Review

Age-related risk factors and severity of SARS-CoV-2 infection: a systematic review and meta-analysis

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Keywords

COVID-19 pandemic • Symptoms and comorbidities • Systematic review • Age-related risk factors • Correlation analysis

Summary

Objectives. *We aimed to estimate the prevalence of reported symptoms and comorbidities, and investigate the factors associated with age of the SARS-CoV-2 infected patients.*
Methods. *We performed a systematic review with meta-analysis (PROSPERO registration: CRD42020182677) where the databases (PubMed, SCOPUS, EMBASE, WHO, Semantic Scholar, and COVID-19 Primer) were searched for clinical studies published from January to April, 2020. Initially, the pooled prevalence of symptoms and comorbidity of COVID-19 patients were estimated using random effect model and the age –related factors were identified performing multivariate analysis [factor analysis].*
Results. *Twenty-nine articles with 4,884 COVID-19 patients were included in this study. Altogether, we found 33 symptoms and 44 comorbidities where the most frequent 19 symptoms and 11 comorbidities were included in the meta-analysis. The fever (84%), cough/dry cough (61%), and fatigue/weakness (42%) were found more prevalent while acute respiratory distress syndrome, hypertension and diabetes were the most prevalent comorbid condition. The factor analysis showed positive association between a cluster of symptoms and comorbidities with patients' age. The symptoms comprising fever, dyspnea/shortness of breath, nausea, vomiting, abdominal pain, dizziness, anorexia and pharyngalgia; and the comorbidities including diabetes, hypertension, coronary heart disease, COPD/lung disease and ARDS were the factors positively associated with COVID-19 patient's age.*
Conclusion. *As an unique effort, this study found a group of symptoms (fever, dyspnea/shortness of breath, nausea, vomiting, abdominal pain, dizziness, anorexia and pharyngalgia) and comorbidities (diabetes, hypertension, coronary heart disease, COPD/lung disease and ARDS), associated with the age of COVID-19 infected patients.*

Introduction

The COVID-19 pandemic caused by Severe Acute Respiratory Virus 2 (SARS-CoV-2) is a serious public health crisis in the history of humanity. Originated in Wuhan, China, SARS-CoV-2 has spread to every corner of the world within a few months. As of March 22, 2021, over 123 million confirmed cases and 2.72 million deaths have been reported from over 219 countries [1].
As the virus is moving fast, various clinical spectrum and differential clinical outcomes are unfolding across different geographic locations. Several symptoms have been reported which includes fever, cough, myalgia, sputum production, headache, hemoptysis, diarrhea, and dyspnea [2]. The severity of COVID-19 has been reported to be linked with various host factors including diabetes, hypertension, cardiovascular disease, chronic obstructive pulmonary disease (COPD), malignancy, and chronic liver disease [2]. While susceptibility to COVID-19 covers all age groups, people with compromised immune systems and or having comorbidity are at a higher risk [3, 4]. A few review studies investigated symptoms and comorbidities of the COVID-19 infected patients with a shorter time-frame [3, 5-8]. The mortality rate is high in older COVID-19 patients with organ dysfunctions comprising shock, acute respiratory distress syndrome (ARDS), acute cardiac injury, and acute kidney injury [9]. However, there is a scarce information regarding the relationship between symptoms, comorbidities, and age of the COVID-19 patients. The objective of this study was to estimate the prevalence of all reported symptoms and comorbidities, and then identified the risk factors associated with age of COVID-19 infected patients.

Methods

The PRISMA-P-2009 guidelines was followed in our systematic review and meta-analysis (PROSPERO registration: CRD42020182677) [10].

Data sources and search strategy

The major databases, such as PubMed, SCOPUS, EMBASE, WHO, Semantic Scholar, and COVID-19

Tab. I. Search strategy used in different databases.

PubMed	SCOPUS/EMBASE	WHO/Semantic Scholar
ALL ("COVID-19" OR "COVID-2019" OR "severe acute respiratory syndrome coronavirus 2" OR "severe acute respiratory syndrome coronavirus 2" OR "2019-nCoV" OR "nCoV" OR "SARS-CoV-2" OR "2019nCoV" OR "coronavirus") AND ALL ("clinical for epidemiological characterization" OR "Symptom" OR "Symptoms") AND ALL ("comorbidity" OR "comorbidities" AND full text[sb] AND ("2019/12/31"[PDat] : "2020/04/30"[PDat]) AND Humans[Mesh]	ALL ("COVID-19" OR "COVID-2019" OR "severe acute respiratory syndrome coronavirus 2" OR "severe acute respiratory syndrome coronavirus 2" OR "2019-nCoV" OR "nCoV" OR "SARS-CoV-2" OR "2019nCoV" OR "coronavirus") AND ALL ("clinical for epidemiological characterization" OR "Symptom" OR "Symptoms") AND ALL ("comorbidity" OR "comorbidities") AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (PUBYEAR , 2020)) AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "re"))	("COVID-19" OR "COVID-2019" OR "severe acute respiratory syndrome coronavirus 2" OR "severe acute respiratory syndrome coronavirus 2" OR "2019-nCoV" OR "nCoV" OR "SARS-CoV-2" OR "2019nCoV" OR "coronavirus") AND ("clinical or epidemiological characterization" OR "Symptom" OR "Symptoms") AND ("comorbidity" OR "comorbidities")

Primer were searched to include peer-reviewed and pre-proof research articles. The mortality starts falling at the end of April 2020 [11] and we limited our review within initial period to high mortality period. Also, our literature search strategy covered almost hundred percent of the COVID-19 symptoms and comorbidities, and the overall sample size for our data analysis was sufficiently large [n = 4,884]. Therefore, we restricted our search language in only English literature within the time period January to April, 2020.

The search terms used included: "COVID-19" OR "COVID-2019" OR "severe acute respiratory syndrome coronavirus 2" OR "2019-nCoV" OR "2019nCoV" OR "nCoV" OR "SARS-CoV-2" OR "coronavirus" AND "clinical for epidemiological characterization" OR "Symptom" OR "Symptoms" AND "comorbidity" OR "comorbidities". Some articles were manually retrieved from Google Scholar and other databases. We also searched the reference lists of the selected publications. MMR, BB, and MJU independently screened the titles and abstracts of the articles and checked full-text eligibility (Tab. I).

Inclusion/exclusion criteria

Research articles were selected if they reported clinical characteristics (both symptoms and comorbidities) of the COVID-19 patients. The inclusion criteria for studies were: clinical investigations or consecutive cases; focused on infected patients; reported at least ten cases and considered all age-groups from any countries. Studies were excluded if they were: grey literature, case report, and secondary studies; specific to children or pregnant women; less than 10 small sample; and only reported symptoms or comorbidities. A standardized form was used to extract data from eligible studies. Disagreements were resolved through discussion with co-reviewers. For each study, publication details, research design and the participants' characteristics with major findings were recorded.

Data quality assessment and analysis

The quality of each study was assessed by ZF using Joanna Briggs Institute (JBI) guidelines [12]. A set of eight questions was used for the quality assessment. Random effect model was used to estimate the prevalence of all reported symptoms and comorbidities in the COVID-19 patients. Heterogeneity was assessed using the Cochran Q and the I^2 statistic [13, 14]. We performed Egger test ($p < 0.001$) to examine the presence of publication bias and small-study effects. Multivariate analysis [multivariable factor analysis (MFA)] was performed to examine the correlation/association among symptoms and comorbidities with the patients' age [15, 16]. All statistical analyses were conducted by Stata version 15 (Stata Corp, College Station, TX) using the metaprop, metabias; and R-programming language using the FactoMineR package.

Supplementary Table S1 have provided in the supplementary file. Please see supplementary file.

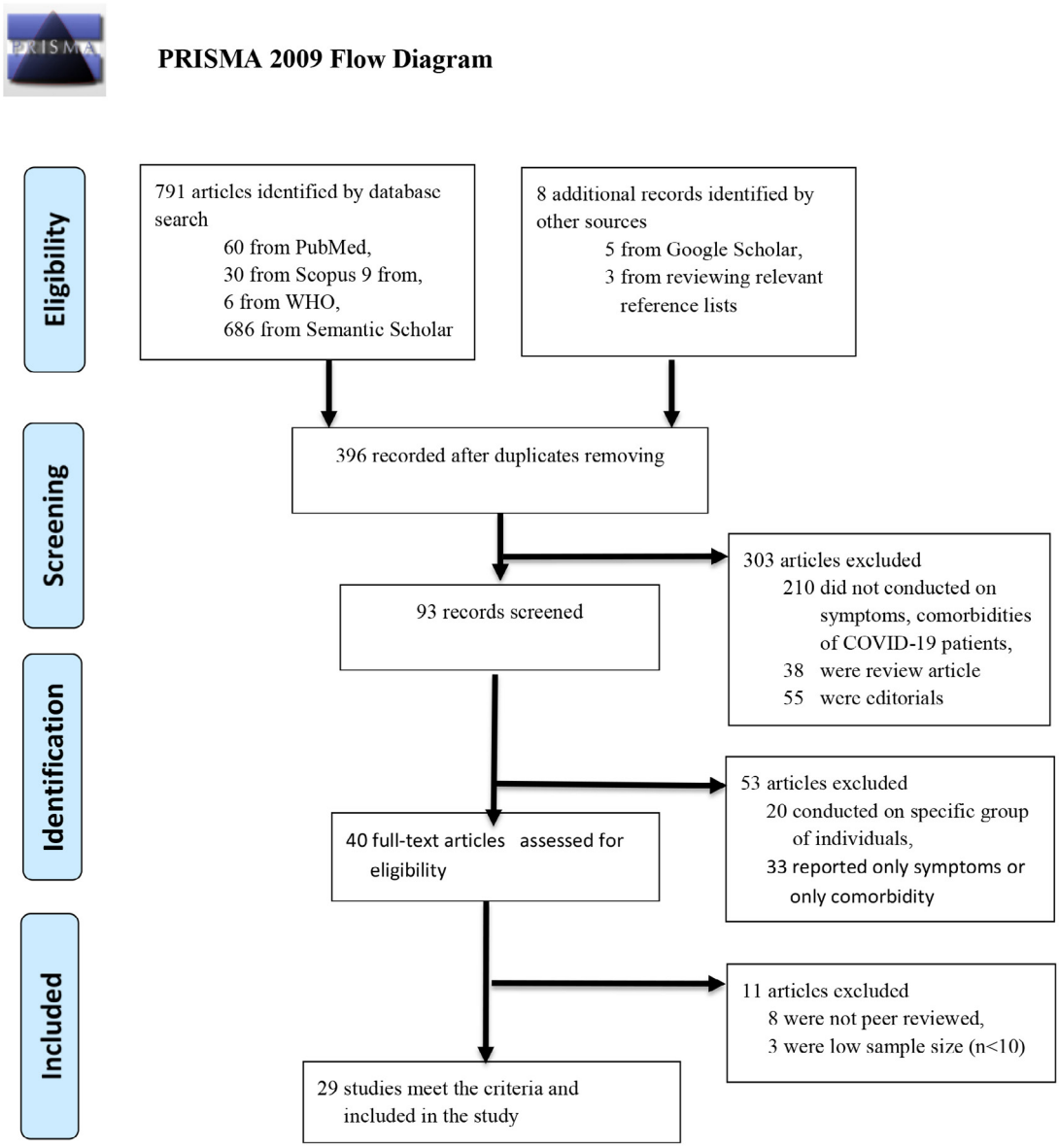
Results

A total of 799 articles (databases: 791, other sources: 8) were retrieved. Of them, 403 articles were removed due to duplication and irrelevance. Furthermore, 303 review articles, editorials, case reports, and irrelevant study populations were excluded. Fifty-three articles were excluded as they failed to meet all inclusion criteria. Finally, eleven articles were excluded due to not peer-reviewed and small sample sizes, resulting in the selection of 29 articles for our review. The PRISMA flow diagram visualizes the screening process of selected studies (Fig. 1).

Supplementary Table S1 summarizes the characteristics of the selected studies and 83% of selected studies for this meta-analysis were reported from China. Five studies were conducted in the USA, India, Spain, and South Korea. The overall sample size was 4,884 COVID-19 patients, with an age range of 10 to 92 years. Among the patients, 2,675 (55%) were male, and 2,208 (45%) were female. The sample size ranged from 12 to 1,099 patients, where most studies (79%) had a retrospective research design.

Altogether, 33 symptoms and 43 comorbidities were found. Almost all the studies reported fever (proportion of

Fig. 1. Preferred reporting items for systematic reviews and meta-analyses (PRISMA) flow diagram for the study selection process.



patients ranging from 25 to 100%), cough/dry cough (22-92%) and myalgia or muscle ache (3-63%) as common symptoms of COVID-19. Other reported symptoms were: headache (3-66%); diarrhea (3-48%); fatigue/weakness (9-85%); dyspnea/shortness of breath (1-88%); sputum production or expectoration (4-42%); vomiting (1-19%); nausea (4-27%); chest tightness (7-55%); and sore throat (5-32%). For the comorbidities, about 93% and 86% of studies reported two comorbidities: diabetes (2 to 35%) and hypertension (8-50%). Other prevalent comorbidities were chronic obstructive pulmonary disease (COPD)/ lung infection (0.2-38%); cardiovascular disease (5-23%); chronic liver disease (1-29%); malignancy (1-7%); coronary heart disease (1-33%); cerebrovascular disease (1-19%); chronic renal disease (1-8%); chronic kidney disease (1-29%); and Acute respiratory distress syndrome (ARDS) (17-100%). The less reported symptoms and comorbidities were presented in Supplementary Table S1.

Meta-analysis of symptoms and comorbidities

We meta-analysed 19 symptoms and 11 comorbidities, using random effect models that were reported in at least five selected articles (Tab. II and Supplementary Figs S2-S31). Meta-analysis showed a higher prevalence of fever (pooled prevalence: 84, 95% confidence interval (CI): 80-88%) and cough/dry cough (61, 95% CI: 55-67%); followed by fatigue/weakness (42, 95% CI: 34-51%); dyspnea/shortness of breath (39, 95% CI: 27-51%); headache and diarrhea (12, 95% CI: 8-17%); sore throat (15, 95% CI: 11-20%); myalgia/muscle ache and sputum production/expectoration (24, 95% CI: 18-30%); rhinorrhea (13, 95% CI: 4-26%); chest tightness (25, 95%

CI: 15-31%); and anorexia (26, 95% CI: 16-38%). The less prevalent symptoms were: chest pain (3%), nausea (8%), vomiting (6%), abdominal pain (4%), dizziness (5%), pharyngalgia (7%), and hemoptysis (2%).

The most prevalent comorbidities were ARDS (61, 95% CI: 15-97%), hypertension (23, 95% CI: 18-28%), and diabetes (12, 95% CI: 9-15%), followed by cardiovascular disease (10, 95% CI: 7-13%); coronary heart disease (7, 95% CI: 3-12%); cerebrovascular disease (6, 95% CI: 2-08%); COPD/lung disease (3, 95% CI: 02-50%); chronic liver disease (05, 95% CI: 03-07%); chronic Renal disease (0.01, 95% CI: 00%-03%); chronic Kidney disease (05, 95% CI: 02-10%); and malignancy (03, 95% CI: 02-04%).

There was a high heterogeneity (I^2 ranged from 85 to 97%, Cochran Q-statistic $p < 0.001$) in all the prevalence of symptoms, except chest pain ($I^2 = 0\%$, Cochran Q-statistic $p < 0.95$); abdominal pain ($I^2 = 22.89\%$, Cochran Q-statistic $p < 0.26$); dizziness ($I^2 = 64.21\%$, Cochran Q-statistic $p < 0.002$); and haemoptysis ($I^2 = 63.48\%$, Cochran Q-statistic $p < 0.01$). In the case of comorbidities, the heterogeneity was found higher in almost all the comorbidities (I^2 ranged from 68.06 to 98.01%, Cochran Q-statistic $p < 0.001$) (Tab. II).

