Original Article

A Prospective Cohort Study on Suspected COVID-19 Patients undergoing Nasopharyngeal Swab PCR and HRCT

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ABSTRACT

Objective: To Determine the Specificity, Accuracy and Sensitivity of HRCT in Diagnosis of Covi-19. **Methods:** Prospective cohort study was done with 181 participants who were suspected for COVID-19 infection and were followed to evaluate PCR and HRCT reporting in patients with clinical symptoms. **Results:** 86.8% of patients had a dry cough, followed most commonly with shortness of breath. 65(35.9%) of patients had ground-glass opacities of haze on HRCT followed by 47(26 %). who had consolidations present. 147(81.2)patients had a positive PCR whereas 34 (18.7%) was negative had an HRCT that was suggestive of having COVID-19 pneumonia. **Conclusion:** In conclusion clinical symptomatology, HRCT findings and PCR all should be used in a triple examination. It is concluded that a positive PCR test is very specific and used to make diagnosis for Covid-19. CT has a higher sensitivity but a lower specificity, thus helping with disease diagnosis and therapy.

INTRODUCTION

The Covid-19 pandemic started in China in 2019[1]. It is the fifth pandemic to be reported in present era because of its unexpected course in patients and vast dissemination[2]. It has transformed the way modern medicine is practiced and brought a component of infectious diseases to all fields of medicine.Fever(85%), cough(70%), and shortness of breath (43%) are the most common symptoms of COVID-19, but stomach and other symptoms are also possible or the disease can be silent. In some series of patients with a positive Covid-19 test, the overall death rate is 2.3 percent[3]. It is unaware that many people were sick but never tested for the virus, the true mortality rate of all[4] infected persons is likely to be significantly lower[5]. The severity of an illness can range from minor to serious. Mild symptoms include no symptoms, mild coughing[6], and a mild fever. Dyspnea, hypoxia, or more than 50% lung involvement on imaging are all signs of severe lung involvement[7]. Respiratory failure, shock, and multi-organ failure are all considered critical.Covid-19 was discovered on December 8, 2019 in Wuhan, China according to multiple epidemiological studies. After expanding through Iran, Europe, India, United Kingdom and Pakistan it was declared a pandemic on March

11, 2020. The first case of this disease was discovered in Pakistan around the end of February 2020[8]. Covid-19 is highly contagious and spreads mostly through human-to-human transmission[9]. According to data given by the Pakistani government on February 15, 2021, there were 564,077 total reported cases in Pakistan, with 12,333 total deaths and 525,277[10] total recoveries. A lot of patients of Covid-19 may have a positive PCR somehow be asymptomatic; radiologists carry a significant burden in assisting in the identification of these patients. The CO-RADS criteria were created by radiologists to simplify radiological abnormalities on chest CT scans for the diagnosis and severity grading of Covid-19 infections[11,12]. The severity scale goes from unlikely to atypical infection to typical infection with a high suspicion[13], with one being the least likely possibility of COVID-19 infection and 6 being documented COVID-19 infection; the severity scale goes from unlikely to atypical infection to typical infection with a high suspicion[15]. In addition, the CO-RADS criteria were created with both usual and unusual observations in mind. Crazy paving, consolidations[14] with ground glass opacities, and other finds are common. Halo sign, infiltrates, and effusions are examples of unexpected findings[16]. Despite the fact that HRCT is a useful supplementary tool in the screening of early symptoms in the lung parenchyma, PCR remains the gold standard. However, it is not uncommon for HRCT to reveal early alterations in symptomatic individuals despite a negative PCR. In the current pandemic, the efficacy of both methods[17], PCR and HRCT, cannot be overstated, and the importance of HRCT as a follow-up tool for pulmonary symptoms expansion and remission remains critical. Furthermore, while HRCT may be deemed sensitive, PCR remains specific. Though there is no shortage of literature on Covid-19 patients, with numerous publications following the pandemic with evolving strains[18] and ever-growing changes in presentation and findings literature on Covid-19 remains a constant need to establish better and clearer management and diagnosis criteria[19].
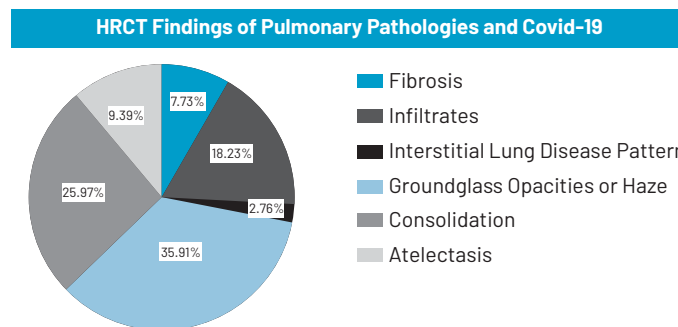
METHODS

This study was conducted from December 2020 till August 2021 at a Private Secondary Care Hospital in Lahore, Pakistan. The Suspected COVID-19 patients were reviewed and followed-up until PCR result became available confirmed and HRCT was done. This prospective cohort study was done with the objective to study the relationship between PCR results and HRCT results amongst suspected COVID-19 patients. Informed consent was taken from all patients and ethical approval taken from ethical review Committee. SPSS V 22.0 was used to analyze the data of 181 patients that presented as suspected COVID-19 patients in this hospital over the study period.

