Original Research Article

An observational study to evaluate the correlation between CO-RADS grading and SPO_2 (oxygen saturation percentage) in patients undergoing chest computer tomography

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Abstract

Background:The CO-RADS grading is advocated to know the level suspicion of COVID-19 by looking at specific radiological features which are more specific for COVID-19. More the score ,more probability of having infected with COVID-19.Since this is primarily a respiratory disease measurement of SPO2 has become important parameter to monitor. But all patients with COVID -19 do not suffer with pulmonary parenchymal involvement. This study is aimed to evaluate any correlation exists between CORADS SCORING which is used for diagnosis in COVID-19 and SPO2 monitoring also used in COVID-19. **Aims**:This study will be conducted to determine whether a correlation exists between CO-RADS GRADES and Oxygen Saturation percentage SPO2. **Materials and methods**:In this Prospective Observational Study in 100 adult patients(age >18 yrs) who undergo CT scan. Adults (age >18 yrs) who are RT-PCR negative for COVID 19. symptoms, duration of symptoms, co-morbid conditions of patients undergoing chest CT scan to be recorded. SPO2noted along with CO-RADS grading. It will be Observational study of a sample size of 100 patients randomly selected chest CT scans obtained in a group of consecutive patients presenting to the emergency ward with suspected SARS-CoV-2 infection, in whom RT-PCR was performed. In these patients symptoms, duration of symptoms, co-morbid conditions of patients, SPO2noted along with CO-RADS grading. **Results**:Oxygen saturation is decreased with increase in age. It is less in subjects >60 years of age.Oxygen saturation in patients with CORAD-2(mean of 89% with range 65-99%) is significantly decreased when compared other groups. Oxygen saturation in patients with CORAD-4 mean of 91% with range 80-99% followed by Oxygen saturation in patients with CORAD-5 mean of 92% with range 76-98%, Oxygen saturation in patients with CORAD-3 mean of 93% with range 73-99% and Oxygen saturation in patients with CORAD-1 mean of 94% with range 81-99%. **Conclusion:**Reporting and Data System (CO-RADS) grading and Oxygen saturation percentage(SPO2) both does not correlate with each other .

Key words:CORADS Scoring,Computerized Tomography,Oxygen Saturation Percentage.

Introduction

CO-RADS classification became a standardized reporting system for patients with suspected COVID-19 infection developed for moderate to high prevalence setting. Because of high prevalence rate chest CT reporting is represented with CO-RADS grading with remarks on comorbidity and a differential diagnosis. The interpretation of the CT findings has to be combined with clinical symptoms and duration of symptoms[1]. The CT findings of COVID-19 show overlap with other diseases like; H1N1, Adeno virus, CMV, influenza and Acute interstitial pneumonitis.The diseases affecting lung parenchyma effect the oxygen

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saturation in the blood to some extent. Oxygen saturation is the fraction of oxygen saturated hemoglobin relative to total hemoglobin.The peripheral oxygen saturation is measured with the help of a device called the pulse oximeter.This is quickest measurement that can be obtained.A normal healthy person would have SPO_2 96-99% while breathing in room air. If a persons SPO_2 levels fall below 90%, they risk the development of hypoxemia. Persons suffering with lung parenchymal diseases like COPD may show SPO_2 of 90-92%. Many patients with lung disease with pulmonary involvement have known to show low oxygen saturations[2]. The correlation between CO-RADS grading and quick measurement of SPO_2 with pulse oximeter may facilitate to assess /confirm the severity of the lung disease. Thus also helps the clinician to start the treatment of the patient early.The objective of this study is to investigate the correlation between CO-RADS classification and oxygen saturation.

Materials and methods

In this Prospective Observational Study in 100 adult patients(age >18 yrs) who undergo CT scan who are RT-PCR negative for COVID-19 are observed. Chief complaints comorbidities should noted. Provisional Diagnosis is also noted. SPO_2 is measured with the help of finger pulseoximeter before CT scan is performed. CO-RADS grading is noted. All patients undergoing chest CT Scan in Osmania General Hospital in Radiology Department for a period of 2 months for months August 2020 and September 2020. Duration of symptoms, co-morbid conditions of patients undergoing chest CT scan to be recorded. Study was conducted to evaluate whether a correlation exists between CORADS Scoring and oxygen saturation percentage whether a high score means more severe the disease.

Inclusion Criteria: All adult (age >18 yrs) patients who undergo chest CT scan.

Exclusion criteria: All who are age<18 yrs.

Those patients who have contraindications for undergoing CT scan. Medical ethics committee approval was obtained prior to the study. Informed consent was waived, and data collection and storage were carried out in accordance with local guidelines. Study was done on Pulse oximeter & CT scan (Scenaria - HITACHI CT scanner 128 slice), CO-RADS classification.

