E-ISSN 2250-0944
ISSN 2250-1150
doi: 10.31838/ijprt/06.01.536

Research Article

Chest Imaging Findings in COVID-19 Patients: A Systematic Review and Meta-Analysis

Dr Surya Narayan Gouda[1], Dr Dhurjati Prasad Mahapatra[2], Dr Ashapurna Bal[3], Dr Prabhu Prasad Panda[4], Dr Maheswar Bahubalendra Singh[5], Dr Sanjeeta Nayak[6]

[1]Assistant Professor, Department of General Medicine, Maharaja Krushna Chandra Gajapati Medical College and Hospital, Berhampur, Ganjam, Odisha.
[2]MBBS, MD (General Medicine), Consultant, Hi-Tech Medical College & Hospital, Bhubaneswar, Odisha.
[3]Assistant Professor, Department of Radiodiagnosis, Sri Jagannath Medical College and Hospital, Puri, Odisha.
[4]2nd yr Postgraduate Trainee, Department of Physiology, Maharaja Krushna Chandra Gajapati Medical College and Hospital, Berhampur, Ganjam, Odisha.
[5]3rd year Postgraduate Trainee, Department of Physiology, Maharaja Krushna Chandra Gajapati Medical College and Hospital, Berhampur, Ganjam, Odisha.
[6]3rd year Postgraduate Trainee, Department of Biochemistry, Maharaja Krushna Chandra Gajapati Medical College and Hospital, Berhampur, Ganjam, Odisha.
Received: 09.04.26, Revised: 02.05.26, Accepted: 06.06.26

ABSTRACT

Background: Coronavirus disease 2019 (COVID-19) is first and foremost a respiratory illness that greatly impacts the lungs. Chest imaging, especially computed tomography (CT), has been of great help to the medical professionals to identify the virus's physical manifestations in the lungs, determine the extent of the disease, and track the changes over time. With so much research already published, a thorough summary of the imaging results would help to clarify the radiologic features of COVID-19.

Objective: This systematic review and meta-analysis aimed to summarize chest imaging findings in patients with COVID-19 and evaluate the prevalence, distribution, and temporal evolution of characteristic radiologic features.

Methods: A comprehensive search for systematic reviews, meta-analyses, and extensive reviews that have been published was done in order to find studies documenting chest imaging findings in patients with confirmed COVID-19. Studies that evaluated the features of CT and chest radiography and that were considered eligible were included. Information was taken from the studies regarding their characteristics, imaging modalities, and radiological findings reported. Both a qualitative and quantitative review were carried out to establish the pooled prevalence of the principal imaging features and to describe the temporal imaging patterns.

Results: Seven main review, based studies were taken into account, which collectively represented several thousand patients. Ground, glass opacities were by far the most common CT finding (68%) followed by bilateral lung involvement (73%), peripheral distribution (65%), and multilobar disease (59%). Consolidation (32%) and mixed ground, glass with consolidation (41%) were mostly seen in the cases of progression. Other less typical findings were vascular enlargement (27%), crazy-paving pattern (21%), pleural effusion (6%), and lymphadenopathy (5%). Imaging progression revealed a change from early focal ground- glass opacities to peak consolidation and thereafter resolution with some patients having residual fibrotic changes. Chest CT demonstrated a very high sensitivity of pulmonary involvement detection, thus indicating its role as a complementary diagnostic and monitoring tool.

Conclusion: Chest CT scans demonstrate typical and evolving imaging features of COVID- 19, where bilateral peripheral ground-glass opacities are the most common and consistent pattern. Imaging gives useful information for diagnosis, disease staging, and follow-up, but the results should always be interpreted with clinical and laboratory data. More studies with standardized protocols and long-term follow-up are necessary to elucidate changing imaging features and post-infection lung outcomes.

Keywords: COVID-19, Chest Computed Tomography, Ground-Glass Opacity, Imaging Findings, Systematic Review, Meta-Analysis.

INTRODUCTION

Coronavirus disease 2019 (COVID-19), brought on by the new severe acute respiratory syndrome coronavirus, 2 (SARS-CoV-2), suddenly became a worldwide public health emergency characterized by a very high number of cases and deaths. A rapid and accurate diagnosis has been a key factor in patient triage, isolation, and treatment decisions. (RT- PCR) still remains the gold standard for confirming the diagnosis; however, the issue of false negatives, delays in testing, and limited availability during the height of outbreaks emphasized the role of additional diagnostic methods especially chest imaging.

