DOI: https://doi.org/10.53350/pjmhs221641030

ORIGINAL ARTICLE

Role of Computed Tomography in Diagnosis and Assessment of Disease Severity in Covid 19; Trends in Pakistan

M. RIZWAN ASGHAR[1], TAYYIBA AKHTER[2], KHUBAIB SHAHID[3], NAMRA CHAUDHARY[4], IMRAN KHAN[5], SOHAIB AMJAD[6]
[1]*Senior Registrar, Fatima Memorial Hospital Lahore*
[2]*Assistant Professor, Department of Radiology, Fatima Memorial Medical College/ Hospital Lahore*
[3]*Professor of Radiology, Fatima Memorial Medical College/Hospital Lahore*
[4]*Postgraduate resident Diagnostic Radiology, Fatima Memorial Hospital Lahore*
[5]*Assistant Professor Diagnostic Radiology Fatima Jinnah Medical University/Sir Ganga Ram Hospital Lahore*
[6]*Medical officer Sir Ganga Ram Hospital Lahore*
Correspondence to: M. Rizwan Asghar, Email: rizwanasghar190@hotmail.com

ABSTRACT

Objective: To observe and compare relationship of High Resolution Computed Tomography severity score with presenting symptoms of COVID-19 positive patients in mild, moderate and severe disease and to analyze the trends of morbidity and mortality in Pakistan.

Study Design: Retrospective Observational study

Subjects and Methods: All OPD and admitted adult male and female patients serially presented to Fatima Memorial and Sir Ganga Ram Hospital Lahore with positive COVID PCR test or clinical symptoms were included in the study. These patients were classified in three groups; Group I: Mild disease, i.e. symptomatic patients who didn't need hospital admission or oxygen support. Group II: Moderate disease, i.e. patients having oxygen saturation more than 90% & needing oxygen support at times, and Group III: severe disease, i.e. patients needing hospital admission or ventilator support and having oxygen saturation less than 90%. High resolution chest CT scan was the approach in all cases. CT severity score was used to assess the severity of lung parenchymal involvement by COVID-19 on all the HRCT. Data collected was entered and analysis made using SPSS v 25.

Results: Total number of patients were 200(100%) with age ranging from 14-85 years and mean age was 49.5+ 5 years, out of which 135(67%) were males and 65(32%) were females with male to female ratio 2:1. HRCT scans of all patients were done with COVID PCR test positive in 146(73%) patients. Group I had 98(49%) patients, 87(43.5%) patients were included in Group II and 15(7.5%) patients in Group III. Oxygen was required in 78(39%) patients from group II and 14(7%) patients from severe disease required ventilator.

Conclusion: Our research work presented the trends of CT severity scoring having positive correlation to clinical symptoms of patients. Moreover, most of the patients in our country were having mild and moderate disease and only 7% patients showed severe disease symptoms and CT scoring in our study. Out of those severe disease patients, mortality was only 1% as compared to 2.89% mortality reported in Iran.

Keywords: COVID-19 infection, HRCT Chest, Severity score

INTRODUCTION

Coronavirus was declared a pandemic by the World Health Organization and has affected a large proportion of the population in almost every country worldwide. The intimidating effects and significant morbidity of this disease, as well as morbidity, have adversely affected health care systems. Numerous people have been influenced by its universal spread [1]. COVID-19 has not only caused physical, psychological distress but also caused physical complication in non-COVID-19 patients [2].

Severe acute respiratory syndrome-coronavirus (SARS-CoV-2) has not only affected respiratory system but also caused multi organ damage due to cytokine storm. A wide variety of symptoms has been reported, including cough, low to high grade fever, sneezing, pneumonia, fatigue, and myalgia. Some people also experience a sore throat and rhinorrhea, whereas diarrhea and other gastrointestinal complaints became more pronounced during the second wave of COVID-19 [3]. Patients having comorbid conditions are thought to be more prone to the deadly effects of COVID-19. These conditions include preexisting hypertension, chronic kidney disease, and diabetes mellitus [4]. Thus, isolation has become the normal approach for separating infected individuals from others [5].

COVID-19 infection is typically confirmed by clinical evaluation and lab testing by real time reverse-transcription polymerase chain reaction (RT-PCR). Diagnosis and prediction of disease severity are complemented by radiological assessment by non-contrast high-resolution CT scan of the chest (HRCT), which has become the gold standard for scoring disease severity. Studies have reported that HRCT is an effective tool for detecting infection at the early stage or in those who are highly suspicious asymptomatic [6]. HRCT can be done serially to provide expert judgment on the evolution of the illness [7]. The large number of COVID-19 patients has placed great stress on healthcare facilities and treatment resources. Thus, there has been an immense need for a continuous management plan for this critical situation so that the maximum number of patients can have access to the relatively limited number of life supportive regimens, as severe COVID-19 cases are admitted to the hospital, and provided with intensive care until symptoms improve [8,9].

