

ORIGINAL ARTICLE

Study of Tissue Damage in the Respiratory System of Patients with COVID-19 in Al-Muthanna Governorate

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Abstract

The object of study was conducted on 30 patients from three different geographical areas of Al-Muthanna Governorate, Samawah city, Al-Rumaitha district, and Al-Khader. The study was conducted on 30 patients, 18 females and 12 males. Ages ranges were between 20 – 75 years old. The aim of study was determination tissue damage levels in the respiratory system in patients with COVID-19. The study showed that females are more susceptible to get COVID-19 than males Percentage of females was 60%. the percentage of tissue damage in the tissues of the respiratory system wide range between 2 - 80% Percentage of damage at the site of the lungs and main bronchi which is the most, was 55%. As for the ages of the patients, the study showed that the ages older than 60 years old 43.3% from total patients they are the ones most susceptible to infection. Relative to the rate of tissue damage in the respiratory system for patients older than 60 years old was 64.7%, it is the highest percentage of tissue damage in relation to other ages

Keywords: COVID-19, respiratory system, tissue damage, Epidemiology, SARS COV-2.

1 Introduction

During the recent respiratory pandemic in 2019, the human coronavirus type seventh, severe acute respiratory syndrome 2 which is symbolized by the symbol (SARS-CoV-2), was discovered in Wuhan city - China [1, 2]. Since then, the virus has infected about 5 million people worldwide, killing about 300,000 patients as of May 20 - 2020 [3]. SARS-CoV-1 and SARS-CoV-2, and Middle East respiratory syndrome coronavirus which is symbolized by the symbol (MERS-CoV) all cause severe pneumonia, with mortality percentages of 2.9%, 9.6%, and 36%, respectively [4–6]. This illness has the ability to kill. An rising percent-

age of patients with life-threatening diseases have died around the globe. The elderly population has greater mortality rates, according to epidemiological studies [7], It's also far less common among children [8, 9]. A large number of research have been based on China's experiences to date. During the early stages of the pandemic, COVID-19 cases were mostly found among the elderly [10]. Extensive research, case studies, and reports have recently been undertaken in an attempt to provide a thorough grasp of the virus structure, binding mechanism, and curative procedures.

2 The structure of SARS-COV-2

Coronaviruses belong to the Coronavirinae subfamily of the Coronaviridae family, which is divided into 4 genera: (1)Alphacoronavirus, (2)Betacoronavirus, (3)Gammacoronavirus, (4)Deltacoronavirus. CoVs have (+ssRNA) genome of any RNA virus (27–32 kb). The nucleocapsid protein (N) creates the capsid outside the genome, and an outer envelope made up from 3 structural proteins: (1) protein M, (2) protein S, (3) protein E [11]. Coronavirus penetrate the host cells tissue by the spikes glycoprotein (S protein) [12–14] Transmembrane spike glycoprotein homotrimers protrude out from virus surface. The spike glycoprotein is a prospective antiviral target since it is essential for coronavirus entry. The S protein, which is made up of (2) functional subunits, is made up of the S1 subunits and S2. The S1 subunit is made up of the (NTD) and (RBD). The S1 subunit's job is to bind to the receptors on the host cells. The fusion peptide (FP), heptad repeat 1 (HR1), central helix (CH), connector domain (CD), heptad repeat 2 (HR2), transmembrane domain (TM), and cytoplasmic tail (CT) are all found in the S2 subunit (CT) Figure 1.

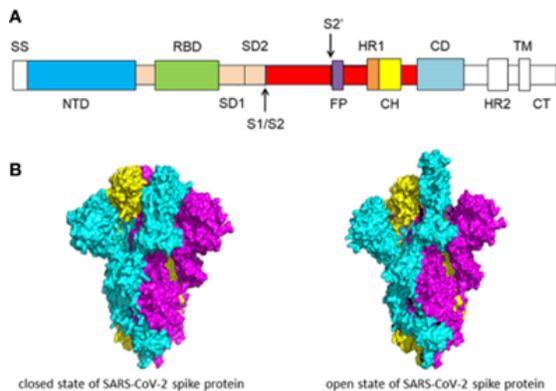


Figure 1: Primary structure of SARS-CoV-2 protein spike.

