



Review Article

Pharmacological and Radiological Study of Patients with COVID-19 in Iran

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ARTICLE INFO

Article history

Received: 2021-10-22

Received in revised: 2021-11-06

Accepted: 2021-11-12

Manuscript ID: JMCS-2110-1299

Checked for Plagiarism: Yes

Language Editor:

Ermia Aghaie

Editor who approved publication:

Dr. Zeinab Arzehgar

DOI:10.26655/JMCHMSCI.2022.2.9

KEYWORDS

CT
COVID-19 Struggle
Radiological
Critical Evaluation
Heart Disease

ABSTRACT

The present systematic review and meta-analysis study revealed that CT imaging features with high sensitivity can help diagnose patients with Covid-19 to be able to choose an appropriate treatment. In general, it seems that from a perspective, strategies and strategies to deal with the new corona virus worldwide, in four areas including strategies to combat social stigma caused by coronation, psychological such as strategies to combat fear and panic due to coronary heart disease, physical economic and in countries with religious places and behaviors and rituals, in the field of spiritual health can be examined. The aim of current study was to evaluate the radiological findings of patients with COVID-19. 534 studies were reviewed, of which the full text of 94 studies was reviewed and finally seven studies were selected for meta-analysis. Sensitivity and Specificity of ground glass opacity with other features in CT findings in diagnosis of COVID-19 was (ES, 0.92 95% CI 0.87, 0.96. P=0.00) and (ES, 0.67 95% CI 0.63, 0.72. P=0.00), Respectively. From another perspective, coping strategies with the new coronavirus can be considered in two categories: public coping strategies and public or private coping strategies. From the third point of view, coping strategies with Covid-19 can be divided into pre- and post-corona strategies. It seems that future review studies on issues such as: Critical evaluation of other new coronavirus coping strategies from different perspectives and based on the above divisions will pave the way for policymakers, officials and non-governmental organizations in the field of Covid-19 struggle.

GRAPHICAL ABSTRACT



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Introduction

In this study, based on the evidence published up to March 1, 2020, the epidemiological and etiological characteristics of the new coronavirus-2019, its basic biological characteristics, including its receptors and route of transmission, the description of disease prevention and treatment approaches - 19 presented [1-4]. Radiology is the science of various methods of imaging the human body that are used in medical science to diagnose diseases faster and more accurately. Radiology; The science of body imaging Radiology is used for four purposes:

1- Diagnostic radiology: during which, using medical equipment, it is determined whether the person has the disease or not [5].

2- Interventional radiology: This method helps the doctor to use a better and safer way to treat the disease [6].

3- Therapeutic radiology: Radiology can also be used for therapeutic aspects, for example, it targets and kills cancer cells. This is called radiotherapy [7].

4- Nuclear radiology: includes drug therapy during which radioactive materials enter the patient's body in the form of drugs. These substances cause the doctor to see a clear picture of the function of the organ [8].

Benefits of Radiology

Radiology allows doctors to enter the patient's body with the least complication and get information from it. Before the invention of radiology, this was done only by opening the body with surgical methods, and many patients faced many hardships in this way.

Accelerate the diagnosis of diseases from each other

By taking only a few radiological photos, the doctor can give the correct diagnosis of the disease in the person and start treatment immediately. Radiation-related radiology is dangerous for pregnant women and can lead to fetal malformations [9-11]. Therefore, every woman should make sure that she is not pregnant before radiology Spend the least amount of time diagnosing diseases: The doctor decides in a short time, based on radiographs and

other tests of the patient, whether the person needs surgery or not. Spending this little time is completely to the benefit of the patient [12-15].

Increase accuracy

Taking accurate image of several points of the body provides a lot of information about the function of the body organs and increases his decision-making power to better treat the disease. - One of the most important benefits of radiology is the diagnosis and treatment of two important causes of death in the world, namely heart disease and various cancers [16].

Types of Radiology

1- *Radiography*: During this type of radiology, X-rays are irradiated to a part of the body and his bones and soft tissue are identified on radiographs. X-rays pass through adipose tissue, but cannot pass when exposed to denser tissue such as bone and tumor. This type of imaging is usually used to diagnose heart and lung problems.

