Evaluation of Corona Virus Related Respiratory Illness by Chest Radiography at Tertiary Care Hospital, Agartala: A Descriptive Study

Dr. Tanusri Debbarma
Sr. AGMC &
GBP HOSPITAL

Dr. Asim DE
Prof. A & HODAGMC &
GBP HOSPITAL

Dr. Kaushik Debbarma
MO, Dhalai District
Hospital

Abstract: Coronavirus related respiratory illness usually manifests clinically as pneumonia with predominant imaging findings of an atypical or organizing pneumonia. Plain radiography is very helpful for the assessment and follow-up of COVID-19 disease. It provides an accurate insight into the disease course.

We aimed at determining the course of COVID-19 disease and it's severity by using chest X-ray (CXR) scoring system and correlate these with age, sex, and outcome of the patients.

Results: In our study, 98 patients with COVID-19 diseasewere enrolled; out of that 70 patients (71.4%) had abnormal chest x-ray and 28 patients (28.57%) had normal chest xray. In the course of follow-up, 55 patients (56.12%) of the normal baseline CXR showed CXR abnormalities. Among the abnormal chest X-ray, ill defined opacity with an air bronchogram features suggestive of consolidation were the most common finding seen in 45 patients (45.91%), followed by ground glass opacity(GGO) seen in 37 patients (37.75%) & reticular interstitial thickening seen in 30 patients (30.61%). Out of 98 patients, Pleural effusion were seen in 19 patients (19.38%). Bilateral lung was involved around (48 patients, 48.97%) with peripheral distribution (33 patients, 33.67%) and lower zone affection (28 patients, 28.57%).
The total severity score (TSS) on follow up with CXRranged from 0 to 8. The outcome of COVID-19 disease was significantly related to the age, sex, and TSS of the patients. Male patients older than 40 years especially had higher TSS. They had significantly higher mortality rate than the female patients (*P* value 0.025).

Conclusion: Radiographic findings are very good predictors forthe assessment of the course of COVID-19 disease and it could be used to monitor long-term consequences. Our study showed a positive correlation between the patients age and total severity score to the final disease outcome.

Keywords:- Covid pneumonia, consolidation, ground glass opacity, central and peripheral.

I. INTRODUCTION

In the year 2019, last week of December, the WHO China Country Office first informed the cases of pneumonia of unknown etiology (unknown cause) in Wuhan City, Hubei Province of China.[1] The highly infectious disease, commonly called Coronavirus Disease 19 (COVID-19) causedlung infection which resulted in severe pneumoniaand more aggressive acute respiratory distress syndrome (ARDS) [2, 3] Genetic sequencing of SARS-CoV-2 has enabled the rapid development of real-time reverse transcription polymerase chain reaction (RT-PCR) of viral nucleic acid, and it is the diagnostic gold standard [2]. This pneumonia was confirmed later to be secondary to infection by a novel coronavirus. This virus was originally called the 2019 novel coronavirus (2019-nCoV), but on February 11, 2020, the disease was named COVID-19 by the World Health Organization (WHO), and the virus was named "severe acute respiratory syndrome coronavirus 2" (SARS-CoV-2) by the International Committee on Taxonomy of Viruses (ICTV). COVID-19 virus had a zoonotic origin and began in the Huanan wet seafood wholesale market in Wuhan. It had been proven by SARS-CoV-2 that it is extremely contagious and spreads easily from person to person. [1]

Several limitations had been seen by the serology test with high number of false-negative tests and the delayed results. Radiological evaluation of patients with clinical–epidemiological suspect of COVID-19 was mandatory, especially in the emergency department (ED) while waiting for RT-PCR results, in order to have a rapid evaluation of thoracic involvement. The recent COVID-19 radiological literature focuses primarily on computed tomography (CT) findings, which is more sensitive and specific than chest X-ray (CXR): [4, 5].

But due to the radiation hazards of CT Scan and considering the young patients,the most Italian hospitals were employing CXR as the first-line method, with faster results compared to those of RT-PCR, especially by using portable X-ray units which reduced the movement of patients and so minimizing the risk of cross-infection [6–8] .
Our aim of this study was therefore to assess the extent of pulmonary involvement in COVID-19 patients based on the British Society of Thoracic Imaging classification and to evaluate the disease pattern in terms of any deviation or similarity.

