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Original Article

Hematologic and Computed Tomography Features for Discriminating COVID-19 From Non-COVID-19 Pneumonia

Javad Poursamimi[1, 2*], Soleyman Saravani[3], Roghayeh Hossein Beigi[4], Sara Rashki Ghalenoo[5], Mehrangiz Ghafari[6], Majid Valizadeh[7]

1. Department Immunology, Faculty of Medicine, Zabol University of Medical Sciences, Zabol, Iran.
2. Department of Laboratory Sciences, School of Paramedical Sciences, Zabol University of Medical Sciences, Zabol, Iran.
3. Department of Community Medicine, School of Medicine, Zabol University of Medical Sciences, Zabol, Iran.
4. Department of Internal Medicine, School of Medicine, Zabol University of Medical Sciences, Zabol, Iran.
5. Department of Cardiology, School of Medicine, Zabol University of Medical, Sciences, Zabol, Iran.
6. Department of Pathology, School of Medicine, Zabol University of Medical Sciences, Zabol, Iran.
7. Department of Basic Sciences, School of Medicine, Zabol University of Medical Sciences, Zabol, Iran.

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ABSTRACT

Introduction: The clinical symptoms of COVID-19 and non-COVID-19 pulmonary infections are very similar. This study aimed to differentiate between these groups of patients by evaluating laboratory criteria and abnormalities in CT scans.

Materials & Methods: The medical records of 200 patients referred to Amir Hospital in Zabol were analyzed between February 2020 to February 2021. Some of our findings in the COVID-19 group, compared to the non-COVID-19 group, included increase in red blood cell counts (RBCs), mean corpuscular hemoglobin concentration (MCHC), mean hematocrit (HCT), erythrocyte sedimentation rate (ESR), neutrophil-to-lymphocyte ratio (NLR), and platelet-to-lymphocyte ratio (PLR).

Results: The COVID-19 group had a lower mean corpuscular volume (MCV) of 80 femtoliters (fL) and mean cell hemoglobin (MCH) below 36. The symptoms of pulmonary infection were mostly bilateral in the COVID-19 group, whereas in the non-COVID-19 group, they were predominantly unilateral. In total, 21.6% of patients had 5 to 10 lesions, while 24.7% of the non-COVID-19 group had fewer than 3 lesions. The COVID-19 group showed a distribution of both peripheral and diffuse lesions, whereas the non-COVID-19 group had a predominantly

*** Corresponding Author:**
Javad Poursamimi, Assistant Professor.
Address: *Department of Immunology, School of Medicine, Zabol University of Medical Sciences, Zabol, Iran.*
Tel: *+98 (54) 32225402*
E-mail: *poursj1357@zbmu.ac.ir; Javadpoursamimi@gmail.com*

peripheral distribution. Linear opacity and ground-glass opacity (GGO) were observed in 10(6.2%) and 40(24.7%) individuals in the COVID-19 group, and in 13(8%) and 32(19.8) individuals in the non-COVID-19 group, respectively. Twenty-one (13%) COVID-19 patients and 16(9.9%) non-COVID-19 patients exhibited septal thickening. Moreover, fine reticular opacities, crazy paving patterns, and pleural effusion were observed in 6(3.7%), 19(11.7%), and 8(4.9%) of the COVID-19 patients, and in 20(12.3%), 24(14.8%), and 18(11.1%) of the non-COVID-19 patients, respectively.

Conclusion: Finally, this study concluded that laboratory indices such as MCV, and CT scan findings such as septal thickening are very beneficial for distinguishing between these two groups.

1. Introduction

The COVID-19 pandemic, caused by the SARS-CoV-2 virus in the 21st century, has been a primary concern of the World Health Organization (WHO). Despite efforts to control the disease, multiple instances of infection with new variants and new forms of the disease have underscored the importance of drawing on past experiences in dealing with COVID-19 [1, 2]. The acute course of COVID-19 varies, ranging from asymptomatic infection to severe respiratory failure. Patients who recover from COVID-19 may experience persistent symptoms and varying degrees of pulmonary abnormalities [3].

