

Original Research Article

A RETROSPECTIVE STUDY TO EVALUATE HRCT FINDINGS OF COVID 19 PATIENTS AND ITS CORRELATION WITH CLINICAL MANIFESTATIONS

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ABSTRACT:

Purpose-

To investigate and quantify the severity of COVID-19 infection on HRCT and to determine its relationship with clinical profile and outcome.

Material And Methods-

Study population- 95 COVID-19 positive patients who were hospitalised to J A Group of Hospitals & SSH, Gwalior, M.P were taken for retrospective analysis , referred to Department of Radiodiagnosis for HRCT evaluation.

Results:

In our study group most of patients were in fifth and sixth decade with mean age 47 year, majority of patients are male, (52.63%) patients were symptomatic, whereas (13.68%) were asymptomatic. Fever and cough were the most frequent presenting symptoms in symptomatic patients, followed by shortness of breath, chest pain and myalgia, sore throat and headache. Approx. 26.4% of patients had an underlying co-morbid condition with diabetes mellitus, hypertension were the most common co-morbidities seen. Along with ground glass opacity(GGO) , COVID-19 patients also showed some nonspecific findings like pleural effusion, mediastinal lymphadenopathy.

Conclusion-

The diverse COVID-19 spectrum included symptoms such as fever, coughing, shortness of breath, sore throat, etc. Major concomitant conditions were CAD, COPD/K-Chest, hypertension, diabetes mellitus, and hypertension. Positive CT findings were more noticeable in symptomatic patients and patients with co-morbid conditions, giving HRCT chest in COVID-19 patients significant diagnostic and prognostic significance. CT imaging is important for monitoring patients' clinical progress. The findings of this study supported the importance of chest CT in the identification and treatment of COVID-19 infection.

1. INTRODUCTION

Since November 2019, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection that caused the fast outbreak of coronavirus disease 2019 (COVID-19) has drawn attention from around the world.[1] Globally, COVID-19 has had a tremendously negative impact. Clinical consequences of COVID-19 infection might range from asymptomatic to severe life-threatening course or death. For the creation and application of efficient control strategies and management protocols, characterization of epidemiological, clinical, co-morbid characteristics with recovery and mortality of COVID-19 is essential. According to current estimations, the incubation period lasts typically 3 to 7 to 14 days.[2] According to published data, the patient population's median age is 47 to 59 years, and 41.9 to 45.7% of patients are women.[3] After infection, the elderly and those with underlying conditions are more critically unwell. Infants and children are susceptible to infection. Diabetes, hypertension, cardiovascular and cerebrovascular disorders are the most often reported conditions, and many patients have reported having at least one co-morbidity with these conditions.

The SARS-CoV-2 is essentially identical to the SARS-CoV and has clinical characteristics that are comparable to SARS. 6 The non-specific prodromal phase symptoms of COVID-19 infection include fever, dry cough, and malaise.[4],[7] Some patients can even have no symptoms at all. Therefore, high-resolution computed tomography (HRCT), in particular, is a useful method for detecting COVID-19 infections in patients at an early stage when clinical signs could be ambiguous.[8],[9],[10] Chest CT is essential for a final diagnosis and re-examination of every suspicious patient. Chest radiography and CT were the main diagnostic tools used while SARS was widespread, in accordance with WHO and the centers for Disease Control and Prevention guidelines.

According to the World Health Organization and the centers for Disease Control and Prevention guidelines, chest radiography and CT were the major diagnostic components when SARS was prevalent.[11] The early COVID-19 clinical and imaging symptoms are crucial. They are employed to establish the diagnosis, modify the course of treatment, and guess the prognosis. In India, there have been 43,236,695 confirmed cases of COVID-19 with 524,777 fatalities reported to WHO between 3 January 2020 and 6:13pm CEST on 14 June 2022. As of 6:13 p.m. CEST on June 14, 2022, there were 533,816,957 confirmed cases of COVID-19 worldwide, including 6,309,633 fatalities [12]. The objectives of this retrospective study were to investigate the utility of CT in predicting short-term mortality and to ascertain the relationship between a semi-quantitative CT-based score of pulmonary involvement and clinical illness staging.

AIMS AND OBJECTIVES

- To investigate and quantify the severity of COVID-19 infection on high-resolution chest computed tomography (CT).
- To determine its relationship with clinical profile and outcome.

