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ORIGINAL ARTICLE

The Accuracy 0f CT Chest in Determining Between Ground Glass Opacities And Those Caused by Covid-19 And Other Medications

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ABSTRACT

Introduction: Diagnostic ct scanning of the chest is currently being investigated for its ability to distinguish between ground glass opacities (GGO) caused by coronavirus 2019 (COVID-19) and GGO produced by other causes.

Place and Duration: From January 2022 until June 2022, I will work as a Radiologist at Qazi Hussain Ahmad Hospital in Nowshera.

Methods: This study was cross sectional study carried out at the Qazi Hussain Ahmad Hospital, Nowshera for a period of six months. The overall sample size in the current study was100 non-contrast chest CTs. Eexperienced radiologists analyzed the CT images of the chest after redacting any personal information. laboratory results and the patient's medical history were noted.

Results: The participants comprised 46 people with COVID19 and 100 without COVID19 who also had ground glass opacities on chest CT. There was no statistically significant difference in age between the groups (p-value = 0.212). Out of the non-COVID-19 GGO cases, three patients have hypersensitivity pneumonia in 3, eosinophilic pneumonia in 3, interstitial pneumonia in 7, pulmonary pneumonia in 3, pulmonary fibrosis in 7, drug-induced lung damage in 7, pulmonary alveolar hemorrhage in 3, and pulmonary emphysema in 11.

Practical implication: This study will provide physician with the data to compare the likelihood that COVID-19 causes ground glass opacities on a chest CT scan versus the likelihood that they are caused by other probable causes

Conclusion: Moreover, the specificity of chest CT in differentiating COVID-19 from viral pneumonia is only intermediate, and the specificity of chest CT in distinguishing COVID-19 from other reasons of ground glass opacities is poor.

Keywords: CT Chest, Determining, Ground-Glass Opacities, Covid-19, Medications

INTRODUCTION

WHO estimates that as of July 2022, over 2.8 billion people have tested positive for covid-19, and over 8 lac people have died due to the outbreak. The United States has documented more than 70% of these cases with covid-210-6, even though it originated in China. Infection with COVID-19 is marked by the presence of a cough, a high temperature, muscular pains, and shortness of breath [1]. Swabs were taken from the mouth (nasopharyngeal or oropharyngeal), the nose (oropharyngeal), the trachea (tracheal aspiration), or the lungs (bronchoalveolar lavage) and then tested with polymerase chain reaction (PCR) are the most accurate methods of identification [2]. A susceptible RT-PCR test for identifying COVID-19 has just been published. Possible causes include a decreased virus load or an experimental error [3].

However, the sensitivity of chest CT in the early phases of COVID-19 diagnosis ranged from 56% to 95%, making it about half as sensitive as other methods. However, new research indicates that CT of the chest has lower specificity (26% in COVID-19 analysis) than previously thought. Crazy-paving patterns, ground-glass opacification, and consolidation in the chest are all typical CT findings for individuals with COVID-19 pneumonia [4]. Both traction bronchiectasis and vascular dilatation were seen often in COVID-19 patients, indicating that both conditions are hallmarks of GGO. Some individuals have

experienced structural damage, such as the development of subpleural bands, during the height of their

disease. Non-rounded GGO, nonspecific distribution, and diffuse, unilateral, multifocal, or perihilar GGO with or without consolidation are all symptoms of COVID-19 indeterminacy [5]. Secondary infections often manifest as centrilobular nodules, bronchial wall thickening, and mucosal obstruction, but not as lymphadenopathy or pleural effusion [6]. Many lung diseases, particularly those associated with ground glass opacities, may mask the appearance of COVID-19 on computed tomography, which may explain why chest CT has low specificity [7, 8]. This study set out to compare the likelihood that COVID-19 causes ground glass opacities on a chest CT scan versus the likelihood that they are caused by other probable causes [9]. The limited specificity of chest CT may be attributable to the existence of a variety of pulmonary diseases, particularly those linked to GGO, that can resemble the CT look of COVID-19. The most frequent types of pneumonia that mimic COVID-19 are viral pneumonia, atypical bacterial pneumonia, Pneumocystis jiroveci pneumonia (PJP), interstitial pneumonia, hypersensitivity pneumonitis, eosinophilic pneumonia, diffuse alveolar haemorrhage, drug-induced lung damage, and pulmonary edoema (cardiogenic and non-cardiogenic). Therefore, the goal of this study is to evaluate how well chest CT distinguishes between COVID-19 and non-COVID-19 causes of GGO.