Symptoms and comorbidity factors associated with age of COVID-19 infected Patients

Nineteen symptoms and 11 comorbidities were categorized into: symptom group and comorbidity group to determine the association between symptoms/comorbidities and age of the COVID-19 patients (Fig. 2). In factor analysis, the correlation circle represented between/within-group integration with the patients' age. The longer vectors indicated more influential than others, and the vectors that were close to each other with the same direction indicated a highly positive association. Vectors that were the opposite direction showed a negative association, and the vectors with an almost 90-degree angle demonstrated no association. The first principal component showed 31.59% variation and the second one showed 20.45% variation in the dataset.

Tab. II. Overall prevalence summary for clinical symptoms and comorbidities of the COVID-19 patients.

Clinical characteristics (symptoms)	No. reports	No. patients	Pooled prevalence	Test for Heterogeneity		Egger's test
				I^2 (%)	P-value	
Fever	29 (100%)	4,115	0.84 (0.80-0.88)	90.670	< 0.001	< 0.001
Cough/dry cough	29 (100%)	3,039	0.61 (0.55-0.67)	93.400	< 0.001	0.382
Fatigue/Weakness	21 (72.41%)	1,627	0.42 (0.34-0.51)	96.320	< 0.001	0.107
Dyspnoea/shortness of breath	18 (62.06%)	920	0.39 (0.27-0.51)	97.370	< 0.001	< 0.001
Headache	22 (72.86%)	448	0.12 (0.09-0.16)	89.980	< 0.001	0.109
Diarrhoea	22 (72.86%)	474	0.12 (0.08-0.17)	93.720	< 0.001	0.004
Sore throat	9 (31.03%)	348	0.15 (0.11-0.20)	84.990	< 0.001	0.266
Myalgia/muscle ache	25 (86.20%)	925	0.24 (0.18-0.30)	95.000	< 0.001	< 0.001
Rhinorrhoea	5 (17.24%)	48	0.13 (0.04-0.26)	88.010	< 0.001	0.088
Sputum production/expectoration	15 (51.72%)	1,066	0.24 (0.19-0.30)	92.310	< 0.001	0.956
Chest tightness	11 (37.93%)	462	0.25 (0.15-0.31)	88.440	< 0.001	0.527
Chest pain	5 (17.24%)	15	0.03 (0.01-0.04)	0.000	< 0.95	0.878
Nausea	12 (41.37%)	238	0.08 (0.04-0.12)	91.780	< 0.001	0.023
Vomiting	14 (48.27%)	209	0.06 (0.03-0.09)	88.330	< 0.001	0.096
Abdominal pain	6 (20.68%)	42	0.04 (0.03-0.06)	22.890	< 0.26	0.431
Dizziness	6 (20.68%)	71	0.05 (0.03-0.08)	64.21	< 0.002	0.132
Anorexia	7 (24.13%)	339	0.26 (0.16-0.38)	94.470	< 0.001	< 0.001
Pharyngalgia	6 (20.68%)	86	0.07 (0.04-0.13)	88.030	< 0.001	0.017
Haemoptysis	7 (24.13%)	47	0.02 (0.01-0.04)	63.480	< 0.01	0.005
Comorbidity						
Diabetes	27 (93.10)	539	0.12 (0.09-0.15)	83.09	< 0.001	0.009
Hypertension	25 (86.20)	1,096	0.23 (0.18-0.28)	93.24	< 0.001	0.149
Cardiovascular disease	15 (51.72)	212	0.1 (0.07-0.13)	73.96	< 0.001	0.031
Coronary heart disease	10 (34.48)	141	0.07 (0.03-0.12)	92.21	< 0.001	0.007
Cerebrovascular disease	10 (34.48)	100	0.06 (0.02-0.08)	90.77	< 0.001	0.004
COPD/lung disease	21 (72.41)	136	0.03 (0.02-0.05)	86.67	< 0.001	< 0.001
Chronic liver disease	15 (51.72)	96	0.05 (0.03-0.07)	78.23	< 0.001	< 0.001
Chronic renal disease	9 (31.03)	32	0.01 (0.00-0.03)	54.63	< 0.001	0.003
Chronic kidney disease	6 (20.68)	41	0.05 (0.02-0.10)	86.69	< 0.001	0.036
Malignancy	15 (51.72)	82	0.03 (0.02-0.04)	68.06	< 0.001	< 0.001
ARDS**	4 (13.79)	111	0.61 (0.15-0.97)	98.01	< 0.001	0.301

** ARDS reported in four studies and we include this study into our analysis because it showed higher prevalence rate.

In symptom group, fever, dyspnea/shortness of breath, nausea, vomiting, abdominal pain, dizziness, anorexia, and pharyngalgia were found positively associated with the COVID-19 patients' age. In contrast, sore throat, headache, rhinorrhea, myalgia/muscle ache, fatigue, and hemoptysis were negatively associated with age. Similarly, in the comorbidity group, diabetes, hypertension, coronary heart disease, COPD/lung disease, and ARDS were in the same direction and positively associated with the age of the COVID-19 infected patients. The symptoms like chest tightness/pain and the comorbidities, including chronic liver and kidney diseases, showed no association with the patients' age.

Considering group integration, the fever, dyspnea/shortness of breath, dizziness, pharyngalgia, and anorexia in the symptom group were positively associated with diabetes, ARDS, and kidney, cardiovascular, and liver diseases in comorbidity group. The symptoms like diarrhea, nausea, vomiting, and abdominal pain were positively associated with hypertension, coronary heart disease, and COPD/lung disease. The symptoms of sore throat, headache, rhinorrhea, myalgia/muscle ache, fatigue, and hemoptysis were positively associated with cerebrovascular disease (Fig. 2).

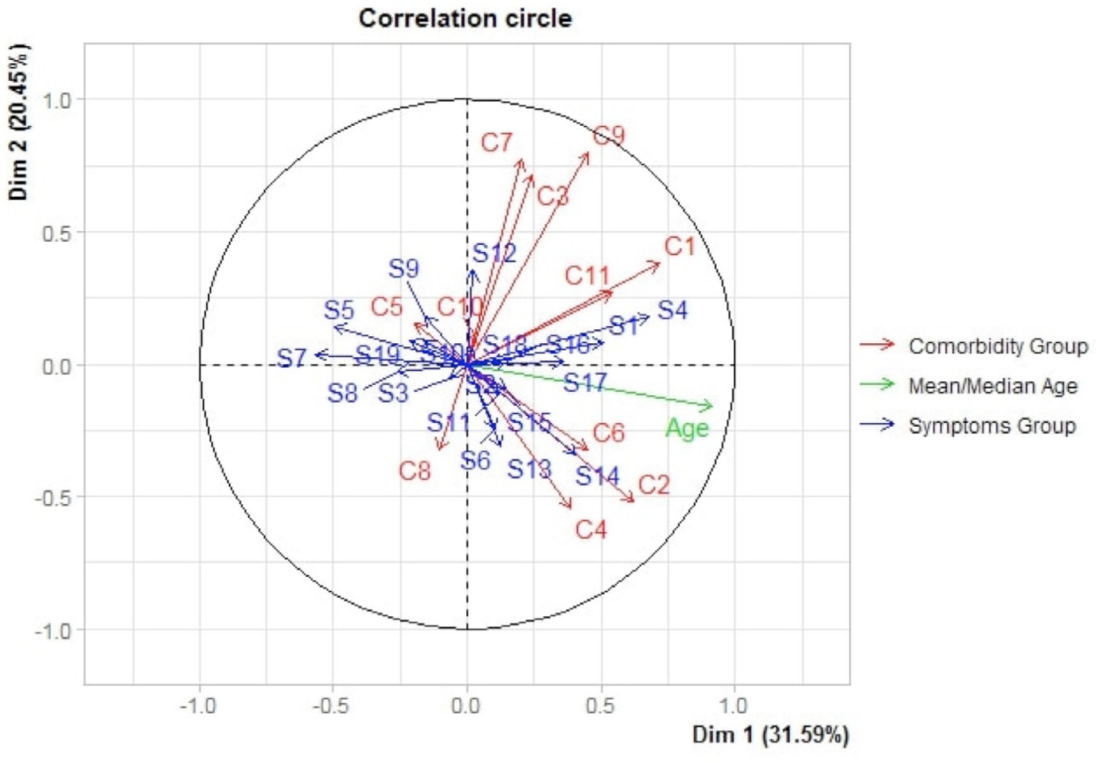
Table III summarizes the quality assessment of the selected studies. In 16 (55%) studies, participant recruitment method was appropriate, while the method was unclear in 45% studies. Thirteen (45%) studies had a sample size of more than 100, and about 96% of studies reported the subjects and design in detail. Validated methods were used in all studies, where the measurement was reliable, and the response rate was 100% (Tab. III).

The Egger test of symptoms – fever, dyspnea/shortness of breath, diarrhea, myalgia/muscle ache, nausea, anorexia, pharyngalgia, and hemoptysis – were found significant ($p < 0.05$), which suggested the presence of small-study effects. The comorbidities- diabetes, cardiovascular disease, cerebrovascular disease, COPD/lung disease, chronic liver disease, chronic renal disease, chronic kidney disease, and malignancy were found significant ($p < 0.05$) by the Egger's test, that recommended the presence of small-study effects.

Discussion

We aimed to estimate the prevalence of all reported symptoms and comorbidities, and investigate the factors associated with age of patients tested positive in COVID-19. In our selected 29 studies, the ratio

Fig. 2. Group association of symptoms and comorbidities with age of the COVID-19 patients (*Symptom Group*: S1: Fever, S2: Cough/Dry cough, S3: Fatigue, S4: Dyspnea/Shortness of breath, S5: Headache, S6: Diarrhea, S7: Sore Throat, S8: Myalgia/Muscle Ache, S9: Rhinorrhea, S10: Sputum Production/Expectoration, S11: Chest tightness, S12: Chest pain, S13: Nausea, S14: Vomiting, S15: Abdominal Pain, S16: Dizziness, S17: Anorexia, S18: Pharyngalgia, S19: Haemoptysis. *Comorbidity Group*: C1: Diabetes, C2: Hypertension, C3: Cardiovascular Disease, C4: Coronary heart disease, C5: Cerebrovascular disease, C6: COPD/Lung disease, C7: Chronic liver disease, C8: Chronic Renal disease, C9: Chronic Kidney disease, C10: Malignancy, C11: ARDS).



Tab. III. Quality assessment of the selected studies.

Authors	Were study participants sampled in an appropriate way?	Was the sample size adequate?	Were the study subjects and the setting described in detail?	Was the data analysis conducted with sufficient coverage of the identified sample?	Were valid methods used for the identification of the condition?	Was the condition measured in a standard, reliable way for all participants?	Was there appropriate statistical analysis?	Was the response rate adequate, and if not, was the low response rate managed appropriately?
Wan et al. [17]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zhang et al. [18]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Xu et al. [19]	Not Clear	No	Yes	Yes	Yes	Yes	Yes	Yes
Zhu et al. [20]	Not Clear	No	Yes	Yes	Yes	Yes	Yes	Yes
Chen et al. [21]	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Liu et al. [22]	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Chen et al. [23]	Not Clear	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mo et al. [24]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Liu et al. [25]	Not Clear	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Jin et al. [26]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wang et al. [27]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yuan et al. [28]	Not Clear	No	Yes	Yes	Yes	Yes	Yes	Yes
Guan et al. [29]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Liu et al. [30]	Not Clear	No	Yes	Yes	Yes	Yes	Yes	Yes
Zhou et al. [31]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Huang et al. [2]	Not Clear	No	Yes	Yes	Yes	Yes	Yes	Yes
Chen et al. [32]	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Du et al. [33]	Not clear	No	Yes	Yes	Yes	Yes	Yes	Yes
Xu et al. [34]	Yes	No	Yes	Yes	Yes	Yes	Not Clear	Yes
Goyal et al. [35]	Not Clear	Yes	Yes	Yes	Yes	Yes	Not Clear	Yes
Barrasa et al. [36]	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Yan et al. [37]	Yes	No	Not Clear	Yes	Yes	Yes	Yes	Yes
Gupta et al. [38]	Not Clear	No	Yes	Yes	Yes	Yes	No	Yes
Yang et al. [39]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Han et al. [40]	Not Clear	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kim et al. [41]	Yes	No	Yes	Yes	Yes	Yes	Not Clear	Yes
Wang et al. [42]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Shi et al. [43]	Not Clear	No	Yes	Yes	Yes	Yes	Yes	Yes
Yang et al. [44]	Not Clear	No	Yes	Yes	Yes	Yes	Yes	Yes

of infection was reported higher in males than in females (100:82.5), and this result is consistent with previous studies [2, 5, 27, 45]. It is generally assumed that males are more likely to be infected by bacteria and viruses than females, because of the women's robust innate and adaptive immune responses [3, 46]. Moreover, males are more vulnerable to infectious disease because of different patterns of occupation, social communication, and lifestyle than females. Furthermore, in many developing countries, women are housewives who stay at home and have little contact with others [47].

We found 33 symptoms and 43 comorbidities in the studies, and our meta-analysis included most reported 19 symptoms and 11 comorbidities. Fever, cough/dry cough, fatigue, dyspnea, anorexia, chest tightness, myalgia, sore throat, rhinorrhea, headache, and diarrhea were highly prevalent symptoms where the others symptoms were found rarely. All studies reported fever (84%) and cough/dry cough (61%) as symptoms consistent with relevant studies across the countries [19, 23, 25, 48]. Previous studies reported hypertension as the most common comorbidity [3, 6, 7], but our study suggests three major comorbidities – acute respiratory distress syndrome (61%), hypertension (23%), and diabetes (12%). Acute respiratory distress syndrome was found a higher prevalence rate (61%) as reported in three studies in China and one in outside China [28, 32, 36, 44]. We observed that the symptoms like anorexia (26%), chest tightness (25%) and rhinorrhea (13%), and one comorbidity, i.e., acute respiratory distress syndrome (61%) were examined with significant prevalence, but they were under-reported in the published systematic reviews [5, 6, 49, 50].

Human aging is associated with declines in adaptive and innate immunity, and it loses the body's ability to protect against infections [51-53]. Virologists and clinicians agree that the older adults are more vulnerable to COVID-19, and the patient's age can strongly be associated with symptoms and comorbidities [30, 54-57]. Our multivariate analysis revealed that a cluster of symptoms, including fever, dyspnea/shortness of breath, nausea, vomiting, abdominal pain, dizziness, anorexia, and pharyngalgia, as well as a cluster of comorbidities, including diabetes, hypertension, coronary heart disease, COPD/lung disease, and ARDS, were positively associated with the age of COVID-19 infected patients. The Centers for Disease Control and Prevention (CDC) suggested that the older adults are more likely to be asymptomatic and they are at greater risk of requiring hospitalization or dying if they are diagnosed with COVID-19 [58]. The comorbid conditions (e.g. hypertension, heart problems, diabetes) and disease symptoms were more severe in the elderly age than any other age groups [59-63]. In a study, Wu Z and the authors reported that the COVID-19 infected elderly aged above 80 years had a higher case fatality rate (14.8 *vs* 8.0%) than 70-80 years aged peoples [64]. The World Health Organization (WHO) reported that older people with pre-existing medical conditions including asthma, diabetes, and heart disease appear to be more vulnerable to becoming severely ill with the virus and this findings supports to many other studies [65-68].

