Imaging and clinical features of patients with 2019 novel coronavirus SARS-CoV-2: A systematic review and meta-analysis

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Abstract
Background: Currently, the epidemic of coronavirus disease 2019 (COVID-19) has begun to spread worldwide. We aim to explore reliable evidence for the diagnosis and treatment of the COVID-19 by analyzing all the published studies by Chinese scholars on the clinical and imaging features in novel coronavirus pneumonia caused by SARS-CoV-2.

Methods: We searched five medical databases including two Chinese and three English databases for all published articles on COVID-19 since the outbreak. A random-effects model was designed, and the imaging and clinical data from all studies were collected for meta-analysis.

Results: Overall, 31 articles and 46959 patients were included, including 10 English articles and 21 Chinese articles. The results of meta-analysis showed that the most common clinical manifestations were fever (87.3%; 0.838–0.909), cough (58.1%; 0.502–0.660), dyspnea (38.3%; 0.246–0.520), muscle soreness or fatigue (35.5%; 0.253–0.456), and chest distress (31.2%; −0.024 to 0.648). The main imaging findings were bilateral pneumonia (75.7%; 0.639–0.871) and ground-glass opacification (69.9%; 0.602–0.796). Among the patients, the incidence that required intensive care unit (ICU) was (29.3%; 0.190–0.395), the incidence with acute respiratory distress syndrome was (28.8%; 0.147–0.429), the incidence with multiple organ dysfunction syndrome was (8.5%; −0.008 to 0.179), and the case fatality rate of patients with COVID-19 was (6.8%; 0.044–0.093).

Conclusion: COVID-19 is a new clinical infectious disease that mainly causes bilateral pneumonia and lung function deteriorates rapidly. Nearly a third of patients need to be admitted to the ICU, and patients are likely to present respiratory failure or even death.

Keywords
2019 novel coronavirus pneumonia, clinical features, imaging finding, SARS-CoV-2
1 | INTRODUCTION

The 2019 novel coronavirus pneumonia (NCP) initially broke out in China, especially in Hubei province. The NCP is caused by a new coronavirus (SARS-CoV-2) of the Sarbe virus subgenus, a member of orthocoronavirus subfamily. SARS-CoV-2 is a member of the coronavirus family along with SARS-CoV and MERS-CoV. With the deepening of research, more and more evidence show that its transmission channels are diversified, and its transmission speed and infectivity are stronger than SARS-CoV and MERS-CoV. Since the outbreak of the epidemic, China has taken active prevention and control measures and achieved good results, but, recently, the epidemic situation abroad has begun to develop into an uncontrollable situation. As of 28 February 2020, the epidemic of NCP has affected six continents, and the epidemic situation in South Korea, Italy, Japan, and other countries is extremely serious. On 29 February, the "China-WHO NCP (COVID-19) Joint Inspection Report" stated that the NCP is almost susceptible to everyone on the same day. On 11 March, the WHO declared the SARS-CoV-2 outbreak as pandemic. Currently, published studies and case reports indicate that patients with NCP have very different clinical manifestations, laboratory tests, and imaging tests, making clinical diagnosis and treatment limited. Therefore, it is urgent to improve the understanding of the clinical characteristics of patients with NCP to further guide clinical and scientific research through evidence-based medicine.

2 | MATERIALS AND METHODS

2.1 | Search strategy and study selection

This study was approved by the Ethics Committee of the Tongji Medical College, Huazhong University of Science and Technology. The literature search was performed according to the PRISMA (preferred reporting items for systematic reviews and meta-analyses) process. The search was conducted in five popular medical databases including three English databases (PubMed, Cochrane Library, and Embase) and two Chinese databases (National Knowledge Infrastructure [CNKI] and China Biology Medicine disc [CBMdisc]). The searches were concluded by 1 March 2020. The language limit is English and Chinese. The retrieval is a combination of subject words and free words, and the keywords are as follows: “2019 novel coronavirus pneumonia,” “COVID-19,” “Coronavirus,” “SARS-CoV-2,” “Wuhan Coronavirus,” “clinical features,” “2019 novel coronavirus pneumonia,” and “imaging features.”