II. METHODS

Retrospective descriptive study was conducted at AGMC & GBP HOSPITAL, Agartala. All RT-PCR COVID 19 positive patients presented from august 2020 to December 2020 were included. Chest radiographs of all COVID-19 confirmed patients in this duration 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 is presented as mean along with age range. Qualitative variables like gender, symptoms and co morbid were presented as frequency and percentages.

III. ETHICS COMMITTEE

No individual data were included in the study. The Research Ethics Committee approved this study. Verbal informed consent was given to the participants and it was advised by our medical research ethics committee, particularly in such unusual risky situation to reduce the risk of transmission of the disease by avoiding any unnecessary contact with the positive patients.

IV. RESULTS

In our study, there were 98 patients proven with positive COVID-19 disease; 70 patients (71.4%) had abnormal baseline CXR and 28 patients (28.57%) had normal baseline CXR. During follow-up chest X-ray studies, 55 patients (56.12%) of the normal baseline CXR showed CXR abnormalities. (Table/Fig-1-3)

In the chest X-ray findings, consolidation were the most common finding around 45 patients (45.91%), followed by GGO seen in 37 patients (37.75%) & reticular interstitial thickening seen in 30patients (30.61%). pleural effusion was seen in 19 patients (19.38%) (Table /Fig-4-6).Most of the patients showed bilateral lung affection (48 patients, 48.97%) with peripheral distribution (33 patients, (33.67%) and lower zone affection (28patients, 28.57%).

The total severity score was estimated in the baseline and follow-up CXR and it ranged from 0 to 8. The outcome of COVID-19 disease significantly related to the age, sex, and TSS of the patients. Male patients showed significantly higher mortality rate as compared to the female patients (P value 0.025). Also, the mortality rate was higher in patients older than 40 years especially with higher TSS.
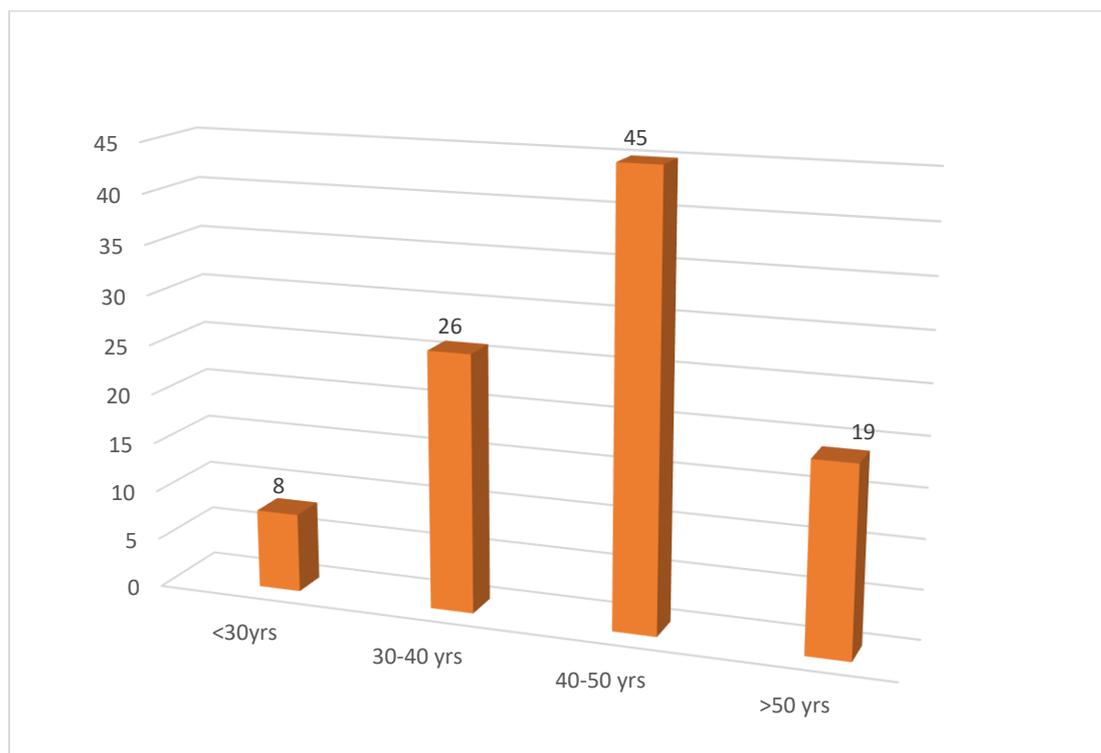

