Clinical Characteristics of 2019 Novel Coronavirus Pneumonia in China: A Systematic Review and Meta-analysis

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**Abstract**

**Background**

Although novel pneumonia associated with the Corona Virus Disease 2019 (COVID-19) suddenly broke out in China, China has controlled this epidemic effectively. Therefore, evidence-based descriptions of medical and clinical characteristics in China are necessary.

**Methods**

Literatures have been systematically performed a search on PubMed, Embase, Web of Science, GreyNet International, and The Cochrane Library from inception up to March 15, 2020. Quality of evidence was evaluated according to the STROBE checklist, and publication bias was analyzed by Egger's test. In the single-arm meta-analysis, A random-effects model was used to obtain a pooled incidence rate. We conducted subgroup analysis according to geographic region and research scale.

**Results**

A total of 30 Chinese studies and 1969 patients were included in this meta-analysis. The valid pooled incidence rates of symptoms were as follows: rhinorrhea 5.1% (95% CI: 3.7–6.8, $I^2 = 31.90$), diarrhea 11.0% (95% CI: 9.3–12.9, $I^2 = 16.58$), pharyngalgia 9.4% (95% CI: 7.5–11.7, $I^2 = 36.40$), headache 9.5% (95% CI: 8.5–11.1, $I^2 = 5.7$), and lymphocytopenia 36.7% (95% CI: 33.8–39.8 $I^2 = 28.73$). Meanwhile, 4.3% (95% CI: 3.5–5.4, $I^2 = 0.00$) of patients were found without any symptoms, although they were diagnosed by RT-PCR. In terms of lung CT imaging, most of the patients showed bilateral mottling or ground-glass opacity, and 7.7% (95% CI: 4.4–12.9, $I^2 = 35.64$) of patients had a crazy-paving pattern. In subgroup analysis, the pooled incidence rate of normal CT presentations in the Wuhan area and outside Wuhan area was 2.3% (95% CI: 1.4–3.6, $I^2 = 24.78$) and 5.8% (95% CI: 4.4–7.7, $I^2 = 32.76$) respectively ($P = 0.001$).

**Conclusions**

The findings suggest that although most of the COVID-19 patients have symptoms or abnormal CT imaging presentations, a few of them accompany with no symptoms or abnormal CT imaging results should also be noticed. The digestive symptoms and lymphocytopenia may be the potential clinical characteristics, especially for patients with a history of contact with COVID-19. Additionally, the incidence rate of ARDS in the Wuhan area and outside Wuhan area was different; however, the reasons for this phenomenon are unclear.

**Background**

Since December 8, 2019, many cases of previously unknown pneumonia have been reported in Wuhan, Hubei Province, China[1]. On January 3, 2020, the 2019 novel coronavirus was identified in samples of bronchoalveolar lavage fluid from a patient in Wuhan and was confirmed as the cause of the COVID-19[2]. This coronavirus (CoV) was named "2019 novel coronavirus" or "2019-nCoV" by the World Health Organization (WHO)[3]. Six kinds of human coronaviruses had been previously identified[4]. These are HCoV-NL63 and HCoV-229E, which belong to the Alphacoronavirus genus; and HCoV-OC43, HCoVHKU1, severe acute respiratory syndrome coronavirus (SARS-CoV), and Middle East respiratory syndrome coronavirus (MERS-CoV), which belong to the Betacoronavirus genus[5]. Coronaviruses have become associated with deadly respiratory infections in humans following the emergence of SARS-CoV in Guangdong, China in 2002, which affected 8,098 people in 37 countries[6]. There then followed the MERS-CoV outbreak[7]. Early in the 2019-nCoV outbreak, it has already become clear that the virus can be transmitted from human to human[8]. More than 30,000 COVID-19 cases in the world have been confirmed. Therefore, places all over the world will probably encounter this severe public health issue.

