ISSN:0975-3583,0976-2833 VOL13, ISSUE01,2022

ORIGINAL RESEARCH ARTICLE

CROSS SECTIONAL STUDY AMONG COVID-19 POSITIVE HYPERTENSIVE OR DIABETIC AND NON-HYPERTENSIVE AND NON-DIABETIC PATIENTS IN TERTIARY HEALTHCARE SET UP IN NORTH MAHARASHTRA

[1]Dr. Suyash Pradip Gunjal, [2]Dr.Sushant H Bhadane, [3]Dr. Devendra V Kulkarni, [4]Dr. Amol Jagdale, [5]Dr MeenalMohgaonkar

[1]3rd year PG resident, Department of Radiology, SMBT Institute of Medical Sciences and Research Centre, Dhamangaon, Nashik, Maharashtra, India

[2]Professor & HOD, Department of Radiology, SMBT Institute of Medical Sciences and Research Centre, Dhamangaon, Nashik, Maharashtra, India

[3]Assistant Professor, Department of Radiology, SMBT Institute of Medical Sciences and Research Centre, Dhamangaon, Nashik, Maharashtra, India

[4,5]Professor, Department of Radiology, SMBT Institute of Medical Sciences and Research Centre, Dhamangaon, Nashik, Maharashtra, India

Corresponding Author:

Dr.Suyash Pradip Gunjal (suyashgunjal07@gmail.com)

Abstract

Background: Humanity has encountered many viruses that have threatened it at different times throughout history. The recent COVID-19 pandemic has affected all aspects of society. The rapid spread of the novel coronavirus has caused panic around the world since December 2019. High Resolution Computed Tomography (HRCT) chest played a major role in the triage and management of patients with confirmed or suspected COVID-19 pneumonia. Present study was conducted with an aim to compare HRCT severity scores among COVID-19 positive hypertensive or diabetic and non-hypertensive and non-diabetic patients.

Materials and Methods: Present cross-sectional study conducted in the department of Radiology. Total 304 patient's records included as per inclusion- exclusion criteria and after obtaining IEC permission. **Results:** DM-HTN co-morbid patients (72.94%) had more typical HRCT presentation than non-co-morbid patients (20.88%). HRCT score was predominantly severe type of DM-HTN co-morbidity patients than non-co-morbids. Statistically significant {F;3.47, P: 0.03}difference was observed among the mean severity score of Covid patients with diabetes (9.17 ± 4.74), Covid patients with hypertension (6.17 ± 4.80) and Covid patients without comorbidities (6.33 ± 5.30).

Conclusion: High Resolution Computed Tomography (HRCT) could be used to quickly and objectively to distinguish the severity of pulmonary involvement in with

ISSN:0975-3583,0976-2833 VOL13, ISSUE01,2022

and without comorbidities Covid-19 patients. Likelihoods of getting sever type of Covid-19 infection is more in diabetes than hypertensive and non-co-morbid patients.

Keywords: High resolution computed tomography (HRCT), Covid-19, diabetes, hypertension, comorbidities

Introduction

Humanity has encountered many viruses that have threatened it at different times throughout history[1].The recent COVID-19 pandemic has affected all aspects of society[2].The rapid spread of the novel coronavirus has caused panic around the world since December 2019[3].There are various research works being done presently all over the world for understanding the pathogenesis, clinical, biochemical, radiological manifestations of the disease, so that proper management can be achieved[4].Due to the disease's novelty, the criteria that influence the severity of the condition and mortality remain largely unclear[5].

Patients with underlying medical disorders, including high blood pressure or diabetes, are deemed at risk for developing severe coronavirus infection. Furthermore, such patients are considered more prone to developing subsequent complications, and their risk of dying from COVID-19 is high[6].CT has high accuracy for the diagnosis of COVID 19 by revealing the features of viral pneumonia and hence helpful in early diagnosis and proper patient management and follow-up[7].

