

# Clinical characteristics, laboratory abnormalities and CT findings of COVID-19 patients and risk factors of severe disease: a systematic review and meta-analysis

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**Background:** The coronavirus disease 2019 (COVID-19) is an emerging pandemic of global public health concern. We aimed to summarize the characteristics of COVID-19 patients in the early stage of the pandemic and explore the risk factors of disease progression.

**Methods:** We conducted a systematic review with meta-analysis, searching three databases for studies published between January 1, 2020, and March 18, 2020. We used random-effects models to calculate the 95% confidence intervals of pooled estimated prevalence and the odds ratio between the severe and non-severe cases.

**Results:** Ninety studies involving 16,526 COVID-19 patients were included. Hypertension (19.1%) and diabetes (9.5%) were the most common comorbidities. The most prevalent clinical symptoms were fever (78.4%), cough (58.5%), and fatigue (26.4%). Increased serum ferritin (74.2%), high C-reactive protein (73.3%), and high erythrocyte sedimentation rate (ESR) (72.2%) were the most frequently reported laboratory abnormalities. Most patients had bilateral lung involvement (82.2%) and showed peripheral (66.9%) and subpleural (62.1%) distribution, with multifocal involvement (73.1%). And the most common CT features were vascular enlargement (64.3%), ground-glass opacity (GGO) (60.7%), and thickened interlobular septa (55.1%). Respiratory failure was the most common complication (30.7%) and the overall case-fatality rate (CFR) was 4.2%. Moreover, male, history of smoking, and comorbidities might influence the prognosis. Most clinical symptoms such as fever, high fever, cough, sputum production, fatigue, shortness of breath, dyspnoea, and abdominal pain were linked to the severity of disease. Some specific laboratory indicators implied the deterioration of disease, such as leucocytosis, lymphopenia, platelet, alanine aminotransferase (ALT), aspartate aminotransferase (AST), albumin, creatinine, creatine kinase (CK), lactic dehydrogenase (LDH), C-reactive protein, procalcitonin (PCT), and D-dimer. Besides, the risk of bilateral pneumonia, consolidation, pleural effusion, and enlarged mediastinal nodes was higher in severe cases.

**Conclusions:** Most COVID-19 patients have fever and cough with lymphopenia and increased inflammatory indices, and the main CT feature is GGO involved bilateral lung. Patients with comorbidities and worse clinical symptoms, laboratory characteristics, and CT findings tend to have poor disease progression.

Keywords: Coronavirus disease 2019 (COVID-19); clinical characteristics; laboratory abnormalities; CT findings; risk factors

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# Introduction

In late December 2019, the coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome CoV-2 (SARS-CoV-2), has become an emerging pandemic of global public health concern (1). Then, the number of confirmed cases has exploded. As of March 30, 2020, almost 690 thousand confirmed patients have been reported with over 30 thousand deaths worldwide (2).

In 2003 and 2012, severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV) caused epidemics respectively. According to the prior studies, the SARS-CoV-2, a betacoronavirus, is both similar and different to the SARS-CoV and MERS-CoV (3). As reported, the mortality of SARS-CoV and MERS-CoV is higher than that of SARS-CoV-2. But the pandemic caused by COVID-19 has exceeded the previous two diseases (4).

It is important to find out the epidemiological, clinical, laboratory and image features of patients with SARS-CoV-2 infection and risk factors of severe illness for better prevention and treatment of this disease. Large quantities of researches have made effort to understand this subject, but most were case series, cross-sectional studies, and case reports which were conducted in a particular hospital or area (5-20). Because of different study designs, small samples, and incomplete information, the characteristics and risk factors of COVID-19 are still unclear.

Some systematic reviews and meta-analyses have been already published, they summarized the clinical, laboratory and chest CT findings of COVID-19 patients (21,22). However, they included a relatively small number of studies which were limited to China. In addition, few meta-analyses studied the risk factors related to poor outcomes owing to the lack of prognostic information in early studies. In this review, we summarized the prevalence of comorbidities, clinical symptoms, laboratory characteristics, chest CT findings, and complications of patients with SARS-CoV-2 infection in the early stage of the pandemic. Moreover, we analyzed the features of severe cases and non-severe cases and identified the risk factors of disease progression to offer clinicians references for clinical application and follow-up studies. We presented the following article in accordance with the PRISMA reporting checklist (available at http://dx.doi.org/10.21037/apm-20-1863).

#### Methods

#### Search strategy and selection criteria

Our systematic review was in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (23). We searched three databases, PubMed, Chinese medical journal network, and CNKI (China national knowledge infrastructure) to select relevant studies reporting COVID-19 which were published between Jan 1, 2020, and Mar 18, 2020. We used the following search terms: "COVID-19" or "Novel coronavirus" or "Novel coronavirus 2019" or "2019 nCoV" or "SARS-CoV-2". In order to ensure the comprehensiveness and accuracy of our study, we also reviewed the references of each included article.

We included studies that reported more than 50 cases of SARS-CoV-2 infection confirmed by real-time reverse transcriptase-polymerase chain reaction (RT-PCR) with demographical, clinical, laboratory, and image characteristics. Study type limit was not set, and we applied no language restrictions. We excluded the studies that only reported the infection in children, the elderly, or asymptomatic patients and the studies that lacked complete information or clear diagnostic criteria, as well as study sample was smaller than 50. Duplicate reports, review articles, commentary articles, and opinion articles were also excluded.

#### Data extraction and quality assessment

Three independent researchers (JX, TZ, YX) conducted data extraction and evaluated the literature quality. Any disagreement was resolved by another researcher (PZ). We collected the following variables from each included study: first author, the publishing institution, publication time, area, number of patients with COVID-19, median or mean age, sex ratio, smoking history, comorbidities, clinical symptoms, laboratory characteristics, image features, complications, and clinical outcome. All the outcomes of laboratory testing and chest CT we extracted were at the time of admission. We also extracted information of nonsevere and severe patients respectively. When the authors had no diagnostic criteria for severe illness, patients in the intensive care unit (ICU) were classified as severe cases. In the whole meta-analysis of pooled estimated prevalence, we excluded studies that only provided information of severe cases or non-severe cases, but included them in the metaanalysis that was limited to severe cases or non-severe cases, respectively. We used the MINORS to assess bias risk (24).

# Statistical analysis of data

For pooled estimated prevalence, State software version 15.0 was used to analyze the data we extracted. We used random-effects models to calculate 95% confidence intervals (95% CI) of pooled estimated prevalence (sex ratio, smoking history, comorbidities, clinical symptoms, laboratory characteristics, image features, and complications of COVID-19 patients). If the included article had a prevalence of 0% or 100%, it would affect the accuracy of overall estimates. As reported, the Freeman-Tukey double arcsine transformation might minimize the effect, so we used this transformation to stabilize the variance before analysis (25). For calculating the odds ratio (OR), randomeffects models were used by Review Manager software version 5.3 due to the heterogeneity between the studies. Besides, the I<sup>2</sup> statistic and Cochran's Q test were used to evaluate the degree of heterogeneity. Because most confirmed COVID-19 cases in China occurred in Wuhan and the Chinese government adopted different epidemic prevention measures in Wuhan and other cities, we conducted a subgroup analysis by city groups (Wuhan or other cities) to explore the possible source of heterogeneity and find out whether the prevalence of outcomes differed by different areas. P<0.05 was considered to be statistically significant. Besides, we evaluated publication bias by Begg's test.

#### Results

# Study selection and quality assessment

We searched 4,219 papers from the online databases by the

above search strategy. A total of 3,712 papers were retained after the deletion of duplicate papers. By reading the titles and abstracts, 3,461 papers were excluded. Then, we assessed the full texts of the remaining 251 articles, of which 124 had a sample size less than 50, 5 did not report clear diagnostic criteria, 3 only focused on infection in children, the elderly, or asymptomatic patients, and 29 did not report complete information or original data. Finally, we included 90 papers in our meta-analysis (Figure 1). We divided them into 4 parts, part 1 (5-20), part 2 (26-50), part 3 (51-75), part 4 (76-99). Among the included studies, five studies only provided information of severe cases and two studies only provided information of non-severe cases, which were excluded from the whole metaanalysis but were included in the meta-analysis limited to severe cases and non-severe cases, respectively. In addition, 28 studies provided information on both severe and non-severe patients and we included them in the meta-analysis to identify the risk factors of disease progression.

*Table 1* lists the baseline characteristics of the included studies. All of the included studies were published between Jan 30, 2020, and Mar 18, 2020, in a sample size ranging from 50 to 1,590 patients. Among the included 90 studies with a total of 16,526 patients, 88 (97.8%) were from China, of which 37 (41.1%) were from Wuhan. Mean or median age of patients ranged from 37 to 68 years (median 48.8 years; 74 studies). Moreover, the proportion of severe cases ranged from 0.0% to 100.0% (median 23.1%; 65 studies).

Table S1 lists the bias risk assessment of the included studies. Overall, according to the MINORS, all the included studies were rated fair for quality. The scores of these 90 studies ranged from 9 to 14.

#### Demographical characteristics and comorbidities

The proportion of men in the 77 studies was 53.1% (95% CI, 41.3–55.0%). Moreover, the proportion of patients who had a history of smoking was 10.2% (95% CI, 7.1–13.4%). 32.5% of the patients had comorbidities (95% CI, 29.0–36.1%), and the most common were hypertension (19.1%, 95% CI, 16.4–21.8%), diabetes (9.5%, 95% CI, 8.1–10.8%), and cardiovascular disease (5.4%, 95% CI, 4.2–6.7%) (*Figure 2*).

# Clinical symptoms and laboratory characteristics

We analyzed the prevalence of 22 clinical symptoms. In which, the most prevalent were fever (78.4%, 95% CI, 74.5–82.3%), cough (58.5%, 95% CI, 51.4–65.6%), fatigue

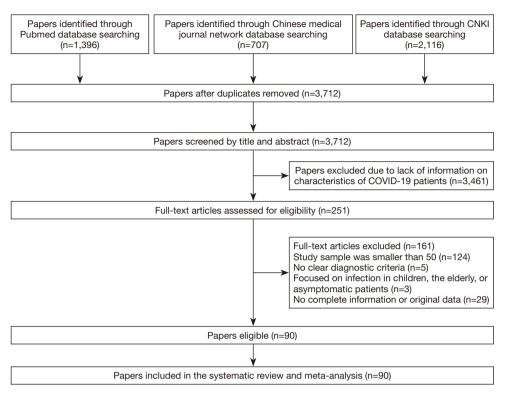


Figure 1 Flow diagram of the study selection process.

(26.4%, 95% CI, 21.4–31.4%), sputum production (22.7%, 95% CI, 18.2–27.2%), chest distress (18.7%, 95% CI, 12.5–25.0%), and shortness of breath (18.5%, 95% CI, 12.9–24.2%). The proportions of high fever, myalgia or arthralgia, dyspnoea, chills, and anorexia were also above 10% (*Figure 3*).

Regarding the 32 frequently reported laboratory findings, the most common abnormalities were increased serum ferritin (74.2%, 95% CI, 64.9–83.5%), high C-reactive protein (CRP) (73.3%, 95% CI, 65.2–80.6%), high ESR (72.2%, 95% CI, 62.1–82.3%), decreased eosinophil (59.2%, 95% CI, 40.9–77.4%), increased interleukin 6 (IL-6) (58.2%, 95% CI, 32.7–83.6%), lymphopenia (46.5%, 95% CI, 38.5–54.4%), high lactic dehydrogenase (LDH) (41.6%, 95% CI, 22.5–60.7%), and hyperglycemia (40.1%, 95% CI, 29.5–50.6%) (*Figure 4*).

# Chest CT findings

The proportion of patients who had normal CT imaging features was 6.1%. Eighty-two point two percent of the patients had bilateral lung involvement, 66.9% showed peripheral distribution, 73.1% showed multifocal

involvement, and 62.1% showed subpleural distribution. Although all lung lobes can be involved, right lower lobe (65.1%) and left lower lobe (70.4%) were more likely to be involved. More than half of the COVID-19 patients had >3 lobes involved (57.9%) (*Figure 5*).

The most common characteristics seen on chest CT were vascular enlargement (64.3%, 95% CI, 50.7–77.8%), ground-glass opacity (GGO) (60.7%, 95% CI, 51.1–70.3%), thickened interlobular septa (55.1%, 95% CI, 38.2–72.1%), interstitial abnormalities (48.3%, 95% CI, 4–92.7%), mixed GGO and consolidation (44.5%, 95% CI, 29–60%), and air bronchogram (39.9%, 95% CI, 21.3–58.5%). Pericardial effusion (4.4%), pleural effusion (4.2%), and enlarged mediastinal nodes (2.9%) were rare (*Figure 5*).

