ORIGINAL ARTICLE

High Resolution CT Chest Findings in PCR Positive or Clinically Suspected patients of Covid-19 Infection

MAIMOONA GULSHAN[1], SYEDA KHADIJA EJAZ[2], MEHWISH TAHIR[3], ATTKA MARYAM[4], SADAF QADIR[5], ZAFAR RAFIQUE[6]
[1]Assistant professor Radiology, Shalamar Hospital, Lahore
[2]Medical imaging technologist, Shalamar Hospital, Lahore
[3]Assistant professor Radiology, Shalamar Hospital, Lahore
[4]Assistant professor Radiology, Rashid Latif Medical College/Hospital, Lahore
[5]MIT Programme Coordinator, SAHS, Lahore
[6]Professor and head of department Radiology, Shalamar Hospital, Lahore
Correspondence to Dr. Mehwish Tahir, Assistant Professor Radiology, Shalamar Hospital, Lahore

ABSTRACT

Aim: HRCT chest findings in PCR positive or clinically suspected patients of COVID-19 infection.
Methods: Retrospective study recruited 207 clinically suspected patients of COVID disease with duration of 1-14 days from the radiology department of Shalamar Hospital Lahore. Patients were categorized into two groups on the basis of PCR +ve (123) and PCR -ve group (84).
Results: Among 123 PCR +ve patients, 107 patients were CT Positive and 16 were CT negative. While from 84 PCR -ve patients, 38 patients were CT positive. Among PCR Positive patients, most prevalent finding was GGO (84.5%), followed by lymphadenopathy(48.8%), interlobular septal thickening (41.5%), consolidation (5.7%) on HRCT chest. The GGO was mostly bilateral (82.2%) and Peripheral (47.8%). Among 84 PCR negative patients, GGO (45.3%), followed by interlobular septal thickening (28.6%), lymphadenopathy (19.1%). The GGO was mostly bilateral (26.2%) and Peripheral (25%). HRCT Chest has Sensitivity (86%), specificity (54%) and accuracy 74%.
Conclusion: GGOs with bilateral and peripheral distribution was the most common finding in both PCR positive and negative patients, whereas lymphadenopathy in PCR positive and Interlobular septal thickening in PCR negative patients was the second common finding. High resolution CT Chest performs a significant role in early diagnosis of patients with COVID-19 due to its high sensitivity and specificity.
Keywords: PCR, GGO, COVID-19

INTRODUCTION

Corona virus is a single stranded RNA virus that generally causes upper respiratory tract infection in birds as well as mammals, including human beings and is a member of the Nidovirales order, Corona viridae family, and Orthocorona virinae subfamily[1]. The Pandemic was brought on by the "severe acute respiratory syndrome coronavirus-2." SARS-Cov-2 was initially identified in Wuhan City, China, in December 2019, as a global health crisis. This highly infectious disease affects the human population and its rapid spread results in a very high death rate within a few months[2]. In 2002, with the early identification of SARS-CoV, human corona viruses have been recognized since then. Human corona viruses are mostly respiratory pathogens[3].

METHODOLOGY

This observational and retrospective study was conducted in Radiology Department of Shalamar Hospital Lahore for a period of six months from 01-01-2021 to 30-06-2021. Sample size was 207 patients and sampling technique used was a purposive sampling technique. Records of PCR positive and clinically suspected patients irrespective of PCR results (both PCR positive and negative) of COVID-19 infection referred to the Radiology department of Shalamar hospital for HRCT chest.
Inclusion Criteria: Clinically suspected male and female, irrespective of PCR results (both PCR positive and negative) with duration of illness is 1-14days
Exclusion Criteria: Patient with co morbidities i.e. TB, interstitial lung disease, bronchiectasis and paediatric patients. After obtaining the approval from Shalamar Medical and Dental College, Institutional Review Board (SMDC-IRB), the study was commenced. The data collected was entered and analyzed using SPSS 25.

RESULTS

Total 207 patients were included.