However, CT manifestations in hypertensive and diabetics patients' suffering from Covid-19 have not been yet described in the literature comprehensively and understanding is still developing. With this background present conducted to ascertain and compare HRCT severity scores among covid-19 positive hypertensive or diabetic and non-hypertensive and non-diabetic patients in tertiary healthcare set up in north Maharashtra.

Materials and Methods

Institutional Ethics Committee (IEC) permission was sought before the commencement of study. Present Descriptive Cross-Sectional study was carried out in the Department of Radiology of tertiary care medical teaching hospital of Western Maharashtra. Hospital has a state-of art infrastructure to provide comprehensive health care services to rural and tribal people. The study was conducted over period of 06 months from the date of IEC approval. Secondary data was used for the analysis in present study. Total 321 patient's records were reviewed retrospectively. Incomplete and records of pregnant women's, known cases of lung diseases were excluded. Total 321 records were selected in the present study. All were covid-19 patients diagnosed by either Reverse Transcription Polymerase Chain Reaction (RT-PCR) or Rapid Antigen Test (RAT) test. High Resolution Computer Tomography (CHRCT) Chest was done on GE BRIVO CT 385-16 SLICE machine and the findings were re-evaluated using the Picture Archiving and Communication Systems (PACS) as and when required. Two associate professor of the department of radiology had reviewed HRCT images independently and the decision of confounding images was made by consensus. HRCT severity scoring[8] calculated using percentages of each five lobes involved. Scores of individually affected lobes were added to get the total score. Score was ranged from 0 (no involvement) to 25 (maximum involvement). Depending on lobar involvement,

ISSN:0975-3583,0976-2833 VOL13, ISSUE01,2022

severity was categorized as mild (0-7), moderate (08-15), and severe (16-25).[4] (Table 01)

Table 1: HRCT severity scoring

Sr. No	Percentages of involvement	Score	Severity	
1.	**Non-involvement**	**00**		
2.	< 05%	01	Mild	00 to 07
3.	05% to 25%	02		
4.	26 to 49%	03	Moderate	08 to 15
5.	50% to 75%	04		
6.	> 75%	05	Severe	16 to 25

According to RSNA experts consensus[9] the pattern of CT changes were categorized in to four types as follows.

1. **Typical:** Peripheral, bilateral (multilobar) GGO or multifocal GGO of rounded morphology, w/ or w/o consolidation, or visible intralobular lines (crazy paving).
- Reverse halo sign or other findings of organizing pneumonia.
2. **Indeterminate:** Absence of typical features and the presence of multifocal, diffuse, perihilar or unilateral GGO w/ or w/o consolidation and are non-rounded or non-peripheral.
- Few very small GGO with a non-rounded & non-peripheral distribution.
3. **Atypical:** Absence of typical or indeterminate features and presence of
- Isolated lobar or segmental distribution w/o GGO.
- Discrete small nodules (centrilobular, tree in bud).
- Lung cavitations.
- Smooth interlobular septal thickening, w/ pleural effusion.
4. **Negative:** No CT features to suggest pneumonia.

Data analysis

Data tools were checked for their completeness and data entry and coding was done in Microsoft Excel and statistical analysis was done by using SPSS version 21 (Statistical Package for Social Sciences) software. The raw data was compiled, classified and presented in a tabulated and graphical manner to bring out important details. Descriptive statistics viz. Mean, standard deviation and frequency, percentage were used for quantitative and qualitative data, respectively. Chi square test was used for categorical data to determine the association between variables. ANOVA was used to compare the average across three different groups.Tukey-Kramer Test was used to compare different pairs of means who were significantly different from each other. Level of significance ≤ 5% considered significant.