Although China is the earliest country to have an outbreak of COVID-19, China has controlled the epidemic effectively. As of March 15, 2020, 895 articles have been published regarding the epidemiology and clinical features of COVID-19, and most of them are Chinese clinical data. In spite of the fact that some features are controversial in different clinical environments, the Chinese evidence-based descriptions of medical and clinical characteristics are necessary.

**Methods**

The systematic review protocol was prepared based on the STROBE Statement[9] and Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines for systematic reviews and meta-analyses[10]. Keywords and study eligibility criteria were determined. The protocol for the review was registered with PROSPERO (registration number: CRD42020168532)
Search Strategy

PubMed, Embase, Web of Science, GreyNet International (http://www.greynet.org/), and The Cochrane Library were searched for articles published until March 8, 2020. Each database was searched using terms identified from Medical Subject Headings (MeSH) related to “Coronavirus Pneumonia”, “Pneumonia”, and “SARS”, as well as terms used for systematic reviews on similar topics in various combinations as follows: “2019-nCoV,” “COVID-19,” “Wuhan pneumonia,” “Novel Coronavirus Pneumonia,” “SARS-CoV-2.” According to expand our search, the references of the retrieved articles were also screened for relevant studies. In addition, a manual search was done on references of included studies to avoid missing any relevant publications (the retrieval process is shown in Figure 1).

Selection and Exclusion Criteria

The inclusion criteria were as follows: (1) studies reporting information regarding COVID-19 in China; (2) Study inclusion was not limited by study design (e.g., cross-sectional, cohort, case-control study design); and (4) those with available clinical data which could be drawn from the articles. The exclusion criteria were as follows: (1) repeat articles, letters, editorials, and expert opinions; (2) studies without usable data; (3) studies that used nonhuman subjects or cadavers; (4) less than three patients in a single study and (5) articles published in languages other than English and Chinese.

Data extraction

Two investigators (K.Q. & Y.D.) independently extracted data from eligible studies; disagreements were resolved by discussion with a third investigator (L.H.J). For each study, the following information was recorded: necessary information (e.g., first author, year of publication), research characteristics (e.g., cross-sectional, cohort, case-control study design), and study subject characteristic variables (e.g., gender, age, CT images, symptoms, therapies, and the incidence of complications).

Quality control

Quality of evidence was evaluated according to the STROBE checklist for cohort, case-control, and cross-sectional studies (combined)[11]. The following four domains were assessed for quality: study design and setting; study participants, outcomes, and eligibility criteria. Studies were assigned a score of 1 for each domain assessed when they contained the information listed in the checklist and could be replicated using the information provided, giving a maximum total quality assessment score of 4[12]. If minor quality concerns were identified within a domain, a 0.5 score was allocated, whereas in case of a study clearly not meeting quality criteria, a score of zero was allocated[12]. Discrepancies were resolved by consensus.

Publication bias

Funnel plots were used to detect publication bias. Publication bias was analyzed using Egger’s linear regression test, which measures funnel plot asymmetry[13].

Statistical analysis

Data from individual studies were pooled using the proportion meta-analysis in Comprehensive Meta-Analysis (Version 2). The DerSimonian and Laird random-effects model was fitted and pooled incidences and 95% CI for each infectious and parasitic disease was estimated as described by others[14]. Cochran Q test and $I^2$ statistic were used to assess the inter-study heterogeneity[15]. $I^2 < 30\%$ generally indicated consistent results and homogeneous studies, whereas $I^2 > 50\%$ was used as a threshold to show significant heterogeneity[16]. To explore the sources of heterogeneity further and examine whether the results differed by study characteristics, subgroup analysis was performed according to geographic region (Wuhan area and outside Wuhan area), sample size (< 50 cases and ≥ 50 cases)[16]. In all of the analyses, statistical significance was set at $P < 0.05$.