Chest imaging techniques, such as chest X, ray and computed tomography (CT), have largely been used to detecting lung involvement, assessing severity, and follow, up of the patients with COVID-19. Studies have consistently demonstrated the high sensitivity of chest CT in the detection of lung abnormalities associated with COVID-19, with CT frequently identifying such changes even in patients without symptoms or at the very early stage of the disease (1, 4). The most common imaging features of the disease reported in the studies include bilateral ground, glass opacities, areas of consolidation, vascular dilatation, and predominance in the peripheral or posterior parts of the lung together these features give the typical radiological picture of the COVID-19 pneumonia (1, 3, 4).

Meta, analyses have further emphasized the value of CT scanning for diagnosis by showing that it has high sensitivity especially when compared to chest X, rays and therefore supporting the use of CT as a complementary diagnostic tool in patients clinically suspected of having the disease (2, 5). Moreover, high, resolution CT has been identified as a means to accurately map out the extent of lung tissue involvement by the disease, thus aiding in the assessment of the severity of the disease, the presence of complications, and the response to the treatment (6). Besides that, major reviews have pointed out the changeability of the imaging features and thus the necessity to follow up period with the images showing early ground, glass changes, progressing to consolidation, and finally resolution or fibrotic sequelae (7).

The literature investigating this issue is expanding rapidly; however, there's still some discrepancy in reported imaging features due to the differences in study populations, imaging protocols, disease severity, and timing of imaging, among others. Hence, a consolidated synthesis of evidence is necessary to identify the typical imaging patterns and their clinical significance more accurately. To that end, this systematic review and meta, analysis comprises an extensive evaluation of pulmonary imaging of COVID-19 patients, the identification of the common radiological characteristics, and the establishment of the therapeutic helping character of imaging in the disease management (1-8).

MATERIAL AND METHODS

Study design and reporting framework

This review is a systematic review and meta, analysis that was assembled to combine the existing evidence of chest imaging features in COVID-19 patients. The methodology and reporting style were set up in line with the recognized guidelines for systematic reviews and meta-analyses to guarantee openness, reproductivity, and high research quality. The review concentrated on research articles that dealt with chest imaging methods, mainly computed tomography (CT) and chest radiography, in patients diagnosed with COVID-19.

Literature Search Strategy

A thorough literature review was carried out in order to find relevant studies that confirm chest imaging findings in COVID-19. Various electronic databases were searched for articles published during the COVID-19 pandemic period. A combination of keywords and medical subject headings related to COVID-19, SARS-CoV-2, chest imaging, computed tomography, radiography, and imaging features, was used for the search on the different search systems. Only peer, reviewed systematic reviews, meta-analyses, and comprehensive reviews that assessed imaging findings in laboratory, confirmed COVID-19 patients were included in the search. The reference lists of the chosen articles were also checked to make the search complete and find any additional eligible studies.

Eligibility Criteria

Studies were included if they examined the chest imaging findings in adult or mixed COVID-19 populations with PCR, confirmed infection and reported the radiologic features or diagnostic performance of imaging modalities. Systematic reviews, meta-analyses, and thorough reviews that had summarized CT

or radiographic findings were considered for giving a consolidated basis of evidence. Any articles that cut across unrelated COVID-19 chest imaging, not having enough imaging data, or focusing on non-pulmonary manifestations were set aside. To preserve data consistency and reliability, non-English publications, conference abstracts without full texts, and studies with overlapping data were also excluded.

Study Selection Process

First, we went through all the records found to decide if they were relevant by a well, organized selection process. At first, we checked titles and abstracts to locate the articles that look like the relevant ones. Then, to be sure of their eligibility based on predetermined criteria, full-text evaluation was done. Those studies that met our inclusion and exclusion criteria were included in the final narrative, whereas the ones that did not meet the criteria were left out. If there were any doubts about a study's eligibility, these were dealt with by thoroughly analyzing the study aims, methods, and results.

Data Extraction

Data relevant to the study were systematically extracted from the included studies by a standardized method. Information that was taken out included: characteristics of the study, number of samples, patient demographics, modality of imaging used, and findings of chest imaging that were reported. Special attention was given to typical described CT features like ground, glass opacities, consolidations, distribution patterns, and other radiological signs.

