



IMPACT OF COVID-19 SEVERITY ON PULMONARY PARAMETERS AND FUNCTIONAL CAPACITY AMONG INDIAN ADULTS

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ABSTRACT

The COVID-19 pandemic has kind of left long-term effects on respiratory health, especially in people who live more of a sedentary lifestyle. In this study, we tried to do a comparative meta-analytic review of pulmonary function outcomes, mainly focusing on vital capacity (VC), among sedentary adults between 30–40 years in India. Basically, comparing those who had COVID-19 and those who didn't. For this, systematic research was carried out using databases like PubMed, Scopus, and Google Scholar, covering studies published from 2020 to 2025. Around 22 studies which matched the inclusion criteria were finally taken for analysis. The findings more or less show that there is a consistent reduction in vital capacity in sedentary individuals who recovered from COVID-19, as compared to those who were not affected. So, it kind of suggests that both sedentary lifestyle and COVID together make things worse for lung function. Overall, the study highlights that there is a need for proper physical activity interventions, because without that the respiratory decline may continue or even get worse.

Keywords: COVID-19, Vital Capacity, Sedentary Lifestyle, Lung Function, Meta-analysis, Indian Adults

INTRODUCTION

COVID-19 has really affected global health in a big way, and mostly it targets the respiratory system first. Even though the acute symptoms go away after some time, still many people report long-term lung issues, especially those who are not physically active much. Sedentary behaviour is generally linked with lower lung capacity, weak respiratory muscles and also reduced oxygen use in the body. And when this gets combined with COVID-19 infection, the problem can become more serious, like the effects get worse and lead to more decline in pulmonary function. Vital Capacity (VC) is an important indicator of lung function; it basically shows the maximum air a person can exhale after taking a deep breath. So, it is quite important while assessing respiratory health and overall functional capacity. In India, nowadays sedentary lifestyle is increasing, especially in urban adults of age group 30–40 years, which makes them more at risk. But still, there are not many studies which have comparatively analysed VC between sedentary individuals who had COVID and those who did not have it.

NEED AND SIGNIFICANCE OF THE STUDY

The combined effect of sedentary lifestyle and COVID-19 on lung function is still not properly explored, especially in the Indian population. There is limited understanding of how these two factors together influence respiratory health, particularly in terms of pulmonary parameters such as vital capacity. Therefore, the present study aims to analyze vital capacity among sedentary adults post-COVID and to compare vital capacity between sedentary COVID-affected and non-affected individuals. In addition, it seeks to synthesize existing research findings in the Indian context to provide a clearer understanding of this relationship.

Understanding this association is important because it can help in designing effective rehabilitation strategies and promoting preventive health measures. It also has implications for physical education and public health programs, although this area still requires greater attention. Several studies have reported that pulmonary function, especially vital capacity (VC), decreases in people who have recovered from COVID-19. For example, Mo et al. (2020) found that many discharged patients were still showing abnormal lung function, with reduced lung volumes which indicates some kind of restrictive problem.

In a similar way, Huang et al. (2021) reported that even after six months of recovery, some lung function abnormalities were still present, showing that the effects can last for a longer time. Torres-Castro et al. (2021) also



reported that people who recovered from COVID had lower lung capacity. Torres-Castro et al. (2021) also reported that patients who recovered from COVID showed a decrease in lung capacity. Their lungs were not working at full efficiency. Along with this, they also had problems in diffusion capacity, which means the exchange of oxygen and carbon dioxide was not proper. This condition may be because of damage to the alveoli, which are small air sacs in the lungs. In some cases, it can also be due to fibrosis, where lung tissues become stiff and less flexible.

When we look at overall findings, most of the previous studies suggest that COVID-19 can have long-term harmful effects on lung function. These effects do not always go away quickly. The main reason behind this is the structural and functional changes in lung tissues. The internal structure of lungs may get damaged, and their normal functioning also gets disturbed. Because of this, breathing efficiency can reduce over time. Research shows a clear connection between a lack of physical activity and reduced lung function. People who are less active often have weaker respiratory systems. This happens because the body isn't used to regular physical activity. Their lungs don't open fully, so breathing becomes less effective and a bit shallow. Warburton and Bredin (2017) explained that physical inactivity can weaken the respiratory muscles over time. These muscles are important for proper breathing. When they become weak, lung expansion becomes limited. Due to this, the total lung volume also gets reduced. In simple words, inactive lifestyle slowly affects how well the lungs can work. Also, Booth et al. (2012) pointed out that long-term sedentary habits can cause physiological deconditioning, and this includes problems in respiratory function as well. In India, due to increasing urbanization and lifestyle changes, people are becoming more sedentary, especially adults, and this is not good for overall lung health.

These studies suggest that people who are sedentary, even without any diagnosed illnesses, might already have some level of reduced lung function.

This study attempts to provide evidence-based insights into differences in pulmonary health among sedentary individuals; however, further research is needed to fully understand the long-term impact.

METHODOLOGY

The present study more or less followed a systematic review and meta-analytic approach, based on PRISMA guidelines. A detailed literature search was done using databases like PubMed, Scopus, and Google Scholar for studies published between 2020 to 2025. Some common keywords used were "COVID-19," "vital capacity," "sedentary adults," and "lung function."

The inclusion criteria included studies on Indian adults aged around 30–40 years who were considered sedentary, and where vital capacity and COVID-19 status was clearly reported. Studies where physical activity level or lung parameters were not clearly mentioned, those were excluded.

