Libyan Journal of Medical Research

www.ljmr.ly/ eISSN:2413-6096

Original Article

The Correlation Between Chest CT Severity and Clinical Data Of Patients with COVID-19

Nagwa. R. Bochwal [1], Huda M. Ibrahim [1], Wfa A.A Nweh [1] Muhammad .Y.Alsawy [2] . Ghanem .M. Jamal [2] . Abdullh .A.Ali [2], Hamza. F. Atia [2] . Fared .R. Fared [2]

1 . Faculty of Medical Technology, University of Tobruk, Tobruk, Libya.

2. Students at the Faculty Of Medical Technology, University of Tobruk, Tobruk, Libya.

Corresponding Author: Nagwa .R. Bochwal: E-mail. **najwa.rezg24684@gmail.com**

Received:05/05/2025Accepted:07/08/2025Published:09/08/2025,DOI :https://doi.org/10.54361/LJMR.19.2.21

ABSTRACT:

Purpose: The study aims to examine the correlation between clinical laboratory data, including RT-PCR results, and the severity of chest CT findings in COVID-19 patients. Early detection of severe cases can help reduce ICU admissions and improve patient outcomes. Data were collected from the laboratory at Tobruk Medical Center (TMC) and non-contrast high-resolution chest CT scans by a professional team. **Materials and Methods:** A retrospective analysis was conducted on 94 COVID-19 patients treated at The Medical Center of Tobruk in 2021. The study population included 58 males and 35 females, covering both young and elderly patients with and without chronic illnesses. Epidemiological, demographic, clinical, and outcome data—including ICU admissions and mortality—were analyzed using Microsoft Excel 2010. RT-PCR test results were obtained from the accredited Department of Laboratory Medicine at Tobruk Medical Center, which is responsible for PCR testing in the Tobruk region. The case definition followed the World Health Organization (WHO) interim guidance. **Results:** The results showed that 58% of the patients were male, while 35% were female. Patients were divided into two age groups: those below 40 years and those above 40 years. Among them, 4% of females and 7% of males were under 40, while 9% of females and 54% of males were above 40. The study also analyzed the presence of chronic illnesses: 27 patients had hypertension (BP), 5 had both hypertension and diabetes (DM), 1 had cerebrovascular accident (CVA), 18 had diabetes only, and 40 had no chronic diseases. **Conclusion:** This study highlights the significant correlation between chest CT severity and clinical data, particularly in older patients and those with chronic illnesses. Males exhibited a higher severity rate. The findings emphasize the importance of integrating laboratory and imaging data for early detection, which can aid in reducing ICU admissions and improving patient management.

KEYWORDS: COVID-19; Chest CT Severity; RT-PCR; ICU Admission; Chronic Illness

How to cite this article: Bochwal, N.R, Ibrahim. H.M, Nweh W.A, Alsawy.M.Y, Jamal.G .M, Ali. A.A, Atia.H. F, Fared.F.R.The Correlation Between Chest CT Severity and Clinical Data Of Patients with COVID-19.

Libyan19-2

INTRODUCTION

COVID-19 is an infectious disease that has spread rapidly across the world, leading to a global pandemic since its emergence in late 2019 [1].COVID-19 has posed significant challenges to healthcare systems worldwide, including increased mortality rates and heightened pressure on intensive care units (ICUs). Libya, like many other countries, has experienced a surge in COVID-19 cases, further straining medical resources [2]. One of the critical challenges in managing this pandemic has been the accurate and timely diagnosis of infected individuals. The primary diagnostic tool for COVID-19 has been the reverse transcription-polymerase chain reaction (RT-PCR) test, which detects
viral RNA from nasopharyngeal swabs. While RT-PCR is considered the gold standard for COVID-19 diagnosis, it has a notable false-negative rate, leading to missed diagnoses in some cases [3].