2- *Fluoroscopy*: The patient is injected with radioactive material or he has to swallow the radioactive material and different parts of his body are displayed on the monitor screen. This type of test is commonly used to evaluate the function of the intestines, heart, blood vessels, and urinary tract. Radioactive material can also be used to detect abnormal masses in body tissues, Medical and health articles, medical advice, health

3- *CT scan*: Using X-rays to create a three-dimensional image is another type of radiology application. It is usually used in an emergency, such as a blood clot, a ruptured appendix, or internal bleeding. The doctor makes a more accurate and faster diagnosis based on the images obtained from the CT scan [17-19].

4- *Ultrasound*: Using sound waves, images of body tissues are obtained. This procedure is usually done to check the health of the fetus in pregnant women, because X-rays have been shown to have adverse effects on fetal health. It is also used to determine the sex of the fetus and to identify any developmental abnormalities. Of course, ultrasound is also used to examine other organs such as the uterus, prostate, breast

5- *MRI*: Magnetic field is used to change radio waves to create images of internal structures of the body. MRI is commonly used to look at the body at different levels. MRI provides the best images of soft tissue to the physician and is commonly used to diagnose disorders of the musculoskeletal system [20].

6- *Nuclear medicine*: The patient is injected with a radioactive substance to diagnose any disease related to different organs of the body. Nuclear

medicine is also used to determine the stages of cancer, heart function and blood flow.

Risks of Radiology

Radiographs are generally not completely safe and can be dangerous to the patient due to the use of radiation. One of these risks is cancer. But in general, the benefits of radiology outweigh the risks [21].



Figure 1: Radiological anatomy: X-ray, CT, MRI

The rapid rise in infection and death from the new coronavirus epidemic has led to varying levels of anxiety, fear, mistrust and gossip among the general public [22-24]. Rapid sharing of scientific information is an effective way to reduce the general fear and anxiety caused by the new coronavirus epidemic [25-27]. This will not be possible except with the provision of real-time

analyses by epidemiologists and statistical modelers to predict the future state and possible effects of interventions [28-30]. It should be noted that real-time analysis is the analysis of new available data using logic and mathematics in the shortest possible time after the creation of the same data (Figure 2), which is done to try to quickly solve the health problem [31].

Category	X-rays		
COVID-19			
Normal			

Figure 2: Radiologic diagnosis of patients with COVID-19

We still have a lot of unfinished business about the new coronavirus and its disease. Therefore, the publication of real-time analyzes obtained from real scientific information at this time is even more necessary [32-35]. Therefore, considering the significant importance of this disease and its significant spread in the world

that has been published so far about the epidemiology and strategies to combat this disease (Figure 3) [36]. In this study, we try to Use a new method to review the COVID-19 in Radiological with new findings and describe this finding to present our new ways to control it [37].

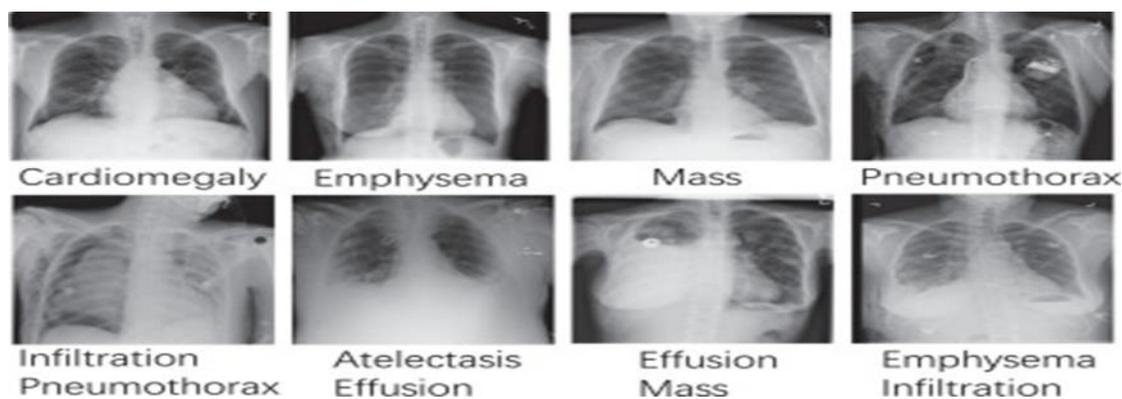


Figure 3: Radiologic diagnosis of patients with COVID-19

Results and Discussion

In the review of the existing literature using the studied keywords, 552 studies were found. In the initial review, duplicate studies were eliminated and abstracts of 534 studies were reviewed. At this stage, 440 studies did not meet the inclusion criteria, so they were excluded, and in the second