Table 1: Sex distribution

Gender	N	Male	Female
	207(100%)	119(57.2%)	88(42.8%)

Table 2: Frequency of PCR results

PCR results	N	PCR-Positive	PCR-Negative
	207	123 (58.9%)	84 (40.2%)

Table 3: COVID Detection on HRCT Chest

COVID Detection on HRCT Chest	N	Positive	Negative
	207	145(69.5%)	62 (29.7%)

Table 4: HRCT Chest and Detection on PCR

COVID detection On HRCT chest	Detection on PCR		Total
	+ve	-ve	
+Ve	107	38	145
-ve	16	46	62
Total	123	84	207

Chi square 41.475   P value 0.000

Table 5: HRCT Findings in PCR Positive and negative patients

HRCT Chest	PCR Positive	PCR Negative
Ground Glass Opacities	104 (84.5%)	38 (45.3%)
Bilateral GGO	101 (82.2%)	22 (26.2%)
Peripheral GGO	59 (47.8%)	21 (25%)
Non Peripheral GGO	31 (25.3%)	5 (6%)
Interlobular Septal Thickening	51(41.5%)	24 (28.6%)
Consolidation	7(5.7%)	2 (2.45%)
Crazy Paving	8 (6.6%)	4 (4.8%)
Lymphadenopathy	60 (48.8%)	16 (19.1%)
Pleural Effusion	5 (4.1%)	2 (2.45%)
Traction Bronchiectasis	4 (3.3%)	2 (2.45%)

Table 6: HRCT Chest findings and Detection on PCR

HRCT Chest		PCR +ve	PCR-- ve	Chi Squar	p-value
GGO	Yes	104	38	35.815[a]	0.000
	No	19	46		
Bilateral GGO	Yes	101	36	34.369[a]	0.000
	No	22	48		
Peripheral GGO	Yes	59	21	11.104[a]	0.001
	No	64	63		
Non Peripheral GGO	Yes	32	5	13.688	0.000
	No	91	79		
Interlobular Septal Thickening	Yes	51	24	3.591[a]	0.0058
	No	72	60		
Consolidation	Yes	7	2	Fisher Exact	0.316
	No	116	82		

Table 7: Sensitivity, Specificity, PPV, NPV and Accuracy of HRCT Chest

HRCT Chest	
Sensitivity	87%
Specificity	55%
PPV	73%
NPV	74%
Accuracy	74%

DISCUSSION

In the current study, 207 symptomatic patients of Covid were scanned by HRCT chest, out of which 119 patients were men and 88 women. Participants had an average age of 50.7years with Standard Deviation of 14.056. Highest proportion of the population presented with high temperature, followed by non productive cough, SOB, sore throat and the least number of patients were presented with fatigue within 5 to 8 days of illness. Ashraf et al[2] reported a similar pattern of clinical features which indicated that the majority of patients presented with fever, dry cough, and dyspnea.

Out of 207 participants, 123 were PCR positive and 84 were PCR negative. Among 123 PCR Positive patients, 107 patients were CT Positive and 16 were CT negative. While from 84 PCR Negative patients, 38 patients were CT positive and 46 were CT negative. These outcomes were matched with the results of the Ashraf et al[2].

In our study, we categorized the HRCT chest findings in PCR +ve and PCR -ve patients. In PCR +ve patients, GGOs with bilateral and peripheral location were the most frequent findings followed by lymphadenopathy, ILST, crazy paving, consolidation while pleural effusion and traction bronchiectasis were seen in least number of patients whereas in PCR –ve cases, frequency of HRCT Chest findings were in similar pattern except interlobular septal thickening which was more prevalent than lymphadenopathy but, reticulation, pneumothorax, vascular dilation and architectural distortion was seen neither in PCR positive nor in PCR negative patient. Study conducted by Ashraf et al., 2020[2] evaluated the HRCT chest finding only in PCR positive patients and also showed the GGO was the most frequent HRCT chest finding. In Recent analysis, the sensitivity of HRCT chest was 87%, specificity was 55% and diagnostic accuracy of HRCT chest was 74% whereas the sensitivity of CT in study conducted by He et al[4] was 77% and the specificity was 96%.

