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REVIEW

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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 46 959 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

Yinghao Cao and Xiaoling Liu contributed equally to this study.

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.[1] 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.[2-4] 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.[5]

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[6-36] 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.

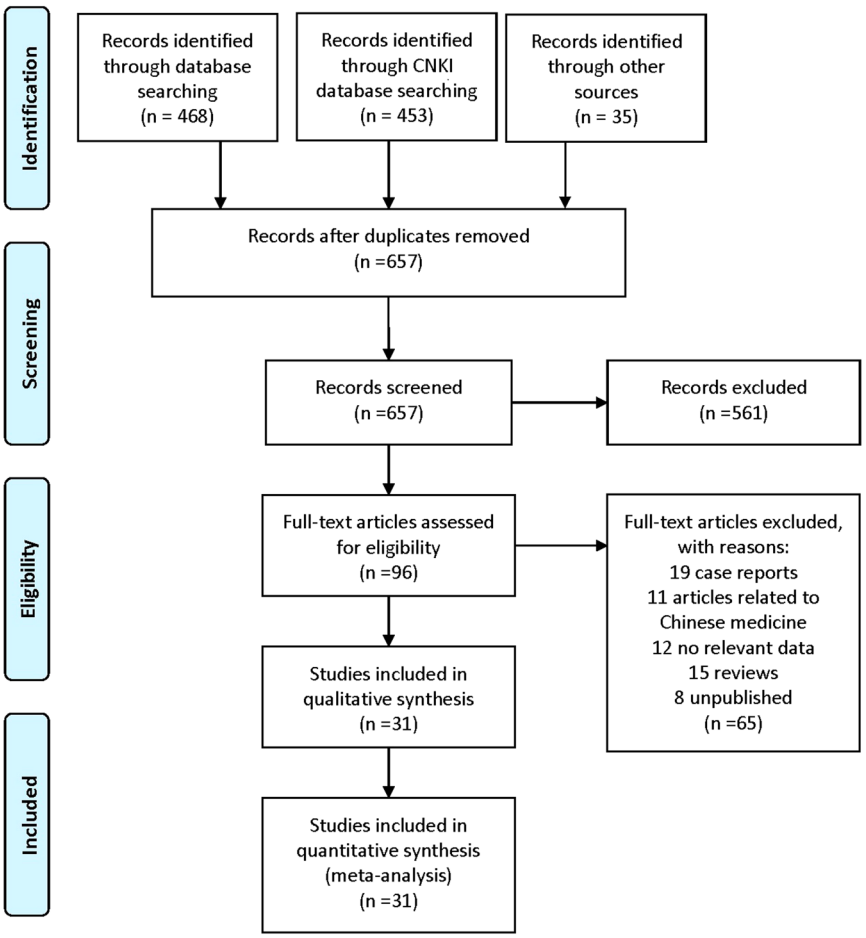

FIGURE 1 Diagram of documents retrieval

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

TABLE 1 The characteristics of the included literature

References	Journal	Year	Date (M/D)	Country	No. patient	Sex (male)	Average age	Research type	Quality
Huang et al[6]	*Lancet*	2020	01/24	China	41	30	49	Retrospective study	8
Chen et al[7]	*Lancet*	2020	01/30	China	99	67	55.5	Retrospective study	8
Yu et al[35]	*J Pract Med*	2020	01/31	China	40	22	45.9	Retrospective study	5
Michael et al[8]	*Radiology*	2020	02/04	China	21	13	51	Retrospective study	5
Wang et al[9]	*JAMA*	2020	02/07	China	138	75	56	Retrospective study	8
Liu et al[10]	*Chin J Pediatr*	2020	02/07	China	137	61	57	Retrospective study	5
Chang et al[11]	*JAMA*	2020	02/07	China	13	10	34	Retrospective study	6
Zheng et al[12]	*Shanghai Med J*	2020	02/10	China	70		…	Retrospective study	4
Liu et al[13]	*Sci China Life Sci*	2020	02/12	China	12	8	…	Retrospective study	6
Gao et al[14]	*J Xi'an Jiaotong Univ (Med Sci)*	2020	02/13	China	10	6	41.8	Retrospective study	5
Gong et al[15]	*Radiol Prac*	2020	02/13	China	33	13	51	Retrospective study	5
Pan et al[16]	*Eur Radiol*	2020	02/13	China	63	33	…	Retrospective study	6
Liu et al[17]	*Preprint Lancet*	2020	02/13	China	24	8	43	Retrospective study	6
Pan et al[18]	*Radiology*	2020	02/13	China	21	6	40.9	Retrospective study	5
Zhang et al[19]	*Chin J Tuberc Respir Dis*	2020	02/15	China	9	5	36	Case series	5
Feng et al[20]	*Chin J Pediatr*	2020	02/17	China	15	5	…	Case series	5
Wang et al[21]	*Chin J Pediatr*	2020	02/17	China	34	14	8	Retrospective study	5
Zhang et al[22]	*J. Chin Epi*	2020	02/17	China	44 672	22 981	…	Retrospective study	6