3 Epidemics Science

3.1 Disease Display

Patients with covid-19 infection might experience symptoms range from mild to very severe, and many others are asymptomatic carriers. Cough (82%), Fever (83%), and the most main symptoms are Poor breathing (31%) [15]. In patients, chest X-rays frequently show a lot of opacity and spots [15, 16]. Digestive problems like nausea, diarrhea, and stomach pain are observed in 2–10% of patients [15, 17], Moreover, Before the start of temperature and respiratory symptoms, 10% of individuals experience diarrhea and nausea [15]. COVID-19 patients had greater WBC, NEUT counts, and CRP, LDH, AST, and ALT serum

levels, as well as lower lymphocyte and EO counts, lower average HGB values, and lower average HGB values [18]. In addition, early C-reactive protein serum level have been shown to be a reliable predictor of COVID-19 sickness severity [19, 20]. Whereas coronavirus mostly affects the lungs, ACE2 receptors are found throughout the body [21] It's possible that it'll injure the heart, intestinal tract, he kidneys, liver, CNS, and eye must all be examined on a regular basis. [22].

3.2 Transmission and spread of SARS-COV-2

SARS-CoV-2, like some other respiratory viruses, transmits most effectively and infectiously through the respiratory system. Aerosols may also be necessary, despite the fact that drop transmission is the most well-known way [23, 24]. Like SARS-CoV, the virus could also spread by the oral-fecal route. SARS-CoV-2 RNA was discovered in the feces of a person with COVID-19 pneumonia [25]. As a consequence, The transmission of SARS-CoV-2 could be aided by sewage. In light of this, methods to solve, for example biosorption able to retain and deactivates the virus must be researched [26]. Covid-19 has indeed been discovered in ill people's saliva [27], This is due the combination of ACE2 sensors in epithelial cells that lining the oropharyngeal paths [28]. Various investigations have looked for SARS-CoV-2 viral RNA in patient urine. In these trials, Positive RNA pool rate was only about 5-6%; however, the time it takes for a virus to lose its coat in urine testing, as well as the pathogenicity of urine, have yet to be identified [29]. In the places of patients infected with COVID-19, the virus is present on metal surfaces and patient tools. Persons accompanying or who are in the same places as the infected people can transmit the infection to them through the mouth, nose or eyes [24]. On the other hand, a study was conducted on nine pregnant women who already had Covid-19 infection, and transmission of infection from mother to infant was not detected or diagnosed [30].

3.3 Interstitial and Alveolar Epithelium

The pathobiological repercussions of (SARS-CoV2) infection on alveolar epithelial damage. SARS-CoV2 infection in a host In the alveolar epithelium, the expression of ACE2 (angiotensin-converting enzyme-2) and TMPRSS2 is critical (transmembrane serine protease 2). To begin, a Corona virus link to ACE2 on alveolar type II (AT2) cells Via one of the four proteins that make up the structure, glycoprotein S (spike), Secondly, TMPRSS2 cleaves ACE2, allowing ACE2 to be cleared from the cell surface, and also the vi-

ral glycoprotein S, into subunits S1 and S2, culminating in viral uncoating and cytoplasmic release of the viral DNA. The viruses are then replicated in the (ER), with the viral core proteins S, M, N, and E being translated by the machinery of both the virus and the host cell (ER), Virus particles are formed and packaged into small pocket vesicles in the ER-Golgi-intermediate compartment before being Exocytosis occurs when a cell is transported to the cellular membranes. AT2 malfunction or loss caused by SARS-CoV2 infection is harmful to the wounded lung for various reasons: (1) Alveolar collapse and atelectasis are more likely when surfactant levels are low. (2) Alveolar type I (AT1) cell replacement is affected by a drop in AT2 progenitor cells, which inhibits alveolar repair and may promote fibrosis. (3) In a geographically confined area, downregulation of ACE2 produces overactivity of the ACE/Angiotensin II/AT1 receptor axis, intensifying the tissue-destructive effects of the inflammatory reaction. (4) Immune cell infiltration, lymphatic fluid, and capillary extravasation in the alveolar tissue spaces are caused by viral-induced cytokine secretion by AT1/AT2 cells.

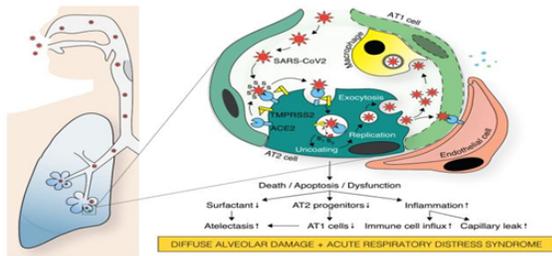


Figure 2: Alveolar epithelial damage caused by the (SARS-CoV2) infection.

