



The COVID-19 Outbreak and Implications on Medical Comorbidity and Sports

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ABSTRACT

In December 2019, a previously unknown novel strain of coronavirus became recognised as the cause of pneumonia in China. COVID-19 sudden outbreak created a massive impact on sports that eventually resulted in the postponement or cancellation of all the major sports worldwide. The medical and epidemiological experts consistently report that the aftermath impact of COVID-19 is strongly associated with an individual's comorbidity state. At this critical period, maintaining a robust immune system is mandatory to fight against the virus since there is no apparent cure. However, newly developed vaccines such as AstraZeneca, sputnik-V, and Pfizer-BioNTech vaccine yield promising results. Hence, the experts recommend enhancing cardiopulmonary fitness via increased physical activities through regular exercise with moderate intensity because this approach positively affects immune-boosting against viral respiratory infections. In addition, indoor exercise helps to boost the immune system against viral infections through a change in Th1/Th2 cell.

Keywords: COVID-19, Chronic disease, Comorbidities, Diabetic, Obesity, Sports activities.

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1. INTRODUCTION

Unprecedented outbreak of Coronavirus disease 2019 (COVID-19), which conformed as a pandemic by the World Health Organization (WHO), has caused many cases respiratory-like diseases nationwide.¹ Initially, the virus spread quickly and widely in China, Italy, Korea, Japan, and Iran, before spreading to the rest of Europe and the United States.² Universally, about 170,000 confirmed cases of COVID-19 due to the 2019 novel coronavirus has been reported in the first quarter of 2020 with an estimated 7,000 fatalities in nearly 150 countries.³ Lu, Zhao [4] indicated that COVID-19 could infest the human body through a similar cell as in severe acute respiratory syndrome (SARS) and the Middle East respiratory syndrome (MERS) with similar symptoms as in respiratory diseases.

Team⁵ reported that the most vulnerable subset of population are the older adults, especially those suffering from severe and acute health conditions.⁶ Consequently, they are at higher risk of infection-linking with illness and ultimately mortality compared to the younger people. Though reports on the case figures of COVID-19 in China were slight, 80% of the fatalities happened among adults aged ≥ 60 years: just one (0.1%) death occurred in a person aged ≤ 19 years.⁷ A typical manifestation of the disease includes fatigue, cough, myalgia and fever. One proposed theory on COVID-19 infestation on humans is that the young are less vulnerable; in sports such as football that parade a significantly high number of young active talents that exercise regularly, such are believed to possess less vulnerability and better resistant to COVID-19 infection compared to the general population, and consequently are at lower risk for severe illness or death.⁸

The general secretary of the United Nations narrated that it is essential to stop the transmission of COVID-19 to protect people from the high possibility of mortality and to diminish the pandemic so that health care systems are not stressed beyond their capabilities, especially considering those with chronic diseases. Comorbidity is a chronic state of disease that is prevalently common worldwide. Severally defined and interpreted as a chronic illness associated with poor quality of life and increased fold of poor treatment outcome. The consequences of specific disease

combinations, however, depend on many factors, such as in this period of sudden COVID-19 outbreak where chronic illnesses are more prone to the COVID-19 infection with the possible worst outcome if it involves older adults.⁹

The unexpected COVID-19 outbreak has spread rapidly into most countries, and the preventive measurement strategies put forward by health authorities to curtain the spread should be carried out by all parastatals, including the sports medicine workers.¹⁰ The different preventive measures will allow the governing bodies, i.e., WHO, FIFA etc. to control the spread of the disease, maintain the player's health and ensure a safe return to competitive sports¹¹. Therefore, the overarching aims of this review are to highlight the aftermath of outbreak of COVID-19 on individuals with comorbidities and athletes and understand the potential impact of physical training in the era of COVID-19.

