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ORIGINAL ARTICLE

Investigating the Impacts of Smoking and Exercise History on the Recovery Course among Covid-19 Patients

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ABSTRACT

Aim: The purpose of this study was to explore the effects of exercise and smoking history of the COVID-19 patients on their recovery course and time.

Methods: In this respect, as the data source, we observed a total of 310 patients, 176 males 134 females, who tested positive for COVID-19, had no chronic disease, and received inpatient or outpatient treatment. The patients also filled out a personal information form covering their demographic background, including smoking and exercise history. All participants received favipiravir as the standard medication, and their symptoms and the durations of these symptoms were evaluated using the focus group interview method. We analyzed the data on SPSS 17.0 utilizing Independent T-Test, one-way ANOVA, Chi-Square, and Pearson Correlation tests.

Results: The results revealed significant differences between former smokers and those who never smoked and quitted smoking by recovery time ($p<0.01$). There were also significant differences between those doing exercises actively and those who never did or quitted exercise ($p<0.01$). Again, with regard to recovery time, we found significant differences between groups that quitted exercise in different periods ($p<0.05$) and between those with different weights ($p<0.05$). In addition, we reached smoking cessation time and exercise history had positive relationships with recovery time.

Conclusion: Considering the results, we concluded that non-smoking and exercise had a positive impact on avoiding adverse effects of the COVID-19 disease.

Keywords: Covid-19, exercise, smoking, sports, acute respiratory syndrome

INTRODUCTION

In December 2019, the world met a new outbreak due to Coronavirus 2019 (COVID-19). This novel disease, initiated by severe acute respiratory syndrome coronavirus 2 (SAR2-COV-2), initially emerged in Wuhan, China[1]. Then, it has spread all over the world and become a global pandemic. Those infected with the virus show signs from a mild respiratory illness to severe conditions that may end up with mortality. Hopefully, case fatality rates (CFR) in COVID-19 are much lower than severe acute respiratory syndrome (SARS). CFRs of SARS and the Middle East respiratory syndrome (MERS) are 9.5% and 34.4%, respectively[2]. Yet, SARS-CoV-2 is more contagious, with an average R0 value of 3, and bears higher total mortality rates[2,3].

Smoking is among the leading risk factors for respiratory system infections[4]. Influenza and pneumonia are likely to develop two and five times more in smokers than in non-smokers, respectively. Therefore, smoking may necessarily be a factor exacerbating the effects of SARS-CoV-2. Previous research suggested substantial evidence that smoking is linked with an elevated risk of intensive care admission, more severe conditions, and higher mortality rates in hospitalized COVID-19 patients[1,5]. Some recent reports have suggested that COVID-19 patients often have other smoking-associated conditions; yet, such hospitalized patients interestingly have lower current smoking rates when compared to smoking prevalence in the population.

While some studies specifically focused on smoking[6], others combined active and former smokers,[5] suggesting that smoking prevalence data in these samples may be lacking. It is deemed essential to distinguish active smoking effects from long-term impacts of smoking history. Doing exercise is considered a kind of convenient, complementary therapy and well-known to have desirable impacts on many conditions. The American College of Sports Medicine and the American Medical Association officially urged that "exercise is medicine" in 2017. Regarding such a proposal, there is substantial evidence that doing exercise is closely linked with the immune system capacity[7]. Engaging in regular exercise may significantly contribute to the immune system and help reduce and eliminate infectious disease incidences[8]. However, it should be noted that one may experience an immunity decline due to a lack of exercise or high-intensity workouts[9,10].

Bernardi et al. reported that regular moderate-intensity exercise could undoubtedly boost the immune ability and effectively reduce the incidence of respiratory diseases[11,12]. Moreover, some studies concluded that the incidence, duration, and severity of upper respiratory infections could significantly reduce upon doing regular, moderate-intensity physical activities[13,14]. Shimojo et al. found out that mice with endotoxemia had an alleviation in inflammatory cytokines and increased anti-inflammatory cytokines thanks to one hour of swimming per day[15]. Prospective research persistently revealed that one may reduce their risk of infection or severity of latent infections by engaging in regular exercises[16,17]. In addition to contributing to a robust immune system, doing regular physical activities will also contribute to weight control, improved mood, better sleeping, anxiety relief, and accompanying symptoms in COVID-19 patients[18].

Ultimately, this study aimed to systematically explore the desired roles of non-smoking and exercise in

stimulating recovery and improving the quality of life among COVID-19 patients.

MATERIAL AND METHODS

The purpose of this study was to explore the effects of exercise and smoking history of the COVID-19 patients on their recovery course and time. In this respect, as the data source, we observed a total of 310 patients, 176 males 134 females, who tested positive for COVID-19, had no chronic disease and received inpatient or outpatient treatment. The patients also filled out a personal information form covering their demographic background, including smoking and exercise history. All participants received favipiravir as the standard medication, and their symptoms and durations of these symptoms were evaluated using the focus group interview method.

We analyzed the data on SPSS 17.0 using the Independent T-Test, one-way ANOVA, and Pearson Correlation tests.

RESULTS

We presented the findings of this study below in tables and evaluated them in the light of the relevant literature.