MATERIALS AND METHODS

This study was cross sectional study carried out at the Qazi Hussain Ahmad Hospital, Nowshera for a period of six months. The overall sample size in the current study was100 non-contrast chest CTs. Non-probability sampling technique was used in the current study. Forty-six patients with GGO confirmed by RT- PCR due to Covid-19 (27 males and 19 females, mean age 45.20 13.15), and 100 patients with GGO confirmed by chest CT but not Covid-19 were investigated (65 males and 35 females). Medical records provide information about a patient's health. The etiology of the second group was established using imaging, bronchoscopic data, and pathology literature. PCR, sputum culture, blood test, or bronchoalveolar lavage were conducted after treatment. All patients had a single-breath CT scan from the head to the kidney. Filtration of the lungs at the coronal, sagittal, and axial levels. COVID-19 participants were divided into four groups by chest CT experts. Peripheral, bilateral, multifocal GGO with or without consolidation characterizes classic COVID-19. COVID-19 test results were negative for pneumonia and diffuse, unilateral, multifocal, or perihilar GGO with nonspecific distribution or no consolidation. Radiologists were instructed to check for lateralized, lobe-involved (up or dorsal), and pleural thickening, as well as mediastinal lymphadenopathy, pulmonary nodules (tree-in-bud or centrilobular), and pleural effusion (central, diffuse, or peripheral). Percentages and numbers are used to describe categorical variables.

Radiologists' efficiency and effectiveness were evaluated based on diagnostic accuracy and precision. COVID-19 was detected despite pneumonia. To compute specificity, sensitivity, NPV, PPV, and accuracy, SPSS 24 requires a P value of 0.04.

RESULTS

The overall sample size in the current study was100 non-contrast chest CTs. Non-probability sampling technique was used in the current study. Forty-six patients with GGO confirmed by RT- PCR due to Covid-19 (27 males and 19 females, mean age 45.20 13.15), and 100 patients with GGO confirmed by chest CT but not Covid-19 were investigated (65 males and 35 females). No statistically significant difference between the groups could be seen in age (p=0.129).

There are three cases of atypical bacterial pneumonia, twenty-two cases of GGO following viral pneumonia, seven cases of interstitial pneumonia, three cases of pulmonary hypersensitivity pneumonia, two cases of eosinophilic pneumonia, and seven cases of hypersensitivity pneumonia, three cases of drug- induced lung injury, three cases of pulmonary alveolar hemorrhage, and three cases of pulmonary emphysema (cardiogenic and noncardiogenic). A variety of bacterial and viral infections and ground glass opacities are included in Table 1 as potential causes of interstitial pneumonia.

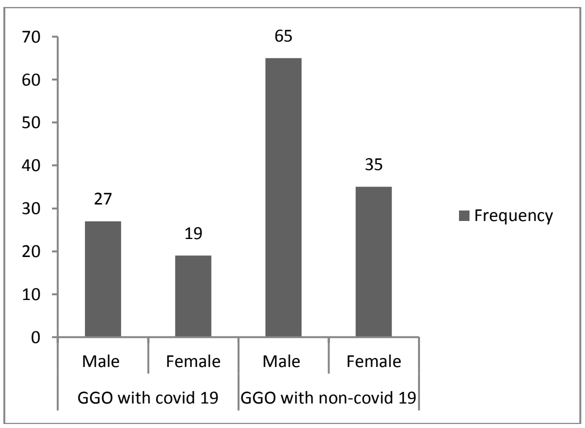

Figure 1: Distribution of patients

Table 1: highlights the underlying reasons for ground-glass opacities in the total sample.

COVID-19 Non	46
Pneumonia Viral	22
(H1N1) Influenza A	8
(SARS)	3
(MERS)	1
(RSV)	1
(HSV)	3
(adenovirus)	2
(Rhinovirus)	4
pneumonia Atypical bacterial	3
(Mycoplasma)	3
(Chlamydia)	1
(Klebsiella)	1
(PJP)	3
pneumonia Interstitial	7
(NSIP)	3
(DIP)	2
(OP)	3
(HP)	4
(EP)	1
(DAH)	3
(injury Drug-induced lung)	3
(cardiogenic and non-cardiogenic Pulmonary edema)	5

Compared to patients without corona, individuals with COVID-19 were more likely to have fever (75% vs. 45%, p 0.001) and gastrointestinal (GI) symptoms such as nausea, vomiting, and diarrhea (12% vs. 3%, p 0.002). No significant difference was found (P = 0.28) between the two groups regarding respiratory system symptoms (shortness of breath and cough). Lymphopenia was more common among individuals with COVID-19 (54% vs. 23%, p 0.001), whereas leucocytosis was more common among those without COVID-19 (44% vs. 19%, p 0.001).

Subpleural bands were more common in patients with COVID-19 (21% vs. 13%, p = 0.04), as were isolated GGO (21% vs. 14%, p = 0.041), vascular bed thickness (26% vs. 12%, p = 0.013), and the reverse halo sign (12% vs. 4%, p = 0.005). Patients infected with COVID-19 are more likely to develop lesions in the lower lobes (87% vs. 55%, p = 0.003) and the periphery (75% vs. 47%, p = 0.002). Both sets of people used a crazy paving design, had comparable consolidation, and had a similar lateral pattern.

Table 2: compares the two groups' demographics, test results, imaging studies, and clinical outcomes.