#### Complications and outcomes

Among the COVID-19 patients, respiratory failure was the most common complication (30.7%, 95% CI, 10.2–51.1%). In addition, 15.5% of the patients had acute respiratory distress syndrome (ARDS), 10.7% had acute cardiac injury, 4.5% had acute kidney injury, 9.6% had secondary infection, and 4.6% had shock. The overall mortality was

	Date	i	No. of	Quality	Age [median	Age range		Severe/critical -		Outcomes	
Author (N	(DD/MM)	City	patients	score	(IQR)/mean ± SD, years]	(years)	Male (%)		Hospitalization (%) Discharge (%)	Discharge (%)	Death (%)
Liu W	2/28	Wuhan	78	12	38 (33.0–57.0)	I	39 (50.0)	8 (10.3)	I	I	2 (2.6)
Chen C	3/6	Wuhan	150	10	59±16	I	84 (56.0)	24 (16.0)	I	I	11 (7.3)
Tian S	2/27	Beijing	262	13	47.5 (median)	1–94	127 (48.5)	46 (17.6)	214 (81.7)	45 (17.2)	3 (1.1)
Li K	2/29	Chongqing	83	10	45.5±12.3	I	44 (53.0)	25 (30.1)	I	I	I
Хи ҮН	2/25	Beijing	50	12	43.9±16.8	3–85	29 (58.0)	13 (26.0)	I	I	I
Yang W	2/26	Wenzhou	149	13	45.11±13.35	I	81 (54.4)	0 (0)	76 (51.0)	73 (49.0)	0 (0)
Guan WJ	2/28	Multi-city	1,099	14	47.0 (35.0–58.0)	I	637/1,096 (58.1)	173 (15.7)	1,029 (93.6)	55 (5.0)	15 (1.4)
Wu J	2/29	Jiangsu	80	13	46.10±15.42	I	39 (48.8)	3 (3.8)	61 (76.3)	21 (26.3)	0) 0
Mo, P.	3/16	Wuhan	155	13	54 (42.0–66.0)	I	86 (55.5)	92 (59.4)	I	I	22 (14.2)
Zhou F	3/11	Wuhan	191	14	56.0 (46.0–67.0)	18–87	119 (62.3)	119 (62.3)	0) 0	137 (71.7)	54 (28.3)
Liu K	3/11	Hainan	56	13	I	I	31 (55.4)	9 (16.1)	0 (0)	53 (94.6)	3 (5.4)
Xu T	3/13	Changzhou	51	13	I	I	25 (49.0)	I	I	I	I
Wang Z	3/16	Wuhan	69	13	42.0 (35.0–62.0)	I	32 (46.4)	I	44 (63.8)	18 (26.1)	5 (7.2)
Xu XW	2/19	Zhejiang	62	13	41 (32.0–52.0)	I	35 (56.5)	1 (1.6)	61 (98.4)	1 (1.6)	0) 0
Ruan Q	3/3	Wuhan	150	6	I	I	102 (68.0)	41 (27.3)	0) 0	82 (54.7)	68 (45.3)
Chen J	3/11	Shanghai	249	13	51 (36.0–64.0)	I	126 (50.6)	22 (8.8)	32 (12.9)	215 (86.3)	2 (0.8)
Lin D	3/5	Shenzhen	92	10	I	I	I	I	I	I	I
Li Y	3/4	Wuhan	51	10	58±17	26-83	28 (54.9)	I	I	I	I
COVID-19 team Australia	3/11	Australia	71	10	45 (median)	0-94	I	I	47 (66.2)	22 (31.0)	2 (2.8)
Zhou S	3/5	Wuhan	62	10	52.8±12.2	I	39 (62.9)	Ι	I	I	I
Wang J	2/24	Zhejiang	52	10	44±14	13–73	29 (55.8)	I	I	I	I
Qin C	3/12	Wuhan	452	10	58 (47.0–67.0)	22–95	235 (52.0)	286 (63.3)	I	I	I
Han R	3/17	Wuhan	108	10	45 (mean)	21–90	38 (35.2)	I	I	I	I
Sun WW	3/15	Zhejiang	391	0	I	I	192 (49.1)	I	I	I	I
Dong XC	3/13	Tianjin	135	0	48.62±16.83	8–90	72 (53.3)	62 (45.9)	I	I	3 (2.2)
Xiao F	3/3	Guangdong	73	10	I	I	32 (43.8)	4 (5.5)	I	I	I
Fan BE	3/4	Singapore	67	10	42 (35.0–54.0)	I	37 (55.2)	9 (13.4)	I	I	0 (0)
Shi Y	3/18	Zhejiang	487	12	46 (median)	I	259 (53.2)	49 (10.1)	I	I	I
X nX	2/28	Guangzhou	06	13	50 (median)	18–86	39 (43.3)	I	I	I	I
He XW	3/15	Wuhan	54	10	68.0 (59.8-74.3)	I	34 (63.0)	54 (100.0)	I	I	I

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Age range (years)Male (%)Severes/critical (%)Hospitalization (%) $(years)$ $(\% = 10)$ $(\% = 10)$ $(\% = 10)$ $ + 8 (51.1)$ $    + 8 (51.1)$ $  16 (19.8)$ $17-75$ $56 (55.4)$ $14 (13.9)$ $ 17-75$ $56 (55.4)$ $14 (13.9)$ $ 17-75$ $56 (55.4)$ $14 (13.9)$ $ 25-88$ $72 (21.6)$ $57 (17.1)$ $ 20-88$ $72 (21.6)$ $57 (17.1)$ $ 5)$ $ 31 (57.4)$ $16 (12.2)$ $ 19-80$ $66 (62.3)$ $15 (14.2)$ $  15 (14.2)$ $21 (7.2)$ $  15 (45.7)$ $21 (7.2)$ $  15 (42.9)$ $39 (50.0)$ $  15 (42.9)$ $139 (98.6)$ $  15 (45.7)$ $21 (7.2)$ $  15 (45.7)$ $21 (7.2)$ $  15 (45.7)$ $23 (50.0)$ $  15 (45.1)$ $12 (12.9)$ $   13 (98.6)$ $                                  -$						Age [median					Outcomes	
3/3         Muth-city         130         4         4.4:15         25-60         76 (6.0)         - <th< th=""><th>Author</th><th>Date (MM/DD)</th><th>City</th><th>No. of patients</th><th>Quality score</th><th>(IQR)/mean ± SD, years]</th><th>Age range (years)</th><th>Male (%)</th><th>Severe/critica (%)</th><th></th><th>Discharge (%)</th><th>Death (%)</th></th<>	Author	Date (MM/DD)	City	No. of patients	Quality score	(IQR)/mean ± SD, years]	Age range (years)	Male (%)	Severe/critica (%)		Discharge (%)	Death (%)
3/16         Wuhan         94         10 $-$ 48 (51.1) $  -$ 2/24         Wuhan         11         13 $   -$	Vu J	3/3	Multi-city	130	6	43±15	25–80	78 (60.0)	I	1	1	I
2/24         Wuhan         81         13         445.±110         25-61         42 (51.9)         -         16 (19.8)         82 (76.5)           3/3         Hunan         101         9         14.44±12.22         17.75         56 (55.4)         14.47(16)         13 (65.5)           3/13         Wuhan         533         10         2016430)         24-86         7.17.7)         56 (55.4)         14.47(16)         13 (65.5)           3/14         Xinyang         106         10         44.9±13.3         19-80         66 (62.3)         15 (14.2)         -         -         -         -           3/14         Xinyang         106         10         44.9±13.3         19-80         66 (62.3)         15 (14.2)         -         <	Han H	3/16	Wuhan	94	10	I	I	48 (51.1)	I	I	I	I
33         Hunan         101         9 $4.4.4\pm12.22$ $17.73$ 56,5.4.1         14 (13.9)         -           1         3/3         Wuhan         201         13         51 (43.0-60.0) $21-83$ 128 (63.3)         57.4.1         144.7(16)         13 (65.5)           3/12         Wuhan         261         13 $5.5(5.65-68.5)$ -         151 (12.0)         -         -         -           3/14         Xinyang         106         12 $43.9\pm16.3$ - $1517.41$ 16(26.5) $3672.20$ $1147(16)$ 13 (65.5)           3/14         Xinyang         106 $12.265.16.6.68.51$ - $154(62.7)$ $2517.20$ $144.7(16)$ $13 (65.5)$ 3/14         Xinyang         10 $43.9\pm16.80$ 0 $66(2.3)$ $15(1.72)$ $-         -$	Shi H	2/24	Wuhan	81	13	49.5±11.0	25-81	42 (51.9)	I	16 (19.8)	62 (76.5)	3 (3.7)
3/13         Wuhan $201$ $13$ $51$ $447$ $145$ $13$ $6.5$ $3/12$ Wuhan $233$ $10$ $62,60.60.0$ $21-83$ $72/21.6$ $1447$ $15$ $13$ $6.5$ $3/12$ Wuhan $54$ $13$ $62,60.5.65.6$ $1-2$ $37(7,1)$ $1-2$ $37(7,1)$ $57(17,1)$ $-7$ $-7$ $3/18$ Shanghal $282$ $10$ $439+13.3$ $-1$ $57(3,1)$ $51(42,2)$ $-1$ $-7$ $2/11$ Wuhan $1286$ $10$ $439+13.3$ $-1$ $573(1,07)65.3$ $57(4,1)$ $17(2,1)$ $-7$ $-7$ $2/11$ Wuhan $1286$ $10$ $373(1,07)65.3$ $37(7,2)$ $21(7,2)$ $-7$ $-7$ $2/11$ Wuhan $1286$ $10$ $373(1,07)65.3$ $37(42,3)$ $37(7,3)$ $31(4,25)$ $37(7,2)$ $31(4,65)$ $2/11$ $100$ $377(5,10,10,0)$ $373(1,2,2)$ $31(2,2$	Zhao W	3/3	Hunan	101	6	44.44±12.32	17-75	56 (55.4)	14 (13.9)	I	I	I
	Wu C	3/13	Wuhan	201	13	51 (43.0–60.0)	21-83	128 (63.7)	53 (26.4)	144 (71.6)	13 (6.5)	44 (21.9)
3/12         Wuhan         54         13 $22.5(60.5-68.5)$ -         31(57.4)         16 (23.6)         39(72.2)         11 (20.4)           3/14         Xinyang         106         10 $43.91:1.1$ 19-80         66 (62.3)         15 (14.2)         -         -           3/14         Xinyang         106         10 $43.91:1.3$ 19-80         66 (62.3)         15 (14.2)         -         -           2/11         Wuhan         1265         10 $57.242$ 20-80         66 (62.3)         15 (14.2)         -         -         -           2/11         Wuhan         1265         10 $57.242$ 20-80         66 (62.3)         15 (14.2)         -<	Wang SH	3/9	Wuhan	333	10	62 (median)	26–88	72 (21.6)	57 (17.1)	I	I	I
$3/4$ Kinyang         106         10 $483\pm13.1$ $19-30$ $66(62.3)$ $15(142)$ $  3/16$ Shanghai $282$ 10 $493\pm16.3$ $ 1534(12.7)$ $2172)$ $  3/12$ Henan $1/265$ 10 $ 57324$ $20-90$ $60(68.3)$ $45(43.7)$ $  2/12$ Wuhan         101 $0$ $57324$ $20-90$ $60(68.3)$ $45(43.7)$ $   -$	Shi JH	3/12	Wuhan	54	13	62.5 (50.5–68.5)	I	31 (57.4)	16 (29.6)	39 (72.2)	11 (20.4)	4 (7.4)
3/18         Shanghai         222         10 $49.\pm 16.3$ -         154(3.7.1)         21(7.2)         -         -         -         -         -         -         154(3.7.1)         -         -         -         -         154(3.7.1)         -         -         -         -         -         154(3.7.1)         -	Zhao Y	3/14	Xinyang	106	10	48.9±13.1	19–80	66 (62.3)	15 (14.2)	I	I	I
-         3/2         Henan         1,265         10         -         -         573/1,079 (53.1)         72 (5.7)         632 (50.0)         614 (48.5)           2/11         Wuhan         103         10 $57\pm24$ $20-89$ 60 (68.3)         45 (43.7)         -	Ling Y	3/18	Shanghai	292	10	49.9±16.3	I	154 (52.7)	21 (7.2)	I	I	1 (0.3)
$2/11$ Wuhan         103         10 $57\pm 24$ $20-90$ $66(6.3.)$ $45(4.3.7.)$ $  2/12$ Wuhan         141         10 $49(median)$ $9-87$ $77(54.6)$ 139(96.6) $  2/13$ Wuhan         106         10 $57\pm 15$ $22-82$ $64(6.4)$ $    2/13$ Wuhan         106         10 $57\pm 15$ $22-82$ $64(6.4)$ $  -$	Cheng JL	3/2	Henan	1,265	10	I	I	573/1,079 (53.1)	72 (5.7)	632 (50.0)	614 (48.5)	19 (1.5)
$2/12$ Wuhan         141         10         49 (median)         9-87         77 (54.6)         139 (96.6)         -         - $2/13$ Wuhan         106         10 $57\pm 15$ $22-82$ $64 (60.4)$ -         -	Huang L	2/11	Wuhan	103	10	57±24	20-89	60 (58.3)	45 (43.7)	I	I	2 (1.9)
$2/13$ Wuhan $106$ $10$ $57\pm16$ $22-82$ $64(60.4)$ $  -$	Lu XF	2/12	Wuhan	141	10	49 (median)	9–87	77 (54.6)	139 (98.6)	I	I	I
$2/19$ Guangzhou $91$ $10$ $50(33.0-62.0)$ $ 39(42.9)$ $8(8.9)$ $  2/77$ Anhui $60$ $12$ $39\pm11$ $15-57$ $40(657)$ $2(3.3)$ $0(0)$ $60(100.0)$ $3/5$ Shiyan $105$ $12$ $44.38\pm15.69$ $0-88$ $55(52.4)$ $    3/13$ Beijing $64$ $13$ $45\pm15$ $18-76$ $2(5.0)$ $     3/12$ Wuhan $93$ $10$ $65(50.0-72.0)$ $ 51(54.9)$ $12(12.9)$ $   2/27$ Guangzhou $164$ $10$ $  10(651.7)$ $ 44(88.5)$ $20(31.3)$ $2/27$ Kaogan $205$ $10$ $49.1\pm13.6$ $      2/27$ Kuangzhou $164$ $10$ $  10(651.7)$ $    2/27$ Vuhan $51$ $10$ $49.1\pm13.6$ $      2/28$ Kaoogan $205$ $10$ $49.1\pm13.6$ $        2/27$ Vuhan $51$ $10$ $66(1.7)$ $                       -$ <td< td=""><td>Liu HF</td><td>2/13</td><td>Wuhan</td><td>106</td><td>10</td><td>57±15</td><td>22–82</td><td>64 (60.4)</td><td>I</td><td>I</td><td>I</td><td>I</td></td<>	Liu HF	2/13	Wuhan	106	10	57±15	22–82	64 (60.4)	I	I	I	I
$2/27$ Anhui6012 $39\pm11$ $15-57$ $40$ (66.7) $2$ (3.3) $0$ (0) $60$ (100.0) $3/5$ Shyan10512 $4.38\pm15.69$ $0-88$ $55$ (52.4) $    3/13$ Beljing6413 $45\pm15$ $18-76$ $32$ (50.0) $     3/12$ Wuhan9310 $65(50.0-72.0)$ $  51(3.57)$ $14(85.8)$ $20$ (31.3) $2/27$ Guangzhou16410 $   75(45.7)$ $14(85.8)$ $20$ (31.3) $2/27$ Wuhan5310 $65(50.0-72.0)$ $  75(45.7)$ $14(85.9)$ $   2/27$ Guangzhou16410 $   76(45.7)$ $14(85.8)$ $20$ (31.3) $3/7$ Wuhan5110 $49.1\pm13.6$ $          2/28$ Kiaogan $205$ 10 $49.1\pm13.6$ $  -$ <td>Yu CC</td> <td>2/19</td> <td>Guangzhou</td> <td>91</td> <td>10</td> <td>50 (33.0–62.0)</td> <td>I</td> <td>39 (42.9)</td> <td>8 (8.8)</td> <td>I</td> <td>I</td> <td>I</td>	Yu CC	2/19	Guangzhou	91	10	50 (33.0–62.0)	I	39 (42.9)	8 (8.8)	I	I	I
$3/5$ Shiyan $105$ $12$ $44.38\pm15.69$ $0-88$ $55(5.4.4)$ $   -$ <td>Li XH</td> <td>2/27</td> <td>Anhui</td> <td>60</td> <td>12</td> <td>39±11</td> <td>15–57</td> <td>40 (66.7)</td> <td>2 (3.3)</td> <td>0 (0)</td> <td>60 (100.0)</td> <td>0 (0)</td>	Li XH	2/27	Anhui	60	12	39±11	15–57	40 (66.7)	2 (3.3)	0 (0)	60 (100.0)	0 (0)
$3/13$ Beijng $64$ $13$ $45\pm15$ $18-76$ $32(50.0)$ $ 44(68.8)$ $20(31.3)$ $3/12$ Wuhan $93$ $10$ $65(5072.0)$ $ 51(54.8)$ $12(12.9)$ $   2/26$ Xiaogan $164$ $10$ $  75(45.7)$ $14(8.5)$ $   2/26$ Xiaogan $205$ $10$ $49.1\pm13.6$ $  106(51.7)$ $    2/26$ Xiaogan $205$ $10$ $  106(51.7)$ $      3/16$ Wuhan $51$ $10$ $  -$ </td <td>Hu R</td> <td>3/5</td> <td>Shiyan</td> <td>105</td> <td>12</td> <td>44.38±15.69</td> <td>0-88</td> <td>55 (52.4)</td> <td>I</td> <td>I</td> <td>I</td> <td>I</td>	Hu R	3/5	Shiyan	105	12	44.38±15.69	0-88	55 (52.4)	I	I	I	I
$3/12$ Wuhan9310 $65(50.0-72.0)$ $ 51(54.5)$ $12(12.9)$ $  2/27$ Guangzhou $164$ 10 $  75(45.7)$ $14(85)$ $   2/26$ Xiaogan $205$ 10 $49.1\pm13.6$ $  75(45.7)$ $14(8.5)$ $   2/26$ Xiaogan $205$ 10 $49.1\pm13.6$ $  106(51.7)$ $     3/7$ Wuhan $51$ 13 $62.12\pm12.95$ $30-92$ $28(48.3)$ $58(100.0)$ $30(51.7)$ $21(36.2)$ $3/16$ Wuhan $51$ 10 $         2/70$ Shanghai $50$ 9 $50.4\pm16.8$ $10-74$ $77(50.3)$ $21(13.7)$ $148(96.7)$ $5(3.3)$ $2/10$ Shanghai $50$ 9 $50.4\pm16.8$ $      2/70$ Shanghai $50$ 9 $50.4\pm16.8$ $10-74$ $77(50.3)$ $21(13.7)$ $148(96.7)$ $5(3.3)$ $2/10$ Shanghai $50$ 9 $50.4\pm16.8$ $       2/70$ Shing $50$ 9 $50.4\pm16.8$ $10-74$ $77(50.3)$ $21(13.7)$ $148(96.7)$ $5(3.3)$ $3/7$ Nanjing $57$ 13 $37(median)$ $5-97$ $28(56.0)$ $  -$	Lv ZB	3/13	Beijing	64	13	45±15	18–76	32 (50.0)	I	44 (68.8)	20 (31.3)	0 (0)
$2/27$ Guangzhou16410 $  75(45.7)$ $14(8.5)$ $   2/26$ Xiaogan $205$ 10 $49.1\pm13.6$ $ 106(51.7)$ $  -$ <td>LiY</td> <td>3/12</td> <td>Wuhan</td> <td>93</td> <td>10</td> <td>65 (50.0–72.0)</td> <td>I</td> <td>51 (54.8)</td> <td>12 (12.9)</td> <td>I</td> <td>I</td> <td>I</td>	LiY	3/12	Wuhan	93	10	65 (50.0–72.0)	I	51 (54.8)	12 (12.9)	I	I	I
2/26Xiaogan20510 $49.1\pm13.6$ - $106(51.7)$ <	Shi YL	2/27	Guangzhou	164	10	I	I	75 (45.7)	14 (8.5)	I	I	I
$3/7$ Wuhan5813 $62.12\pm12.95$ $30-92$ $28 (48.3)$ $58 (100.0)$ $30 (51.7)$ $21 (36.2)$ $3/16$ Wuhan $51$ 10 $   30 (58.8)$ $  2/28$ Chongqing $153$ 13 $46 (median)$ $10-74$ $77 (50.3)$ $21 (13.7)$ $148 (96.7)$ $5 (3.3)$ $2/10$ Shanghai $50$ 9 $50.4\pm16.8$ $ 28 (56.0)$ $    3/9$ Beijing $50$ 10 $40.0\pm18.4$ $3-79$ $32 (64.0)$ $    3/16$ Wuhan $62$ 13 $37 (median)$ $5-97$ $29 (50.9)$ $0 (0)$ $0 (0)$ $57 (100.0)$ $3/10$ Anhui $75$ 13 $37 (median)$ $5-97$ $29 (50.9)$ $0 (0)$ $0 (0)$ $57 (100.0)$ $3/14$ Anhui $75$ 10 $43.9\pm15.1$ $8-82$ $46 (61.3)$ $   3/13$ Chongqing13910 $4.91$ $4.97$ $76 (54.7)$ $31 (22.3)$ $  3/12$ Huanshi30810 $        3/12$ Huanshi $308$ $10$ $         3/14$ Anhui $75$ $10$ $76 (54.7)$ $157 (30.6)$ $       3/14$ A	Li RQ	2/26	Xiaogan	205	10	49.1±13.6	I	106 (51.7)	I	I	I	I
$3/16$ Wuhan $51$ $10$ $   30(58.8)$ $   2/28$ Chongqing $153$ $13$ $46$ (median) $10-74$ $77(50.3)$ $21(13.7)$ $148(96.7)$ $5(3.3)$ $2/10$ Shanghai $50$ $9$ $50.4\pm16.8$ $ 28(56.0)$ $    3/3$ Beijing $50$ $10$ $40.0\pm18.4$ $3-79$ $32(64.0)$ $    3/3$ Nanjing $57$ $13$ $377(median)$ $5-97$ $29(50.9)$ $0(0)$ $0(0)$ $57(100.0)$ $3/16$ Wuhan $62$ $13$ $377(median)$ $5-97$ $29(50.9)$ $0(0)$ $0(0)$ $57(100.0)$ $3/16$ Anhui $75$ $10$ $43.9\pm15.1$ $8-82$ $46(61.3)$ $    3/14$ Anhui $80$ $10$ $45.33(median)$ $4-91$ $45(56.3)$ $    3/13$ Chongqing $139$ $10$ $46(36.0-54.0)$ $15-79$ $76(54.7)$ $31(22.3)$ $   3/12$ Huangshi $308$ $10$ $  30-86$ $152(49.4)$ $121(39.3)$ $  -$	Bai P	3/7	Wuhan	58	13	62.12±12.95	30–92	28 (48.3)	58 (100.0)	30 (51.7)	21 (36.2)	7 (12.1)
$2/28$ Chongqing15313 $46$ (median) $10-74$ $77$ (50.3) $21$ (13.7) $148$ (96.7) $5$ (3.3) $2/10$ Shanghai509 $50.4\pm16.8$ - $28$ (56.0) $3/9$ Beijing5010 $40.0\pm18.4$ $3-79$ $32$ (64.0) $3/3$ Nanjing5713 $37$ (median) $5-97$ $29$ (50.9)0 (0)0 (0)57 (100.0) $3/16$ Wuhan6213 $62.9\pm15.3$ - $39$ (62.9)62 (100.0)29 (46.8)19 (30.6)1 $3/10$ Anhui7510 $43.9\pm15.1$ $8-82$ $46$ (61.3) $3/14$ Anhui8010 $45.33$ (median) $4-91$ $45$ (56.3) $3/13$ Chongqing13910 $46$ (36.0-54.0) $15-79$ $76$ (54.7) $31$ (22.3) $3/12$ Huangshi30810 $30-86$ $152$ (49.4) $121$ (39.3)	Sun DW	3/16	Wuhan	51	10	I	I	I	30 (58.8)	I	I	I
$2/10$ Shanghai $50$ $9$ $50.4\pm16.8$ $ 28(56.0)$ $   -$	Wan Q	2/28	Chongqing	153	13	46 (median)	10–74	77 (50.3)	21 (13.7)	148 (96.7)	5 (3.3)	0 (0)
3/9       Beijng       50       10       40.0±18.4       3-79       32 (64.0)       - <t< td=""><td>Lu YF</td><td>2/10</td><td>Shanghai</td><td>50</td><td>6</td><td>50.4±16.8</td><td>I</td><td>28 (56.0)</td><td>I</td><td>I</td><td>I</td><td>I</td></t<>	Lu YF	2/10	Shanghai	50	6	50.4±16.8	I	28 (56.0)	I	I	I	I
3/3       Nanjing       57       13       37 (median)       5-97       29 (50.9)       0 (0)       67 (100.0)       57 (100.0)         3/16       Wuhan       62       13       62.9±15.3       -       39 (62.9)       62 (100.0)       29 (46.8)       19 (30.6)       1         3/10       Anhui       75       10       43.9±15.1       8-82       46 (61.3)       -	Yu SM	3/9	Beijing	50	10	40.0±18.4	3–79	32 (64.0)	I	I	I	I
3/16       Wuhan       62       13       62.9±15.3       -       39       62       100.0)       29       46.8)       19       (30.6)       1         3/10       Anhui       75       10       43.9±15.1       8-82       46       (61.3)       -       <	Yang K	3/3	Nanjing	57	13	37 (median)	5–97	29 (50.9)	0) 0	0 (0)	57 (100.0)	0 (0)
3/10       Anhui       75       10       43.9±15.1       8-82       46 (61.3)       - <t< td=""><td>Xu S</td><td>3/16</td><td>Wuhan</td><td>62</td><td>13</td><td>62.9±15.3</td><td>I</td><td>39 (62.9)</td><td>62 (100.0)</td><td>29 (46.8)</td><td>19 (30.6)</td><td>14 (22.6)</td></t<>	Xu S	3/16	Wuhan	62	13	62.9±15.3	I	39 (62.9)	62 (100.0)	29 (46.8)	19 (30.6)	14 (22.6)
3/14     Anhui     80     10     45.33 (median)     4–91     45 (56.3)     -     -     -     -     -       3/13     Chongqing     139     10     46 (36.0–54.0)     15–79     76 (54.7)     31 (22.3)     -     -     -       3/12     Huangshi     308     10     -     30–86     152 (49.4)     121 (39.3)     -     -	Ma PQ	3/10	Anhui	75	10	43.9±15.1	8-82	46 (61.3)	I	I	I	I
3/13 Chongqing 139 10 46 (36.0–54.0) 15–79 76 (54.7) 31 (22.3) – – – – 33/12 Huangshi 308 10 – 30–86 152 (49.4) 121 (39.3) – – –	Wang Y	3/14	Anhui	80	10	45.33 (median)	4–91	45 (56.3)	I	I	I	I
3/12 Huangshi 308 10 - 30-86 152 (49.4) 121 (39.3)	Chen X	3/13	Chongqing	139	10	46 (36.0–54.0)	15–79	76 (54.7)	31 (22.3)	I	I	I
	Fang L	3/12	Huangshi	308	10	I	30–86	152 (49.4)	121 (39.3)	I	I	16 (5.2)

