Original Research Article

Study on chest X-Ray Findings in Covid-19 Patients in Tertiary Care Hospital of Bihar

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Abstract

Objective: To analyze the chest x ray findings in Covid-19 patients, presented at Nalanda Medical College and Hospital (NMCH), Patna, based on chest x-ray classification of British Society of Thoracic Imaging (BSTI)**Methods**: In this observational study, 87 Reverse Transcriptase-Polymerase Chain Reaction (RT-PCR) COVID-19 positive patients above 14 years of age screened at NMCH, Patna from 15th July 2020 to 30th September 2020 were included. CXR findings were classified according to BSTI classification and documented in frequencies and percentages.
Results: Out of total 87 number of patients, 7 patients (8.04%) had normal chest x rays, 15(7.24%) patients had classic bilateral, peripheral and basal consolidation/Ground glass opacity (GGO), 55 (63.21%) patients had indeterminate group i.e those that did not fit in classic or non - Covid-19 or had poor quality film,10(11.49%) patients had non - Covid-19 chest x rays.**Conclusion:** In this study, Covid-19 chest x rays generally presented as a spectrum of pure ground glass opacity, mixed GGO to consolidation in bilateral peripheral middle and lower lung zones. BSTI chest x rays 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: Covid, Chest Image, Ground Glass Opacity, Consolidation.

Introduction

In December 2019, a new beta coronavirus causing severe acute respiratory syndrome (SARS-CoV-2) was identified as the causative agent of coronavirus disease 2019 (COVID-19), becoming a pandemic since March 11, 2020, as announced by the World Health Organization.Chest X Rays(CXRs) are the most commonly performed investigation in COVID 19 suspected cases. British Society of Thoracic Imaging(BSTI) has classified CXRs findings, based on European patients[1]. Our local population is different both in habitat and disease patterns, it was therefore thought to see pattern of CXR findings in our COVID 19 positive patients. CT scan is a preferred investigation in terms of diagnosis and disease follow up, but it is not feasible to use it as a screening tool in terms of its availability,cost effectiveness and rigorous time-consuming decontamination measures.CXR is the first- choice imaging modality for evaluating acute respiratory illness[2].The purpose of this study was to analyze chest X-rays findings in our patients based on British Society of Thoracic Imaging classification and to evaluate disease pattern in terms of any deviation or similarity.

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Materials and Method

This is a retrospective observational study conducted in Nalanda Medical College and Hospital, Patna. The study was approved by the institutional research and ethical committee. An informed and written consent was taken from all the subjects included in this study.This study was concluded over a period of 2.5 months,from 15th July,2020 to 30th September,2020.The study sample consisted of routine diagnostic radiographs of the patients admitted to our institution in COVID ward.No subject was irradiated without a reason. Radiation hygiene protocol was followed for all the subjects during imaging. A total of 87 RT-PCR positive patients above the age of 14 years admitted under Medicine Department of NMCH was taken in this study.Chest radiograph findings of Covid-19 confirmed patients was analyzed and classified according to BSTI classification and documented in frequencies and percentages.The British Society of Thoracic Imaging chest radiography reporting criteria.

The data was tabulated and was subjected to statistical analysis using SPSS Software version 11.0.

Table 1:Parameters

Normal	COVID-19 not excluded, please correlate with PCR
Classic/probable COVID- 19	Lower lobe and peripheral predominant multiple opacities that are bilateral (>> unilateral)
Indeterminate for COVID-19	Does not fit Classic or Non-COVID-19 descriptors or poor-quality film
Non-COVID-19	Pneumothorax/pleural effusion(s)/cavitating lesions/healed calcific granulomas/bilateral hilar lymphadenopathy /other

Results

Chest x rays of 87 RT-PCR positive Covid-19 positive patients above the age of 14 years were analyzed. Chest x rays were classified according to BSTI Covid-19 chest x ray classification. Out of total 87 number of patients, 7 patients (8.04%) had normal chest x rays, 15(7.24%) patients had classic bilateral, peripheral and basal consolidation/Ground glass opacity (GGO), 55 (63.21%) patients had indeterminate group i.e those that did not fit in classic or non - Covid-19 or had poor quality film,10(11.49%) patients had non - Covid-19 chest x rays. (Fig 1)

