ORIGINAL RESEARCH

Spectrum Of Hrct Findings In Covid Patients With Clinical Correlation

[1]Dr. George B Mangalath, [2]Dr. Jawahar Vontivillu, [3]Dr .Richa Mariam Roy

[1]MBBS MD Radiodiagnosis Consultant Radiologist MBMM hospital
[2]Associate professor, Dept of Radiology Dr Dypatil Hospital Navi mumbai
[3]Resident Radiodiagnosis Dy patil medical college Pune

Corresponding author
[2]Dr. Jawahar Vontivillu
[2]Associate professor, Dept of Radiology Dr Dypatil Hospital Navi Mumbai

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Abstract
Aim: The aim of this study was to investigate the relation between chest HRCT findings and clinical condition of Covid-19 pneumonia.
Material and methods: All patients underwent scanning with GE OPTIMA 360 .The acquisition parameters were set at 120 kvp :100-200 mAs pitch 0.75-1.5 and collimation, 0.625-5mm.Ct images were acquired at full inspiration with the patient in supine position
Results:24.8 percent of the patients belonged to the age group of 51 to 60 years while 24.7 percent of the patients belonged to the age group of 41 to 50 years. 22.6 percent of the patients belonged to the age group of 30 to 40 years. Mean age of the patients was 47.06 years.
Overall comorbidities were seen in 20.7 percent of the patients. Diabetes and hypertension were seen in 17.6 percent and 11.9 percent of the patients respectively. Thyroid abnormalities, COPD and CKD were seen in 2.7 percent, 4.1 percent and 3.8 percent of the patients respectively.
Conclusion: In patients with COVID-19 infection, the CT severity score is linked to age, clinical profile, inflammatory laboratory markers, and hospital stay. There exist significant correlations among the degree of pulmonary inflammation and the main clinical symptoms and laboratory results. Computed tomography played an important role in the diagnosis and evaluation of this emerging global health emergency. It also plays an important role in guiding physicians with their management plans and can serve as a predictor of disease severity and outcomes. However; further studies are recommended.
Keywords: Benign Prostatic Hyperplasia, Holmium LASER Enucleation (Ho LEP), Thulium LASER Enucleation (Thu LEP), Post Void Residue, International Prostate Symptom Score, Maximum Flow Rate (Qmax)

Introduction

WHO was notified of instances of pneumonia with an unknown cause in Wuhan City, China, on December 31, 2019. Chinese authorities discovered the root of the problem on January 7, 2020, and it was given the temporary moniker "2019- nCoV." The wide family of viruses known as coronaviruses (CoV) can cause illnesses ranging from the common cold to more serious ones that have not yet been linked to any known disorders. Humans are a new coronavirus (nCoV). The "Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)" was later given to the novel virus. The WHO declared COVID-19 to be a Public Health Emergency of International Concern on January 31, 2020. (PHEIC). On March 11, 2020, WHO Director-General Dr. Tedros Adhanom Ghebreyesus declared that the epidemic might be classified as a pandemic due to the sharp rise in cases outside of China. By that point, 114 countries had reported more than 118 000 cases, and 4291 people had died as a result. By the middle of March 2020, the WHO European Region had emerged as the epicentre of the epidemic, with more than 40% of all cases that had been officially confirmed worldwide. By 28 April 2020, the Region accounted for 63% of all viral deaths worldwide.[1] According to the most recent epidemiological survey, the majority of people had been to or from Wuhan City or Hubei Province in China or had a history of being in close contact with someone who had 2019-nCoV infection. Typically, the incubation phase lasts 3 to 7 days (within 14 days). 2019-nCoV infection symptoms lacked specificity. The beginning of a fever, widespread weakness, and a dry cough were the most typical symptoms. Myalgia and/or headache were common in certain patients, although upper respiratory issues including a runny nose were uncommon. Diarrhoea, which had been recorded at 10.6% in SARS and up to