As of August 18, 2024, the global death toll from the COVID-19 virus had reached 7,060,609, with an additional 46,936 new infections reported in August 2024 [4]. In Iran, however, the official statistics on COVID-19 deaths have differed from the actual figures. The mortality rate in the country varied by gender, with men experiencing a higher rate than women (326 vs 264 deaths per 100,000). Additionally, the mortality rate was influenced by age. Geographically, the highest death rates were observed in the central and northwestern provinces of Iran [5].

Developing countries such as Iran have faced numerous challenges in combating the COVID-19 epidemic. These challenges have been apparent at all stages of prevention, identification, and treatment of the disease. For this reason, certain regions in southeastern Iran have at times reported the highest number of COVID-19 cases [6]. The symptoms of acute COVID-19 are similar to those of other pulmonary infectious diseases. These include fever, fatigue, dry cough, sputum production, sore throat, shortness of breath, and headache. In severe cases, pneumonia, edema, and respiratory distress can occur. The severity of symptoms depends on factors such as the age of the patients (over 65), cardiovascular disease, high blood pressure, diabetes, cancer, and chronic obstructive pulmonary disease [7]. Zabol, located in southeast of Iran, is one of the most polluted areas in the country in terms of acute pulmonary diseases, particularly those caused by *Mycobacterium tuberculosis* [8]. Exposure to fine dust and soil, which has increased as a result of climate change, has also intensified the severity of pulmonary diseases in this region [9].

Currently, the issue of air pollution caused by climate change has become the most pressing challenge for residents in these areas. The rise in winds carrying aerosols throughout all seasons of the year has increased the quantity and severity of pulmonary diseases, leading to a significant increase in hospitalized patients in 2020-2021 [10]. It is evident that using modern techniques to diagnose and differentiate diseases in their early stages can significantly reduce stress for patients of all age groups, especially middle-aged individuals, the elderly (aged 65 and older), and pregnant women. This approach can also help prevent casualties. Computed tomography (CT) scan can be used to diagnose COVID-19 patients and predict the potential development of acute pulmonary conditions like sepsis, acute respiratory distress syndrome (ARDS), pneumonia, and bronchitis [11]. In these cases, ground-glass opacity (GGO) and the appearance of a crazy-paving pattern are findings that can be identified through CT imaging techniques and are linked to the interpretation of laboratory indices [12]. In this retrospective study, patients were divided into two groups based on whether their acute pulmonary infection was caused by COVID-19 or a non-COVID-19 pathogen. We then compared the laboratory diagnostic indicators and CT imaging of patients in a specific region of southeast Iran.

2. Materials and Methods

2.1. Study design

This descriptive-analytical study received approval from the Research Committee of Zabol University of

Medical Sciences in January 2023. The study examined the records of 200 patients from Amir Hospital in Zabol, Iran, covering the period from February 2020 to February 2021. Among these patients, 60 were diagnosed with acute COVID-19 infection, while 45 had acute non-COVID-19 infections. All patients underwent CT scans of the lungs and had their laboratory indices assessed.

During data collection, patients were grouped based on their symptoms, including cough and fever, along with the results of the polymerase chain reaction (PCR) diagnostic test.

Patients were excluded from the study if they had bacterial infectious diseases, showed normal lung parenchyma on CT scans, had non-infectious parenchymal lesions such as lung cancer, pneumothorax, or pulmonary edema, experienced a delay of more than 7 days between their lung CT and reverse transcription-PCR (RT-PCR) testing [13], were hospitalized for non-pulmonary symptoms, or did not have a lung CT scan available.

2.2. Laboratory indices and CT scan

The hematologist carefully reviewed the patients' laboratory indices, which included white blood count (WBC), lymphocytes, neutrophils, eosinophils, monocytes, red blood cell (RBC) counts, hemoglobin (Hb), mean hematocrit (HCT), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), and mean corpuscular hemoglobin concentration (MCHC), platelet count (PLT), neutrophil-to-lymphocyte ratio (NLR), erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP).