Given this limitation, high-resolution computed tomography (HRCT) of the chest has emerged as a crucial supplementary tool in detecting COVID-19-related pulmonary involvement, particularly in patients with respiratory symptoms and negative RT-PCR results [4]. Chest computed tomography (CT) plays an even more significant role in the detection, evaluation, and management of COVID-19.CT scans are superior to plain radiography because they can detect subtle abnormalities like GGO that may be missed on standard chest X-rays [5]. Thin-section chest CT is recommended for early detection, as it reveals GGO and consolidation, often in the peripheral regions of the lungs. Typical findings on CT include GGO, consolidation, pleural effusion, lymphadenopathy, lung cavitation, and calcification, particularly along the borders of the inferior and dorsal pulmonary areas. CT is crucial not only for diagnosing SARS-CoV-2 infections but also for assessing disease progression. A pooled analysis of studies on CT findings in COVID-19 revealed that GGO was present in 71.64% of patients, mixed patterns in 35.22%, and consolidation in 29.15% [6].Uncommon findings included pleural effusion (5.08%), lymphadenopathy (7.64%), and the reversed halo sign (14.98%). Bilateral lung involvement was common, with peripheral areas being most affected. The Left Lower Lobe (LLL) was more frequently involved than the Left Upper Lobe (LUL), consistent with the effect of gravity [7]. CT findings can significantly help clinicians assess the severity of COVID-19, particularly in cases where RT-PCR results are delayed or inconclusive, providing valuable information for treatment decisions and patient management [7].

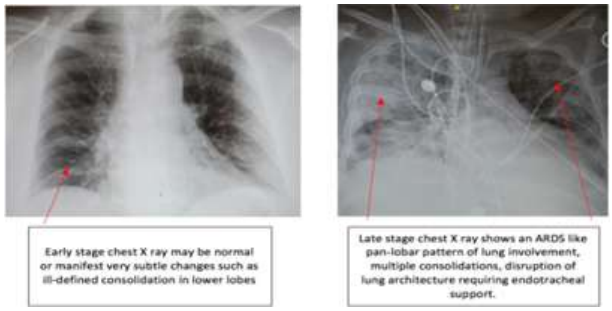

Figure 1. CXR normal &abnormal

This study aims to assess the correlation between HRCT chest findings and RT-PCR results in COVID-19 patients. By evaluating the diagnostic and prognostic value of HRCT, we seek to determine its role in identifying severe cases requiring ICU admission. Furthermore, this study will provide insights into the reliability of HRCT as a diagnostic method in cases where RT-PCR results are inconclusive or negative despite strong clinical suspicion. The findings will contribute to enhancing COVID-19 diagnostic strategies and optimizing patient management during the ongoing pandemic.

MATERIALS AND METHODS:

Study Design and Participants

Data was collected from COVID-19 patients admitted to the Medical Center of Tobruk in 2021. A total of 94 patients were included, with 58 males and 35 females. The participants varied in age, from young to elderly individuals, and included both those with chronic illnesses and those without. The data collected comprised epidemiological, demographic, and clinical details, and outcomes such as ICU admission and mortality, in addition to RT-PCR test results.

Data Collection and Analysis

A retrospective analysis was conducted on all suspected COVID-19 cases. Epidemiological, demographic, clinical, and outcome data were gathered from hospital records. Data analysis was performed using Microsoft Excel 2010, applying descriptive and comparative statistical methods to assess relationships between clinical features and outcomes.

Case Definition and Diagnostic Testing

The case definition followed the World Health Organization's (WHO) interim guidance for COVID-19. Diagnostic RT-PCR tests were conducted by the accredited Department of Laboratory Medicine at Tobruk Medical Center, which is responsible for PCR testing in the Tobruk region.

Sampling Methodology

Samples were collected by healthcare professionals from the National Emergency Service or local healthcare providers. For patients requiring hospitalization or ventilation, lower respiratory tract samples (tracheal sputum) were obtained, while for other patients, upper respiratory tract samples (nasopharyngeal or pharyngeal swabs) were taken. All specimens were labeled with the patient's name, date of birth, specimen type, and the date and time of collection. The samples were placed in individual sterile collection tubes, which were then securely packaged in double-wall plastic bags for transport to the laboratory.

Imaging Procedure

CT scans were performed using a Toshiba 32-slice CT machine (model 32SLIDEI) located in the radiology department at Tobruk Medical Center. The CT imaging was conducted using axial, sagittal, and coronal modalities to evaluate lung involvement in COVID-19 patients.