30% in MERS, was frequently found. The median time from the start of the disease to the onset of dyspnoea was eight days, and more than half of the patients experienced this symptom. If the 2019-nCoV infection was not treated, patients would experience acute respiratory distress syndrome (ARDS), septic shock, refractory metabolic acidosis, and coagulation dysfunction (Cytokine storm).Several individuals were afebrile or had an illness that was physiologically verified to be asymptomatic. These mysterious cases of walking pneumonia could act as a cause for the pandemic. It is necessary to conduct additional research on the epidemiological significance of these asymptomatic instances.The total white blood cells, lymphocytes, and platelets in the patients' blood were lower than average, and their levels of C-reactive protein, muscle enzymes, and activated thromboplastin time were all higher. If the condition worsened, D-dimer levels were higher and lymphocyte counts gradually decreased. The cytokine storm, which includes IL1B, IL1RA, IL7, and IL8, may be related to the severity of the illness.[2-7] On a chest CT scan, the multifocal ground glass alterations were typical of viral pneumonia. On a chest CT scan, the bilateral numerous lobular and subsegmental foci of consolidation would be visible if the disease worsened. In contrast to younger patients, older individuals' lungs displayed more broad and diffuse imaging. Patients' sputum or nasopharyngeal swab samples could be tested using particular RT-PCR assays for 2019-nCoV to find the highly conserved RdRp and variable S gene. Higher virus loads were found in the lower respiratory tract as evidenced by the cycle threshold values of the sputum samples being 8–13 cycles sooner than those of throat swabs. It is in line with the observations made in patients with MERS who had lower respiratory tract samples with greater virus loads than upper respiratory tract samples. Therefore, CT may be a useful tool for early COVID-19 screening and diagnosis. The gold standard for early staging with RT-PCR, which detects viral load and is the current reference standard in the detection of COVID-19 infection, is the sensitivity of the CT in the current pandemic situation. According to several researchers, the sensitivity of chest CT without contrast for detecting COVID-19 disease is 98% as opposed to preliminary findings with 71% sensitivity in RT-PCR. According to a different study, the chest CT has a high sensitivity of 97%. However, despite having a low specificity of only 25% and a diagnosis accuracy of 68% for COVID-19, it may be used as the main instrument in the current pandemic crisis in places that have been positively affected. At an early and during disease progression stage, no aberrant CT findings have been seen. Later, an abnormal CT result with GGO, consolidation, and nodule may develop. Additionally, pleural effusion and fibrosis, primarily in the peripheral, basal lungs, may develop.[7-9] CT has proven to be the best tool for tracking the progression of diseases. COVID-19 symptoms include variable degrees of fever, myalgia, cough, dyspnea, diarrhoea, and changes in taste or smell. Numerous carriers without symptoms have also been found. Elderly with co-morbid conditions are more likely to develop a serious infection and die as a result. Based on the lobes and segments implicated, various CT severity rating methods are identified, which, when combined with clinical classification, evaluate the severity of the disease and direct a better treatment plan. Due to the variety of radiological manifestations at various stages of the disease, the timing of CT conduction from the onset of symptoms is essential.[8] Bilateral, multi-lobar GGO and/or multi-focal consolidations in sub-pleural locations are shown on the chest on a CT scan are regarded as pathognomic for COVID-19. Septal thickening predominates against a background of GGO with illness development, appearing as crazy paving look. While the majority of patients recover and have fibrosis and subpleural bands, those who are very ill get white-out lungs. Meng et al. and Hu et al., respectively, reported that GGO alone was present in 94.8% and 50% of asymptomatic individuals. In order to improve staging, Wang characterized temporal alterations of coronavirus illness in sequential CT scans.[8-11] Hence; under the light of above mentioned data, the present study was undertaken for assessing the spectrum of HRCT findings in COVID patients with clinical correlation.

Material and methods

A total of 1000 patients satisfying the inclusion criteria from the date of approval onwards. All patients underwent scanning with GE OPTIMA 360 .The acquisition parameters were set at 120 kvp :100-200 mAs pitch 0.75-1.5 and collimation ,o.625-5mm.Ct images were acquired at full inspiration with the patient in supine position. The descriptive and analytical statistics was done. All data was analyzed. Results were expressed as mean ± standard deviation and proportions. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy of the tests was calculated. The statistical significance was determined at $p<0.05$.