2. MATERIAL AND METHODS

95 COVID-19 positive patients who were hospitalised to J A Group of Hospitals (SSH), Gwalior, M.P., in the months of November and December 2020 were the subject of the current descriptive, retrospective analysis. Following the declaration of COVID-19 as a

public health emergency of pandemic proportions, formal screening and diagnostic investigations for SARS-CoV-2 were launched across India. As there was no possible harm to the patients, informed permission was not required. Patients' confidentiality and privacy were respected in accordance with standards. Here, we included 100 patients with COVID-19 who had been admitted to our facility in order to guarantee the quality and integrity of clinical, laboratory, and imaging data.

3. OBSERVATION AND RESULTS

In our study group most of patients were in fourth to sixth decades with mean age 47 years. Males (57.89%) patients were higher than females patients (42.1%) with an average sex ratio of female: male 0.72. Out of the total evaluated individuals, 72 (52.63%) were symptomatic, whereas 23 (13.68%) were asymptomatic. The most frequent clinical manifestations in symptomatic individuals were fever (62%), cough (56.8%), shortness of breath (22%), chest discomfort (13.7%), and 74 myalgia (11.6%), while some patients (33%) also reported other symptoms as headache, sore throat, etc. In the sample population, 26.4% of patients had one or more co-morbid diseases. Following were the co-morbidities that were most common in the sample population: 9% of people have diabetes mellitus, 9% have hypertension, 5.3% have both diabetes and hypertension, and 2.10 percent have coronary artery disease (CAD). On HRCT chest imaging, 95 patients were divided into 63 patients (66.32%) who had radiologically positive results and 32 patients (28.68%) who had normal or non-COVID CT findings. The average CT severity index was 5.84. Unsurprisingly, 30% of symptomatic patients had a CT severity level of zero. Out of the radiologically positive patients, (24.2%) had consolidation and (66.3%) showed ground glass opacities. Out of the 63 individuals who had radiological findings overall, 68% on average had lower lobe involvement, and maximum patients (55%) having peripheral distribution of GGO. CT chest imaging also showed some non specific findings which includes pleural effusion, pulmonary nodules, mediastinal lymphadenopathy and fibrotic bands.

Table 1: Age wise distribution of patients

Age (Years)	No. of Patients	Percentage
<20	5	5.26
20-40	26	27.5
40-60	42	44.2
>60	27	28.42
Total	95	100%

Table2: Clinical manifestations of COVID patients.

Clinical features	Total patients	Percentage among total patients
Fever	59	62%
Cough	54	56.8%
Chest pain	13	13.7%
SOB	21	22.1%
Myalgia	11	11.6%
SORE THROAT	5	5.3%

Table 3: Comorbidity in COVID patients

Clinical features	Among total patients	Percentage among total patients
DM	9	9.5
HTN	9	9.5
CAD	2	2.1
DM WITH HTN	4	5.3
Total	24	26.4%

Table 4: Imaging characteristics in HRCT chest

Imaging features	No. of patients	% among total patients
GGO	63	66.3%
Consolidation	23	24.2%
Fibrotic bands/ interlobular septal thickening	16	16.8%
Pleural effusion	4	4.2%
Pulmonary nodules	3	3.2%
Mediastinal lymphadenopathy	17	17.9%
Total	95	100%

Table 5: CT severity index v/s clinical presentation in COVID patients

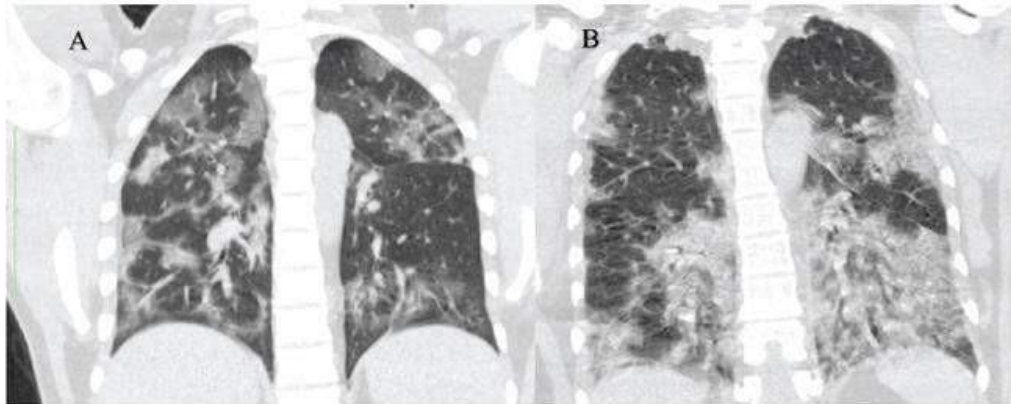
CT severity index	No of patients(among symptomatic) n(%)	No of patients(among asymptomatic) n(%)	Total patients
0	22	10	32
Upto 5	20	5	25
6 to 10	14	6	20
11 to 15	12	2	14
16 to 20	10	0	10
21 to 25	2	0	2
Total	72	23	95