Liu et al[23]	*Radiol Prac*	2020	02/18	China	41	32	48.45	Retrospective study	5
Zhuang et al[24]	*Chin J Nosocomiology*	2020	02/19	China	26	18	…	Retrospective study	6
Wang et al[25]	*J Clin Med*	2020	02/19	China	30	16	…	Retrospective study	5
Chen et al[26]	*Herald Med*	2020	02/19	China	54	27	58.5	Retrospective study	5
Zhong et al[27]	*Med J Wuhan Univ*	2020	02/19	China	30	18	50.17	Retrospective study	5
Fu et al[28]	*Med J Wenzhou Univ*	2020	02/20	China	35	21	47	Retrospective study	5
Yang et al[29]	*Lancet Respir Med*	2020	02/21	China	52	35	59.7	Retrospective study	7
Ji et al[30]	*Chin J Med Imaging Technol*	2020	02/24	China	45	27	45.4	Retrospective study	6
Chen et al[36]	*Chin J Tuberc Respir Dis*	2020	02/25	China	29	21	56	Retrospective study	5
Chen et al[31]	*J Clin Med*	2020	02/26	China	12	8	63	Retrospective study	4
Zeng et al[32]	*J Emerg Tradit Chin Med*	2020	02/27	China	18	10	45.94	Retrospective study	5
Cao et al[33]	*Med J Wuhan Univ*	2020	02/28	China	36	20	72.45	Retrospective study	5
Guan et al[34]	*NEJM*	2020	02/29	China	1099	640	47	Retrospective study	8

TABLE 2 Meta-analysis results of the incidence of demographical and comorbidities

Variable	N[a]	Estimate	95% CI	N[b]	Standard error	P	T^2	Q	P[c]	I^2
Sex, male	30	0.556	0.530 to 0.602	24 250	0.018	<.001	0.004	104.391	<.001	72.22
Age, mean	14	46.62	31.71 to 61.531	334	7.608	<.001	801.948	2756.956	<.001	99.528
ICU	9	0.293	0.190 to 0.395	2371	0.052	<.001	0.022	487.408	<.001	98.359
Comorbidities	10	0.356	0.267 to 0.444	464	0.045	<.001	0.015	75.378	<.001	88.06
Tumor	8	0.011	0.003 to 0.020	135	0.004	.009	0.000	22.143	.002	68.387
Diabetes	13	0.103	0.069 to 0.136	1261	0.017	<.001	0.002	97.488	<.001	87.691
Hypertension	12	0.183	0.130 to 0.236	2964	0.027	<.001	0.006	160.717	<.001	93.156
Cardiovascular disease	11	0.112	0.078 to 0.145	1023	0.017	<.001	0.002	136.694	<.001	92.684
Phthisis	3	0.021	−0.005 to 0.047	515	0.013	.120	0.000	2.655	.265	24.672
COPD	8	0.039	0.011 to 0.067	46	0.014	.006	0.001	53.971	<.001	87.03
Chronic hepatonephropathy	7	0.030	0.021 to 0.039	46	0.005	<.001	0.000	5.144	.525	0

Abbreviations: CI, confidence interval; COPD, chronic obstructive pulmonary disease; ICU, intensive care unit.
[a]Number of studies.
[b]Number of patients.
[c]Heterogeneity *P* value.

