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Original Research Paper

General Medicine

TO STUDY THE CORRELATION OF INFLAMMATORY MARKERS WITH CT CHEST FINDINGS IN COVID PATIENTS

Dr. R. Aswinth	Assistant Professor, Department of General Medicine, Rajah Muthiah Medical College and Hospital, Chidambaram, India, 608002.
Dr. Ravi Kiran Yatagiri*	Post Graduate, Department of General Medicine, Rajah Muthiah Medical College and Hospital, Chidambaram, India, 608002. *Corresponding Author
Prof. Dr. S. Sudharsan	Professor, Department of General Medicine, Rajah Muthiah Medical College and Hospital, Chidambaram, India, 608002.

ABSTRACT **Background:** To investigate the association of clinical profile and inflammatory markers with CT chest findings in COVID 19 positive patients. **Materials:** It is a Prospective study. This study is to be conducted in 100 RT PCR COVID 19 positive patients admitted in Covid wards/ ICU under department of Medicine, Rajah Muthiah Medical College and Hospital. Study period is November 2020 to April 2022. **Results:** The mean age of the study patients was 58.10 ± 14.49 years. The mean CRP of the study patients was 61.57 ± 49.33. There was significant strong positive correlation between CTSS and CRP, r= 0.787, P=0.001 <0.005. Hence when CRP was higher there was significantly higher CTSS and Vice-Versa. The mean ferritin D.Dimer was 584.68 ± 261.79 and 931.14 ± 461 respectively. There was a strong positive and significant correlation between ferritin with CTSSS, r = 0.869, P=0.001 <0.054. Therefore when ferritin was high there was correspondingly higher CTSS and Vice – Versa. Likewise there was significantly strong positive correlation between D.Dimer and CTSS, r=0.735, P=0.001 <0.05. Hence when D.Dimer was more, the corresponding CTSS was higher of Vice-versa. The mean IL6, TLC, Neutrophils and lymphocytes were 101.95±71.65, 15971.40 ± 4293.14 77.17 ± 6.96 and 14.56 ± 5.19 respectively. There was a strong positive correlation between IL6, TLC, neutrophils and lymphocytes with CTSS, P<0.05. Therefore when IL6, neutrophils and lymphocytes were higher there was correspondingly higher CTSS and Vice – Versa. The mean NL ratio was 6.12 ± 2.63 and there was significantly strong positive correlation between NL ratio and CTSS, r=0.798, P=0.001<0.05. **Conclusion:** This study results showed a strong positive correlation of CRP, D DIMER, Serum ferritin, NL Ratio, IL 6 values with CT chest findings.

KEYWORDS : CTSS (CT severity score), SARS CoV 2, CRP, D DIMER, Serum ferritin, NL Ratio, IL 6 values.

INTRODUCTION

SARS CoV 2 was found to be responsible in Wuhan, China in December 2019, in an outbreak of pneumonia. It was spreading by droplets and contact. Soon it spread to several countries. It mainly affects the lungs. Persons who have comorbidities are affected severely than who didn't have comorbidities. It was detected by RT PCR throat and nasopharyngeal swabs. Persons who acquired the disease were kept in isolation. Severity of disease is correlated mainly by CT chest findings. It also complications in long term like Myocardial Infarction, Cerebrovascular accidents and Thromboembolic diseases.

MATERIALS AND METHODS

It is a Prospective study. This study is to be conducted in 100 RT PCR COVID 19 positive patients admitted in Covid wards/ ICU under department of Medicine Rajah Muthiah Medical College and Hospital . Study period is November 2020 to April 2022.

Inclusion Criteria:

Age > 14yrs, RT PCR Positive Covid 19

Exclusion Criteria:

Age < 14yrs, RT PCR Negative Covid 19, Pregnancy

RESULTS

In the present work clinical profile of 100 Covid patients were studied. Further the correlation of inflammatory markers was analysed with reference to CT severity score. The statistics tools used were descriptive statistics such as mean, Standard deviation and class interval analysis.