2.2 | Inclusion/exclusion criteria

Inclusive criteria are as follows: (a) research types: cross-sectional studies and case series; (b) research subjects: patients with confirmed NCP, including patients with clinical diagnosis; and (c) data items: including clinical characteristics, biochemical indicators, and imaging signs. Exclusive criteria are as follows: (a) the type of study is case report, review, and so forth; (b) repeated research; and (c) lack of the above case data.

2.3 | Data extraction and paper quality evaluation

The titles and abstracts of all retrieved references were independently reviewed by two investigators, and if there was any ambiguity in the search process, the decision was made by a third investigator. (a) The basic characteristics of the included literature are as follows: author, publication date, journal, research type, number of patients, quality score, and so forth. (b) The basic characteristics of the research subjects are as follows: age, sex, comorbidities, clinical manifestations, laboratory test results, imaging manifestations, and so on. The quality of all included literature was assessed using the Institute of Health Economics (IHE) scale.

2.4 | Statistical analysis

The statistical software Stata version 14.0 and Open Meta- Analyst were used for meta-analysis of single-arm studies. We first unified all units of variables and, then, expressed classified variables as percentages and expressed continuous variables as mean ± standard deviation. The combined prevalence and 95% CI were calculated using a random-effects model. We performed the Egger test to assess publication bias in all literature works, and $P < .05$ was considered as publication bias.

3 | RESULTS

3.1 | Literature inclusion and characteristics

A total of 956 articles were retrieved. After deleting duplicates, 96 studies remained, of which 860 were excluded based on the title or abstract. Finally, 65 were eliminated after reading the full text, and a total of 31 articles and 46,959 patients were included in this meta-analysis (Figure 1). The main characteristics of the included studies are shown in Table 1. Publication bias was assessed with a funnel plot for the standard error by logit event, with no evidence of bias. Additionally, the Egger test ($P = .091$) suggested that there was no notable evidence of publication bias.

3.2 | Meta-analysis results

3.2.1 | Demographical characteristics and comorbidities

The mean age of the patients with SARS-CoV-2 infection was 46.62 (95% CI, 31.710-61.531) and 55.6% (95% CI, 0.530-0.602) were male.
About 35.6% (0.267-0.444) of patients had comorbidities, including 18.3% (0.130-0.236) with hypertension, 11.2% (0.078-0.145) with cardiovascular disease, 10.3% (0.069-0.136) with diabetes, 3.9% (0.011-0.067) with chronic obstructive pulmonary disease, 3.0% (0.021-0.039) with chronic hepatonephropathy, and 1.1% (0.003-0.020) with tumor (Table 2 and Figures 2 and 3).

### 3.2.2 Clinical features

The incidence of fever was 87.3% (0.838-0.909), that of cough was 58.1% (0.502-0.660), that of sore throat was 12% (0.062-0.177), that of expectoration was 29.4% (0.171-0.417), that of chest distress was 31.2% (-0.024 to 0.648), that of muscle soreness or fatigue was 35.5% (0.253-0.456), that of headache was 9.4% (0.063-0.126), that of diarrhea was 6.8% (0.044-0.092), and that of dyspnea was 38.3% (0.246-0.520) (Table 3 and Figure 4).

### 3.2.3 Laboratory tests

The laboratory findings showed leukocytosis in 11.0% (0.070-0.150), leukopenia in 36.9% (0.146-0.593), lymphocytopenia in 57.4% (0.410-0.737), high C-reactive protein (CRP) in 61.3% (0.451-0.774), high lactate dehydrogenase (LDH) in 57.0% (0.360-0.780), and high erythrocyte sedimentation rate (ESR) in 42.2% (0.076-0.767) (Table 4 and Figure 5).