Figure 2 shows the CT in the medical center in Tobruk.

Ethical Approva

This study was conducted in compliance with ethical standards. Ethical approval was granted by the National Centre for Public Health. All patient data was anonymized, and privacy was maintained by ethical requirements for retrospective studies. By following the above procedures, the study aimed to investigate the relationship between clinical features, diagnostic methods, and patient outcomes in COVID-19 cases at Tobruk Medical Center.

RESULTS :

The patient sample was composed of 58% males and 35% females, as shown in Fig. 3. Age distribution also varied, with significant differences observed between patients above and below 40 years of age.

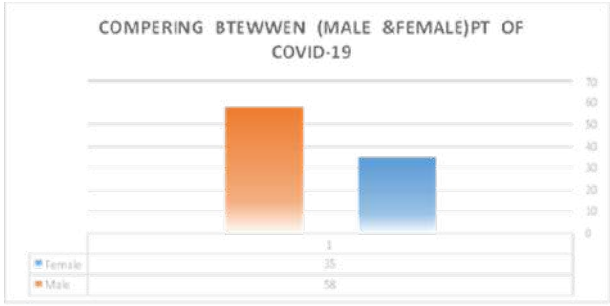

Figure 3. Gender Distribution of COVID-19 Patients at the Medical Center of Tobruk

The age distribution of patients was analyzed to explore the differences between those above and below 40 years of age. Fig. 4 revealed that 4% of female patients were below 40 years, while 9% were above 40 years. Among male patients, 7% were below 40 years, and a higher percentage, 54%, were above 40 years.

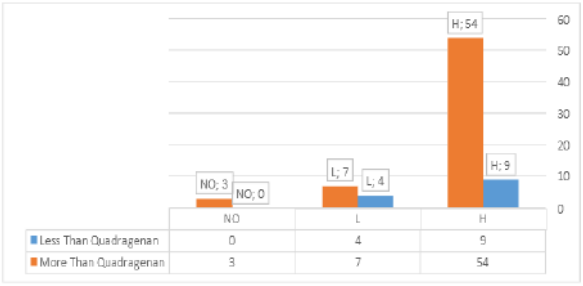

Figure 4. Age and Gender Distribution of COVID-19 Patients Above and Below 40 Years.

This suggested a notably higher proportion of older male patients, which may have indicated that age was a significant factor in the severity and outcomes of COVID-19. In Fig. 5, male patients were further categorized by age group, showing that 2 males were in the low age range (below 40 years), 16 were in the middle age range (40–60 years), and 29 were in the high age range (above 60 years).

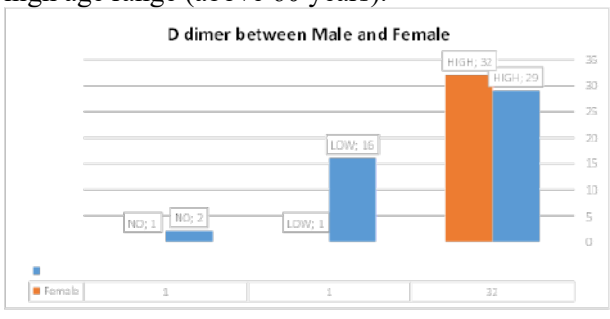

Figure 5. show 4% from females and 7% from males below quadragenarian, and 9% from females, and 54% from males above quadragenarian.

This highlighted those older males (above 60 years) represented the majority of male patients, reinforcing the association between older age and more severe

COVID-19 outcomes. Fig. 6 presented the chronic disease distribution, showing that 27 patients had hypertension, 1 patient had both hypertension and a cerebrovascular accident (CVA), 5 had hypertension and diabetes, 1 had a CVA alone, 18 had diabetes, and 40 had no chronic diseases.