The correlation of blood profile with CTSS was analysed by Pearson's correlation coefficient. The entire statistical analysis was carried out by the statistical packages of the social sciences (SPSS-21).

Table: 1 Age Of The Study Patients – Descriptive Statistics

Age (in years)	M	S.D
	58.10	14.49

M- Mean, S.D – Standard Deviation

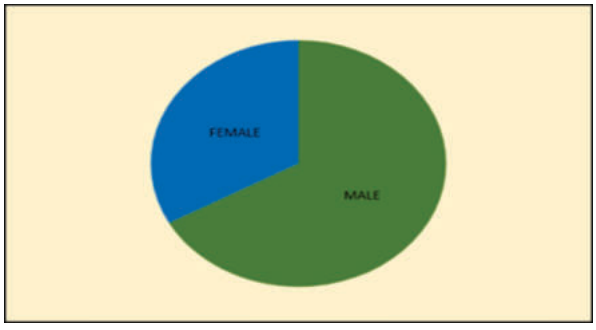
The mean age of the study patients was 58.10 ± 14.49 years.

Table: 2 Gender Distribution Of The Study Patients

Gender	%
Male	67
Female	33

%- Percentage

The majority of the study patients were male 67%. The proportions of Female patients were 33%.



Graph: 1 Gender distribution of the study patients

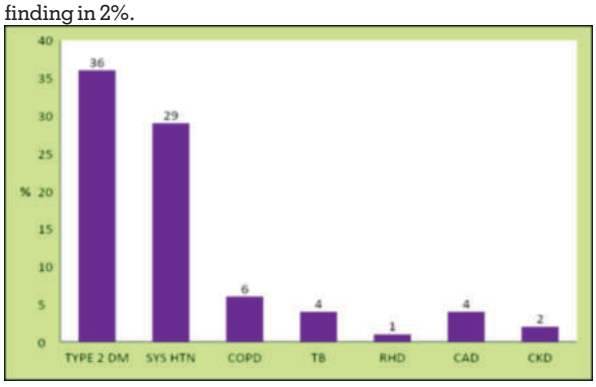
Table: 3 Co-morbid Status Of The Study Patients

Comorbid	%
Type 2 DM	36
Sys HTN	29
COPD	6

TB	4
RHD	1
CAD	4
CKD	2

%- Percentage

The diabetes was the common comorbidity (36%) followed by systemic hypertension (29%). COPD was noted in 6% and TB was observed in 41%. CAD was noted in 4% and CKD was the finding in 2%.



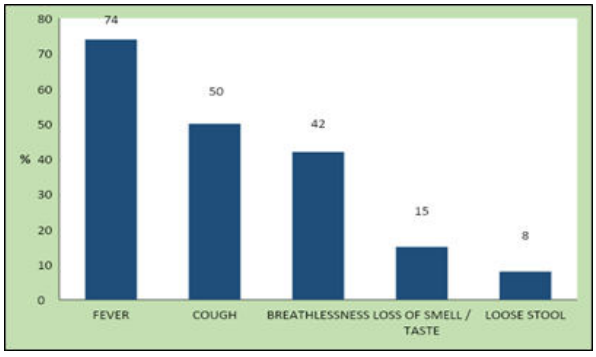
Graph: 2 Co-morbid Status Of The Study Patients

Table: 4 Clinical Presentation Of The Study Patients

Clinical presentation	%
Fever	74
Cough	50
Breathlessness	42
Loss of smell of taste	15
Lose stools	8

%- Percentage

The fever was the common presentation, 74% followed by cough (50%) and breathlessness (42%). Loss of smell or taste was observed in 8% of the study patients.