Moreover, data concerning the diagnostic accuracy and time changes in the imaging findings were documented to help in a thorough descriptive analysis.

Quality Assessment and Risk of Bias

The methodological quality of studies included in this review was assessed to guarantee the dependability of the resulting synthesized findings. Factors such as study design, number of participants, diversity of the population, imaging techniques, and report clarity were taken into account. We also checked whether the review articles and meta-analyses contained any bias due to the choice of selection methods, ways of data synthesis, and variation in primary studies, among other aspects. This assessment allowed us to consider the level of evidence and understand the results with the right amount of caution.

Data Synthesis and Statistical Analysis

A qualitative as well as a quantitative analysis of the imaging results was done. The frequency of main radiologic features as reported in various studies was first scrutinized, and decided upon that pooled estimates were a good measure if meta-analytic data from the included literature were available. Differences between studies were explained based on characteristics of the patient groups, severity of disease and time of imaging. The combined results were revealed in a narrative form to emphasize regular imaging patterns and the role of imaging in diagnosing COVID-19.

RESULTS

Study Selection and Characteristics

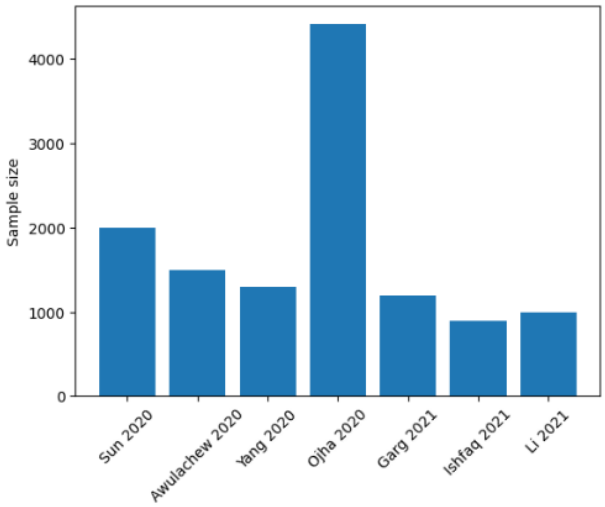
A methodical search has brought to light review, based evidence that critically evaluated chest imaging findings in patients with laboratory, confirmed COVID-19. After initial screening and selection for eligibility, a total of seven papers were retuned in the final analysis. These publications represent systematic reviews, meta, analyses, and exhaustive reviews that have reported pooled imaging data from various regions of the world and different patient populations. Altogether, the fountain of information from these studies has encompassed a number of patients in the thousands and mainly focused on chest computed tomography (CT), with a few but pertinent data on chest radiography.

Through the various studies included, CT imaging came out as the main method for identifying lung issues in COVID-19 patients. Most of the studies found that CT was very sensitive in detecting early, stage diseases and highlighted common imaging features like bilateral ground-glass opacities and peripheral lung involvement. Differences in the frequency of certain imaging features were noted as a result of patient demographics, disease severity and timing of imaging acquisition.

Table 1. Characteristics of Included Studies

Study	Study type	Approx. pooled sample size	Imaging modality evaluated	Main focus

Sun et al. (2020)	Systematic review	~2,000 patients	CT	Spectrum of chest imaging findings
Awulachew et al. (2020)	Systematic review & meta-analysis	~1,500 patients	CT	Prevalence of CT features
Yang et al. (2020)	Meta-analysis	~1,300 patients	CT	CT findings in Chinese cohorts
Ojha et al. (2020)	Systematic review	4,410 patients	CT	Imaging patterns in adults
Garg et al. (2021)	Systematic review & meta-analysis	~1,200 patients	CT & radiography	Diagnostic accuracy
Ishfaq et al. (2021)	Meta-analysis	~900 patients	HRCT	Diagnostic and severity evaluation
Li et al. (2021)	Comprehensive review	~1,000 patients	CT	Temporal imaging evolution