Fig. 1: Age distributions of patients with RTPCR positive for covid -19 patients

SL No.			Findings
	Age	Mean	42 yrs
		Range	25-75yrs
	Gender	Male	62 (63.26%)
		Female	36(36.73%)
	H/O Travel		13(13.26%)
	H/O Contact	Cough	20 (20.40%)
		fever	38 (38.77%)
		Sore throat	40 (40.81%)
	Symptoms	Cough	40 (40.81%)
		fever	53 (54.08%)
		Sore throat	32 (32.65%)
		Loss of smell	44 (44.89%)
		GIT Symptoms	21 (21.42%)
		HTN	12 (12.22%)
	Comorbid	Renal complaints	1(1.02%)
		DM	2(2.04%)
		Tuberculosis	3(3.06%)
		Malignancy	1 (1.02%)

Table 1: Patients Profile

Findings	Findings
NORMAL with RT-PCR positive	12 (12.24%)
2. CLASSIC /PROBABLE COVID -19	
Consolidation /ground glass haze	45 (45.91%)
Bilateral, peripheral ,basal	38 (38.77%)
3. Indeterminate for COVID -19 • Consolidation/ground glass haze	
i). Location	37 (37.75%)
Unilateral	12 (12.24%)
Bilateral	45 (45.91%)
ii). Distribution	
Diffuse lung involvement	25 (25.51%)
Peripheral lung involvement	33(33.67%)
iii). Zonal predominance Middle and lower zones involvement	28 (28.57%).
Only Middle zones involvement	24 (24.49%)
• Associated Features Pleural Effusion	19 (19.38%).
Old healed calcific granulomas	3 (3.06%)
Cavitating lesions/pneumothorax	2 (2.04%)
Bilateral hilar lymphadenopathy	1 (1.02%)
Pneumomediastinum	11 (1.02%)
Pneumothorax	1 (1.02%)

Table 2: Radiographic findings using BSTI covid-19 CXR report proforma in patients.

V. DISCUSSION

The morbidity and mortality rate due to COVID-19 was rapidly increasing, with thousands of reported death worldwide. The WHO has already declared this pandemic as a global health emergency.

In our study, there were 62 males (63.26%) and 36 females (36.73%) with male patients showing significantly higher & high mortality rate compared to the female patients. (Table/Fig-1) This agreed with Borghesi et al., who did a study on 783 Italian patients. They found that most patients (67.9%) were males and only 15.2% were younger than 50 years. They stated that older age groups were more associated with pulmonary affection & highest severity score seen in males ≥ 50 years or female ≥ 80 especially with underlying comorbidities (such as hypertension, diabetes, cardiovascular disease, and oncologic history) are risk factors of fatal outcome in adult patients with confirmed SARS-CoV-2 infection [9]

The most common CXRs features detected in COVID-19 cases was consolidation (47%), followed by GGO (33%). Also, peripheral predominance was seen in 33.67% of CXR abnormalities with middle zone distribution (24.49%), with

bilateral lung involvement (45.91%) & pleural effusion (19.38%).

This agreed with Wong et al. who did a study on 64 COVID-19 patients, they found that Consolidation was the most common finding (47%), followed by GGO (33%). Also, peripheral predominance was seen in 41% of CXR abnormalities with lower zone distribution (50%), with bilateral lung involvement (50%). Pleural effusion was uncommon, only seen in 3% [10,11].

In our study, the predisposing conditions for COVID-19 pneumonia tend to be old age with medical comorbidities which is similar to previous viral infections such as influenza H7N9.[12,13]

Fever, cough, and dyspnoea were the most common symptoms in patients with COVID-19 pneumonia, consistent with the manifestation of lower respiratory tract infections. By contrast, upper respiratory tract symptoms were less common in these patients, indicating that the cells targeted by the virus might be located in the lower airway.[14]

VI. LIMITATION

Small sample size. Follow-up CXR could notbe performed in a uniform pattern as it was dedicated by the clinician as regards the clinical condition. For severe cases in the intensive care unit, the portable AP CXR was suboptimal with only few cases performed CT, so we could not judge the sensitivity of CXR.

