



CHEST RADIOGRAPHIC FINDINGS ON DISTRIBUTION OF LUNG LESIONS IN A COHORT OF COVID 19 PATIENTS

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Abstract

Background: Chest radiographs remain the mainstay modality for diagnosis and determining prognosis in Covid-19 patients. An extensive data on radiographic findings on predilection of lesions in the lungs can provide guidance to clinicians for management of the pathology. This study provides radiographic findings on the distribution of lung lesions in large Cohort of Covid 19 patients.

Method: In a cohort of 273 Covid-19 patients, chest x-ray findings are reported which include patients' demographics, distribution and severity of lung lesions based on CXR (Chest Radiograph) scores and their statistical analysis.

Result: The study showed a higher prevalence of male patients 68% over females 32%. The affection in the lower zone of either lung scored higher than upper and middle zone. There was no significant difference in the severity of the affection between either side of the lung. 85% of patients scored between 0-8 and 15% of the patients scored within 9-18 on the CXR grading.

Conclusion: Radiographic evaluation of Covid 19 patients shows a predilection of lesions in the lower zone of each lung, with no significant difference of affections in right versus left lung. Majority of the patients exhibited mild to moderate severity in lung lesions.

Introduction

The Covid-19 pandemic has swamped the entire world since it first broke out in Wuhan (the capital city of Hubei Province in central China) in December 2019[1]. Notably one of the deadliest pandemics which snatched away millions of lives worldwide has also evoked the urgent need to identify the pathogenesis of the disease and plan its prevention and therapy. Established reports so far are suggestive that the primary mode of transmission is in the form of respiratory droplets and the disease manifests itself primarily in the lower respiratory tract, major cause of death involves the lung pathology [2]. Clinically, Covid-19 is expected to prevail as an important differential diagnosis for the foreseeable future in patient presenting to hospital with a flu-like illness, lymphopenia on full blood count, any change in normal sense of smell or taste [3]. Although radiodiagnosis has a significant role in identifying the pathognomonic features of lung affections and disease prognosis, the data still remains sparse. BSTI[4] precludes the role for computed tomography imaging in the diagnosis of covid-19 unless the patient is seriously ill OR if PCR is unavailable and the American Society of Thoracic Radiology (STR)[5] recommends that routine screening with computed tomography for the identification of covid-19 pneumonia is currently not

advocated by most radiology societies; moreover The Fleischner Society for thoracic radiology also endorses the aforementioned approach[6]. Considering the above, X ray radiography remains the mainstay protocol for lung examination in Covid -19 patients and an appropriate data base will not just aid in diagnosis but will also contribute in the differential diagnosis of the Covid-19 pathology from other forms of pneumonia.

The current study is the presentation of clinical findings of chest radiographs from a large cohort of Covid-19 patients which will add to the existing body of literature and database for future directions.

Materials and Methods

Setting

This retrospective cross-sectional study was conducted at –ESI PGIMSR ESIC Medical College Joka.in accordance with the principles of the Declaration of Helsinki and in compliance with Institutional Ethical guidelines and clearance vide ESIC/51/IEC(JOKA)/2021 dated 25.8.2021.

Imaging acquisition and interpretation

The imaging was performed using 60mA portable Xray machine and processed in Konica Computerised Radiography system to obtain the image.

Two radiologists with extensive experience in interpreting CXR imaging, reviewed all images, and classified the CXR. In case of any disagreement, the same radiologists reviewed together the images to reach a consensus on the basis of the available radiological literature data.

The demographic details were classified on basis of sex and age. The radiographic findings of lesions in each lung and different zones of the lungs were classified and scored according to standard scoring system [7]in brief 0=No lung abnormalities,1= interstitial infiltrates,2=Interstitial and alveolar infiltrates (interstitial predominance),3=Interstitial and alveolar infiltrates(alveolar predominance).

The distribution of the abnormal findings was recorded considering scoring of the lung lesions assigned based on the three criteria: (a) laterality (unilateral or bilateral) (c) longitudinal distribution (UZ, superior and/or MZ, middle and/or LZ, inferior).

