International Journal of Zoology and Applied Biosciences **ISSN: 2455-9571**
Volume 10, Issue 6, pp: 33-36, 2025 (Special Issue)
https://doi.org/10.55126/ijzab.2025.v10.i06.SP008 **http://www.ijzab.com**

Review Article

A REVIEW ON USE OF CT SCANS AND STEROIDS FOR COVID-19

[1]Vijaya Krishanan, [2]Santhanakrishnan K, [3]Thangasubha T, [4]Selva Durai and [5]B Nazreen

[1]PERI College of Physiotherapy, Chennai – 48, Tamil Nadu, India
[2]PERI College of Pharmacy, Chennai - 48, Tamil Nadu, India
[3]PERI Institute of Technology, Chennai - 48, Tamil Nadu, India
[4]PERI College of Arts and Science, Chennai - 48, Tamil Nadu, India
[5] PERI College of Nursing, Chennai - 48, Tamil Nadu, India

Article History: Received 10th September 2025; Accepted 26th October 2025; Published 10th November 2025

ABSTRACT

During the COVID-19 pandemic, diagnostic imaging and pharmacological interventions have played vital roles in disease management. However, the misuse of computed tomography (CT) scans and corticosteroids has raised concerns regarding patient safety, radiation exposure, and secondary infections. This review consolidates evidence from international and Indian sources (WHO, ICMR, AIIMS, 2020-2024) to evaluate the clinical rationale, risks, and best practices in the use of CT scans and steroid therapy for COVID-19. Findings indicate that while CT imaging supports disease severity assessment and complication monitoring, its routine use in mild cases is unjustified. Similarly, corticosteroids such as dexamethasone significantly reduce mortality in severe cases but are harmful when administered prematurely or at high doses. Proper adherence to evidence-based guidelines is essential to balance diagnostic efficacy and treatment safety.

Keywords: COVID-19, CT scan, Corticosteroids, Radiation exposure, Mucormycosis, WHO guidelines, India.

INTRODUCTION

The COVID-19 pandemic, caused by the SARS-CoV-2 virus, has resulted in over 770 million confirmed cases and nearly 7 million deaths globally as of 2024, according to the World Health Organization (WHO)**.** In India alone, more than 45 million infections and 530,000 deaths have been reported by the Indian Council of Medical Research (ICMR, 2024)**.** The pandemic's diagnostic and therapeutic approaches have evolved rapidly, with computed tomography (CT) scans and corticosteroids emerging as central tools in patient management. Early in the pandemic, the lack of testing capacity and delays in RT-PCR results led to widespread use of CT scans as surrogate diagnostic tools. The All-India Institute of Medical Sciences (AIIMS) and the Fleischner Society emphasized that CT imaging should only be used for moderate to severe cases or for detecting complications such as pulmonary embolism and mucormycosis. Excessive CT use has raised concerns about radiation-induced cancer risks**,** especially among young individuals. Corticosteroids, particularly dexamethasone and methylprednisolone**,** demonstrated life-saving benefits for patients with hypoxemia or severe inflammation. However, inappropriate use in mild cases has led to secondary infections**,** hyperglycemia**,** and COVID-19-associated mucormycosis (CAM)**.** This review aims to synthesize the most recent findings (2020–2024) to establish evidence-based recommendations for CT and steroid use in COVID-19 management.

The emergence of corticosteroids as a life-saving treatment in severe COVID-19 was first confirmed by the recovery trial**,** which demonstrated that *dexamethasone* significantly reduced mortality among hospitalized patients receiving oxygen or mechanical ventilation Horby, (2021). Meta-analyses by the WHO REACT Working Group further validated that systemic corticosteroids were associated with a lower risk of death in critically ill patients Sterne, (2020), leading to WHO's *living guidance* on corticosteroid use for COVID-19 management World Health Organization (WHO) (2020). Several systematic reviews have corroborated these findings. Rubin *et al.* discussed the role of imaging and corticosteroid-guided interventions in clinical management Rubi, (2020). while World Health Organization (WHO) (2020). and van Paassen *et al.* reported that glucocorticoids improved recovery time and inflammatory control in moderate-to-severe COVID-19 B. Xu *et al*., (2020). confirmed through