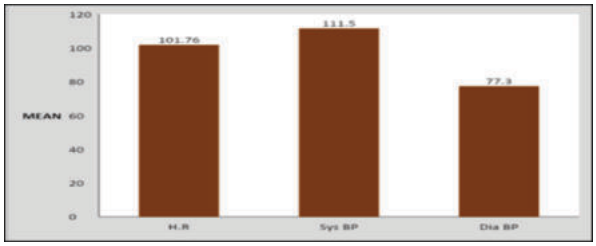


Graph: 3 Clinical Presentation Of The Study Patients

Table: 5 Vital Parameters Of The Study Patients

Vital Parameter	M	S.D
Heart rate	110.76	20.19
SBP	111.50	12.66
DBP	77.30	8.86

M- Mean, S.D – Standard Deviation

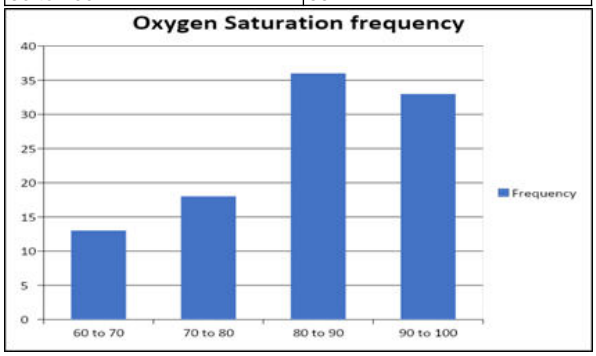


Graph: 4 Vital Parameters Of The Study Patients

The mean HR was 101.76 b/m ± 20.19 b/m. the mean SBP was 111.50 mmhg ± 12.66 mmhg and the mean DBP was 77.30 ± 8.86 mmhg.

Table: 6 Oxygen Saturation Of The Study Patients

Saturation	Frequency
60 to 70	13
70 to 80	18
80 to 90	36
90 to 100	33



Graph: 5 Oxygen Saturation Of The Study Patients

Table: 7 CTSS Of The Study Patients: Descriptive Analysis

CTSS	M	S.D
	11.99	6.79

M- Mean, S.D Standard Deviation

The mean CTSS was 11.9 ± 6.79.

Table: 8 Blood Analysis Of The Study Patients Distributive Statistics And Correlation Analysis CTSS Score

Blood Analysis	M	S.D	Correlation Analysis	
			R	p
CBG	270.97	113.31	0.409	0.001*
CRP	61.57	49.33	0.787	0.001*
Ferritin	584.68	261.79	0.869	0.001*
D-Dimer	931.14	461.11	0.735	0.001*
IL6	101.95	71.65	0.788	0.001*
TLC	15971.40	4293.14	0.749	0.001*
Neutrophils	77.17	6.96	0.699	0.001*
Lymphocytes	14.56	5.19	0.800	0.001*
NL Ratio	6.12	2.63	0.798	0.001*

M- Mean, S.D – Standard Deviation, r –Correlation coefficient, P- Probability, * - Significant

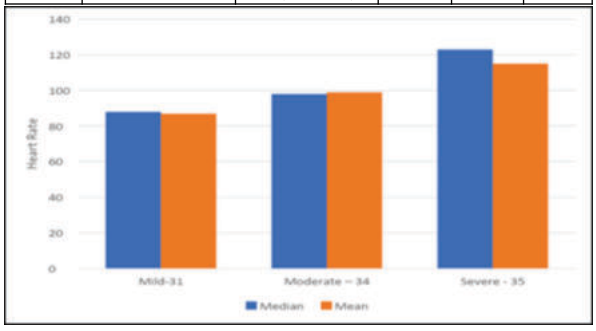
The patient with high CT severity score, diabetics, nondiabetics have high blood sugars. The mean CRP of the study patients was 61.57 ± 49.33. There was significant strong positive correlation between CTSS and CRP, r= 0.787, P=0.001 < 0.005. Hence, when CRP was higher there was significantly higher CTSS and Vice-Versa.