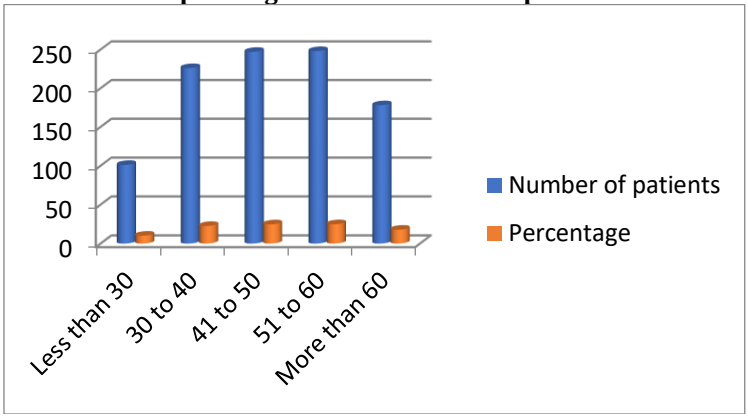
Results

The present study was conducted for assessing the correlation of clinical profile with Chest CT findings in 1000 COVID-19 patients. Following results were obtained:

Table 1: Age-wise distribution of patients

Age group (years)	Number of patients	Percentage
Less than 30	101	10.1
30 to 40	226	22.6
41 to 50	247	24.7
51 to 60	248	24.8
More than 60	178	17.8
Total	1000	100
Mean ± SD	47.09± 12.2	

Graph 1: Age-wise distribution of patients

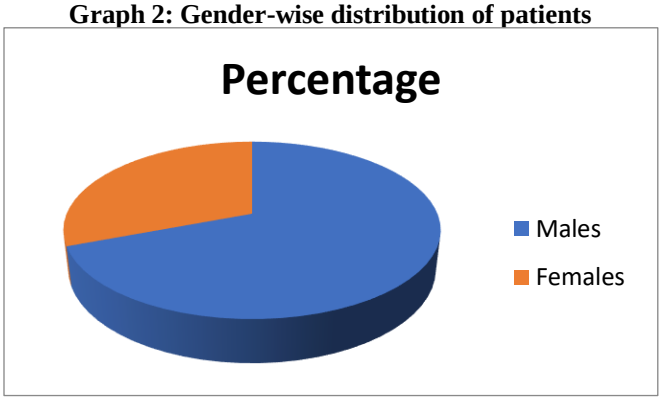


24.8 percent of the patients belonged to the age group of 51 to 60 years while 24.7 percent of the patients belonged to the age group of 41 to 50 years. 22.6 percent of the patients belonged to the age group of 30 to 40 years. Mean age of the patients was 47.06 years.

Table 2: Gender-wise distribution of patients

Gender	Number of patients	Percentage
Males	692	69.2
Females	308	30.8
Total	1000	100

Graph 2: Gender-wise distribution of patients

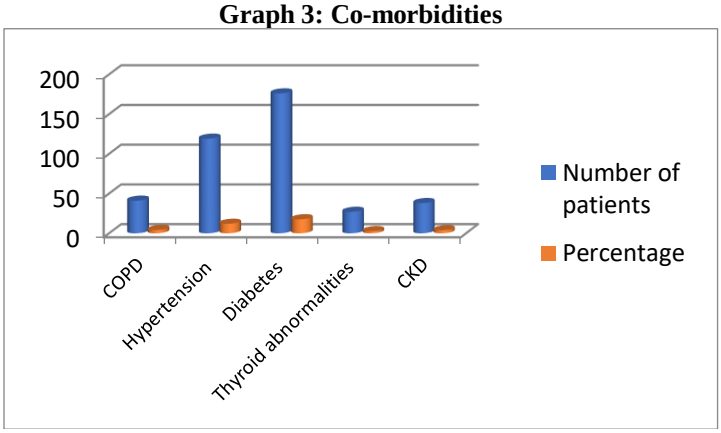


69.8 percent of the patients were males while the remaining were females.