stage, the full text of 94 studies was reviewed by two authors. At this stage, 87 studies were excluded from the study due to incomplete data, inconsistency of results in a study, poor studies, lack of access to full text, inconsistent data with the purpose of the study. Finally, seven studies were selected (Figure 4).

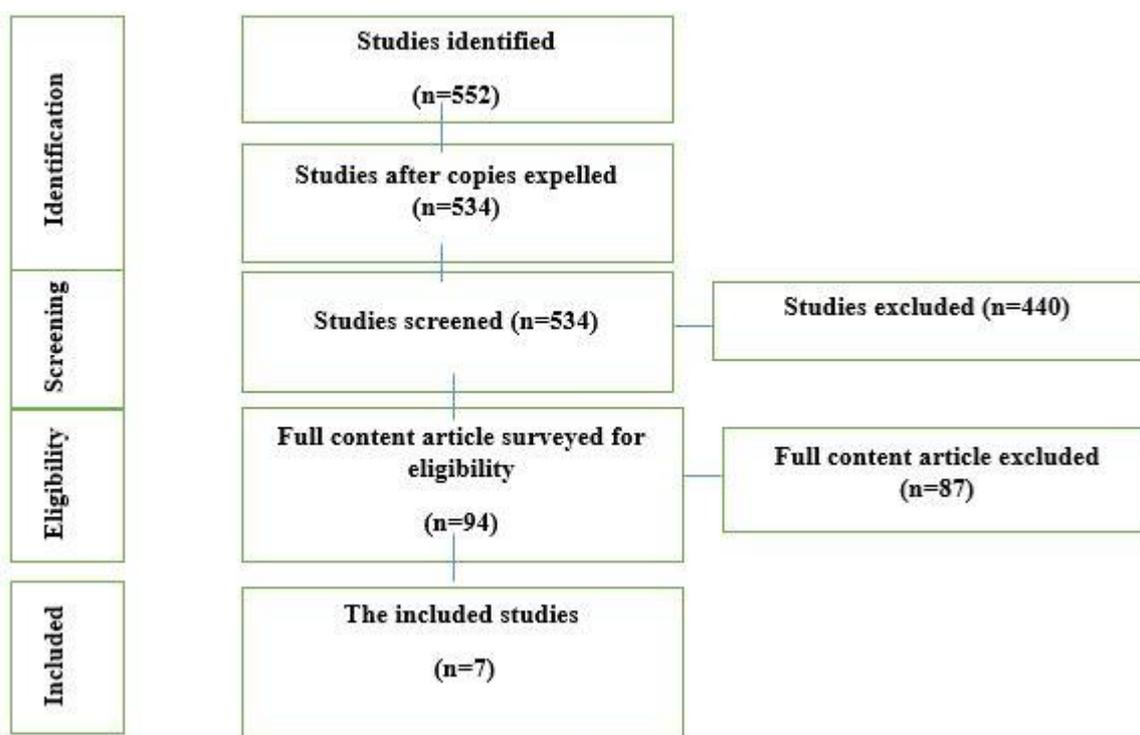


Figure 4: Study Attrition

Characteristics

The emergence of Covid-19 disease due to infection with the new coronavirus quickly led to the announcement of a pandemic. Although the disease often improves after different clinical phases, with the disease, several short-term or long-term complications of various organs of the

body have been reported. Lung involvement has been identified as a leading cause of death. Complications such as pulmonary fibrosis, secondary bacterial or fungal infections, heart involvement (myocarditis and pericarditis), and vascular complications such as pulmonary artery embolism have been reported frequently. Various imaging techniques, especially chest CT scans, not

only play an important role in the initial diagnosis of the disease, but are also widely used during the treatment process to follow up, diagnose, and treat possible secondary complications. In this review study, some of the most important pulmonary and cardiovascular manifestations caused by Covid-19 are discussed and the common radiological patterns associated with them are investigated. Familiarity with common imaging findings in patients, and

especially radiological manifestations of complications from primary infection, is essential for timely treatment and prevention or reduction of mortality in patients. The number of patients with and without COVID-19 was 950 and 850, respectively and a total was 1800 with 50.84 mean of years. The number of female and men was 928 and 872, respectively. Features obtained in CT in each study showed in Table 1.