Results

Literature Search

We initially retrieved 1686 articles about COVID-19, 30 of which met the criteria for inclusion in our series (eTable 1). Reasons for exclusion included duplicate reports (n=791), reports not describing clinical characteristics (n=736), and other types of studies such as comments and letters to the editor (n=129) (Figure 1). Both two independent reviewers screened all records. The agreement between reviewers, as determined by weighted kappa, was 0.92 (95% CI:0.88–0.95), indicating excellent interrater reliability[24].

Study Characteristics
All included studies are summarized in detail in eTable 1 (online supporting information). Data were grouped under the following subheadings: author and area, reference, study setting, study quality as reported by STROBE score (between 0 and 4). The most common methodological issues included absent or incomplete definitions of outcome variables or minor inconsistencies in data analyses. Among these studies, there were 21 cross-sectional studies, 9 retrospective studies, and 8 studies included individual patient data of 26 patients[17][18][2][25][26][27][28][29] (eTable 2). Among all of these studies, 16 were from the Wuhan area; the other 14 studies were from outside the Wuhan area. Study size ranged from 3 to 201 subjects. 16 studies involved less than 50 cases, and 14 studies involved more than 50 cases.

Clinical symptoms

There were 10 frequent symptoms of COVID-19 that were reported in China. The valid pooled incidence rate was calculated for four symptoms, which have the lower heterogeneity, i.e., rhinorrhea 5.1% (95% CI: 3.7-6.8, I²=31.90), diarrhea 11.0% (95% CI: 9.3-12.9, I²=16.58), pharyngalgia 9.4% (95% CI: 7.5-11.7, I²=36.40), headache 9.5% (95% CI: 8.5-11.1, I²=5.7). Notably, 73 patients were found without any symptoms although they were diagnosed by RT-PCR. The pooled incidence rate of patients without obvious symptoms was 4.3% (95% CI: 3.5-5.4, I²=0.00) (Table 1). Among the reported clinical symptoms, significant of heterogeneity was present in the symptoms of fever (I² = 86.79%, P = 0.000), cough (I² = 79.51%, P = 0.004), expectoration (I² = 83.08%, P = 0.000), anhelation (I² = 83.95%, P = 0.001), muscle pain (I² = 76.76%, P = 0.000), and fatigue (I² = 86.69%, P = 0.000). We found no identifiable sources of heterogeneity using subgroup analysis. The results of subgroup analyses according to geographic region and study scale are presented in Table 2.

Blood routine examination

Lymphocytes were below the normal range in 725 patients, the pooled incidence rate of elevated neutrophils was 36.7% (95% CI: 33.8-39.8), and no significant heterogeneity was found (I² = 28.73%, P = 0.083) (Table 1). There were 327 patients with neutrophils above the normal range, and evidence of heterogeneity and publication bias was present among these findings (I² = 80.71%, P = 0.01). White blood cells were below the normal range in 318 patients (I² = 73.77, P = 0.000) and above the normal range in 335 patients (I² =80.01, P = 0.000). We found no identifiable sources of heterogeneity using subgroup analysis (Table 2).

CT imaging

The chest CT images of COVID-19 patients were reported in different ways. By reviewing the literature, we found three common manifestations, as follows: (1) bilateral mottling or ground-glass opacity, (2) unilateral mottling or ground-glass opacity, and (3) crazy-paving pattern. Among the studies, 1477 patients showed bilateral mottling or ground-glass opacity, 312 patients showed unilateral mottling or ground-glass opacity, and 150 patients showed a crazy-paving pattern (7.7%, 95% CI: 4.4-12.9, I²=35.64). Evidence of heterogeneity was present in the bilateral mottling or ground-glass opacity (I² = 80.05%, P = 0.000), and in the unilateral mottling or ground-glass opacity (I² = 73.15%, P = 0.000). We found no identifiable sources of heterogeneity using subgroup analysis. Furthermore, there were 44 patients with normal CT presentations during the period of COVID-19. Significant heterogeneity was observed in this group (I² = 56.92%, P = 0.000). However, in subgroup analysis, heterogeneity was decreased (I² = 24.78%, P = 0.187, egger's test P = 0.874), which indicated that the heterogeneity may come from the geographic region (Table 2). The pooled incidence rate of normal CT presentations in the Wuhan area and outside Wuhan area was 2.3% (95% CI: 1.4-3.6) and 5.4% (95% CI: 4.4-7.7), respectively (P=0.001) (Table 2, Figures 2, 3).