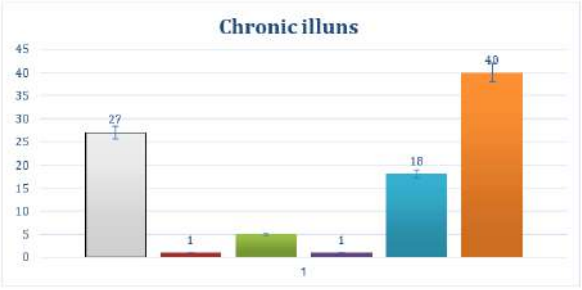

Figure 6 shows patients with chronic diseases, 27 have BP, 1 with Bp with CVA, 5 have Bp with Di, 1 has CVA, 18 have Di, and 40 have no diseases

The high prevalence of hypertension and diabetes among patients, particularly older adults, was consistent with global trends, as these conditions were known to be associated with more severe COVID-19 outcomes. This suggested that managing chronic diseases was crucial in the treatment and prevention of COVID-19, especially for older individuals.

DISCUSSION:

The findings of this study indicate that computed tomography (CT) scanning demonstrated relatively strong performance compared to reverse transcription-polymerase chain reaction (RT-PCR) as the reference standard for the initial detection of COVID-19. The study observed a low false-negative rate of approximately 9%, suggesting that CT scans can effectively identify a significant proportion of COVID-19 cases during a pandemic. However, the false-positive rate was notably higher, around 22.5%, which may impact diagnostic accuracy in settings with varying prevalence rates [8]. The diagnostic performance of any test is highly context-dependent, and the effectiveness of CT scans in identifying COVID-19 may differ outside of a pandemic setting or in regions with different endemic patterns. The findings suggest that CT scan reliability might decline under non-pandemic conditions due to an increased rate of false positives. This aligns with previous studies highlighting the relatively modest median positive likelihood ratio for CT scans even within pandemic conditions [9]. Nevertheless, in patients presenting with acute cardio-respiratory symptoms requiring hospitalization, a negative CT scan, especially when corroborated by a negative RT-PCR result, provides reassurance, given the low median negative likelihood ratio [10]. For effective pandemic management, an ideal diagnostic test should be rapid, highly sensitive, and capable of minimizing false negatives. Such a test would facilitate accurate decision-making regarding patient isolation in hospital and community settings. This study found that among patients with a suggestive CT scan but a negative initial RT-PCR result, CT was able to detect a high proportion of hospitalized COVID-19 cases. Additionally, a small subset of patients initially testing RT-PCR negative but later testing positive demonstrated suggestive CT findings in 79.2% of cases (42 out of 53 patients). However, it is important to acknowledge that not all initially RT-PCR-negative patients were systematically retested, potentially skewing these findings [11]. Overall, the results suggest that while CT scanning can serve as a supplementary diagnostic tool in certain situations, it should not replace RT-PCR as the primary testing method. This aligns with published guidelines, which do not recommend routine CT scans for COVID-19 diagnosis [11]. CT scans also come with inherent limitations, including radiation exposure risks, particularly in pregnant patients. Furthermore, excessive use of CT imaging can lead to incidental findings, increasing unnecessary healthcare costs and workload for radiology departments. Additionally, sterilization protocols required after each CT scan can delay urgent imaging for other life-threatening conditions [12]. Given these limitations, the study suggests that chest CT should be restricted to a complementary diagnostic role, particularly for patients with persistent COVID-19 symptoms but at least one or more negative RT-PCR test results. In such cases, repeat upper respiratory tract RT-PCR testing, which is simple and cost-effective, should be prioritized over CT scanning. However, in clinical practice, some patients with strong clinical suspicion of COVID-19 remain RT-PCR negative even after multiple tests, and it is in such cases that CT scans may provide circumstantial evidence supporting the diagnosis [13].

CONCLUSION:

The study systematically synthesized the best available comparative evidence regarding the identification of COVID-19 using chest CT scans versus RT-PCR as the reference standard. The findings indicate that chest CT may serve as a valuable adjunct in the initial detection of COVID-19, particularly in hospitalized patients during a pandemic. However, RT-PCR should remain the primary diagnostic tool due to its higher specificity.

We recommend that chest CT be considered only in cases where there is a strong clinical suspicion of

COVID-19 despite multiple negative RT-PCR results, provided that infection prevention and control measures are maintained. Additionally, a negative CT scan can provide reassurance in RT-PCR-negative patients who require hospitalization for suspected COVID-19.