Typical lesion description were glass ground appearance, interstitial opacities, confluence of alveolar opacities.

Statistical analysis of the data was performed using student's t test and conclusions were derived.

Results

Patient Characteristics

The chest radiographs of a total of 273 Covid-19 patients were evaluated. Demographic analysis shows a higher prevalence of male patients' 68% than that of females 32%. The average age of affected males was 54.5yrs and females were 51.7 yrs. (Fig1)

Chest X ray features

There was no significant difference in the scoring of the lesions based on laterality $p=0.5547$, both the right and left lung were affected with equal severity. Likewise, there was no significance difference in the severity score between the upper zone ($p=0.0896$), middle zone ($p=0.610$) and lower zone, $p= (0.2445)$ between the right and left lung. However, the predilection of lesion was higher in the lower zones of each lung, severity scoring was significant $p=5.38E-41$, between upper and lower zone and $p=1.07E-15$ for middle and lower zone of left lung. Similarly, severity scoring was significant $p=2.38E-36$, between upper and lower zone and $p=1.32E-18$ for middle and lower zone of right lung. (Fig1, Fig 2).

Interestingly in this large cohort of covid-19 patients 85% scored between 0-8 and 15% of the patients scored within 9-18 on the CXR grading indicating mild to moderate severity of lung lesions in majority of the patients. (Fig3).

Discussion

Chest radiography is the recommended modality for routine determination of lung affection and its severity in Covid -19 patients. The major advantage of chest radiographs over CT scans in the reduced radiation exposure to the patients and health workers. Although it is a common knowledge that CT scans are more sensitive than chest radiographs for locating lesions in the early stages of Covid -19, but one report shows even CT scan has failed to demonstrate the lesions within first 3 days of symptoms in 54% of Covid -19 cases [8].

Considering the close clinical features of other viral infections affecting the lungs, it is imperative to have defined radiographic features for creating a database for the differential diagnosis with other lung affections. In view of the paucity of information on the subject, we have considered sharing the Chest X ray score (CXR) in a cohort of 273 Covid-19 patients to add to the existing body of literature.

Our demographic findings show similar incidence higher number of male patients versus female patients [9] which probably could be attributed to a greater number of males getting exposed and infected.

We report no significant change in severity of lung lesions between left and right lung, however there are several studies reporting a higher affection in the right lung [10]. The possible explanation for the anatomical predisposition of the right lung, is owing to the anatomical structure of the trachea and bronchi: as the right bronchus is short and straight, the causative virus might tend to favour this location [11]. It is possible that mentioned changes are witnessed in the initial stages and as the disease progresses, both lungs may similarly get affected as evidenced in our study, however the drawback of the our study is that we have not classified the stage of the disease in our cohort of patients. Critical analysis of established reports may establish further leads on the laterality. Our findings of high incidence of affections in the lower zones of each lung conforms to previous reports [12] and the lower lobes (especially the anterior basal segment, lateral basal segment, and posterior basal segment) are the most commonly affected sites. This may be because of the anatomical structure of the trachea and bronchi—the bronchus of lower lobes is relatively straight, and the virus arrives more easily in the lower lobes [13]

We conclude that radiographic evaluation of a large cohort of Covid 19 patients shows a predilection of lesions in the lower zone of each lung, with no significant difference of affections in right versus left lung in either zone. Majority of the patients exhibited mild to moderate severity in lung lesions.

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Figures legends

Fig 1. Shows the Bar graphs depicting a higher prevalence of male patients' 68% than that of females 32%. The average age of affected males was 54.5yrs and females were 51.7 yrs. The lung lesions in the lower zone were higher than middle zone with no difference between the left and right lungs in either zone.

Fig 2. Shows the bar graphs depicting no significant difference in the predilection of lesions in the upper zone of left and right lungs. However, there was significant difference in the distribution of lesion in between the upper zone versus lower zone and middle zone versus lower zone in both left and right lungs, indicating the prevalence of the lesion in the lower zone of both the lungs.