Oxygen therapy

Nearly all of the patients accepted oxygen therapy. Among these studies, 458 patients accepted mechanical ventilation, and the inhaled oxygen concentration was 35-100%; There was significant heterogeneity in the mechanical ventilation group (I² = 72.45%, P = 0.000) (Table 1). We cannot identify sources of heterogeneity by subgroup analysis (Table 2). Additionally, 28 patients were treated with extracorporeal membrane oxygenation (ECMO); the pooled incidence was 2.9% (95% CI: 1.8-4.4, I²=26.77) (Table 1). There was no evidence of heterogeneity or publication bias.

ARDS

Among these studies, 421 patients developed to ARDS. There was significant of heterogeneity (I² = 77.35%, P = 0.000) (Table 1). In subgroup analysis, heterogeneity was decreased, which indicated that the heterogeneity might come from the geographic region. We found the Wuhan area (34.3%, 95% CI: 30.6-38.1) has a significant higher incidence of ARDS than outside Wuhan areas (15.1%, 95% CI: 12.0-18.8), P=0.000 (Table 2).

Discussion
In our research, the number of male patients was more than female patients (57.1% vs. 42.9%). This result is consistent with the gender distribution of MERS-CoV, and SARS-CoV[30, 31]. Meanwhile, Chen et al. also showed that 2019-nCoV infection is more likely to affect males[22]. The reduced susceptibility of females to viral infections could be attributed to protection from the X chromosome and sex-specific effects in infectious disease susceptibility[32]. On the contrary, however, a recent report that showed there was no difference in the proportion of men and women between ICU patients and non-ICU patients[23]. Although the mechanism of this difference cannot be explained at present, more attention should be paid to male patients.

A recent study showed that nCoV was detected in stool samples of patients with abdominal symptoms [33]. In our research, the pooled incidence rate of diarrhea was 11.0%. This result is lower than the reported results of about 20~25% in patients with MERS-CoV or SARS-CoV infection[34]. Although the cause of this phenomenon is unclear, it suggests that we need to pay attention to patients with gastrointestinal symptoms, and contact isolation should be taken. In addition, 4.3% of patients who had no obvious symptoms were diagnosed by RT-PCR. Such patients will become a challenge in the future epidemic prevention process, which requires us to have detailed screening strategies, and we should be more vigilant with patients without obvious symptoms.

In terms of laboratory tests, the pooled incidence rate of patients with reduced lymphocytes was 36.7%. Meanwhile, the pooled incidence rate of elevated neutrophils was 44.6%. These abnormalities are similar to those previously observed in patients with MERS-CoV and SARS-CoV infections[35]. These conclusions further confirm that lymphopenia along with neutrophilia was a feature of SARS-CoV, and 2019-nCoV might mainly act on lymphocytes, especially T lymphocytes[36]. Virus particles spread through the respiratory mucosa and infect other cells, induce a cytokine storm in the body, generate a series of immune responses, and cause changes in peripheral white blood cells and immune cells, such as lymphocytes[22]. In addition, lymphopenia can be caused by glucocorticoids, and thus any debilitating condition has the potential to induce lymphopenia via a stress mechanism involving the hypothalamic-pituitary-adrenal axis. Therefore, treatment with glucocorticoids complicates the lymphopenia issue[37].