Table 1: Systematic review and meta-analysis

Study. Years	Sample size		Mean of age (years)	Gender of participants		features obtained in CT
	Patients with COVID-19	Patients without COVID-19		male	female	
Rakei et al., 2019	32	84	40.5	56	60	ground glass opacity, Consolidation, Pleural effusion (23)
Danesh et al., 2018	219	205	54.4	222	202	ground glass opacity, Mixed ground glass opacity, Consolidation, reticulation/thickened interlobar septa, nodules (24)
Danesh et al., 2018	19	15	42.2	17	17	Multiple mottling and ground glass opacity (24)
Rakei et al., 2019	6	15	64	12	9	ground glass opacity-predominant lesion, Bilateral ground glass opacity-predominant lesion, ground glass opacity- and peripheral predominant lesion (23)
Abdallah et al., 2021	601	413	51.6	467	547	ground glass opacity, Consolidation, reticulation/thickened interlobar septa, nodules [5].
Azadmehr et al., 2018	62	96	57.3	83	75	Peripherally ground glass opacity with multilobe and posterior involvement, bilateral distribution, and subsegmental vessel enlargement (> 3 mm) (8)
Bahrami et al., 2020	11	22	45.9	15	18	ground glass opacity, Mixed ground glass opacity, Consolidation, Air bronchogram, Centrilubular nodules, Reticular pattern (18)

Bias Assessment

All studies had a total score between 10-14/14 (low risk of bias), this score indicates the high quality of the studies (Table 2).

Table 2: Detailed QUADAS-2 assessment of all included studies

2: low 1: unclear 0: high	Patient selection	Laboratory analyses	Outcome	Timing and flow	Patient selection	Laboratory analyses	Outcome	
								12
								11
								12
								11
								11
								14
								11

Sensitivity of ground glass opacity with other features in CT findings in diagnosis of COVID-19 was 92% (ES, 0.92 95% CI 0.87, 0.96. P=0.00)

with low heterogeneity ($I^2=28.98\%$; $P =0.23$) (Figure 5 and 6).