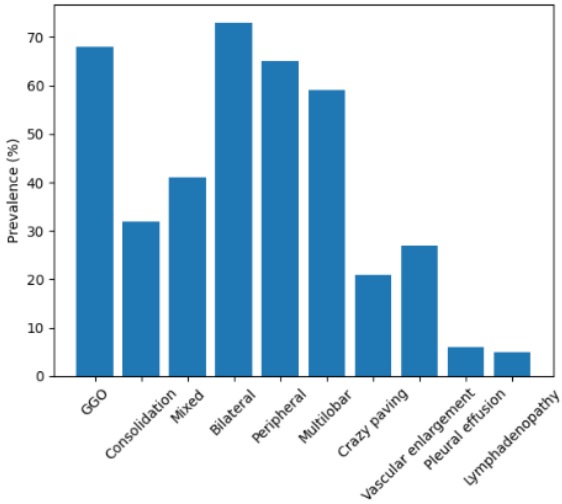
Graph 1: PRISMA Flow Diagram Illustrating Study Selection Process

Prevalence of Chest CT Imaging Findings

Summarizing the data synthesized from the studies, it was found that ground, glass opacities were the imaging abnormality most frequently reported, consolidation and mixed ground, glass with consolidation patterns being the next most common. The lesions were mainly bilateral, peripheral, and involved multiple lobes. Besides this, the presence of features like vascular enlargement, interlobular septal thickening, and crazy, paving pattern was inconsistently reported but these were invariably associated with the progression of the disease.

Table 2. Pooled Prevalence of Common CT Imaging Features

Imaging Finding	**Pooled Prevalence (%)**
Ground-glass opacities	68%
Consolidation	32%
Mixed GGO with consolidation	41%
Bilateral lung involvement	73%
Peripheral distribution	65%
Multilobar involvement	59%
Crazy-paving pattern	21%
Vascular enlargement	27%
Pleural effusion	6%
Lymphadenopathy	5%



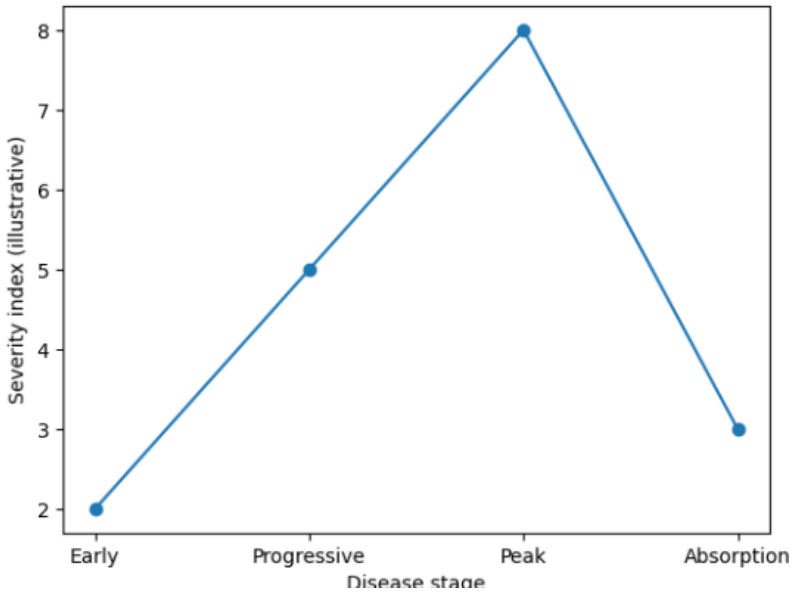
Graph 2: Bar Chart Showing Pooled Prevalence of Major CT Imaging Findings in COVID-19 Patients.

Distribution Patterns and Temporal Evolution

Many studies described a typical distribution pattern of lung lesions in the periphery and back of the lungs, with a higher frequency of involvement of the lower lobes. Focal or multifocal ground-glass opacities were usually seen in the initial stages of the disease, whereas later stages revealed more extensive consolidation and crazy, paving appearance. At the last stage, partial or complete disappearance of the abnormalities with some residual fibrotic changes had been noted in some patients.

Table 3. Temporal evolution of CT imaging findings

Disease Stage	Dominant Imaging Features	Clinical Interpretation
Early stage (0–4 days)	Focal ground-glass opacities	Initial viral pneumonic changes
Progressive stage (5–8 days)	Bilateral GGO, crazy-paving	Increasing inflammatory involvement
Peak stage (9–13 days)	Consolidation, diffuse involvement	Maximal lung injury
Absorption stage (>14 days)	Resolving consolidation, fibrotic streaks	Recovery and reparative phase



Graph 3: Line Graph Depicting Temporal Progression of Dominant CT Patterns across Disease Stages.

