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Impact of Covid-19 on Respiratory and Cardiovascular Status in Covid Recovered Young Adults

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ABSTRACT

Introduction: Corona viruses are a type of virus that can infect both humans as well as animals. they can impact both the pulmonary and extra-pulmonary systems, resulting in a high fatality rate. The purpose of this review article is to understand the impact of COVID-19 on cardiovascular and respiratory function in young adults who have recovered from Covid-19.

Methodology: To construct a narrative review on this topic, we examined a number of databases, Google Scholar, Medline, PubMed, Researchgate and search approach was using a combination of the words impact of Covid- 19 on young adults, SARS-CoV-2, cardiovascular status, respiratory status.

Discussion: It was found that even while the majority of mild and moderate instances of acute respiratory distress syndrome recover completely, a tiny percentage of severe cases of acute respiratory distress syndrome remain hypoxemic despite obtaining proper care and VO2 max is seen to be reduced in COVID-19 symptomatic patients compared to asymptomatic. There was a high prevalence of multi-organ failure and associated elevated d-dimer, fibrinogen, and delayed thrombin time in severe diseases, and their negative outcomes were linked to co-morbidities such as hypertension, cardiovascular, pulmonary illness and acute respiratory distress syndrome (ARDS).

Conclusion: The long-term effect of Coronavirus on cardiopulmonary function is highly controversial. It is expected that some patients will have subclinical and possibly observable cardiovascular abnormalities. Patients with allegedly recovered cardiac function may still be at risk of CAD, atrial fibrillation or ventricular arrhythmias. Recovered patients with compromised respiratory status are more vulnerable to develop respiratory and cardiac ailments later in life.

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Introduction

COVID-19 is worldwide pandemic exerting dramatic impact on healthcare system all over world. In December 2019, China reported cluster of cases of Pneumonia due to an unidentified microbial agent in Wuhanand its overspread with human-to-human transmission was confirmed [1-3]. It is an infectious disease caused by novel corona virus also called as SARS-CoV-2 (severe acute respiratory syndrome 2). At the onset of outbreak of COVID-19 most affected population were elderly and as it continued number of cases among adults and children also increased. It has caused serious complications and is fatal for all age groups [3-5]. Corona virus affects almost all organs of body including pulmonary system, but it has a typical influence on lungs with initial symptoms including shortness of breath, fever and its long-term effect is known to reduce respiratory performance [3-7]. The symptoms of COVID-19 infection range from mild to severe and the symptomatology and prognosis of disease are determined by the location of infection.Common symptoms are Muscle soreness, muscle dysfunction, fatigue, weakness, fever, chills, headache, dyspnea, diarrhea, vomiting, weight loss etc [1-10]. The influence of COVID-19 on pulmonary and extra pulmonary organ system in larger age groups and at midterm follow-up has been extensively studied; however, the long-term impact of COVID-19 on respiratory and cardiovascular status in young adults (18-25 years of age) have not been studied. COVID-19 recovered patients are prone to develop cardio respiratory issues in future due to the sequalae of this virus.

Methodology

We examined a number of databases, Google Scholar, Medline, PubMed, Researchgate and used search engines to find papers, literature, and various articles or cases for original and review articles about the effect of COVID-19 on cardiopulmonary function that had been published since the onset of COVID-19. The search was done using a combination of words like impact of Covid- 19 on young adults, effect of Covid- 19 on young adults, outcome, pathophysiology, and COVID-19, COVID, SARS-CoV-2, cardiac, cardiovascular, cardiovascular function, cardiovascular status, cardiac injury, respiratory tract, respiratory

function, respiratory status, pulmonary injury, young adults and a variety of additional terms, heart, lungs, cardiac system, respiratory system, cardiac status in young adults, respiratory status in young adults, myocardial injury.

Discussion

On comprehensive evaluation we found that covid-19 has affected a large population in which the young adult group was largely neglected, them being asymptomatic playing a major role. Long-term complications are numerous, with respiratory and cardiovascular issues being two of the most common. Covid recovered patients often complaint of reduced respiratory endurance, easy fatigue, dyspnoea on exertion and reduced work capacity, these together makes them more vulnerable to develop further respiratory and cardiac complication in future [3-5,7,8,10-13].

According to Abbasi J, SARS-CoV-2 infects the respiratory tract initially, but it may also affect the cardiovascular system in a variety of ways and can cause myocardial inflammation and severe myocarditis [14]. ACE-2 (angiotensin converting enzyme) is a functional receptor which is highly expressed on pulmonary epithelial cells and acts as a binding site for SARS-CoV-2 hence the virus is more likely to infiltrate and destroy epithelial cells in the lungs [3,4,6,11-17]. Lungs, heart, ileum, kidneys, and bladder have significant levels of ACE2 in them [4,5,12-17]. it was suggested that COVID-19 recovered individuals also showed various degrees of radiologic, laboratory abnormalities, functional, musculoskeletal (such as fatigue, weight loss, joint pain) and psychological problems in recent studies [18,19]. similarly, H. ahmed et al. demonstrated that at 6 months follow up patients showed impaired DLCO and reduced exercise capacity (6-minute walk test). There was high prevalence of multi-organ failure, elevated d-dimer, fibrinogen, and delayed thrombin time in severe diseases [20].