During literature search, we were limited to only in English texts within the time frame January to April, 2020. The majority of the studies were found in China, and only five from other countries. More studies outside of China could add value in prevalence estimation. We found no data for <10 years children and thus, more studies are warranted in the child COVID-19 patients. Lastly, a few studies were found low sample size.

Conclusions

This review study is the unique effort of its kind that estimated all frequent symptoms and comorbidities, and determines the age related risk factors of the COVID-19 patients. We found a cluster of symptoms and comorbidities that were the age associated risk factors of patients infected in COVID-19. Thus, in very early stages of SARS-CoV-2 infection, if a patient exhibits any of the symptoms within the cluster, this patient should be isolated and the necessary actions should be taken. Our findings also suggest a prioritize vaccination by age groups and older people with underlying conditions. Finally, policymakers should develop a comprehensive mass media campaign to educate the general population about these symptoms and comorbidities.

Data availability statement

The full list of data and the data entries for all included studies is provided in the manuscript as a supplementary file. No additional supporting data is available.

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Conflict of interest statement

The authors declare no conflict of interest.

Authors' contributions

MMR contributed to conceptualization, design and supervision of the study. MMR, BB and ZF

contributed to the screening of studies for inclusion and data extraction. MMR, BB, MJU and MABC searched the databases. MMR and ZF contributed to the analysis and interpretation of the data. MMR, BB and MH contributed to drafting and formatting of the manuscript. MMR, MH, MABC, MSH, MHS, MZI, ER and MJU contributed to supervision, editing and checking of the manuscript. All authors contributed to the reviewing for important intellectual context and approved of the manuscript to be submitted.

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Supplementary Material

S1. Characteristics of studies that evaluated the age related risk factors of COVID-19 patients.

Authors	Publication Date	Country & Location	Study Design	Mean/ Median Age	Patient No. (n)	Male (n)	Female (n)	Gender	Fever	Cough / Dry cough	Fatigue	Dyspnoea/ Shortness of breath	Headache	Diarrhoea
Wan et al.	21.3.2020	Chongqing, China	N/M	47	135	72	63	Both	0.89	0.77	0.33	0.13	0.33	0.13
Zhang et al.	18.2.2020	Wuhan, China	N/M	57	140	71	69	Both	0.79	0.64	0.64	0.31	N/M	0.13
Xu et al.	19.2.2020	Zhejiang, China	Retrospective	41	62	35	27	Both	0.77	0.81	0.52	N/M	0.34	0.08
Zhu et al.	13.3.2020	Anhui, China	Retrospective	46	32	15	17	Both	0.84	0.66	0.16	N/M	0.03	0.03
Chen et al.	16.02.2020	Wuhan, China	Retrospective	56	21	17	4	Both	0.99	0.80	0.85	0.52	0.10	0.20
Liu et al.	9.02.2020	Shenzhen, China	N/M	60	12	8	4	Both	0.83	0.92	N/M	N/M	N/M	0.17
Chen et al.	26.03.2020	Wuhan, China	Retrospective	62	274	171	103	Both	0.91	0.68	0.50	0.44	0.11	0.28
Mo et al.	16.3.2020	Wuhan, China	Retrospective, single center	54	155	86	69	Both	0.81	0.63	0.73	0.32	0.10	0.05
Liu et al.	07.02.2020	Hubei, China	Retrospective	57	137	61	76	Both	0.82	0.48	0.32	0.19	0.10	0.08
Jin et al.	24.03.2020	Zhejiang, China	Retrospective	46	651	331	320	Both	0.84	0.67	0.18	N/M	0.10	N/M
Wang et al.	17.03.2020	Wuhan, China	Retrospective, single center	56	138	75	63	Both	0.99	0.59	0.70	0.31	0.07	0.10
Yuan et al.	19.03.2020	Hubei, China	Retrospective	60	27	12	15	Both	0.78	0.59	N/M	0.41	N/M	N/M
Guan et al.	28.02.2020	China (30 provinces)	Cohort	47	1099	639	460	Both	0.89	0.68	0.38	N/M	0.14	0.04
Liu et al.	27.03.2020	Hainan, China	Retrospective	68	56	31	25	Both	0.76	0.36	0.09	N/M	N/M	N/M
Zhou et al.	12.03.2020	Wuhan, China	N/M	51	254	115	139	Both	0.84	0.39	0.52	0.04	0.11	N/M
Huang et al.	24.01.2019	Wuhan, China	Cohort	49	41	30	11	Both	0.98	0.76	0.44	0.55	0.08	0.03
Chen et al.	29.01.2019	Wuhan, China	Retrospective, single center	55.5	99	67	32	Both	0.83	0.82	N/M	N/M	0.08	0.02
Du et al.	3.04.2020	Wuhan, China	Retrospective	66	85	62	23	Both	0.92	0.22	0.59	0.71	0.05	0.19
Xu et al.	28.02.2020	Guangzhou, China	N/M	50	90	39	51	Both	0.78	0.63	0.21	N/M	0.04	0.06
Goyal et al.	17.04.2020	New York, USA	Retrospective	62	393	238	155	Both	0.77	0.79	N/M	0.57	N/M	0.24
Barrasa et al.	1.04.2020	Vitoria, Spain	N/M	63	48	27	21	Both	1.00	0.73	N/M	0.88	N/M	N/M
Yan et al.	12.4.2020	USA	Cross sectional	48.5	59	29	29	Both	0.70	0.66	0.81	0.54	0.66	0.48
Gupta et al.	6.04.2020	New Delhi, India	Retrospective, Observational	40	21	14	7	Both	0.43	0.43	N/M	N/M	0.14	N/M
Yang et al.	21.02.2020	Wenzhou, China	Retrospective cohort	45	149	81	68	Both	0.77	0.58	N/M	0.01	0.09	0.07
Han et al.	15.04.2020	Wuhan, China	Retrospective	62.5	206	91	115	Both	0.67	0.26	0.45	N/M	N/M	0.33
Kim et al.	6.04.2020	South Korea	Cohort	40	28	15	13	Both	0.25	0.29	0.11	N/M	0.25	0.11
Wang et al.	15.03.2020	Wuhan, China	Retrospective, single-centre	69	339	166	173	Both	0.92	0.53	0.40	0.41	0.04	0.13
Shi et al.	24.02.2020	Wuhan, China	Retrospective	49.5	81	42	39	Both	0.73	0.59	0.09	0.42	0.06	0.04
Yang et al.	21.02.2020	Wuhan, China	Retrospective, single-centre, Observational	60	52	35	17	Both	0.98	0.77	N/M	0.64	0.06	N/M

N/M: Not Mentioned

S1 (Continued). Characteristics of studies that evaluated the age related risk factors of COVID-19 patients.

Authors	Sore Throat	Myalgia/ Muscle Ache	Rhinorrhea	Cough/ Sputum Production	Chest tightness	Chest pain	Nausea	Vomiting	Abdominal Pain	Dizziness	Anorexia	Pharyngalgia	Hemoptysis	Others	No. of Symptoms
Wan et al.	N/M	0.33	N/M	0.09	N/M	N/M	N/M	N/M	N/M	N/M	N/M	0.18	0.03	Loss of appetite-4.4%, Palpitation-3.7%, Retching-3%	13
Zhang et al.	N/M	N/M	N/M	N/M	0.31	N/M	0.17	N/M	0.06	N/M	0.17	N/M	N/M	N/M	9
Xu et al.	N/M	0.52	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	0.03	N/M	7
Zhu et al.	N/M	0.16	N/M	0.16	0.09	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	8
Chen et al.	N/M	0.40	N/M	N/M	0.55	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	8
Liu et al.	N/M	0.33	N/M	N/M	N/M	N/M	0.17	0.17	N/M	N/M	N/M	N/M		Chill- 42%	7
Chen et al.	N/M	0.22	N/M	0.30	0.38	N/M	0.09	0.06	0.07	0.08	0.24	0.04	0.03	N/M	16
Mo et al.	N/M	0.61	N/M	N/M	0.39	0.04	0.04	0.04	0.02	0.02	0.32	N/M		N/M	14
Liu et al.	N/M	0.32	N/M	0.04	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	0.05	Heart palpitation-7%	10
Jin et al.	0.15	0.11	N/M	0.35	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	0.02	Nasal Obstruction-6%,	9
Wang et al.	N/M	0.35	N/M	0.27	N/M	N/M	0.10	0.04	N/M	0.09	0.40	0.17	N/M	N/M	13
Yuan et al.	N/M	0.11	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	4
Guan et al.	0.14	0.15	N/M	0.34	N/M	N/M	0.05	0.05	N/M	N/M	N/M	N/M	0.01	Conjunctival congestion-1%, Nasal congestion-5%, Chils-11.5%, Throat congestion-2%, Tonsil sweling-2%, Rash-0.2%	17
Liu et al.	N/M	N/M	N/M	N/M	0.07	N/M	N/M	0.17	N/M	N/M	N/M	N/M	N/M	Nasal congestion-5%,	6
Zhou et al.	0.06	0.34	N/M	0.42	0.26	N/M	N/M	N/M	N/M	0.07	N/M	N/M	N/M	N/M	10
Huang et al.	N/M	0.44	N/M	0.28	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	0.05	N/M	9
Chen et al.	0.05	0.11	0.04	N/M	N/M	0.02	0.01	0.01	N/M	N/M	N/M	N/M	N/M	N/M	10
Du et al.	N/M	0.17	N/M	0.38	N/M	0.02	N/M	0.05	0.04	N/M	0.57	0.02	N/M	N/M	14
Xu et al.	0.26	0.28	N/M	0.12	N/M	N/M	0.06	0.02	N/M	N/M	N/M	N/M	N/M	Chills-7%	11
Goyal et al.	N/M	0.19	N/M	N/M	N/M	N/M	0.19	0.19	N/M	N/M	N/M	N/M	N/M	N/M	7
Barrasa et al.	N/M	0.04	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	Malaise-44%	5
Yan et al.	0.32	0.63	0.31	N/M	N/M	N/M	0.27	N/M	N/M	N/M	N/M	N/M	N/M	Nasal obstruction 47.5%, Anosmia 68%, Ageusia 71%	13
Gupta et al.	0.24	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	5
Yang et al.	0.14	0.03	N/M	0.32	0.10	0.03	0.01	0.01	N/M	N/M	N/M	N/M	N/M	Chill-14%, Snotty-3%	14
Han et al.	N/M	0.21	N/M	N/M	0.24	N/M	N/M	0.12	0.04	N/M	N/M	0.06	N/M	Poor apitite-34%	11
Kim et al.	0.29	0.25	0.07	0.21	N/M	N/M	N/M	N/M	0.04	N/M	N/M	N/M	N/M	N/M	10
Wang et al.	N/M	0.05	N/M	0.28	0.26	N/M	0.04	N/M	N/M	0.04	0.28	0.04	N/M	N/M	13
Shi et al.	N/M	N/M	0.26	0.19	0.22	N/M	N/M	0.05	N/M	0.02	0.01	N/M	N/M	N/M	12
Yang et al.	N/M	0.12	0.06	N/M	N/M	0.02	N/M	0.04	N/M	N/M	N/M	N/M	N/M	Malaise-35%, Arthralgia-2%	10

N/M: Not Mentioned

S1 (Continued). Characteristics of studies that evaluated the age related risk factors of COVID-19 patients.