CT scans of the chest were acquired on 16- to 64-multidetector CT scanners (Philips Brilliance 16, Philips Healthcare; GE LightSpeed 16, GE Healthcare; GE VCT LightSpeed 64, GE Healthcare; Somatom Sensation 64, Siemens Healthcare; Somatom AS, Siemens Healthcare; Somatom Spirit, Siemens Healthcare; GE Optima 680, GE Healthcare).

2.3. CT-scan image analysis

We used original cross-sectional images for analysis. All images were analyzed by two experienced chest radiologists who were blinded to the clinical details. In cases where their reports were not consistent, the final report was determined by consensus.

In the CT images of patients, indicators considered included the involvement (unilateral and bilateral), distribution (peripheral, central, or diffuse), linear opacity, GGO, consolidation, interstitial changes (septal thickening, fine reticular opacity, or none), crazy-paving pattern, and pleural effusion.

2.4. Statistical analysis

The collected data were analyzed using SPSS software, version 26. A one-way ANOVA test was employed to compare the means when appropriate. A P<0.05 was considered statistically significant.

3. Results

3.1. Patient demographic data

There were no significant differences in patient distribution based on gender and age. The average age of patients was 50.96±19.90 years for the COVID-19 group and 49.77±18.82 years for the non-COVID-19 group. The COVID-19 group consisted of 24 men (40%) with an average age of 52.41±4.21 and 36 women (60%) with an average age of 50.00±3.27 years. The non-COVID-19 group consisted of 17 men (37.7%) with an average age of 54.29±5.02 years and 28 women (62.3%) with an average age of 47.03±3.28 years.

3.2. Patients' blood indices

The COVID-19 group (4.81±0.21) showed a higher RBC count compared to the non-COVID-19 group (4.24±0.16, P=0.043). The other indices have been summarized in Table 1 (P>0.05).

The MCV in the COVID-19 group (80.02±1.49) was lower compared to the non-COVID-19 group (85.41±2.23). However, there was no significant difference in the MCV comparison between the groups based on gender (P>0.05; Table 2). Additionally, the COVID-19 group (25.76±0.67) showed a decrease in MCH compared to the non-COVID-19 group (27.78±1.18) (P=0.043). In contrast, the COVID-19 group (32.43±0.43) showed a higher MCHC compared to the non-COVID-19 group (32.33±0.76) (P>0.05).

In terms of Hb concentration and HCT, the COVID-19 group (12.38±0.61; 38.39±1.68) was slightly higher than the non-COVID-19 group (11.91±0.71; 36.35±1.78), respectively (P>0.05; Table 2).

Table 1. The Mean±SD of the hematologic indices is presented

Groups	WBC	Mean±SD			
		RBC	Neutrophils	Lymphocytes	PLTs
COVID-19	8.02±3.34	4.81±0.81	6.72±3.29	1.12±0.52	218±68.06
non-COVID-19	9.10±4.05	4.24±0.16	7.21±3.85	1.54±0.85	222.6±64.97
P	-	0.043	-	-	-

The ESR level in the COVID-19 group (66±16.62) was higher compared to the non-COVID-19 group (34.67±9.23) (P>0.05). Furthermore, ESR levels of both men and women in the COVID-19 group were high compared to the non-COVID-19 group (P>0.05; Table 3). In terms of CRP, the COVID-19 group (2.07±0.26) was slightly lower compared to the non-COVID-19 group (2.42±0.72) (P>0.05; data not shown). Additionally, there were no significant differences based on gender (P>0.05; Table 3).

The mean NLR and platelet-to-lymphocyte ratio (PLR) indices in the COVID-19 group (7.17±1.23; 217.95±23.79) were higher than those in the NLR and PLR in the non-COVID-19 group (6.16±1.32; 188.06±27.78), respectively (P>0.05). Additionally, there was no significant difference in the mean NLR and PLR based on gender (P>0.05; Table 3).

