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Research Article

CHEST COMPUTED TOMOGRAPHY SEVERITY SCORING AND ITS RELATION WITH AGE AND GENDER DURING THE SECOND WAVE OF COVID-19 PANDEMIC – A RETROSPECTIVE AND OBSERVATIONAL STUDY

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ABSTRACT

Objective: Our study aimed to assess the lung involvement using computed tomography (CT) severity scores and to determine how age and gender affect the severity of infection during the second wave of COVID-19.

Methods: This retrospective and observational study was conducted in a dedicated COVID hospital. A total of 650 positive patients who gave their consent were included in this study. The CT severity score (25 points) was categorized as mild (<7), moderate (7–18), and severe (>18).

Results: Patient's age of 10–86 years with a mean and SD was 47.77±15.21 years, of which 440 were male and 210 were females. Males were more significantly affected than females (p=0.007). The mean±SD of CT severity score was 8.69±6.28, and ranging from 0 to 25. The most affected age group in the second wave of COVID-19 was 41–60 years (275 patients, 42.3%). A significant positive correlation between total CT severity with age, but it was mild (r=0.16, p=0.003).

Conclusion: The age range with the highest CT severity score and the majority of men was 41–60 years. In addition, there was a strong association between the severity of the CT and both male gender and age.

Keywords: Computed tomography severity, Computed tomography, Age, Gender, COVID-19.

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INTRODUCTION

The main technique for identifying the COVID-19 pandemic produced by the severe acute respiratory syndrome coronavirus 2 (SARS-COV-2) virus is reverse-transcriptase polymerase chain reaction (RT-PCR) testing [1]. But RT-PCR tests sometimes show false negative reports in spite the clinical presentation of symptoms [2,3]. This may lead to delays in the isolation of patients and more spread of the virus. Chest computed tomography (CT) has evolved as a screening and diagnostic tool along with RT-PCR. Chest severity ratings and the COVID-19 reporting and data system (CO-RADS) are often employed. Based on the characteristics detected on an unenhanced chest CT, CO-RADS assigns a degree of suspicion for COVID-19 pulmonary involvement. The lung changes and involvement are graded using the CT severity index score, which is based roughly on the afflicted lung areas. Individual lobar scores are totaled up to get a final score out of 25 [4]. During the second wave of the pandemic (March–July 2021), patients are found to be mildly symptomatic with major lung changes. The coronavirus's new delta variant (B.1.617.2) seems to be highly infectious [5]. Therefore, the second wave of COVID-19 was the focus of our study, which intended to measure lung involvement using CT severity ratings and explore the association between age and gender with the CT severity score.

METHODS

A total of 650 individuals have confirmed cases of COVID-19 after receiving consent from the Institutional Ethics Committee and Clinical Trial Registry-India (RTPCR positive or CORADS 6). Data were collected from the record in a dedicated COVID hospital from March 1 to June 30, 2021. The study population includes an age group from 10 to 86 years, as per the record, of which 440 were male and 210 were female. Age was classified: Group 1 = from 10 to 16 years, Group 2 = from 17 to 40 years, Group 3 = from 41 to 60 years, Group 4 = from 61 to 80 years, and Group 5 = more than 80 years.

High-resolution CT (HRCT) was performed by a multi-detector CT scanner (GE Optima 660, 128 slices). Axial images were obtained using a single breath-holding technique in the supine position to reduce the motion artifact, and then the images were reconstructed into sagittal and coronal planes. The tube voltage and current used were 120 Kv and 160 mA, respectively. CT images were of thickness 0.63 mm and 1.2 mm intervals in lung window setting (Window level-500 HU and of window width 1200 HU) and matrix size 512×512.

In the COVID-19 patients, we found subpleural discrete and confluent Ground glass opacities, Inter/intralobar septal thickening, early consolidation changes, bronchovascular dilatations, subpleural and intraparenchymal fibrotic bands, and very occasionally pleural effusion. Chest CT severity was assessed by a 25-point score after the summation of individual lobar scores. The CT score was categorized as mild <7, moderate 7–18, and severe >18 [6].