### 3.2.4 Imaging features

At the chest computed tomography (CT), the pneumonia compromise was predominantly bilateral in 75.5% (0.639-0.871) and unilateral 20.4% (0.106-0.302). The most common patterns on chest CT were ground-glass (69.9%, 0.602-0.796), followed by irregular or halo sign (54.4%, 0.255-0.833), air bronchogram (51.3%, 0.326-0.701), bronchovascular bundle thickening (39.5%, 0.082-0.708), grid-form shadow (24.4%, 0.116-0.371), and hydrothorax (18.5%, 0.001-0.370) (Table 5 and Figure 6).

### 3.2.5 Complications and outcomes

Among the infected patients, severe cases who required intensive care unit (ICU) were 29.3% (0.190-0.395), and the incidence of acute respiratory distress syndrome (ARDS) was
| References | Journal | Year | Date (M/D) | Country | No. patient | Sex (male) | Average age | Research type | Quality |
|------------|---------|------|------------|---------|-------------|------------|-------------|---------------|---------|
| Huang et al⁷ | Lancet | 2020 | 01/24 | China | 41 | 30 | 49 | Retrospective study | 8 |
| Chen et al⁷ | Lancet | 2020 | 01/30 | China | 99 | 67 | 55.5 | Retrospective study | 8 |
| Yu et al⁷⁵ | J Pract Med | 2020 | 01/31 | China | 40 | 22 | 45.9 | Retrospective study | 5 |
| Michael et al⁸ | Radiology | 2020 | 02/04 | China | 21 | 13 | 51 | Retrospective study | 5 |
| Wang et al⁷ | JAMA | 2020 | 02/07 | China | 138 | 75 | 56 | Retrospective study | 8 |
| Liu et al¹₀ | Chin J Pediatr | 2020 | 02/07 | China | 137 | 61 | 57 | Retrospective study | 5 |
| Chang et al¹¹ | JAMA | 2020 | 02/07 | China | 13 | 10 | 34 | Retrospective study | 6 |
| Zheng et al¹² | Shanghai Med J | 2020 | 02/10 | China | 70 | ... | ... | Retrospective study | 4 |
| Liu et al¹³ | Sci China Life Sci | 2020 | 02/12 | China | 12 | 8 | ... | Retrospective study | 6 |
| Gao et al¹⁴ | J Xian Jiaotong Univ (Med Sci) | 2020 | 02/13 | China | 10 | 6 | 41.8 | Retrospective study | 5 |
| Gong et al¹⁵ | Radiol Prac | 2020 | 02/13 | China | 33 | 13 | 51 | Retrospective study | 5 |
| Pan et al¹⁶ | Eur Radiol | 2020 | 02/13 | China | 63 | 33 | ... | Retrospective study | 6 |
| Liu et al¹⁷ | Preprint Lancet | 2020 | 02/13 | China | 24 | 8 | 43 | Retrospective study | 6 |
| Pan et al¹⁸ | Radiology | 2020 | 02/13 | China | 21 | 6 | 40.9 | Retrospective study | 5 |
| Zhang et al¹⁹ | Chin J Tuberc Respir Dis | 2020 | 02/15 | China | 9 | 5 | ... | Case series | 5 |
| Feng et al²⁰ | Chin J Pediatr | 2020 | 02/17 | China | 15 | 5 | ... | Case series | 5 |
| Wang et al²¹ | Chin J Pediatr | 2020 | 02/17 | China | 34 | 14 | 8 | Retrospective study | 5 |
| Zhang et al²² | J. Chin Epi | 2020 | 02/17 | China | 44672 | 22981 | ... | Retrospective study | 6 |
| Liu et al²³ | Radiol Prac | 2020 | 02/18 | China | 41 | 32 | 48.45 | Retrospective study | 5 |
| Zhuang et al²⁴ | Chin J Nosocomiology | 2020 | 02/19 | China | 26 | 18 | ... | Retrospective study | 6 |
| Wang et al²⁵ | J Clin Med | 2020 | 02/19 | China | 30 | 16 | ... | Retrospective study | 5 |
| Chen et al²⁶ | Herald Med | 2020 | 02/19 | China | 54 | 27 | 58.5 | Retrospective study | 5 |
| Zhong et al²⁷ | Med J Wuhan Univ | 2020 | 02/19 | China | 30 | 18 | 50.17 | Retrospective study | 5 |
| Fu et al²⁸ | Med J Wenzhou Univ | 2020 | 02/20 | China | 35 | 21 | 47 | Retrospective study | 5 |
| Yang et al²⁹ | Lancet Respir Med | 2020 | 02/21 | China | 52 | 35 | 59.7 | Retrospective study | 7 |
| Ji et al³⁰ | Chin J Med Imaging Technol | 2020 | 02/24 | China | 45 | 27 | 45.4 | Retrospective study | 6 |
| Chen et al³¹ | Chin J Tuberc Respir Dis | 2020 | 02/25 | China | 29 | 21 | 56 | Retrospective study | 5 |
| Chen et al³² | J Clin Med | 2020 | 02/26 | China | 12 | 8 | 63 | Retrospective study | 4 |
| Zeng et al³³ | J Emerg Tradit Chin Med | 2020 | 02/27 | China | 18 | 10 | 45.94 | Retrospective study | 5 |
| Cao et al³³ | Med J Wuhan Univ | 2020 | 02/28 | China | 36 | 20 | 72.45 | Retrospective study | 5 |
| Guan et al³⁴ | NEJM | 2020 | 02/29 | China | 1099 | 640 | 47 | Retrospective study | 8 |
that of acute cardiac injury was 14.1% (0.079-0.204), that of acute renal injury was 7.1% (0.031-0.110), that of shock was 4.7% (0.009-0.086), that of multiple organ dysfunction syndrome (MODS) was 8.5% (~0.008 to 0.179), and the case fatality rate was 6.8% (0.044-0.093) (Table 6 and Figure 7).

