VOLUME - 9, ISSUE - 11, November - 2020 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper | Radiodiagnosis

CHEST X-RAYS FINDINGS IN COVID-19 PATIENTS AT A TERTIARY CARE HOSPITAL - A DESCRIPTIVE STUDY

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ABSTRACT

Objective: To describe chest X-Ray findings in COVID-19 positive patients, presenting to the department of radio-diagnosis, DVVPF'S Medical college & Hospital, Ahmednagar; based on Chest X ray classification of British Society of Thoracic imaging (BSTI).

Methods: In this study, all RT-PCR positive COVID-19 patients presenting to the Department of Radio-diagnosis, DVVPF'S Medical college & Hospital, Ahmednagar for CXR were included. Mean-age of the cohort was calculated with age range. Presenting complaints & co-morbidities were analyzed & tabulated in the form of percentages & frequencies. Portable CXR findings were classified according to BSTI classification & documented in percentages & frequencies.

Results: Mean age of the patients was 46 years. Presenting complaints were Fever 36 (60%) ,Cough 40 (67%), Sore throat 12 (20%), loss of sense of smell & taste 8 (13%), shortness of breath 22 (37%). Main co-morbidity was hypertension 12 (20%). 4 (7%) patients had normal and 14 (23%) had classical COVID CXRs . 42 (70%) patients were in indeterminate group with only 2 (3%) having unilateral lung disease. 6 (10%) patients had diffuse lung involvement and 36 (60%) had peripheral lung involvement. Majority of patients 38 (63%), had bilateral middle and lower zonal involvement.

Conclusions: In this study, COVID-19 CXRs manifested a spectrum ranging from pure ground glass opacificaties, mixed ground glass opacities to consolidation in bilateral peripheral, middle and lower lung zones. BSTI CXR reporting classification of COVID-19 is valid in our patients with addition of middle zonal involvement in classical COVID-19 criteria as opposed to just lower zone involvement.

KEYWORDS : Corona virus, COVID-19 patients, Chest X-rays (CXR), British Society of thoracic Imaging classification (BSTI).

INTRODUCTION

COVID-19 (Coronavirus disease 2019) is an infectious disease caused by SARS-CoV-2, a strain of corona virus, and is currently a WHO declared pandemic. The first cases were seen in Wuhan, China, in December 2019 before spreading globally, with more than 1 million deaths and 34 million cases now confirmed [1].

The definitive test for SARS-CoV-2 is the real-time reverse transcriptase-polymerase chain reaction (RT-PCR) test. It is believed to be highly specific, but with sensitivity reported as low as 60-70% [2] and as high as 95-97% [3]. Current best practice advises that CT chest is not used to diagnose COVID-19, but maybe helpful in assessing for complications. Although less sensitive than chest CT, chest radiography (CXR) is typically the first-line imaging modality used for patients with suspected COVID-19 [4]. For ease of decontamination, use of portable radiography units is preferred [5]. British Society of Thoracic Imaging (BSTI) has classified CXRs findings, based on European patients[6]. However our local population is different both in habitat and disease patterns, it was therefore thought to analyze patterns of CXR findings in COVID 19 positive patients in our setup.

The purpose of this study was to analyze CXR findings in our patients based on British Society of Thoracic Imaging (BSTI) classification and to evaluate disease pattern in terms of any deviation or similarity. Another point is that X-ray facilities are available in basic health units and this study will enhance our clinicians understanding of CXR findings in suspected COVID 19 patients.

METHODS

This is a retrospective descriptive study conducted at DVVP'S Medical college & Hospital, Ahmednagar. All RT-PCR COVID-19 positive patients which presented to Radio-diagnosis department, DVVPF Hospital for CXR from 01/09/2020 to 30/09/2020 were included. Chest X-rays of all COVID-19 confirmed patients from 01/09/2020 to 30/09/2020 were included in this study, irrespective of age or gender and were classified according to BSTI classification.

Data Analysis and results: Quantitative variables like age are presented as mean along with age range. Qualitative variables like gender and co morbidities were presented as frequencies and percentages. Outcome variable, portable CXR findings were presented as frequency and percentages.