VII. CONCLUSION

Chest x-ray are a good monitoring tool for COVID-19 chest manifestations and its scoring system provides an accurate method to predict the disease severity. COVID-19 pneumonia tends to manifest on chest xray as bilateral, ground-glass opacities with air bronchograms, ill-defined margins, and a slight predominance in the lower lobe and bilateral lung fields. Our study showed a positive correlation between the patients age and total severity score to the final disease outcome. Chest x-ray also provide a good indicator for the clinicians to identify at an early stage the patients with the highest risk and plan specific treatment strategies for them. It is also an easy, fast and cheap means for follow up cases.

Fig. 2: 47 years male patient complaining of fever with Chest xray showing diffuse ground glass opacity in bilateral lung fieds with cardiomegaly

Fig. 3: 44-year male complaining of SOB, fever, and cough with features showing consolidation in left mid zone and right middle lobe

Fig. 4: 67 years female patient was complaining of cough and fever which showed diffuse ground glass opacity in bilateral lung fields, consolidation lingular lobe & cardiomegaly

REFERENCES

[1.] World Health Organization website. Pneumonia of unknown cause: China. www.who.int/csr/don/05-january-2020-pneumonia-of-unkown-cause-china/ en/. Accessed 13 Feb 2020.

[2.] Wang C, Horby PW, Hayden FG, Gao GF (2020) A novel coronavirus outbreak of global health concern. Lancet 395(10223):470–473.

[3.] Chen N, Zhou M, Dong X et al (2020) Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet 395(10223):507–513.

[4.] Yang W, Sirajuddin A, Zhang X et al (2020) The role of imaging in 2019 novel coronavirus pneumonia (COVID-19). Eur Radiol. https://doi.org/10.1007/s00330-020-06827-4 5.

[5.] Zhou A, Wang Y, Zhu T, Xia L (2020) CT features of Coronavirus disease 2019 (COVID-19) pneumonia in 62 patients in Wuhan, China. Am J Roentgenol 214:1–8

[6.] Giovagnoni A (2020) Facing the COVID-19 emergency: we can and we do. Radiol Med 125(4):337–338

[7.] Neri E, Miele V, Coppola F, Grassi R (2020) Use of CT and artifcial intelligence in suspected or COVID-19 positive patients Statement of the Italian Society of Medical and Interventional Radiology. Radiol Med. https://doi.org/10.1007/s11547-020-01197-9

[8.] ACR recommendations for the use of chest radiography and computed tomography (CT) for suspected COVID-19 infection. American College of Radiology. https://www.acr.org/Advocacyand-Economics/ACR-Position-Statements/Recommendations-forChest-Radiography-and-CT-for-Suspected-COVID-19-infection. Updated March 22 2020

[9.] Borghesi A, Zigliani A, Masciullo R et al (2020) Radiographic severity index in COVID-19 pneumonia: relationship to age and sex in 783 Italian patients. Nucl Med Med Imaging 20

[10.] Wong HYF, Lam HYS, Fong AH-T et al Frequency and distribution of chest radiographic findings in COVID-19 positive patients. Radiology Published Online: Mar -27- 2020

[11.] Ng M-Y, Lee EY, Yang J et al (2020) Imaging profile of the COVID-19 infection: radiologic findings and literature review. Radiol Cardiothoracic Imaging 2:1

[12.] Liu S, Sun J, Cai J, et al. Epidemiological, clinical and viral characteristics of fatal cases of human avian influenza A (H7N9) virus in Zhejiang Province, China. J Infect 2013; 67: 595–605.

[13.] Chen X, Yang Z, Lu Y, Xu Q, Wang Q, Chen L. Clinical features and factors associated with outcomes of patients infected with a novel influenza A (H7N9) virus: a preliminary study. PLoS One 2013; 8: e73362.

[14.] Na Z, Ding Z, Wen W, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet 2020; 395: 497–605.