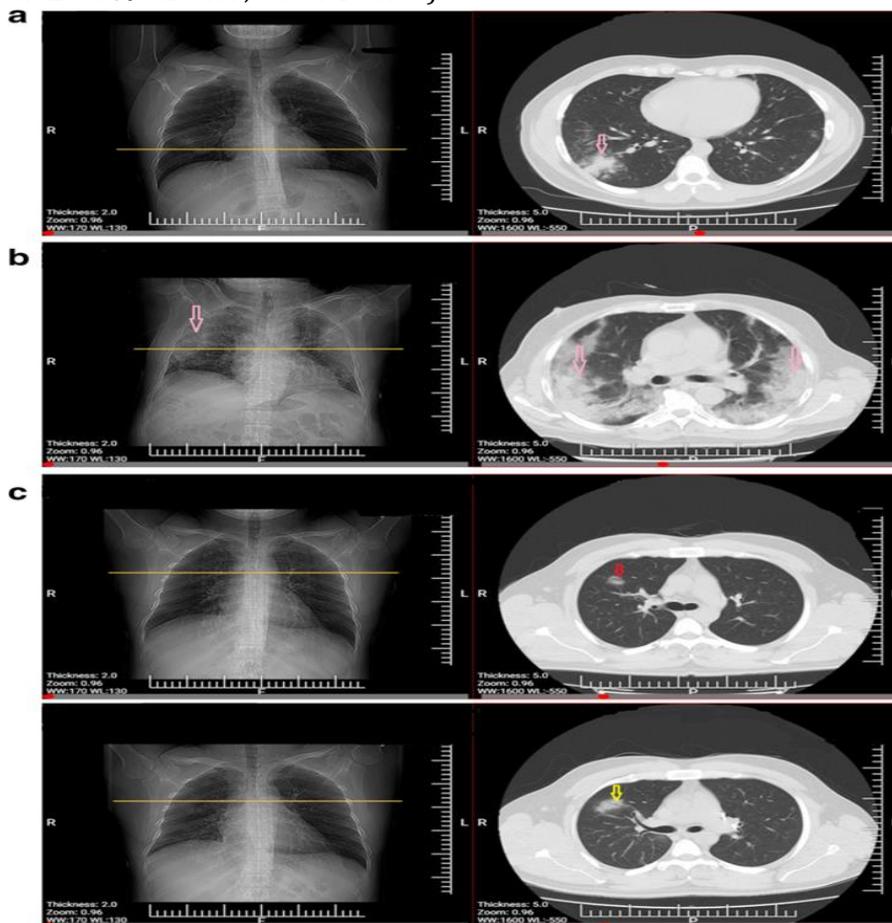


Figure 5: Comparison of clinical, para-clinical and laboratory findings in survived and deceased patients

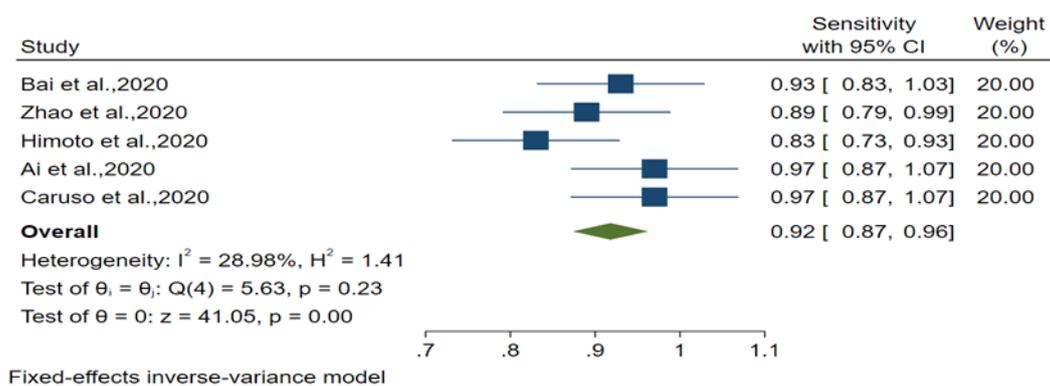


Figure 6: Forest plot showed sensitive of CT imaging features of patients with COVID-19

Specificity of ground glass opacity with other features in CT findings in diagnosis of COVID-19 was 67% (ES, 0.67 95% CI 0.63, 0.72. P=0.00) with high heterogeneity ($I^2=96.82\%$; P =0.00) (Figure 7 and 8) [38].