Nearly 4.5% of patients were diagnosed with COVID-19, although their CT imaging was normal. This result reveals that the CT examination lacks complete sensitivity and cannot alone reliably fully exclude this disease, particularly early in the infection. Therefore, it is necessary to combine the CT examination with RT-PCR to make a definite diagnosis. Ground-glass opacities, interlobular septal thickening, and consolidations are consistent high-resolution CT manifestations in both metapneumovirus infection and SARS, but the presence of a crazy-paving pattern is more suggestive of SARS[38]. Although the pooled incidence of the crazy-paving pattern (defined as thickened interlobular septa and intralobular lines with superimposed ground-glass opacification) was only 8.4%, it is a very important image finding for diagnosing COVID-19.

Until now, conclusions on the ARDS of COVID-19 are inconsistent. The earliest two studies revealed that their mortality rates were 4.3% and 15%, respectively[3, 23]. Nevertheless, compared with more than 10% ARDS of SARSCoV and 35% ARDS of MERSCoV[39], 2019-nCoV has lower incidence rate of ARDS. In our research, the pooled incidence of ARDS in Wuhan area and outside Wuhan area was 34.3% and 15.1%, respectively. Although this conclusion is basically consistent with the previous reports[3, 22], the reason for the regional difference is unclear. We speculated that the reason for this phenomenon is attributed to two observations. First, a single-arm meta-analysis is inherently less stable than a two-arm meta-analysis, but this was unavoidable due to not having enough clinical data. Second, there were not enough diagnosis methods and treatment for COVID-19 at the beginning of the outbreak. Therefore, many Wuhan patients can not accept diagnosis and treatment in time.

Limitations

A number of limitations to our study need to be acknowledged. The limitations include the small number of studies and cross-sectional studies were included in this meta-analysis, limiting the detection of publication bias and leading to uncertainty of practical relevance of the meta-analysis. In addition, the clinical characteristics are related to many factors, such as basic physical condition, severity, disease progress, examination, and treatment conditions. However, we were not able to conduct further subgroup analysis based on the above-mentioned factors because most of the included studies did not separate the participants into different groups for outcome measurements. Third, significant heterogeneity remains a critical concern in this meta-analysis. To solve this problem, we used random-effects in the meta-analysis, and subgroup analysis was performed in this study[40]. What’s more, we did not calculate the pooled incidence rate unless the source was identified by subgroup analysis. Thus, there may be significant heterogeneity or a publication bias[16]. Last but not least, in a single-arm meta-analysis without a control group, causality is difficult to determine from the cases alone. However, all over the world, the onset of activation has been relatively short and consistent.

Conclusions
The results of this single-arm meta-analysis and systematic review give us quantitative pooled incidence rates of clinical characteristics of COVID-19. All of these clinical characteristics have great potential to improve diagnosis and patient stratification in COVID-19. These findings may also have a clinical impact, as disease features are routinely used in clinical diagnosis, providing an unprecedented opportunity to improve decision support in COVID-19 for diagnosis or treatment at fast and low cost. The findings suggest that although most COVID-19 patients have symptoms or abnormal CT imaging presentations, a few patients have no symptoms or abnormal CT imaging results. Therefore, a prescriptive diagnosis process and vigilance for COVID-19 is necessary. In addition, digestive symptoms and lymphocytopenia should be of concern, especially for patients with a history of contact with COVID-19. However, since we are at the beginning of the epidemic, the current lack of clinical research might influence the results of the meta-analysis. Further multivariate studies are warranted to corroborate the findings of this meta-analysis.

**Abbreviations**

COVID-19  
Corona Virus Disease 2019  
ECMO  
Extra-Corporeal Membrane Oxygenation  
2019-nCoV  
2019 novel coronavirus  
SARS-CoV  
severe acute respiratory syndrome coronavirus  
MERS-CoV  
Middle East respiratory syndrome coronavirus  
WHO  
World Health Organization  
ARDS  
Acute respiratory distress syndrome

**Declarations**

**Ethics approval and consent to participate**

Not applicable

**Consent for publication**

All authors and patients involved in this article agree to publish this article on *BMC Public Health*.