Results

In the present study, records of 304 Covid-19 positives patients admitted at a tertiary care teaching hospitals were reviewed retrospectively. Out of them, 33.6% (102) and 66.4% (202) were females and males respectively. Mean age of all patients was 48.31 ± 6.06 years. Age and gender distribution of the participants is shown in Table 01. The

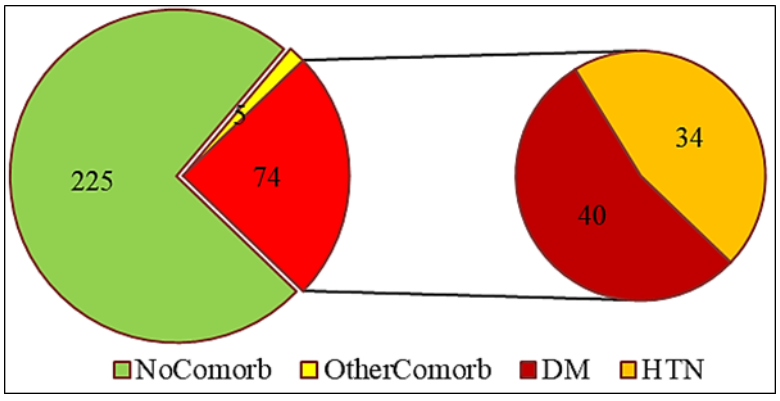
ISSN:0975-3583,0976-2833 VOL13, ISSUE01,2022

mean age of female and male patients was 48.72 ± 5.84 and 48.10 ± 6.18, respectively, and the mean age difference was found to non-statistically significant among genders (Mann Whitney U test, P: 0.36 NS).

Table 1: Age and Gender distribution of the participants (n=304)

Sr. No.	Age Groups	Gender		Total
		Female	Male	
1.	40 Yrs.	11	25	36
2.	41-45 Yrs.	24	63	87
3.	46-50 Yrs.	35	41	76
4.	51-55 Yrs.	17	47	64
5.	56-60 Yrs.	15	25	40
6.	≥ 61 Yrs.	00	01	01
7.	Total	102	202	304
Chi-Square ($\chi 2$) 9.04, df:05 P:0.10, NS				

With respect to preexisting comorbidities out of 304 patients, 13.2% (40) were known cases of diabetes, 11.2% (34) were hypertensive. The combined percentage of preexisting diabetes and hypertension (DM-HTN) comorbidities was found to be 24.34% (74). Other morbidities noted were chronic obstetrics pulmonary disease (COPD) (n-1), tuberculosis (n-1), chronic kidney disease (n-1), and ischemic heart disease (IHD) (n-2).(Graph 01).

