



CLINICO RADIOLOGICAL CORRELATION IN COVID-19 PATIENTS.

Pulmonary Medicine

Dr. Bhanu Rekha Bokam

Professor And Hod Department Of Respiratory Medicine.

Dr. Sireesha Puvvadi*

Assistant Professor, Department Of Respiratory Medicine. *Corresponding Author

Dr . K.charan Lakshmi

Post Graduate, Department Of Respiratory Medicine.

ABSTRACT

INTRODUCTION: Coronavirus disease 2019 (COVID-19) is a pandemic infectious disease caused by a novel coronavirus, known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). SARS-CoV-2 genome is similar to that of SARS and Middle East respiratory syndrome. Infection by COVID-19 can result in a range of clinical outcomes, from asymptomatic to severe life-threatening course or death. Most of the affected patients present with high temperature and dry cough¹

Chest radiograph (CXR) played a role in determining the course and the severity of disease during the 2002 severe acute respiratory syndrome (SARS) and the 2012 Middle East respiratory syndrome (MERS) outbreaks²

The diagnostic armamentarium of COVID-19 is inclusive of travel history, history of exposure, clinical features, and reverse transcriptase-polymerase chain reaction (RT-PCR) assay from specimens obtained by oropharyngeal or nasopharyngeal swab, assisted with digital Chest radiograph (CXR)³

AIMS & OBJECTIVES:

1. To Study clinical correlation to chest x ray in covid 19 patients.

2. To Study clinical correlation to outcome in covid 19 patients.

METHODS & MATERIALS: This is a prospective study which included 507 patients with laboratory-confirmed COVID-19 admitted in tertiary care hospital from May 2020 to Nov 2020. The patients were examined clinically, were assessed for signs & symptoms and severity of pneumonia. All patients underwent a digital CXR examination.

RESULTS: Out of 507 patients studied, 58.6% were males, 41.4% were females. Most of the affected patients are between 41-60 yrs of age group. Death percentage is more in critical group compared to noncritical group. Our observational study shows significant correlation between clinical features, CXR and outcome in covid 19 patients.

KEYWORDS

Covid-19, CXR, Clinical Correlation.

INTRODUCTION:

Since November 2019, the rapid outbreak of coronavirus disease 2019 (COVID-19), which arose from severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, has become a public health emergency of international concern⁴.

Characterization of epidemiological, clinical, co morbid features with recovery and mortality of COVID-19 is crucial for development and implementation of effective control strategies and management protocol. Current estimates are that the incubation period is generally 3 to 7 days, and up to 14 days⁵.

The SARS-CoV-2 is highly homologous to SARS-CoV and may cause severe illness⁶.

Symptoms resulting from COVID-19 infection in the prodromal phase includes fever, dry cough, and malaise, which are nonspecific. Some patients may not even have any obvious symptoms⁷.

The clinical and imaging manifestations in the early stage of COVID-19 are particularly important. They can be used to confirm the diagnosis, adjust the treatment plan, and infer the prognosis.

The aim of this endeavor was to study the clinico radiological course in reverse transcriptase polymerase chain reaction (RT-PCR) positive patients in order to understand the clinical course, CXR findings and the final outcome.

MATERIALS & METHODS:

This is a prospective observational study.

Study subjects are the patients admitted in hospital with laboratory-confirmed RT-PCR for COVID-19.

After obtaining detailed history patients are subjected to lab investigations.

All patients underwent digital CXR examination.

Inclusion Criteria:

The lab confirmed cases of COVID-19 Patients.

Exclusion Criteria

Non covid patients, Age < 18 yrs.

Informed consent from the subjects or their legal relatives was taken, Institutional ethical committee clearance was taken.

After obtaining detailed history and clinical examination patients were subjected to CXR.

All patients had a CXR using digital portable posterioranterior, anteroposterior technique as per hospital protocol.

Radiographic features were described according to Fleischner Society glossary of terms including ground glass opacity (GGO) and consolidation.

Chest x-ray (CXR) was done and graded according to RALE (Radiographic Assessment of Lung Edema). Each lung was assessed individually based on consolidation/groundglass opacities and was given 0-4 points. 0 – no involvement; 1 - <25%; 2- 25-50%; 3- 50-75%; 4 - >75%. Overall score is sum of points from both lungs. We have divided our study population into two groups; that patients with <=4 points and patients with >4 points on CXR.