1.1 Purpose of COVID-19 prevention

Wu and McGoogan⁸ indicated that it is highly likely that the typical and active individual or athletes might only experience a slight symptom of COVID-19. So, keeping fit by performing daily or regular exercise is advantageous to avoid contracting of the virus, especially among older people with or without comorbidities.⁸ In addition, preventive measures are also crucial for individuals and competitive players to reduce the disruptions in training and the adverse effects it might have on the athlete's respiratory system and aerobic capacity in both the short and long term.¹²

2. MATERIALS AND METHODS

The studies were selected by locating all relevant studies by searching through the various databases such as PubMed, Cochrane Central Database, and Google Scholar for the published papers, using the keywords to screen carefully up to March 2022. The papers were then evaluated and chosen based on their applicability to the aim of the study. Then a final screening was carried out. The following search terms were used to include all relevant studies: "COVID-19", "SARS-COVID-19", "Exercise", "Physical Activity

3. DISCUSSION

3.1 Mode of transmission of COVID-19

A Recent scientific publication suggest that the virus could be spread through respiratory droplets after an infected person sneezes or coughs, among individuals who are within about six feet of each other, and perhaps through touching the surfaces that have the virus on them, such as door handles, handhold, or telephones.¹³ Moreover, COVID-19 may spread throughout the population by direct contact among people.^{14 16} Lu, Zhao⁴ reported that the cases of COVID-19 were initially connected with seafood shops in China, and the mode of transmission of this virus is more of contact-to-contact, such as from the communication between people through the respiratory droplets. The outbreak control and measures are targeted to reduce the gathering between the population to control, delay the peak and reduce the mortality effect of the pandemic.¹⁶

3.2 Preventing transmission of COVID-19

The rapid transmission is attributed to indirect contact or exposure to infective respiratory droplets on the surface, as the virus has been shown to stay on external surfaces for some hours to days.¹¹ Healthcare professionals and sports medicine providers worked tirelessly to support all the athletes worldwide to overcome the COVID-19 pandemic by recommending strict adherence to preventative measures such as hand hygiene, hand washing or using hand sanitiser. They are advised to avoid mass gatherings and keep social distance, particularly beside someone coughing or sneezing (roughly 6 feet).¹⁷ These procedures were supported by the governments and sports authorities and promoted by professional players.¹¹ Advance-age individuals with medical problems were encouraged to take maximum care by avoiding unnecessary travel and gathering. When coughing or sneezing, individuals must cover their mouth and dispose of all used tissues.¹³ It is recommended to avoid shaking hands to reduce the spread and wearing gloves and face masks in gatherings are encouraged; however, frequent hand washing remains the best way to prevent the disease.

3.3 Impact of covid-19 on comorbid medical diseases

The SARS-CoV-2 virus is a category of COVID-19, a family of viruses that created a health crisis with diverse symptoms in persons infected with the disease.¹³ Not all the people infected with COVID-19 showed similar signs; the most common symptoms are shortness of breath, dry cough, fever, and body aches. Also, the symptom can be associated with abdominal pain, headache, sore throat and diarrhoea; these symptoms usually appear two to fourteen days after exposure.¹³

The medical and epidemiological experts consistently report that the repercussion impact of COVID-19 is strongly associated with the individual's comorbidity state. This state of health is linked with a worse outcome along with a severe effect on the lungs and mortality rate.¹⁸ A study done by Zhou Yu¹⁹ reported that the most frequent comorbidities recorded were diabetes mellitus (19%), coronary heart disease (8%) and hypertension (30%). Other findings by Wu, Chen²⁰ also showed that the most common comorbidities recorded in patients with COVID-19 who had severe respiratory syndrome were cardiovascular disease (6%), diabetes mellitus (19%), and hypertension (27%). A similar study on COVID-19- related comorbidity showed that thirty-two non-survivors from a collection of fifty-two in a concentrated care unit/centre for patients with COVID-19 revealed that diabetes (22%) and cerebrovascular diseases (22%) were the most commonly associated comorbid.²¹ These latter findings were similar to a study by Guan, Ni²², where chronic heart diseases (5.8%), hypertension (23.7%), cerebrovascular disease (2.3%) and diabetes mellitus (16.2%) were the most recorded comorbid in the COVID-19 infected patients.