Khaliq et al [5] conducted a descriptive study to assess HRCT chest finding of covid cases by analyzing the dispersion of the infection in both lungs and chest CT severity score. In each study, GGO, consolidation, mixed pattern, distribution, crazy paving, reverse halo sign, nodules, pleural effusion, and CT severity score were assessed. This study showed that Ground glass/hazel opacity was among the frequent CT features, consolidation and crazy paving 88.5%, 52.8% and 33.3% respectively.

Chen et al[6] conducted a retrospective analysis in China to make a comparison of CT in covid patients. 21 symptomatic patients who had a CT scan and PCR test in 3 days included in study. CT finding recorded and then compared. Study showed that most infections were found in several lobes 67%, bilateral (72%). GGO 95%, consolidation 72%, as well as subpleural distribution 100% were the most notable computed tomography findings. Shah et al[7] conducted a retrospective study in India to analyze the performance of High resolution CT of the chest in PCR +ve covid patients and to assess its severity. 216 patients who had an HRCT chest examination were included. Among them, GGOs in 92.2%, mixed (ground-glass opacities and consolidation) pattern in 9.8%, crazy pavement in 54%,ground glass opacities with reverse halo pattern in 17.7%, GGOs with pulmonary nodules in 28.4%.

Basnet et al[8] conducted a Cross sectional study in Nepal to assess the variety of HRCT Chest features in PCR +ve patients of COVID-19. Among them, 26(60.5%) patients had +ve CT of chest suggesting covid pneumonitis. Patients with lesions in both lungs accounted for 65% of the total, whereas those with scattered lesions accounted for 77% of the total. Common chest CT findings were GGO 92%, GGO plus consolidation 30.7%.

CONCLUSION

Gound glass opacities with bilateral and peripheral distribution were common findings in both PCR positive and negative patients, whereas lymphadenopathy in PCR positive and Interlobular septal thickening in PCR negative patients was the second common finding. PCR is considered the first line investigation for confirmation of covid disease. HRCT Chest plays a significant part in timely detection of covid patients due to its high sensitivity and specificity.

Conflict of interest: Nil

REFERENCES

1. Malik, YA. 2020. Properties of coronavirus and SARS-CoV-2.The Malaysian journal of pathology, 42, 3-11.
2. Ashraf, V., Chaudhry, S., Yousaf, KR et al. 2020. Spectrum of High Resolution Computed Tomography Findings in COVID-19 Infection. Annals of King Edward Medical University, 26, 187-191.
3. Ortiz-prado, E., Simbaña-rivera, K., Gómez-barreno, L et al. 2020. Clinical, molecular, and epidemiological characterization of the SARS-CoV-2 virus and the Coronavirus Disease 2019 (COVID-19), a comprehensive literature review.Diagnostic microbiology and infectious disease, 98, 115094.
4. HE, X., Zheng, J., Ren, J et al. 2020. Chest high-resolution computed tomography imaging findings of coronavirus disease 2019 (Covid-19) pneumonia. Int J Radiat Res, 18, 343-349.
5. Khaliq, M., Raja, R., Khan, N. et al. 2020. An analysis of high-resolution computed tomography chest manifestations of COVID-19 patients in Pakistan. Cureus, 12.
6. Chen, D., Jiang, X., Hong, Y et al. 2021. Can chest CT features distinguish patients with negative from those with positive initial RT-PCR results for coronavirus disease (COVID-19)?.American Journal of Roentgenology, 216(1), pp.66-70.
7. Shah, S. A., Gajbhiye, M. I., Saibannawar, AS et al. 2021. Retrospective analysis of chest HRCT findings in coronavirus disease pandemic (COVID-19)-An early experience.The Indian Journal of Radiology & Imaging, 31, S101.
   Basnet, B., Pant, S., Pant, S et al. 2021. Spectrum of HRCT chest findings in RT-PCR positive asymptomatic COVID-19 patients at a COVID designated hospital in Nepal. medRxiv.