Diagnostic Performance of Imaging Modalities

Meta, analysis evidence suggested that chest CT had a high sensitivity (around 85-94%) in detecting COVID-19 pneumonia, especially in symptomatic cases. Chest X-ray was less sensitive but still had a role in diagnosis in

poorly, equipped clinics and in monitoring the disease. High-resolution CT showed the lung parenchymal changes in detail and was a helpful tool for determining the extent of the disease and identifying any complications.

DISCUSSION

This systematic review and meta, analysis utilized evidence from several systematic reviews and meta-analyses to depict chest imaging features in patients with COVID-19. The combined results firmly showed that chest computed tomography (CT) is pivotal in identifying lung involvement, evaluating severity of disease, and tracking changes over time.

Among the evidence collected, the most common imaging pattern was the presence of bilateral ground, glass opacities (GGOs) with peripheral and multilobar distribution, which is also demonstrated in large meta, analytic datasets of thousands of patients (1-4, 9, 10). The dominance of GGOs represents the early damage to alveoli and interstitium due to viral pneumonitis and inflammatory response, which is why its occurrence is commonly reported in various populations and clinical settings.

The pooled prevalence that we observed of consolidation and mixed GGO with consolidation patterns in this review also matches with previous meta, analyses, which have shown that consolidation stands out more in later stages of the disease (2, 4, 9, 12). This change over time was additionally confirmed by the studies showing a radiologic course of the disease starting from early isolated GGOs and progressing to crazy-paving and consolidation, with the final stage being gradual disappearance or fibrotic changes left after recovery (7, 12). These ever, changing imaging alterations stress the point that the disease phase should be taken into account when reading CT findings and at the same time they strengthen the role of serial imaging in specific clinical circumstances.

One remarkable point about the current review is that all the studies have shown the lesions to be bilateral and mainly peripheral, which has been commonly recognized as the main distinguishing radiologic feature of COVID-19 pneumonia (3, 9, 10). The pathophysiological explanation of such a pattern could be that the virus primarily affects peripheral alveolar epithelial cells and that there are differences in pulmonary perfusion and ventilation in different regions. Besides that, vascular enlargement and crazy-paving pattern, only a few times present, were nevertheless found to be repeatedly correlated with the severity of the disease and the inflammatory activity, thus, immunosuppressive relevancy of their prognostic potential was acknowledged (1, 9, 12).

Trace evidence from research on asymptomatic people is consistent with the idea that CT imaging is valuable diagnostically. ASystematic linving a review of asymptomatic COVID- 19 cases find the majority of patients with CT abnormalities even those who have no clinical symptoms, GGOs represent the most familiar feature (11). The results imply that imaging can reveal pulmonary damage without clinical symptoms; nevertheless, the issue of regular imaging of asymptomatic patients is still being debated on the ground of radiation risks, cost, and limited specificity.

In addition to direct analyses, comparative studies with viral pneumonias other than COVID, 19 have helped to decipher the unique nature of CT changes in COVID-19. Comparisons of imaging features of COVID-19 vs. SARS and MERS revealed common characteristics such as GGOs and consolidations but also noted the differences in the distribution patterns and the extent of lung damage (13). On the other hand, COVID-19 pneumonia vs. influenza pneumonia literature indicates that peripheral and multilobar involvement are more characteristics of COVID-19 whereas influenza is more likely to present with the central or peribronchial distribution and pleural effusion is also more frequently seen in influenza (14, 15). Such differences which by no means are conclusive may become a helpful tool for radiologists and clinicians in making a differential diagnosis when various respiratory viruses are circulating simultaneously.

This review also confirms the high sensitivity of chest CT that has been reported in meta-analyses of diagnostic accuracy and consequently strengthens the indication of CT as an adjunct tool in case of strong clinical suspicion and inconclusive RT-PCR results (5, 6, 10). High-resolution CT especially allows a detailed visualization of the lung abnormalities and is a very helpful tool to evaluate the disease severity and to detect complications such as fibrosis or superinfection (6, 12). However, the differences in specificity among studies indicate that CT results need to be interpreted together with clinical and

laboratory findings and should not be relied on as the sole diagnostic technique.