RESULTS

Sixty COVID 19 positive cases had reported during the specified time, all were included in the study. Mean age of the patients was 46 with age range 8- 84 years. 4 patients were of 8 years of age. There were 48 (80%) males and 12 (20%) females. Male predilection of this disease is noted down in this study. 20 (33%) patients had history of travel. History of contact was positive in only 10 (17%) patients. Cough was the predominant presenting complaint in 40 (67% patients, followed by fever in 36 (60%), Shortness of breath 22 (37%), sore throat 12 (20%), loss of sense of smell and taste 8 (13%) and GIT complaints in 6 (10%) patients. In 26 (43%) patients there were no co-morbidities. 12 (20%) patients had ischemic heart disease and hypertension, 6 (10%) patients had diabetes, 4 (7%) patients were smokers, and 12(18%) patients had other diseases tabulated in **Table-I.**

Table-I.

Sr No.			Findings
1.	Age	Mean Range	46 Years 8-84 Years
2.	Gender	Male Female	48 (80%) 12 (20%)
3.	H/O Travel		20 (33%)
4.	H/O Contact		10 (17%)

5.	Symptoms	Cough	40 (67%)
		Fever	36 (60%)
		Shortness of breath	22 (37%)
		Sore throat	12 (20%)
		Loss of taste & smell	08 (13%)
		GIT symptoms	06 (10%)
6.	Co-morbidities	No co-morbidities	26 (43%)
		IHD & Hypertension	12 (20%)
		Diabetes Mellitus	06 (10%)
		Smoker	04 (7%)
		Renal Diseases	02 (3%)
		Stroke	02 (3%)
		Tuberculosis	02 (3%)
		Asthma	02 (3%)
		Arthritis	02 (3%)
		Malignancies	02 (3%)

Chest X-rays of all 60 patients were classified as normal, classical and indeterminate according to BSTI COVID-19 CXR classification. 4 patients had normal chest X-rays (7%) and 14 patients (23%) had classical picture of bilateralperipheral, basal ground glass haze/consolidation. Rests of 42 patients (70%) were falling in indeterminate group with 2 (3%) having unilateral lung disease and 40 (67%) patients had bilateral lung disease. Diffuse lung involvement was seen in 6 (10%) and peripheral lung involvement in 36 (60%) of patients. Majority of indeterminate patients, 38 (63%) had bilateral middle and lower zonal involvement and only 4 (7%) patients had middle zone involvement. Associated features in indeterminate group were pleural effusion 8 (13%), old healed calcific granulomas 2 (3%), and bilateral hilar lymphadenopathy 2 (3%). There were no cavitating lesions or pneumothorax. **Table-II**

Table-II

Sr. No	Findings	No of Patients
1.	**NORMAL. Correlated with RT-PCR**	**04 (7%)**
2.	**CLASSIC/ PROBABLE COVID-19**	**14 (23%)**
	Consolidation/ ground glass haze	
	• **Bilateral, peripheral, basalIndeterminate for COVID-19**	
	• **Consolidation/ ground glass haze**	
	I. Location	
	Unilateral	**02 (3%)**
	Bilateral	**40 (67%)**
	II. Distribution	
	Diffuse lung involvement	**06 (10%)**
	Peripheral lung involvement	**36 (60%)**
	III. Zonal predominance	
	Middle and lower zones involvement	**38 (63%)**
	Only Middle zones involvement	**04 (7%)**
	• **Associated features**	
	Pleural effusion	**08 (13%)**
	Old healed calcific granulomas	**02 (3%)**
	Cavitating lesions/ pneumothorax	**00 (0%)**
	Bilateral hilar lymphadenopathy	**02 (3%)**

(Figures are presented as whole numbers with percentages in brackets).

DISCUSSION

Viruses belonging to the family of coronaviridae had already resulted in acute respiratory distress syndrome (SARS) in 2003 and Middle East respiratory syndrome[7,8](MERS) in 2012. COVID 19 virus has recently erupted and is still a mystery. Lot of research is going on all across the world and knowledge is being shared. Portable chest X-ray is the most commonly performed radiological investigation in terms of feasibility and cost effectiveness even in developed countries. In a dedicated Covid Care Centre like our setup, where on an average more than hundred suspected patients are being screened for COVID 19, portable chest X-ray is the optimal radiological screening tool. Strict decontamination measures could be ensured which are not possible in busy general OPD X-ray rooms. Due to limited RT-PCR kits and delayed results up to 48 hours, cases of high clinical suspicion with positive CXR findings are kept in isolation wards. CXR has a low sensitivity[9] and it is difficult to distinguish between COVID 19 and other viral pneumonias purely on CXR findings. CT scan is the preferred imaging modality regarding early detection of disease as well as of its complications but it has infection control challenges including strict decontamination measures, ventilation and airflow[10].