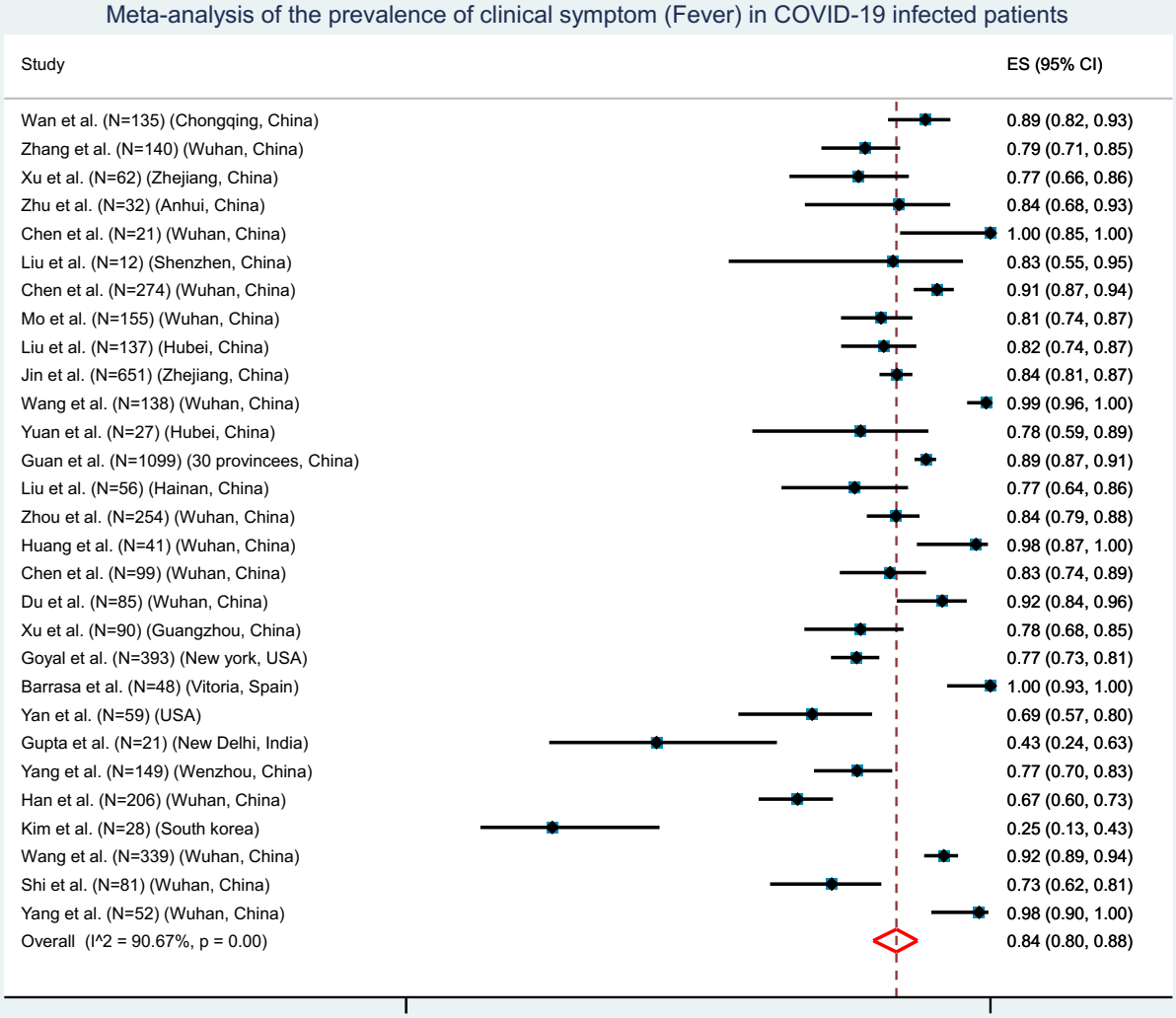
Authors	Diabetes	Hypertension	Cardiovascular Disease	Coronary heart disease	Cerebrovascular disease	COPD /Lung disease	Chronic liver disease	Chronic Renal disease	Chronic Kidney disease	Malignancy	ARDS	Others	No. of Comorbidities
Wan et al.	0.09	0.10	0.05	N/M	N/M	0.007	0.02	N/M	N/M	0.03	N/M	N/M	6
Zhang et al.	0.12	0.30	N/M	0.05	N/M	0.014	0.06	0.01	N/M	N/M	N/M	Gastric ulcer & Hyperlepedemia-5%, Thyroid disease-3.6%, Urolithiasis-2.1%, Arrhythmia-3.6%, Cholilithiasis-4.3%	12
Xu et al.	0.02	0.08	N/M	N/M	0.02	0.020	0.11	0.02	N/M	N/M	N/M	N/M	6
Zhu et al.	0.13	0.22	N/M	0.06	0.03	0.060	0.06	0.03	N/M	N/M	N/M	Mental disorder- 3%, Tumor-6%	9
Chen et al.	0.14	0.24	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	2
Liu et al.	0.08	0.25	N/M	0.33	N/M	0.080	N/M	0.08	N/M	N/M	N/M	Bacterial co infection-17%, Pneumonia-100%,	7
Chen et al.	0.17	0.34	0.08	N/M	0.01	0.070	N/M	N/M	0.01	0.03	N/M	HBV infection-4%, Metabolic arthritis & Autoimmune disease & Gastro Intestinal disease- 1%	11
Mo et al.	0.10	0.24	0.10	N/M	0.05	0.030	0.05	0.04	N/M	0.05	N/M	Tuberculosis-2%, HIV-1%	10
Liu et al.	0.10	0.10	0.07	N/M	N/M	0.015	N/M	N/M	N/M	0.02	N/M	N/M	5
Jin et al.	0.07	0.15	N/M	0.01	N/M	0.002	0.04	0.01	N/M	0.01	N/M	Immunosuppression-0.17%,	8
Wang et al.	0.10	0.31	0.15	N/M	0.05	0.030	0.03	N/M	0.03	0.07	N/M	HIV infection-1%	9
Yuan et al.	0.22	0.19	0.11	N/M	N/M	N/M	N/M	N/M	N/M	N/M	0.41	Tumor & Cerebral infraction & Chronic gastric- 4%	9
Guan et al.	0.07	0.15	N/M	0.03	0.01	0.010	N/M	0.01	N/M	0.01	N/M	Hepatitis B Infection-2%, Immune deficiency-0.2%,	9
Liu et al.	0.07	0.17	N/M	0.11	N/M	N/M	0.06	N/M	0.03	N/M	N/M	Persistent arterial fibrilliation-6%,	6
Zhou et al.	0.10	0.25	0.05	0.07	N/M	0.020	0.01		N/M	0.01	N/M	HIV infection-0.4%,	8
Huang et al.	0.20	0.15	0.15	N/M	N/M	0.020	0.02	N/M	N/M	0.02	N/M	N/M	6
Chen et al.	N/M	N/M	N/M	N/M	N/M	N/M	N/M	0.03	N/M	N/M	0.17	Acute Respiratory Injury-8%, Septic shock-4%, Pneumonia-1%	5
Du et al.	0.22	0.38	0.08	0.12	N/M	0.020	0.06	N/M	0.04	0.07	N/M	N/M	8
Xu et al.	0.06	0.19	0.03	N/M	N/M	0.010	N/M	N/M	N/M	0.02	N/M	Tuberculosis-2%,	6
Goyal et al.	0.25	0.50	N/M	0.14	N/M	0.050	N/M	N/M	N/M	N/M	N/M	Asthama-12.5%, Obesity-35%	6
Barrasa et al.	0.19	0.44	N/M	0.10	N/M	0.380	N/M	N/M	N/M	N/M	1.00	Obesity-48%, Immunosuppression-3%	7
Yan et al.	0.09	0.14	0.05	N/M	N/M	0.050	N/M	N/M	N/M	0.04	N/M	Allergic rhinitis-34%, Sinus disease 3%	7
Gupta et al.	0.14	0.24	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	N/M	Anxity-5%, Hypothyroidism-5%, Migrane-5%, Obstructive sleep aponea-5%	6
Yang et al.	N/M	N/M	0.19	N/M	0.19	N/M	N/M	N/M	N/M		N/M	Respiratory system disease - 0.67%, Digestive system disease- 5%, Endocrine disease- 6%	5
Han et al.	0.10	0.27	N/M	N/M	0.08	0.040	N/M	N/M	N/M	N/M	N/M	N/M	4
Kim et al.	0.07	N/M	N/M	N/M		N/M	0.04		N/M	0.04	N/M	Obesity-18%, Asthama-4%	5
Wang et al.	0.16	0.41	0.16	N/M	0.06	0.060	0.01	N/M	0.04	0.04	N/M	Autoimmune disease-1.5%	9
Shi et al.	0.12	0.15	0.10	N/M	0.07	0.110	0.09	0.04	N/M	0.05	N/M	N/M	8
Yang et al.	0.35	N/M	0.23	N/M	N/M	N/M	0.29	N/M	0.29	N/M	0.67	Urinary tract infection-2%, Gastrointestinal haemorrhage-4%	7

N/M: Not Mentioned

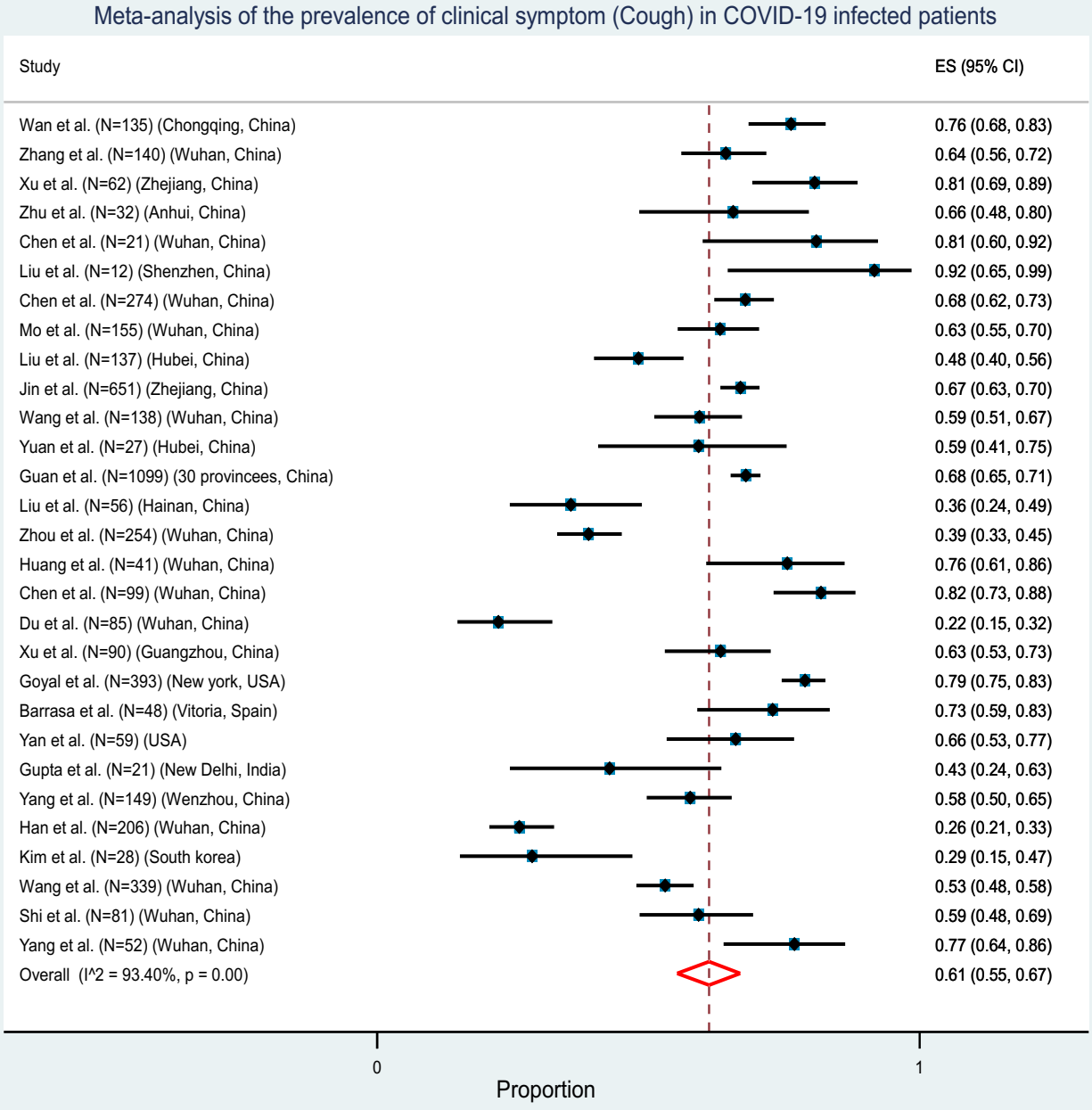
Pooled estimation of the symptoms and comorbidities

