

## Assessment of Role of HRCT, RT-PCR in the Evaluation of COVID-19 Symptomatic Patients

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### Abstract

**Background:** To assess role of HRCT, RT-PCR in the evaluation of COVID-19 symptomatic patients. **Material and Methods:** This retrospective study was conducted in the department of Radiology and Microbiology at Aarupadaiveedu Meddical College and Hospital .Eighty- five clinically suspects of COVID-19 patients of either gender was enrolled in the study and underwent RT-PCR test and HRCT Thorax . HRCT images were studied by Three radiologists independently. CURB- 65 and SOFA was recorded. **Results:** There were 50 males and 35 females in our study. Disease severity CURB was 1 and SOFA was 3. Chest CT had suspicious for COVID-19 in 45 and RT-PCR SARS-CoV2 positive in 40. 42 had no comorbidity, 8 had peripheral vascular disease, 12 had cerebrovascular disease 13 had hypertension and 10 had diabetes mellitus. The difference was significant ( $P < 0.05$ ). In all 40 patients of PCR SARS-CoV-2 positive, 35 HRCT were judged as suspicious for COVID-19. In 45 cases of PCR SARS-CoV-2 negative, 10 HRCT scans were judged as not suspicious for COVID-19. HRCT Thorax had a sensitivity of 87.5%, specificity of 77.8%, PPV of 77% and NPV of 87.5%. **Conclusion:** The diagnostic accuracy of HRCT Thorax in symptomatic patients is good, but not good enough to safely diagnose or exclude COVID-19 patients. RT-PCR is useful in addition with HRCT in diagnosis of COVID-19 patients.

**Keywords:** Chest CT, Corona virus disease, RT- PCR.

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### Introduction

Corona virus disease 2019 (COVID-19) is a highly contagious disease caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). Early diagnosis of 2019 novel coronavirus disease (COVID-19) is crucial for disease treatment and control.<sup>[1]</sup> Early differentiation between patients with and without the disease is extremely important particularly in patients who visit the emergency department (ED) and patients who are admitted to the hospital.<sup>[2]</sup>

Coronavirus diseases mainly cause respiratory tract infections as seen in severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS), although other organs, including the gastrointestinal tract and cardiovascular system, can also be affected. The diagnosis of COVID-19 is primarily based on laboratory tests, chest imaging modalities, including chest X-ray (CXR) and high resolution computed tomography (HRCT), RT- PCR etc.<sup>[3]</sup>

Reverse-transcriptase-polymerase-chain-reaction (RT-PCR) is the reference standard in diagnosing COVID-19. It may take up to 24 hours to get a test result, although same day results are achieved most of the times.<sup>[4]</sup> RT-PCR taken by nasal or oropharyngeal route is considered the reference standard for the detection of COVID-19 disease. Due to emerging mutant strains of SARS-COV-2, the false positive PCR results are raising, making this pandemic to spread more due to lack of early diagnosis and isolation.<sup>[5]</sup> HRCT Thorax plays a

pivotal role in diagnosing COVID-19 due to typical imaging features of bilateral, peripheral, sub-pleural, ground glass attenuation in a posterior distribution. This may progress to consolidation or crazy paving appearance ending in bilateral white out lung.<sup>[6]</sup> We performed present study to assess role of HRCT, RT-PCR in the evaluation of COVID-19 symptomatic patients.

### Material and Methods

This Retrospective study was conducted in the Department of Radiology and Microbiology At Aarupadaiveedu Medical college and Research Institute. About Eighty- five clinically suspects of COVID-19 patients of either gender was enrolled in the study after considering the utility of the study and obtaining approval from ethical review committee of the institute. Patients with pulmonary and extra pulmonary lung malignancy, chest trauma, previous chest surgery and pediatric age group were excluded.

Demographic data was entered in case sheet. All were confirmed using RT-PCR test and HRCT chest. All patients underwent 16 slice spiral CT in a supine position taken with GE BRIVO machine operating with tube voltage 120 kVP; slice thickness of 1 mm tube current 450 mAs, field of view (FOV) 406 mm and pitch of 1.4. The total scan time was 3.89 seconds with rotation time of 0.5 seconds. Multi planar reconstruction (MPR) was done. HRCT images were studied by three radiologists independently. CURB- 65 and SOFA( Sequential Organ Failure Assesment) was recorded. The results were compiled and subjected for statistical analysis using Mann Whitney U test. P value less than 0.05 was set significant.