The mean ferritin D.Dimer was 584.68 ± 261.79 and 931.14 ± 461 respectively. There was a strong positive and significant correlation between ferritin with CTSSS, r = 0.869, P=0.001<0.054. Therefore when ferritin was high there was correspondingly higher CTSS and Vice – Versa. Likewise there was significantly strong positive correlation between D.Dimer and CTSS, r=0.735, P=0.001<0.05. hence when D.Dimer was more, the corresponding CTSS was higher of Vice-versa. The mean IL6, TLC, Neutrophils and lymphocytes were 101.95±71.65, 15971.40 ± 4293.14 77.17 ± 6.96 and 14.56 ± 5.19 respectively. There was a strong positive correlation between IL6, TLC, neutrophils and lymphocytes with CTSS, P<0.05. Therefore when IL6, neutrophils and lymphocytes were higher there was correspondingly higher CTSS and Vice – Versa. The mean NL ratio was 6.12 ± 2.63 and there was

significantly strong positive correlation between NL ratio and CTSS, r=0.798, P=0.001<0.05.

Table: 9 Correlation Of Heart Rate With CTSS

HR	N	Median	Mean	R	P
	Mild-31	88 (64-126)	87	0.639	0.001*
	Moderate – 34	98 (69-132)	99		
	Severe - 35	123 (78-152)	115		

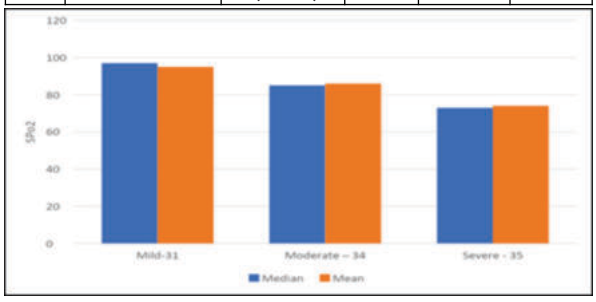


Graph: 6 Correlation Of Heart Rate With CTSS

There is statistically significant positive correlation between heart rate and CT severity score. Most of the patients are having tachycardia.

Table: 10 Correlation Of SPo2 With CTSS

SPo2	N	Median	Mean	R	P
	Mild-31	97 (90-99)	95	-0.8723	0.001*
	Moderate – 34	85 (76-98)	86		
	Severe – 35	73 (61-88)	74		

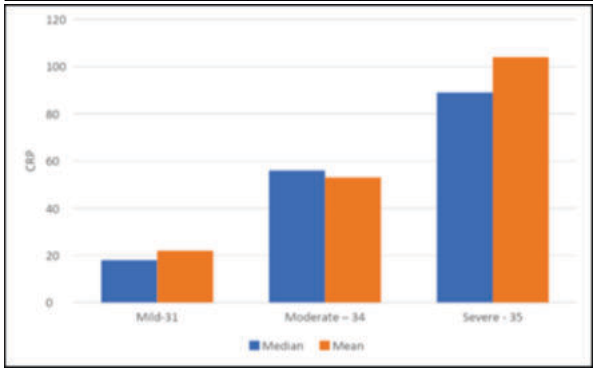


Graph: 7 Correlation of SPo2 with CTSS

There is statistically significant negative correlation between SPo2 and CT severity score.

Table: 11 Correlation Of CRP With CTSS

CRP	N	Median	Mean	R	P
	Mild-31	18 (5-68)	22	0.787	0.001*
	Moderate – 34	56 (24-89)	53		
	Severe – 35	89 (13-277)	104		

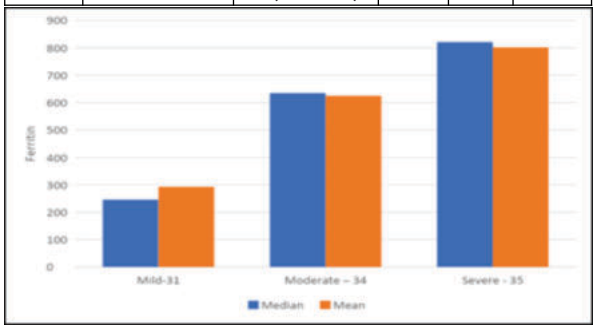


Graph: 8 Correlation of CRP with CTSS

There is statistically significant positive correlation between CRP with CTSS.