Table 1: CORADS*Level of suspicion COVID-19 infection[3]

Grading	COVID suspect	CT findings
CO-RADS-1	No	Normal or non infectious abnormalities
CO-RADS-2	Low	Abnormalities consistent with infections other than COVID-19
CO-RADS-3	Indeterminate	Unclear whether OCVID-19 is present
CO-RADS-4	High	Abnormalities suspicious for COVID-19
CO-RADS-5	Very high	Typical COVID-19
CO-RADS-6	PCR+	

Patient characteristics (age, gender, comorbidities), clinical follow up, including a multidisciplinary clinical diagnosis, if applicable, and RT-PCR results were extracted from electronic patient records. During the study all the adult patients who undergo CT Scan oxygen saturation percentage is noted with the help of finger pulse oximeter. Chief symptoms, duration of symptoms and co-morbid conditions are noted along with provisional diagnosis.

Statistical Analysis: The experimental data were expressed as mean ± Standard deviation. The significance of the differences between treatments and respective controls was analyzed using the student's t-test using Microsoft excel.

Results

Total 100 patients were is included in study

Table 2: Patients characteristics in present study

Patient Characteristics	Number of Patients	Percentages
<30 years	22	22
31-40 years	17	17
41-50 years	29	29
51-60 years	14	14
>61 years	18	18
Gender	**100**	**100**
Males	55	55
Females	45	45
Symptoms		
SOB	53	53
Cough	35	35
Fever	18	18
Chest Pain	4	4
Comorbidities		
HTN	26	26
DM	18	18
CKD	4	4
COPD	2	2
TB	2	2

Patient baseline characteristics of the 100 patients included as most common age group included is 41-50 years men Shortness of breath is the most common finding . Hypertension is most common comorbidty associated with patients.

Table 3: Oxygen saturation in present study in accordance with age and gender

Age	Mean SPO2 in percentages	Range of SPO2 in percentages
<30 years	99	96-100
31-40 years	98	96-99
41-50 years	98	95-99
51-60 years	97	95-99
>61 years	95	91-97
Gender		
Males	97	93-100
Females	98	91-100

Oxygen saturation is decreased with increase in age. It is less in subjects >60 years of age

Table 4: Trend of oxygen saturation in correlation with CORADS

	CORADS-1	CORADS-2	CORADS-3	CORADS-4	CORADS-5
Number of Subjects	20	22	21	17	22
Mean	94	89	93	91	92
Minimum	81	65	73	80	76
Maximum	99	99	99	99	98

Oxygen saturation in patients with CORAD-2(mean of 89% with range 65-99%) is significantly decreased when compared other groups.Oxygen saturation in patients with CORAD-4 mean of 91% with range 80-99%followed by Oxygen saturation in patients with CORAD-5 mean of 92% with range 76-98%, Oxygen saturation in patients with CORAD-3 mean of 93% with range 73-99% and Oxygen saturation in patients with CORAD-1 mean of 94% with range 81-99%

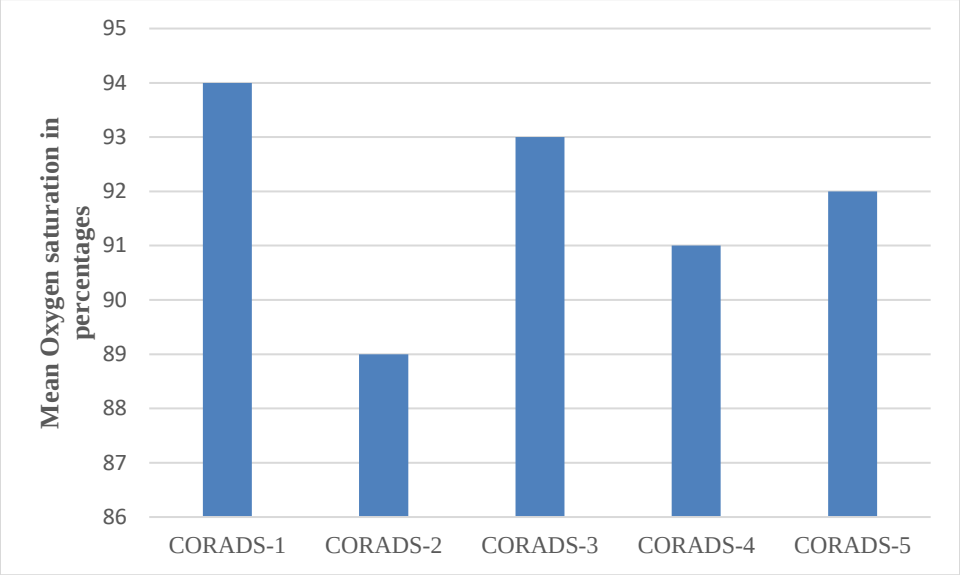

Fig 1:Mean distribution of oxygen saturation in CORAD groups.

Mean oxygen saturation of CORAD-2 is less compared to others CORAD , there is no significant correlation between CORADs and oxygen saturation .