**Availability of data and materials**

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

**Competing interests**

Not applicable

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**Authors' contributions**

Conception and design: KQ, YHT, LHJ; Administrative support: LHJ; Data extraction: YD, KQ; Collection and assembly of data: KQ, YHT; Data analysis and interpretation: HP, JP; Manuscript writing: All authors; Final approval of manuscript: All authors.

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Tables

Table 1. Descriptive Characteristics of Cases of Confirmed COVID-19 from inception up to March 15, 2020 (n = 356)
### Table 2. Subgroup analysis of incidence rate of clinical characteristics

| Characteristic                  | Pooled Value | 95% CI     | P value | $I^2$ |
|---------------------------------|--------------|------------|---------|-------|
| **Age, year**                   |              |            |         |       |
| Mean                            | 52.4         | N.A.       | N.A.    | N.A.  |
| Range                           | 0-97         | N.A.       | N.A.    | N.A.  |
| **Sex, n (%)**                  |              |            |         |       |
| Male                            | 1124 (57.1)  | N.A.       | N.A.    | N.A.  |
| Female                          | 845 (42.9)   | N.A.       | N.A.    | N.A.  |
| **Clinical symptom, n (%)**     |              |            |         |       |
| Fever                           | 1652 (82.3)  | 74.4-88.1  | 0.000   | 86.79 |
| Rhinorrhea                      | 79 (5.1)     | 3.7-6.8    | 0.055   | 31.90 |
| Cough                           | 313 (30.1)   | 27.2-33.1  | 0.000   | 83.08 |
| Expectoration                   | 371 (23.1)   | 16.1-31.9  | 0.000   | 83.95 |
| Anhelation                      | 163 (8.6)    | 5.2-13.9   | 0.000   | 76.76 |
| Fatigue                         | 593 (30.5)   | 23.0-39.3  | 0.000   | 86.69 |
| Diarrhea                        | 250 (11.0)   | 9.3-12.9   | 0.215   | 16.85 |
| Pharyngalgia                    | 162 (9.4)    | 7.5-11.7   | 0.050   | 36.40 |
| Headache                        | 195 (9.5)    | 6.5-11.1   | 0.380   | 5.70  |
| No obvious symptoms             | 73 (4.3)     | 3.5-5.4    | 0.870   | 0.00  |
| **WBC, n (%)**                  |              |            |         |       |
| Increased                       | 335 (14.8)   | 10.3-21.0  | 0.000   | 80.01 |
| Decreased                       | 318 (15.7)   | 11.7-20.7  | 0.000   | 73.77 |
| **Neutrophils, n (%)**          |              |            |         |       |
| Increased                       | 372 (24.6)   | 21.9-27.4  | 0.000   | 80.71 |
| Decreased                       | 725 (36.7)   | 33.8-39.8  | 0.083   | 28.73 |
| **CT Imaging, n (%)**           |              |            |         |       |
| BGGO                            | 1477 (74.5)  | 67.4-80.5  | 0.000   | 80.05 |
| UGGO                            | 312 (17.3)   | 13.0-22.7  | 0.000   | 73.15 |
| CPP                             | 150 (7.7)    | 4.4-12.9   | 0.563   | 35.64 |
| Normal presentations            | 44 (4.5)     | 3.5-5.7    | 0.000   | 56.92 |
| **Oxygen therapy, n (%)**       |              |            |         |       |
| Mechanical ventilation          | 458 (23.6)   | 18.9-29.0  | 0.000   | 72.45 |
| ECMO                            | 28 (2.9)     | 1.8-4.4    | 0.105   | 26.77 |
| ARDS                            | 421 (23.9)   | 19.3-29.2  | 0.000   | 77.32 |