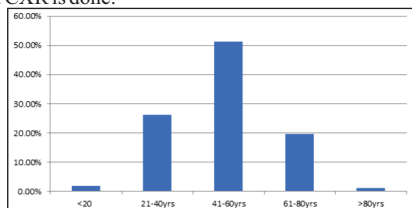
The clinical severity outcomes of COVID-19 patients were classified, based on National Health Commission and U.S. Center for Disease Control and Prevention (CDC) Clinical Guidance for Management of Patients with Confirmed Coronavirus Disease as detailed into *critical status*, if the patient developed severe or critically severe symptoms during hospital course, and *non-critical status*, if the patient was discharged after improvement or resolution of symptoms

Clinical outcome according to severity

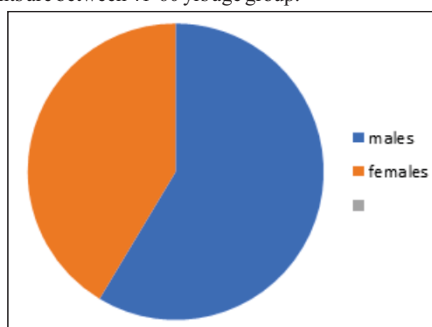
Category	Severity	Criteria
Non-critical	Mild	low grade fever, no other respiratory symptoms.
	Moderate	Mild symptoms with dyspnea, high grade fever, underlying respiratory or other chronic diseases
Critical	Severe	Respiratory distress with RR > 30 times/min, oxygen saturation at rest <93%.
	Critically severe	Respiratory failure needing mechanical ventilation, or needing ICU intensive care.

RESULTS :

Data was pooled from 507 covid-19 patients who were admitted in Dr.Psims & RF between May 2020 to November 2020. Of these 507 patients 424 patients were considered under non critical group, 83 patients were under critical group. All the patients underwent CXR and scoring of CXR is done.

**Table-1 Age distribution**

Out of 507 covid-19 patients studied, < 5% patients were below 20 years of age, 26% of patients are between 21-40 years, 53.2% are between 41-60 years, < 20 % patients are between 61-80 years age group and 3% in > 80 years age group of patients. In our study most of the patients are between 41-60 yrs age group.

**Figure-1 Gender distribution**

Out of 507 patients in the study group, 297 patients (58.6%) were males and 210 patients (41.4%) were females. Males constituted majority of the study population (58.6%).

Correlation of gender to outcome**Table-2 Correlation of gender to outcome**

			OUTCOME		TOTAL
			RECOVERY	DEATH	
SEX	MALE	COUNT	261	36	297
		%	57.9	64.3	58.6
	FEMALE	COUNT	190	20	210
		%	42.1	35.7	41.4
TOTAL		COUNT	451	56	507
		%	100.0%	100.0%	100.0%

Gender to outcome correlation showed that both recovery and death rate were more in males compared to females. 451 patients out of 507 were recovered and discharged from the hospital.

Clinical correlation to CXR**Table-3 clinical correlation to CXR**

		GROUP		TOTAL	P-VALUE
		NONCRITICAL	CRITICAL		
CXR	< 4	Count	337	43	0.001
		%	79.5 %	51.8%	
	>4	Count	87	40	
		%	20.5%	48.2%	

In non critical group, out of 424 patients, 337 patients (79.5%) had CXR <4 and 87 patients (20.5%) comes under CXR >4.

Out of total 83 patients in critical group 43 patients (51.8%) had CXR < 4 and 40 patients (48.2%) shows CXR > 4.

We noticed a significant clinical correlation to CXR findings.

Clinical correlation to outcome**Table-4 clinical correlation to outcome**

			GROUP		TOTAL	P-VALUE
			NONCRITICAL	CRITICAL		
OUTCOME	RECOVERY	Count	395	56	451	0.003
		%	93.4%	66.7%	89.0%	
	DEATH	Count	28	28	56	
		%	6.6%	33.3%	11.0%	
TOTAL			423	84	507	
		100.0%	%	100.0%		

Clinical correlation to outcome showed 395 patients (93.4%) in non critical group recovered completely, whereas 28 patients (6.6%) had mortality.

Out of 83 patients in critical group, 56 patients (66.7%) recovered and 28 patients (33.3%) become dead.

Mortality is more in critical group compared to noncritical group which shows significant correlation

DISCUSSION:

The present study was conducted in Department of Pulmonary Medicine, PSIMS, Gannavaram from May 2020 to November 2020 after obtaining permission from institutional ethics committee and consent from the patients.

Here an attempt was made to outline the distribution of age, gender, clinical features at presentation, co morbidity of patients, chest x ray (cxr) findings in COVID-19 patients, and their correlation with symptomatology.