The selection process went through different steps like identification, screening, checking eligibility and then final inclusion. In the end, total 22 studies were included for analysis.

Data like sample size, participant details and vital capacity values were collected from these studies. Then a comparison between the groups was done in a simple way. The researcher tried to see how one group is different from the other. For this, standardized mean differences was used. It helped in showing the size of difference between the groups. This method also made it easier to understand the results, even when the measurements were not exactly same.

DISCUSSION

The findings of the present meta-analytic review kind of show that sedentary adults who have recovered from COVID-19 have noticeably reduced vital capacity when compared to sedentary people who never had COVID. This difference is not due to just one reason, but more like a combination of the direct effects of the infection along with already existing deconditioning because of sedentary lifestyle. COVID-19 primarily targets the respiratory system. It triggers inflammation within the alveolar tissues, which in turn diminishes the lungs' ability to exchange gases. In certain instances, this can even progress to pulmonary fibrosis. Many studies have shown that these effects do not completely go away even after recovery. For example, Mo et al. (2020) observed that even after discharge, patients were showing abnormal pulmonary function, mostly restrictive in nature. Similarly, Huang et al. In 2021, it was reported that lung function impairments persisted even six months after the initial infection. Torres-Castro and his



colleagues (2021) discovered this as well also found reduced lung capacity and respiratory efficiency in post-COVID individuals. All these changes more or less affect lung compliance and elasticity, which ultimately reduces vital capacity.

Along with this, sedentary lifestyle itself also plays a negative role in pulmonary health. Warburton and Bredin (2017) suggest that physical inactivity is linked to a weakening of the respiratory muscles and a decrease in how efficiently the lungs work. In addition, Booth and his team (2012) study indicated that extended periods of inactivity lead to a general decline in physical condition, including problems with how the respiratory system functions. Essentially, people who don't exercise have a lower starting point for lung function, and COVID-19 makes this worse. When both these factors come together, the effect seems to be more additive in nature. Spielmanns et al. (2021) reported that post-COVID patients with low physical activity levels had much lower pulmonary function compared to healthy individuals. Hermann et al. Polastri and his team (2020) also found that especially in people with poor physical fitness, breathing problems continued even after recovery.

As we talked about in 2021, not getting enough exercise can make it harder for the lungs to heal and cause long-term problems with physical function. Another important factor is how well the breathing muscles are working. These muscles play a big role in proper respiration. In sedentary people, there is not much regular activity. Because of this, respiratory muscles like the diaphragm become weak over time. When these muscles are weak, lungs cannot expand properly. This leads to reduced breathing efficiency and lower lung capacity. When this condition is combined with COVID-related lung damage, it results in a more noticeable decline in vital capacity. There is also enough support from rehabilitation-based studies which highlight the importance of physical activity. Liu et al. (2020) found that respiratory rehabilitation can really improve lung function in patients after COVID. It helps the lungs to recover better.

Barker-Davies et al. (2020) also explained that structured exercise is very useful. It helps in improving the strength of breathing muscles. It also supports better use of oxygen in the body. Overall, regular exercise plays an important role in recovery. Spruit et al. (2020) also recommended pulmonary rehabilitation as an important part of recovery after COVID-19. All this indirectly suggests that if physical activity is missing, like in sedentary behaviour, recovery may become slower and pulmonary outcomes may worsen. From an Indian point of view, these findings are quite important, because sedentary lifestyle is increasing rapidly among adults aged 30–40 years. So when this inactivity combines with post-COVID complications, it can increase the chances of respiratory problems in this group. Comparative studies kind of show that sedentary individuals who had COVID-19 experience more reduction in vital capacity as compared to those sedentary people who never got infected. Like, Spielmanns et al. (2021) reported that post-COVID patients who were in rehabilitation had significantly lower baseline lung function when compared to healthy individuals. Likewise, Hermann and colleagues (2020) observed persistent respiratory difficulties following recovery, particularly among individuals with reduced physical activity levels. Polastri and his research group (2021) proposed that a confluence of inactivity and post-COVID sequelae might impede recuperation and exacerbate pulmonary manifestations.

Even though the present study mainly focuses on sedentary individuals, still a lot of existing studies clearly show that physical activity plays an important role in improving lung function. Liu and colleagues (2020) found that respiratory rehabilitation significantly improves lung function in people who have had COVID-19. Moreover, Barker-Davies and his team (2020) showed that structured exercise programs help improve the strength of the respiratory muscles and overall lung function. In the same way, Spruit et al. (2020) also suggested that pulmonary rehabilitation is an important strategy to restore lung function after COVID-19. So indirectly, these studies kind of support the idea that if physical activity is lacking, like in sedentary behaviour, it may slow down recovery and can even worsen pulmonary outcomes.

Overall, it can be said that the reduction in vital capacity among sedentary post-COVID individuals is not due to a single factor, but rather a combined effect of lung damage caused by the infection and the already existing lifestyle-related deconditioning.

CONCLUSION

The study concludes that sedentary adults who have recovered from COVID-19 tend to exhibit lower vital capacity



compared to sedentary individuals without a history of infection, indicating that inactivity and COVID-19 together have a compounded negative effect on pulmonary health. This highlights the need for targeted interventions to improve respiratory function in this population. It is therefore recommended to promote regular physical activity among sedentary adults, implement structured post-COVID pulmonary rehabilitation programs, and increase awareness regarding respiratory health. Additionally, more research focusing on the Indian population is required to better understand long-term pulmonary outcomes and to develop context-specific health strategies.

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