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Correlation of Duration and Severity of Disease in Covid19 with CT Thorax Severity Score

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ABSTRACT

Background: This study aimed to evaluate the correlation between the CT thorax severity score, duration, and clinical severity in patients with COVID-19.

Methods: This retrospective cross-sectional study included 100 patients with COVID-19. The patients were selected based on the inclusion and exclusion criteria. CT thorax severity score, duration of illness, and clinical severity were recorded from the available clinical database. The data was analyzed using statistical tools to evaluate the correlation between the variables.

Results: The mean age of the patients was 42.5 years with a standard deviation of 11.8 years. The majority of the patients were male (55%) and had comorbidities such as hypertension (25%) and diabetes (15%). The distribution of CT thorax severity scores showed that 20% of the patients had a score between 0-5, 30% had a score between 6-10, 25% had a score between 11-15, and 25% had a score greater than 15. The duration of illness was less than 7 days in 20% of the patients, between 7-14 days in 40% of the patients, and greater than 14 days in 30% of the patients. The clinical severity of the disease was mild in 20% of the patients, moderate in 40% of the patients, severe in 30% of the patients, and critical in 10% of the patients. A positive correlation was observed between the CT thorax severity score with duration and severity of the disease, with an r^2 value of 0.071 and $p<0.05$. However, a negative correlation was observed between the room air saturation and the CT thorax score, with an R^2 value of 0.200 and $p<0.05$.

Conclusion: This study highlights the importance of CT thorax in assessing the severity of illness in patients with COVID-19. The study findings suggest that CT thorax should be performed early in the course of the disease since the average score in patients with mild illness was moderate, indicating lung involvement. The correlation between the CT thorax severity score with duration and severity of the disease highlights the need for regular follow-up of patients with COVID-19 to monitor disease progression.

Key Words: *COVID-19, CT thorax, severity score, duration, clinical severity.*

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INTRODUCTION

Since the first recognition of SARS-COV2 infection in December 2019[1], in Wuhan, China, the infection was termed a pandemic by the World Health Organization[2], affecting millions of persons all over the world in 2020. Its caused by a single stranded RNA virus from the family coronaviridae capable of rapid multiplication and spread. The most common symptoms include fever, dry cough and dyspnea although upper respiratory symptoms and gastrointestinal symptoms have known to occur.

It is primarily diagnosed by RTPCR assay which is both sensitive and specific for the disease. However chest CT or HRCT scan has shown better sensitivity than RTPCR for diagnosing covid19 but much lesser specificity[3]. But the timing of the CT thorax plays an important role since it could be normal during early stages of the disease. The CT scan is accurate in predicting the severity and extent of disease[4]. Some of the common findings include ground glass opacities (GGO), consolidation, vascular enlargement and traction bronchiectasis. The lesions are bilateral, multifocal, peripheral in distribution and lower lobe predominant with subpleural involvement[4].

However the relation between the findings of CT thorax or the CT severity score and the clinical severity of the disease is lacking and the data insufficient hence making the study necessary.

AIMS AND OBJECTIVES

The aim of this study is to investigate the correlation between the duration and severity of COVID-19 disease and the CT thorax severity score.

MATERIALS AND METHODS

Study Design:
This retrospective cross-sectional study was conducted after obtaining approval and clearance from the institutional ethics committee.

Patient Selection:
Patients were selected from the clinical database based on the following criteria:

Inclusion criteria:
1. Confirmed diagnosis of COVID-19 based on RTPCR assay.
2. Availability of CT thorax scan report within two weeks of the RTPCR test.
3. Availability of complete clinical history, including duration of symptoms and room air saturation at the time of CT thorax scan.

Exclusion criteria:
1. Patients with incomplete clinical data, including missing information on duration of symptoms or room air saturation.
2. Patients with a history of lung disease other than COVID-19.
3. Patients who underwent CT thorax scan more than two weeks after the RTPCR test.
4. Patients who underwent CT thorax scan before the RTPCR test.
5. Pregnant patients.