Table 6: Correlation of CT Severity index with associated comorbidity

	CT SEVERITY INDEX						P value
	NORMAL	MILD	MODERATE	SEVERE	TOTAL		
NO	29(87.9)	26(81)	10(55.6)	5(41.7)	70(73.7)	0.025 (significant)	
HTN	2(6.1)	2(6.2)	4(22.2)	1(8.3)	9(9.5)		
DM	1(3)	4(12.5)	1(5.6)	3(25)	9(9.5)		
DM WITH HTN	1(3)	0(0.0)	2(11.1)	2(16.7)	5(5.3)		
CAD	0(0)	0(0)	1(5.6)	1(8.3)	2(2.1)		
TOTAL	33(100)	32(100)	18(100)	12(100)	95(100)		

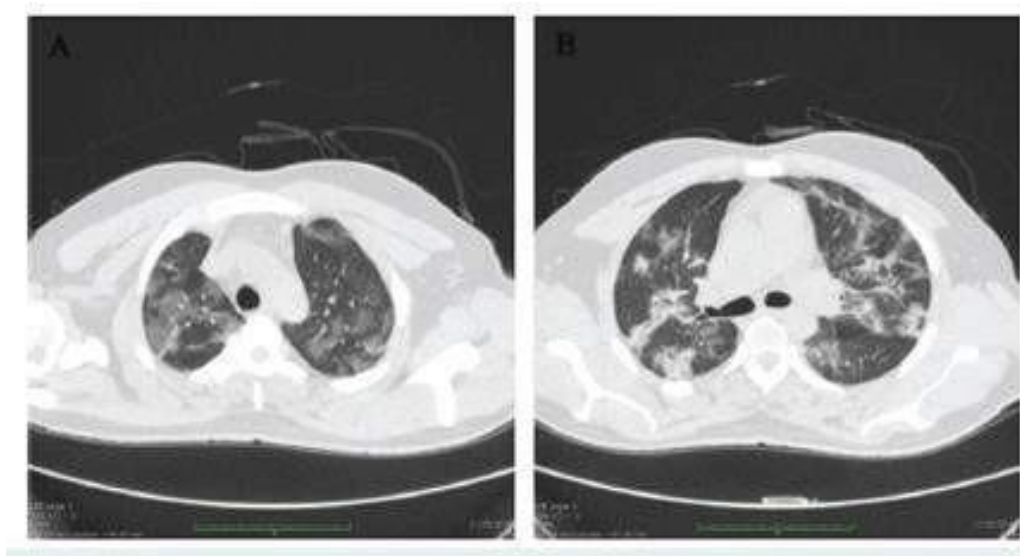
Fig. 1 : Cases

Coronal section of a 56 year old male patient show (A) Presence of mixed pattern with both



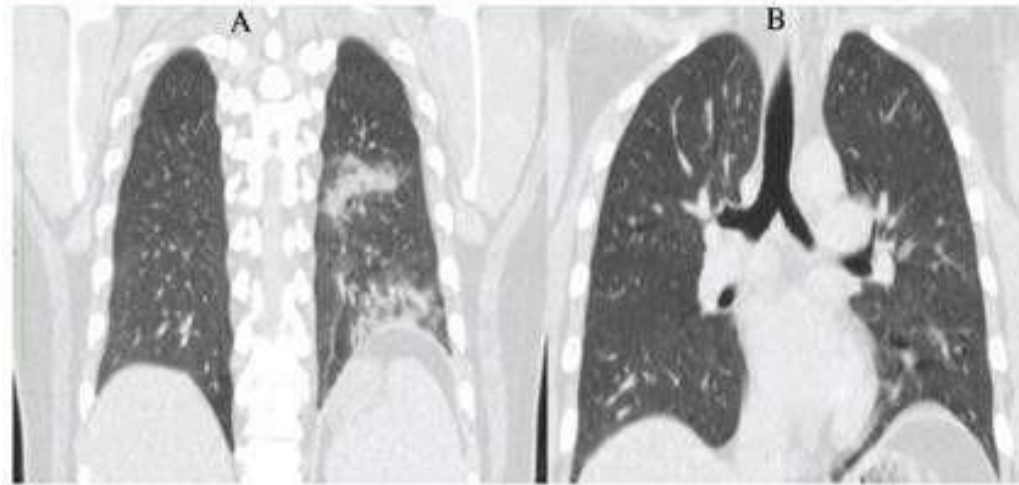
GGO and consolidation (B) Predominance of lesions can be noted in the lower lobe in. The CT severity score in this case was 21/25