4 Methods of Diagnostic

The study was conducted in Al-Muthanna Governorate in April 2022. Patients were diagnosed with Covid-19 from three different Hospital, from three different geographical areas of Al-Muthanna Governorate, Al-Hussein Teaching Hospital, Al-Rumaitha Hospital and Al-Khader Hospital by PCR swabs, and the levels of tissue damage caused by the destruction of virus-infected cells were determined for each patient by MRI.

5 Results

The results showed a large discrepancy between the percentage of damage and age on the one hand, and in relation to the percentage of lung damage on the one hand, and the location of the damage in the respiratory system on the other. The study was conducted

on 30 patients, 18 females and 12 males. Ages ranges were between 20 to 75 years old. And the percentage of tissue damage in the respiratory system ranges between 2 to 85%. As for the site of the infection in the respiratory system, it differed from one patient to another. Percentage of damage at the site of the lungs and main bronchi was 55% from total patients, Percentage of damage at the site of the right site of the lungs was 17%, and the site of the left site of the lungs was also 17%, Percentage of damage at the site of the trachea and main bronchi was 7%, and mild lung damage was 4%. Figure 3,4, 5.

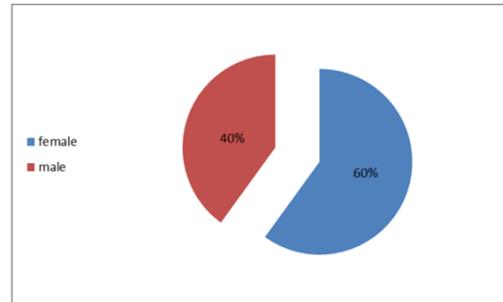


Figure 3: Percentage of male and female patients.

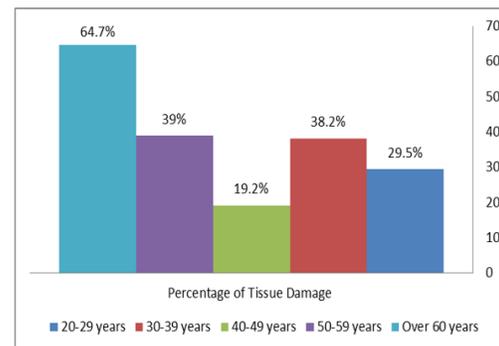


Figure 4: The relationship .between the level of tissue damage and the age of patients.

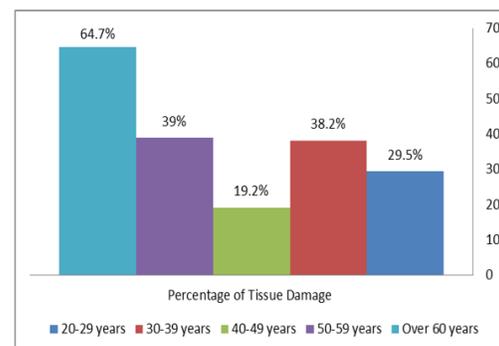


Figure 5: Distribution of tissue damage in the respiratory system.

6 Discussion

When analyzing patient data, the study showed different results between males and females and the level of tissue damage, and it was found that Covid-19 can infect different parts of the respiratory system, which include the middle part of the lung tissue, which is the most common in the patients studied, And parts of the bronchi and their branches, and the upper and lower part of the lung tissue. As for the level of tissue damage caused by tissue infection with the virus, it was at a wide rate among patients, as it varies from one patient to another, due to the difference in the body's physiology and respiratory system and the effectiveness of the immune system [31]. The largest percentage of tissue damage in the respiratory system has been determined for patients over the age of 60 years old, and this confirms that the elderly are more susceptible to complications from Covid-19, and therefore the largest percentage of tissue damage is due to the reduced efficiency of vital organs in the body, including the immune system because of age [32].

7 Conclusion

Deduced from the study that females are more susceptible to infection with Covid-19 than males, and patients over 60 years old are the most exposed to tissue damage in the respiratory system, specifically in the middle part of the lungs.

Conflict of Interest: None

Ethical consideration: from ethical committee in the Conflict of Interest: None

Ethical consideration: from ethical committee in the Department of Medical Laboratory, AL-Furat AL-Awsat Technical University, Samawah Technical Institute, Samawah, Iraq

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