3.3. CT-scan findings

Lung involvement in the COVID-19 group was bilateral in 52 patients and unilateral in eight patients. In contrast, the non-COVID-19 group included two patients with bilateral lesions and 43 patients with unilateral lesions in the non-COVID-19 group (P=0.00). Additionally, there was no significant difference in the involvement pattern based on gender (P>0.05).

The lesion count was analyzed across four categories: Fewer than 3, between 3 and 5, between 5 and 10, and over 10. In the COVID-19 group, 37% of participants exhibited lesions, compared to 15.2% in the non-COVID-19 group (Table 4).

The analysis of lesion distribution across three categories—central, peripheral, and diffuse—in the COVID-19 group compared to the non-COVID-19 group showed a significant difference (P=0.00).

In the COVID-19 and non-COVID-19 groups, one (0.6%) and two (1.2%) individuals were classified as Central, 40(24.7%) and 42(25.9%) as Peripheral, and 19(11.7%) and one (0.6%) individual as diffuse, respectively. The highest rate of lesion distribution was associated with the Peripheral status in both groups.

GGO was observed in 40 individuals (24.7%) in the COVID-19 group and 32 individuals (19.8%) in the COVID-19 and in the non-COVID-19 group (P>0.05). Additionally, 20 individuals (12.3%) in the COVID-19 group and 13 individuals (8%) in the non-COVID-19 groupwere negative for GGO (P>0.05). However, analysis of GGO showed a significant association with age (P=0.028; Figure 1a).

Linear opacity was observed in 10 individuals (6.2%) in the COVID-19 group and 13 individuals (8%) in the non-COVID-19 group (P>0.05). Additionally, 50 individuals (30.9%) in the COVID-19 group and 32 individuals (19.8%) in the non-COVID-19 group were negative for linear opacity (P>0.05; Figure 1b).

Table 2. The Mean±SD of the blood indices is presented

Groups	Gender	Mean±SD							
		MCV	MCH	MCHC	PLT	RBC	WBC	Hb	HCT
COVID-19	Male	79.64±2.34	25.74±1.18	32.21±0.73	207.42±24.21	4.95±0.95	8.24±0.43	12.67±1.02	39.12±2.69
	Female	80.41±2.03	25.78±0.75	32.05±0.51	228.57±24.65	4.67±0.17	7.81±1.81	12.11±0.75	37.67±2.18
Non-COVID-19	Male	84.34±2.74	27.04±1.95	31.81±1.58	214.28±26.07	4.34±0.32	10.52±1.81	12.02±1.41	36.87±3.32
	Female	86.24±3.45	28.35±1.53	32.73±0.68	236.23±23.48	4.17±0.17	7.98±1.07	11.81±0.73	35.95±2.02

Table 3. The Mean±SD of the blood cell ratios (NLR, PLR), ESR, and CRP is presented

Groups	Gender	Mean±SD			
		NLR	PLR	ESR	CRP
COVID-19	Male	6.19±0.95	174.18±18.09	78.00±29.00	2.00±0.37
	Female	8.16±2.34	261.72±38.56	54.00±23.00	2.14±0.41
non-COVID-19	Male	8.31±2.78	187.74±51.02	26.75±10.24	2.13±0.26
	Female	4.51±0.76	188.31±32.44	50.51±16.50	2.71±0.18

Female: F; Male: M.

The consolidation index was observed in 18 individuals (11.1%) in the COVID-19 group and 14 individuals (8.6%) in the non-COVID-19 group (P>0.05). Additionally, 42 individuals (25.9%) in the COVID-19 group and 31 individuals (19.1%) in the non-COVID-19 group were negative for consolidation (P>0.05; Figure 1c).