	COVID-19 (n = 46)	Non-COVID-19 (n = 100)	P value
=Age	45.20 ± 13.15	45.01 ± 15.15	0.123
=Sex =Male	27 (55%)	32 (56%)	0.11
=Female	19 (42%)	22 (43%)	0.092
=Clinical dataFever	51 (73%)	34 (52%)	< 0.003
=Cough and dyspnea	30 (62%)	36 (71%)	0.27
=GIT manifestations	6 (14%)	2 (3%)	< 0.002
=Laboratory findingsLeukocytosis	7 (17%)	30 (52%)	< 0.002
=Lymphopenia	20 (42%)	20 (19%)	< 0.002
=CT features =Isolated GGO	9 (20%)	16 (15%)	0.043
=Consolidation	27 (55%)	76 (71%)	0.23
=Crazy-paving	9 (21%)	25 (23%)	0.35
=Reversed halo	5 (10%)	4 (4%)	0.001
=Sub pleural bands	10 (21%)	14 (13%)	0.04
=Vascular thickening	12 (25%)	15 (14%)	0.011
=Traction bronchiectasis	5 (11.1%)	36 (31%)	0.003
=Pulmonary nodules	7 (16%)	40 (34%)	< 0.002
=Lymphadenopathy	1 (1%)	15 (14%)	< 0.002
=Pleural effusion	2 (7%)	29 (27%)	< 0.002
=Laterality Unilateral	8 (17%)	26 (22%)	0.32
=Bilateral	40 (82%)	84 (75%)	0.25
=Lobar affectionUpper	19 (41%)	25 (43%)	0.041
=Lower	38 (83%)	30 (52%)	0.002
=DistributionPeripheral	34 (72%)	27 (49%)	< 0.002
=Central	6 (5%)	07 (11%)	< 0.002
=Diffuse	7 (6%)	23 (34%)	< 0.002

DISCUSSION

Concerns about the fast human-to-human transmission and ARDS-causing potential of a previously unknown coronavirus (COVID-19) emerged late in 2019. (ARDS). The first and most popular approach for diagnosing a throat infection with a swab was RT-PCR; however, its specificity (50-75% for recognizing viral RNA) is low, leading to many false-negative findings that need to be retested [10]. In cases of suspected COVID-19 infection, a chest HRCT is advised [11]. To identify COVID-19 GGO, chest CT has an analytical sensitivity of 60–75% and a rational analysis sensitivity of 75–83. For viral infections and COVID-19 pneumonia, CT has a specificity of 43–65%. To compare ground-glass opacities with Covid-19 causes [12], Bai et al. evaluated data from 215 patients in radiography clinics in the United States and China [13]. There is a statistically significant improvement in analytical precision when using AI (80% vs. 95%, p 0.002) [16]. No abnormalities in the chest area. All symptoms of influenza and other respiratory viruses include interstitial thickening, diffuse GGO, treelike buds, pleural effusion, less circular GGO, and reduced nodular density. Coronavirus-induced GGO is characterized by an air bronchogram pattern, without nodules thickening of the pulmonary septum, consolidation of the lungs, and the reverse halo sign [14].

Pleural effusion from herpes simplex virus, human papillomavirus, or human immunodeficiency virus infections in the elderly, after organ transplantation, or in immunocompromised individuals has been linked to the development of irregular, multifocal, extensive GGO and ARDS 2021-2022 [15]. Ground glass opacities may also be brought on by other diseases. Lung opacity may be caused by human pneumonia, but not in one specific area as it is with COVID-19. Different from COVID-19, the progression of interstitial pneumonia takes time [15]. CT imaging reveals honeycomb architectural distortion, traction bronchiectasis, and basal peripheral vascular fibrosis in patients with NSIP. Drugs (particularly chemotherapies) have a long history of causing lung injury. Imaging might be challenging due to the non-localized nature of the symptoms [16]. Pulmonary edema may be caused by cardiovascular or noncardiac illness. GGO is suggested by the presence of a hilum, an increase in interstitial thickness, and pleural effusion. Hypersensitive pneumonia is induced by allergen exposure [17].

Acute granulomatous ophthalmopathy (GGO) presents bilateral lesions, internal nodules, and bilateral fibrosis [18]. The progression, severity, and harmful consequences of COVID-19 may be influenced by fever. Even though both groups improved GITl symptoms (nausea, vomiting, and diarrhea), COVID-19 showed a more significant decrease (p 0.002). Coronavirus has the potential to attach to ACE- II receptors in the stomach mucosa, leading to electrolyte disturbances28. Lymphopenia was 43% more common in patients with COVID-19 than in controls (p 0.001) [19].

CONCLUSION

Our study concludes that chest CT had medium specificity for COVID-19 GGO from other causes and insufficient specificity for separating COVID-19 from other viral pneumonia. Thus, precise diagnostics and fewer false positives may be achieved using accurate radiological assessments, laboratory data, and clinical situations, especially during an epidemic.

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