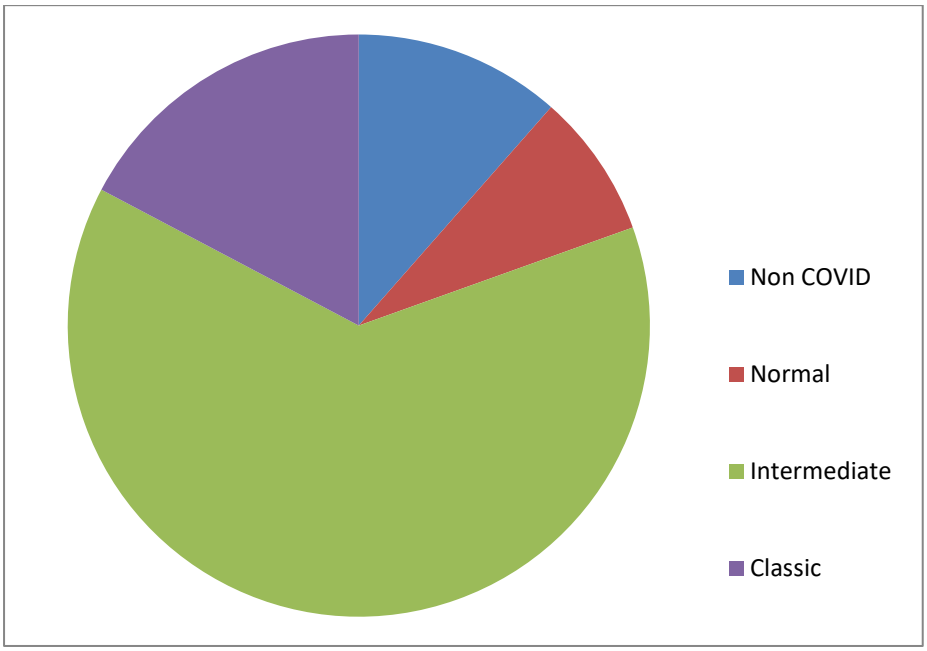

Fig 1:Distribution of subjects according to X-Ray finding

Out of 55 (63.21%) indeterminate group of patients 8 (9.19%) patients had poor quality, 10 (11.49%) patients had unilateral involvement and 37 (42.52%) had bilateral involvement, 10 (11.49%) had diffuse involvement and 37 (42.52%) had peripheral involvement.According to zonal predominance 37 (42.52%) of indeterminate had both middle and lower lung zone involvement, 6 (6.89%) had only middle zone and 4 (4.59%) had only lower zone involvement.

Out of non covid-19 x rays 3 (3.44%) patients had pleural effusion, 3 (3.44%) had cavitating lesion or pneumothorax, 2 (2.29%) had bilateral hilar lymphadenopathy and calcific granulomas respectively.Majority of patients were in the indeterminate group 55(63.21%) with bilateral involvement in 37 (42.52%) patients, peripheral involvement in 37(42.52%) patients and middle and lower zone involvement in 37 (42.52%) patients. (Table -1 and Fig 1, 2 & 3)

Table 1: Total Number of Patients (n= 87)

Findings	No. of Patients	%
Normal	7	8.04
Classic/Probable	15	17.24
Indeterminate	55	63.21
A) Poor Quality Film	8	9.19
B) Location:		
Unilateral	10	11.49
Bilateral	37	42.52
C) Distribution		
Diffuse	10	11.49
Peripheral	37	42.52

D) Zonal Predominance		
Middle and Lower Zone	37	42.52
Only Middle Zone	6	6.89
Only Lower Zone	4	4.59
Non Covid-19	10	11.49
A) Pleural Effusion	3	3.44
B) Pneumothorax/Cavitating Lesion	3	3.44
C) Old Healed Calcific Granuloma	2	2.29
D) Bilateral Hilar Lymphadenopathy	2	2.29
Total	87	100

Fig 1: Bilateral non homogenous Diffuse opacity in lower and middle zone of both lungs.

Fig 2: Bilateral non homogenous peripheral opacity in lower and middle zone of both lungs.

Fig 3: Bilateral non homogenous peripheral opacity in lower zone of both lungs.

Discussion

Viruses belonging to the family of coronaviridae had already resulted in acute respiratory distress syndrome (SARS) in 2003 and Middle East respiratory syndrome[4,5](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[3].In a dedicated corona hospital like Nalanda Medical College and Hospital, chest X-ray is the optimal radiological screening tool. 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 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 its use has been limited due to contamination risk, cost effectiveness in developing country like India, and feasibility.In HY Yoon et al study, 33% patients had abnormal initial radiographic findings in contrast to 92% abnormal chest findings in our study[4]. In SARS these initial abnormal chest findings were in 78.3-82.4% and in MERS10 83.6% [5].British society of thoracic imaging13 has classified COVID -19 chest X-rays as normal co related with RT- PCR,14 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 cavitating or healed calcific granulomas. Radiological findings were described according to Fleischner Society glossary of terms for Thoracic imaging. 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[6]. Our study also shows that only 15 (17.24%) 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. This can imply that radiographic presentation of our patients was more severe in intensity[7].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[8].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 lymph adenopathy and pleural effusion as mentioned in international studies were also uncommon in our local population.

Limitations of our study: Absence of serial CXRs to see progression of disease, variable presentations and long-term outcomes in our population.

Conclusion

Chest x ray is a first-choice imaging modality for evaluation of COVID – 19 pneumonia as it is cheaper, feasible, portable, less time consuming and less risk of contamination. In this study, Covid-19 chest x rays generally presented as a spectrum of pure ground glass opacity, mixed GGO to consolidation in bilateral peripheral middle and lower lung zones. BSTI chest x rays 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.

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