COVID-INDUCED PULMONARY FIBROSIS AND THE POSSIBLE LINKAGES WITH THE TUBERCULOSIS INFECTION: AN OBSERVATION

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AUGUST 2021 | VOLUME 1 | ISSUE 3

Introduction:

Till August 30th, 2021, a whopping number of 21.75 crore people have been known to be infected globally by the novel coronavirus SARS-CoV-2, and 45.19 lakh people have succumbed to the ongoing COVID-19 pandemic [1]. Research has shown that progressive fibrotic lung disease is one of the possible consequences of pulmonary pneumonia induced by the novel coronavirus and is one of the most worrisome complications following the recovery from the COVID-19 [2]. Considering its importance and sensitivity in the human body, lung performance is a good indicator for understanding the host tolerance to infectious diseases [3]. Therefore, in lung functionality, the discussions revolving around pulmonary fibrosis are even more relevant.

Pulmonary fibrosis is a lung condition commonly associated with severe lung injury when the lung tissues around and between the air sacs (alveoli) become damaged and scarred. Fibrosis in the lungs leads to thickening of the tissue, and the stiff tissue results in improper functioning of the lungs. As the pulmonary fibrosis condition worsens, the shortness of breath experienced by the person suffering from it becomes more acute [4].

Since the scarring of the lung tissues can occur in the absence of a clear initial acute inflammatory phase and can manifest to an advanced stage without a clinically acute symptom, no inciting agent has been pinpointed yet as the pivotal cause of pulmonary fibrosis. However, the medical community broadly opines that the germination of pulmonary fibrosis is owed to abnormal wound-healing mechanisms following repetitive alveolar microinjury [5]. Activities like smoking, as well as the microaspiration of gastric content (a risk factor commonly associated with intubated critically ill Pneumonia patients who are unable to breathe on their own and need to be on ventilator support), and microbial infection are known to trigger the fibrotic response in the lung [6]. Even exposure to hazardous materials (e.g., silica dusts, asbestos fibers etc.) can lead to lung fibrosis [7].

Scarred lung tissues heavily restrict the supply of oxygen to the rest of the body. This eventually affects the right side of the heart. Pulmonary fibrosis can result in high blood pressure in the lungs, known as pulmonary hypertension. In severe cases, it can cause heart failure, resulting in the demise of the patient suffering from it [8].

Some of the symptoms that can indicate the signs of lung fibrosis include shortness of breath (dyspnea), fatigue (due to insufficient oxygen being supplied to the muscles), cyanosis (bluish skin in fair-skinned individuals), persistent dry cough, sudden and unexplained loss of body weight, aching muscles, and joints, as well as widening and rounding of the fingertips and toe-tips (also known as clubbing) [9].

Dr Sonye Danoff (MD, PhD), an Associate Professor of Medicine and the Co-Director of Interstitial Lung Disease / Pulmonary Fibrosis Program at Johns Hopkins University, from her research experience associated with 41 men and women with idiopathic pulmonary fibrosis, found that the patients on an average exhibited more than twice the amount of night-time sleep disturbances and about double the number of daytime episodes of drowsiness as compared to the people with healthy lungs [10]. Therefore, it is evident that pulmonary fibrosis affects the quality of life of the patients substantially.

It is noteworthy that pulmonary fibrosis is characterized by the replacement of normal lung parenchyma with collagenous tissue, resulting in architectural changes in the lung that are irreparable and largely irreversible [11]. However, specific anti-fibrotic drugs and therapies can sometimes help in improving the quality of life by alleviating some of the symptoms in patients whose lung function tests fall within certain limits [12]. For extreme cases, a lung transplant might also be required.

Linkage between Tuberculosis (TB), COVID and Pulmonary Fibrosis

Pulmonary tuberculosis is known to be responsible for several respiratory problems in the long run, viz. chronic obstructive pulmonary disease (COPD), pulmonary fibrosis, and restrictive lung diseases (i.e., the lung diseases that prevent the lungs from fully expanding with air) [13]. Particularly, a past record of pulmonary tuberculosis (TB) increases the risk factor towards developing long-term respiratory impairment in TB patients [13].

Published research indicates that the bacterium responsible for tuberculosis infection (i.e., Mycobacterium tuberculosis) latently resides in about 25% of the global population, and it may enhance the chances and severity of the SARS-CoV-2 (COVID-19) infection [14].

In a sample study comprising 36 COVID-19 cases from Shenyang, China, the tuberculosis history (both of active and latent TB) of the patients emerged as a key risk factor associated with the SARS-CoV-2 infection. The patients with active or latent TB exhibited greater susceptibility to SARS-CoV-2, and in those patients, the symptom development and progression of COVID-19 were rapid and severe [14].

Further, if a patient who is already suffering from pulmonary fibrosis (due to COVID or any other triggering agents/diseases) contracts pulmonary tuberculosis, a grave situation can unfold. In such cases, it may be difficult to cure the tuberculosis infection of the patient, primarily owing to the reduced oxygen-carrying capacity of the lungs.