### Results

**Table No 1: Patients characteristics**

Parameters	Variables	Number	P value
Gender	Male	50	0.04
	Female	35	
Disease severity	CURB- 65	1	0.02
	SOFA	3	
Chest CT	CT suspicious for COVID-19	45	0.82
RT-PCR	PCR SARS-CoV2 positive	40	
Comorbidity	No	42	0.01
	Peripheral vascular disease	8	
	Cerebrovascular disease	12	
	Hypertension	13	
	Diabetes mellitus	10	

There were 50 males and 35 females in our study. Disease severity CURB was 1 and SOFA was 3. Chest HRCT had suspicious for COVID-19 in 45 and RT-PCR SARS-CoV2 positive in 40. 42 had no comorbidity, 8 had peripheral vascular disease, and 12 had cerebrovascular disease 13 had hypertension and 10 had diabetes mellitus. The difference was significant (P< 0.05). [Table 1]

**Table No 2: Chest CT and RT-PCR result**

CT scan	PCR SARS-CoV-2 positive	PCR SARS-CoV-2 negative	Total
HRCT suspicious for COVID-19	35	10	45
HRCT not suspicious for COVID-19	5	35	40
Total	40	45	85

In all 40 patients of PCR SARS-CoV-2 positive, 35 CT were judged as suspicious for COVID-19. In 45 cases of PCR SARS-CoV-2 negative, 10 CT scans were judged as not suspicious for COVID-19. [Table No: 2]

**Table No 3: Diagnostic accuracy of Chest CT for diagnosing COVID-19**

Parameters	Percentage
Sensitivity	87.5%
Specificity	77.8%
PPV (%)	77%
NPV (%)	87.5%

Chest CT had a sensitivity of 87.5%, specificity of 77.8%, PPV of 77% and NPV of 87.5%.

### Discussion

Coronavirus disease (COVID-19) is caused by severe respiratory syndrome corona virus (SARS-COV-2), which emerged from the city of Wuhan, China.<sup>[7]</sup> Initially through foreign, followed by local transmission of this disease, COVID-19 spread as a pandemic including almost 213 countries with America, Italy, Spain, UK being affected the most.<sup>[8]</sup> As most COVID-19 patients present with pneumonia, High Resolution computed tomography (CT) scanning of the thorax could be helpful in screening and diagnosing.<sup>[9,10]</sup> In addition, CT has the advantage that the results can be available almost directly.<sup>[11]</sup> HRCT Thorax can show characteristic findings including areas of ground-glass, with or without signs of reticulation, consolidative pulmonary opacities in advanced stages and the “reverse halo” sign.<sup>[12,13]</sup> We performed present study to assess role of HRCT, RT-PCR in the evaluation of COVID-19 symptomatic patients.

