiveness in relation to symptoms, severity, and recovery in COVID 19 patients in major cities in the Qassim region of Saudi Arabia. Therefore, it is necessary to regain the physical activity of inactive people and position it as a tool in the management of COVID 19 patients. Furthermore, given that COVID19 syndrome is beneficial in some medical conditions that are similar in both symptoms and possible pathogenic mechanisms, the potential beneficial effects should be considered to bring recovery to these patients. Most of our participants had been infected by COVID-19 (75.8%), and more than half of them had experienced the most common symptoms (fever, dry cough, and tiredness), and less than a third experienced both most common and less common symptoms (pain, loss of taste and smell, diarrhea and sore throat) of COVID-19. Even though less than half of our participants were doing exercise, our results revealed that moderate exercise was significantly associated with the disappearance of symptoms of COVID19. Furthermore, the higher percentages of quick disappearance of symptoms (2 to 6 days) were observed among respondents doing exercise. These findings followed the results of several studies that have reported that moderate-intensity exercise decreases the period and symptoms of infectious episodes among COVID19 patients (8) (9) (10). However, another study in Iran showed that low-intensity exercises were more suitable than moderate exercise (11). Another study suggested that early rehabilitation exercise in patients with exacerbated disease is associated with a higher mortality rate (12). The association between exercise and improvement in symptoms, severity, and the recovery rate in this study may be due to immunological bases stated by previous studies; first of all, moderate physical exercise can promote blood circulation, let the immune cells timely transport and destroy the virus in the body, which is the main basis for physical exercise you effectively resist and contain coronavirus (13). Secondly, increasing the activity of the angiotensin-converting enzyme (ACE) in the renin-angiotensin system (RAS) during exercise improves the structural adaptability of the coronary artery tree, which can effectively resist SARS-CoV-2 and play a positive role in the mechanism of acute myocardial injury caused by COVID-19 (14). Third, sedentary living at home can lead to muscle fixation, damage, and deterioration of mitochondrial stability and cause organic and systemic inflammation, which is also an important mechanism of COVID-19

pathogenesis (15). Previous information about obesity and the increased severity of viral illnesses have raised concerns about the correlation between obesity and the current COVID-19 pandemic. In this study, we have outlined the impact of Body Mass Index (BMI) in relation to symptoms, severity, and the recovery rate in COVID-19 patients; the chi-square test was used. A statistically significant association (p < 0.05) was found between the symptoms and symptoms disappearance. Furthermore, our results revealed that the most common symptoms and less common symptoms of COVID-19 were most reported among respondents with normal weight, while the serious symptoms were most reported among respondents with overweight. Moreover, we found that the higher percentages of quick disappearance of symptoms (2 to 6 days) were observed among respondents with normal weight, while the higher percentages of the slow disappearance of symptoms (7 to ≥ 10 days) were observed among respondents with overweight. This is consistent with another study in the United Kingdom, which reported that the comorbidities associated with obesity were correlated with a severe clinical course of COVID-19 and increased mortality and high BMI be correlated with hospitalization, the need for mechanical ventilation, and non-survival (16). This is most likely due to various adverse effects of obesity on the cardiovascular and respiratory systems. Our study is a cross-sectional observational study; therefore, it cannot prove a causal relationship between variables. Furthermore, recall bias is common among these types of studies. Thus, additional types of studies such as case-control and cohort studies should be carried out, and also, studies on the immunological and inflammatory changes of these patients during exercise could be considered in the future. However, our study provided good evidence that moderate exercise could be an effective tool to decrease the severity and symptoms of COVID19.

5. CONCLUSION

The findings of this article show that moderate exercise, along with normal BMI, significantly reduces the symptoms and severity of COVID19. Therefore, the impact of these factors should be considered in COVID19 prevention and treatment protocols. In addition, further research is needed to elucidate this relationship on an immunological and molecular basis. In addition, systems and mechanisms to facilitate the integration of physical activity and medical cooperation need to be improved to address core technologies directly related to disease treatment and rehabilitation.

AUTHORS' CONTRIBUTION

All authors were involved in conceptualization, study design, searching of literature, and preparation of the manuscript. All authors have read and approved the final article.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

DISCLOSURE STATEMENT

None.

ETHICAL CONSIDERATION

Ethical clearance was obtained from the College of Medicine, Qassim University, KSA. Written consents were also obtained from all subjects who participated.

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