Table: 12 Correlation Of Ferritin With CTSS

Ferritin	N	Median	Mean	R	P
	Mild-31	246(31-588)	293	0.869	0.001*
	Moderate – 34	635(267-872)	625		
	Severe - 35	821(13-1167)	802		

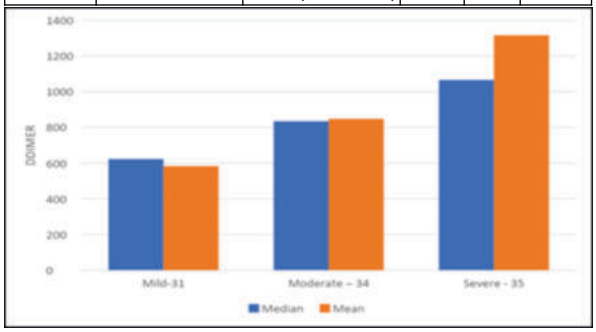


Graph: 9 Correlation of Ferritin with CTSS

There is statistically significant positive correlation between serum Ferritin with CTSS.

Table: 13 Correlation of DDIMER with CTSS

DDIMER	N	Median	Mean	R	P
	Mild-31	624 (142-884)	584	0.735	0.001*
	Moderate – 34	836 (624-1445)	849		
	Severe – 35	1067 (741-2700)	1318		

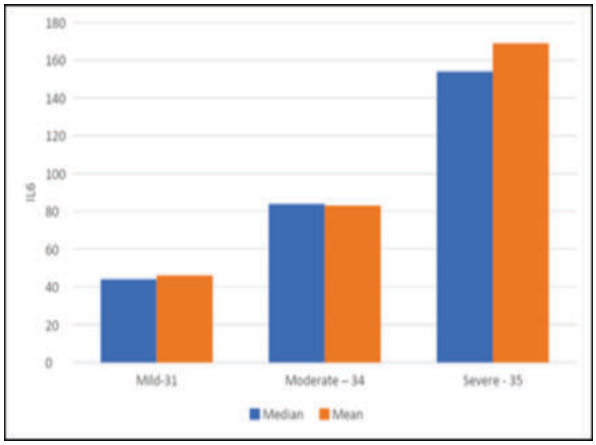


Graph: 10 Correlation of DDIMER with CTSS

There is statistically significant positive correlation between DDIMER with CTSS.

Table: 14 Correlation Of IL6 With CTSS

IL6	N	Median	Mean	R	P
	Mild-31	44 (10-88)	46	0.788	0.001*
	Moderate – 34	84 (43-140)	83		
	Severe – 35	154 (58-341)	169		

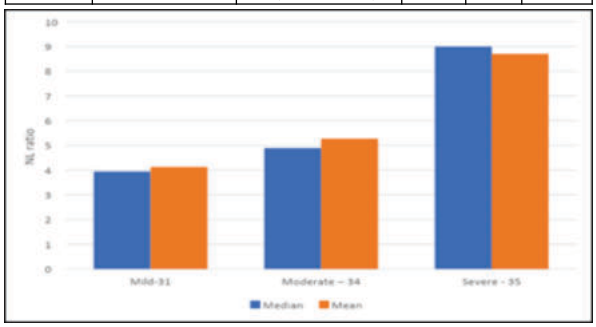


Graph: 11 Correlation of IL6 with CTSS

There is statistically significant positive correlation between IL6 with CTSS.

Table: 15 Correlation of NL ratio with CTSS

NL ratio	N	Median	Mean	R	P
	Mild-31	3.94 (2.26 – 8.4)	4.130	0.798	0.001*
	Moderate – 34	4.89 (3.60 – 9.33)	5.27		
	Severe - 35	9.0 (4.8 – 13.4)	8.70		



Graph: 12 Correlation of NL ratio with CTSS

There is statistically significant positive correlation between NL ratio with CTSS.