In HY Yoon et al study,[11] 33% patients had abnormal initial radiographic findings in contrast to 93% abnormal chest findings in our study. In SARS[12] these initial abnormal chest findings were in 78.3-82.4% and in MERS[13] 83.6%. In Wong HYF et al.[14] study consolidation was found in 47% of cases and this finding is consistent with other studies.[15] British society of thoracic imaging[16] has classified COVID -19 Chest X-rays as normal co related with RT-PCR,[17] classical, having multiple bilateral, peripheral basal opacities more bilateral than unilateral, indeterminate that does not fit into classical or non COVID descriptors and Non COVID-19 X-rays having pneumothorax, pleural effusion and pulmonary edema. UCLA CXR COVID reporting classification is based upon recommendation from Radiological society of North America[18] as typical having multifocal peripheral opacities with differential diagnosis of drug toxicity, influenza pneumonia and organizational pneumonia, indeterminate as non-peripheral consolidation with differential of lots Of infectious processes, atypical with uncommon imaging features and negative (does not exclude COVID-19).

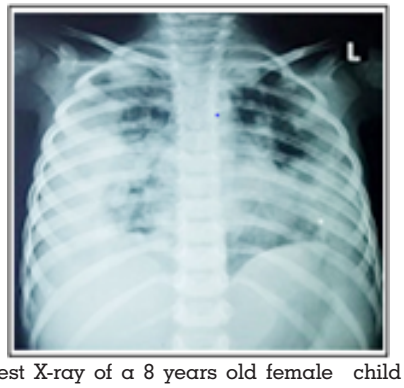

Fig.1: Chest X-ray of a 8 years old female child showing Extensive Bilateral peripheral consolidation with air bronchograms predominantly right side, partially obscured right diaphragmatic silhouette and obscured ipsilateral CP angle. Radiographic findings are indeterminate for COVID-19. She had strong contact history, presented in ER with acute complains of SOB, cough, fever and flu.

Fig.2: Chest X-ray image of a COVID -19 positive 56 years old

male with no travel/contact history, presented with high grade fever, sore throat and cough for two days, showing bilateral mid and lower zones homogenous consolidation in peripheral distribution (L>R) along with Obscuration of both CP angles- Findings fall in the category of indeterminate for COVID-19

Radiological findings were described according to Fleischner Society glossary of terms for Thoracic imaging.[19] Ground glass opacities were defined as increased opacification of lung parenchyma not obscuring blood vessels and bronchi. Consolidation was described as homogenous opacification of lung parenchyma obscuring blood vessels and bronchi. We classified all CXRs on BSTI classification and found that majority of patients had bilateral, peripheral ground glass opacities and consolidation as documented in international studies. There may be diffuse lung involvement with perihilar infiltrates as well, marking severity of disease process. Fig.1. Our study also shows that only 14 (23%) of patients had BSTI classical picture of COVID-19 pneumonia of bilateral peripheral basal consolidation /ground glass haze. Majority of patients were of indeterminate group because of bilateral peripheral, multifocal middle and lower zonal lung involvement. Fig.2. This can imply that radiographic presentation of our patients was moresevere in intensity.[20]This pattern of consolidation had variable presentation in terms of shape and density. Some patients had smooth homogenous consolidation, while majority had inhomogenous, confluencing or patchy nodular opacities in peripheral distribution. 6 patients with diffuse lung involvement had severe disease with no cephalocaudal or peripheral versus central discernment. Inclusion of middle lobe involvement in classical CXR definition of COVID-19 should be considered for indian population. This could be a roadmap for future studies on a larger scale. There was no literature available from our neighboring countries to see if there was any similarity in classical CXR presentation of COVID-19 in South Asian population. Indeterminate group included radiological Characterization of COVID-19 keeping in view, peculiar presence of tuberculosis, seasonal emergence of allergic chest diseases and hypersensitivity pneumonitis in our local population. Pulmonary edema, interstitial pneumonitis and drug induced pneumonitis in immune-compromised patients can also mimic COVID-19 pneumonia. Uncommon imaging features such as lymphadenopathy and pleural effusion as mentioned in international studies were also uncommon in our local population.

CONCLUSION

COVID-19 pneumonia generally manifested a spectrum of pure ground glass, mixed ground glass opacities to consolidation in bilateral peripheral middle and lower lung zones in our local population. BSTI chest reporting classification COVID-19 is valid in our patients with addition of middle zonal involvement in classical COVID-19 criteria as opposed to just lower zone involvement.

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