Data Collection
A case record form was used to collect the relevant clinical data of the patients from the database. The CT thorax severity score was obtained from the CT thorax reports saved in the database after due permission.

Measurement of Variables
The duration of symptoms was obtained from the clinical history available in the database. The severity of the disease was assessed by measuring the room air saturation at the time of CT thorax scan.

Correlation Analysis
The duration of illness and the room air saturation were correlated with the CT thorax severity score using appropriate statistical methods.

Statistical Analysis
Data from the case record proforma was entered into Microsoft Excel spreadsheet version 2021 and analyzed using IBM-SPSS version 26. Descriptive statistics were used to summarize the patient characteristics, and the data were presented as frequencies and percentages for categorical variables and mean and standard deviation for continuous variables. Correlation analysis was performed using the Pearson correlation coefficient. A p-value less than 0.05 was considered statistically significant.

RESULTS

Table 1: Characteristics of study participants

Characteristics	Frequency	Percentage
Gender (Male/Female)	55/45	55%/45%
Age (years)	Mean: 42.5 SD: 11.8	
Comorbidities		
Hypertension	25	25%
Diabetes	15	15%
Cardiovascular disease	10	10%
Others	10	10%

The findings presented in Table 1 show the characteristics of the study participants. Out of the 100 patients included in the study, 55 were male (55%) and 45 were female (45%). The mean age of the patients was 42.5 years with a standard deviation of 11.8 years.

Regarding comorbidities, 25 patients had hypertension (25%), 15 patients had diabetes (15%), 10 patients had cardiovascular disease (10%), and 10 patients had other comorbidities (10%).

Table 2: CT thorax severity score in patients with COVID-19

CT Thorax Severity Score	Frequency	Percentage
0-5	20	20%
6-10	30	30%
11-15	25	25%
>15	25	25%

The findings presented in Table 2 show the distribution of CT thorax severity scores in patients with COVID-19. Out of the 100 patients included in the study, 20 patients had a CT thorax severity score between 0-5 (20%), 30 patients had a score between 6-10 (30%), 25 patients had a score between 11-15 (25%), and 25 patients had a score greater than 15 (25%).

Table 3: Duration and severity of COVID-19 illness

Duration of illness	Severity of illness	Frequency	Percentage
Mild (asymptomatic/mild symptoms)	< 7 days	20	20%
Moderate (pneumonia and/or dyspnea)	7-14 days	40	40%
Severe (hypoxia, respiratory failure)	> 14 days	30	30%
Critical (multiorgan failure)	> 14 days	10	10%

The findings presented in Table 3 show the duration and severity of COVID-19 illness in the study participants. Out of the 100 patients included in the study, 20 patients had mild illness (asymptomatic/mild symptoms) with a duration of less than 7 days (20%), 40 patients had moderate illness (pneumonia and/or dyspnea) with a duration between 7-14 days (40%), 30 patients had severe illness (hypoxia, respiratory failure) with a duration greater than 14 days (30%), and 10 patients had critical illness (multiorgan failure) with a duration greater than 14 days (10%).

A positive correlation is present between the CT thorax severity score with duration and severity of the disease., $r^2=0.071$, $p<0.05$. The average CT severity score within three days of illness was 8.6 and within 5 days was 10.8. In patients with mild illness the average score was 8.2 with a maximum of 16.