RESULTS

The mean age of the study patients was 58.10 ± 14.49 years. The majority of the study patients were male 67%. The male gender was statistically significantly correlated with moderate to severe CT chest findings. The common clinical presentation was fever (74%), cough (50%) and breathlessness (42%). The average CTSS was 11.99 ± 6.79. Patients with higher CTSS, diabetics and nondiabetics have high sugars. The mean CRP of the study patients was 61.57 ± 49.33. There was significant strong positive correlation between CTSS and CRP, r= 0.787, P=0.001 <0.005. Hence when CRP was higher there was significantly higher CTSS and Vice-Versa. The mean ferritin D.Dimer was 584.68 ± 261.79 and 931.14 ± 461 respectively. There was a strong positive and significant correlation between ferritin with CTSSS, r = 0.869, P=0.001<0.054. Therefore when ferritin was high there was correspondingly higher CTSS and Vice – Versa. Likewise there was significantly strong positive correlation between D.Dimer and CTSS, r=0.735, P=0.001<0.05. Hence, when D.Dimer was more, the corresponding CTSS was higher of Vice-versa. The mean IL6, TLC, Neutrophils and lymphocytes were 101.95±71.65, 15971.40 ± 4293.14 77.17 ± 6.96 and 14.56 ± 5.19 respectively. There was a strong positive correlation between IL6, TLC, neutrophils and lymphocytes with CTSS, P<0.05. Therefore when IL6, neutrophils and lymphocytes were higher there was correspondingly higher CTSS and Vice – Versa. The mean NL ratio was 6.12 ± 2.63 and there was significantly strong positive correlation between NL ratio and CTSS, r=0.798, P=0.001<0.05

DISCUSSION

Mean age of study patients was 58.10. Where as in a study conducted by Abd El Megid et al. was 41.9. Bhandari et al had noticed, most of the patients were men in 5th and 6th decade of age group. Their study results were found to be similar to our study.

The majority of patients were male (67%) and female patients were (33%). Male gender was statistically significantly correlated with moderate to severe chest CT severity scores. In the study conducted by Abd El Megid et al males were 66.2%, Females (33.8%).[1] Bhandari et al had noticed, most of the patients were men in 5th and 6th decade of age group. Their study results were found to be similar to our study.

In our study Diabetes is the most common comorbidity followed by Systemic Hypertension (29%), COPD noted in 6%, CAD noted in 4%, TB noted in 4%, CKD noted in 2%. In the study conducted by Nalini Kurri et al, HTN was the most common comorbidity (55%), followed by Diabetes Mellitus (52%).[2] In the study conducted by Bhandari et al Diabetes (56%) was the most common comorbidity followed by systemic hypertension (52%). Their study results were found to be similar to our study.

Fever (74%) was the most common presentation followed by cough (50%) and breathlessness (42%).

In our study most of the patients are having Tachycardia (Mean =110 bpm).

Patients having Oxygen saturation 90 % to 100% are 33 patients, between 80% to 90% are 36 patients, between 70% and 80% are 18 patients and between 60% and 70% are 13 patients. In our study there is statistically significant negative correlation between CT Severity scores and Oxygen Saturation levels. The Initial blood saturation measurements revealed that the mean blood oxygen saturation in mild CTSS cases was 95%, in moderate CTSS cases was 86% and in Severe CTSS cases was 74%. Hypoxic patients show high CTSS. In a study done by Abd et al the mean blood oxygen saturation was 95.6% among mild to moderate cases, 85.4% among sever cases according to CT severity score.[1] Their study shows a high statistically negative correlation between CT Severity score and oxygen saturation levels. Their study results were found to be similar to our study.