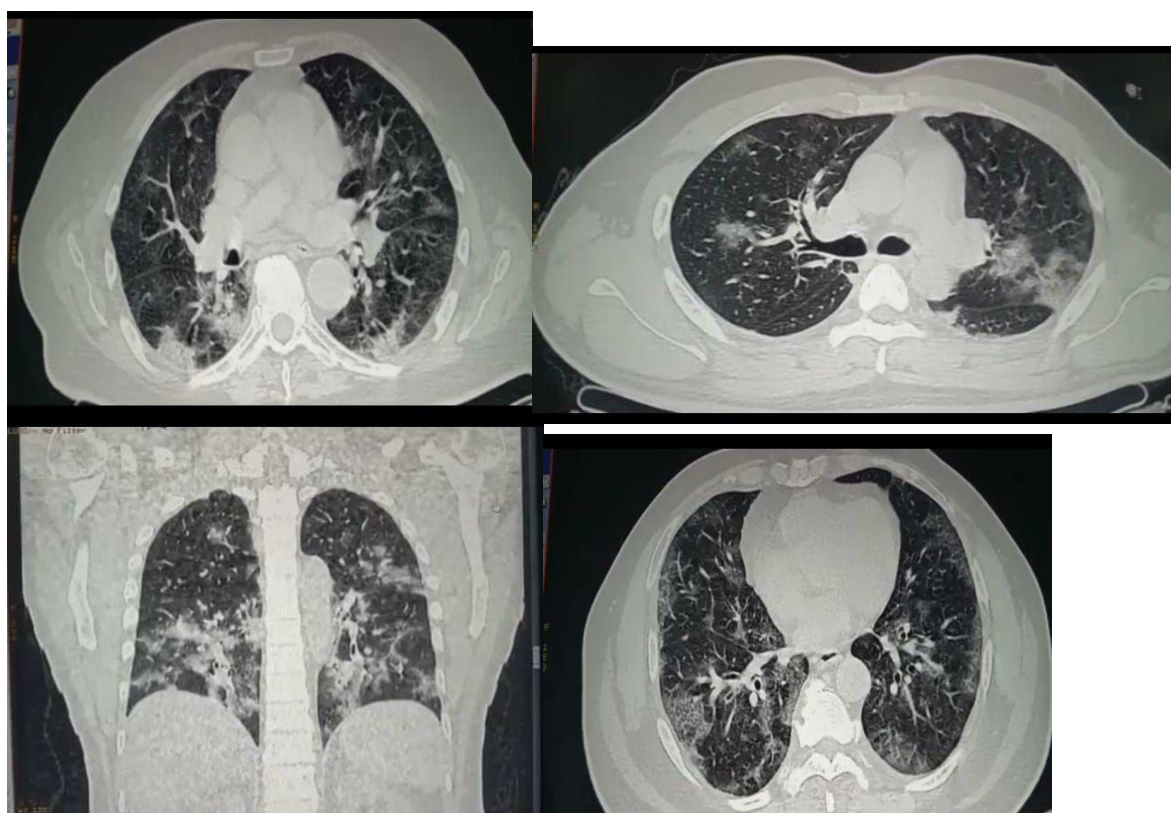
Our results showed that there were 50 males and 35 females. Disease severity CURB was 1 and SOFA was 3. HRCT Thorax had suspicious for COVID-19 in 45 and RT-PCR SARS-CoV2 positive in 40. 42 had no comorbidity, 8 had peripheral vascular disease, and 12 had cerebrovascular disease 13 had hypertension and 10 had diabetes mellitus. Hanif et al,<sup>[14]</sup> compared the diagnostic accuracies of HRCT chest and RT-PCR results in diagnosis of coronavirus disease (COVID-19). A total of 94 patients, 55 (58.5%) males and 39 (41.5%) were females. Out of them, 83% patients had positive HRCT chest findings of COVID-19, 17% had negative HRCT chest findings; while 40.4% had positive and 59.6% had negative first PCR. Among the repeat second PCR, 19.6% had negative, 1.8% had positive PCR results; while 78.6% patients didn't undergo repeat PCR. The sensitivity, specificity, NPV, PPV and accuracy of HRCT chest was 92%, 23%, 81%, 45%, and 51%; while of first RT-PCR was 45%, 81%, 23%, 92% and 51%, respectively. Our results demonstrated that in all 40 patients of PCR SARS-CoV-2 positive, 35 HRCT were judged as suspicious for COVID-19. In 45 cases of PCR SARS-CoV-2 negative, 10 HRCT scans were judged as not suspicious for COVID-19. HRCT Thorax had a sensitivity of 87.5%, specificity of 77.8%, PPV of 77% and NPV of 87.5%. Gietema et al,<sup>[15]</sup> found that in total, 43.0% of patients had a positive PCR and 56.5% a positive HRCT, resulting in a sensitivity of 89.2%, specificity 68.2%. Sensitivity was higher in patients with high-risk pneumonia (CURB-65 score >3; n = 17, 100%) and with sepsis (SOFA score >2; n = 137, 95.5%). Of the 35 patients (31.8%) with a suspicious CT and a negative RT-PCR, 9 had another respiratory viral pathogen, and in 7 patients, COVID-19 was considered likely. One of nine patients with a non-suspicious CT and a positive PCR had developed symptoms within 48 hours before scanning. Long compared initial HRCT and PCR in a study and showed high CT sensitivity of 97.2%, as compared to sensitivity of 83% of initial RT-PCR. Song et al described HRCT findings of

bilateral lung involvement (86%) with ground glass opacities (77%) in subpleural posterior distribution mainly in lower lungs.

Pilli et al,<sup>[16]</sup> in their study on 70 patients, 43 had positive and 27 had negative RT-PCR results with a positive rate of 61.4% (43/70). Of forty-three patients with positive RTPCR results, 93% (40/43) had positive chest CT scans. Of 27 patients with negative RT-PCR results, 74% (20/27) had positive chest CT scans. The median time interval between the paired chest CT exams and RTPCR assays was 2 days. Eighty-six percent of patients had positive chest CT findings. The main chest HRCT findings were ground-glass opacity (63% [38/60]) consolidations (38% [23/60] and Reticular/Thickened interlobular septa (31% [19/60]).

## IMAGES

Diffuse Bilateral pleural and subpleural patchy ground glass opacities in axial and coronal HRCT images



## Conclusion

The diagnostic accuracy of chest CT in symptomatic patients is good, but not good enough to safely diagnose or exclude COVID-19 patients. RT- PCR is useful in addition with HRCT in diagnosis of COVID-19 patients.

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