28.8% (0.147-0.429), 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%,[37] lower than that of SARS (9.6%) and

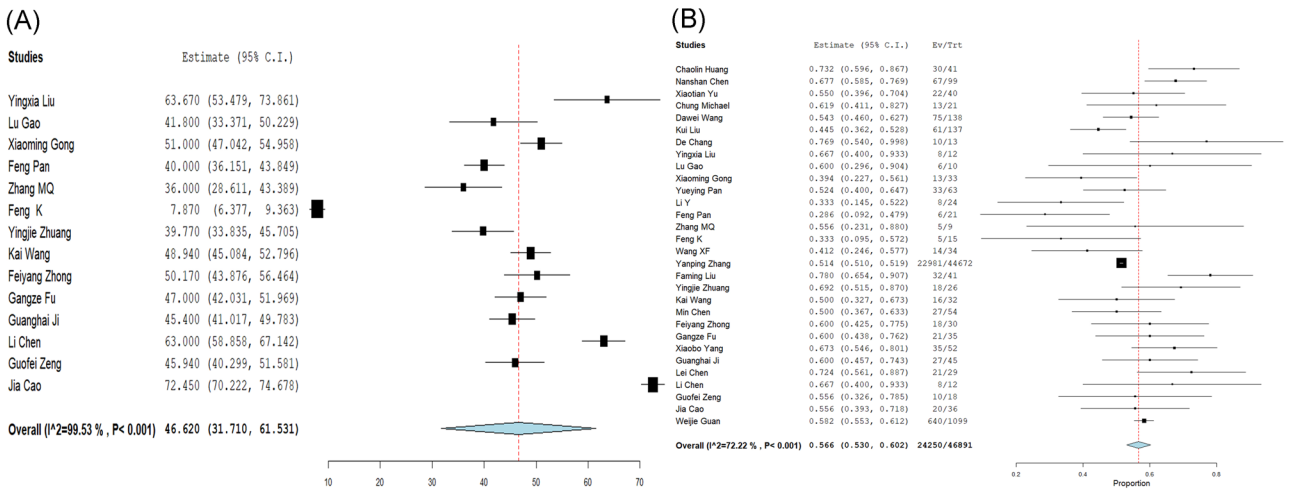

FIGURE 2 The forest plots of age and sex. A, age and (B) sex

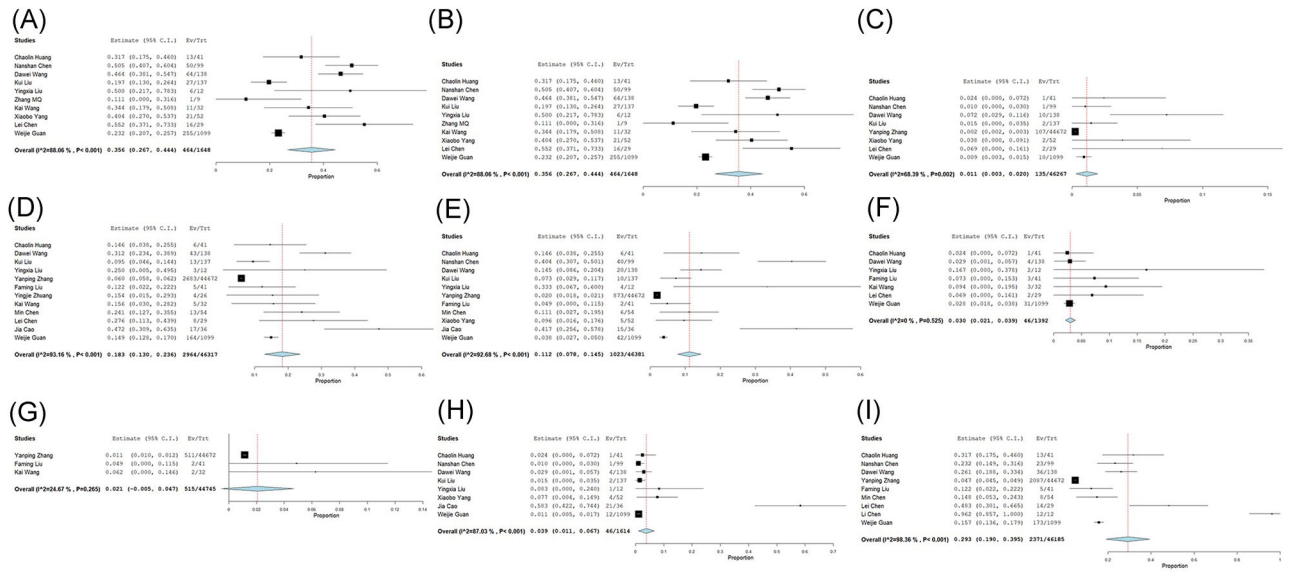

FIGURE 3 The forest plots of the incidence of comorbidities and intensive care unit (ICU). A, Comorbidities; (B) tumor; (C) diabetes; (D) hypertension; (E) cardiovascular disease; (F) phthisis; (G) chronic obstructive pulmonary disease; (H) chronic hepatonephropathy; (I) ICU