The association between obesity and chronic disease has long been researched. Obesity is associated with increased infection due to the negative impact of obesity and body fat on the immune system. Petrilli, Jones,²³ reported that people with obesity have more chronic diseases and are immunocompromised; these individuals have a poor prognosis when infected with COVID-19. These complications and health disorders are sometimes race-associated as certain racial groups, e.g., Americans, Asians, and Africans,

have shown higher risk and worse COVID-19 outcomes during this on-going outbreak. A study by Simonnet, Chetboun et al.²⁰ supports these latter findings, indicating that people with obesity tend to have more severe COVID-19 sickness and fatality rates.²⁴ Research carried in France²⁴ on the outcomes of COVID-19 in people with obesity showed that there was a seven-fold rise in ICU admission and mechanical ventilator demand to support the obese patients (BMI >30 kg/m²) compared to the non-obese (BMI <30 kg/m²) with COVID-19 infection.

In the United States, during this pandemic, the health experts data reviewed that patients who are more than 60 years old with BMI between 30 to 34 kg/m² and >35 kg/m² were 1.8 times and 3.6 times more probably to be confined to the severe care centre respectively than persons with BMI <30 kg/m².²⁵ Furthermore, Sattar, McInnes²⁵ reported that obesity and excess ectopic fat deposition are relative risk factors for acute COVID-19 infection. Obesity shows a vital role in the pathogenesis of COVID-19 infection. Additionally, immunity has a high effect on the pathogenesis of the virus and plays a significant role in obesity-induced fatty tissue inflammation. This inflammation of fatty tissue outcomes in metabolic dysfunction is possibly foremost to insulin resistance, dyslipidaemia, hypertension, cardiovascular disease and type 2 diabetes mellitus.²⁶ Biomedical analysis of patients who are obese with respiratory infections found that obesity has an essential role in the virus spread; for instance, obesity increases the duration of virus shedding longer than adults who do not have obesity.²⁶ As the obese showed increasing vulnerability to infections, it might be one of the risk factors associated with the worst fatality.²⁷ Peng Meng et al²⁸ reported that individuals with BMI > 25.0 kg/m² were more frequently seen in the acute and critically infected cases with the worst outcome. The obesity-associated thrombosis events are prevalent and contribute highly to mortality in obese patients than in non-obese patients.²⁹

The adipose fatty tissues show higher angiotensin-converting enzyme 2 (ACE2) expression in COVID-19 – positive patients compared to non-COVID-19 patients. Since ACE2 is a possible portal of entry and propagation of COVID-19 into host cells, people with obesity are likely to be two-fold at risk of contracting COVID-19 because they tend to have a higher proportion of fatty tissues. Also, adipose tissue is highly susceptible to viral infections

such as adenovirus Ad-36, influenza-A virus, human immunodeficiency virus, cytomegalovirus, and Trypanosoma gondii.³¹ Therefore, this adipose fatty tissue – COVID-19 link represents an important finding because people with obesity might be the most vulnerable to COVID-19.^{26,32,33}

3.4 Covid-19 impact on sports

The COVID-19 sudden outbreak created a massive impact on the sport that eventually resulted in the postponement or cancellation of all the major sports worldwide in March 2020. The International Olympic Committee in March 2020 indicated that the Tokyo 2020 Paralympic Games and the Olympic Games would be suspended for Summer 2021 due to the unprecedented outbreak of COVID-19.³⁴

At this critical period, maintaining a robust immune system is mandatory to fight against the virus since there is no apparent cure; however, newly developed vaccines such as AstraZeneca, sputnik-V, Biontech vaccine are yielding promising results. Hence, the health experts to the populace are maintained, via regular exercise and physical activity with moderate intensity, because this approach positively affects the immune-boosting against viral respiratory infections.³⁵ Different exercises and physical activities with moderate intensity will increase stress hormones, leading to reduced extreme inflammation.³⁶ Physical training combined with strength and aerobic exercises will maximise health benefits and stimulate the hormonal system. High-intensity interval training is highly recommended due to its beneficial effects on biological and hormonal levels. The more intense the exercise, the more these hormones (cortisol) and endorphins chemicals are released, which improve the sleep cycles.³⁷ In addition, indoor exercise helps to strengthen the immune system against viral infections through modulating Th1/Th2 cell responses.³⁵ This further strengthens the individual's immune system, heightening protection against COVID-19 transmission. While there is evidence that the intensity of the training, including moderate-intensity indoor exercises daily, improved immune function and potentially reduced the risk of upper respiratory tract infections by 20–30 % .¹⁵ The impact of the training intensity on the body's physiological response has been extensively studied.³⁸ The moderate-intensity exercise was showed

to augment the immune system and reduce the risk of respiratory tract viral infections; moreover, high-intensity exercise for a long duration may lead to fatigue if implemented without adherence to the principle of training.^{35 36 39} Among the leading modifiable risk factors for cardiovascular disease and all-cause mortality worldwide are sedentary behaviour and physical inactivity.⁴⁰ Therefore, it is recommended to engage in at least 150 min/week of physical activities or exercise to enhance cardiorespiratory fitness are necessary for all races, age groups and ethnicities for both genders to reduce and prevent chronic cardiovascular disease and boost their immunity.⁴⁰