On chest HRCT, the primary findings of COVID-19 include multifocal ground glass opacities and consolidation with a peripheral and lower zone distribution. Pleural effusion and cavitation are less pronounced features, with pulmonary fibrosis as a late manifestation. Chest HRCT has played a pivotal role in both the diagnosis and management of COVID-19.

The main purpose of this multicenter study was to assess the correlation of CT severity score with disease severity in a COVID-19 patient cohort in Pakistan. Although Pakistan has witnessed dire manifestations of COVID-19, its extent has been milder compared to the worldwide mortality rate. Thus, this study was performed to assess trends of COVID-19 severity and mortality in Pakistan

SUBJECTS AND METHODS

This study was approved by the relevant ethics committee. All OPD and admitted patients serially presenting to the Radiology Department of Fatima Memorial Hospital and Sir Ganga Ram Hospital Lahore with a positive COVID-PCR test or clinical symptoms were included in this study. Male and female patients of all adult age groups were included. Patients were divided in three groups: Group I: mild disease, i.e., symptomatic patients who did not require hospital admission or oxygen support; Group II: moderate disease, i.e., patients having oxygen saturation more than 90% and needing oxygen support at times; and Group III: severe disease, i.e., patients requiring hospital admission or ventilator support and having oxygen saturation less than 90%. All patients included in this study underwent chest HRCT on a 16-slice Toshiba scanner.

The chest CT index has been used in multiple studies as effective tool to assess the severity of lung parenchymal involvement due to COVID-19 on HRCT images [10]. The lung opacities in all five lobes of the lung were subjectively assessed and percentage values were assigned according to the following criteria: 1. <5% involvement 2. 5-25% involvement

3. 26-49% involvement 4. 50-75% involvement

5. >75% involvement

The total CT score was determined as the sum of the individual lobar scores and ranged from 0 (no involvement) to 25 (maximum involvement). All images were assessed by two radiologists having more than six years of experience using a Vitrea diagnostic system workstation. Data was analyzed using SPSS v25 (IBM, USA) and p value was calculated to establish statistical significance.

RESULTS

As shown in Table 1, a total of 200 patients (135 males, 65 females) were recruited for this study with age ranging from 14-85 years (mean age 49.5 ± 5 years). All patients underwent HRCT scans, but COVID-19 PCR tests were performed in only 146 (73%) patients. Group I had 98(49%) patients, Group II had 87 (43.5%) patients, and Group III had 15 (7.5%) patients. Oxygen was administered to 78 (39%) patients in Group II and 14 (7%) patients with severe disease required a ventilator

Table 2 shows that the upper lobe of the right lung was involved in 85 patients with mild disease, 85 patients with moderate group, and all patients with severe disease. The middle lobe of the right lung was affected in 93 patients with mild disease, 83 patients with moderate disease, and all patients with severe disease. The lower lobe of the right lung was abnormal in all patients in groups I, II, and III.

The upper lobe of the left lung was involved in 90 patients with mild disease, 83 patients with moderate disease, and all patients with severe disease. The lower lobe of the left lung was abnormal in all patients with mild, moderate, and severe disease.

Table 1: General data / Study to summarize

Total no of patients in Study (N)	200 (100%)
Age	14-85 years(Mean age 49.5+ 5 years)
Males	135 (67%)
Females	65 (32%)
Male: Female	2 : 1
HRCT Scans	200 (100%)
COVID PCR test done	146 (73%)
Group I- Mild Disease	98 (49%)
Group II- Moderate disease	87 (43.5%)
Group III- Severe Disease	15 (7.5%)
Oxygen administration in moderate disease	78 (39%)
Ventilator requirement in severe disease	14 (7%)
Patients who lost follow up	12 (6%)

Table 2: shows site of involvement.

Table II: Sites involved		
Sites	Right lung involvement	Left lung involvement
	Upper lobe Middle lobe Lower Lobe	Upper lobe Lower lobe
Group I: Mild Disease 98 (100%)	85(86%) 93(94%) 98(100%)	90(91%) 98(100%)
Group II: Moderate Disease 87(100%)	85(97%) 83(95%) 87(100%)	83(95%) 87(100%)
Group III: Severe Disease 15(100%)	15(100%) 15(100%) 15(100%)	15(100%) 15(100%)

Table 3: shows HRCT score predicting disease severity

	Group I: Mild disease 98(100%)	Group II: Moderate Disease 87(100%)	Group III : Severe disease 15(100%)	p-Value (<0.05=significant)
Score 7 or less in both lungs	95(96%)	3 (3.4%)	0	0.000
Score from 8-17 in both lungs	3 (3.06%)	85 (97%)	0	0.000
Score 18 and above	0	0	15 (100 %)	0.000

DISCUSSION

In our study, we observed that 96% of patients labeled as clinically mild had a CT severity score of 7 or less in both lungs, 3.4% patients with moderate disease severity showed a CT severity score in this range, and no severe disease patients had a score 7 or less. By contrast, the proportions of mild, moderate, and severe CT severity scores were 90%, 6%, and 1%, respectively, in a similar study done by Li K et al. [11].