Table 1: Demographic characteristics of the sample

Parameters	Groups	N	%
Age	20 – 40 years	171	55.2
	41 – 60 years	139	44.8
Height	150 – 170 cm	182	58.7
	171 cm and over	128	41.3
Weight	60 -80 kg	174	56.1
	81 – 100 kg	136	43.9
Gender	Male	176	56.8
	Female	134	43.2
Smoking	Yes	70	22.6
	Never	201	64.8
	Quitted	39	12.6
Smoking Cessation Time	0 – 3 years	271	87.4
	3 years and over	39	12.6
Exercise History	Active	123	39.7
	Never	187	60.3
Exercise Cessation Time	0 – 3 years	280	90.3
	3 years and over	30	9.7
Recovery Time	7 days	117	37.7
	15 days	114	36.8
	16 days and over	79	25.5

As in Table 1, we concluded that the participants showed a sufficiently homogeneous structure in this study regarding their demographic characteristics.

As in Table 3, we also conducted a correlation analysis to see the interrelationships amongst our variables. We used Spearman correlation since some of our variables were categoric. As a result of the correlation analysis, we reached a positive correlation between exercise history and recovery time ($r=0.743$, $p<0.01$), medication and recovery time ($r=0.169$, $p<0.05$), Moreover we found that smoking was negatively correlated with recovery time ($r=-0.301$, $p<0.01$). Interestingly, we found a positive relationship between weight and recovery time ($r=0.143$, $p<0.05$).

As seen in Table 2, the results revealed significant differences between former smokers and those who never smoked and quitted smoking by recovery time ($p<0.01$). There were also significant differences between those doing exercises actively and those who never did or quitted exercise ($p<0.01$). Again, with regard to recovery time, we found significant differences between groups that quitted exercise in different periods ($p<0.05$) and between those with different weights ($p<0.05$). Nevertheless, we could not reach significant differences between the groups in other parameters. Overall, we concluded that active smokers, those who never did exercise, those with more weights, and those quitting sports more recently had prolonged recovery time than others.

Table 2: Statistical findings of recovery time by demographic characteristics

Parameters		N	M±SD	DF	T	p-value
Smoking Chi-Suquare	Yes	70	2.45±0.50	2	143,116	α=0.000 p≤0.01**
	Never	201	1.68±0.82			
	Quitted	39	1.82±0.38			
Gender	Male	176	1.80±0.80	308	3.302	α ≥ 0.70
	Female	134	1.97±0.75			
Height	150-170 cm	182	1.88±0.78	308	0.694	α ≥ 0.694
	171 cm and over	128	1.86±0.79			

Age	20 – 40 years	171	1.88±0.78	308	0.284	α ≥ 0.776
	41 – 60 years	139	1.86±0.79			
Smoking Cessation Time	0-1,9 years	271	1.88±0.82	308	0.630	α ≥ 0.630
	2 years and over	39	1.82±0.38			
Exercise Cessation Time	0-1,9 years	280	1.91±0.80	308	0.23	α=0.023 p≤0.05*
	2 years and over	30	1.56±0.50			
Weight	60 – 80 kg	175	1.78±0.77	308	-2.113	α=0.035 p≤0.05*
	81 – 100 kg	135	1.97±0.79			
Exercise History Chi-Suquare	Active	125	1.04±.21	308	11.613	α=0.001 p≤0.01**
	Never	185	2.42±0.49			

Table 3: Correlations between parameters and measured values of the sample

	Age	Height	Weight	Gender	Smoking	Smoking Cessation Time	Exercise History	Exercise Cessation Time	Medication	Recovery Time
Age	1	-.013	.159**	.156**	.021	.140*	.045	.190**	-.052	-.016
Height	-.013	1	.397**	.380**	-.162**	-.053	.098	.310**	-.074	.026
Weight	.159**	.397**	1	.465**	.159**	.268**	.174**	.144*	-.079	.143*
Gender	.156**	.380**	.465**	1	.116*	.256**	.207**	.107	.166**	.103
Smoking	.021	-.162**	.159**	.116*	1	.649**	-.257**	-.120*	-.245**	-.301**
Smoking Cessation Time	.140*	-.053	.268**	.256**	.649**	1	.102	.059	-.032	-.023
Exercise History	.045	.098	.174**	.207**	-.257**	.102	1	.359**	.161**	.743**
Exercise Cessation Time	.190**	.310**	.144*	.107	-.120*	.059	.359**	1	-.027	-.064
Medication	-.052	-.074	-.079	.166**	-.245**	-.032	.161**	-.027	1	.169**
Recovery Time	-.016	.026	.143*	.103	-.301**	-.023	.743**	-.064	.169**	1

DISCUSSION

The COVID-19 pandemic is undoubtedly a disaster. While SARS and MERS previously caused local outbreaks, the consequences of COVID-19 are clearly greater this time around. More than a year has passed since the onset of COVID-19, which has caused increasing numbers of mortalities. Many states and regional administrations have introduced quarantine policies to minimize the spread of the virus, which has led to a drastic reduction in exercise opportunities. Yet, current evidence suggests that doing regular physical activities can substantially contribute to the immune capacity[19] and reduce the likelihood of infection[20], which enlightens the way to treat COVID-19.