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Table 1 (continued)	(pəi										
Author	Date (MM/DD)	City	No. of patients	Quality score	Age [median (IQR)/mean + SD_vears]	Age range (years)	Male (%)	Severe/critical (%)	Outcomes Hospitalization (%) Discharge (%)	Outcomes Discharge (%)	Death (%)
Fang XW	2/25	Anhui	79	13	45.1±16.6	5–91	45 (57.0)	24 (30.4)	44 (55.7)	34 (43.0)	1 (1.3)
Zhong Q	3/16	Zhejiang	67	10	I	15–90	I	29 (43.3)	I	I	I
Ran J	3/6	Chongqing	209	10	46.52±15.71	14–71	123 (58.9)	37 (17.7)	I	I	I
Yuan J	3/6	Chongqing	223	13	46.5±16.1	I	105 (47.1)	31 (13.9)	111 (49.8)	112 (50.2)	0 (0)
Xiao KH	2/27	Chongqing	143	13	45.13±1.04	I	73 (51.0)	36 (25.2)	25 (17.5)	117 (81.8)	1 (0.7)
Wang AH	3/18	Chongqing	06	10	48.19±17.85	3–89	58 (64.4)	13 (14.4)	22 (24.4)	68 (75.6)	0 (0)
Wang XJ	3/17	Gansu	91	10	45 (median)	1–94	32 (35.2)	15 (16.5)	24 (26.4)	65 (71.4)	2 (2.2)
Li JS	3/12	Henan	524	10	45 (33.0–55.0)	I	304 (58.0)	175 (33.4)	I	I	I
Han J	3/16	Wuhan	120	10	53±14	15-89	63 (52.5)	41 (34.2)	71 (59.2)	40 (33.3)	9 (7.5)
Dai ZH	3/6	Hunan	918	10	44. 73±16. 00	0-88	478 (52.1)	77 (8.4)	I	I	I
Chen W	3/17	Jingmen	91	10	41.59±15.53	2–85	43 (47.3)	21 (23.1)	0) 0	86 (94.5)	5 (5.5)
Cheng KB	3/12	Wuhan	463	13	51 (43.0–60.0)	15-90	244 (52.7)	181 (39.1)	0) 0	463 (100.0)	0 (0)
Zhou SY	3/13	Shandong	537	10	I	I	299 (55.7)	28 (5.2)	371 (69.1)	164 (30.5)	2 (0.4)
Sui HY	2/24	Tianjin	88	10	48.52±15.67	9–91	49 (55.7)	32 (36.4)	I	I	I
Zhou YP	3/4	Xianning	107	10	I	I	I	I	I	I	I
Ding Y	3/17	Wuhan	56	10	54.6±15.5	24–86	30 (53.6)	5 (8.9)	45 (80.4)	11 (19.6)	0 (0)
Xiong J	3/3	Wuhan	89	13	53.0±16.9	I	41 (46.1)	31 (34.8)	0) 0	82 (92.1)	7 (7.9)
Hou KK	3/17	Chengdu	56	13	48±13.5	19–84	29 (51.8)	18 (32.1)	0) 0	53 (94.6)	3 (5.4)
Chen ZY	3/17	Wuhan	64	10	54.55±14.04	28-84	31 (48.4)	I	I	I	I
Chang ZY	3/5	Wuhan	150	10	55.27±6.33	27–81	80 (53.3)	57 (38.0.)	I	I	20 (13.3)
Qian ZC	3/17	Wuhan	50	13	57.6 (mean)	30-84	25 (50.0)	50 (100.0)	0) 0	43 (86.0)	7 (14.0)
Lu ZL	3/10	Wuhan	101	10	I	I	34 (33.7)	34 (33.7)	I	I	12 (11.9)
Chen NS	1/30	Wuhan	66	14	55.5±13.1	21–82	67 (67.7)	23 (23.2)	57 (57.6)	31 (31.3)	11 (11.1)
Liang W	2/14	Multi-city	1,590	13	I	I	910 (57.2)	131 (8.2)	I	I	I
Yang XB	2/21	Wuhan	52	14	59.7±13.3	I	35 (67.3)	52 (100.0)	12 (23.1)	8 (15.4)	32 (61.5)
Wang DW	2/7	Wuhan	138	14	56 (42.0–68.0)	I	75 (54.3)	36 (26.1)	85 (61.6)	47 (34.1)	6 (4.3)
Liu K	2/7	Wuhan	137	13	55±16	20-83	61 (44.5)	I	77 (56.2)	44 (32.1)	16 (11.7)
Pan YY	2/13	Wuhan	63	10	44.9±15.2	I	33 (52.4)	I	I	I	I
Zhang JJ	2/19	Wuhan	140	13	57 (median)	25–87	71 (50.7)	58 (41.4)	I	I	I
-, not available, not reported. MM/DD, Month, Day.	, not reportec	I. MM/DD, Mo.	nth, Day.								