Interstitial changes were categorized into three subsections: septal thickening, fine reticular opacity, and none. Septal thickening was observed in 21 individuals (13%) in the COVID-19 group and 16 individuals (9.9%) in the non-COVID-19 group (P=0.038). Additionally, fine reticular opacity was present in six individuals (3.7%) in the COVID-19 group and 20 individuals (12.3%) in the non-COVID-19 group (P=0.038). The remaining participants — 33 individuals (20.4%) in the COVID-19 group and 9 inividuals (5.6%) in the non-COVID-19 groups— showed no interstitial changes (P=0.038; Figure 1d).

The crazy paving pattern structure was observed in 19 individuals (11.7%) in the COVID-19 group and 24 individuals (14.8%) in the non-COVID-19 group (P=0.025). Conversely, 41 individuals (25.3%) in the COVID-19 group and 21 individuals (13%) in the non-COVID-19 group were negative for this pattern (P=0.025; Figure 1e).

Pleural effusion was observed in eight individuals (4.9%) in the COVID-19 group and 18 individuals (11.1%) in the non-COVID-19 group (P=0.002). Conversely, 52 individuals (32.1%) in the COVID-19 group and 27 individuals (16.7%) in the non-COVID-19 group were negative for pleural effusion (P=0.002; Figure 1f).

3.4. Correlations

The analysis of the correlation between laboratory indices and CT imaging findings in both groups showedseveral statistically significant associations. In the non-COVID-19 group plural effusion was negatively correlated with NLR (correlation coefficient: −0.515, P=0.041), and consolidation was negatively correlated with MCHC (−0.505, P=0.046). In the COVID-19 group, the crazy paving pattern showed a negative correlation with lymphocyte counts (−0.566, P=0.035), while overall lung involvement was positively correlated with lymphocyte counts (0.660, P=0.010).

Table 4. The lesion count across four categories is displayed

Lesion Count		No. (%)				
		Less of 3	Between 3 to 5	Between 5 to 10	Over 10	Total
COVID-19	Female	4(50)	6(75)	22(62.8)	4(44.5)	36(60)
	Male	4(50)	2(25)	13(37.1)	5(55.5)	24(40)
	Total	8(100)	8(100)	35(100)	9(100)	60(100)
non-COVID-19	Female	7(50)	2(100)	-	-	9(56.3)
	Male	7(50)	-	-	-	7(43.7)
	Total	14(100)	2(100)	-	-	16(100)