On the other hand, scholars found that smoking and smoking history significantly increase the risk of severe COVID-19 among people[5,6,21]. In this context, our findings contribute to such a spreading consensus in the literature by referring to the relevant research and exploring the relationships between smoking and exercise and the severity of COVID-19.

Several meta-analyses revealed that active smokers are at greater risk of mortality and may suffer from severe complications[22]. Besides, a meta-analysis interestingly showed that about half of the former smokers and 24% of the active smokers suffered severe complications during their recovery from COVID-19[22]. It may have been because former smokers had longer exposure times or suffered concomitant diseases [(e.g., Chronic obstructive pulmonary disease (COPD)] due to smoking. A similar issue was also revealed in a non-systematic meta-analysis by Guo FR. The study suggested that the patients with COPD developed severe COVID-19 by 4.38 times more than others[23]. In parallel with such findings, another non-systematic meta-analysis uncovered that the hospitalized active smokers experienced increased severity and mortality from COVID-19[24]. In addition, smoking history was previously reported to boost COVID-19 progression[25]. There is growing evidence supporting the statements from the WHO that COVID-19 is likely to follow a severe course in smokers, which may lead to mortality[26]. It seems, on the other hand, that the pandemic may be a noteworthy opportunity to quit smoking because of worse clinical outcomes and complications[27].

A recent study revealed that COPD patients and active smokers are likely to face upregulated ACE-2 gene expression in their airway epithelium, causing the emergence of a mechanism that leads to an increased risk of COVID-19 in smokers[28]. What mediates such upregulation is the α7 subtype of nicotine acetylcholine receptors (α7-nAChR) in smokers or regular nicotine consumers[29]. Thus, the research interest may be shifted to explore α7-nAChR antagonists (e.g., A-conotoxin, methyllycaconitine), used to assist smoking cessation, for their potential impacts on ACE-2 expression[30,31]. In addition, further research may focus on α7-nAChR and ACE-2 as potential therapeutic targets.

Previous research concluded that severe COVID-19 condition is associated with prevalent comorbidities (e.g., chronic kidney disease, cardiovascular disease, hypertension, and diabetes)[21]. Moreover, COPD is shown to be linked with insufficient clinical recovery and outcomes in spite of treatment. Also, COPD patients are likely to have severe COVID-19 four times more than those without COPD[32], which may be due to systemic and chronic inflammation, reduced respiratory function and capacity, and respiratory failures in COPD patients. In terms of smoking, Wheaton et al. (2019) found 15.2% of active smokers, 7.6% of former smokers, and 2.8% of non-

smokers had COPD[33]. Hence, COPD and smoking should be regarded as a single risk factor for severe COVID-19.

Some factors put limitations on the interpretation of the present results. First, most of the studies referred to in this research are retrospective and epidemiological ones. Secondly, some of the studies included did not attempt to differentiate active or former smokers and their exercise statuses. Thirdly, previous studies categorized COVID-19 cases as (i) mild to moderate, (ii) mild, (iii) non-severe, (iv) prevalent type, (v) non-ICU, and (vii) COVID-19 survivor. Further research may elucidate such issues by adopting a comprehensive approach to describe the disease severity and reveal the relationship between smoking and exercise.

In addition to tobacco consumption, one should not underestimate hookah and electronic cigarette use since consumption patterns of these products can increase the risk of contamination due to repetitive hand-mouth interactions, keeping cigarette packs, and blowing smoke. Thus, tobacco consumers are expected to have severe COVID-19 symptoms. Similarly, excessive exposure to smoke may modify ACE-2 gene expression, which may lead to immune system alterations. In other words, smoking also poses a potential risk for other individuals around, including friends and family members.

Further studies may be recommended to maintain keeping the registry of nicotine consumption, including daily exercise, the frequency of smoking, passive smoking, and COPD grade. Moreover, if relevant, they are recommended to assess the interaction dynamics of smoking and exercise with COVID-19. In addition, future research may scrutinize smoking habits (e.g., light and heavy consumption or hookah/electronic cigarette use) in relation to SARS-COV-2 transmission and recovery and severity of COVID-19. Also, researchers may focus on the treatment of severe COVID patients by exploring the effects of nicotine and the relationship between COPD severity and COVID-19. Finally, clinicians may stay alert about the smoking and exercise history of COVID-19 patients and aim to identify mechanisms that boost or reduce disease risks.

CONCLUSION

The current research revealed that active smoking, smoking history, and not exercising were significantly associated with increased COVID-19 symptom severity. The pandemic times may serve as a driving force for maintaining good health practices, smoking cessation, and gaining a habit of regular exercise.

Indeed, many studies have revealed the contributions of regular and adequate exercise in maintaining quality of life, which also applies to improving the course of acute or chronic diseases. It is also known that regular exercise strengthens the cardiovascular system, improves metabolism, and hinders the adverse effects of smoking on lung capacity. This research revealed that gaining a habit of regular exercise and smoking cessation have positive impacts on the protection from COVID-19 and/or recovery from the infection.

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