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	No. Studie:	No. s Patien	ts						Prevalence% (95%Cl)	l²(%)	Begg
Male	77	15038				+			53.10 (51.30, 55.00)	79.2%	0.013
History of smoking	13	4729							10.20 (7.10, 13.40)	93.8%	0.502
Comorbidities	31	7285							32.50 (29.00, 36.10)	90.4%	0.083
Diabetes	37	5699	+						9.50 (8.10, 10.80)	65.0%	0.008
Hypertension	35	5558		-					19.10 (16.40, 21.80)	85.8%	0.000
Cardiovascular disease	28	4916	+						5.40 (4.20, 6.70)	78.7%	0.239
Cerebrovascular disease	15	2848	+						3.00 (2.00, 4.00)	46.1%	0.711
COPD	21	3704	+						2.50 (1.80, 3.40)	53.2%	0.008
Tuberculosis	6	1119	•						1.60 (0.90, 2.40)	0.0%	1.000
Respiratory system diseases	13	1487	+						2.60 (1.30, 3.90)	65.5%	0.024
Digestive system disease	10	1341	+						3.70 (2.40, 5.00)	38.8%	0.707
Chronic liver disease	19	2808	+						2.90 (2.10, 3.80)	38.8%	0.537
HBV infection	9	2264	+						2.40 (1.30, 3.60)	59.6%	0,806
Chronic renal disease	22	4108							1.20 (0.90, 1.50)	0.0%	0.707
Malignancies	25	6113	•						1.80 (1.20, 2.40)	61.3%	0.669
mmunodeficiency	8	1891 -	÷						1.30 (0.40, 2.60)	64.9%	0,368
		-			1		-	-1			

Figure 2 Meta-analysis of the sex ratio, smoking history, comorbidities of COVID-19 patients. COPD, chronic obstructive pulmonary disease; HBV, hepatitis B virus.

	No. Studies	No. Patients				Prevalence% (95%Cl)	12(96)	Begg
Fever	65	10881				78.40 (74.50, 82.30)	97.0%	0.000
High fever(≥39℃)	14	4021				13.10 (9.10, 17.00)	97.4%	0.945
Cough	62	10571				58.50 (51.40, 65.60)	98.7%	0.000
Sore throat	33	5808	-			9.20 (7.40, 11.00)	83.3%	0.103
Rhinorrhea	16	3051 -	•• ·			5.50 (3.50, 7.50)	88.5%	0,732
Nasal congestion	9	2712 -	-			5.10 (2.40, 7.80)	92.4%	1.000
Sputum production	35	6964				22.70 (18.20, 27.20)	97.0%	0.000
Haemoptisis	6	2039+				1.70 (0.70, 2.80)	53.6%	1.000
Fatigue	45	8938				26.40 (21.40, 31.40)	97.7%	0.012
Myalgia or arthralgia	35	6398				16.00 (13.20, 18.80)	92.3%	0.075
Headache	35	7379	+			9.30 (7.60, 11.00)	86.4%	0.035
Dizziness	10	1831 🔸				4.20 (2.50, 5.90)	70.8%	0.260
Shortness of breath	19	5964				18.50 (12.90, 24.20)	97.8%	0.149
Dyspnoea	25	3871				15.20 (11.30, 19.00)	97.2%	0.496
Chest pain	17	3197 +				3.90 (2.40, 5.40)	87.1%	0.174
Chest distress	25	3632				18.70 (12.50, 25.00)	97.9%	0,833
Chills	14	3841				13.70 (8.10, 19.20)	97.6%	0.827
Abdominal pain	12	1586 +				3.30 (2.20, 4.60)	35.7%	0.013
Diamhea	46	8278	+			6.80 (5.40, 8.20)	87.6%	1.000
Nausea	9	1004 -	-			6.60 (3.80, 9.40)	77.9%	0.368
Vomiting	12	1591 +				3.30 (2.40, 4.20)	0.0%	0,806
Anorexia	16	2623				12.90 (8.70, 17.00)	94.6%	0.161
		1	1	-1-	 	1		

Figure 3 Meta-analysis of the prevalence of clinical symptoms in COVID-19 patients.

	No.	No.	Prevalance®( (05% CI)	12(0/)	Deer
S	tudies	Patients	Prevalence% (95%Cl)	l²(%)	Begg
Leucocytosis	28	5061	7.80 (5.40, 10.60)	90.7%	0.022
Leukopenia	31	5280	24.10 (20.80, 27.30)	86.3%	0.009
Neutrophilia	8	826	17.20 (8.50, 25.80)	95.3%	0.024
Neutropenia	5	438	19.60 (9.10, 30.10)	89.8%	0.462
lymphocytosis	5	1093 🔶	2.40 (1.30, 3.80)	19.2%	0.08
Lymphopenia	33	5619	46.50 (38.50, 54.40)	97.7%	0.03
Mononucleosis	4	480	17.00 (8.80, 25.30)	83.1%	0.73
Eosinophil, decreased	4	382	59.20 (40.90, 77.40)	93.4%	0.089
Platelet, increased	5	1394	10.10 (0.90, 27.40)	98.1%	0.30
Platelet, decreased	8	808	10.20 (5.60, 16.00)	83.4%	0.368
Anemia	3	370 +	33.70 (11.00, 56.40)	95.5%	0.296
ALT, increased	12	2096	19.30 (14.40, 24.20)	87.7%	0.27
AST, increased	13	2066	21.00 (15.20, 26.90)	91.4%	0.45
Albumin, decreased	8	1366	39.40 (5.50, 73.20)	99.9%	0.54
Total Bilirubin, increased	7	1660	8.20 (4.30, 12.00)	90.1%	0.45
Creatinine, increased	8	1605	5.70 (2.60, 8.90)	88.3%	0.80
BUN, increased	4	456 🔸	4.10 (2.30, 5.90)	0.0%	1.00
Creatine kinase, increased	11	1789	12.30 (9.90, 14.70)	51.5%	0.21
CK-MB, increased	6	626	11.80 (5.50, 18.00)	86.6%	0.22
LDH, increased	15	2335	41.60 (22.50, 60.70)	99.3%	0.843
Troponin I, increased	3	374	16.00 (12.30, 19.70)	0.0%	1.000
Glucose, increased	4	525	40.10 (29.50, 50.60)	84.2%	0.308
ESR, increased	9	983	72.20 (62.10, 82.30)	94.2%	0.048
CRP, increased	25	3069	73.30 (65.20, 80.60)	95.6%	0.013
PCT, increased	15	2117	13.50 (9.20, 17.70)	95.1%	0.04
IL-6, increased	4	408	58.20 (32.70, 83.60)	97.2%	0.30
Serum ferritin, increased	3	390	74.20 (64.90, 83.50)	78.4%	1.00
APTT, increased	3	327	20.70 (4.10, 37.30)	94.0%	1.00
APTT, decreased	3	374	8.90 (1.70, 16.10)	86.1%	1.00
PT, increased	5	704	11.00 (4.30, 17.70)	92.9%	1.00
PT, decreased	3	328	11.10 (0.40, 21.70)	94.0%	1.00
D-dimer, increased	11	1731	29.50 (16.70, 42.30)	98.1%	0.02
		I I I I I 0 20 40 60 8	I 0 100		

**Figure 4** Meta-analysis of the proportion of laboratory abnormalities in COVID-19 patients. ALT, alanine aminotransferase; AST, aspartate aminotransferase; BUN, blood urea nitrogen; CK-MB, creatine kinase-MB; LDH, lactic dehydrogenase; ESR, erythrocyte sedimentation rate; CRP, C-reactive protein; PCT, procalcitonin; IL-6, interleukin 6; APTT, activated partial thromboplastin time; PT, prothrombin time.

4.2% (95% CI, 2.6-6.3%) (Figure 6).

# Subgroup analysis

According to the subgroup analysis, the prevalence of comorbidities, clinical symptoms, laboratory abnormalities, and complications most was higher in Wuhan than in other cities. However, the proportions of patients who had a history of smoking and abnormal chest CT characteristics (such as GGO, consolidation, and pleural effusion) were higher in other cities. Besides, we also found a significantly higher CFR in Wuhan than in other cities (10.4%, 95% CI, 6.3–15.5%; versus 1.3%, 95% CI, 0.7–1.9%) (*Table 2*).

# Comparison between severe and non-severe cases and risk factors of severe illness

Among the included 90 studies, 30 and 35 studies reported information of non-severe and severe cases, respectively. The proportion of male was significantly higher in severe patients compared with non-severe patients (60.9%, 95% CI, 57.3–64.4%; versus 49.5%, 95% CI, 46.6–52.4%). We compared the differences in the comorbidities, clinical symptoms, laboratory abnormalities, image findings, and complications between the two groups. Most of the proportions were higher among severe cases, except for chronic liver disease and headache. In addition, the