**Note:** BGGO = Bilateral mottling or ground-glass opacity; UGGO = Unilateral mottling or ground-glass opacity; CPP = Crazy-paving pattern; ECMO = Extracorporeal membrane oxygenation; ARDS= acute respiratory distress syndrome.
| Characteristic          | Wuhan area |                | Outside Wuhan area |                | < 50 cases |                | ≥ 50 cases |                |
|------------------------|------------|----------------|---------------------|----------------|------------|----------------|------------|----------------|
|                       |            |                |                     |                |            |                |            |                |
|                       | R% (95%CI) | t²  | P        | R% (95%CI) | t²  | P        | R% (95%CI) | t²  | P        |
| Symptom                |            |                |                     |                |            |                |            |                |            |
| Fever                  | 89.1(83.4- 93.0) | 72.57 | 0.000 | 75.6(72.1- 78.7) | 88.98 | 0.000 | 70.4(61.3- 78.2) | 58.71 | 0.020 |
|                        |            |                |                     |                |            |                |            |                |            |
| Rhinorrhea             | 4.7(2.9- 7.6) | 45.65 | 0.035 | 5.4(3.7- 8.0) | 16.79 | 0.270 | 10.9(6.2- 18.4) | 12.06 | 0.318 |
|                        |            |                |                     |                |            |                |            |                |            |
| Cough                  | 66.4(63.4-69.4) | 80.12 | 0.000 | 52.6(49.0- 56.2) | 85.08 | 0.000 | 59.5(52.0- 66.6) | 21.97 | 0.209 |
|                        |            |                |                     |                |            |                |            |                |            |
| Expectoration          | 31.1(27.7- 34.7) | 81.86 | 0.000 | 26.9(22.1- 32.3) | 85.40 | 0.000 | 30.7(22.7- 40.1) | 64.83 | 0.000 |
|                        |            |                |                     |                |            |                |            |                |            |
| Anhilation             | 34.9(31.4- 38.6) | 80.91 | 0.000 | 16.0(13.0- 19.5) | 84.79 | 0.000 | 39.9(25.1- 56.9) | 62.84 | 0.001 |
|                        |            |                |                     |                |            |                |            |                |            |
| Muscle pain            | 25.4(21.5- 29.8) | 70.87 | 0.000 | 13.1(9.8- 17.3) | 63.34 | 0.001 | 21.3(14.4- 30.2) | 48.49 | 0.018 |
|                        |            |                |                     |                |            |                |            |                |            |
| Fatigue                | 37.8(34.7- 41.1) | 87.11 | 0.000 | 29.1(25.7- 32.5) | 86.68 | 0.000 | 20.4(10.7- 35.2) | 47.55 | 0.003 |
|                        |            |                |                     |                |            |                |            |                |            |
| Diarrhea               | 9.3(7.1- 12.4) | 29.48 | 0.142 | 12.6(10.4- 15.1) | 0.00 | 0.663 | 12.2(8.0- 16.0) | 0.00 | 0.890 |
|                        |            |                |                     |                |            |                |            |                |            |
| Pharyngalgia           | 7.2(7.0- 11.9) | 25.27 | 0.182 | 15.6(6.6- 24.1) | 48.09 | 0.023 | 13.5(7.7- 22.9) | 26.29 | 0.165 |
|                        |            |                |                     |                |            |                |            |                |            |
| Headache               | 9.0(6.5- 12.5) | 46.78 | 0.032 | 9.7(7.8- 11.9) | 0.00 | 0.975 | 10.3(6.6- 15.9) | 23.65 | 0.645 |
|                        |            |                |                     |                |            |                |            |                |            |
| No obvious symptoms    | 4.1(3.0- 5.6) | 0.00 | 0.954 | 4.5(3.3- 6.2) | 0.00 | 0.973 | 5.7(3.1- 10.3) | 0.00 | 0.98 |
|                        |            |                |                     |                |            |                |            |                |            |
| WBC                    |            |                |                     |                |            |                |            |                |
| Increased              | 17.9(11.9- 26.1) | 76.73 | 0.000 | 15.5(7.8- 22.5) | 80.11 | 0.000 | 20.0(11.4- 32.6) | 54.82 | 0.006 |