Our study shows a significant positive correlation between CRP levels and CT severity scores. Mean CRP value in mild CTSS Cases was 22, moderate CTSS was 53 and Severe CTSS cases was 104. There was statistically positive correlation between the levels of C Reactive protein and CT severity scores. In the study conducted by Abd et al, Mean CRP value was 24.7 in mild to moderate cases and 80.3 among severe cases. In the study conducted by Cosmin Citu et al, the results showed that CRP levels had a significant correlation with CT Findings for severity in COVID 19 patients. In the study conducted by Tan et al, correlation analysis showed that CRP was positively correlated with CT scores. In the study done by Gupta et al, their findings shows significant association of levels of CRP with severity of lung involvement. Their study results were found to be similar to our study. In the study done by Nalini Kurri, there was no correlation between CRP and disease severity.

In our study there was statistically significant correlation between levels of Serum Ferritin and CT Severity scores. Mean Ferritin levels in mild cases was 293, in moderate CTSS cases was 625 and in severe CTSS cases was 802. Patients having high levels of Serum Ferritin show high CTSS scores. In the study conducted by Abd et al, mean Ferritin levels was 551 among mild to moderate cases and 926.8 among severe cases. There was significant correlation between D DIMER levels and CT findings. In the study done by Gupta et al,[4] there was a strong and significant association of raised Ferritin with severity of lung involvement of disease. Their study results were found to be similar to our study. Where as in study conducted by Nalini Kurri,[2] they didn't find any correlation between Ferritin and disease severity.

In our study there was statistically significant correlation between levels of D DIMER and CT Severity scores. Mean D DIMER levels in mild cases was 584, in moderate CTSS cases was 849 and in severe CTSS cases was 1318. Patients having high levels of D DIMER show high CTSS scores. In the study conducted by Abd et al, mean Ferritin levels was 380 among mild to moderate cases and 1230 among severe cases. There was significant correlation between D DIMER levels and CT findings. In the study done by Gupta et al, there was a strong and significant association of raised D DIMER with severity of lung involvement of disease. In study conducted by Nalini Kurri, CTSS and D DIMER are found to be positively

associated with disease severity. In the study done by Gupta et al, their study shows a significant positive correlation of D DIMER with severity of lung involvement. Their study results were found to be similar to our study.

In our study there was statistically significant correlation between levels of IL 6 and severity of findings in CT CHEST. In the study conducted by Cosmin Citu et al, there results showed similar significant correlation of IL6 levels with CT severity findings. Liu et al showed that IL 6 was positively correlated with CT severity. Their study results were found to be similar to our study. In study done by Gupta et al, there was no significant association between levels of IL6 and severity of lung involvement.

In our study there was statistically significant relationship between NL RATIO and CT severity scores. In a study done by Cosmin Citu et al NL Ratio positively correlated with CT findings. Cross sectional study conducted by Man et al, NLR Correlates with severe CT findings. In the study done by Nalini Kurri et al, High NLR is significantly associated with disease severity. Their study results were found to be similar to our study.

In our study there was a high significant negative correlation between CTSS and Absolute Lymphocyte Count. Similar results are document by Abd et al in their study.

CONCLUSION

No of the study population is 100 patients who are Covid RT PCR positive. In this study 67% are males, 33% are females. Diabetes mellitus (36%) is the most common comorbidity in our study followed by systemic hypertension (29%). Fever (74%) is the most common presentation, followed by cough 50% and breathlessness (42%). Most of the patients are having tachycardia (mean=110bpm). Heart rate is showing significant positive correlation with CTSS. Spo2 is negatively correlated with CTSS hypoxic patients have significantly higher CT severity score according to our findings. CRP is showing significant positive correlation with CT severity scores. Patients with high CRP levels are having significantly higher CT severity score. Chest CT scan can help clinicians to develop management strategy and serve as a predictor of disease severity. In individuals with Covid-19 infection severity of a chest CT scan positively correlated to Inflammatory markers. High blood sugars are seen in high CT severity score diabetics and nondiabetics. Patients with high CT severity score showed low absolute lymphocyte ratio and high NLR ratio.

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