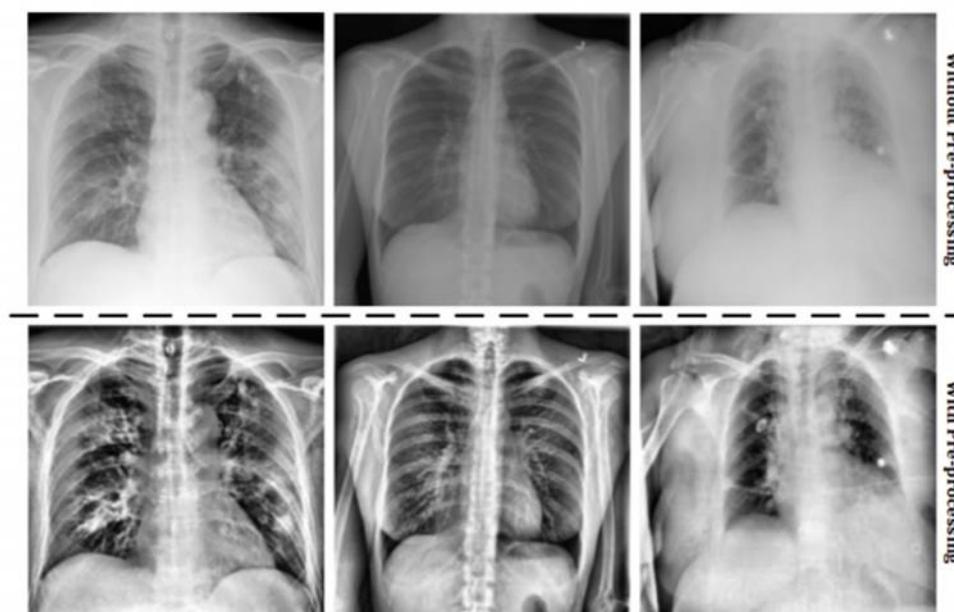


Figure 7: Using Lung X-rays to Diagnose COVID-19

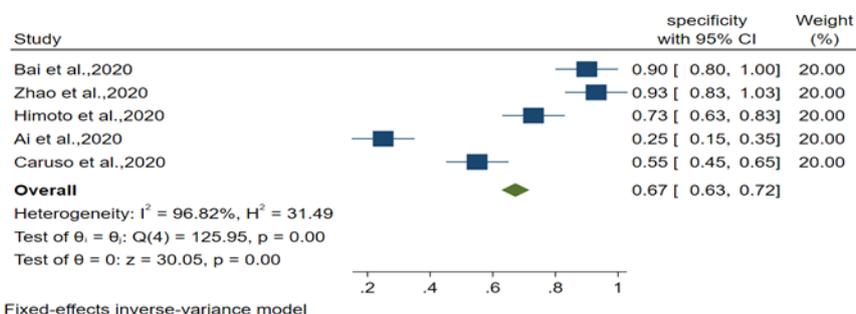


Figure 8: Forest plot showed specificity of CT imaging features of patients with COVID-19

Positive diagnosis ratio of ground glass opacity with other features in CT findings in diagnosis of COVID-19 was 5.20 (ES, 5.20 95% CI 0.70, 9.71. P=0.02) with high heterogeneity ($I^2=99.99\%$; P =0.00); negative diagnosis ratio in this regard was 0.12 (ES, 0.12 95% CI 0.08, 0.17. P=0.17) with low heterogeneity ($I^2=0.01\%$; P =0.54) (Figure 9 and 10).

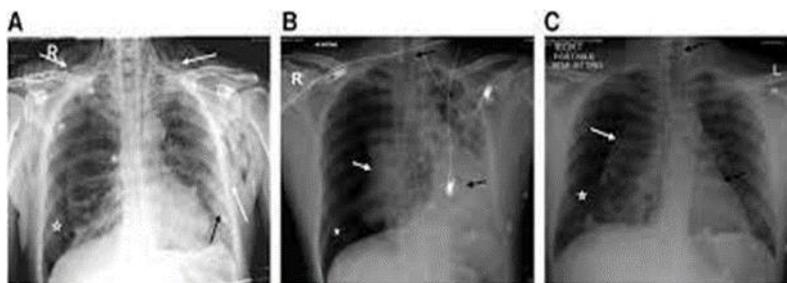


Figure 9: Case Report: COVID-19–Related Pneumothorax—Case Series Highlighting a Significant

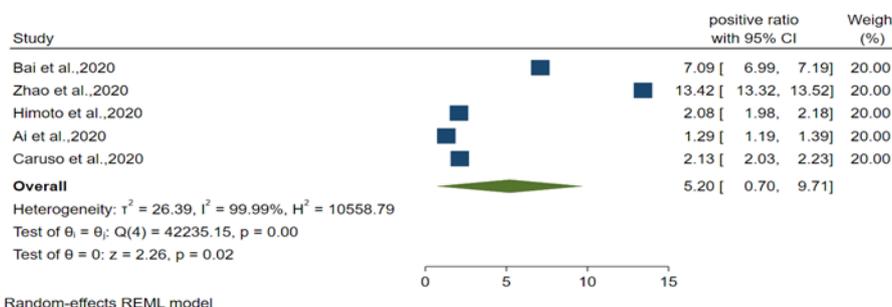


Figure 10: Forest plot showed diagnostic accuracy of the chest CT of patients with COVID-19

Diagnostic score of ground glass opacity with other features in CT findings in diagnosis of COVID-19 was 3.64 (ES, 3.64 95% CI 3.60, 3.69. $P=0.00$) with high heterogeneity ($I^2=99.71\%$; $P=0.00$) (Figure 11 to 13).