|                        |            |                |                     |                |            |                |            |                |            |
| Decreased              | 14.7(9.1- 22.9) | 72.77 | 0.000 | 19.1(14.4- 26.6) | 51.43 | 0.013 | 19.9(14.6- 26.6) | 35.20 | 0.794 |
|                        |            |                |                     |                |            |                |            |                |            |
| Neutrophils            |            |                |                     |                |            |                |            |                |
| Increased              | 16.1(9.1- 26.7) | 84.25 | 0.000 | 19.2(12.6- 26.1) | 73.56 | 0.000 | 22.9(10.9- 42.0) | 73.00 | 0.000 |
|                        |            |                |                     |                |            |                |            |                |            |
| Decreased              | 36.7(32.2- 41.4) | 39.61 | 0.070 | 3.6(3.2- 4.1) | 21.71 | 0.218 | 35.3(28.3- 43.0) | 4.71 | 0.400 |
|                        |            |                |                     |                |            |                |            |                |            |
| CT Imaging             |            |                |                     |                |            |                |            |                |
| BGGO                   | 78.0(69.1- 84.9) | 71.47 | 0.000 | 70.1(59.3- 79.9) | 78.97 | 0.000 | 73.2(61.9- 82.2) | 49.08 | 0.050 |
|                        |            |                |                     |                |            |                |            |                |            |
| UGGO                   | 13.7(9.4- 19.3) | 66.55 | 0.002 | 22.8(15.6- 30.0) | 76.01 | 0.000 | 20.5(12.7- 31.4) | 40.22 | 0.054 |
|                        |            |                |                     |                |            |                |            |                |            |
| CPP                    | 7.7(3.8- 15.0) | 76.12 | 0.000 | 7.1(2.7- 17.4) | 86.03 | 0.000 | 12.0(7.6- 18.4) | 23.56 | 0.678 |
|                        |            |                |                     |                |            |                |            |                |            |
| Normal presentations   | 2.3(1.4- 3.6) | 24.78 | 0.187 | 5.8(4.4- 7.7) | 32.76 | 0.113 | 8.9(5.2- 14.7) | 53.1 | 0.006 |
|                        |            |                |                     |                |            |                |            |                |            |
| Oxygen therapy         |            |                |                     |                |            |                |            |                |
| Mechanical ventilation | 26.9(22.4- 31.9) | 54.18 | 0.008 | 19.1(12.6- 27.8) | 63.54 | 0.002 | 26.6(17.2- 38.9) | 44.88 | 0.031 |
|                        |            |                |                     |                |            |                |            |                |            |
| ECMO                   | 2.8(1.5- 5.4) | 43.61 | 0.041 | 2.8(1.6- 5.2) | 14.41 | 0.296 | 6.9(3.8- 12.2) | 26.71 | 0.820 |
|                        |            |                |                     |                |            |                |            |                |            |
| ARDS                   | 34.3(30.6- 38.1) | 24.78 | 0.187 | 15.1(12.0- 18.8) | 27.72 | 0.158 | 26.7(20.8- 33.7) | 0.00 | 0.898 |

Note: BGGO = Bilateral mottling or ground-glass opacity; UGGO = Unilateral mottling or ground-glass opacity; CPP = Crazy-paving pattern; ECMO = Extracorporeal membrane oxygenation; ARDS= acute respiratory distress syndrome.

Figures
Figure 1

PRISMA flow chart for article selection in the meta-analysis.
Figure 2

Forest plot of pooled data to detect publication bias for normal CT presentation incidence rate. Subgroup analysis was performed according to geographic region (Wuhan area & outside Wuhan area). The size of each square is proportional to the study's weight. Horizontal lines indicate 95% CI. Diamonds indicate pooled incidence rate with its corresponding 95% CI.
Figure 3

Funnel plot to assess publication bias among studies. Each circle represents an identified study. Egger test, \( P = 0.847 \)

**Supplementary Files**

This is a list of supplementary files associated with this preprint. Click to download.

- eTable2.docx
- eTable1.docx
- PRISMA2009checklist.doc