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Studies       Patients         Normal chest CT findings       43       7433         Unilateral Pneumonia       22       2287         Bilateral Pneumonia       28       3046         Peripheral distribution       7       593         Central distribution       3       232         Pripheral and central distribution       5       402         Unifocal involvement       12       1022         Multifocal involvement       13       1100         Diffuse       7       757         Subpleural       6       425         Peribronchovasular       2       208         Ground-glass opacity       24       3549         Consolidation       17       1562         Mixed GGO and consolidation       7665         Nodules       8       775         Reticular pattern       4       414         Fibrous stripes       6       452         Thickened interlobular septa       6       486         Interstital abnormalities       3       1171         Grazy-paving pattern       6       471         Air broncholgram       10       897         Pieural effusion       22       201	Prevalence% (95%Cl)	l²(%)	Begg
Juliateral Pneumonia       22       2287         Bilateral Pneumonia       28       3046         Perpheral distribution       7       593         Central distribution       3       232         Perpheral and central distribution       5       402         Juliócal involvement       12       1022         Multifocal involvement       13       1100         Diffuse       7       757         Subpleural and peribronchovasular       4       283         Subpleural and peribronchovasular       208	6.10 (3.60, 9.20)	95.9%	0.108
Bilateral Pneumonia       28       3046         Peripheral distribution       7       593         Central distribution       3       232         Peripheral and central distribution       5       402         Unifocal involvement       12       1022         Unifocal involvement       13       1100         Diffuse       7       757         Subpleural       6       425         Periphonchovasular       208       Ground-glass opacity         Subpleural and peribronchovasular       208       Ground-glass opacity         Consolidation       17       1562	13.60 (9.60, 18.10)	89.1%	0.02
Peripheral distribution 7 593 Central distribution 3 232 Peripheral and central distribution 5 402 Julifocal involvement 12 1022 Wultifocal involvement 13 1100 Offuse 7 757 Subpleural 6 425 Peribronchovasular 4 283 Subpleural and peribronchovasular 3 208 Ground-glass opacity 24 3549 Consolidation 17 1562 Wixed GGO and consolidation 7 665 Reticular pattern 4 414 Consolidation 17 1562 Thickened interlobular septa 6 486 Interstitial abnormalities 3 1171 Crazy-paving pattern 6 471 Air bronchogram 10 897 Ground-grain 10 897 Pericardial effusion 4 335 ← Pericardial effusion 4 335 Enlarged mediastinal nodes 14 1233 Right upper lobe 7 596 Right twiddle lobe 7 596 Right	82.20 (76.90, 87.00)	92.7%	0.00
Central distribution       3       232         Peripheral and central distribution       5       402         Jnifocal involvement       12       1022         Juitifocal involvement       13       1100         Diffuse       7       757         Subpleural       6       425         Peribronchovasular       4       283         Subpleural and peribronchovasular       3       208         Ground-glass opacity       24       3549         Consolidation       17       1562         Mixed GGO and consolidation       7       665         Viked GGO and consolidation       7       665         Vike docogram       10       897         Starbord partition       2       2015         Vic bronchogram       10	66.90 (55.60, 78.30)	90.1%	0.00
Peripheral and central distribution       5       402	13.80 (0.70, 39.30)	95.2%	1.00
Julifocal involvement       12       1022         Wultifocal involvement       13       1100         Diffuse       7       757         Subpleural       6       425         Peribronchovasular       4       283         Stubpleural and peribronchovasular       3       208         Ground-glass opacity       24       3549         Consolidation       17       1562         Viked GO and consolidation       7       665         Vodules       8       775         Reticular pattern       4       414         Fibrous stripes       6       452         Thickened interiobular septa       6       486         Interstilial abnormalities       3       1171         Crazy-paving pattern       6       471         Air bronchogram       10       897         Zonschildettasis       5       523         Vascular enlargement       7       681         Pleura thickening       7       596         Callardeflusion       12       2015         Pericradial effusion       12       2015         Periardial effusion       1233       Enlarge mediastinal nodes         14	36.10 (28.60, 43.70)	61.5%	0.22
Multifocal involvement       13       1100         Diffuse       7       757         Subpleural       6       425         Peribronchovasular       4       283         Subpleural and peribronchovasular       3       208         Soudidation       17       1562         Consolidation       17       1562         Vodules       8       775         Reticular pattern       4       414         -tirbrous stripes       6       452         Thickened interlobular septa       6       486         nterstitial abnormalities       3       1171         Crazy-paving pattern       6       471         Air bronchogram       10       897         Zoncholictasis       5       523         Vascular enlargement       7       681         Pleural effusion       22       2015         -       -       -       -         Paricardial effusion       14       1233         -       -       596       -         Right mediastinal nodes       14       1233       -         -       7       596       -       -         Silperal uper lob	10.50 (7.40, 13.50)	64.7%	0.01
Diffuse       7       757         Subpleural       6       425         Peribronchovasular       3       208         Subpleural and peribronchovasular       3       208         Sound-glass opacity       24       3549         Consolidation       17       1562         Mixed GGO and consolidation       7       665         Vodules       8       775         Reticular pattern       4       414	73.10 (64.00, 82.20)	94.1%	0.00
Subpleural       6       425         Peribronchovasular       3       208         Subpleural and peribronchovasular       3       208         Souppleural and peribronchovasular       3       208         Weed GGO and consolidation       7       665	15.60 (7.90, 23.30)	94.0%	0.06
Peribronchovasular     4     283       Subpleural and peribronchovasular     3     208       Subpleural and peribronchovasular     3     208       Ground-glass opacity     24     3549       Consolidation     17     1562       Aixed GGO and consolidation     7     665       Aixed GGO and consolidation     7     665       Aixed GGO and consolidation     7     665       Consolidation     7     665       Tribous stripes     6     452       Thickened Interlobular septa     6     486       Interstitial abnormalities     3     1171       Crazy-paving pattern     6     471       Vis bronchogram     10     897       Barocholectasis     5     523       Vascular enlargement     7     681       Perioardial effusion     22     2015       Perioardial effusion     4     335       Perioardial effusion     1233     -       Right upper lobe     7     596       Right middle lobe     7     596       Right upper lobe     7     596	62.10 (39.20, 85.10)	97.6%	0.00
Bubpleural and peribronchovasular       3       208         Ground-glass opacity       24       3549         Consolidation       17       1562         Aixed GGO and consolidation       7       665         Nodules       8       775         Vedicular pattern       4       414         Fibrous stripes       6       452         Chrackened interlobular septa       6       486         Interstitial abnormalities       3       1171         Crazy-paving pattern       6       471         Vis bronchogram       10       897         Bronchiolectasis       5       523         Vascular enlargement       7       681         Veraratial effusion       22       2015         Pericardial effusion       22       2015         Pericardial effusion       4       335         Finalraged mediastinal nodes       14       1233         Right upper lobe       7       596         Right upper lob	7.80 (1.60, 14.10)	79.6%	0.29
Ground-glass opacity       24       3549         Consolidation       17       1562         Mixed GGO and consolidation       7       665         Vodules       8       775         Reticular pattern       4       414         Valued Sites       6       452         Thickened Interlobular septa       6       486         Interstitial abnormalities       3       1171         Crazy-paving pattern       6       471         Vir bronchogram       10       897         Tronchiolectasis       5       523         /ascular enlargement       7       681         Pieural effusion       22       2015         -       -       -       -         Pieural effusion       12       35         -       -       596       -         Right upper lobe       7       596       -         Right middle lobe       7       596       -         Right upper lobe       7       596	38.30 (12.40, 64.20)	94.6%	0.29
Consolidation         17         1562           Mixed GGO and consolidation         7         665           Vodules         8         775           Reticular pattern         4         414           Tibrous stripes         6         452           Chickened interlobular septa         6         486           Introkened interlobular septa         6         471           Crazy-paving pattern         6         471           Stroncholocitasis         5         523           Ascular enlargement         7         681           Pleural effusion         22         2015           Percardial effusion         4         335           Enlarged mediastinal nodes         14         1233           Right upper lobe         7         596           Right tower lobe         7         596           Right nover lobe         7         596           Bilateral upper lobe         7         596           Bilateral upper lobes         6         432           Bilateral upper lobes         5         375	60.70 (51.10, 70.30)	97.9%	0.00
Mixed GGO and consolidation       7       665	25.50 (16.80, 34.20)	96.1%	0.00
Nodules     8     775       Reticular pattern     4     414       ibrous stripes     6     452       Fhickened interlobular septa     6     486       Interstitial abnormalities     3     1171       Crazy-paying pattern     6     471       Air bronchogram     10     897       Stonchiolectasis     5     523       Pleural enlargement     7     681       Pleural effusion     22     2015       Pericardial effusion     4     335       Enlarged mediastinal nodes     14     1233       Right upper lobe     7     596       Right nowe lobe     8     737       ent upper lobe     7     596       Sight tower lobe     7     596       Bilateral lower lobes     6     432       Bilateral lower lobes     5     375	44.50 (29.00, 60.00)	94.9%	0.07
Reticular pattern       4       414         Fibrous stripes       6       452         Fibrous stripes       6       452         Interstitial abnormalities       3       1171         Crazy-paving pattern       6       471         Arbornchologram       10       897         Bronchiolectasis       5       523         Asscular enlargement       7       681         Pleural effusion       22       2015         Pericardial effusion       22       2015         Pericardial effusion       4       335         Chard and abstrial nodes       14       1233         Right upper lobe       7       596         Right nower lobe       8       737         Left upper lobe       7       596         Right upper lobe       7       596         Asscular lower lobe       6       432         Bilateral upper lobes       6       432	9.80 (5.40, 14.30)	83.0%	0.07
Fibrous stripes       6       452         Thickened interlobular septa       6       486         Interstitial abnormalities       3       1171         Crazy-paving pattern       6       471         Vir bronchogram       10       897         Torochiolectasis       5       523         Vascular enlargement       7       681         Vieura thickening       7       629         Pieural effusion       22       2015         Percardial effusion       22       2015         Percardial effusion       23.5	• 27.20 (4.40, 50.00)	98.3%	0.29
nterstitial abnormalities       3       1171         Crazy-paving pattern       6       471         Vir bronchogram       10       897         Stronchiolectasis       5       523         Asscular enlargement       7       681         Pleura thickening       7       629         Percardial effusion       22       2015         Enlarged mediastinal nodes       14       1233         Sight upper lobe       7       596         Right lower lobe       8       737         eff upper lobe       7       596         Sight middle lobe       7       596         Bilateral upper lobe       7       596         Bilateral upper lobes       6       432         Bilateral upper lobes       5       375	19.10 (3.90, 42.00)	96.7%	0.22
nterstitial abnormalities       3       1171         Crazy-paving pattern       6       471         Vir bronchogram       10       897         Stronchiolectasis       5       523         Asscular enlargement       7       681         Pleura thickening       7       629         Percardial effusion       22       2015         Enlarged mediastinal nodes       14       1233         Sight upper lobe       7       596         Right lower lobe       8       737         eff upper lobe       7       596         Sight middle lobe       7       596         Bilateral upper lobe       7       596         Bilateral upper lobes       6       432         Bilateral upper lobes       5       375	55.10 (38.20, 72.10)	94.1%	0.13
Crazy-paving pattern         6         471           Air bronchogram         10         897           3ronchiolectasis         5         523           3ronchiolectasis         5         523           Vascular enlargement         7         681           Pleura hickening         7         629           Percardal effusion         22         2015           Percardal effusion         4         335           Enlarged mediastinal nodes         14         1233           Right upper lobe         7         596           Right middle lobe         7         596           Air tuper lobe         7         596           Air tuper lobe         7         596           Air tuper lobe         7         596           Bilateral upper lobes         6         432           Bilateral upper lobes         5         375	48.30 (4.00, 92.70)	99.3%	1.00
Air bronchogram       10       897         Bronchiolectasis       5       523         Jaccular enlargement       7       681         Pleura hinkening       7       629         Pericardial effusion       22       2015         Pericardial effusion       4       335         Enlarged mediastinal nodes       14       1233         Right upper lobe       7       596         Right nower lobe       8       737         eff upper lobe       7       596         Bilateral upper lobes       6       432         Bilateral lower lobes       5       375	30.90 (15.20, 46.50)	95.0%	0.26
Bronchiolectasis         5         523           Ascular enlargement         7         681           Pleural effusion         22         2015           Perioradial effusion         4         335           Perioradial effusion         4         1233           Right upper lobe         7         596           Right tower lobe         8         737           effu oper lobe         7         596           Right upper lobe         7         596           Right upper lobe         7         596           Bilateral upper lobe         7         596           Bilateral upper lobes         6         432           Bilateral lower lobes         5         375	\$ 39.90 (21.30, 58.50)	98.6%	0.00
Asscular enlargement         7         681           Pleura thickening         7         629           Pleural effusion         22         2015           Pericardial effusion         4         335           Enlarged mediastinal nodes         14         1233           Right middle lobe         7         596           Right node         8         737           eff upper lobe         7         596           Git upper lobe         7         596           Sight node         8         737           eff upper lobe         7         596           Sight node         7         596           Bilateral upper lobes         6         432           Bilateral upper lobes         5         375	◆ 30.40 (15.60, 45.10)	93.9%	0.22
Pleural hickening       7       629         Pleural hickening       22       2015         Pericardial effusion       4       335         Enlarged mediastinal nodes       14       1233         Right upper lobe       7       596         Right middle lobe       7       596         Right node       8       737         eff upper lobe       7       596         Sildetral upper lobe       7       596         Bilateral upper lobes       6       432         Bilateral upper lobes       5       375	64.30 (50.70, 77.80)	93.7%	0.13
Pleural effusion         22         2015         +           Pericardial effusion         4         335         +         -           Enlarged mediastinal nodes         14         1233         +         -         -           Right upper lobe         7         596         - <td< td=""><td>29.80 (16.00, 43.60)</td><td>97.7%</td><td>0.02</td></td<>	29.80 (16.00, 43.60)	97.7%	0.02
Pericardial effusion         4         335           Enlarged mediastinal nodes         14         1233           Night upper lobe         7         596           Right lobe         7         596           Right lobe         7         596           Alight lobe         7         596           Right lobe         7         596           Alight lobe         7         596           Right lobe         7         596           Bilateral upper lobe         7         596           Bilateral upper lobes         6         432           Bilateral lower lobes         5         375	4.20 (2.80, 5.80)	63.6%	0.00
Enlarged mediastinal nodes     14     1233       Right upper lobe     7     596       Right middle lobe     7     596       Right over lobe     8     737       Jeft upper lobe     7     596       Right over lobe     7     596       Bilateral upper lobes     6     432       Bilateral lower lobes     5     375	4.40 (0.90, 10.40)	78.6%	0.08
Right upper lobe         7         596           Right middle lobe         7         596           Right middle lobe         7         596           Right upper lobe         8         737           Left upper lobe         7         596           Right upper lobe         7         596           Bilateral upper lobes         6         432           Bilateral upper lobes         5         375	2.90 (1.10, 5.60)	82.4%	0.25
Right middle lobe         7         596           Right lower lobe         8         737           Left upper lobe         7         596           Left lower lobe         7         596           Bilateral upper lobes         6         432           Bilateral lower lobes         5         375	58.60 (28.90, 88.40)	98.8%	0.01
Right lower lobe         8         737           Left upper lobe         7         596           Left lower lobe         7         596           Bilateral upper lobes         6         432           Bilateral lower lobes         5         375	51.30 (27.00, 75.70)	98.0%	0.01
Left upper lobe         7         596           Left lower lobe         7         596           Bilateral upper lobes         6         432           Bilateral lower lobes         5         375	65.10 (37.70, 92.50)	99.3%	0.00
Left lower lobe         7         596           Bilateral upper lobes         6         432           Bilateral lower lobes         5         375	60.70 (28.90, 92.50)	99.1%	0.03
Bilateral upper lobes         6         432           Bilateral lower lobes         5         375	• 70.40 (38.60, 93.80)	98.4%	0.13
Bilateral lower lobes 5 375	◆ 46.90 (14.10, 79.80)	99.0%	0.13
	69.10 (47.90, 90.30)	97.0%	0.46
3 lobes involved 4 254	37.50 (22.00, 53.10)	86.2%	0.08
3 lobes involved 4 254	57.90 (45.00, 70.90)	78.7%	0.73
1 1			

Figure 5 Meta-analysis of the prevalence of chest CT findings of COVID-19 patients. GGO, ground-glass opacity.

mortality rate in severe patients was significantly higher than that in non-severe patients (12.6%, 95% CI, 6.6–20.3%; versus 0.2%, 95% CI, 0.1–0.4%) (*Table 3*).

The results obtained by calculating the OR were similar to those obtained by direct comparison of prevalence. Male (OR 1.43, P<0.0001), history of smoking (OR 1.55, P=0.005), and comorbidities (OR 2.87, P<0.00001) such as hypertension, diabetes, cardiovascular disease, cerebrovascular disease, chronic obstructive pulmonary disease (COPD), malignancies, and chronic renal disease might influence the prognosis of the patients with SARS-CoV-2 infection (Figure S1, *Table 4*). Most clinical symptoms such as fever, high fever, cough, sputum production, fatigue, shortness of breath, dyspnea, and abdominal pain were linked to the severity of the disease, while there was no statistical difference between the two

groups in sore throat, myalgia or arthralgia, headache, chest distress, and diarrhea (Figure S2, Table 4). Many laboratory indicators implied the deterioration of disease, such as leucocytosis, lymphopenia, platelet, alanine aminotransferase (ALT), aspartate aminotransferase (AST), albumin, creatinine, creatine kinase (CK), LDH, CRP, procalcitonin (PCT), and D-dimer. However, the prevalence of leukopenia was not significantly higher in severe cases than in non-severe cases (OR 1.32, P=0.35) (Figure S3, Table 4). For chest CT findings, the risk of bilateral pneumonia, consolidation, pleural effusion, and enlarged mediastinal nodes was higher in severe patients than in non-severe patients. But the analysis did not present that the difference in GGO between severe and non-severe patients was statistically significant (OR 1.03, P=0.92) (Figure S4, Table 4).

	No. Studies	No. Patien						Prevalence% (95%CI)	l²(%)	Begg
Respiratory failure	5	559				-		30.70 (10.20, 51.10)	97.2%	0.086
ARDS	9	2332			h			15.50 (5.80, 28.80)	98.1%	0.035
Acute cardiac injury	4	474		-				10.70 (5.50, 15.90)	71.3%	0.734
Acute kidney injury	7	1915						4.50 (1.00, 10.50)	95.0%	0.452
Secondary infection	4	550		-				9.60 (3.10, 16.10)	87.2%	0.734
Shock	9	1952						4.60 (1.40, 9.70)	93.1%	0.230
Death	42	7797	+					4.20 (2.60, 6.30)	93.8%	0.000
		3	0	20	40	1 60	80	1 100		

Figure 6 Meta-analysis of the prevalence of complications and clinical outcomes of COVID-19 patients. ARDS, acute respiratory distress syndrome.