Diagnostic score of ground glass opacity with other features in CT findings in diagnosis of

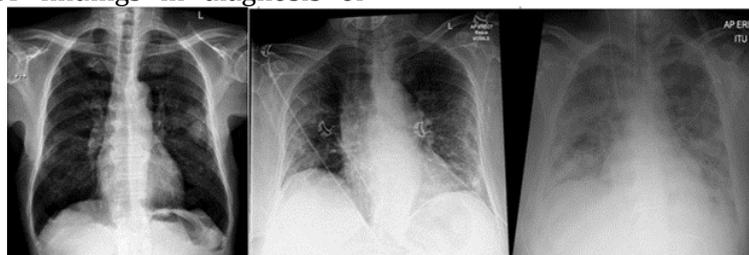


Figure 11: COVID-19 in the radiology department: What radiographers need to know

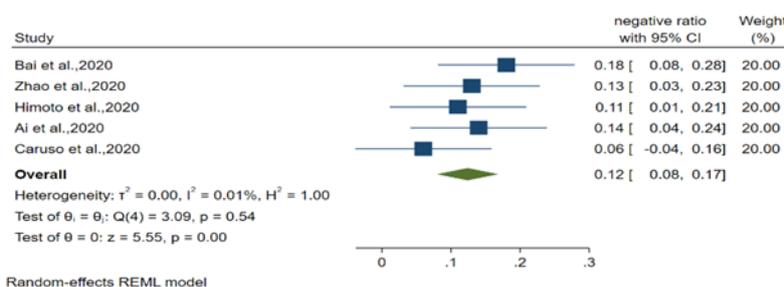


Figure 12: Forest plot showed diagnostic accuracy of the chest CT of patients with COVID-19

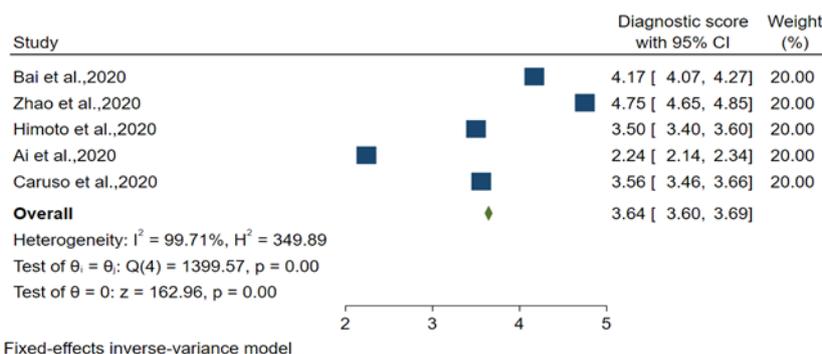


Figure 13: Forest plot showed Diagnostic score of ground glass opacity with other features in CT findings

In this study, almost the common features of CT imaging in patients with COVID-19 were investigated. Pulmonary consolidation occurs when the disease is in severe and progressive stages, which can coexist with ground-glass and fibrotic changes. Studies show that CT imaging findings may be associated with disease severity and disease progression after treatment [39]. According to the results of the present study, which showed the acceptable value of CT in the diagnosis of COVID-19, the skills of radiologists

should not be ignored. The more abilities and skills of the radiologist, the more accurate the diagnosis of COVID-19. Studies show that radiologists' diagnosis is very important [24]. Regarding the specificity of CT in the diagnosis of COVID-19, which was not a significant number, the reason for this can be considered high heterogeneity between studies [40] (Figure 14).