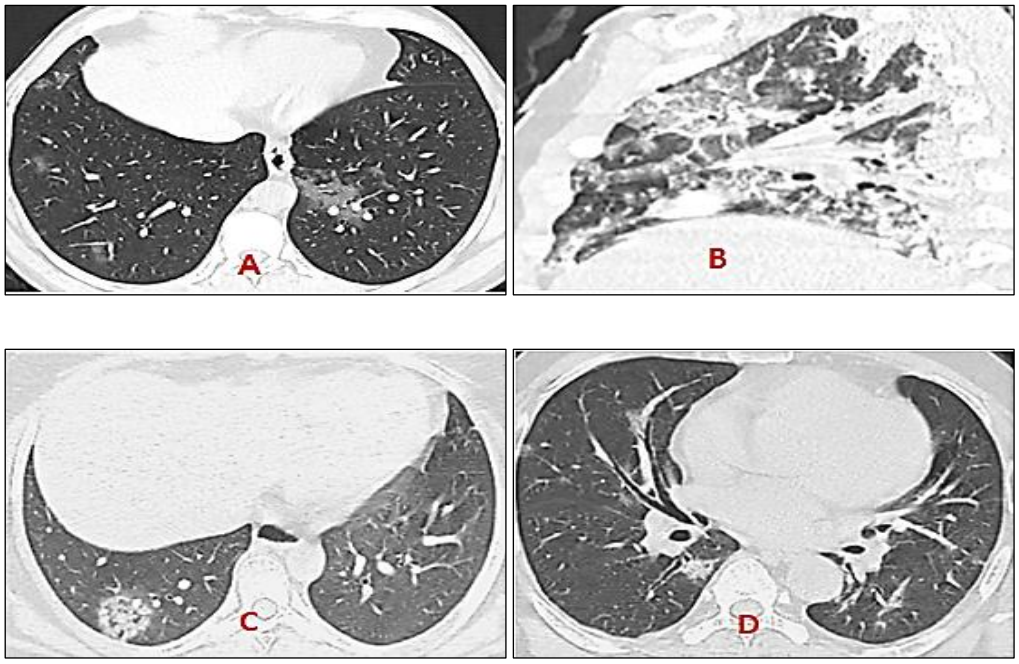


Graph 1: Distribution of Pre-existing diseases

Among patients with DM-HTN comorbidities 82.43% (61) were symptomatic while 44% (99) patients without comorbidities were symptomatic. Fever (n-107, 66.87%), cough (n-22, 13.75%), breathlessness (n-03, 1.87%)and mayalgia (n-28, 17%) were predominant complaints among symptomatic (160).Out of all patients, 20.72% (63)

ISSN:0975-3583,0976-2833 VOL13, ISSUE01,2022

were overweight, 72.69% (221) and 06.5% (20) were normal and underweight, respectively. In the present study, raised serum CRP level were seen 48.88% (110) patients with DM-HTN comorbidities and 14.86% (11) patients without comorbidities.
HRCT findings of the present study were categories in to four types. viz. typical, indeterminate, atypical, and negative. Typical pattern was more predominantly seen in patients with comorbidities than patients without co-morbidities. The HRCT findings are shown in table 02. Statistically significant difference was observed between the HRCT findings of patients with DM-HTN comorbidities and without comorbidities. (Table 02) Ground glass opacities (GGO), crazy pattern of GGO, traction bronchiectasis, vascular dilatation, round consolidation were the most common patterns noted on HRCT. Reverse Halo sign was also seen in a few cases. (Figure 01)



F Figure 01: HRCT lungs findings. Ground Glass Opacities (A), Crazy Paving (B), Round Consolidation (C) and Traction Brobchiectasis (D)

Table 2: Distribution of HRCT findings as per presence or absence of co-morbidities

Sr. No	HRCT pattern	Patients DM-HTN Co-morbidities	Patients without co-morbidities
1.	Typical	54 (72.97%)	47 (20.88%)
2.	Indeterminate	03 (04.54%)	19 (08.44%)
3.	Atypical	11 (14.86%)	42 (18.66%)
4.	Negative	06 (08.10%)	117 (52.0%)
5.	Total	74 (100%)	225 (100%)
Chi-square ($\chi 2$) 72.71 df:03 P:0.0001. S			

*Patients with other comorbidities (n-5) were excluded.

HRCT severity scoring was calculated by considering the percentage of the lobar involvement and classified as mild, moderate, and severe. (Table 03) Statistical significance association was observed between HRCT score severity and the presence

ISSN:0975-3583,0976-2833 VOL13, ISSUE01,2022

and absence of comorbidities.

Table 3: HRCT score severity in patients with and without co morbidity

Sr. No	Severity	Patients DM-HTN Co-morbidities	Patients without co-morbidities
1.	Mild	41 (55.40%)	199 (88.44%)
2.	Moderate	11 (14.86%)	17 (07.55%)
3.	Severe	22 (29.72%)	09 (04.0%)
4.	Total	74 (100%)	225 (100%)
Chi-square ($\chi 2$) 46.07 df:02 P:0.0001 S			

Mean HRCT severity score of diabetic patients was 9.17 ± 4.74, while it was 6.17 ± 4.80 for patients with hypertension. Severity score of patients without comorbidity was 6.33 ± 5.30. (Table 04)

Table 4: Mean HRCT severity score

HRCT Severity Score	Patients with DM (40)	Patients with HTN (34)	Patients without co morbidities(225)	ANOVA P
Mean ± SD	9.17 ± 4.74	6.17 ± 4.80	6.33 ± 5.30	0.005
Tukey-Kramer Multiple Comparison Test				
	Mean difference	**95% CI**	**P**	
DM vs HTN	3.002	0.15-5.84	<0.05 S	
DM vs NoMorb	2.84	0.74-4.97	< 0.01 S	
HTN vs NoMorb	-0.16	-2.40-2.08	> 0.05 Ns	

*Patients with other comorbidities (n-5) were excluded.