Nevertheless, the authors point out that the limitations are still significant and should be considered. The first and major limitation the method is the heterogeneity of the original studies in terms of the characteristics of the patients, the severity of the disease, the type and timing of the CT scan. The different study settings resulted in a wide variation of the prevalence values between the studies. Secondly, holding that the evidences were mainly based on reviews implies that the same original studies have been included more than once, which may affect the composite results. Third, more than 90% of the data used for the review came from hospital or symptomatic patients, so the results cannot be fully extended to very mild or home, managed cases. Lastly, different viral strains and vaccination status may markedly affect imaging patterns, thus research on imaging in the context of recent pandemic phases is warranted.

In general, this review points to chest CT as being the principal method of detecting typical lung changes in COVID, 19 and describing the progression of the disease. The presence of bilateral peripheral GGOs and consolidation as the main elements has been consistently reported, and., radiologically, they constitute a recognizable signature. Ancillary features and temporal progression, in fact, help with the evaluation of severity and clinical decisions. Observing a consistent set of bilateral peripheral ground, glass opacities (GGOs) and consolidations in the majority of cases, these features constitute a recognizable radiological signature. At the same time, the incorporation of minor features and temporal evolution aids in the assessment of severity and the formulation of clinical decisions. Research work in the future should be centered around standardized imaging protocols, conducting longitudinal studies on post, COVID lung changes, and assessing the influence of new variants and vaccination on imaging patterns so that chest imaging can be further utilized in diagnosing and determining the prognosis of COVID-19 (1-7, 9-15).

CONCLUSION

Concluding this systematic review and meta-analysis emphasizes highly the importance of chest imaging, especially computed tomography, for the assessment of lung involvement in COVID-19 patients. The combined data have been showing that bilateral ground, glass opacities with peripheral and multilobar distribution constitute the most stable radiological features, whereas consolidation, crazy-paving pattern, and vascular enlargement are often linked with the advancement of the disease. The time, related changes of imaging features from initial ground, glass opacities to maximum consolidation and later resolution highlight the changing character of COVID-19 pneumonia and the role of imaging in tracking the disease progression. Chest CT was demonstrated to have very high sensitivity in detecting lung abnormalities. This supports its use as a complementary diagnostic modality in clinically suspected cases, especially when laboratory findings are inconclusive or delayed. Furthermore, imaging findings can be helpful to determine the severity of the disease, recognize complications, and distinguish it from other viral pneumonias, thus clinical decision-making being more informed. Regardless, differences in imaging features among different population groups and stages of disease highlight the need for incorporating radiologic findings along with clinical and laboratory data. There is a need for further research with unified imaging methods and long, term follow, up to gain insights into the pulmonary sequelae over time and the changes in imaging patterns in the scenario of new variants and widespread vaccination. Undoubtedly, chest imaging is one of the diagnostic tools that provides valuable assistance in the overall management of COVID-19 by offering diagnostic and prognostic information. Moreover, multidisciplinary interpretation is required to get the best treatment for the patient.

REFERENCES

1. Sun Z, Zhang N, Li Y, Xu X. A systematic review of chest imaging findings in COVID-19. Quant Imaging Med Surg. 2020 May;10(5):1058-1079. doi: 10.21037/qims-20-564. PMID: 32489929; PMCID: PMC7242306.
2. Awulachew E, Diriba K, Anja A, Getu E, Belayneh F. Computed Tomography (CT) Imaging Features of Patients with COVID-19: Systematic Review and Meta-Analysis. Radiol Res Pract. 2020 Jul 23;2020:1023506. doi: 10.1155/2020/1023506. PMID: 32733706; PMCID: PMC7378588.
3. Yang H, Lan Y, Yao X, Lin S, Xie B. The chest CT features of coronavirus disease

2019 (COVID-19) in China: a meta-analysis of 19 retrospective studies. Virol J. 2020 Oct 21;17(1):159. doi: 10.1186/s12985-020-01432-9. PMID: 33087181; PMCID: PMC7576554.