Table 3: Co-morbidities

Co-morbidities	Number of patients	Percentage
COPD	41	4.1
Hypertension	119	11.9
Diabetes	176	17.6
Thyroid abnormalities	27	2.7
CKD	38	3.8
None	793	79.3

Graph 3: Co-morbidities

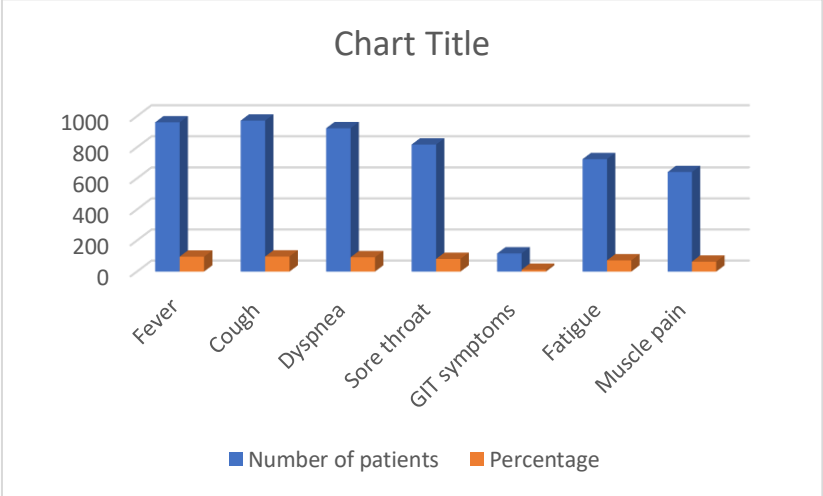


Overall comorbidities were seen in 20.7 percent of the patients. Diabetes and hypertension were seen in 17.6 percent and 11.9 percent of the patients respectively. Thyroid abnormalities, COPD and CKD were seen in 2.7 percent, 4.1 percent and 3.8 percent of the patients respectively.

Table 4: Clinical profile

Clinical profile	Number of patients	Percentage
Fever	961	96.1
Cough	972	97.2
Dyspnea	923	92.3
Sore throat	818	81.8
GIT symptoms	117	11.7
Fatigue	724	72.4
Muscle pain	641	64.1

Graph 4: Clinical profile



Fever, cough and dyspnea were seen in 91.1 percent, 97.2 percent and 92.3 percent of the patients respectively. Sore throat, GIT symptoms and muscle pan were seen in 81.8 percent, 11.7 percent and 64.1 percent of the patients respectively. Fatigueness was seen in 72.4 percent of the patients.

Table 5: Correlation of CT Severity scoring and age

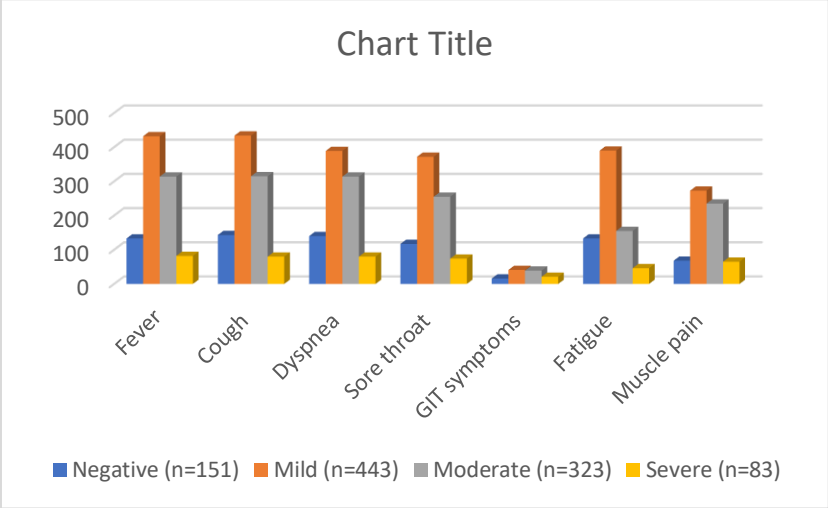
CT Severity scoring	Mean (years)	SD	p- value
Negative	33.63	8.74	0.000*
Mild	44.05	9.50	
Moderate	54.25	9.52	
Severe	59.96	9.26	