Professional organizations such as American College of Radiology classified the role of CT chest as "usually not appropriate" for acute respiratory illness. Hence recommends the CT should be used sparingly.

In our study we comprehensively evaluated the value of CXR findings as adjunct to help clinicians make decisions in confirmed covid 19 patients.

Out of 507 covid-19 patients studied, < 5% patients were below 20 years of age, 26% of patients are between 21-40 years, 53.2% are between 41-60 years, < 20 % patients are between 61-80 years age group and 3% in > 80 years age group of patients. In our study most of the patients are between 41-60 yrs age group.

Similar study done by C. A. Musat, M. Hadzhiivanov..., shows mean age was 72.9 years⁸. Sudhir Bhandari, Ajeet Singh et al., studied Fifty-two patients of which most of the patients (79%) were above 50 years of age with a mean age of patients was 56.5 years.

Males constituted majority of the study population (58.6%). Out of 507 patients, 297 patients (58.6%) were males and 210 patients (41.4%) were females. Manoj saluja, Drishya pillai et al studied 406 patients, most of the patients were between 21-50 yrs of age with male predominance¹⁴.

C. A. Musat, M. Hadzhiivanov et al ..., shows 54.5 % were males and 45.5% were females. similar to our study this also shows male predominance⁸. Ajeet Singh, Bhandari Sudhir shows 42 were men and 10 were women. Men constituted 78% of the sample population¹⁰.

In our study regarding correlation of gender to outcome 451 patients out of 507 were recovered and discharged from hospital. Present study shows recovery and death rate were more in males compared to females. This could be due to male predominance in the study population. The overall mortality in our study was 56 out of 507 patients.

Similar to our study Musat C., shows overall mortality rate for the COVID-19 positive patients during the hospital admission was (58/255)⁸.

CXR is a cost-effective and readily available essential investigation tool to evaluate lung changes following COVID-19 pneumonia. In non critical group, out of 424 patients , 337 patients (79.5%) had CXR <4 and 87 patients(20.5%) comes under CXR >4. Out of total 83 patients in critical group 43 patients(51.8%) had CXR < 4 and 40 patients(48.2%) shows CXR > 4. We noticed a significant clinical correlation to CXR findings .

Study done by Ajeet Singh, Bhandari Sudhir out of 52 patients,29 patients (55.77%) on CXR had classic COVID-19 pneumonia findings of bilateral, multiple, peripheral, and lower zone predominant GGOs , 38.46% patients had indeterminate findings of discrete lobar pneumonia and hilar enlargement, and 5.77% had non-COVID CXR findings had found a positive correlation between the symptoms and radiological scoring system¹⁰.

Manoj saluja ,Drishya pillai studied 406 patients ,out of which 162 patients were symptomatic and 244 were asymptomatic .336 patients had abnormal X-Rays of which 141 were symptomatic implying that less than 50% of patients with imaging abnormality had any clinical presentation¹⁴.In contrast to our study, their study patients were brought in by the rapid response team, majority of whom were asymptomatic. In our study majority of the patients included were symptomatic and our study shows positive correlation between symptoms and radiological scoring.

In our study , 395 patients (93.4%) in non critical group recovered completely, whereas 28 patients (6.6%) had mortality. Out of 83 patients in critical group ,56 patients (66.7%) recovered and 28 patients (33.3%) died. In this study, mortality is more in critical group compared to noncritical group which shows significant correlation. Recovery rate in our study is more compared to other studies (89%).

Similar to our study, Antonio et al. showed that the number of opacified lung zones in SARS patients was a predictive prognostic indicator of mortality with two thirds of those patients who died had involvement of 4 or more zones¹¹.

Toussie et al. described the predictive value of initial CXR on admission and concluded that involvement of ≥ 3 zones in COVID-19 patients is associated with worse outcomes, however this study targeted younger adults aged 21–50 years old

CONCLUSION:

In conclusion, COVID-19 is a spectrum of disease ranging from mild to critical and we found a significant correlation between clinical and radiological features .

The results of our study could help pulmonologists in identifying the high risk patients, allowing for timely initiation of treatments currently available against SARS-CoV-2 infection.

Hence, in areas where CXR cannot be done ,clinical assessment can play a role in assessment of severity and prognosis of COVID19 pneumonia.

Limitations :

This was a single centred study ,limits generalizability to other population.

We only included hospitalized patients for their clinical and CXR correlation .

HRCT chest was not done in our study.

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