RESULTS

A Total of 181 participants, mean age of participants was 55.6 year S.D 14.6, the oldest patient was 87 years old and the youngest was 19 years old. 34.2% were female and 65.8% were male. The three most common symptoms, 77.6% had shortness of breath; 86.8% had a dry cough, 57.9% had fever and 6.6% had chest pain or tightness. 84.2% of patients in our study had a positive PCR test result that is 147(81.2) of the participants, whereas only 34 (18.7%) had a negative result. HRCT findings for pulmonary diseases and Covid-19 were mentioned and evaluated using special protocols on computed Tomography.

HRCT Findings of Pulmonary Pathologies and Covid-19				
	Frequency	Percent	Valid Percent	Cumulative Percent
Fibrosis	14	7.7	7.7	7.7
Infiltrates	33	18.2	18.2	26.0
Interstitial Lung Disease Pattern	5	2.8	2.8	28.7
Ground glass Opacities or Haze	65	35.9	35.9	64.6
Consolidation	47	26.0	26.0	90.6
Atelectasis	17	9.4	9.4	100.0
Total	181	100.0	100.0	

HRCT Findings of Pulmonary Pathologies and Covid-19

- Fibrosis
- Infiltrates
- Interstitial Lung Disease Pattern
- Groundglass Opacities or Haze
- Consolidation
- Atelectasis

Fibrosis was present in 14(7.7 %) patients who had a history of tuberculosis, however they were PCR positive. The most common appearance was Ground glass opacities or haze 65 (35.9%) following second common Consolidations 47(26 %). Both of the Patients have all 3 main Symptoms of Covid 19. Less common were Interstitial Lung Disease 5 (2.85) and Atelectasis with 17(9.4). A chi-square test was done to see if PCR result was significantly associated to HRCT result, a p-value off 0.01 was obtained, thus showing there is a significant association between a positive PCR test and an HRCT suggestive of Covid-19 pneumonia.

Chi-Square test was conducted on different findings of HRCT were significantly correlated with the HRCT being suggestive of Covid-19.

Chi square on findings on HRCT Suggestive of Covid-19 Pneumonia	
HRCT Findings	**P-Value**
Infiltrates	0.001
Fibrosis	0.50
Atelectasis	0.60
Consolidation	0.001
Ground Glass Density	0.001

On HRCT, infiltrates, consolidation, and ground-glass haze or densities were all linked to a suspicion of Covid-19 pneumonia. HRCT sensitivity was measured at 65.6 percent, specificity was 0 percent, and accuracy was calculated at 56 percent using PCR as a gold standard.

DISCUSSION

In current study results were based on 181 participants having 86.8% of patients had a dry cough, followed most commonly with shortness of breath. 65 (35.9%) of patients had ground-glass opacities of haze on HRCT followed by 47 (26 %). who had consolidations present. 147 (81.2)patients had a positive PCR whereas 34 (18.7%) was negative had an HRCT that was suggestive of having COVID-19 pneumonia.Sensitivity and specificity were 92 percent and 23 percent, respectively, in a study conducted in Pakistan in 2021, while accuracy was 51 percent. While their sensitivity was 92 percent, ours was 65.6 percent, indicating that the true positive rate with HRCT in our study was lower. However, while their specificity was 23 percent, ours was 0 percent because no participants in our study had HRCTs that were negative for COVID-19 and also had a negative PCR result. Patients with symptoms and HRCT characteristics indicative of COVID-19 pneumonia were found patients PCRs that were negative. According to a systematic review, sensitivity was higher, especially in places where the pandemic was more severe, with values exceeding 90%; but, in areas where the cases were lower, sensitivity was as low as 61%[6]. This is especially true in Pakistan, where cases and positivity rates are lower than in most other locations, with the peak positivity rate in May 2020 hovering around 25%. The systematic review also discovered that specificity rates varied, with higher specificities in places with higher positivity and where the pandemic is more established[12], and lower specificities in other locations as low as 25%[10].This raises the possibility that the 34 patients in our study who were PCR negative but were diagnosed with COVID-19 based on HRCT findings and symptomatology had a false negative PCR result[16], but the HRCT was appropriately positive in this case. It raises the possibility that, rather than utilizing PCR as a gold standard, clinical scenarios should be assessed using symptomatology, PCR results, and HRCT findings; a sort of triple testing. Two positive of the three should be used as the primary criterion for determining whether or not someone is infected with COVID-19 pneumonia[13]. The most specific results with COVID-19 pneumonia were ground-glass opacities, infiltrates, and consolidation, with ground-glass opacities being a typical finding recognized by the Dutch Radiological Society[20]. It's worth noting that these were the findings that were shown to be positively associated on HRCTs where COVID-19 was validated by PCR in our study. With this in mind, we may anticipate that such data, when combined with the clinical picture[11], should raise a high level of suspicion for COVID-19 pneumonia among doctors who may be experiencing diagnostic challenges or considering other diagnoses during the pandemic.

CONCLUSSION

In conclusion Covid-19 pneumonia shows characteristic patterns on HRCT, and that is applicable to the CO-RADs criteria of HRCT establishing a diagnosis. Clinical symptomatology, HRCT findings, and PCR should all be used in a triple examination, especially in locations where COVID-19 positive is low.A positive PCR test is very specific and used to make the diagnosis for Covid-19. CT has a higher sensitivity but a lower specificity, and it can help with disease diagnosis and therapy.

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