Symptoms

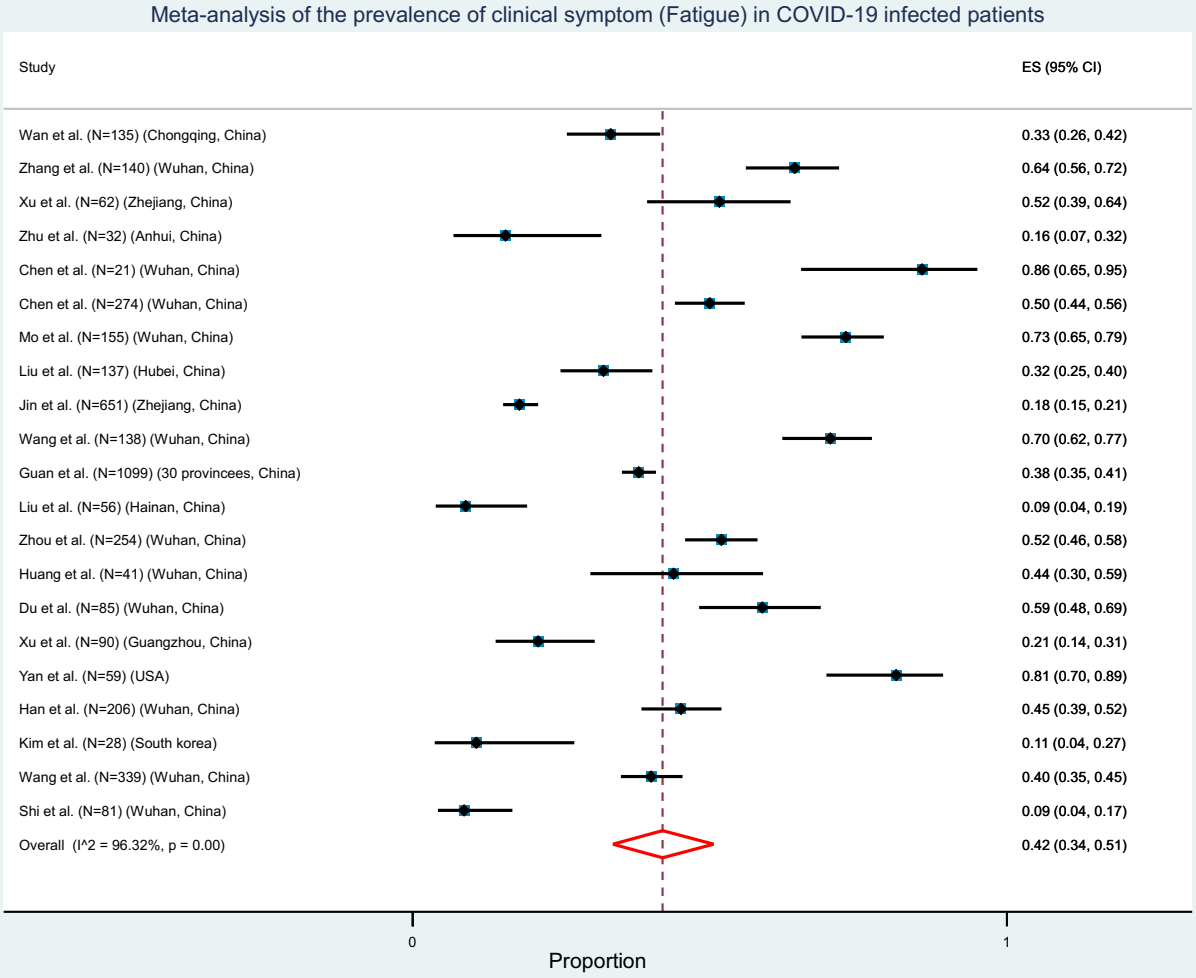
S2. Fever



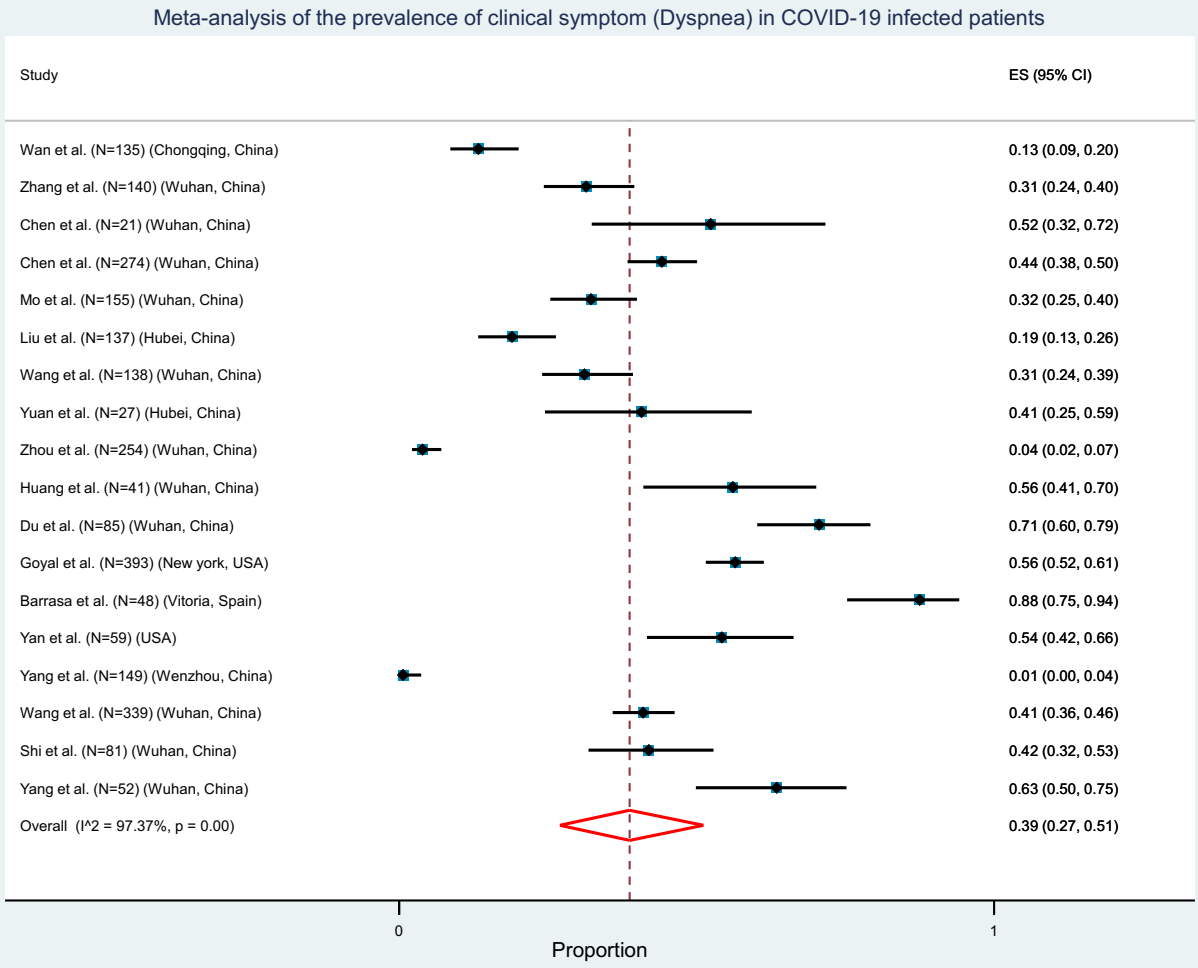
S3. Cough / Dry Cough



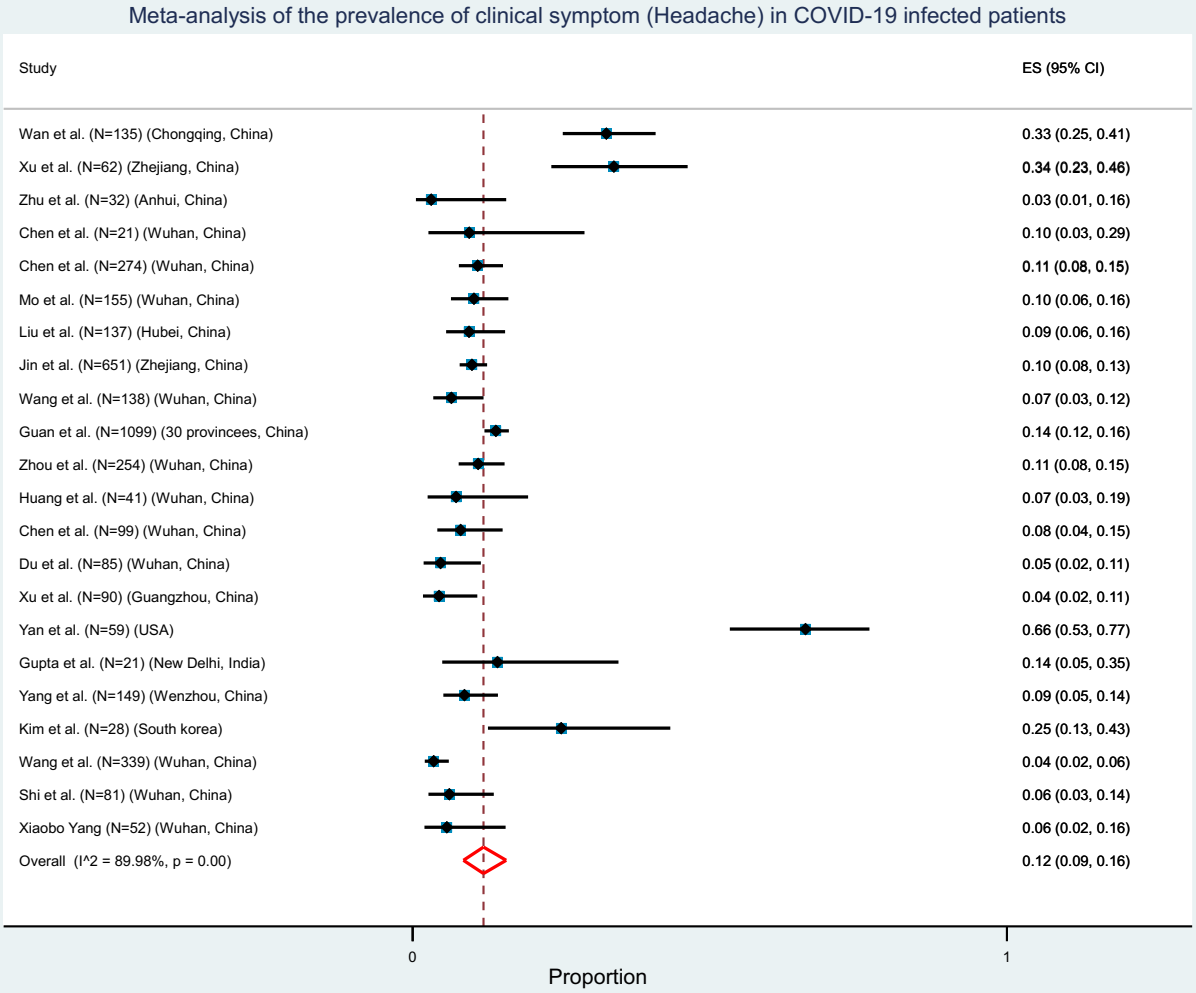
S4. Fatigue/Weakness



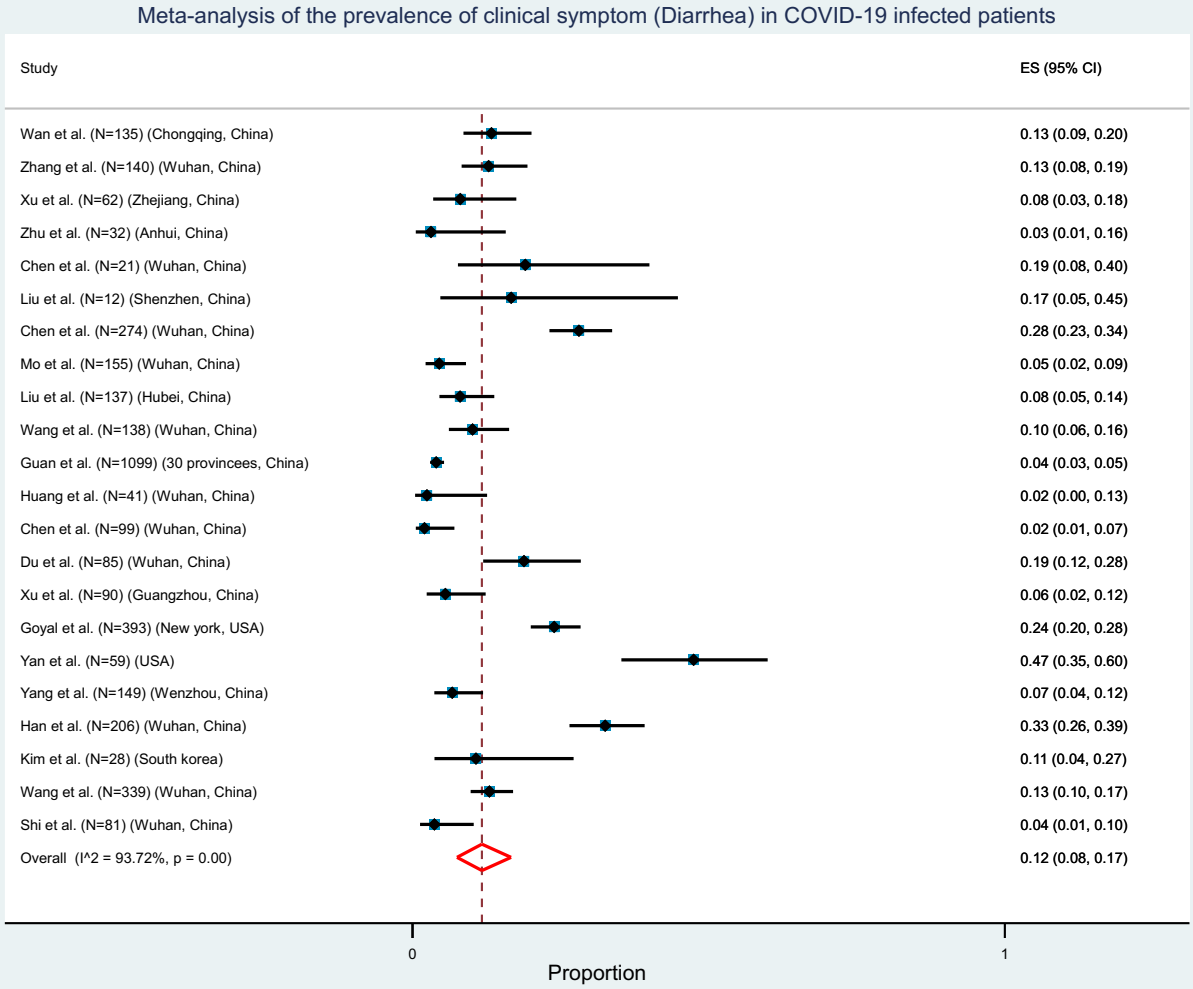
S5. Dyspnea/Shortness of breath



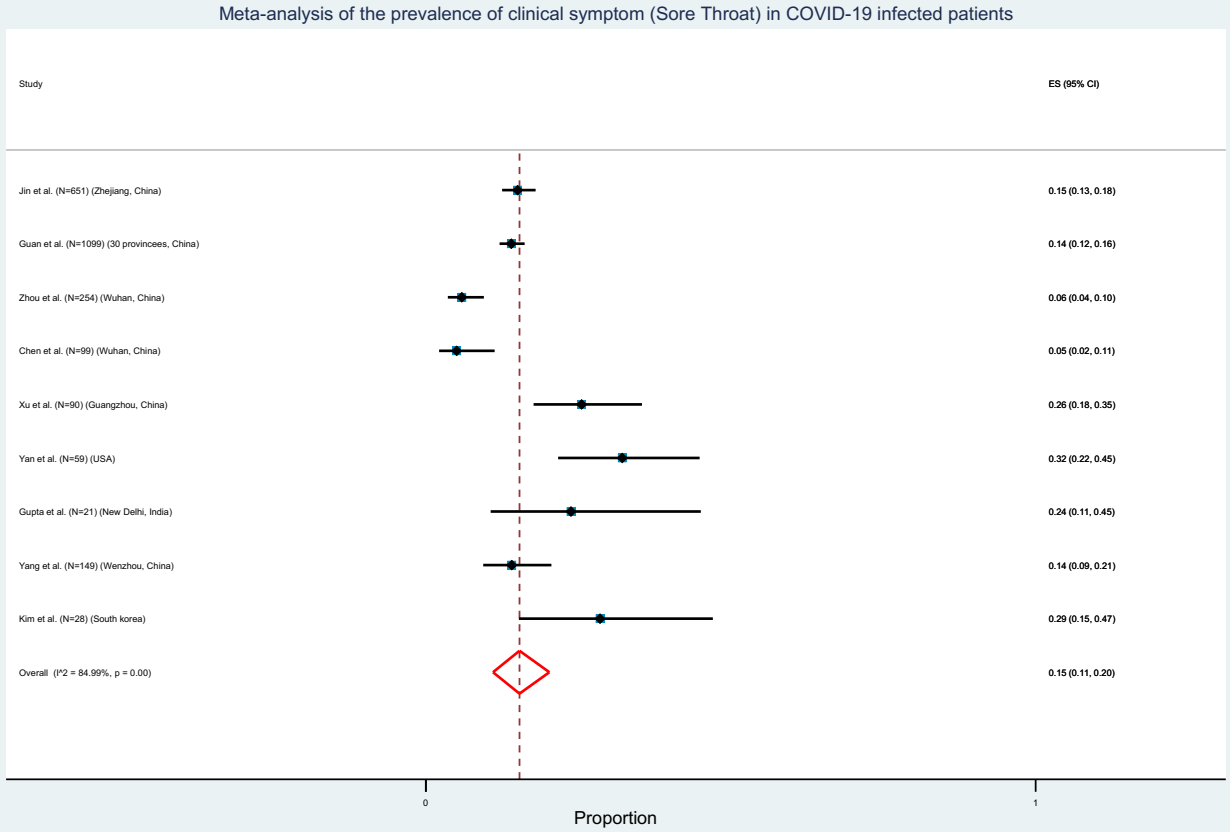
S6. Headache


Meta-analysis of the prevalence of clinical symptom (Headache) in COVID-19 infected patients
Study
ES (95% CI)
Wan et al. (N=135) (Chongqing, China) 0.33 (0.25, 0.41)
Xu et al. (N=62) (Zhejiang, China) 0.34 (0.23, 0.46)
Zhu et al. (N=32) (Anhui, China) 0.03 (0.01, 0.16)
Chen et al. (N=21) (Wuhan, China) 0.10 (0.03, 0.29)
Chen et al. (N=274) (Wuhan, China) 0.11 (0.08, 0.15)
Mo et al. (N=155) (Wuhan, China) 0.10 (0.06, 0.16)
Liu et al. (N=137) (Hubei, China) 0.09 (0.06, 0.16)
Jin et al. (N=651) (Zhejiang, China) 0.10 (0.08, 0.13)
Wang et al. (N=138) (Wuhan, China) 0.07 (0.03, 0.12)
Guan et al. (N=1099) (30 provincees, China) 0.14 (0.12, 0.16)
Zhou et al. (N=254) (Wuhan, China) 0.11 (0.08, 0.15)
Huang et al. (N=41) (Wuhan, China) 0.07 (0.03, 0.19)
Chen et al. (N=99) (Wuhan, China) 0.08 (0.04, 0.15)
Du et al. (N=85) (Wuhan, China) 0.05 (0.02, 0.11)
Xu et al. (N=90) (Guangzhou, China) 0.04 (0.02, 0.11)
Yan et al. (N=59) (USA) 0.66 (0.53, 0.77)
Gupta et al. (N=21) (New Delhi, India) 0.14 (0.05, 0.35)
Yang et al. (N=149) (Wenzhou, China) 0.09 (0.05, 0.14)
Kim et al. (N=28) (South korea) 0.25 (0.13, 0.43)
Wang et al. (N=339) (Wuhan, China) 0.04 (0.02, 0.06)
Shi et al. (N=81) (Wuhan, China) 0.06 (0.03, 0.14)
Xiaobo Yang (N=52) (Wuhan, China) 0.06 (0.02, 0.16)
Overall (I^2 = 89.98%, p = 0.00) 0.12 (0.09, 0.16)
0
1
Proportion