Statistical analysis

The statistical analysis tool IBM SPSS New York version 23 was used for analyzing of data. Categorical data such as numbers and percentages were assessed using Chi-square test. Continuous data were represented using the mean and standard deviation. The Spearman's rho relationship was indicated weak (r=0.10–0.39), moderate correlation (r=0.40–0.59), strong correlation (r=0.60–0.90), and perfect correlation (r=1). p<0.05 was considered statistically significant.

RESULTS

A total of 650 HRCT of COVID-19-positive cases were evaluated. In an age range between 10 and 86 years, the mean and SD was 47.77±15.21 years (Table 1). The frequency and percentage of patients in different age groups with mean CT severity score was 8.69 (SD 6.28), minimum 0 and a maximum value of 25 given in Table 2.

The relation of gender with chest CT severity; of 440 (67.7%) males, 177 (40.2%), 218 (49.5%), and 45 (10.2%) had been found to have mild, moderate, and severe CT score, respectively (Table 3). Two hundred and ten (32.3%) females tested positive for COVID-19, out of which 109 (51.9%), 90 (42.9%), and 11 (5.2%) showed mild, moderate, and severe CT scores, respectively. As per statistical analysis, males were significantly more affected than females (p=0.007) in this second wave of COVID-19. Of 650 patients, 286 (44%), 308 (47.4%), and 56 (8.6%) showed mild, moderate, and severe CT severity scores, respectively. Among 210 females, 109 (51.9%), 90 (42.9%), and 11 (5.2%) had mild, moderate, and severe CT scores. In males, mild CT score was noticed in 177 (40.2%), 218 (49.5%) moderate, and 45 (10.2%) severe. Severe CT scores were found to be 80.4% in males compared to 19.6% in females. The female (38.1%) compared to male (61.9%) patients, had a CT score of 7 or less. Moderate CT score was seen in more males (70.8%) compared to females (29.2%).

The most affected age group in the second wave of COVID-19 was 41–60 years (275 patients, 42.3%), followed by 17–40 years (208 patients, 32%), 61–80 years (155 patients, 23.8%), more than 80 years (9 patients, 1.4 %), and least affected being 1–16 years (3 patients, 0.5%) as shown in Table 4. Severe CT score was highest (55.4%) in the age 41–60 years, followed by 25% and 19.6% in the age 17–40 years and 61–80 years, respectively (p=0.012). None of the patients aged 1–16 and over 80 years had a CT score of 18 or more. Mild CT score was 1% in the age 1–16 years, 38.5% in age 17–40 years, 38.1% in 41–60 years, 21.7% in 61–80 years, and 0.7% in patients over 80 years. Of 44% of patients were found to have mild CT severity scores out of total study population, whereas moderate and severe CT severity score had 47.4% and 8.6%, respectively. CT severity score and age had a significant positive relationship. However, it was determined to be mild (r=0.16, p=0.003) (Table 4).

Table 1: Distribution of CT severity score in the age group

CT severity	Mean±SD	Minimum	Maximum	Range
Age (in years)	47.77±15.208	10	86	76
Total CT severity score	8.692±6.277	0	25	25

CT: Computed tomography, SD: Standard deviation

Table 2: Distribution of cases in age groups

Age groups (years)	Cases (%)
1–16	3 (0.5)
17–40	208 (32)
41–60	275 (42.3)
61–80	155 (23.8)
>80	9 (1.4)
Total	650 (100)

Table 3: Distribution of gender with CT severity

Gender	CT severity (number of cases/%)			Total	p value
	1	2	3		
Female					
Cases	109 (51.9)	90 (42.9)	11 (5.2)	210 (100)	0.007
CT	38.1	29.2	19.6	32.3	
Total	16.8	13.8	1.7	32.3	
Male					
Cases	177 (40.2)	218 (49.5)	45 (10.2)	440 (100.0)	
CT	61.9	70.8	80.4	67.7	
Total	27.2	33.5	6.9	67.7	
Total					
Cases	286 (44.0)	308 (47.4)	56 (8.6)	650 (100.0)	
CT	100.0	100.0	100.0	100.0	
Total	44.0	47.4	8.6	100.0	

CT: Computed tomography

DISCUSSION

The COVID-19 pandemic was declared by the World Health Organization (WHO) in December 2019 after the detection of first case in Wuhan, China [7,8]. For COVID-19 infection WHO advised HRCT thorax as a part of diagnostic workup whenever RT-PCR testing was not possible, if test results were delayed, or when there was a high clinical suspicion despite initial negative RT-PCR testing which is the gold standard diagnostic test [9,10].