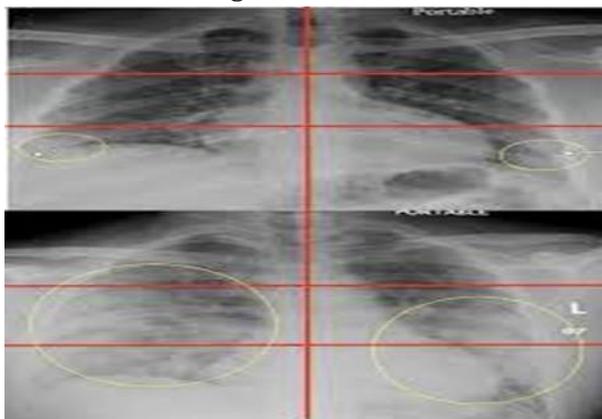


Figure 14: Chest X-rays in emergency rooms can help pred

The present study had some limitations, including RCT studies that examined CT results in Covid-19 patients and compared them with healthy individuals [4] (Figure 15). High heterogeneity was found between studies that studies should use similar methods to assess the specificity and diagnostic score of CT in Covid-19 patients [5]. Also, reporting the time interval

between symptoms and evaluating CT scans has not been reported in studies that could help better compare [6]. On the other hand, one of the most important factors in the diagnosis of COVID-19 based on CT scan is the skill of the radiologist, which should be examined in all studies to provide stronger evidence [9].



Figure 15: The Cardiac Implications of Novel Coronavirus

In a cohort study of 103 recovered patients from Covid, parenchymal changes were examined in CT scan of patients after 3 months of follow-up. In 25% of patients, some degree of residual radiological changes, mainly in the GGO area, in 20% of cases, fibrotic parenchymal bands were seen. In another study, 12 patients with severe

pulmonary involvement who needed to be admitted to the intensive care unit were studied. The mean time of radiological examination in this patient was about 56 days from the onset of symptoms. In patients undergoing lung CT scan, despite the relative improvement of acute period lesions such as GGO and consolidation,

parenchymal changes, mainly in the form of fibrotic findings, were still visible [9]. In another study by Yun *et al.* [10], it was found that people with more severe primary disease had a slower radiological healing process and were more likely to develop pulmonary fibrosis than patients with less severe manifestations. Such findings can be made prematurely in patients recovering from the acute phase of Covid. On the other hand, the continuation of pulmonary fibrosis findings in longer follow-ups confirms the slow process of their recovery and in some cases, the possibility of their persistence [10].

Conclusion

The present Systematic Review and Meta-Analysis study showed that CT imaging features with high sensitivity, can help diagnose patients with Covid-19 and choose an appropriate treatment. As a result, combining clinical and laboratory findings with evaluation of imaging features can be helpful in diagnosing COVID-19. The use of viruses is a reasonable option to overthrow nations because of their high rate of spread and lethality, the lack of need for warfare, or the high economic and human costs. Coronavirus 2019 will shed light on new dimensions of the impact of bioterrorism on the world's population and economy, and Covid's panic is not only related to its current killing but also to more complex problems in the not-too-distant future. Not creating stress and anxiety among people, while advising and educating people to observe all the principles of health and well-being, inducing and maintaining peace of people is also very important to deal with this disease. This study demonstrated that most of the patients with severe disease manifestations were elderly and had a history of underlying disease, symptoms of shortness of breath, cough and fever, and extensive lung involvement in imaging and changes in laboratory results. The disease has been high.

Acknowledgments

The authors express their gratitude to the Vice Chancellor for Research and Information Technology of Zahedan University of Medical Sciences for approving this research and the head

of Khatam al-Anbia Hospital as well as all participating families for their cooperation in doing this research.

Future research

It is necessary to conduct further studies with larger sample sizes to investigate administering the right sedative for traumatic children who are admitted to the emergency department. It is also rewarding to use ketamine and midazolam in non-emergency situations where there is enough time to sedate the patient or in emergency departments that are not very crowded.

Funding

The current study was funded by Zahedan University of Medical Sciences.

Authors' contributions

All authors have contributed significantly and met criteria for authorship. All the authors read and approved the final copy of the manuscript.

Conflict of Interest

We have no conflicts of interest to disclose.

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HOW TO CITE THIS ARTICLE

Maryam Ziaei, Mahjoubeh Keykha, Faeze Kazemi, Ali Abdolrazaghnejad. Comparing the Sedative Effect of Oral Midazolam Versus Oral Ketamine on Children Aged 1-7 Years in Need of Radiologic Procedures, *J. Med. Chem. Sci.*, 2022, 5(2) 215-226

DOI: 10.26655/JMCHMSCI.2022.2.9

URL: http://www.jmchemsci.com/article_140512.html