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.[38] 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.[4] 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.[3]

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

Variable	N[a]	Estimate	95% CI	N[b]	Standard error	P	T^2	Q	P[c]	I^2
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.
[a]Number of studies.
[b]Number of patients.
[c]Heterogeneity *P* value.

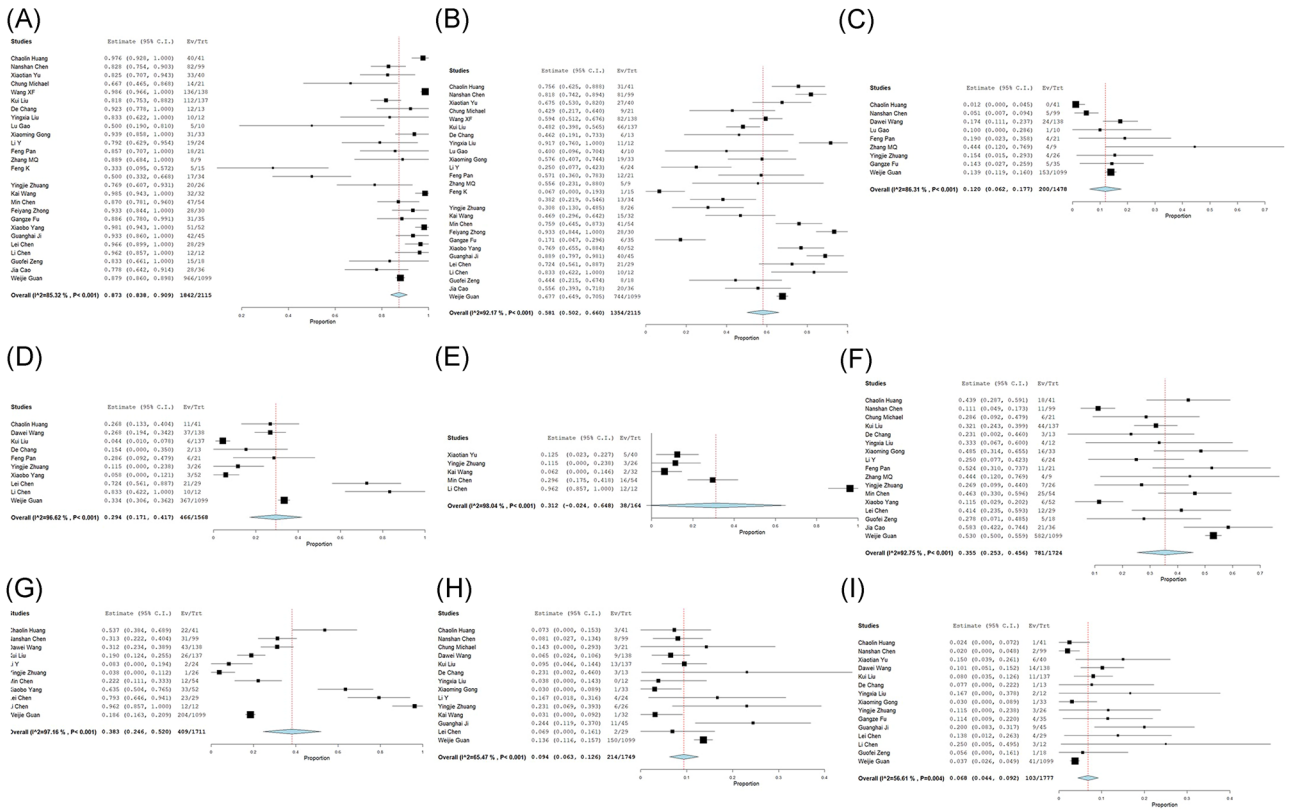

FIGURE 4 The forest plots of the incidence of clinical features. A, Fever; (B) cough; (C) sore throat; (D) expectoration; (E) chest distress; (F) muscle soreness or fatigue; (G) headache; (H) diarrhea; (I) dyspnea