The study's contributions extend to both the scientific and economic domains. From a scientific perspective, it highlights the complementary role of CT imaging in COVID-19 diagnosis, helping clinicians make informed decisions in challenging cases. Economically, limiting CT use to specific situations can reduce unnecessary healthcare costs, optimize resource allocation, and prevent overburdening radiology departments. Future research should explore the integration of CT imaging with emerging diagnostic techniques to improve overall diagnostic accuracy in infectious disease outbreaks.

REFERENCES:

1. Malik YS, Kumar N, Sircar S, Kaushik R, Bhat S, Dhama K, Gupta P, Goyal K, Singh MP, Ghoshal U, El Zowalaty ME. Coronavirus disease pandemic (COVID-19): challenges and a global perspective. Pathogens. 2020 Jun 28;9(7):519.
2. Mahmoud AS, Dayhum AS, Rayes AA, Annajar BB, Eldaghayes IM. Exploiting epidemiological data to understand the epidemiology and factors that influence COVID-19 pandemic in Libya. World Journal of Virology. 2021 Jul 25;10(4):156.
3. Komurcuoglu B, Susam S, Batum Ö, Turk MA, Salik B, Karadeniz G, Senol G. Correlation between chest CT severity scores and clinical and biochemical parameters of COVID-19 pneumonia. The Clinical Respiratory Journal. 2022 Jul;16(7):497-503.
4. Rani D, Bajaj H, Singh R. SARS-COV-2 (COVID-19) and role of real time Reverse Transcription Polymerase Chain Reaction (RT-PCR) in its diagnosis. Research Journal of Pharmacy and Technology. 2021;14(6):3437-40.
5. Machnicki S, Patel D, Singh A, Talwar A, Mina B, Oks M, Makkar P, Naidich D, Mehta A, Hill NS, Brown KK. The usefulness of chest CT imaging in patients with suspected or diagnosed COVID-19: a review of literature. Chest. 2021 Aug 1;160(2):652-70.
6. Adams, H. J., Kwee, T. C., Yakar, D., Hope, M. D., & Kwee, R. M. 2020. Chest CT imaging signature of coronavirus disease 2019 infection: in pursuit of the scientific evidence. *Chest* ***158***:1885-1895.
7. Ishfaq A, Farooq SM, Goraya A, Yousaf M, Gilani SA, Kiran A, Ayoub M, Javed A, Bacha R. Role of High-Resolution Computed Tomography chest in the diagnosis and evaluation of COVID-19 patients-A systematic review and meta-analysis. European journal of radiology open. 2021 Jan 1; 8:100350.
8. Ai T, Yang Z, Hou H, Zhan C, Chen C, Lv W, Tao Q, Sun Z, Xia L. Correlation of chest CT and RT-PCR testing for coronavirus disease 2019 (COVID-19) in China: a report of 1014 cases. Radiology. 2020 Aug;296(2): e32-40.
9. Kanne JP. Chest CT findings in 2019 novel coronavirus (2019-nCoV) infections from Wuhan, China: key points for the radiologist. Radiology. 2020 Apr;295(1):16-7.
10. Inui S, Fujikawa A, Jitsu M, Kunishima N, Watanabe S, Suzuki Y, Umeda S, Uwabe Y. Chest CT findings in cases from the cruise ship diamond princess with coronavirus disease (COVID-19). Radiology: Cardiothoracic Imaging. 2020 Mar 17;2(2):e200110.
11. Rubin GD, Ryerson CJ, Haramati LB, Sverzellati N, Kanne JP, Raoof S, Schluger NW, Volpi A, Yim JJ, Martin IB, Anderson DJ. The role of chest imaging in patient management during the COVID-19 pandemic: a multinational consensus statement from the Fleischner Society. Radiology. 2020 Jul;296(1):172-80.
12. Bernheim A, Mei X, Huang M, Yang Y, Fayad ZA, Zhang N, Diao K, Lin B, Zhu X, Li K, Li S. Chest CT findings in coronavirus disease-19 (COVID-19): relationship to duration of infection. Radiology. 2020 Jun;295(3):685-91.
13. Fang Y, Zhang H, Xie J, Lin M, Ying L, Pang P, Ji W. Sensitivity of chest CT for COVID-19: comparison to RT-PCR. Radiology. 2020 Aug;296(2):E115-7.