Fig. 2



Axial section through the CT chest of a 42 year old male patient reveals (A) ground glass opacities in bilateral upper lobes and (B) mixed consolidation and GGO pattern in the lower sections of the same patient

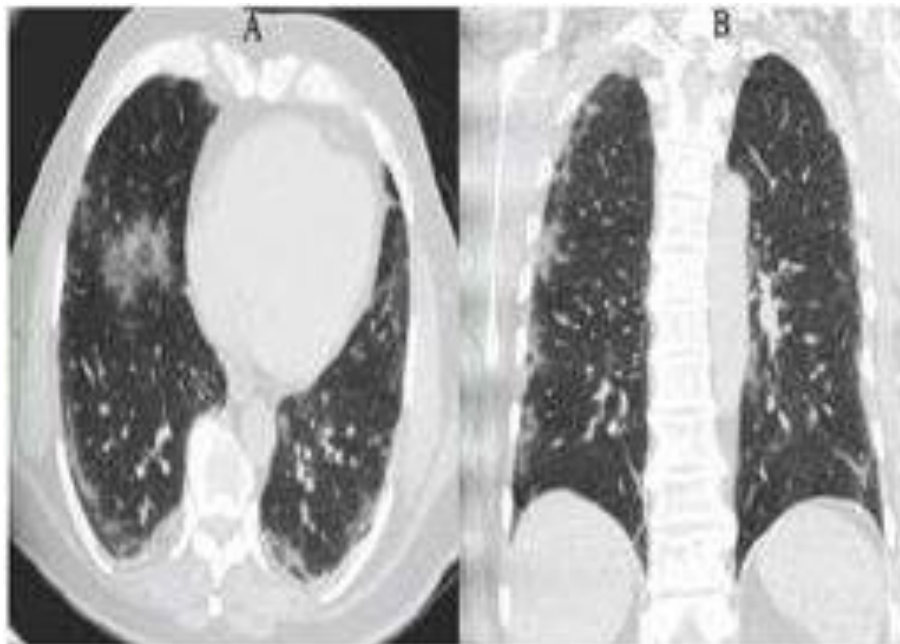
Fig. 3



Coronal sections of a 52 year old male patient show that (A) The lesion were mainly present in the posterior coronal section and (B) Lesion absent in the anterior coronal section

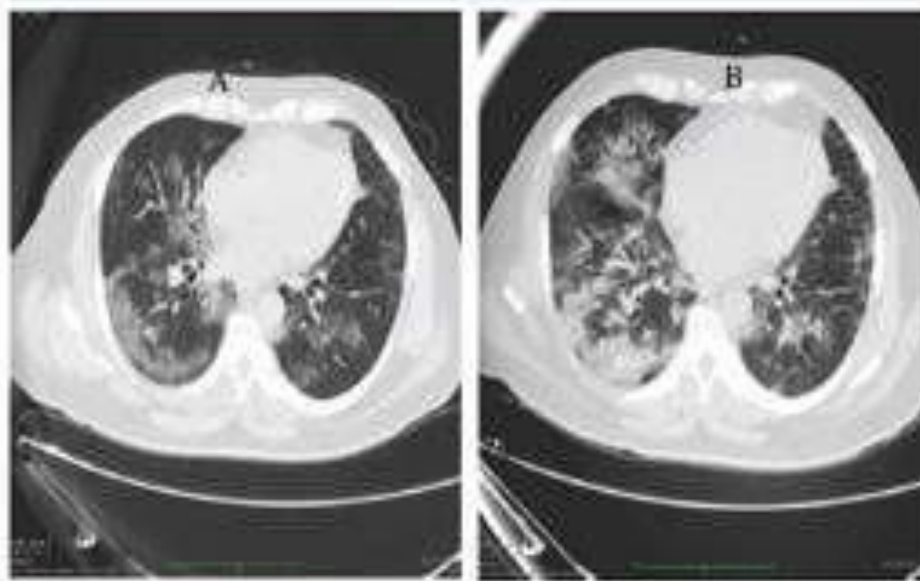
Fig. 4

HRCT chest scan in a 31 year old male patient (A) axial and (B) coronal sections shows peripheral areas of GGO and consolidation and sub- pleural sparing, CT severity score in this



patient was 12/25

Fig. 5



HRCT chest of COVID-19 patient (A) at early phase (day 4) of disease show presence of GGOs (B) at late stage of disease (day 11) show areas of consolidation representing signs of organizing pneumonia