ACE2 was highly expressed in gastric and testicular epithelial cells, and also enriched in colon, heart, kidney, and so on. Over-expressed ACE2 may be related to the elevated liver enzyme.[39] 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,[40,41] 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.[42]

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[c]	I^2	
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	0.114	.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.

[a]Number of studies.

[b]Number of patients.

[c]Heterogeneity *P* value.

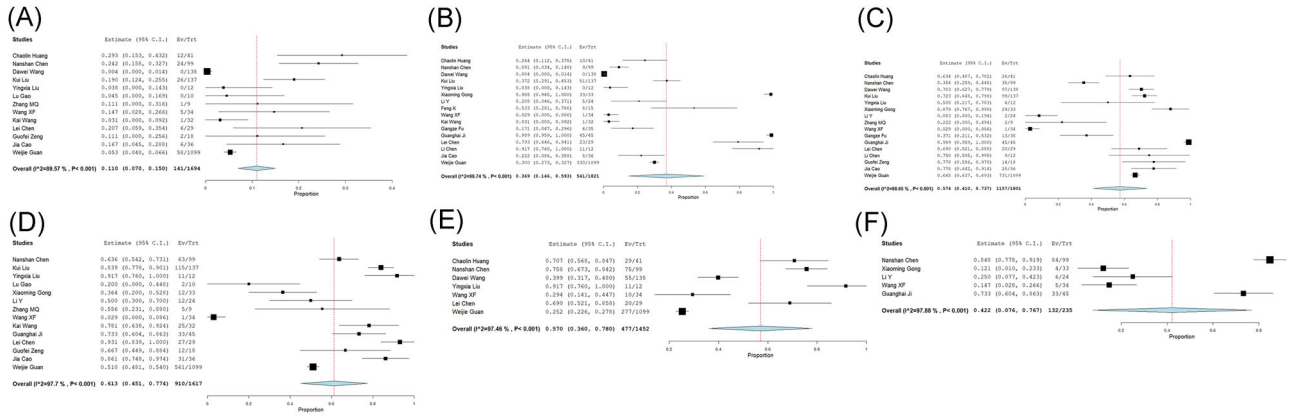

FIGURE 5 The forest plots of the incidence of laboratory test features. A, Leukocytosis; (B) leukopenia; (C) lymphocytopenia; (D) high C-reactive protein; (E) high lactate dehydrogenase; (F) high erythrocyte sedimentation rate

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,[43] 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.[44] 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.[3] 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 neocoronary 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

TABLE 5 Meta-analysis results of the incidence of chest imaging

Variable	N[a]	Estimate	95% CI	N[b]	Standard error	*P*	T^2	*Q*	*P*[c]	I^2
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.
[a]Number of studies.
[b]Number of patients.
[c]Heterogeneity *P* value.