	Table 2 Subgroup	analysis corr	paring studie	es from V	Vuhan and	those from	other cities
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		W	uhan			Othe	er cities	
Variables	No. reports	No. patients	Prevalence% (95% Cl)	l <sup>2</sup> (%)	No. reports	No. patients	Prevalence% (95% Cl)	l <sup>2</sup> (%)
Male	29	3,721	53 (48.1–57.9)	89.3	45	8,501	52.7 (51.2–54.2)	37.9
History of smoking	5	1,016	4.3 (1.9–6.7)	68.6	6	1,038	17.1 (10.6–23.5)	86.9
Comorbidities	9	1,409	40.5 (30.9–50.1)	92.9	20	3,187	29.7 (26.1–33.3)	78.5
Diabetes	18	2,482	12.5 (10.7–14.3)	45.3	18	2,118	6.4 (5.4–7.5)	0.0
Hypertension	18	2,482	23 (18.5–27.6)	87.1	16	1,977	14.9 (11.9–17.8)	70.9
Cardiovascular disease	15	2,253	7.4 (5.8–9)	52.8	12	1,564	3.2 (1.8–4.6)	63.6
Cerebrovascular disease	10	1,414	3.9 (2.6–5.2)	34.7	4	335	2.2 (0.6–3.7)	0.0
COPD	11	1,653	3 (2.3–3.9)	0.0	9	952	2.1 (0.8–4)	65.5
Chronic liver disease	10	1,529	2.9 (1.7–4)	46.1	9	1,279	3.1 (2–4.3)	20.3
Chronic renal disease	12	1,910	1.7 (1.1–2.3)	0.0	9	1,099	1.4 (0.7–2.1)	0.0
Malignancies	14	2,044	3 (1.8–4.3)	70.9	9	1,380	1.2 (0.5–2)	31.1
Fever	23	2,818	85.1 (81.8–88.5)	89.6	41	6,982	75.8 (71.3–80.3)	95.7
High fever (≥39 °C)	5	642	30.3 (7.7–52.9)	98.4	8	2,298	4.1 (2.2–6)	80.1
Cough	21	2,557	63.4 (50.1–76.7)	98.7	40	6,915	55.7 (46.9–64.5)	98.7

Table 2 (continued)

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Table 2 (continued)

		W	uhan			Othe	er cities	
Variables	No. reports	No. patients	Prevalence% (95% Cl)	l <sup>2</sup> (%)	No. reports	No. patients	Prevalence% (95% Cl)	l <sup>2</sup> (%)
Sputum production	15	2,089	25.8 (17.9–33.6)	95.5	19	3,776	19.3 (14.5–24.1)	95.9
Fatigue	16	2,000	33.2 (22.5–43.9)	97.1	28	5,839	22.1 (16.8–27.3)	97.1
Myalgia or arthralgia	12	1,626	20.5 (14.9–26)	88.6	22	3,673	13.4 (10.3–16.5)	91.0
Headache	12	1,594	8.6 (6.6–10.6)	48.8	22	4,686	9.1 (7–11.3)	87.5
Shortness of breath	5	959	34.1 (22.8–45.3)	91.9	12	2,512	11.5 (7.2–15.7)	93.6
Dyspnoea	11	1,270	27.4 (13.4–41.4)	98.2	14	2,601	6.5 (3.7–9.3)	93.7
Chest distress	9	880	27.1 (14.7–39.6)	95.6	16	2,752	14.2 (7–21.4)	98.2
Abdominal pain	8	1,189	4.3 (3.2–5.5)	0.0	4	397	1.7 (0.6–3.3)	13.4
Diarrhea	16	2,088	7.6 (4.5–10.8)	90.3	29	5,091	6.5 (4.9–8.1)	86.2
Leucocytosis	11	1,253	13 (7.7–19.5)	90.0	16	2,785	4.9 (3.3–6.7)	73.3
Leukopenia	9	923	26.1 (18.1–34.1)	88.6	21	3,379	22.6 (19.4–25.8)	78.9
Lymphopenia	11	1,227	54.7 (43.5–66)	94.6	21	3,513	40.3 (33.3–47.3)	94.7
Platelet, decreased	3	371	5.2 (0.5–14.3)	88.7	5	437	14.1 (9.6–19.4)	54.1
ALT, increased	4	555	27.8 (22.3–33.4)	51.1	7	800	14.1 (8.8–19.4)	80.5
AST, increased	4	447	36.1 (25.9–46.2)	80.0	8	862	13.8 (8.9–18.7)	79.2
Albumin, decreased	3	630	81.3 (19.6–95.4)	99.6	5	736	16.7 (6.7–30.1)	94.6
Creatinine, increased	3	483	4 (2.3–5.8)	0.0	4	370	9.9 (0.6–19.2)	92.9
Creatine kinase, increased	3	327	11.1 (7–15.2)	29.5	7	805	12.7 (8.9–16.5)	62.9
LDH, increased	4	542	70.9 (47.4–94.3)	98.2	10	1,118	29.8 (23.8–35.7)	79.7
ESR, increased	5	442	75.6 (61.8–89.3)	92.6	4	541	68.1 (51.2–85)	94.7
CRP, increased	10	964	87.1 (80–92.8)	88.7	14	1,312	62.5 (51.4–73.1)	94.2
PCT, increased	5	581	17.8 (6.6–29)	94.4	9	903	12.4 (7–17.8)	95.3
D-dimer, increased	5	605	43.5 (25.2–61.9)	95.7	5	566	11.8 (4.6–19)	89.9
Normal chest CT findings	14	1,402	0.9 (0.2–1.9)	65.3	26	3,336	10 (7–13.5)	89.2
Bilateral pneumonia	15	1,736	86.7 (80.5–91.8)	92.0	12	1,180	75 (65–83.8)	92.9
Ground–glass opacity	10	961	48.3 (30.4–66.1)	97.7	12	1,483	72 (60.9–83.1)	97.0
Consolidation	8	756	22.5 (9.8–35.2)	95.7	9	806	28.3 (15.1–41.6)	96.6
Pleural effusion	9	819	4.1 (2–6.8)	67.1	12	1,066	4.4 (2.5–6.7)	65.7
Enlarged mediastinal nodes	5	482	5.4 (0.9–13.6)	90.0	9	751	1.8 (0.6–3.7)	62.1
ARDS	5	779	30 (20.7–40.2)	89.1	3	454	3.3 (0.1–10.3)	88.2
Shock	5	568	9 (3.8–16)	84.6	3	285	1.1 (0–5)	73.8
Death	18	2,122	10.4 (6.3–15.5)	91.9	23	4,576	1.3 (0.7–1.9)	64.1

COPD, chronic obstructive pulmonary disease; ALT, alanine aminotransferase; AST, aspartate aminotransferase; LDH, lactic dehydrogenase; CRP, C-reactive protein; PCT, procalcitonin; ARDS, acute respiratory distress syndrome.

Table 3 Comparison between severe COVID-19 patients and non-severe COVID-19 patients

		Sev	ere patients			Non-	severe patients	
Variables	No. reports	No. patients	Prevalence% (95% Cl)	l <sup>2</sup> (%)	No. reports	No. patients	Prevalence% (95% Cl)	l² (%)
Male	27	1,624	60.9 (57.3–64.4)	46.9	24	4,187	49.5 (46.6–52.4)	68.3
History of smoking	8	860	9.2 (4.2–14.3)	88.5	7	2,181	7.9 (4.2–11.7)	90.7
Comorbidities	16	1,289	51.7 (45.8–57.7)	75.9	12	2,660	26 (17.9–34)	96.5
Diabetes	20	1,301	16.1 (14.1–18.1)	0.0	16	2,893	7.3 (5.7–9.2)	62.7
Hypertension	19	1,249	33.9 (28–39.8)	79.4	16	2,893	15.1 (12–18.3)	81.1
Cardiovascular disease	17	1,199	9.7 (7.3–12.4)	49.2	14	2,703	2.7 (1.7–3.9)	62.7
Cerebrovascular disease	11	973	4.8 (2.9–6.7)	38.8	8	1,709	1.8 (1.1–2.7)	20.5
COPD	12	977	5.2 (3.4–7.4)	41.0	10	1,959	1.4 (0.7–2.2)	29.7
Chronic liver disease	11	795	3.3 (1.9–5)	23.3	10	1,545	4.1 (3–5.5)	28.4
Chronic renal disease	11	992	2.6 (1.6–3.6)	0.0	9	2,176	1.6 (0.8–2.6)	50.9
Malignancies	12	1,022	4.5 (2.9–6.5)	39.8	8	2,065	1.8 (0.6–2.9)	68.1
Fever	25	1,629	85 (76.9–91.5)	94.0	22	4,085	74.4 (65.7–83.2)	98.1
High fever (≥39 °C)	7	667	17.4 (7–27.7)	96.5	6	1,986	7.5 (3.4–11.6)	95.8
Cough	24	1,456	70.8 (64.7–76.9)	86.6	20	3,644	59.9 (54.5–65.3)	90.5
Sore throat	16	1,088	11.5 (7.2–15.7)	87.5	14	2,173	6.9 (4.3–9.6)	81.2
Sputum production	17	1,144	30.6 (21.2–40.1)	92.7	15	3,120	21.1 (14.6–27.6)	95.2
Fatigue	18	1,212	38.5 (29.8–47.3)	90.6	18	3,447	31 (23.3–38.6)	96.4
Myalgia or arthralgia	17	1,160	15.5 (11.5–19.5)	70.5	16	3,155	13.7 (10.5–17)	85.8
Headache	15	1,082	8.9 (6–11.7)	58.5	16	3,370	9.1 (7.1–11.2)	71.6
Shortness of breath	8	690	32.3 (20.1–44.6)	90.5	6	1,631	13.5 (5.3–21.7)	97.5
Dyspnoea	13	585	36.1 (23.8–48.5)	91.9	11	1,204	5.7 (0.7–15.1)	96.7
Chest distress	5	126	11.5 (2.8–20.1)	63.6	6	419	7.2 (2.3–14.7)	83.7
Abdominal pain	7	481	6.4 (4.3–8.9)	4.2	7	609	2.2 (0.8–4.3)	50.7
Diarrhea	15	1,162	8.3 (4.2–13.6)	87.3	14	3,080	7 (4.8–9.2)	83.4
Leucocytosis	13	805	12.9 (8.5–18)	72.9	12	2,673	3.3 (2.1–5)	70.6
Leukopenia	11	702	23.6 (13.1–36)	91.7	10	2,572	19.9 (15.3–24.5)	86.1
Lymphopenia	14	763	69.7 (58.2–81.3)	94.2	13	2,679	50 (36.1–64)	98.4
Platelet, decreased	4	396	21.1 (2.6–50.7)	97.0	3	1,053	20.1 (2.4–37.8)	97.9
ALT, increased	5	328	33.9 (18.5–49.4)	90.1	2	798	18.2 (14.3–22.2)	45.4
AST, increased	5	335	43.6 (35.1–52.2)	57.9	2	807	14.5 (6.8–22.1)	88.0
Albumin, decreased	3	270	55.7 (29.2–82.2)	94.0	2	474	22.1 (18.4–25.9)	0.0
Creatinine, increased	3	369	4.8 (2.6–7)	0.0	2	896	1.1 (0.4–1.8)	0.0
Creatine kinase, increased	4	358	16.9 (8–25.8)	76.0	4	1,040	7.6 (2.8–12.3)	86.9

Table 3 (continued)

Table 3	(continued)
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		Sev	ere patients			Non-	severe patients	
Variables	No. reports	No. patients	Prevalence% (95% Cl)	l <sup>2</sup> (%)	No. reports	No. patients	Prevalence% (95% Cl)	l <sup>2</sup> (%)
LDH, increased	6	439	62.5 (53–71.9)	71.9	5	1,185	27.7 (14.7–40.7)	96.0
CRP, increased	9	599	82 (75–89.1)	82.4	7	1,287	59.4 (47.7–71.2)	94.0
PCT, increased	9	458	39.7 (21.8–57.6)	96.2	6	906	11.2 (2.8–24.1)	95.3
D-dimer, increased	3	205	66.2 (53.9–78.5)	70.6	2	494	36.9 (22.1–51.7)	77.8
Bilateral Pneumonia	9	479	97.9 (94.5–99.7)	72.5	7	847	87.1 (78.5–93.7)	90.6
Ground–glass opacity	8	472	72.1 (52.1–88.4)	94.3	10	1,662	66 (53.3–78.6)	96.9
Consolidation	7	315	48.8 (28.1–69.5)	93.4	8	850	12.3 (3.1–26.4)	96.2
Pleural effusion	6	162	13 (6.0–20.0)	45.6	7	493	1.6 (0.1–4.7)	76.3
Enlarged mediastinal nodes	4	97	9.9 (1.8–23.3)	68.7	5	348	0.5 (0–1.5)	0.0
ARDS	3	261	47.6 (9.3–85.9)	97.3	2	1,028	2.6 (0.1–7.9)	83.1
Acute cardiac injury	3	119	20.7 (13.4–27.9)	0.0	2	160	2.4 (0.6–5.4)	0.0
Acute kidney injury	4	292	10.3 (1.3–19.3)	82.9	3	1,086	1.1 (0–3.9)	73.4
Shock	3	240	13.6 (1.9–25.3)	79.0	3	1,086	0.3 (0–0.9)	17.3
Death	19	946	12.6 (6.6–20.3)	90.1	16	2,735	0.2 (0.1–0.4)	0.00

COPD, chronic obstructive pulmonary disease; ALT, alanine aminotransferase; AST, aspartate aminotransferase; LDH, lactic dehydrogenase; CRP, C-reactive protein; PCT, procalcitonin; ARDS, acute respiratory distress syndrome.

#### Heterogeneity and publication bias

We meta-analyzed 114 features of COVID-19 patients. Among them, 36 (31.6%) presented publication bias (*Figures 2-6*, P<0.05 by Begg's test). In the meta-analysis of prevalence, most of the analyses had high heterogeneity (*Figures 2-6*). And in the meta-analysis of risk factors for severity, most had low or moderate heterogeneity (Figures S1-S4).

# **Discussion**

Based on the information from 90 studies with 16,526 laboratory-confirmed COVID-19 patients, our systematic review and meta-analysis provided a comprehensive description of the characteristics of COVID-19 patients, including comorbidities, clinical symptoms, laboratory characteristics, chest CT features, and complications and identified the risk factors of severe disease.

In our article, the overall CFR of confirmed patients was 4.2%, which is close to the estimate (4.8%) reported by the World Health Organization as of March 30, 2020

(33,106 deaths among 693,224 confirmed cases) (2). The Chinese Center for Disease Control and Prevention (China CDC) reported that the overall CFR was 4.1% among 81,518 confirmed patients in mainland China as of March 30, 2020, and the CFR in Wuhan was 5.1% (2,548 deaths among 50,006 confirmed cases) (100). Our subgroup analysis also found a CFR of 10.4% in Wuhan comparing to 1.3% in other cities. This may indicate that earlier outbreak caused more deaths and effective disease control and prevention measures can significantly decline the CFR of communicable diseases.