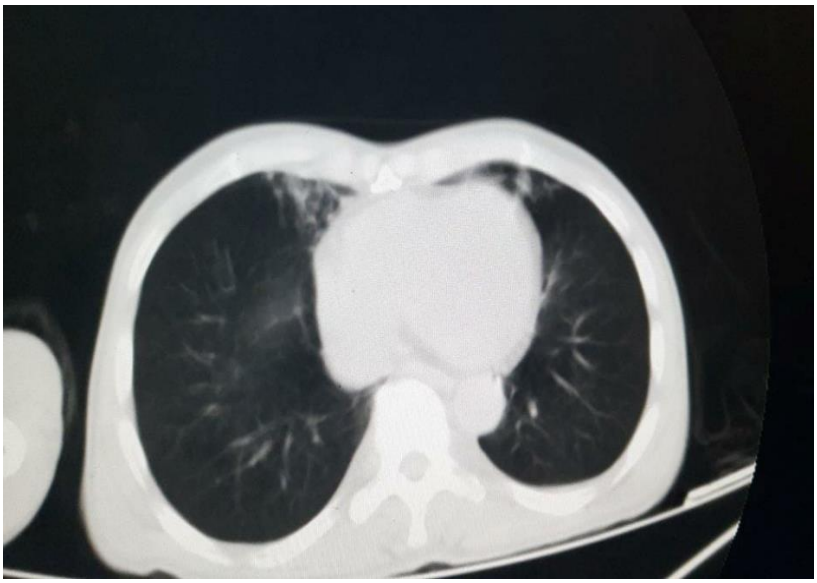

Fig 2:Small peripheral unifocal opacity in peripheral field S/O CORAD-3

Discussion

In this specific period of COVID-19 pandemic and under the current clinical situation, patients with an abnormal chest CT examination(CORADS-5) should be quarantined, and the patient's epidemiological history should be investigated. Some patients with COPD and other conditions are vulnerable to repeated episodes of hypercapnic respiratory failure. In these cases it is recommended that treatment should be based

on the results of previous blood gas estimations during acute exacerbations because hypercapnic respiratory failure can occur even if the saturation is below 88%. Any other evidence from the patient's medical condition that would indicate that blood gas results would be useful in the patient's management. Here we studiedfora period of 2 months and observed whether correlation exists between COVID-19 Reporting and Data System(CO-RADS) grading and Oxygen saturation percentage(SPO_2) in 100 patients undergoing Chest CT for various indications. Thiswill facilitate to assess /confirm the severity of lung disease[4,5]. Oxygen saturation is decreased with increase in age. It is less in subjects >60 years of age. The mean SPO_2 may be lower in older people than in young adults. However, it is difficult to dissociate the effects of advancing age from the effects of the diseases that become commoner in old age. Some papers have reported a fall in the blood SPO_2 in older subjects but others have failed to confirm this observation.13–15 The mean SaO_2 in seated adults aged .64 years in one published study was 95.5% compared with 96.9% in adults aged 18–24 years, and the standard deviation was wider in the older age group with a 2SD range of 92.7–98.3%. The mean (SD) SaO_2 for recumbent healthy men aged >70 years in another study was 95.3 (1.4)% giving a 2SD range of 92.5–98.1% for men of this age. The mean (SD) SaO_2 was 94.8 (1.7)% for recumbent healthy women aged >70 years with a 2SD range of 91.5–98.2%. The authors of this study did not observe any age related decline in SaO_2 beyond the age of 70 years. The mean SaO_2 in this study of approximately 95.0% for recumbent healthy men and women aged >70 years was below the normal range for seated healthy young adults[6-9]. Mean oxygen saturation of CORAD -2 is less compared to others CORAD , there is no significant correlation between CORADs and oxygen saturation. As they are no studies to compare these parameters. Ali Sabri et al concluded hospital mortality was higher in patients with lower O_2 saturation on admission involved with a diffuse parenchymal pattern. By multivariable analysis, in-hospital mortality was higher in patients with O_2 saturation below 88% on admission and a higher number of lung lobes involved with diffuse parenchymal pattern.The oxygen saturation of the systemic arterial blood is associated with the adequacy of respiration, and can be measured non-invasively by pulse oximetry in the systemic tissue. The oxygen saturation of the blood in the pulmonary artery, the mixed venous blood, reflects the balance between oxygen supply to the systemic tissues and their oxygen demand. Noncommunicable respiratory diseases as well as non-COVID infections including TB continue to exist even though the COVID-19 infection heavily dominates the news media and medical press. While we must not let our guard down in any way against the coronavirus, we need to continue to use our resources against other diseases. One hopes that effective strategies to handle these problems are developed along with the measures to control the pandemic and limit its damage[10].

Conclusion

It is concluded that there is no significant correlation between CORADS scoring and Oxygen Saturation Percentage. So one need not asses the condition of patient based CORADS scoring alone. Patients with low oxygen saturations and hypoxemia needs medical attention should be reconsidered with other parameters depending on patients lung condition.

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