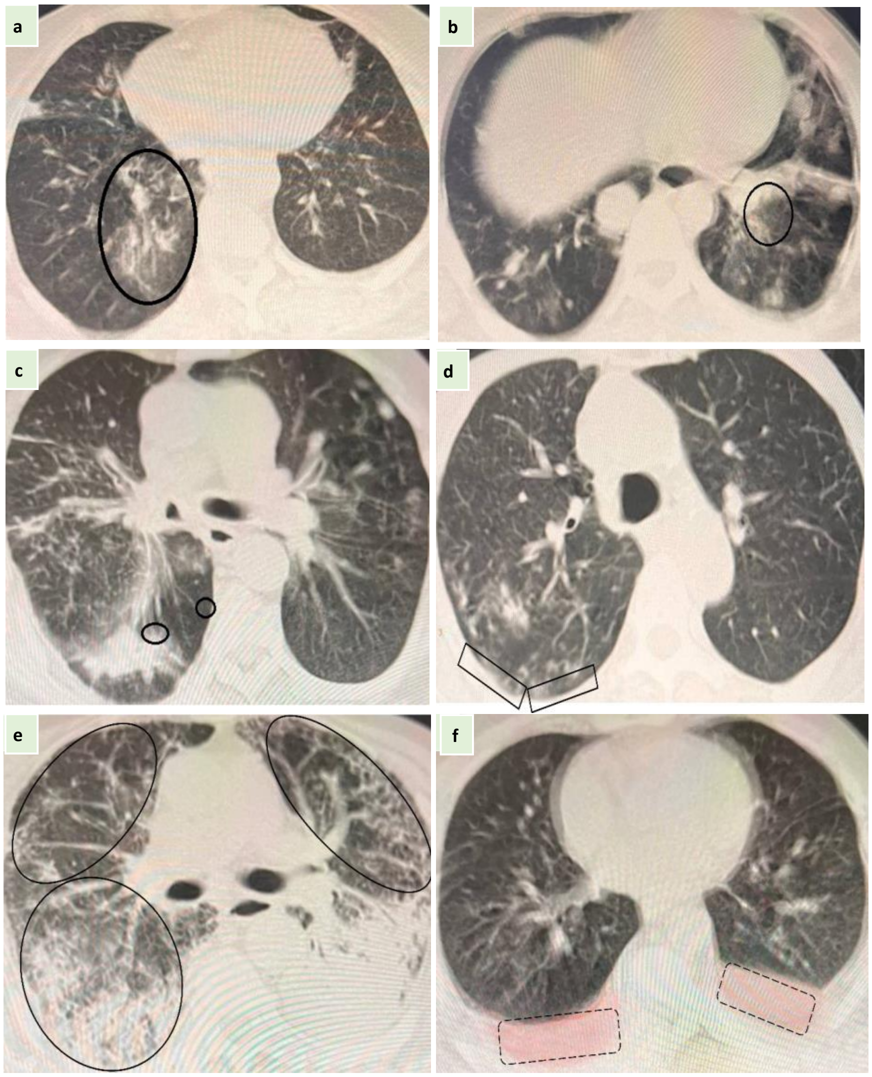

Figure 1. The histopathological changes in lung CT scan images of patients with COVID-19 infection

a) GGO, b) Linear opacity, c) Consolidation, d) Interstitial changes (septal thickening, and fine reticular opacity), e) Crazy-paving pattern, f) Pleural effusion

4. Discussion

The descriptive-analytical study evaluated laboratory indices such as RBC counts and histopathological indices of the lungs, such as GGO detected by CT scans. Due to the unique geographical location of the Zabol area in Iran, as well as the lack of suitable vegetation and recent climate changes, there has been a noticeable increase in the number of patients with acute pulmonary infections in local hospitals [14]. The records were classified into two groups: COVID-19 and non-COVID-19, based on PCR testing. In 2020, Li et al. conducted a study that closely resembles the current research. They used RT-PCR tests to differentiate patients with COVID-19 pulmonary infections from those with non-COVID-19 pulmonary infections [13].

4.1. Findings from the biochemical analysis

The RBC counts were within the normal range. However, there was a significant increase in the COVID-19 group compared to the non-COVID-19 group (P=0.043). In the COVID-19 group, there was a significant decrease in the MCV index among men, to less than 80, which was significantly different compared to the non-COVID-19 group (P=0.034). Additionally, the MCH index for men and women in the COVID-19 group was less than 36. There was a significant decrease in the MCH index in the COVID-19 group compared to the non-COVID-19 group (P=0.043). Furthermore, the mean MCHC index in the COVID-19 group was higher than in the non-COVID-19 group (P>0.05). There were no significant differences in comparisons within the groups based on gender.

In line with our study, a study by Marchi et al. (2022) showed a strong correlation between the severity of clinical symptoms in COVID-19 patients and a decrease in peripheral RBC counts. They found that assessing the morphology of RBCs is essential and can aid in improving patients' condition. The study also revealed that RBCs tend to become microcytic during viral infections [15].

However, our findings showed that the RBC counts were higher in the COVID-19 group compared to the non-COVID-19 group, even though they were within the normal range. On the other hand, the average MCV index for men in the COVID-19 group was less than 80 femtoliters (fL). This suggests that the morphology of the RBCs in the COVID-19 group is likely microcytic.

The microcytic morphology of RBCs had not been evaluated in the hospitals of Zabol City. Some studies have shown a close relationship between a decrease in MCV to under 80 fL and a hereditary origin, particularly the occurrence of heterozygous α- or β-thalassemia. These patients often do not exhibit clinical symptoms of anemia, and their RBC morphology is likely to be microcytic hypochromic [16].