4. DISCUSSION

In this retrospective study which was completed during a period of one year in the Department of Radiodiagnosis, G.R. Medical College, Gwalior. A total of 95 COVID-19 patients who were referred for HRCT Chest were included in the study. In our study group most of patients were in fourth to sixth decade with mean age 47 year. The majority (57.8%) of patients infected by the virus were male with an average sex ratio of female: male 0.72. Fever and cough were the most frequent presenting symptoms in symptomatic patients, followed by shortness of breath, chest pain, myalgia, sore throat and headache. (as compared to study done at SMS Medical College Hospital in Jaipur, Rajasthan, were in their fifth and sixth decades of life, with a mean age of 50.40 years. Male gender was more impacted than female gender with an average sex ratio of 0.69. cough, shortness of breath and sore throat were the most common presenting clinical manifestations while a few patients also had other symptoms like headache, chest pain, pain abdomen, altered sensorium etc. these findings are consistent with our study)[13]. The average age was 44.2 ± 11.9 years, according to a study done at the department of radiology at Sheikh Khalifa Medical City in Abu Dhabi, UAE (85.3% men, 14.7% women). In the current investigation, it was found that co-morbidities have a discernible influence on clinical traits and course in COVID-19 positive patients, approx. 26.4% of patients had an underlying co-morbid condition like Diabetes mellitus, hypertension and coronary artery disease (CAD) were the most common co-morbidities seen. In this investigation, we used CT chest scans to evaluate the involvement of the lungs; nearly two third of patients (63) had positive CT findings, although (75%) of patients experienced symptoms. On HRCT chest imaging, 95 patients were divided into 63 patients who had radiologically positive results and 32 patients who had normal or non-COVID CT

findings. The average CT severity index was 5.84. Unsurprisingly, 30% of symptomatic patients had a CT severity level of zero. More than three-quarters of patients in the current study who had radiologically positive results had typical CT chest imaging findings, including ground glass opacity (GGO) with bilateral, peripheral, and lower lobe predominant distribution of opacities, some patients showed ground glass opacity (GGO) along with consolidation. Zhou et al.^[14] in a study involved 100 patients with duration of 1–7 days from the onset of symptoms reported GGO and consolidations in 43% of patients. The most frequent finding (68.1%) in a different meta-analysis by Zhu et al.^[15] comprising 32 publications and 4121 patients was ground glass opacification. CT chest imaging also showed some nonspecific findings which includes pleural effusion, pulmonary nodules. Thoracic lymphadenopathy and fibrotic bands. Though CT severity score is calculated by estimating GGO, in our study it also shows significant correlation with consolidation, mediastinal lymphadenopathy, pleural effusion and fibrotic bands. The CT severity score was associated with the clinical status of the patients. The clinical condition of the patients deteriorated as the CT severity index increased, which is a poor prognostic indication for COVID-19 patients. CT severity index also increases with associated comorbidities with DM and HTN are more common associated with severe cases.

Early signs of the disease were interstitial thickening, consolidation, and single or numerous tiny ground glass infiltrations. Severe cases had increased consolidation and air bronchograms in the affected lobes as the disease advanced. The individuals who were most badly impacted had the diffuse lesions, which were visible as "white lungs." During the remission phase, fibrous bands were seen.

Findings such vacuolations inside opacification, linear consolidation, and reverse halo sign were observed in individuals who were examined in the later stages of the disease, suggesting organisation of the underlying disease process. Subpleural sparing and curved bands then formed, which suggested a resolution stage and were probably caused by the retraction process. Therefore, the CT severity score and lung involvement percentage can be used to predict outcomes and personalise patient care.

5. CONCLUSION

The diverse COVID-19 spectrum included symptoms such as fever, coughing, shortness of breath, sore throat, etc. Major concomitant conditions were CAD, COPD/K-Chest, hypertension, diabetes mellitus, and hypertension. Patients with an underlying co-morbid illness had a higher level of clinical disease severity, particularly those with numerous co-morbid disorders. Positive CT findings were more noticeable in symptomatic patients and patients with co-morbid conditions, giving HRCT chest in COVID-19 patients significant diagnostic and prognostic significance. The CT severity index and the patients' clinical symptoms have a direct correlation. CT imaging is important for monitoring patients' clinical progress. The findings of this study supported the importance of chest CT in the identification and treatment of COVID-19 infection.

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