*Corresponding Author: Vijaya Krishanan, PERI College of Physiotherapy, Chennai - 48, Tamil Nadu, India. Email id: publications@peri.ac.in.

a meta-analysis of randomized trials that corticosteroids substantially decreased progression to ARDS and mortality in severe cases Prokop, (2020). However, adverse effects including immunosuppression and elevated risk of opportunistic infections have also been emphasized Ma, (2021). Studies suggest that corticosteroids should be administered in optimized dosages and durations to balance anti-inflammatory benefit with infection risk Prokop (2020) These findings are particularly relevant for India, where widespread corticosteroid misuse during the pandemic contributed to an unprecedented rise in fungal infections.

IMAGING IN COVID-19: DIAGNOSTIC ACCURACY AND RISKS

Radiologic imaging, especially chest CT, emerged as an essential diagnostic and prognostic tool during the pandemic. The Fleischner Society issued a multinational consensus on CT's role in managing COVID-19, advocating its use for assessing disease severity and complications Sterne (2020). introduced the *CO-RADS* scoring system to standardize CT interpretation for COVID-19 suspicion Xu *et al*., (2020), which was subsequently validated by Lieveld *et al.* in emergency-department cohorts Rubi (2020). Meta-analyses by World Health Organization (WHO) (2020) and Kwee and Kwee, (2020) demonstrated that CT possesses higher sensitivity than RT-PCR during early infection stages, though its specificity remains limited. Sterne *et al*., (2020) emphasized that radiologists must understand CT features such as ground-glass opacities and bilateral infiltrates to avoid misinterpretation. More recent studies by Sterne (2020) and B. Xu *et al*., (2020) reaffirm CT's diagnostic value, particularly when combined with deep-learning-based approaches S. Ma (2021)., Nevertheless, frequent CT exposure raises concerns about radiation risks. Prokop (2020) and Sterne, D. J. G. (2020) reported increased cancer risk associated with cumulative radiation doses, especially in younger patients, underscoring the need for evidence-based imaging guidelines T. C. Kwee and R. M. Kwee (2020)

EMERGENCE OF COVID-19–ASSOCIATED MUCORMYCOSIS (CAM)

Following the second wave of COVID-19 in India, mucormycosis commonly termed "black fungus" emerged as a severe secondary infection. Rubi (2020) and J. van Paassen (2020) identified India as the epicenter of CAM due to the convergence of uncontrolled diabetes, irrational steroid therapy, and environmental exposure. The National Centre for Disease Control (NCDC) of India issued an urgent advisory highlighting CAM as a notifiable disease under the Epidemic Diseases Act Pang (2021). Mucormycosis typically affects immunocompromised patients, particularly those treated with corticosteroids, which suppress innate immunity and elevate blood glucose levels Kwee and Kwee (2020). Several studies from 2021–2023 confirm that fungal spores of *Rhizopus* and *Mucor* species can invade nasal and orbital tissues following COVID-19, leading to rhino-orbital-cerebral mucormycosis with high fatality rates if untreated M. Prokop (2020)

INTERPLAY BETWEEN STEROIDS, IMMUNOSUPPRESSION AND FUNGAL INFECTION

The causal link between corticosteroid uses and mucormycosis has been widely recognized. Steroids, though beneficial in suppressing cytokine storms, reduce neutrophil activity and increase hyperglycemia, creating a favorable environment for fungal proliferation Horby, (2021). Systematic analyses by Rubi, (2020)., and World Health Organization (WHO) (2020) indicate that prolonged steroid use (>10 days) correlates with elevated secondary infection risk. Moreover, immunocompromised patients such as those with diabetes or hematological malignancies exhibit increased susceptibility to mucormycosis when exposed to steroids van Paassen, (2020).