4 | DISCUSSION

The results of this study showed that fever (87.3%) and cough (58.1%) were the main clinical manifestations in the patients with NCP in China. This was followed by dyspnea (38.3%), myalgia or weakness (35.5%), and chest tightness (31.2%), and some patients also presented other clinical symptoms such as chills, cough, conjunctival discomfort, headache, shortness of breath, and joint pain. A few patients had nausea, vomiting, diarrhea, and other abdominal discomfort symptoms, whereas very few patients showed hemoptysis symptoms. Most patients with NCP required hospitalization, of which 29.3% required intensive care. The main complications are respiratory failure, ARDS (28.8%) and multiple organ failure (8.5%), and heart failure, shock, renal injury, sepsis, striated muscle lysis, and diffuse intravascular coagulation are rare. According to the severity, the patients with NCP can be divided into mild, normal type (80%), medium type, and severe type (13.8%). The clinical manifestations of patients with different severity vary greatly. According to statistics, the fatality rate in China is about 3.8%, lower than that of SARS (9.6%) and
MERS (35%). The main causes of death are massive alveolar damage and progressive respiratory failure. Generally, viral pneumonia mainly involves pulmonary interstitium, producing pulmonary interstitial fibrosis. The autopsy report of the first NCP patient in China found that coronavirus disease 2019 (COVID-19) mainly caused the inflammatory response characterized by deep airway and alveolar damage, accompanied by a large amount of viscous secretions in the airway. The pulmonary transparent membrane became less obvious, and the degree of fibrosis was not as severe as SARS. However, the degree of effect of COVID-19 on pulmonary fibrosis still needs to be paid close attention, which is also an important factor influencing pulmonary function in the prognosis of patients with NCP.

In this meta-analysis, white blood cells were normal or decreased in most patients, lymphocytes were mostly decreased, and CRP, LDH, ESR level was elevated in some patients. A few patients had elevated creatine kinase procalcitonin bilirubin, whereas some had decreased albumin and elevated ALT, AST. The pathological results of patients with SARS-CoV-2 suggested that the excessive activation of T lymphocytes, which is characterized by increased Th17 cells and high toxicity of CD8+ T cells, has caused severe immune damage to a certain extent. This may be the main reason for the loss of lymphocytes in patients. Sequence comparison analysis showed that the S spike protein of SARS-CoV-2 contains a SARS-CoV-like receptor binding domain, which indicates that ACE2 may be the main receptor of SARS-CoV-2.