The average total HCT in the COVID-19 group was slightly higher than in the non-COVID-19 group (P>0.05). It's important to note that the HCT formula calculates the ratio of RBCs to the total volume of blood. It's possible that COVID-19 patients may have experienced a loss of plasma volume, leading to a falsely elevated HCT level. In this direction, Asan et al. (2021) evaluated the HCT index in COVID-19 patients with mild or severe symptoms. They found that the average HCT levels in patients with severe symptoms were lower than those in patients with mild symptoms [17].

The use of HCT in monitoring the condition of COVID-19 patients is crucial due to its close relationship with peripheral blood viscosity. Several studies have indicated a significant increase in the peripheral blood viscosity of COVID-19 patients. Moreover, changes in viscosity have been linked to conditions such as myocardial infarction (MI), venous thrombosis, and venous thromboembolism [18]. Increased blood viscosity in pulmonary viral infections may lead to defects in microcirculation and hemodynamics, highlighting the importance of considering blood viscosity in such cases [19].

The mean ESR, PLR, and NLR in the COVID-19 group were insignificantly higher than in the non-COVID-19 group. In line with this, a study by Li et al. (2024) discovered a direct correlation between the severity of symptoms in patients with lower pulmonary viral infections and an elevated ESR. Furthermore, they reported that an increase in WBC, PCT, and CRP levels could also be beneficial in predicting the prognosis of this patient group [20]. In addition to the ESR and CRP, Asan et al. (2021) identified high levels of the NLR as characteristic features of acute viral infections, particularly in patients with severe COVID-19 symptoms, which aligns with our findings. However, they observed a decrease in the PLR in these patients compared to those with mild symptoms [17].

4.2. Findings from CT scan analysis

In this study, the pathological characteristics, such as unilateral and bilateral lung involvement, were considered to assess symptom severity and predict disease prognosis.

In our study, there were 52(32.1%) individuals with bilateral involvement and eight (4.9%) individuals with unilateral involvement in the COVID-19 group. However, there were two (1.2%) individuals with bilateral involvement and 43(26.5%) with unilateral involvement in the non-COVID-19 group (P=0.00). A study conducted by Wu et al. (2020) showed that out of 130 patients with acute COVID-19 infection who had CT images, only 14 patients had unilateral involvement and 116 patients had bilateral involvement [21].

In our study, the highest number of lesions was observed in the COVID-19 group, ranging between 5-10 lesions, in the female population. However, the number of lesions in the non-COVID-19 group was less than three lesions in both genders. In Wu et al's study, out of a total of 130 COVID-19 patients, nine patients had single lesions and 113 patients had multiple lesions [21].

In our study, the distribution of central, peripheral, and diffuse patterns differed between the COVID-19 group and the non-COVID-19 group (P=0.00). Within the COVID-19 group, 0.6% showed central distribution, 24.7% showed peripheral distribution, and 11.7% of individuals showed diffuse distribution. In contrast, the non-COVID-19 group had 1.2% central distribution, 25.9% peripheral distribution, and 0.6% of individuals showed diffuse distribution. The highest distribution rate was observed in the peripheral pattern in both groups. In relation to this, a study by Li et al. (2020) examined the location, size of lesions, and distribution in the CT images of COVID-19 patients. They found that a peripheral distribution increased the risk of pulmonary infection by 13.5 times compared to the diffuse form. Additionally, lesions larger than 10 cm were associated with COVID-19 pulmonary infection [13].

Linear opacity was only observed in 6.2% of individuals in the COVID-19 group (P>0.05). However, in 2020, Liang et al. did not observe linear opacity characteristics specifically in patients with COVID-19 infection specifically. They acknowledged that linear opacity occurs along with consolidation and GGO in the patients. Additionally, they found a significant relationship between the severity of disease symptoms and the presence of these findings [22].