The sudden outbreak of COVID-19 created a negative impact on all sporting activities at all levels; it especially led to reducing physical activity and sports participation among individuals. Lack of engagement in sport activities during the COVID-19 pandemic could expose the athlete to an increase in adipose tissue, thus becoming vulnerable to certain chronic diseases such as hypertension. The modification of daily lifestyle by increasing physical activity and exercise tolerance is promoted as a non-pharmaceutical intervention to control or prevent hypertension. In the United Kingdom, sports activities have been introduced in prisons inmates and nursing homes to boost their immune system, regulate the blood pressure, and improve their mental health, with positive outcomes.⁴¹

During the COVID-19 lockdown period, all energy-demanding physical activities and sports were stopped as a result of the strict Movement Control Order.²⁶ Lin, Zhang⁴² observed that regular physical activity and sports decrease the risk of cardiovascular diseases, decrease the blood glucose in type 2 diabetes mellitus and improve general health. In addition, Schellenberg, Dryden⁴³ reported that regular exercise from sporting events contributes to delaying or preventing comorbid disease and obesity. Similar to the previous finding, regular exercise is a vital health factor for patients with diabetes mellitus to improve insulin uptake and

sensitivity and to maintain the cardiovascular fitness,⁴⁴ Lastly, overweight and obesity are linked with several comorbid diseases such as obstructive sleep apnoea, osteoarthritis, diabetes mellitus and coronary artery disease. However, engaging in sports and exercise can be one of the essential management programs along with a suitable diet.²¹

4. CONCLUSION

Prem, Liu⁴¹ reported the importance of containing and monitoring the pandemic and implementing effective control strategies to stop the spread of COVID-19 and save many lives.⁴¹ The limited opportunity to exercise outdoors is probably due to fear of a second wave. Most people were weary and cautious outside their homes to avoid and prevent COVID-19 transmissions. Therefore, it is recommended to engage in indoor exercise to maintain their daily activities and general health as well as to avoid COVID-19 transmission supplementary table 1. The researchers suggest taking the precocious measures when performing moderate to vigorous exercises. If COVID-19 infection is suspected, screening must be systematic. Athletes or members who travel during the MCO should be self-isolated for 14 days before returning to sports. Exercise should proceed with precaution among individuals with risk factors for autoimmune disease and other comorbid diseases such as diabetes mellitus, asthma, and cardiovascular disease. An individualised exercise program is recommended for individuals with high-risk factors. Indoor exercises will have a considerable positive impact on the general population's immune system and potentially make it less vulnerable to outbreaks. Adequate exercise and sports participation should be recommended for all individuals with chronic comorbid diseases such as obesity and diabetes mellitus. In addition, the elderly should be encouraged to reduce their daily sedentary period by breaking up sitting time with intervals of body stretch activities.

Author Contribution

1. **S.B:** Conceived and designed the analysis, data collection, wrote the paper

2. **H.A.A:** Conceived and designed the analysis, data collection,

Contributed data or analysis tools

3. **A.M.S:** Conceived and designed the analysis, data collection, performed analysis, wrote the paper

4. **A.A.M:** Conceived and designed the analysis, wrote the paper

5. **A.Y.A:** Conceived and designed the analysis, data collection, wrote the paper

6. **M.M.A:** Conceived and designed the analysis, data collection, wrote the paper

7. **S.I.M:** Conceived and designed the analysis, data collection, performed analysis, wrote the paper

8. **M.H.M:** Conceived and designed the analysis, data collection, wrote the paper

9. **A.H.M:** Conceived and designed the analysis, wrote the paper

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Conflicts of Interest

The authors report no conflict of interest

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