The population is generally susceptible to COVID-19 at all ages, the median age we analyzed was 48.8 years. We found that the proportion of male patients was 53.1% and it was significantly higher in severe cases than in non-severe cases. A previous meta-analysis found a similar finding that male was a risk factor for severe illness in COVID-19 patients (101). But another study did not find significant differences in CFR and the proportion of severe patients between male and female (22). Some studies explained that there are differences between the immune system of men

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Table 4 Meta-analysis of risk factors for severity

Table 4 Meta-analysis of risk factors for severity										
Variables	No. of studies	No. of patients	OR [95% CI]	P value						
Male	22	5,363	1.43 [1.21, 1.69]	<0.0001						
History of smoking	7	2,989	1.55 [1.14, 2.10]	0.005						
Comorbidities										
Comorbidities	12	3,727	2.87 [2.13, 3.86]	<0.00001						
Hypertension	15	3,854	2.50 [1.80, 3.47]	<0.00001						
Diabetes	15	3,854	2.46 [1.77, 3.40]	<0.00001						
Cardiovascular disease	13	3,612	3.28 [2.27, 4.75]	<0.00001						
Cerebrovascular disease	8	2,453	2.78 [1.49, 5.19]	0.001						
COPD	10	2,820	3.60 [2.08, 6.23]	<0.00001						
Malignancies	8	2,861	1.80 [1.08, 3.00]	0.02						
Chronic liver disease	10	2,278	0.82 [0.48, 1.42]	0.49						
Chronic renal disease	9	3,048	1.94 [1.09, 3.42]	0.02						
Clinical symptoms										
Fever	20	5,266	1.78 [1.31, 2.42]	0.0002						
High fever (≥39 °C)	6	2,603	2.25 [1.42, 3.58]	0.0006						
Cough	19	4,760	1.63 [1.28, 2.09]	0.0001						
Sore Throat	13	2,983	1.22 [0.82, 1.82]	0.32						
Sputum production	15	4,144	1.40 [1.08, 1.81]	0.01						
Fatigue	16	4,375	1.57 [1.21, 2.04]	0.0008						
Myalgia or arthralgia	14	3,975	1.32 [0.96, 1.80]	0.09						
Headache	14	4,228	1.25 [0.96, 1.61]	0.09						
Shortness of breath	6	2,209	3.81 [2.39, 6.07]	<0.00001						
Dyspnoea	11	1,683	11.68 [4.13, 33.07]	<0.00001						
Chest distress	5	437	2.36 [0.85, 6.54]	0.1						
Abdominal pain	7	1,090	2.60 [1.05, 6.39]	0.04						
Diarrhea	12	3,896	1.34 [0.95, 1.88]	0.09						
Laboratory abnormalities										
Leucocytosis	10	3,144	2.97 [2.15, 4.10]	<0.00001						
Leukopenia	9	3,058	1.32 [0.74, 2.35]	0.35						
Lymphopenia	11	3,153	2.78 [1.85, 4.19]	<0.00001						
Platelet, decreased	3	1,399	2.35 [1.43, 3.88]	0.0008						
ALT, increased	2	964	2.14 [1.03, 4.45]	0.04						
AST, increased	2	980	3.53 [2.02, 6.17]	<0.00001						
Albumin, decreased	2	686	2.84 [1.34, 6.02]	0.006						
Creatinine, increased	2	1,215	3.63 [1.63, 8.05]	0.002						

Table 4 (continued)

Variables	No. of studies	No. of patients	OR [95% CI]	P value
Creatine kinase, increased	4	1,398	2.51 [1.45, 4.37]	0.001
LDH, increased	5	1,566	3.70 [2.03, 6.73]	<0.0001
CRP, increased	6	1,668	3.40 [2.23, 5.17]	<0.00001
PCT, increased	6	1,194	5.39 [3.51, 8.28]	<0.00001
D-dimer, increased	2	641	2.45 [1.27, 4.71]	0.007
CT findings				
Bilateral Pneumonia	7	1,224	3.16 [1.37, 7.29]	0.007
Ground-glass opacity	8	1,962	1.03 [0.56, 1.88]	0.92
Consolidation	7	1,057	6.70 [3.03, 14.78]	<0.00001
Pleural effusion	6	547	7.15 [2.96, 17.27]	<0.0001
Enlarged mediastinal nodes	4	337	9.37 [1.77, 49.51]	0.008

Table 4 (continued)

COPD, chronic obstructive pulmonary disease; ALT, alanine aminotransferase; AST, aspartate aminotransferase; LDH, lactic dehydrogenase; CRP, C-reactive protein; PCT, procalcitonin.

and women which may cause a high risk of viral infection for men (102,103). Patients with underlying diseases have lower immunity and are more likely to be severely ill. In our study, hypertension (19.1%), diabetes (9.5%), and cardiovascular disease (5.4%) were the most common comorbidities, and the proportion was higher among severe patients. The finding was consistent with another study that found the most prevalent comorbidities were hypertension (21.1%) and diabetes (9.7%), followed by cardiovascular diseases (8.4%) and hypertension, cardiovascular disease, and respiratory system disease were independent risk factors of severe disease in patients with SARS-CoV-2 infection (104).

Guan *et al.* and Chen *et al.* reported that fever and cough were the most common clinical manifestations, and nausea or vomiting and diarrhea were uncommon (11,98). Our study also reached a similar conclusion that the most prevalent symptoms were fever (78.4%) and cough (58.5%), however, the proportion was a little lower than the previous studies (fever, 87–88%; cough 67.8–82%). And gastrointestinal symptoms were rare. Comparing to non-severe patients, most symptoms were more common in severe patients, particularly shortness of breath and dyspnoea. It suggested that severe patients might have worse lung function. The most common laboratory abnormalities showed in our article were increased serum ferritin (74.2%,), high CRP (73.3%), high ESR (72.2%), decreased eosinophil (59.2%), increased interleukin 6 (58.2%), lymphopenia (46.5%), high LDH (41.6%), and hyperglycemia (40.1%). Compared with non-severe patients, the laboratory abnormalities occurred more frequently in severe patients. And we also proposed a link between some specific laboratory indicators (leucocytosis, lymphopenia, platelet, ALT, AST, albumin, creatinine, CK, LDH, CRP, PCT, and D-dimer) and disease severity of COVID-19 patients. This finding suggested that the pathophysiological hallmark of COVID-19 tend to be the sustained inflammatory response and cytokine storm which is similar to those previously found in patients infected with the SARS-CoV and MERS-CoV, and severe inflammation would lead to immune deficiency, hepatic damage, myocardial damage, kidney damage, and coagulation activation (94). A review demonstrated that the evaluation of lymphocyte count, biomarkers (serum PCT and ferritin), and inflammatory indices, such as LDH, CRP, and IL-6 might contribute to identify patients with poor prognosis (105). This conclusion was consistent with our comparison between severe and nonsevere patients. Regarding serum ferritin, two studies presented that higher serum ferritin was related to disease progression (14,106), but no study supported the general elevation of serum ferritin in patients with SARS-CoV-2 infection. We just included 3 studies in the meta-analysis of the prevalence of increased serum ferritin, so the result needed more studies to confirm.

Although the imaging manifestations of viral pneumonia are generally considered to be non-specific (107), with the in-depth studies of the imaging features of COVID-19, some relatively special CT characteristics were found (42,59,108,109). And there are obvious differences between patients of different clinical types and stages (59,109). According to previous studies, typical CT findings of COVID-19 patients were bilateral lung involvement with diffuse distribution and lesions mostly were located peripherally (42,108). The main patterns were groundglass opacity, air bronchograms, and interstitial abnormalities. And pulmonary cavitation, discrete pulmonary nodules, lymphadenopathy, and pleural effusions were absent (42,108). In our study, the finding was similar. Most cases had bilateral lung involvement and presented peripheral and subpleural distribution, with multifocal involvement. More than half of patients had >3 lobes involved and the right lower lobe and the left lower lobe were more likely to be involved. The most common CT features were vascular enlargement, ground-glass opacity, thickened interlobular septa, interstitial abnormalities, mixed GGO and consolidation, and air bronchogram. Pericardial effusion, pleural effusion, and enlarged mediastinal nodes were rare. In addition, our analysis showed that patients presented with bilateral pneumonia, consolidation, pleural effusion, and enlarged mediastinal nodes faced a higher risk of developing a serious illness. In the whole, Chest CT acts a crucial part in the diagnosis and treatment for patients with SARS-CoV-2 infection.

With regard to the complications, the most common were respiratory failure (30.7%) and ARDS (15.5%), but also, a small percentage of patients had acute cardiac injury, acute kidney injury, secondary infection, and shock. Compared with non-severe cases, severe cases significantly had worse disease progression, particularly ARDS (2.6% versus 47.6%) (*Table 3*). Thus, early identification and timely treatment of severe patients would better improve the prognosis.

Although some systematic reviews and meta-analyses which studied the features of patients with COVID-19 have been published (21,22), our study updated the comprehensive information of clinical characteristics of patients with COVID-19 worldwide and analyzed the risk factors of severe illness. High quality and large sample size of the included studies were the strengths of our study. We also conducted a subgroup analysis based on the area. Nevertheless, our review had a few limitations. First, most of the included studies were single-center retrospective studies which were difficult to control the influence of confounding factors. Second, we found significant heterogeneity and publication bias between studies. Third, most included studies were from China, data from other countries are required. Lastly, some detailed information, such as clinical outcomes and prognosis, was incomplete. Based on updated data all around the world, in-depth studies need to be conducted.

# Conclusions

In summary, most patients with COVID-19 have fever and cough with lymphopenia and increased inflammatory indices, and the main CT feature is GGO involved bilateral lung. Patients with comorbidities and worse clinical symptoms, laboratory characteristics, and CT findings tend to have poor disease progression and outcome. COVID-19 is an emerging pandemic of global public health concern. So, the prevention and control of the disease spread are imminent. In addition, more researches are required to elucidate the pathogenesis and the risk factors for severe cases and death.

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# Footnote

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*Ethical Statement*: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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# Supplementary

## Table S1 Bias risk assessment

										Table SI (co	niinuea,							
Study	1	2	3	4	5	6	7	8	Score	Study	1	2	3	4	5	6	7	(8
₋iu W	2	2	2	2	2	1	1	0	12	Wu C	2	2	2	2	2	1	2	0
nen C	2	2	2	2	2	0	0	0	10	Wang SH	2	2	2	2	2	0	0	0
S	2	2	2	2	2	1	2	0	13	Shi JH	2	2	2	2	2	1	2	0
	2	2	2	2	2	0	0	0	10	Zhao Y	2	2	2	2	2	0	0	0
Н	2	1	2	2	2	1	2	0	12	Ling Y	2	2	2	2	2	0	0	0
g W	2	2	2	2	2	1	2	0	13	Cheng JL	2	2	2	2	2	0	0	0
an WJ	2	2	2	2	2	2	2	0	14	Huang L	2	2	2	2	2	0	0	0
J	2	2	2	2	2	1	2	0	13	Lu XF	2	2	2	2	2	0	0	C
Р	2	2	2	2	2	1	2	0	13	Liu HF	2	2	2	2	2	0	0	0
ou F	2	2	2	2	2	2	2	0	14	Yu CC	2	2	2	2	2	0	0	0
К	2	2	2	2	2	1	2	0	13	Li XH	2	2	2	2	2	1	1	0
Т	2	2	2	2	2	1	2	0	13	Hu R	2	2	2	2	2	1	1	0
ang Z	2	2	2	2	2	1	2	0	13	Lu ZB	2	2	2	2	2	1	2	C
ı XW	2	2	2	2	2	1	2	0	13	Li Y	2	2	2	2	2	0	0	C
uan Q	2	1	2	2	2	0	0	0	9	Shi YL	2	2	2	2	2	0	0	C
nen J	2	2	2	2	2	1	2	0	13	Li RQ	2	2	2	2	2	0	0	(
ו D	2	2	2	2	2	0	0	0	10	Bai P	2	2	2	2	2	1	2	(
/	2	2	2	2	2	0	0	0	10	Sun DW	2	2	2	2	2	0	0	C
/ID-19	2	2	2	2	2	0	0	0	10	Wan Q	2	2	2	2	2	1	2	C
ı ralia										Lu YF	2	1	2	2	2	0	0	0
u S	2	2	2	2	2	0	0	0	10	Yu SM	2	2	2	2	2	0	0	0
ang J	2	2	2	2	2	0	0	0	10	Yang K	2	2	2	2	2	1	2	0
in C	2	2	2	2	2	0	0	0	10	Xu S	2	2	2	2	2	1	2	0
an R	2	2	2	2	2	0	0	0	10	Ma PQ	2	2	2	2	2	0	0	0
un WW	2	1	2	2	2	0	0	0	9	Zhao CC	2	2	2	2	2	0	0	0
ong XC	2	1	2	2	2	0	0	0	9	Chen X	2	2	2	2	2	0	0	(
ao F	2	2	2	2	2	0	0	0	10	Fang L	2	2	2	2	2	0	0	C
n BE	2	2	2	2	2	0	0	0	10	Fang XW	2	2	2	2	2	1	2	C
ni Y	2	1	2	2	2	1	2	0	12	Zhong Q	2	2	2	2	2	0	0	(
лХ	2	2	2	2	2	1	2	0	13	Ran J	2	2	2	2	2	0	0	(
e XW	2	2	2	2	2	0	0	0	10	Yuan J	2	2	2	2	2	1	2	C
u J	2	1	2	2	2	0	0	0	9	Xiao KH	2	2	2	2	2	1	2	C
an H	2	2	2	2	2	0	0	0	10	Wang AH	2	2	2	2	2	0	0	C
iН	2	2	2	2	2	1	2	0	13	Wang XJ	2	2	2	2	2	0	0	(
o W	2	1	2	2	2	0	0	0	9	Li JS	2	2	2	2	2	0	0	(
Table S1 (cor	tinued	)								Table S1 (co								

Table 51 (tontinueu)												
Study	$\bigcirc$	2	3	4	5	6	$\bigcirc$	(8)	Score			
Han J	2	2	2	2	2	0	0	0	10			
Dai ZH	2	2	2	2	2	0	0	0	10			
Chen W	2	2	2	2	2	0	0	0	10			
Cheng KB	2	2	2	2	2	1	2	0	13			
COVID-19 team Shandong	2	2	2	2	2	0	0	0	10			
Sui HY	2	2	2	2	2	0	0	0	10			
Zhou YP	2	2	2	2	2	0	0	0	10			
Ding Y	2	2	2	2	2	0	0	0	10			
Xiong J	2	2	2	2	2	1	2	0	13			
Hou KK	2	2	2	2	2	1	2	0	13			
Chen ZY	2	2	2	2	2	0	0	0	10			
Chang ZY	2	2	2	2	2	0	0	0	10			
Qian ZC	2	2	2	2	2	1	2	0	13			
Lu ZL	2	2	2	2	2	0	0	0	10			
Chen NS	2	2	2	2	2	2	2	0	14			
Liang W	2	2	2	2	2	1	2	0	13			
Yang XB	2	2	2	2	2	2	2	0	14			
Wang DW	2	2	2	2	2	2	2	0	14			
Liu K	2	2	2	2	2	1	2	0	13			
Pan YY	2	2	2	2	2	0	0	0	10			
Zhang JJ	2	2	2	2	2	1	2	0	13			

Table S1 (continued)

Score

① A clearly stated aim; ② Inclusion of consecutive patients; ③ Prospective collection of data; ④ Endpoints appropriate to the aim of the study; 5 Unbiased assessment of the study endpoint; 6 Follow-up period appropriate to the aim of the study; (7) Loss to follow-up less than 5%; (8) Prospective calculation of the study size. The items are scored 0 (not reported), 1 (reported but inadequate), or 2 (reported and adequate). The global ideal score being 16 for non-comparative studies.