Fig 3. Shows the radiographic illustration of the severity features of severe (a) and moderate lesions (b) of the covid affected lungs and the distribution of scores in bar graphs as determined in this study.

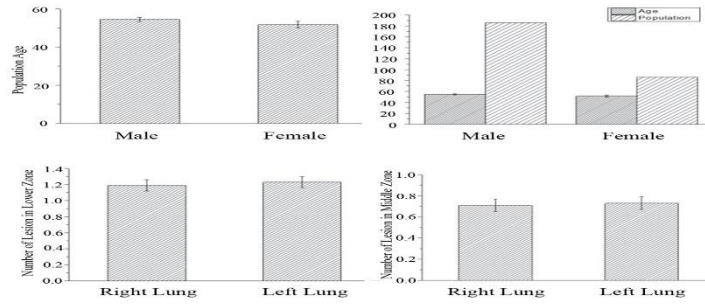


Fig. 1.

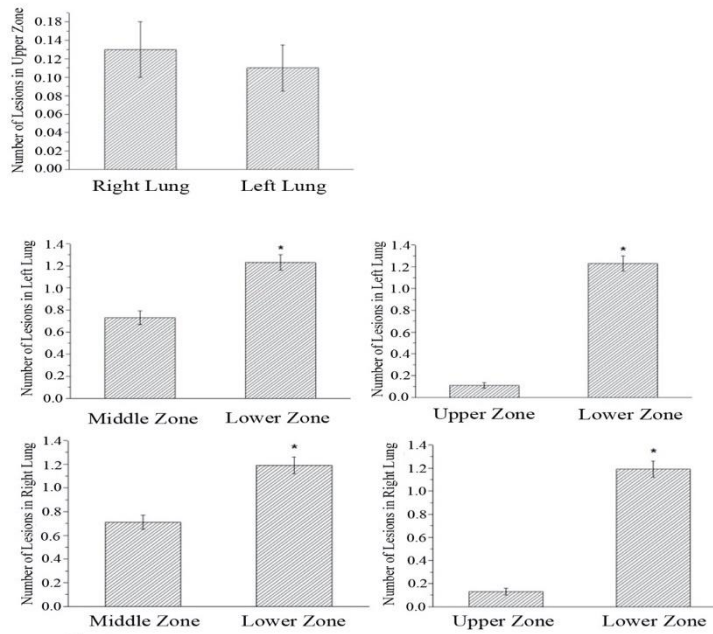


Fig. 2.

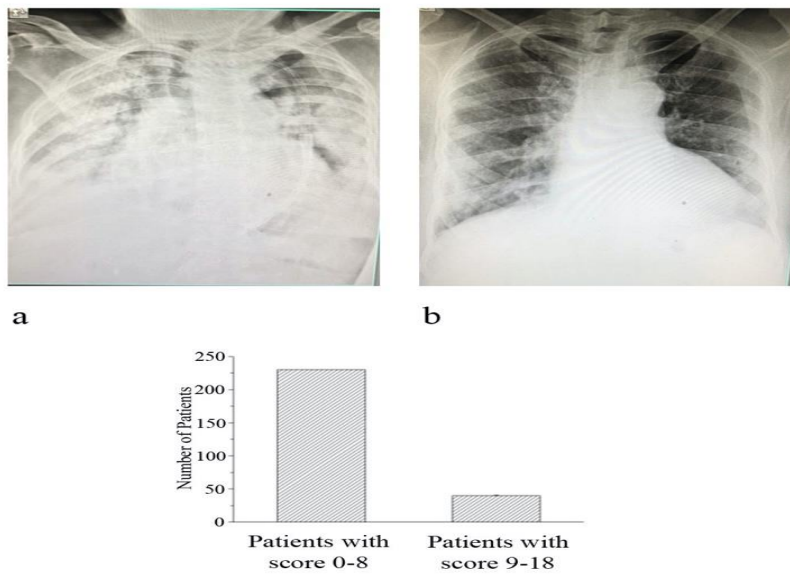


Fig. 3.