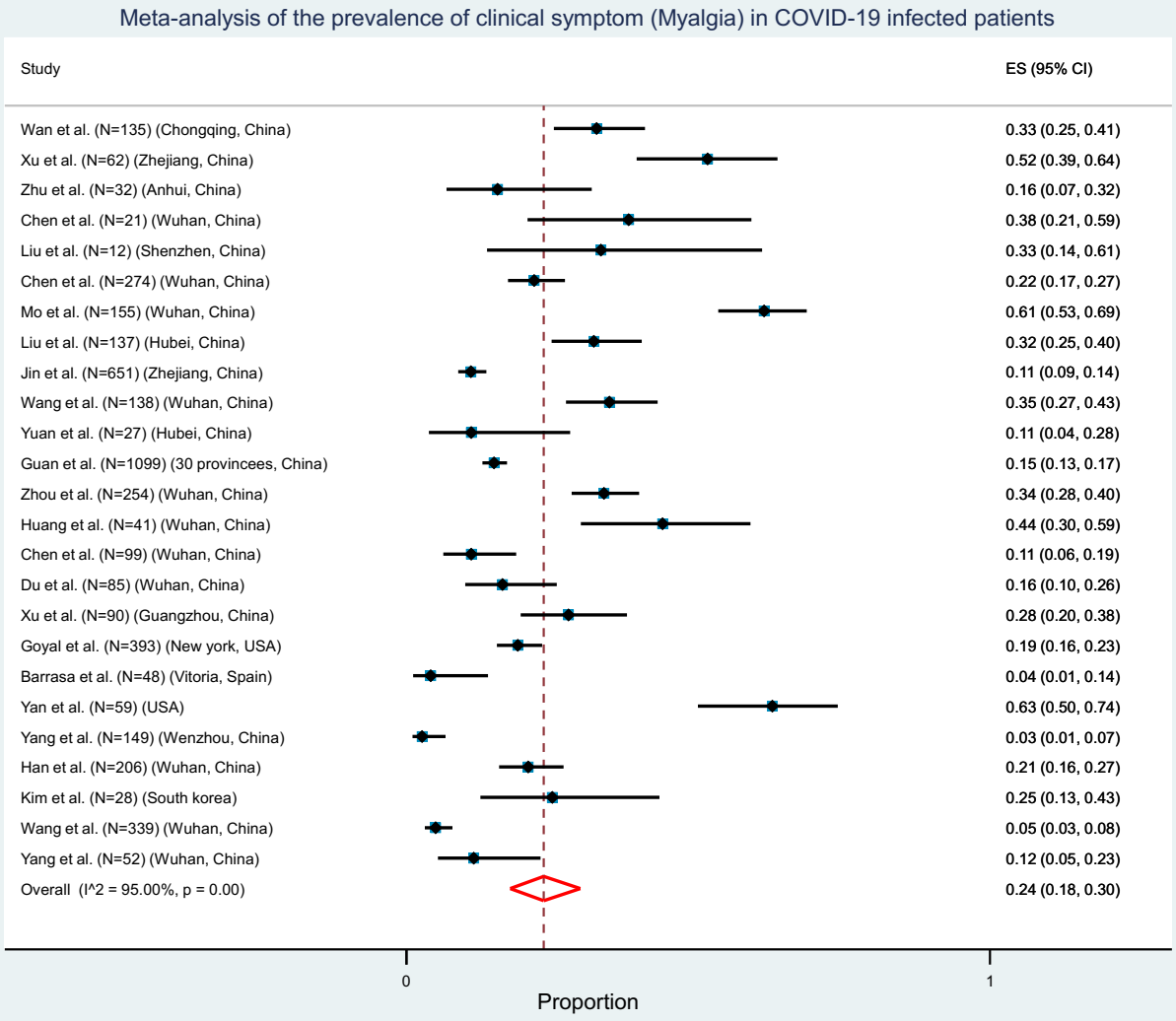
S7. Diarrhea


Meta-analysis of the prevalence of clinical symptom (Diarrhea) in COVID-19 infected patients
Study
ES (95% CI)
Wan et al. (N=135) (Chongqing, China) 0.13 (0.09, 0.20)
Zhang et al. (N=140) (Wuhan, China) 0.13 (0.08, 0.19)
Xu et al. (N=62) (Zhejiang, China) 0.08 (0.03, 0.18)
Zhu et al. (N=32) (Anhui, China) 0.03 (0.01, 0.16)
Chen et al. (N=21) (Wuhan, China) 0.19 (0.08, 0.40)
Liu et al. (N=12) (Shenzhen, China) 0.17 (0.05, 0.45)
Chen et al. (N=274) (Wuhan, China) 0.28 (0.23, 0.34)
Mo et al. (N=155) (Wuhan, China) 0.05 (0.02, 0.09)
Liu et al. (N=137) (Hubei, China) 0.08 (0.05, 0.14)
Wang et al. (N=138) (Wuhan, China) 0.10 (0.06, 0.16)
Guan et al. (N=1099) (30 provincees, China) 0.04 (0.03, 0.05)
Huang et al. (N=41) (Wuhan, China) 0.02 (0.00, 0.13)
Chen et al. (N=99) (Wuhan, China) 0.02 (0.01, 0.07)
Du et al. (N=85) (Wuhan, China) 0.19 (0.12, 0.28)
Xu et al. (N=90) (Guangzhou, China) 0.06 (0.02, 0.12)
Goyal et al. (N=393) (New york, USA) 0.24 (0.20, 0.28)
Yan et al. (N=59) (USA) 0.47 (0.35, 0.60)
Yang et al. (N=149) (Wenzhou, China) 0.07 (0.04, 0.12)
Han et al. (N=206) (Wuhan, China) 0.33 (0.26, 0.39)
Kim et al. (N=28) (South korea) 0.11 (0.04, 0.27)
Wang et al. (N=339) (Wuhan, China) 0.13 (0.10, 0.17)
Shi et al. (N=81) (Wuhan, China) 0.04 (0.01, 0.10)
Overall (I^2 = 93.72%, p = 0.00) 0.12 (0.08, 0.17)
0
1
Proportion