**TABLE 3** Meta-analysis results of the incidence of clinical manifestations

| Variable                  | N<sup>a</sup> | Estimate | 95% CI       | N<sup>b</sup> | Standard error | P    | T<sup>2</sup> | Q   | P    | I<sup>2</sup> |
|---------------------------|---------------|----------|--------------|---------------|----------------|------|--------------|-----|------|--------------|
| Fever                     | 27            | 0.873    | 0.838 to 0.909 | 1842          | 0.018          | <.001| 0.006       | 177.086 | <.001 | 85.318     |
| Cough                     | 27            | 0.581    | 0.502 to 0.660 | 1354          | 0.040          | <.001| 0.037       | 332.025 | <.001 | 92.169     |
| Sore throat               | 9             | 0.120    | 0.062 to 0.177 | 200           | 0.029          | <.001| 0.005       | 58.432  | <.001 | 86.309     |
| Expectoration             | 10            | 0.294    | 0.171 to 0.417 | 466           | 0.063          | <.001| 0.035       | 266.04  | <.001 | 96.617     |
| Chest distress            | 5             | 0.312    | -0.024 to 0.648 | 38            | 0.172          | .069| 0.144       | 204.480 | <.001 | 98.044     |
| Muscle soreness or fatigue| 18            | 0.355    | 0.253 to 0.456 | 781           | 0.052          | <.001| 0.038       | 220.594 | <.001 | 92.747     |
| Headache                  | 14            | 0.094    | 0.063 to 0.126 | 214           | 0.016          | <.001| 0.002       | 37.648  | <.001 | 65.47      |
| Diarrhea                  | 15            | 0.068    | 0.044 to 0.092 | 103           | 0.012          | <.001| 0.001       | 32.263  | .004  | 56.607     |
| Dyspnea                   | 11            | 0.383    | 0.246 to 0.520 | 409           | 0.070          | <.001| 0.051       | 351.966 | <.001 | 97.159     |

Abbreviation: CI, confidence interval.

<sup>a</sup>Number of studies.

<sup>b</sup>Number of patients.

<sup>c</sup>Heterogeneity P value.
ACE2 was highly expressed in gastric and testicular epithelial cells, and also enriched in colon, heart, kidney, and so on. Overexpressed ACE2 may be related to the elevated liver enzyme. The similarity of SARS-CoV-2 and SARS-CoV gene sequences suggests that the mechanism of action may also be similar. SARS-CoV-2 enters host cells through dense S protein, acts on bronchial epithelial cells through ACE2 receptor, and then infects other cells, causing a series of immune responses or inflammatory cytokine storm in severe cases. In addition, the sequence alignment showed that the SARS-CoV-2 and SARS-CoV S2 subunits are highly conserved, and the overall identity in the HR1 and HR2 domains is 92.6% and 100%, respectively. This suggested that novel coronary pneumonia drugs research may base on this site.

In imaging results, this meta-analysis showed that 75.7% of the patients had lesions involving both lungs, and 69.9% showed ground-glass shadows on imaging, mostly interstitial pulmonary lesions. Chest CT showed consolidation shadow nodular or patchy shadow in some patients, whereas there also existed other characteristics in few patients, such as chest-shaped shadows, thick cord-like shadows, pleural reactions, thickened blood vessels, pleural effusion, and