Table S1 (continued)

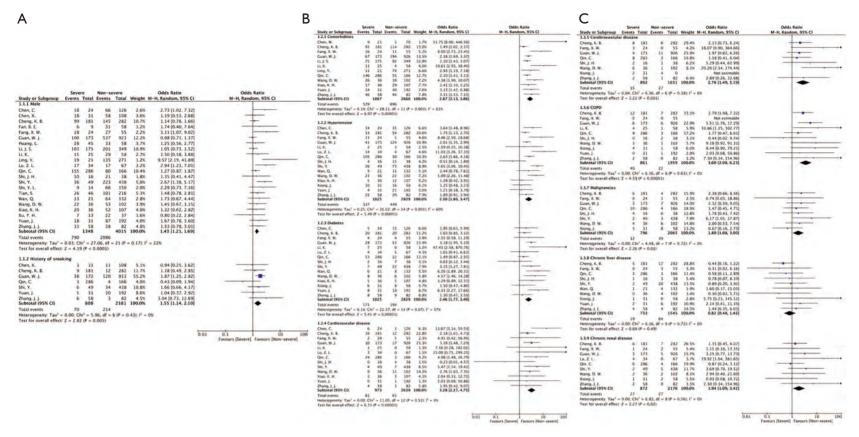


Figure S1 Meta-analysis of male, history of smoking, and comorbidities according to COVID-19 severity. COPD, chronic obstructive pulmonary disease.

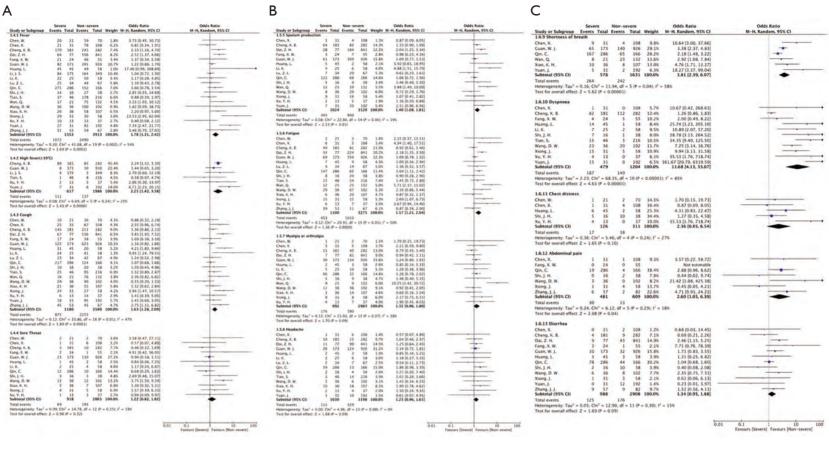


Figure S2 Meta-analysis of clinical symptoms according to COVID-19 severity.

	Sever		Non-				Odds Ratio	Odds Ratio	В	Seve	re	Non-se	evere		Odds Ratio	Odds Ratio
tudy or Subgroup	Events	Total	Events	To	otal W	Veight M	I-H, Random, 95% CI	M-H, Random, 95% CI	Study or Subgroup		Total	Events	Total	Weight M	-H, Random, 95% Cl	M-H, Random, 95% Cl
.7.1 Leucocytosis									1.8.7 Albumin, decre	ased						
Cheng, K. B.		181	22			31.8%	2.73 [1.54, 4.85]		Cheng, K. B.	65	181	60	282	59.6%	2.07 [1.37, 3.14]	
Dai, Z. H.	5	75				10.0%	2.80 [1.01, 7.78]		Yuan, I.	18	31	45	192	40.4%	4,52 [2,06, 9,94]	
Guan, W. J.	19	167	39			31.5%	2.54 [1,43, 4.52]		Subtotal (95% CI)		212		474	100.0%	2.84 [1.34, 6.02]	-
Huang, L.	2	45	0	÷	58	1.1%	6.72 [0.31, 143.64]		<ul> <li>Total events</li> </ul>	83		105				
Li, K.	4	25	5		58	5.3%	2.02 [0.49, 8.26]		Heterogeneity: Tau <sup>2</sup> =		hi <sup>2</sup> = 7 0		1 (P = 0	09) 12 - 66		
Shi, Y. L.	4	14	5	1	150	4.9%	11.60 [2.69, 50.08]		Test for overall effect				10-0			
Xiao, K. H.	1	36			107	2.1%	0.74 [0.08, 6.81]		rest for overall effect	E - E.C.	s (r = 0.	000)				
Xu, Y. H.	0	13	1		37	1.0%	0.90 [0.03, 23.50]		1.8.8 Creatinine, incr	eased						
Yuan, J.	3	31	5		192	4.7%	4.01 [0.91, 17.70]				101		202	C 1 74	2 00 10 05 0 201	
Zhang, J. J.	13	56	4		82	7.5%	5.90 [1.81, 19.20]		Cheng, K. B.		181	2	282	\$1.7%	2.90 [0.96, 8.79]	
Subtotal (95% CI)		643		25	501 1	00.0%	2.97 [2.15, 4.10]	•	Guan, W. J.	6	138	6	614	48.3%	4.61 [1.46, 14.51]	
Total events	85		103						Subtotal (95% CI)		319		890	100.0%	3.63 [1.63, 8.05]	-
Heterogeneity: Tau2 =	0.00; Ch	$i^2 = 7$	75, df =	9 (P	= 0.5	6); $I^2 = 0$	%		Total events	15		11				
Test for overall effect:	Z = 6.59	(P <	0.00001	)					Heterogeneity: Tau <sup>2</sup> =				1 (P = 0	$.57); 1^2 = 09$	6	
									Test for overall effect	Z = 3.17	7 (P = 0.	.002)				
1.7.2 Leukopenia																
Cheng, K. B.	29		47			14.5%	0.95 [0.58, 1.58]	+	1.8.9 Creatine kinase							
Dai, Z. H.	19	75		1	724	14.3%	0.93 [0.54, 1.60]		Cheng, K. B.	17	181	12	277	29.0%	2.29 [1.07, 4.92]	
Fan, B. E.	4	9	15		58	8.1%	2.29 (0.54, 9.68)		Guan, W. J.	23	121	67	536	41.2%	1.64 [0.98, 2.77]	
Guan, W. J.	102	167	228	8	811	15.4%	4.01 [2.84, 5.68]		Yuan, J.	11	31	19	192	24.7%	5.01 [2.09, 12.01]	
Li, K.	4	25			58	8.5%	1.65 [0.42, 6.45]		Zhang, J. J.	3		1	35	5.2%	4.64 [0.45, 47,45]	
Shi, Y. L.	0	14	20	- 1	150	3.3%	0.22 [0.01, 3.82]		Subtotal (95% CI)		358		1040	100.0%	2.51 [1.45, 4.37]	•
Xiao, K. H.	11	36	26	- 1	107	12.2%	1.37 [0.59, 3.16]		Total events	54		99				
Yuan, J.	8	31	42			11.9%	1.24 [0.52, 2.98]		Heterogeneity: Tau <sup>2</sup> =		$hi^2 = 4.9$		3 (P = 0	17) 12 = 40	96	
Zhang, J. J.	9	56	18			11.8%	0.68 [0.28, 1.65]		Test for overall effect				54-0			
Subtotal (95% CI)		594		24	164 1	00.0%	1.32 [0.74, 2.35]	•	rest for overall effect	L - J.L.	10 - 0.					
Total events	186		596						1.8.10 LDH, increase	d						
Heterogeneity: Tau <sup>2</sup> =	0.53; Ch	i <sup>2</sup> = 4	0.27, df	= 8 (	(P < 0.)	00001); 1	<sup>2</sup> = 80%				1.01			25.00	2 45 11 20 2 051	
Test for overall effect:	Z = 0.94	(P =	).35)						Cheng, K. B.	128		132	277	26.6%	2.65 [1.78, 3.95]	
									Fan, B. E.	4	9	5	58	9.5%	8.48 [1.71, 42.13]	
1.7.3 Lymphopenia									Guan, W. J.	72		205	551	26.6%	2.34 [1.57, 3.47]	
Chen, W.	18	21	62		70	5.5%	0.77 [0.19, 3.23]		Xiao, K. H.	15	36	28	107	19.7%	2.02 [0.91, 4.44]	
Cheng, K. B.	113	181	135	2	282	14.4%	1.81 [1.24, 2.65]		Yuan, J.	24	31	35	192	17.6%	15.38 [6.14, 38.52]	
Dai, Z. H.	41	75	310	1 7	724	13.4%	1.61 [1.00, 2.60]	-	Subtotal (95% CI)		381		1185	100.0%	3.70 [2.03, 6.73]	-
Fan, B. E.	7	9	17		58	4.4%	8.44 [1.59, 44.84]		Total events	243		405				
Guan, W. J.	147	153	584	7	726	9.7%	5.96 [2.58, 13.75]		Heterogeneity: Tau <sup>2</sup> =	0.31; CI	hi <sup>2</sup> = 16.	.55, df	4 (P =	0.002); I <sup>2</sup> =	76%	
Huang, L.	36	45	30		58	9.1%	2.44 [0.99, 6.03]		Test for overall effect	Z = 4.24	B(P < 0.	0001)				
LI, K.	22	25	22		58	6.1%	12.00 [3.21, 44.82]									
Shi, Y. L.	9	14	53		150	7.2%	3.29 [1.05, 10.33]		1.8.11 CRP, increase	t l						
Xiao, K. H.	20	36	46			10.5%	1.66 [0.77, 3.55]		Cheng, K. B.	142	181	170	282	32.7%	2.40 [1.56, 3.68]	
Yuan, J.	17	31	30			10.0%	6.56 [2.92, 14.70]		Guan, W. J.	110		371	658	31.0%	3.40 [2.15, 5.40]	
Zhang, J. J.	46	56	58		82	9.8%	1.90 [0.83, 4.38]		Li, K.	23	25	27	58	6.5%	13.20 [2.85, 61.24]	
Subtotal (95% CI)		646			507 1	00.0%	2.78 [1.85, 4.19]	•	Xiao, K. H.	29	36	43	107	14.8%	6.17 [2.48, 15.34]	
Total events	476		1353					1.4.4	Xu, Y, H.	8	13	18	37	8.7%	1.69 [0.46, 6.14]	
Heterogeneity: Tau <sup>2</sup> =					(P = 0	0.002); 12	= 63%		Zhang, J. J.	53	55	72	81	6.2%	3.31 [0.69, 15.97]	
Test for overall effect:									Subtotal (95% CI)	35	445	12		100.0%	3.40 [2.23, 5.17]	
									Total events	365	-43	701	1063	100.076	2:40 [2:23, 3:17]	
1.7.4 Platelet, decrea								100			12 . 6 .		F (D	10. 11	H0/	
Cheng, K. B.	28	181	23			38.1%	2.06 [1.15, 3.71]		Heterogeneity: Tau <sup>2</sup> =				2 (k = 0	.15); 1" = 38	176	
Fan, B. E.	1	9	12		58	5.0%	0.48 [0.05, 4.21]		Test for overall effect	Z = 5.7	z (P < 0.	00001)				
Guan, W. J.	90	156	225			56.9%	2.96 [2.07, 4.22]		1.0.13 007 1							
Subtotal (95% CI)		346			053 1	00.0%	2.35 [1.43, 3.88]	•	1.8.12 PCT, increase			10			and the second second	
Total events	119		260						Fang, X. W.	1	24	0	55	1.7%	7.09 [0.28, 180.32]	

Figure S3 Meta-analysis of laboratory abnormalities according to COVID-19 severity. ALT, alanine aminotransferase; AST, aspartate aminotransferase; LDH, lactic dehydrogenase; CRP, C-reactive protein; PCT, procalcitonin.

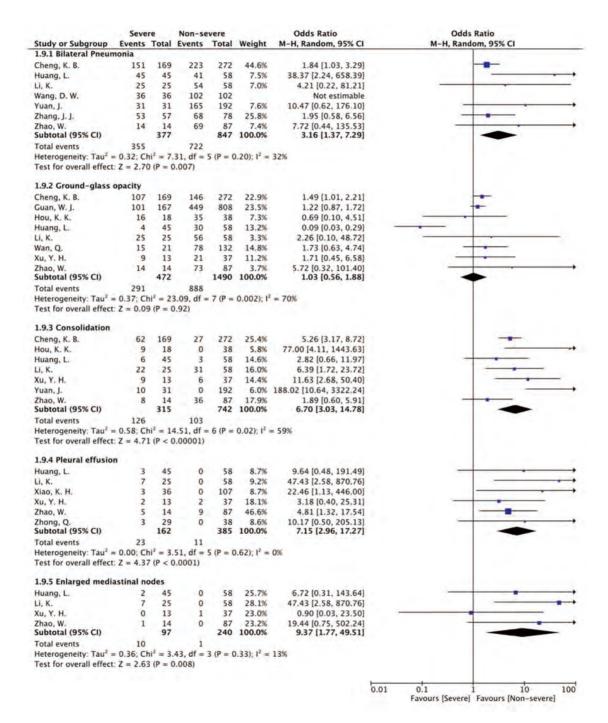


Figure S4 Meta-analysis of CT findings according to COVID-19 severity.