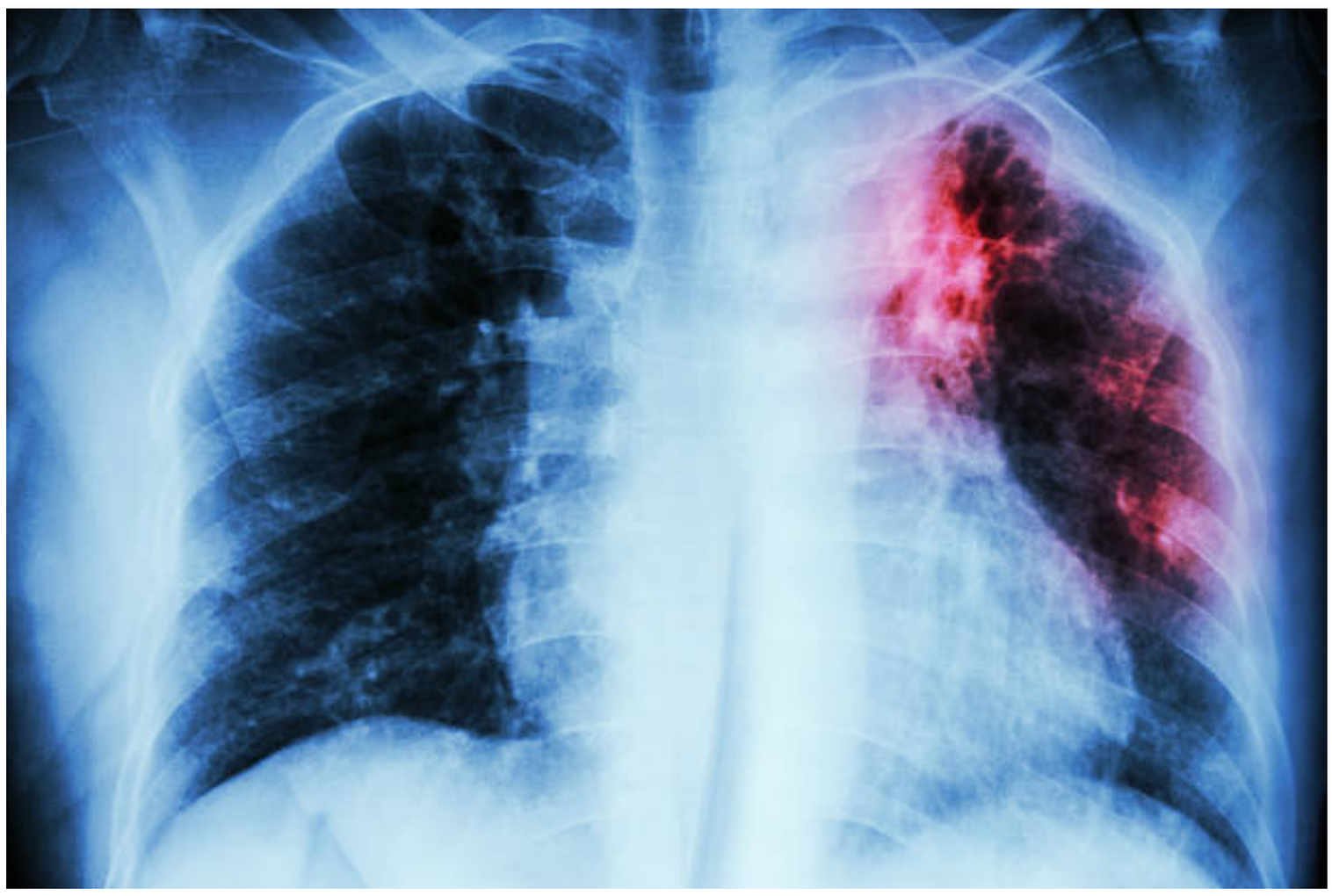
Therefore, during the ongoing pandemic, it is important to carefully evaluate the linkage between pulmonary tuberculosis and the fibrosis in the lungs induced by the extended aftereffect of COVID infections. It is also important to look at an integrated picture of such diseases instead of looking at each one in an isolated manner.

Possible Interventions:

It is widely known that the risk of tuberculosis infection increases substantially for the individuals residing in unclean and crowded living conditions, as well as those suffering from poor nutrition. On the other hand, pulmonary fibrosis can get aggravated due to cigarette smoking and regular inhalation of chemicals or hazardous substances [8].

Further, it is noteworthy that most of the microbial infections are owed to the compromised immune system of the human body. The immune system becomes weak due to several reasons, such as old age, unhealthy and improper dietary habits, unhealthy lifestyle, chronic illnesses, high blood pressure and diabetes, continued stress, as well as smoking and other intoxications.

Therefore, a balanced diet, adequate amount of aerobic exercise and staying away from stress and negative thoughts are quintessential for maintaining a good quality of life. Furthermore, routine check-ups for chronic diseases, strict adherence to the treatment regime, proper social distancing, and a hygienic living condition would prove to be instrumental in ensuring an enhanced level of overall safety during these challenging times marred by the rapid spread of lethal contagious diseases.



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