Our study showed the second wave of COVID-19 impacted men more (67.7%). This observable fact seems to be caused mostly by genetic, immunologic, and sociocultural variations between men and women [11]. Males may be more vulnerable to SARS-CoV-2 infection because of the angiotensin-converting enzyme 2 (ACE2) gene's placement on the X-chromosome and increased gene expression in men [12]. In addition, smoking is linked to greater ACE2 receptor expression, and given that smoking behaviors are sex-related, males are once again more vulnerable to viral entry [13]. According to Moradi *et al*. women with COVID-19 had a better prognosis than males and had considerably lower CT scores <60 years of age [14].

People aged 41–60 are more affected (42.3%) than others. In India, 60 years and above were vaccinated, so the COVID-19 infectivity rate in them was 23.8%, as per our study. Age <16 years were least affected due to less exposure. The most severe CT score was seen in the 41–60 year age group (55.4%), with male predominance (80.4%). This age group

Table 4: Spearman's correlation of age and CT severity score

Age (in years)	CT severity (number of cases/%)			Total	p value
	1	2	3		
1–16					
Cases	3 (100.0)	0 (0.0)	0 (0.0)	3 (100.0)	0.012
CT	1.0	0.0	0.0	0.5	
Total	0.5	0.0	0.0	0.5	
17–40					
Cases	110 (52.9)	84 (40.4)	14 (6.7)	208 (100.0)	
CT	38.5	27.3	25.0	32.0	
Total	16.9	12.9	2.2	32.0	
41–60					
Cases	109 (39.6)	135 (49.1)	31 (11.3)	275 (100.0)	
CT	38.1	43.8	55.4	42.3	
Total	16.8	20.8	4.8	42.3	
61–80					
Cases	62 (40.0)	82 (52.9)	11 (7.1)	155 (100.0)	
CT	21.7	26.6	19.6	23.8	
Total	9.5	12.6	1.7	23.8	
>80					
Cases	2 (22.2)	7 (77.8)	0 (0.0)	9 (100.0)	
CT	0.7	2.3	0.0	1.4	
Total	0.3	1.1	0.0	1.4	
Total					
Cases	286 (44.0)	308 (47.4)	56 (8.6)	650 (100.0)	
CT	100.0	100.0	100.0	100.0	
Total	44.0	47.4	8.6	100.0	
	Spearman's rho				
Age and total CT severity score	0.115				0.003

CT: Computed tomography

was unvaccinated with more exposure and may be associated with comorbidities. Behavior disparity and the protective effect of estrogen might be why fewer females are affected by COVID-19 [15]. It was seen during the first wave of COVID-19 severe CT score was found in elderly male [16]. Studies done in the past have shown that COVID-19 elderly adults with concomitant chronic conditions such as diabetes mellitus, hypertension, or cardiac diseases constitute the major risk age group with high fatal result rates [17,18].

The second wave of the coronavirus impacted people between 41 and 60, and the present research found a substantial, although moderate, correlation between CT severity score and age. Al-Mosawe *et al.* also found a significant correlation between increasing age and CT severity during the first wave of COVID-19 [4]. Earlier research that compared the severity score on chest radiograph in COVID-19 cases of various ages and genders found that lung involvement was considerably higher in both the sex between the ages of 50 and 79 years [19]. In addition, uncommon side effects of COVID-19 pneumonia include subcutaneous emphysema and spontaneous pneumomediastinum [20].

CONCLUSION

During the COVID-19 second wave in India, the most affected age group with higher CT severity score was 41–60 years, with male predominance. In adddition, there was a strong relationship between the CT severity score with age and male gender. This fact seemed to result from genetic, immunologic, hormonal, and social and smoking behavioral variations between men and women. The use of CT scans may help clinicians make informed treatment decisions, act as a predictor of illness severity and outcome, and enhance hospital resource management.

CONFLICTS OF INTEREST

Nil.

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