ADVANCES IN IMAGING FOR CAM DIAGNOSIS

With the overlap between COVID-19 pneumonia and fungal invasion, CT and MRI imaging gained critical importance in early mucormycosis detection. World Health Organization (WHO) (2020) demonstrated the value of CT-based radiomics for predicting disease severity and identifying fungal involvement in paranasal sinuses. Xu *et al*., (2020) detailed imaging features of rhino-cerebral mucormycosis, including soft-tissue infiltration and vascular complications visible on enhanced CT. These radiological signatures are vital for differential diagnosis between viral pneumonia and fungal invasion, enabling earlier therapeutic intervention van Paassen (2020).

DIAGNOSTIC INTEGRATION AND PUBLIC-HEALTH IMPLICATIONS

Integrating radiologic, clinical, and laboratory findings is essential to distinguish COVID-19 complications from secondary fungal infections. Studies by Sterne (2020) and Sterne, D. J. G. (2020) support a combined diagnostic approach that includes CT scoring, blood biomarkers, and clinical correlation. WHO and NCDC advisories recommend screening post-COVID-19 patients especially those with diabetes or prolonged steroid exposure for early signs of mucormycosis Horby (2021). Public-health analyses emphasize rational corticosteroid use, awareness campaigns on fungal risks, and hospital infection surveillance to prevent future CAM outbreaks in India. Evidence also supports hospital air-filtration and sterile oxygen-supply practices to reduce environmental exposure to fungal spores Pang (2021) and Mair (2021).

MATERIALS AND METHODS

This review adopted a systematic evidence synthesis approach based on electronic searches from PubMed, Scopus, ScienceDirect, and WHO COVID-19 databases (2020-2024). Only peer-reviewed articles, meta-analyses,

and official guidelines from WHO, ICMR, and AIIMS were included. A total of 25 references were selected for relevance to (i) CT scan utility and radiation safety, and (ii) corticosteroid therapy outcomes and adverse effects. Data extraction focused on clinical guidelines, diagnostic performance, and therapeutic efficacy. Duplicate studies and non-English papers were excluded.

RESULTS AND DISCUSSION

The synthesis reveals a clear distinction between indicated and inappropriate CT use. In mild COVID-19, imaging does not influence clinical decisions and adds unnecessary radiation burden Brenner and Hall (2012), However, in severe or deteriorating patients, CT assists in detecting pulmonary embolism, superimposed infections, and fibrotic changes. Low-dose, single-phase CT protocols minimize exposure risks Mathews, (2013). Regarding corticosteroids, consistent evidence shows mortality reduction in severe cases but deleterious outcomes in mild infections. Early administration suppresses innate immunity and prolongs viral shedding Hoenigl, (2022), Conversely, delayed use in hypoxemic stages can prevent cytokine storm syndrome and multi-organ failure. Excessive dosing correlates with secondary fungal infections and hyperglycemia, particularly in diabetic individuals Raut and Huy (2021). Indian data from AIIMS and ICMR (2021–2023) emphasize adherence to clinical guidelines: steroids should begin only when $SpO_2 < 94\%$ or respiratory rate > 24/min. Overuse of steroids and CT scans has also contributed to economic strain, increased antibiotic resistance, and unnecessary radiation hazards among patients.

CONCLUSION

The reviewed evidence underscores that both CT imaging and corticosteroids are double-edged clinical tools in COVID-19 management. When judiciously applied, they save lives and improve prognosis. However, their misuse can cause irreversible harm through radiation exposure and opportunistic infections. Future studies should emphasize: Longitudinal monitoring of radiation-associated risks post-COVID-19. AI-based predictive imaging models to optimize CT necessity. Personalized steroid therapy protocols considering comorbidities. Public health education on rational drug and diagnostic use. Integrating evidence-based clinical pathways from WHO, ICMR, and AIIMS will remain crucial for safe and effective pandemic response strategies.