*: Significant

Table 6: Correlation of CT Severity scoring and clinical profile

Clinical profile	Negative (n=151)	Mild (n=443)	Moderate (n=323)	Severe (n=83)	Total	p-value
Fever	133	432	314	82	961	0.122
Cough	143	434	315	80	972	0.389
Dyspnea	140	389	314	80	923	0.122
Sore throat	117	372	255	74	818	0.455
GIT symptoms	16	41	39	21	117	0.936
Fatigue	133	390	155	46	724	0.084
Muscle pain	68	273	235	65	641	0.323

Graph 5: Correlation of CT Severity scoring and clinical profile



While correlating CT severity scoring with clinical profile, non-significant results were obtained.

Discussion

The World Health Organization (WHO) reported more than 43 million confirmed cases of SARS-CoV-2 infection and more than one million deaths globally, with India contributing to >600,000 confirmed patients and >100,000 deaths until October 29, 2020. The first patient in India was reported from Kerala, and gradually COVID-19 has engulfed the entire country. Patients with SARS-CoV-2 infection may have mild-to-asymptomatic illness, but some rapidly progress to acute respiratory distress syndrome (ARDS), multi-organ dysfunction syndrome (MODS) and death.[12-14] The clinical presentations vary from asymptomatic carriers to patients requiring assisted ventilator support, and ICU admissions with increased mortality made it an unusual and unprecedented challenge. The nasopharyngeal swab RT-PCR test has been the diagnostic test used as the standard of reference for disease confirmation. The test is a powerful tool; however, there are a small but significant proportion of false-negative results reported. A noncontrast high-resolution CT chest imaging plays a pivotal and essential role in the early disease detection, particularly in patients with false-negative RT-PCR results, as well as in managing and monitoring the course of disease. Moreover, the disease severity can be ascertained from the imaging findings, significantly supporting the clinicians in their clinical judgment and ensuring effective and timely management. Prognosis can also be affected by the severity of the disease in the critically ill patients allowing appropriate selection of early involvement of the intensive care.[12-14]

Hence; under the light of above mentioned data, the present study was undertaken for assessing the spectrum of HRCT findings in COVID patients with clinical correlation.

AGE: 24.8 percent of the patients belonged to the age group of 51 to 60 years while 24.7 percent of the patients belonged to the age group of 41 to 50 years. 22.6 percent of the patients belonged to the age group of 30 to 40 years. Mean age of the patients was 47.06 years.Our results were in concordance with the results obtained by previous authors who also reported similar findings. In the studies conducted by Saeed

GA et al and Wu J et al, mean age of the patients were 44.2 years and 44 years respectively.[15,16]Soni SL et al and Saluja M et al, in their studies reported the mean age of the patients to be 35.9 years and 38 years respectively.[71, 72] Agarwal et al, in another Indian study reported mean age of the patients to be 49.62 years.[64]

GENDER: 69.8 percent of the patients were males while the remaining were females. Our results were in concordance with the results obtained by previous authors who also reported similar findings. In the studies conducted by Saeed GA et al and Wu J et al, 85.3 percent and 52 percent of the subjects respectively were males.[15,16] Soni SL et al and Saluja M et al, in their studies reported that 57.8 percent and 69.14 percent of the subjects respectively were males.[17,18] Agarwal et al, in another Indian study reported male preponderance in their study (males: 69.52 %).[19]