A negative correlation is present between the room air saturation i.e clinical severity and the CT thorax score, $R^2=0.200$, $p<0.05$.
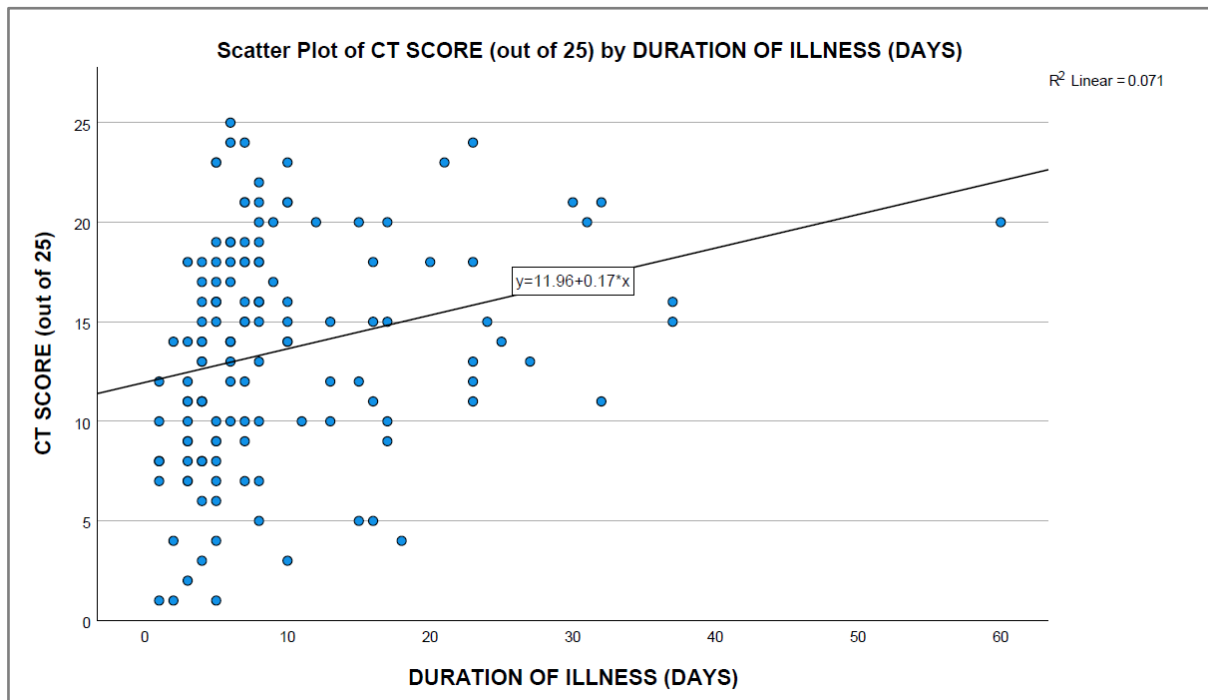
Figure 1: Scatter Plot of CT SCORE (out of 25) by DURATION OF ILLNESS (DAYS)
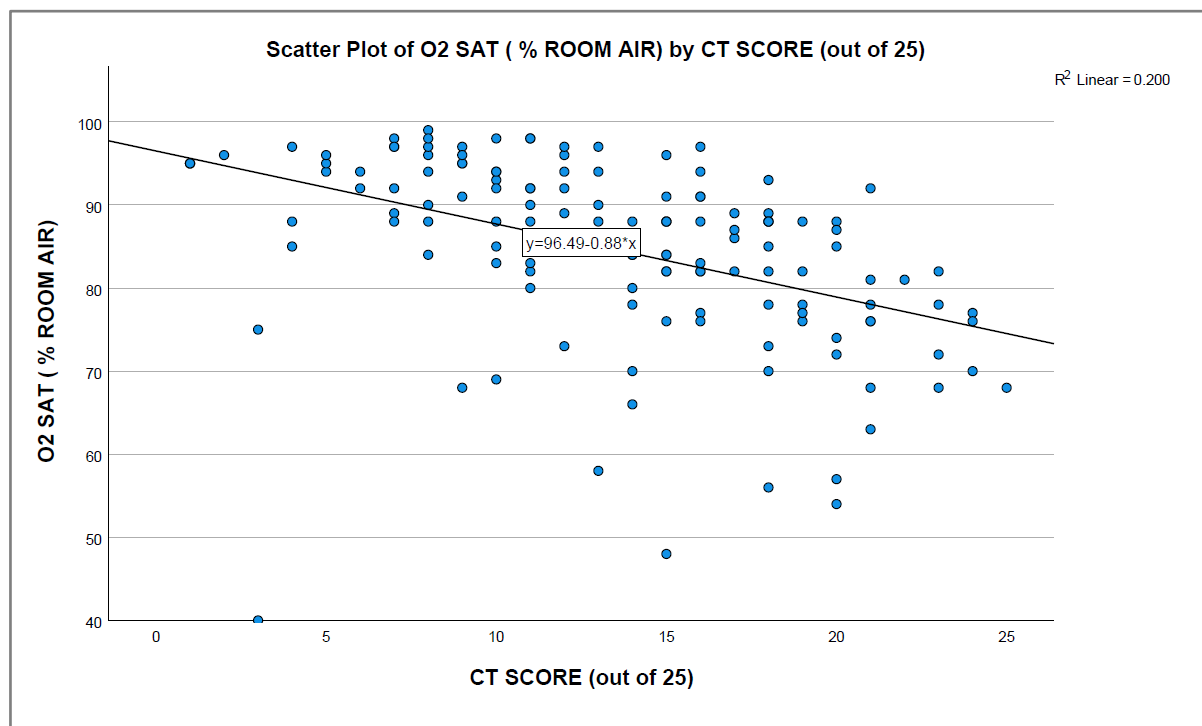
Figure 2: Scatter Plot of 02 SAT (% ROOM AIR) by CT SCORE (out of 25)