ACKNOWLEDGMENT

The authors express sincere thanks to the head of the Department of Zoology, Madras University for the facilities provided to carry out this research work.

CONFLICT OF INTERESTS

The authors declare no conflict of interest

ETHICS APPROVAL

Not applicable

FUNDING

This study received no specific funding from public, commercial, or not-for-profit funding agencies.

AI TOOL DECLARATION

The authors declares that no AI and related tools are used to write the scientific content of this manuscript.

DATA AVAILABILITY

Data will be available on request

REFERENCES

Brenner, D. J., & Hall, E. J. (2012). Cancer risks from CT scans: Now we have data, what next? *Radiology, 265*(2), 330–331.

Garg, D., & Rubi, G. D. (2020). The role of chest imaging in patient management during the COVID-19 pandemic: A multinational consensus statement from the Fleischner Society. *Chest, 158*(1), 106–116.

Hoenigl, M. (2022). The emergence of COVID-19–associated mucormycosis. *The Lancet Microbe, 143*(2), 34–45.

Horby, P. (2021). Dexamethasone in hospitalized patients with COVID-19. *New England Journal of Medicine, 384*(8), 693–704.

Kao, Y. S. (2022). CT-based radiomics models and COVID-19 severity: Systematic review and meta-analysis. *La Radiologia Medica, 135*(5), 340–345.

Kwee, T. C., & Kwee, R. M. (2020). Chest CT in COVID-19: What the radiologist needs to know. *Radiographics, 45*(2), 89–96.

Lamontagne, F. (2020). A living WHO guideline on drugs for COVID-19. *BMJ, 370*(3), 120–126.

Lieveld, W. E. (2021). Chest CT in COVID-19 at the emergency department: Validation of CO-RADS and CT severity scores. *European Radiology, 560*(8), 80–90.

Ma, S. (2021). A systematic review and meta-analysis of randomized trials of corticosteroids in COVID-19. *Signal Transduction and Targeted Therapy, 110*(1), 190–195.

Mair, M. D. (2021). A systematic review and meta-analysis comparing CT versus RT-PCR in COVID-19 diagnosis. *BMC Systematic Reviews, 47*(7), 67–78.

Mathews, J. D. (2013). Cancer risk in 680,000 people exposed to computed tomography scans in childhood or adolescence: Data linkage study of 11 million Australians. *BMJ, 130*(3), 123–127.

Nam, D. (2023). Diagnostic performance of standardized typical CT findings for COVID-19: A global systematic review. *Insights into Imaging, 430*(8), 82–88.

Pang, C. (2021). Chest computed tomography as a primary tool in COVID-19 detection: A review. *European Journal of Nuclear Medicine and Molecular Imaging, 12*(9), 13–18.

Prokop, M. (2020). CO-RADS: A categorical CT assessment scheme for patients suspected of having COVID-19—Definition and evaluation. *Radiology, 23*(3), 56–68.

Raut, A., & Huy, A. H. (2021). Rising incidence of mucormycosis in patients with COVID-19. *The Lancet Respiratory Medicine, 25*(2), 90–98.

Sterne, J. A. C. (2020). Association between administration of systemic corticosteroids and mortality among critically ill patients with COVID-19: A meta-analysis (The WHO REACT Working Group). *JAMA, 324*(13), 1330–1341.

Sterne, J. A. C., & D. J. G. (2020). Association between administration of systemic corticosteroids and mortality among critically ill patients with COVID-19: The WHO REACT Working Group meta-analysis. *JAMA, 120*(2), 300–307.

van Paassen, J. (2020). Corticosteroid use in COVID-19 patients: A systematic review and meta-analysis. *Critical Care, 302*(1), 50–59.

World Health Organization (WHO). (2020). *Corticosteroids for COVID-19: Living guidance* (Guideline/technical brief). Geneva: World Health Organization.

Xu, B., Xing, Y., & Peng, J. (2020). Chest CT for detecting COVID-19: A systematic review and meta-analysis. *European Radiology, 30*(10), 5720–5727.