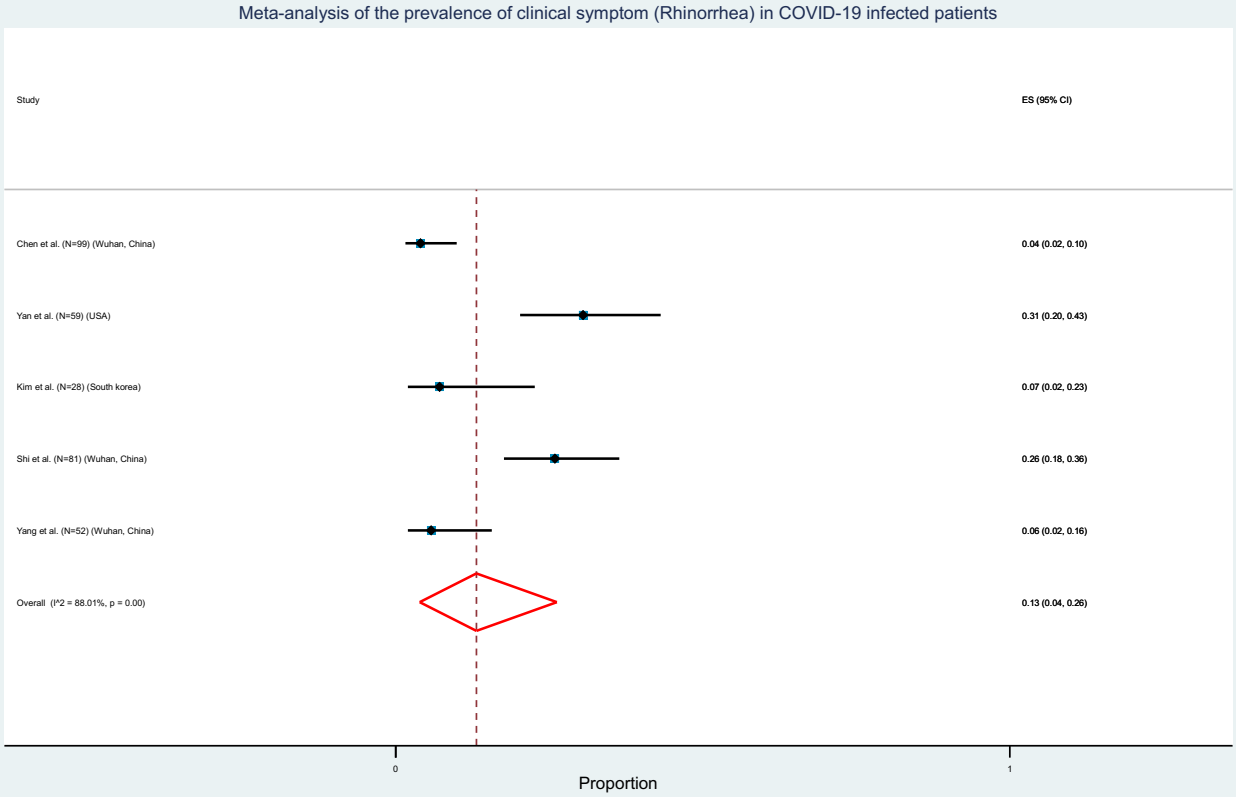
S8. Sore Throat



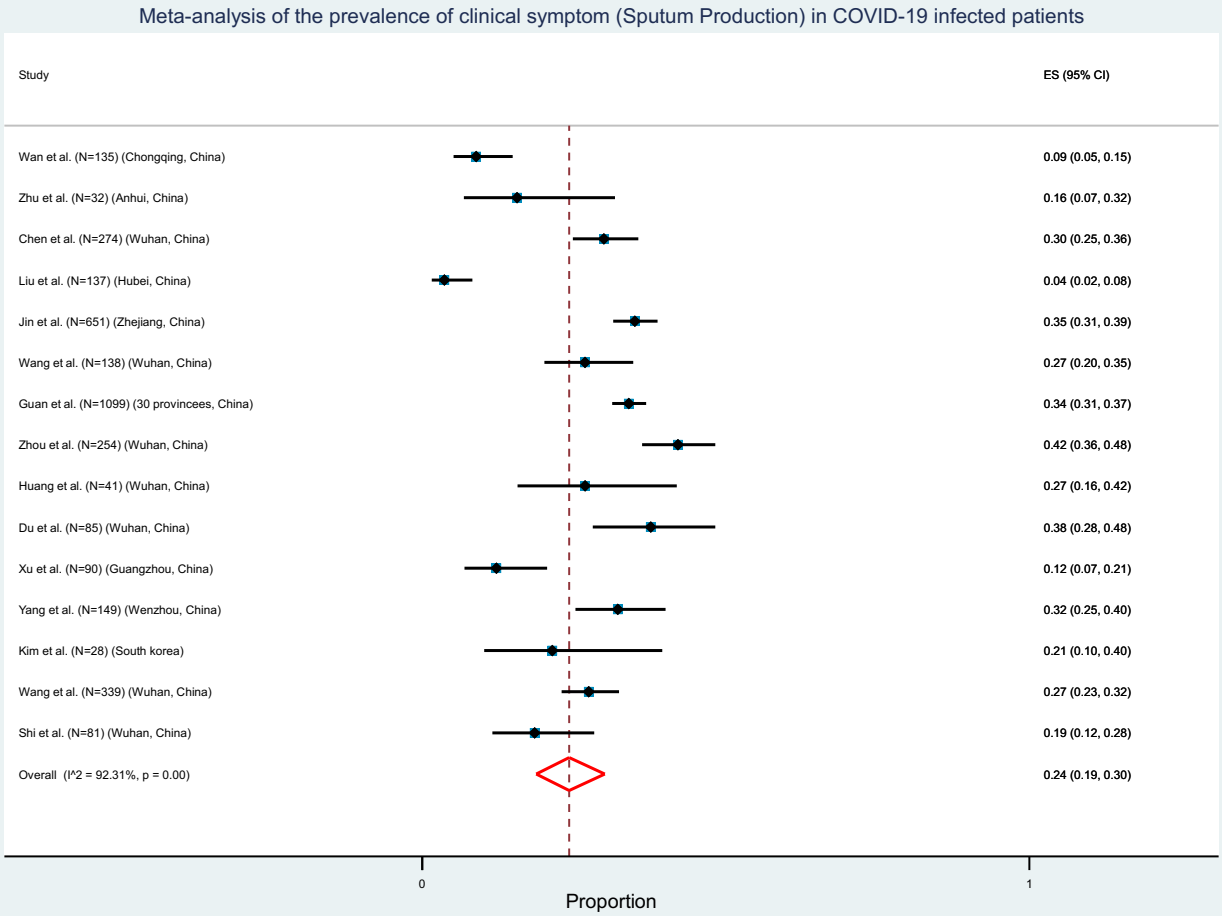
S9. Myalgia/Muscle Ache



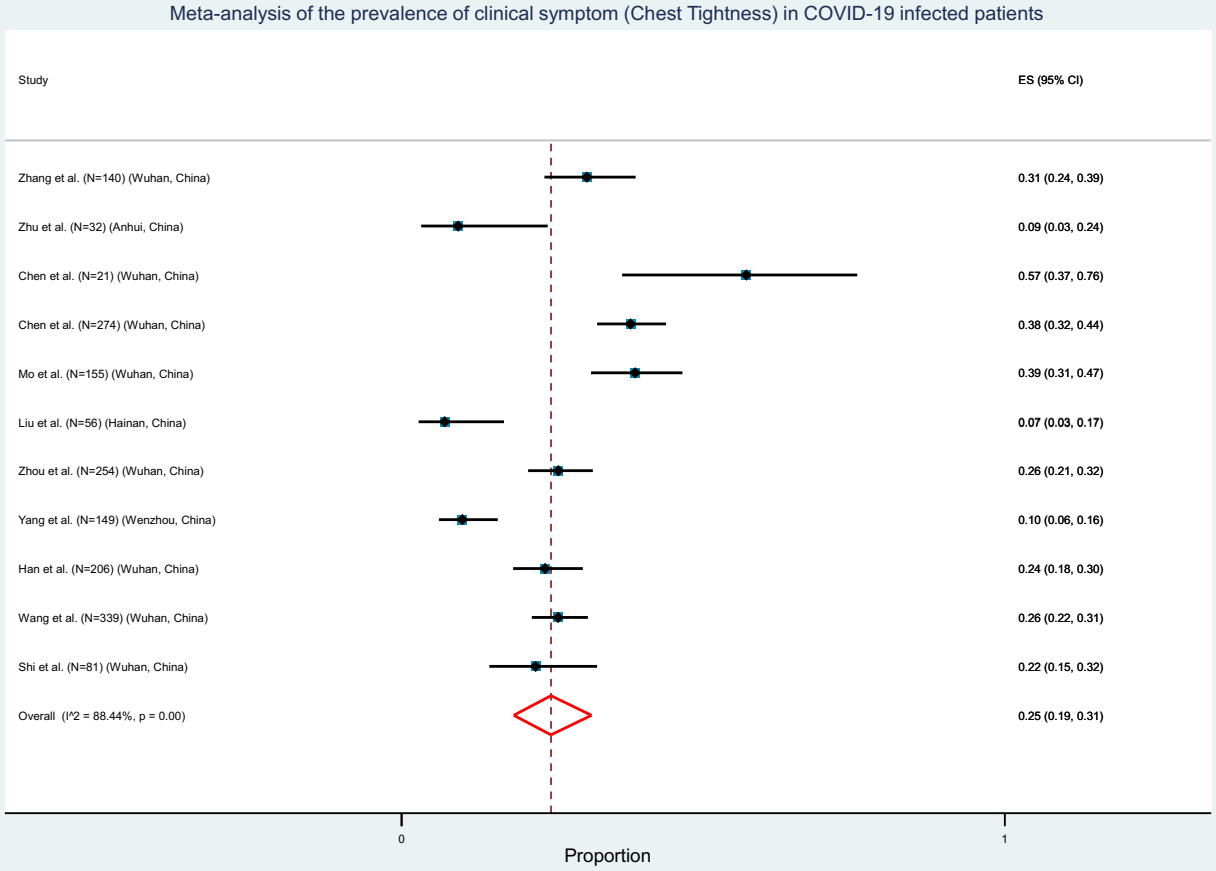
S10. Rhinorrhea



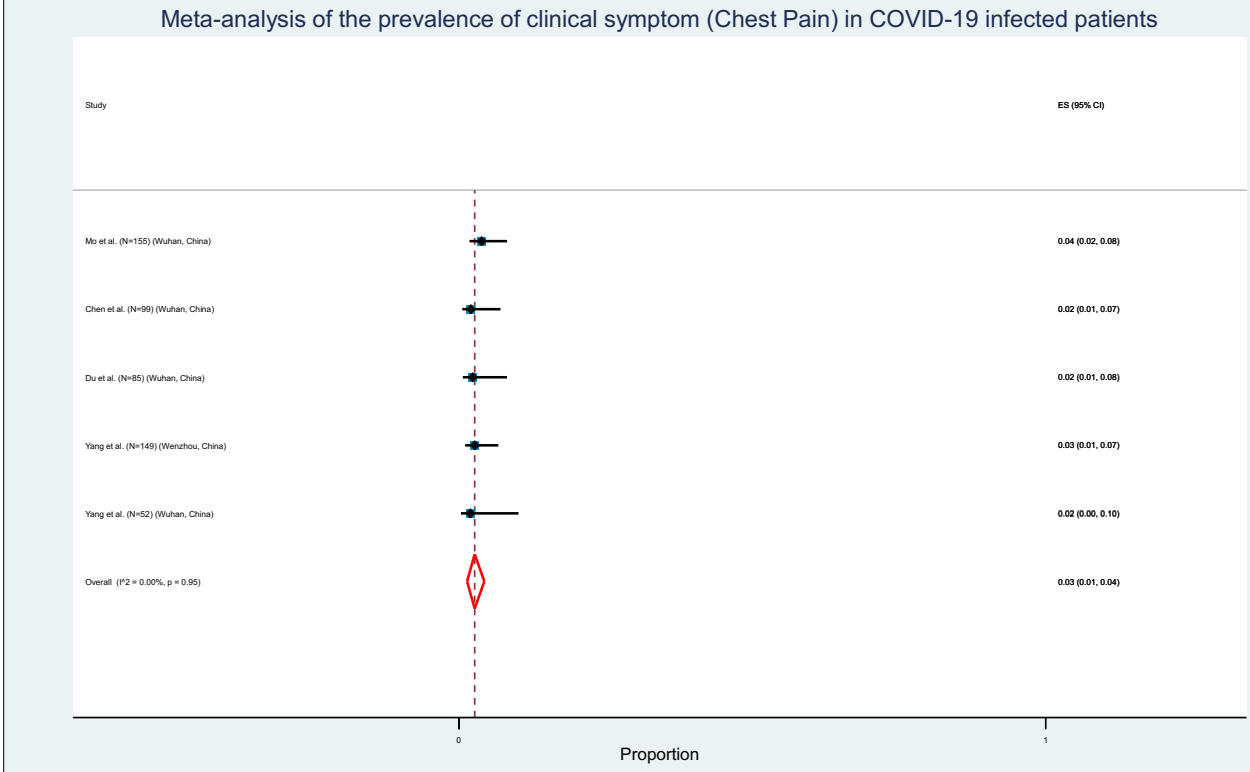
S11. Sputum Production/Expectoration



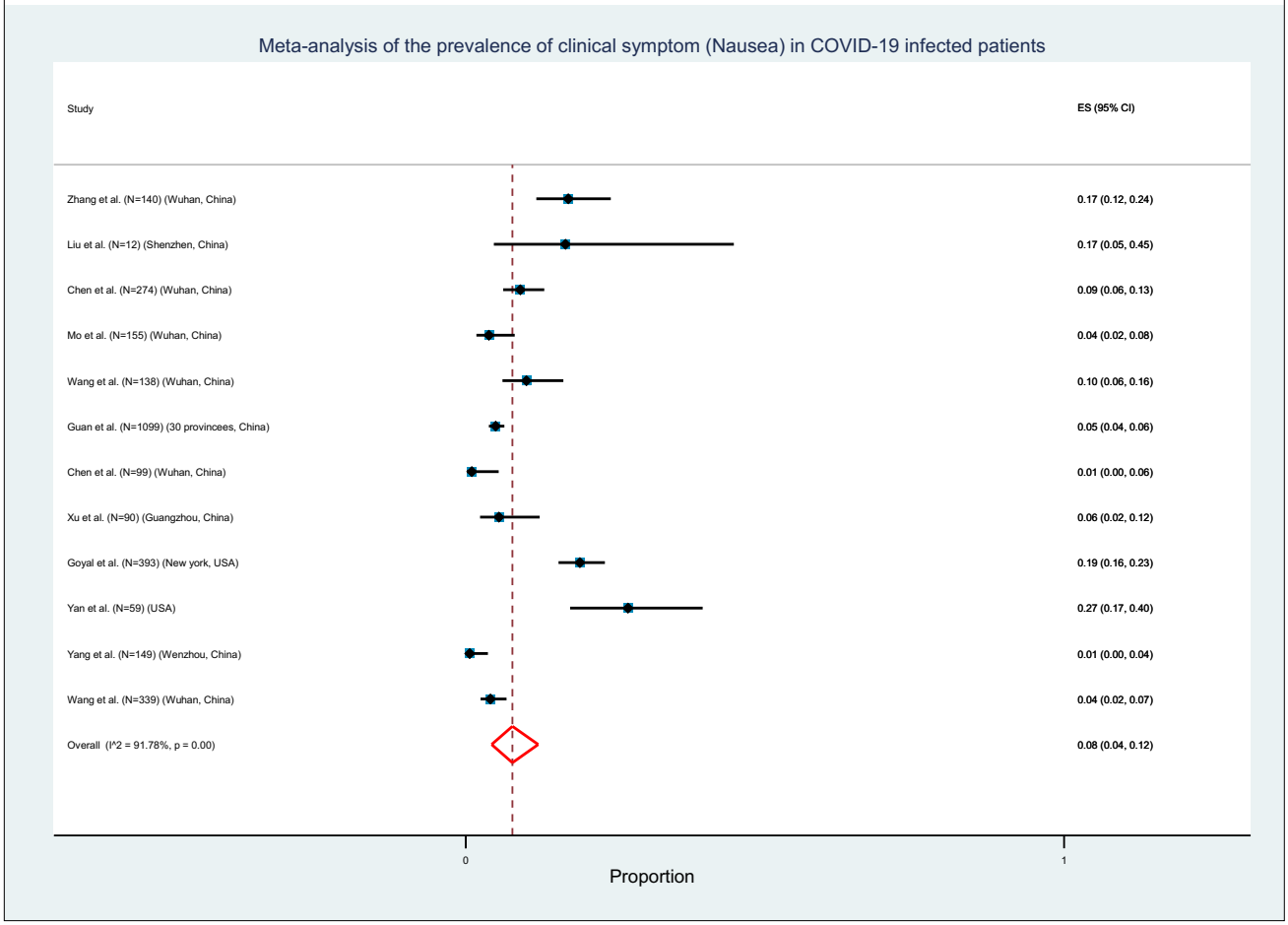
S12. Chest tightness



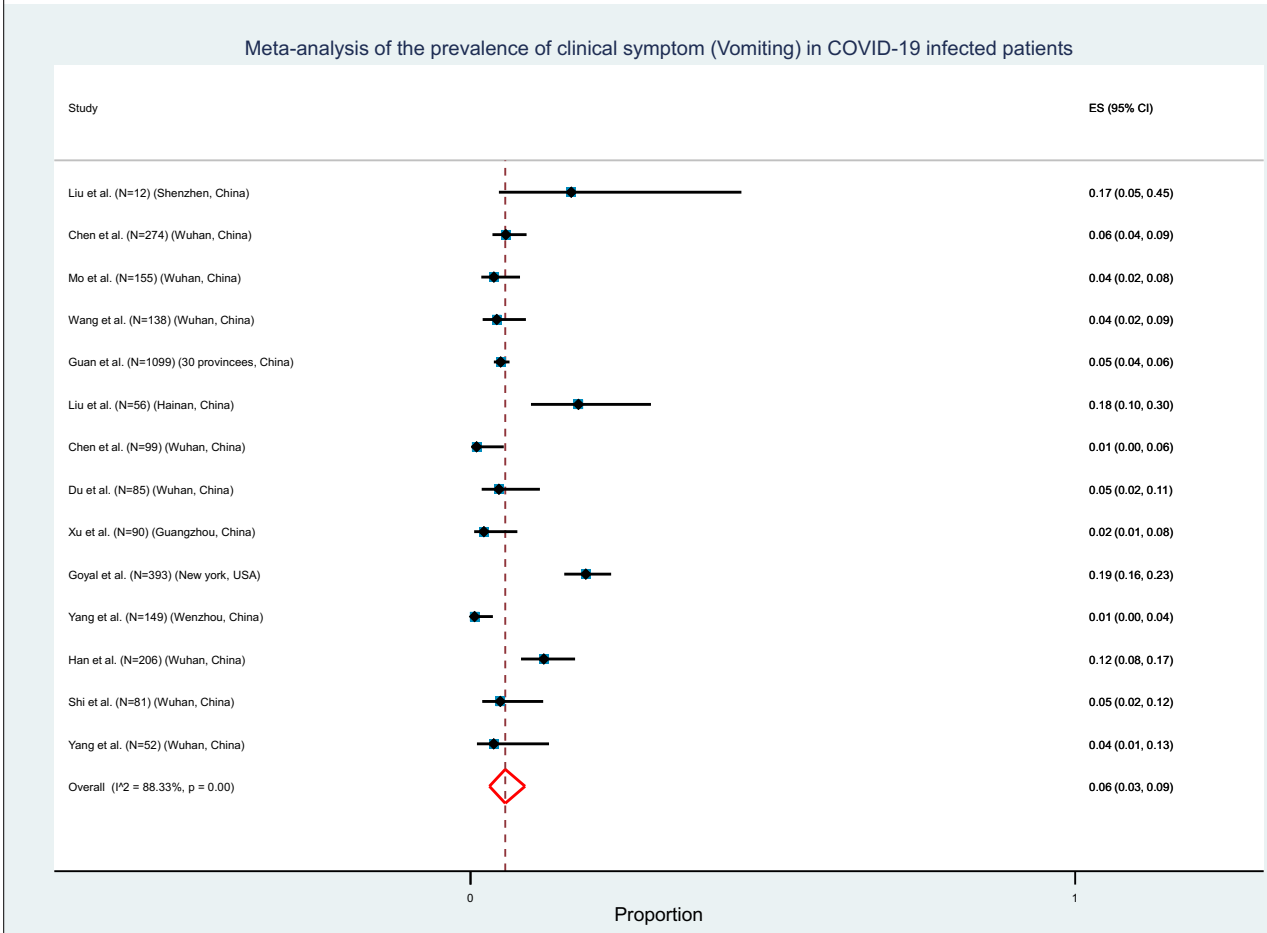
S13. Chest pain



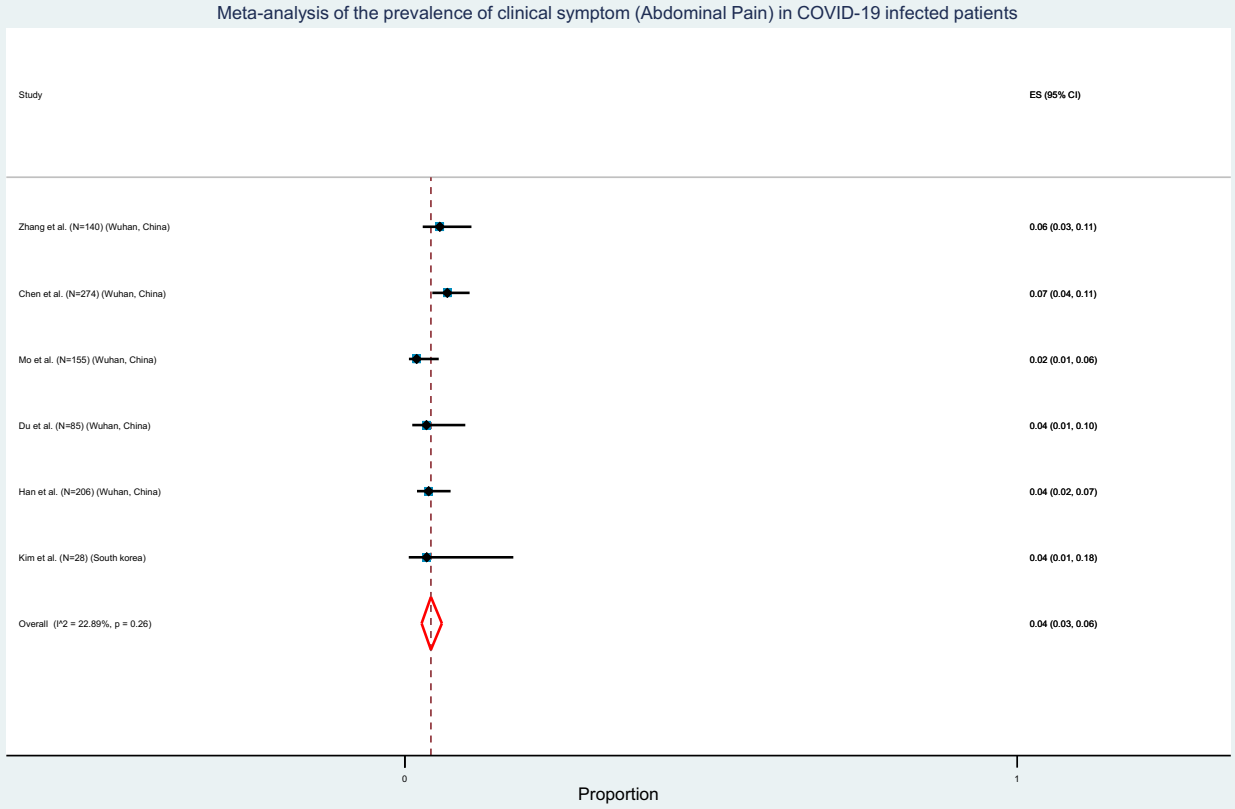
S14. Nausea


Meta-analysis of the prevalence of clinical symptom (Nausea) in COVID-19 infected patients
Study
ES (95% CI)
Zhang et al. (N=140) (Wuhan, China)
0.17 (0.12, 0.24)
Liu et al. (N=12) (Shenzhen, China)
0.17 (0.05, 0.45)
Chen et al. (N=274) (Wuhan, China)
0.09 (0.06, 0.13)
Mo et al. (N=155) (Wuhan, China)
0.04 (0.02, 0.08)
Wang et al. (N=138) (Wuhan, China)
0.10 (0.06, 0.16)
Guan et al. (N=1099) (30 provincees, China)
0.05 (0.04, 0.06)
Chen et al. (N=99) (Wuhan, China)
0.01 (0.00, 0.06)
Xu et al. (N=90) (Guangzhou, China)
0.06 (0.02, 0.12)
Goyal et al. (N=393) (New york, USA)
0.19 (0.16, 0.23)
Yan et al. (N=59) (USA)
0.27 (0.17, 0.40)
Yang et al. (N=149) (Wenzhou, China)
0.01 (0.00, 0.04)
Wang et al. (N=339) (Wuhan, China)
0.04 (0.02, 0.07)
Overall (I^2 = 91.78%, p = 0.00)
0.08 (0.04, 0.12)
0
1
Proportion