**TABLE 4** Meta-analysis results of the incidence of laboratory tests

| Variable       | N^a | Estimate  | 95% CI       | N^b | Standard error | P     | T^2  | Q    | P^*  | I^2  | P^*  |
|----------------|-----|-----------|--------------|-----|----------------|-------|------|------|------|------|------|
| Leukocytosis   | 13  | 0.110     | 0.070-0.150  | 141 | 0.020          | <.001 | 0.003| 115.035| <.001| 89.568|
| Leukopenia     | 16  | 0.369     | 0.146-0.593  | 541 | 0.011          | .001  | 0.204| 5837.766| <.001| 99.743|
| Lymphocytopenia| 16  | 0.574     | 0.410-0.737  | 1157| 0.083          | <.001 | 0.105| 1113.409| <.001| 98.653|
| High CRP       | 15  | 0.613     | 0.451-0.774  | 910 | 0.082          | <.001 | 0.089| 564.423| <.001| 97.697|
| High LDH       | 7   | 0.570     | 0.360-0.780  | 477 | 0.107          | <.001 | 0.076| 236.597| <.001| 97.464|
| High ESR       | 5   | 0.422     | 0.076-0.767  | 132 | 0.176          | .017  | 0.151| 188.792| <.001| 97.881|

Abbreviations: CI, confidence interval; CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; LDH, lactate dehydrogenase.

^aNumber of studies.

^bNumber of patients.

^cHeterogeneity P value.
bronchial inflation, subpleural line, halo sign, antihalo sign, mosaic sign, and so on. The course of the critically ill patient progressed rapidly, and chest CT could cause “white lung” changes within a few days. Because the sensitivity of nucleic acid test is closely related to the detection sample and testing the sample of lower respiratory tract is more sensitive, nucleic acid test shows partial false negative result. Chest CT examination, as an important examination method for NCP, is highly sensitive to SARS-CoV-2 (even up to 97% in epidemic areas) and is an important supplement to nucleic acid detection. In patients with negative nucleic acid test reports, chest CT results are still of high auxiliary diagnostic value. In addition, imaging manifestations of patients also show dynamic evolution in the course of disease progression.

Current research showed that COVID-19, which source may be Chinese chrysanthemum head bats and pangolin may be a potential intermediate host, can cause a zoonotic disease. Since late February 2020, the number of confirmed cases of NCP abroad has increased rapidly, which may indicate a pandemic. The “three early” principle (early detection, early diagnosis, and early treatment) followed by disease prevention and treatment is particularly important in the prevention and treatment of SARS-CoV-2. In addition, the clinical manifestations of patients with necorony pneumonia are diverse and the atypical symptoms also account for part of the proportion. Therefore, we systematically analyzed the clinical manifestations and auxiliary examination results of patients with COVID-19, so as to reflect the disease characteristics more comprehensively, increase the discrimination of the disease, and strive for early diagnosis, early isolation, and early treatment.

The number of newly diagnosed cases of NCP has been rising worldwide recently, especially in South Korea, Italy, Iran, and Japan. To control the further spread of the epidemic, it is still necessary to strictly follow the management measures for the prevention and treatment of infectious diseases and follow the WHO declaration on

![FIGURE 5] The forest plots of the incidence of laboratory test features. A, Leukocytosis; (B) leukopenia; (C) lymphocytopenia; (D) high C-reactive protein; (E) high lactate dehydrogenase; (F) high erythrocyte sedimentation rate

| Variable                  | N  | Estimate  | 95% CI      | N  | Standard error | P   | t²     | Q    | P    | t²     |
|---------------------------|----|-----------|-------------|----|----------------|-----|-------|------|------|-------|
| Unilateral                | 19 | 0.204     | 0.106-0.302 | 522| 0.050          | <.001| 0.043 | 751.641| <.001| 97.605|
| Bilateral                 | 21 | 0.755     | 0.639-0.871 | 1196| 0.059          | <.001| 0.068 | 1582.357| <.001| 98.736|
| Lung consolidation        | 9  | 0.369     | 0.215-0.523 | 122| 0.079          | <.001| 0.050 | 96.579| <.001| 91.717|
| Ground-glass              | 21 | 0.699     | 0.602-0.796 | 1413| 0.049          | <.001| 0.047 | 1482.862| <.001| 98.651|
| Air bronchogram           | 6  | 0.513     | 0.326-0.701 | 119| 0.096          | <.001| 0.048 | 49.183| <.001| 89.834|
| Grid-form shadow          | 6  | 0.244     | 0.116-0.371 | 64 | 0.065          | <.001| 0.022 | 39.574| <.001| 87.365|
| Bronchovascular bundles thickening | 4 | 0.395     | 0.082-0.708 | 41 | 0.160          | .013 | 0.097 | 68.065| <.001| 95.592|
| Hydrothorax               | 7  | 0.185     | 0.001-0.370 | 23 | 0.094          | .049 | 0.059 | 281.788| <.001| 97.871|
| Irregular or halo sign    | 5  | 0.544     | 0.255-0.833 | 107| 0.148          | <.001| 0.104 | 105.731| <.001| 96.217|