4. Ojha V, Mani A, Pandey NN, Sharma S, Kumar S. CT in coronavirus disease 2019 (COVID-19): a systematic review of chest CT findings in 4410 adult patients. Eur Radiol. 2020 Nov;30(11):6129-6138. doi: 10.1007/s00330-020-06975-7. Epub 2020 May 30. PMID: 32474632; PMCID: PMC7261039.
5. Garg M, Gupta P, Maralakunte M, Kumar-M P, Sinha A, Kang M, Agarwal R, Sandhu MS. Diagnostic accuracy of CT and radiographic findings for novel coronavirus 2019 pneumonia: Systematic review and meta-analysis. Clin Imaging. 2021 Apr;72:75-82. doi: 10.1016/j.clinimag.2020.11.021. Epub 2020 Nov 11. PMID: 33217674; PMCID: PMC7657023.
6. Ishfaq A, Yousaf 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. Eur J Radiol Open. 2021;8:100350. doi: 10.1016/j.ejro.2021.100350. Epub 2021 May 13. PMID: 34007865; PMCID: PMC8119228.
7. Li J, Yan R, Zhai Y, Qi X, Lei J. Chest CT findings in patients with coronavirus disease 2019 (COVID-19): a comprehensive review. Diagn Interv Radiol. 2021 Sep;27(5):621-632. doi: 10.5152/dir.2020.20212. PMID: 33135665; PMCID: PMC8480948.
8. Crider K, Williams J, Qi YP, Gutman J, Yeung L, Mai C, Finkelstain J, Mehta S, Pons-Duran C, Menéndez C, Moraleda C, Rogers L, Daniels K, Green P. Folic acid supplementation and malaria susceptibility and severity among people taking antifolate antimalarial drugs in endemic areas. Cochrane Database Syst Rev. 2022 Feb 1;2(2022):CD014217. doi: 10.1002/14651858.CD014217. PMID: 36321557; PMCID: PMC8805585.
9. Zarifian A, Ghasemi Nour M, Akhavan Rezayat A, Rahimzadeh Oskooei R, Abbasi B, Sadeghi R. Chest CT findings of coronavirus disease 2019 (COVID-19): A comprehensive meta-analysis of 9907 confirmed patients. Clin Imaging. 2021 Feb;70:101-110. doi: 10.1016/j.clinimag.2020.10.035. Epub 2020 Oct 25. PMID: 33142125; PMCID: PMC7585632.
10. Karimian M, Azami M. Chest computed tomography scan findings of coronavirus disease 2019 (COVID-19) patients: a comprehensive systematic review and meta-analysis. Pol J Radiol. 2021 Jan 14;86:e31-e49. doi: 10.5114/pjr.2021.103379. PMID: 33708271; PMCID: PMC7934744.
11. Tsikala Vafea M, Atalla E, Kalligeros M, Mylona EK, Shehadeh F, Mylonakis E. Chest CT findings in asymptomatic cases with COVID-19: a systematic review and meta-analysis. Clin Radiol. 2020 Nov;75(11):876.e33-876.e39. doi: 10.1016/j.crad.2020.07.025. Epub 2020 Aug 12. PMID: 32861461; PMCID: PMC7420957.
12. Sharif PM, Nematizadeh M, Saghazadeh M, Saghazadeh A, Rezaei N. Computed tomography scan in COVID-19: a systematic review and meta-analysis. Pol J Radiol. 2022 Jan 5;87:e1-e23. doi: 10.5114/pjr.2022.112613. PMID: 35140824; PMCID: PMC8814899.
13. Chen X, Zhang G, Hao SY, Bai L, Lu JJ. Similarities and Differences of Early Pulmonary CT Features of Pneumonia Caused by SARS-CoV-2, SARS-CoV and MERS-CoV: Comparison Based on a Systemic Review. Chin Med Sci J. 2020 Sep 30;35(3):254-261. doi: 10.24920/003727. PMID: 32972503; PMCID: PMC7521866.
14. Liu M, Zeng W, Wen Y, Zheng Y, Lv F, Xiao K. COVID-19 pneumonia: CT findings of 122 patients and differentiation from influenza pneumonia. Eur Radiol. 2020 Oct;30(10):5463-5469. doi: 10.1007/s00330-020-06928-0. Epub 2020 May 12. PMID: 32399710; PMCID: PMC7216854.
15. Yin Z, Kang Z, Yang D, Ding S, Luo H, Xiao E. A Comparison of Clinical and Chest CT Findings in Patients With Influenza A (H1N1) Virus Infection and Coronavirus Disease (COVID-19). AJR Am J Roentgenol. 2020 Nov;215(5):1065-1071. doi: 10.2214/AJR.20.23214. Epub 2020 May 26. PMID: 32452731.