The GGOs appeared in 24.7% of individuals in the COVID-19 group and 19.8% in the non-COVID-19 groups. Further analysis revealed a significant increase in the occurrence of these lesions with age.

The significance of GGO findings for diagnosing COVID-19 infection is highlighted in Wang et al.'s (2020) study. They identified the distribution of bilateral GGO in the posterior and peripheral lungs, with or without consolidation, as the primary characteristic of COVID-19 infection [23]. In a study conducted by Elmokadem et al (2021), they used GGO to distinguish between COVID-19 and non-COVID-19 pulmonary infections. They found that CT scans can accurately differentiate between GGO caused by COVID-19 and GGO caused by non-COVID-19 conditions, with a diagnostic accuracy ranging from 59% to 77.2% [24].

Only 18 and 14 individuals in the COVID-19 and the non-COVID-19 groups, respectively, showed consolidation lesions in CT images (P>0.05). Concerning this, Yu et al.s' (2021) study revealed a significant direct relationship between the size of consolidation lesions and age in COVID-19 patients [12].

The interstitial changes in the COVID-19 group were significantly different compared to the non-COVID-19 group. There was a notable difference in septal thickening and fine reticular opacity between the two groups. Specifically, 21 individuals in the COVID-19 group and 16 in the non-COVID-19 group exhibited septal thickening. Additionally, six individuals with COVID-19 and 20 with non-COVID-19 infection displayed fine reticular opacity, with significant differences observed between the groups. In relation to this, a study by Barbosa et al. (2020) uncovered a significant increase in interlobular septal thickening and the severity of symptoms in COVID-19 patients. Additionally, a reduction in oxygen saturation was linked to septal thickening, diffuse distribution, and pleural effusion [25].

The crazy-paving pattern was also observed in 19 and 24 individuals in the COVID-19 and the non-COVID-19 groups, respectively (P<0.05). Baeis et al. (2020) found a significant difference between hospitalized and outpatient COVID-19 cases regarding the crazy-paving pattern. They also noted that the crazy-paving pattern is linked to the inflammatory phase of the disease, making it a valuable tool for predicting symptom severity [26].

The CT scans of eight and 18 individuals in the COVID-19 and the non-COVID-19 groups, respectively, showed the presence of pleural effusion (P<0.05). Li et al. (2020) also discovered that the absence of pleural effusion in the CT scans of COVID-19 patients was linked to a 3.5-fold increase in symptoms of pulmonary infections. We also observed an increase in pleural effusion in the non-COVID-19 group [13].

The correlation analysis showed that only pleural effusion-NLR in the non-COVID-19 group, crazy-paving pattern-lymphocyte counts in the COVID-19 group, consolidation-MCHC in the non-COVID-19 group, and involvement-lymphocyte counts in the COVID-19 group were significant.

5. Conclusion

This study identified distinct profiles that effectively differentiate COVID-19 from non-COVID-19 infection. The COVID-19 group was characterized by lower RBC counts and MCV, alongside elevated HCT, ESR, NLR, and PLR. Radiologically, this group predominantly exhibited bilateral lung involvement, a higher lesion count with peripheral and diffuse distribution, increased GGO, consolidation, and septal thickening. In contrast, the non-COVID-19 group demonstrated a higher prevalence of crazy-paving patterns and pleural effusion. These combined hematological and CT-scan features proved highly useful for distinguishing between the two patient groups.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Research Ethics Committee of Zabol University of Medical Sciences, Zabol, Irany (Code: IR.ZBMU.REC.1401.130).

Data availability

The data supporting this study's findings will be made available upon reasonable request to the corresponding author.

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Authors' contributions

Conceptualization, Study design, Statistical analysis, and writing the original draft: Javad Poursamimi; Data analysis and interpretation: Javad Poursamimi and Sara Rashki Ghalenoo; Review and editing: All authors.

Conflict of interest

The authors declared no conflict of interest.

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