CO-MORBIDITIES : Overall comorbidities were seen in 20.7 percent of the patients. Diabetes and hypertension were seen in 17.6 percent and 11.9 percent of the patients respectively. Thyroid abnormalities, COPD and CKD were seen in 2.7 percent, 4.1 percent and 3.8 percent of the patients respectively. Similar findings were reported in the past literature. In an Indian study conducted by Soni SL et al, Hypertension, Diabetes, COPD, Thyroid abnormalities and CKD was seen in 16.6 percent, 14.9 percent, 1.7 percent, 5.2 percent and 2.6 percent of the patients respectively. Overall, they reported presence of co-morbidities in 29.9 percent of the patients with COVID 19.[17] Hefeda MM et al, in another study reported presence of diabetes, hypertension, heart disease and COPD in 18.2 percent, 18.7 percent, 5.3 percent and 4.7 percent of the patients respectively. In a similar study conducted by Wu et al, diabetes, hypertension and COPD was seen in 5 percent, 5 percent and 4 percent of the patients respectively.[20] A number of existing literatures suggested that the presence of risk factors, particularly hypertension, diabetes, lung, and coronary artery diseases, carries a poor prognosis, with even worse outcome when multiple risk factors are present (Guan WJ et al).[21]

CLINICAL PROFILE : Fever, cough and dyspnea were seen in 91.1 percent, 97.2 percent and 92.3 percent of the patients respectively. Sore throat, GIT symptoms and muscle pan were seen in 81.8 percent, 11.7 percent and 64.1 percent of the patients respectively. Fatiguewas seen in 72.4 percent of the patients. Our results were in concordance with the results obtained by previous authors who also reported similar findings. In a similar study conducted by Hefeda MM et al, fever, cough, dyspnea, sore throat, GIT symptoms and muscle pain was seen in 88.1 percent, 84.06 percent,45.27 percent, 38.46 percent, 15.05 percent and 57.36 percent of the patients respectively.[20] Jin C et al, in another study, reported presence of fever, cough, fatigue and dyspnea were seen in 84.8 percent, 58.2 percent, 18.2 percent and 20.6 percent of the patients respectively. In another study conducted by Wu J et al, fever, cough, dyspnea, muscle pain and GIT symptoms were seen in 76 percent, 73 percent, 9 percent, 16 percent and 9 percent of the patients respectively. Lei Q et al reported presence of fever and cough in 90 percent and 52.5 percent of the patients respectively. In another previous study conducted by Sahin et al, fever, cough, dyspnoea and fatigue were seen in 49.3 percent, 36.2 percent, 18.8 percent and 8.7 percent of the patients respectively.[16, 22-24]

CT SEVERITY SCORING AND AGE: Mean age of the patients with mild, moderate and severe CT Severity scoring was 44.05 years, 54.25 years and 59.96 years respectively. While correlating CT Severity scoring and age, it was seen that elderly patients were associated with higher CT Severity scoring. Our results were in concordance with the results obtained by previous authors who also reported similar findings. In a study conducted by Agarwal et al, authors reported that increasing age was a risk factor associated with increasing severity of CT severity score.[19] Soni SL et al, in a similar study, reported that patients with severe CT severity score were associated with higher age (55.9 years) in comparison to the patients with moderate CT severity score (37.08 years) and mild CT Severity score (32.33 years).[17]In the study conducted by Hafeeda MM et al, patients with older age had more severe clinical disease than younger patients.[20]

CT SEVERITY SCORING AND CLINICAL PROFILE: While correlating CT severity scoring with clinical profile, non-significant results were obtained.In a study conducted by Agarwal et al, authors also reported significant results while correlating CT Severity scoring and dyspnea. In the study conducted by Hafeeda MM et al, patients with severe disease suffered from dyspnea more frequently than patients with mild forms. Presence of dyspneamay indicate more damage of the alveoli or the presence of interstitial inflammatory response.[19,20] Xie et al reported higher CT severity score in critically ill patients than patients with mild symptoms. The CT-SS is probably a good indicator of disease severity and may provide a semi-quantitative measure of disease progression.[25]

Conclusion

Under the light of above obtained results, following conclusion can be withdrawn:

1. In patients with COVID-19 infection, the CT severity score is linked to age, clinical profile, inflammatory laboratory markers, and hospital stay. There exist significant correlations among

the degree of pulmonary inflammation and the main clinical symptoms and laboratory results.
2. Computed tomography played an important role in the diagnosis and evaluation of this emerging global health emergency.It also plays an important role in guiding physicians with their management plans and can serve as a predictor of disease severity and outcomes.
3. However; further studies are recommended.

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