In the present study, we observed a CT severity score in the range of 8-17 in only 3.06% of patients in Group I, 97% of patients in Group II, and no patients in Group III. However, a study by Shi et al. [12] reported these proportions to be 7%, 87%, and 0.6%, respectively.

Wang et al. [13] found that no patients in the clinically mild disease group had a CT severity score of 18 or higher, whereas 2% of moderate disease patients and 98% of patients with severe disease had a score from 18-25. Notably, scores in this range were observed for all severe COVID-19 patients in the present study, but none of the patients in Group I or Group II.

Moreover, our results demonstrated that COVID-19 affected patients with a male to female ratio of 2:1 and that more than 90% of patients in the mild and moderate disease category required little to no medical support

CONCLUSION

This study reports the correlation between CT severity scoring and clinical symptoms of COVID-19 patients in Pakistan. Notably, most patients in our country had mild or moderate disease, and only 7% showed severe disease symptoms and CT scoring. Among the severe disease patients, mortality was only 1%.

REFERENCES

1. Zhonghua Liu Xing Bing Xue Za Zhi. : Special Expert Group for Control of the Epidemic of Novel Coronavirus Pneumonia of the Chinese Preventive Medicine A. An update on the epidemiological characteristics of novel coronavirus pneumoniaCOVID-19 . 10.3760/cma.j.issn.0254-6450.2020.02.002
2. Hardik D. Desai, Kamal Sharma, Dhigishaba M. Jadeja,, Harshil M. Desai, and Pratiksha Moliya: COVID-19 pandemic induced stress cardiomyopathy: A literature review. 10.1016/j.ijcha.2020.100628
3. Yang X, Yu Y, Xu J, et al.: Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: A single-centered, retrospective, observational study. Lancet Respir Med . 10.1016/S2213-2600(20)30079-5.
4. Zhang JJY, Lee KS, Ang LW, Leo YS.: Risk factors of severe disease and efficacy of treatment in patients infected with COVID-19: A systematic review, meta-analysis and meta-regression analysis. . 10.1093/cid/ciaa576
5. Wu Z, McGoogan JM.: Characteristics of and important lessons from the Coronavirus Disease 2019 (COVID-19) outbreak in China: Summary of a report of 72314 cases from the Chinese Center for Disease Control and Prevention. . 10.1001/jama.2020.2648
6. Liu J, Yu H, Zhang S.: The indispensable role of chest CT in the detection of coronavirus disease 2019 (COVID-19). European Journal of Nuclear Medicine and Molecular Imaging.. 10.1007/s00259-020-04795
7. Caruso D, Polidori T, Guido G, et al.: Typical and atypical COVID-19 computed tomography findings.. 10.12998/wjcc.v8.i15.3177
8. Kui L, Fang YY, Deng Y, et al.: Clinical characteristics of novel coronavirus cases in tertiary hospitals in Hubei Province.. 10.1097/CM9.0000000000000744
9. Han X, Cao Y, Jiang N, et al.: Novel coronavirus pneumonia (COVID-19) progression course in 17 discharged patients: Comparison of clinical and thin-section CT features during recovery. Clin Infect Dis. 2020, 71:723-31.. 10.1093/cid/ciaa271
10. Ammar Mosa Al-Mosawe, Hiba mohammed Abdulwahid, and Noor Abbas Hummadi Fayadh: Spectrum of CT appearance and CT severity index of COVID-19 pulmonary infection in correlation with age, sex, and PCR test: an Iraqi experience. 10.1186/s43055-021-00422-3
11. Li K, Wu J, Wu F, et al.: The clinical and chest CT features associated with severe and critical COVID-19 pneumonia. Invest Radiol 2020, 55:327-31.. 10.1097/RLI.0000000000000672
12. Shi H, Han X, Jiang N, et al.: Radiological findings from 81 patients with COVID-19 pneumonia in Wuhan, China: A descriptive study. Lancet Infect Dis. 2020, 20:425-34.. 10.1016/S1473-3099(20)30086-4
13. Wang D, Hu B, Hu C, et al.: Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. JAMA. 2020, 323:1061-9. 10.1001/jama.2020.1585