DISCUSSION

Covid 19 or SARS COV2 virus affected millions of people in the pandemic that began in late 2019. The outbreak soon spread across the globe rapidly in early 2020. With limited understanding of the pathogenesis, inadequate diagnostic facilities, the mortality rate was high early in the pandemic. CT thorax scan played a pivotal role in assessing the involvement of the lung. The CT thorax severity index assessed the extent of involvement of the lungs among patients with varying clinical severity of illness. Some patients had only mild illness, but a moderate CT score indicating early involvement of lungs. Such patients also progressed increasing clinical severity of illness. This highlights the importance of performing CT thorax scan at an early stage in the course of illness. This also shows that a mild to moderate amount of lung involvement which has occurred prior to clinical desaturation in the patient.

The results of this retrospective cross-sectional study demonstrate that the severity of COVID-19 illness is positively correlated with the CT thorax severity score (r2=0.071, p<0.05), indicating that patients with more severe illness have a higher CT thorax severity score. This finding is consistent with previous studies that have reported a positive correlation between CT severity score and disease severity in COVID-19 patients [5,6].

Interestingly, the average CT severity score within three days of illness was 8.6, which increased to 10.8 within 5 days. This finding suggests that CT thorax severity score may be a useful tool for predicting disease progression in COVID-19 patients. In addition, our study found that patients with mild illness had an average CT thorax severity score of 8.2 with a maximum score of 16. This finding highlights the importance of considering CT thorax severity score even in patients with mild illness.

Moreover, our study also found a negative correlation between the room air saturation and the CT thorax severity score (R2=0.200, p<0.05), indicating that patients with more severe disease had lower room air saturation. This finding is consistent with previous studies that have reported a negative correlation between room air saturation and disease severity in COVID-19 patients [7,8].

Overall, our study provides further evidence that the CT thorax severity score is a useful tool for predicting disease severity and progression in COVID-19 patients. However, it is important to consider the limitations of our study, including its retrospective nature and the relatively small sample size. Future studies with larger sample sizes and prospective designs are needed to confirm our findings.

CONCLUSION

CT thorax is an important investigation in assessing the severity of illness and correlates well with the clinical severity of the disease. It should be performed in cases with mild illness, since the average score is moderate and indicates the involvement of the lungs early in the course of illness.

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