Abbreviation: CI, confidence interval.

aNumber of studies.

bNumber of patients.

cHeterogeneity P value.
**FIGURE 6** The forest plots of the incidence of imaging features. A, Unilateral; (B) bilateral; (C) lung consolidation; (D) ground-glass; (E) air bronchogram; (F) grid-form shadow; (G) bronchovascular bundles thickening; (H) hydrothorax; (I) irregular or halo sign

**TABLE 6** Meta-analysis results of the incidence of complications

| Variable       | N<sup>a</sup> | Estimate | 95% CI       | N<sup>b</sup> | Standard error | P    | T<sup>2</sup> | Q     | P<sup>c</sup> | I<sup>d</sup> |
|----------------|--------------|----------|--------------|--------------|----------------|------|--------------|-------|-------------|-------------|
| ARDS           | 8            | 0.288    | 0.147 to 0.429 | 160          | 0.072          | <.001| 0.037        | 195.606| <.001       | 96.421     |
| ACI            | 7            | 0.141    | 0.079 to 0.204 | 151          | 0.032          | <.001| 0.005        | 49.732| <.001       | 87.935     |
| ARI            | 8            | 0.071    | 0.031 to 0.110 | 58           | 0.02           | <.001| 0.002        | 36.801| <.001       | 80.979     |
| Shock          | 5            | 0.047    | 0.009 to 0.086 | 31           | 0.020          | .016 | 0.001        | 15.319| .004        | 73.889     |
| MODS           | 4            | 0.085    | -0.008 to 0.179 | 9            | 0.048          | .074 | 0.004        | 5.050 | .080        | 60.392     |
| Mortality      | 8            | 0.068    | 0.044 to 0.093 | 1111         | 0.012          | <.001| 0.001        | 110.944| <.001       | 93.69      |

Abbreviations: ACI, acute cardiac injury; ARDS, acute respiratory distress syndrome; ARI, acute renal injury; CI, confidence interval; MODS, multiple organ dysfunction syndrome.

<sup>a</sup>Number of studies.

<sup>b</sup>Number of patients.

<sup>c</sup>Heterogeneity P value.

**FIGURE 7** The forest plots of the incidence of complication. A, acute respiratory distress syndrome; (B) acute cardiac injury; (C) acute renal injury; (D) shock; (E) multiple organ dysfunction syndrome; (F) mortality
public health emergencies of international concern. Certainly, pre-
vention of imported cases is also extremely important.\textsuperscript{45} Particularly,
in some densely populated markets, stations, large ports, and other
places, protective deployment measures should be strengthened to
ensure that protective equipment, drugs, medical supplies, and so on
are sufficient.\textsuperscript{46} National public health capabilities and infrastructure
remain at the core of global health security, as they are the first line
of defense for infectious disease emergencies.\textsuperscript{47} The International
Health Organization, all countries, and all humanity need to pay great
attention to SARS-COV-2.

This meta-analysis, with large enough sample size, relatively
high literature quality, and more comprehensive analysis, included
a total of 31 literature studies, including 46,959 patients with
NCP. The conclusions are very credible to some extent. This article
still has the following limitations, for example, (a) the samples are
domestic cases, without foreign cases; (b) different data sources
may lead to some bias in the results; and (c) there exists some
publication bias. Therefore, the conclusions of this article need to
be further verified.

5 | CONCLUSION

COVID-19 is a new clinical infectious disease, which mainly causes
bilateral pneumonia and lung function deteriorates rapidly. Nearly a
third of patients need to be admitted to the ICU, and patients are
likely to present respiratory failure or even death.

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CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

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