Xiong Q et al. and Seyed Ahmad Seyed Alinaghi et al in their retrospective studies demonstrated that COVID-19 has an effect on cardiopulmonary function, whereas some other studies shows no change in cardiopulmonary function three or four months after infection when compared to pre-infection examinations, but according to a study on 110 hospitalized patients at the time of discharge, serious patients had a higher prevalence of DLCO (diffusing capacity of lungs for carbon monoxide) impairment, pulmonary fibrosis and certain restrictive ventilatory abnormalities than non-severe patients [19,21,22]. If there is lingering inflammation or fibrosis, there may be serious consequences depending on the type of cardiac injury [18-20,21].

Anant parashar in his review study stated that once virus is attached to the ACE2 it activates pathogenic T cells quickly and causes a massive release of inflammatory cytokines like IL-6 (interleukins-6) and neutrophils, which leads to more inflammatory cytokines being released. This procedure strengthens the inflammatory cascade. Neutrophils and T cells act as double-edged swords i.e. they have the ability to destroy viruses, but can also contribute to cardiopulmonary injury [16]. Viral sepsis is produced by a strong immune response that damages the lungs and other important organs, as well as a directly attacks the other organs induced by cytokine storm and microcirculation dysfunction [4,15-22].

Raul D. Mitrani et al. in their study showed that chest imaging indicates fibrotic anomalies such as traction bronchiectasis, architectural distortion, and septal thickening, gaseous exchange disturbances which were similar to those seen in other fibrotic lung illnesses and asymptomatic individuals [18]. CT scans showed ground glass opacification.VO2 max. is seen to be reduced in symptomatic patients as compared to symptomatic. according to previous study on 237 hospitalized patients 40% of the cases exhibited cardiovascular abnormalities while in 60% of the cases, glucose metabolism changes were seen in patients suffering from respiratory infections also reported in comparable findings [23].

SARS-CoV-2 has the potential to produce direct myocardial injury as well as acute myocardial injury due to disruption of the myocardial oxygen demand-supply relationship, myocardial infarction, and arrhythmias [5,7,14,16-18,20,21]. Increased troponin level and reduced lymphocytes was seen in patients suffering from COVID-19. A recent meta-analysis of 4 studies that looked at cardiac troponin I (cTnI) levels in 341 COVID-19 patients reported remarkable increase in cTnI 36% in patients who were suffering from severe illness compared to non-severe patients. similarly, 49% patients suffering from hypertension, 21% patient's CVD and 18% hypercholestrolemia were reported in a study of 1591 patients conducted in italy and they required higher PEEP (positive end expiratory pressure) level during hospitalization [24]. CMR (cardiovascular magnetic resonance) of some patients showed herald indications of myocardial inflammation, scar, increased heart size due to insufficient pumping [14,16-21]. In several case reports of hospitalized patients there seem to be left ventricular systolic dysfunction and subtle cardiac consequences that could be fatal during physical activity which can lead to arrhythmias, heart failure, cardiac arrest, cardiogenic shock, pericardial effusion [16-21,23,24].

Negative outcomes were linked to comorbidities such as hypertension, cardiovascular, pulmonary illness and acute respiratory distress syndrome (ARDS), especially in smokers or drinkers, and the disease progression is not surprising given the negative effects of smoking and drinking on cardiopulmonary immune function [4,24]. We learned from previous data that smokers, drinkers, and substance users were more likely to have severe COVID-19 symptoms which may lead to ICU support, mechanical ventilation, or death as compared to non-substance users [25]. Even while the majority of mild and moderate instances of acute respiratory distress syndrome recover completely, a small percentage of severe cases of acute respiratory distress syndrome remain hypoxemic despite obtaining proper care. Fabio Anastasio et al. suggested that respiratory therapy and progressive physical activity is required in patients in which residual pulmonary and functional impairment were found on 6MWT, full spirometry and cardio-pulmonary exercise testing (CPET) who developed ARDS and impaired DLCO after hospitalization [3].

According to Huang et al. chest physiotherapy, such as respiratory muscle training, coughing exercises, diaphragmatic training, stretching exercises, and home exercises improve FEV1, FEV1/FVC percent, and carbon monoxide diffusing lung capacity (DLCO %). It also improves endurance and quality of life, as well as reduce anxiety and depression symptoms [13].

Future Scope of Study

In future this study can be carried out in experimental mode where subjects can be made to participate in PFT examinations and the data can be analysed to justify the clinical presentation.

Limitation of Study

- Could have been carried out as an experimental research
- Data available on young adult was limited
- Covid second wave overlapped with the existing symptoms m earlier exposure

Conclusion

Corona virus disease (COVID-19) has been associated to a wide range of symptoms, ranging from asymptomatic to acute illness and death. long term effect of Coronavirus on cardiopulmonary function is highly controversial. Cardiopulmonary protection should be given special attention during COVID-19 treatment. it is expected that some patients will have subclinical and possibly observable cardiovascular abnormalties. patients with allegedly recovered cardiac function may still at risk of CAD (coronary artery disease) or atrial fibrillation or ventricular arrhythmias. This review has confirmed the detrimental influence of COVID-19 on young adults. Early and preventive physiotherapy will be helpful and the role of PM&R physicians and rehabilitation in restoring function and lowering impairment could be crucial in covid recovered young adults, which include nutrition, airway, posture, clearance method, oxygen supplementation, breathing exercises, stretching, manual therapy, and physical activity in prevention of respiratory and cardiac disorders as sequelae of Covid-19.

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