Discussion

In this study, different parameters were analyzed to ascertain the distinction between covid-19 positive hypertensive or diabetic and non-hypertensive and non-diabetic patients. Out of the total 304 patients, males and females were 66.4% (202) and 33.6% (102) respectively. Mean age of all patients was 48.31 ± 6.06 years while the mean age of male and females patients was 48.72 ± 5.84 years and 48.10 ± 6.18 years respectively. In the present study, age and gender wise differences were found to be not statistically significant. Study conducted by Bhandari S *etal*.[10] reported that among the confirmed cases, most of the patients were young adults in the fifth and sixth decade of age group with a mean age of 50.40 years. Bhandari S *etal*.[10]reported that more males suffered from covid-19 than females (59% male and 41% female). Das S *etal*.[4] also reported male (89% males vs 41% females) preponderance in her study.

In the present study, with respect to preexisting comorbidities out of 304 patients, 13.2% (40) were known cases of diabetes, 11.2% (34) were hypertensive. The combined percentage of preexisting diabetes and hypertension (DM-HTN) comorbidities was found to be 24.34% (74). Study was conducted by Rangankar V *etal*.[5]reported that out of 220 patients 18.6% (41) and 81.4% (179) were diabetic and

ISSN:0975-3583,0976-2833 VOL13, ISSUE01,2022

non-diabetic respectively. Das S *etal*.[4] reported that pre-existing comorbidity was found in 22.5% (n-129) patients which included diabetes mellitus (DM) (n-98), hypertension (HTN) (n-32) etc. In this study, she too reported that diabetes mellitus were the most common preexisting comorbidity followed by hypertension. Bhandari S *etal*.[10]reported similar findings. In his study, the most prevalent comorbidities were diabetes mellitus (56%) and hypertension (48.83%).

In our study, among patients with DM-HTN comorbidities 82.43 % (61) were symptomatic while 44% (99) patients without comorbidities were symptomatic. Fever (n-107, 66.87%), cough (n-22, 13.75%), breathlessness (n-03, 1.87%)and myalgia(n-28, 17%) were predominant complaints among symptomatic (160).In Bhandari S *et al*.[10]study 39 patients (48.75%) were symptomatic, among them fever (79.47%), cough (74.35%), shortness of breath (36%) and sore throat (17.94%) were the most common presenting clinical manifestations. Das S *etal*.[4]reported that 89% of patients with co-morbidity were symptomatic, while 48% of patients without co-morbidity were symptomatic and symptoms were found to be statistically associated with co-morbid patients.

In the present study, a statistically significant difference was observed between the HRCT findings of patients with DM-HTN co-morbidities and without comorbidities. In the present study patients with DM-HTN co-morbidities (72.94%) had more typical HRCT presentation than non-co-morbid patients (20.88%); on the other hand negative HRCT was seen more in patients with no-co morbidity. Similar findings were reported by Das S *etal*.[4]In our study, Covid-19 patients without co-morbidities found to have mild score than DM-HTN comorbid patients. Covid 19 patients with diabetes had a higher mean HRCT score than Covid-19 patients with hypertension and non-co-morbid patients and the difference was statistically significant. In Das S, *etal*. study, the typical CT pattern was seen to be predominately associated with comorbid patients. In Rangankar, *etal*.[5]study reported that patients with diabetes had more severe HRCT scores than non-diabetic.

Conclusions

The present study concluded that diabetic patients are at high risk of developing the severe form of COVID-19 with a higher CT lung involvement score than hypertensive and non-comorbid patients. High Resolution Computed Tomography (HRCT) could be used to quickly and objectively to distinguish the severity of pulmonary involvement in with and without comorbidities.

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