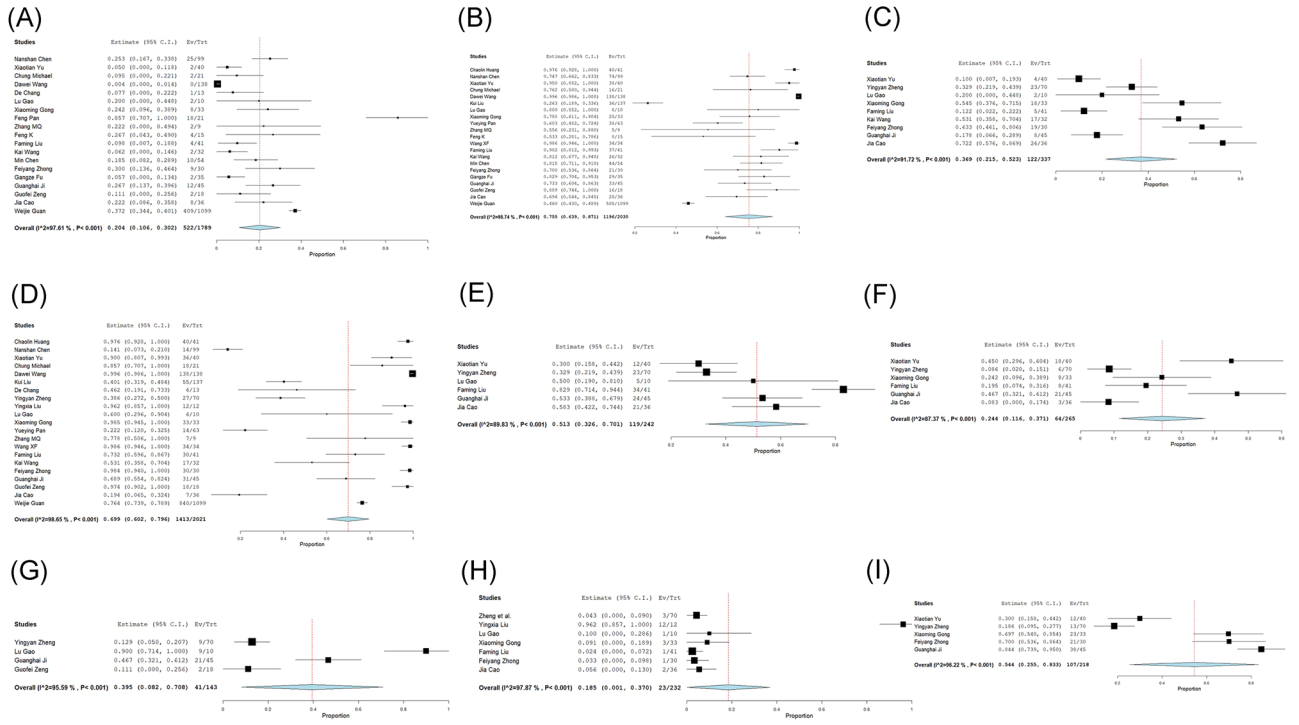

FIGURE 6 The forest plots of the incidence of imaging features. A, Unilateral; (B) bilateral; (C) lung consolidation; (D) ground-glass; (E) air bronchogram; (F) grid-form shadow; (G) bronchovascular bundles thickening; (H) hydrothorax; (I) irregular or halo sign

TABLE 6 Meta-analysis results of the incidence of complications

Variable	N^a	Estimate	95% CI	N^b	Standard error	*P*	T^2	*Q*	P^c	I^2
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.

[a]Number of studies.

[b]Number of patients.

[c]Heterogeneity *P* value.

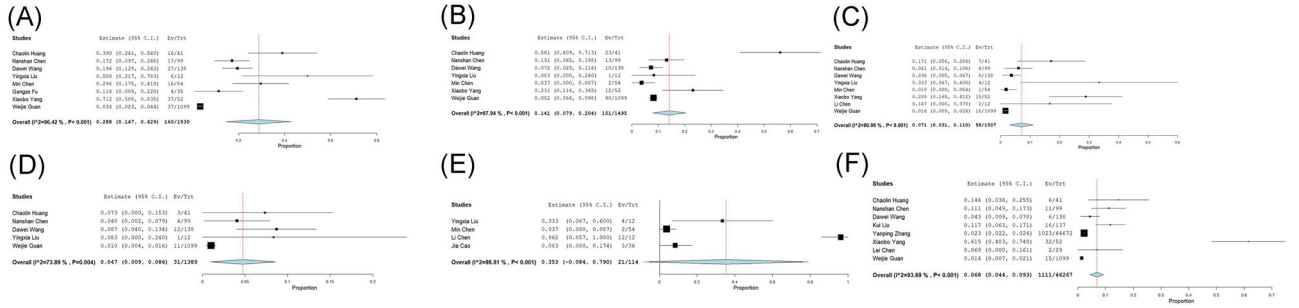

FIGURE 7 The forest plots of the incidence of complication. A, acute respiratory distress syndrome; (B) acute cardiac injury; (C) acute renal injury; (D) shock; (E) multiple organ dysfunction syndrome; (F) mortality

public health emergencies of international concern. Certainly, prevention of imported cases is also extremely important.[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.[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.[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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