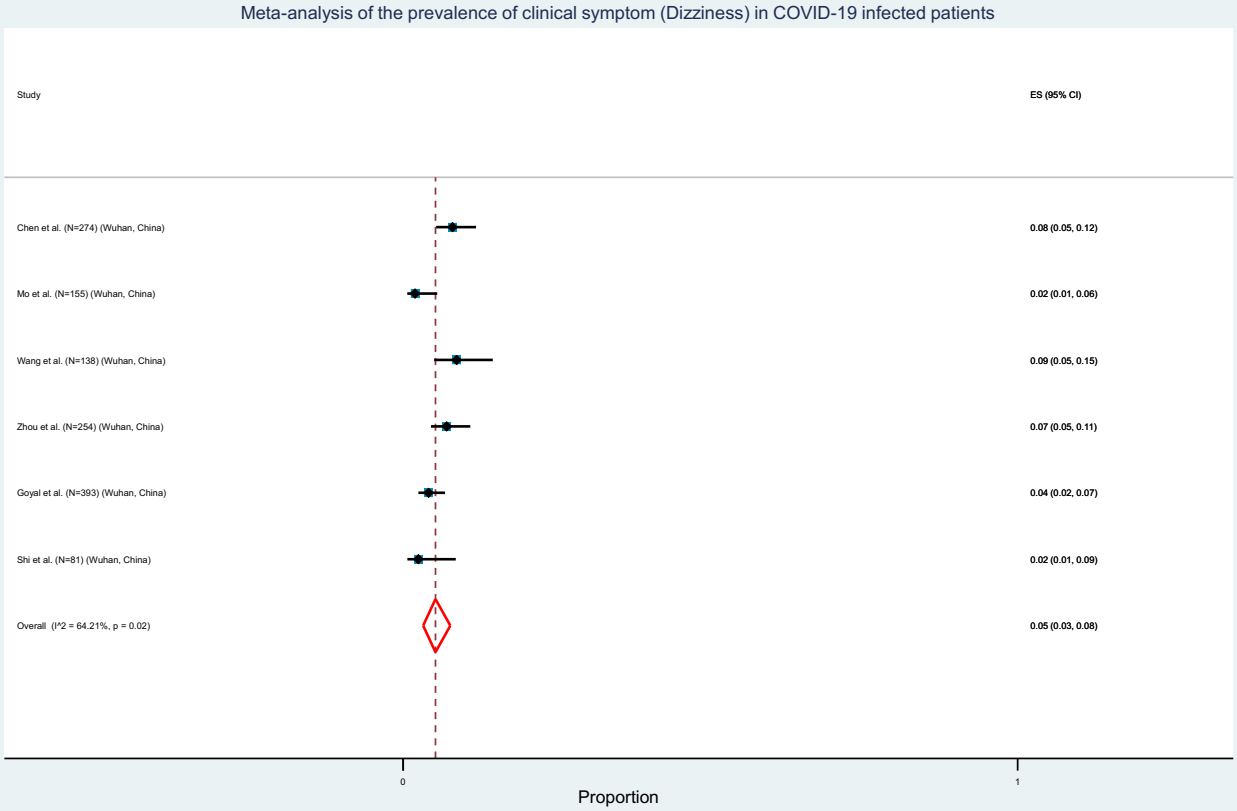
S15. Vomiting



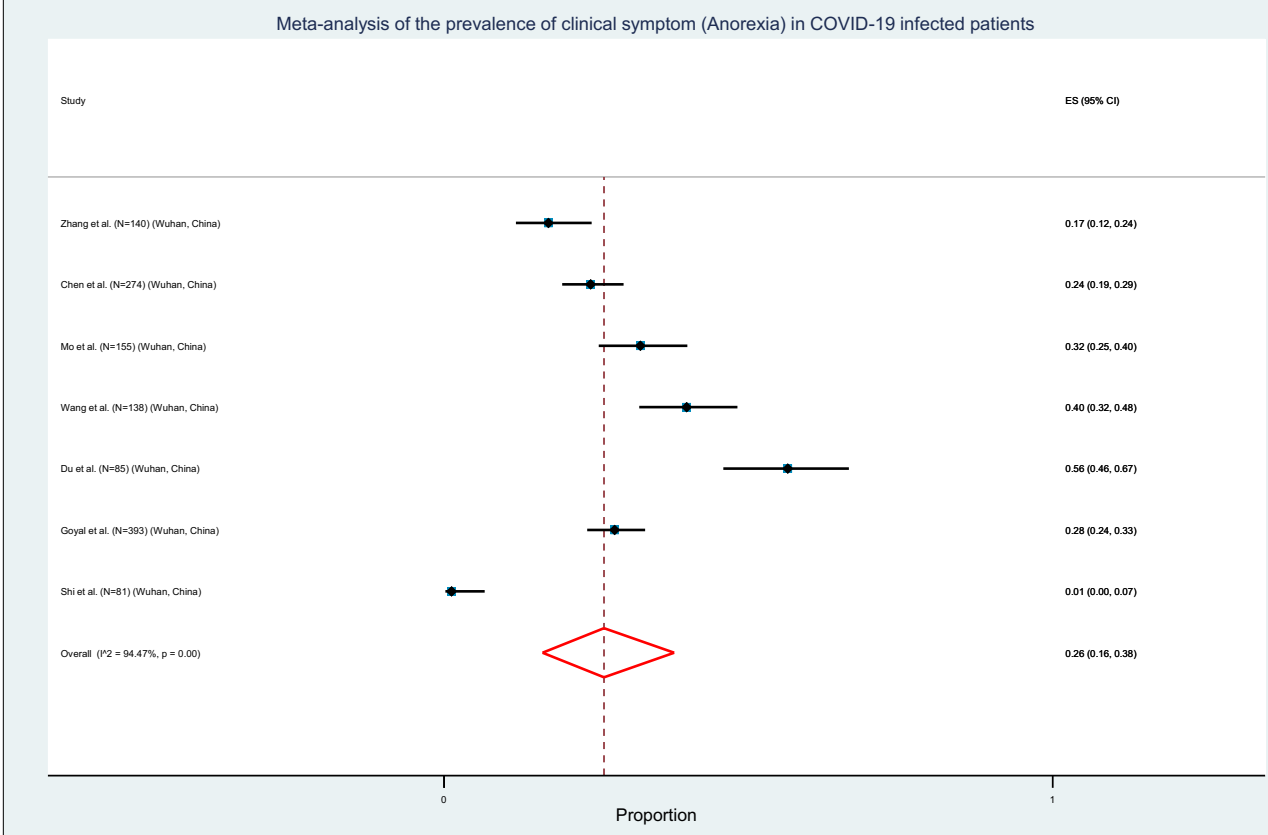
S16. Abdominal Pain



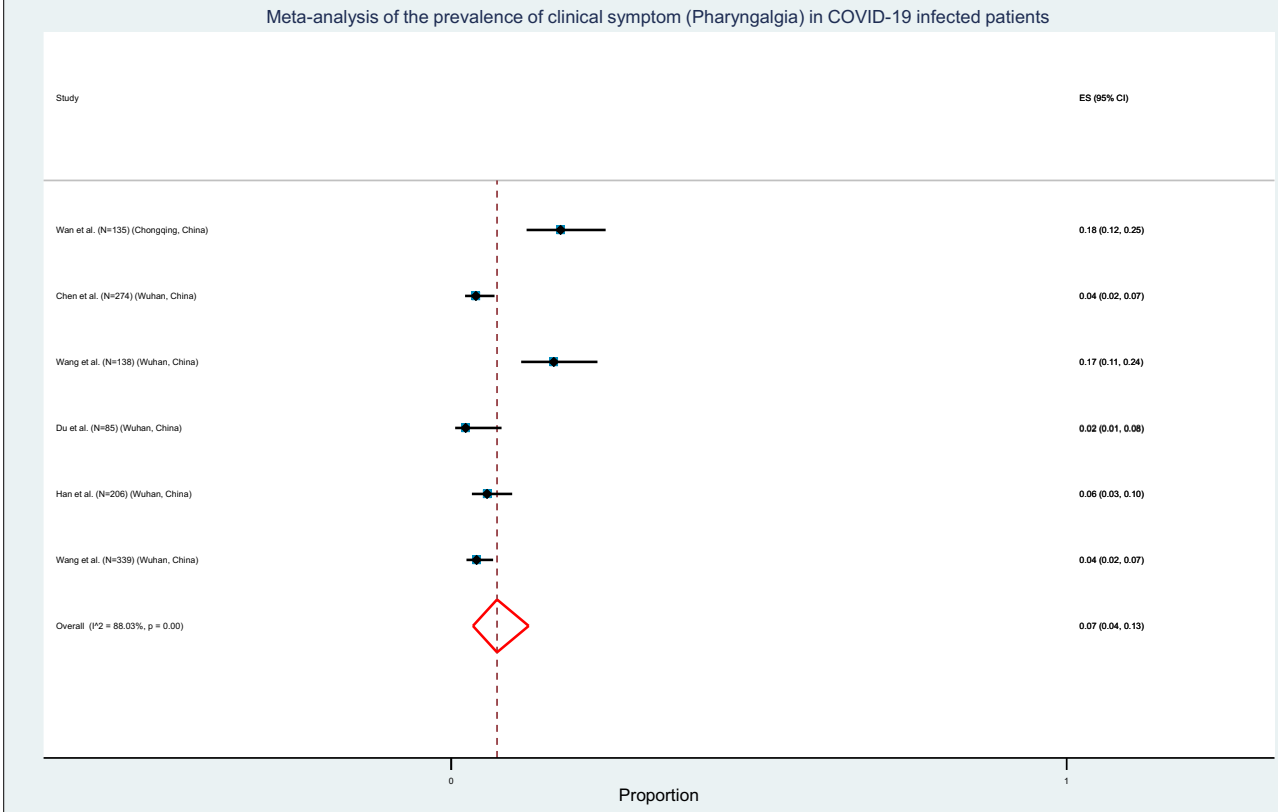
S17. Dizziness



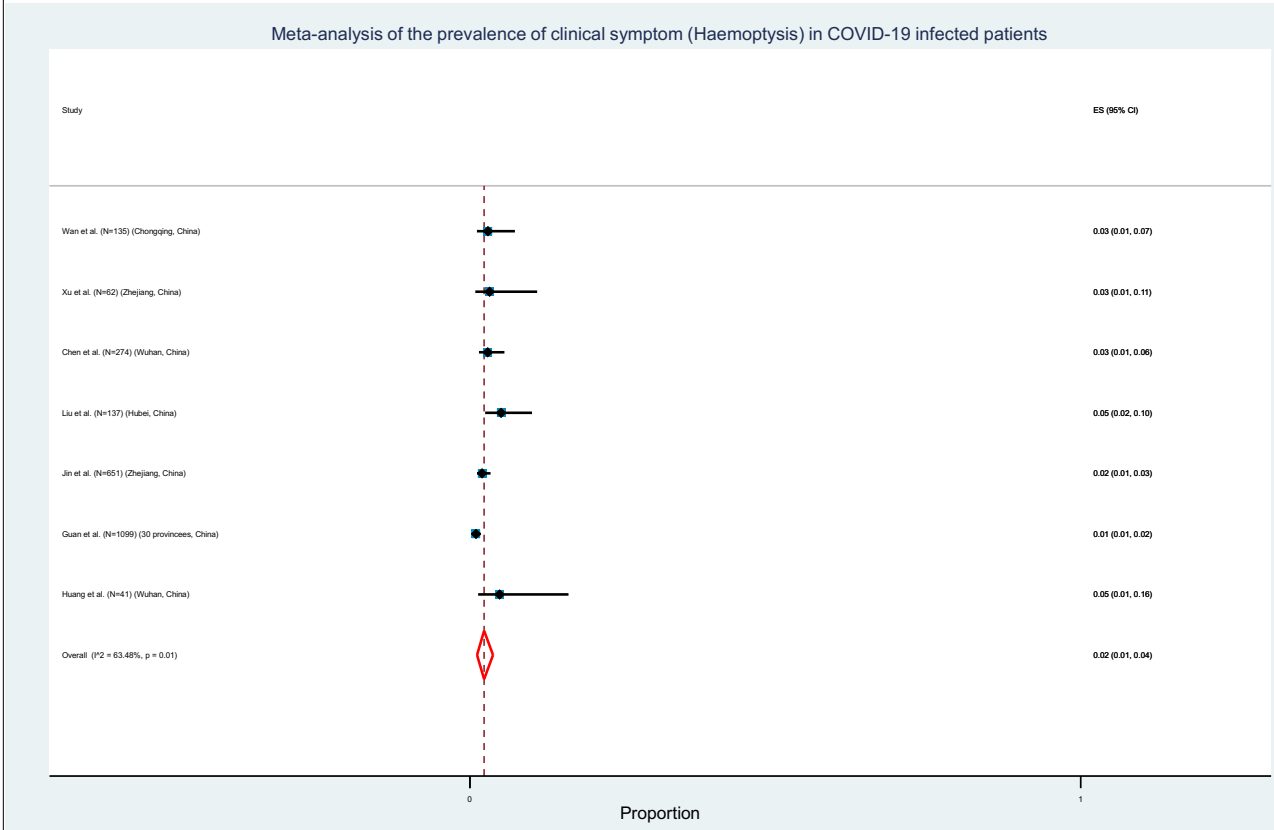
S18. Anorexia



S19. Pharyngalgia

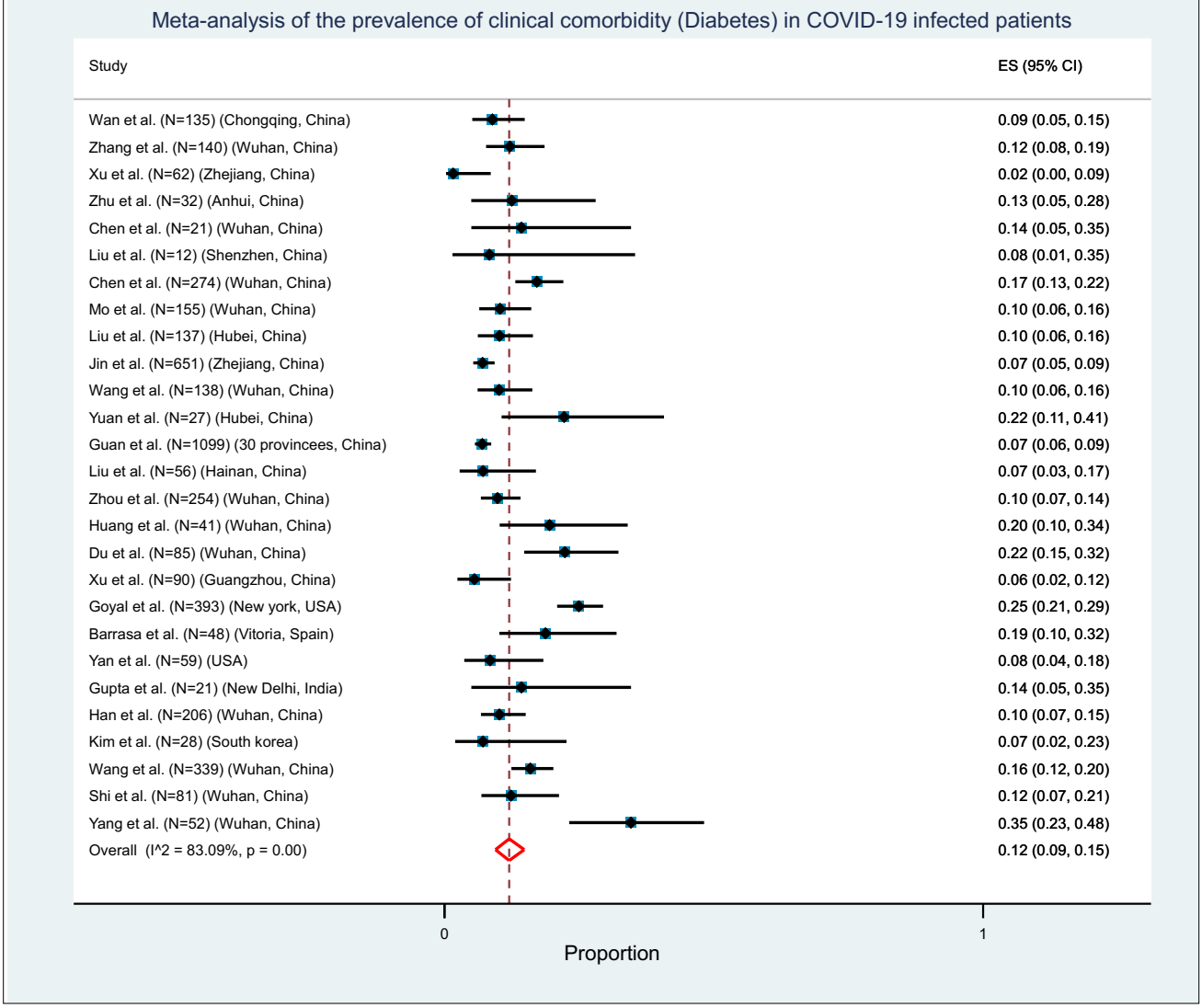


S20. Haemoptysis

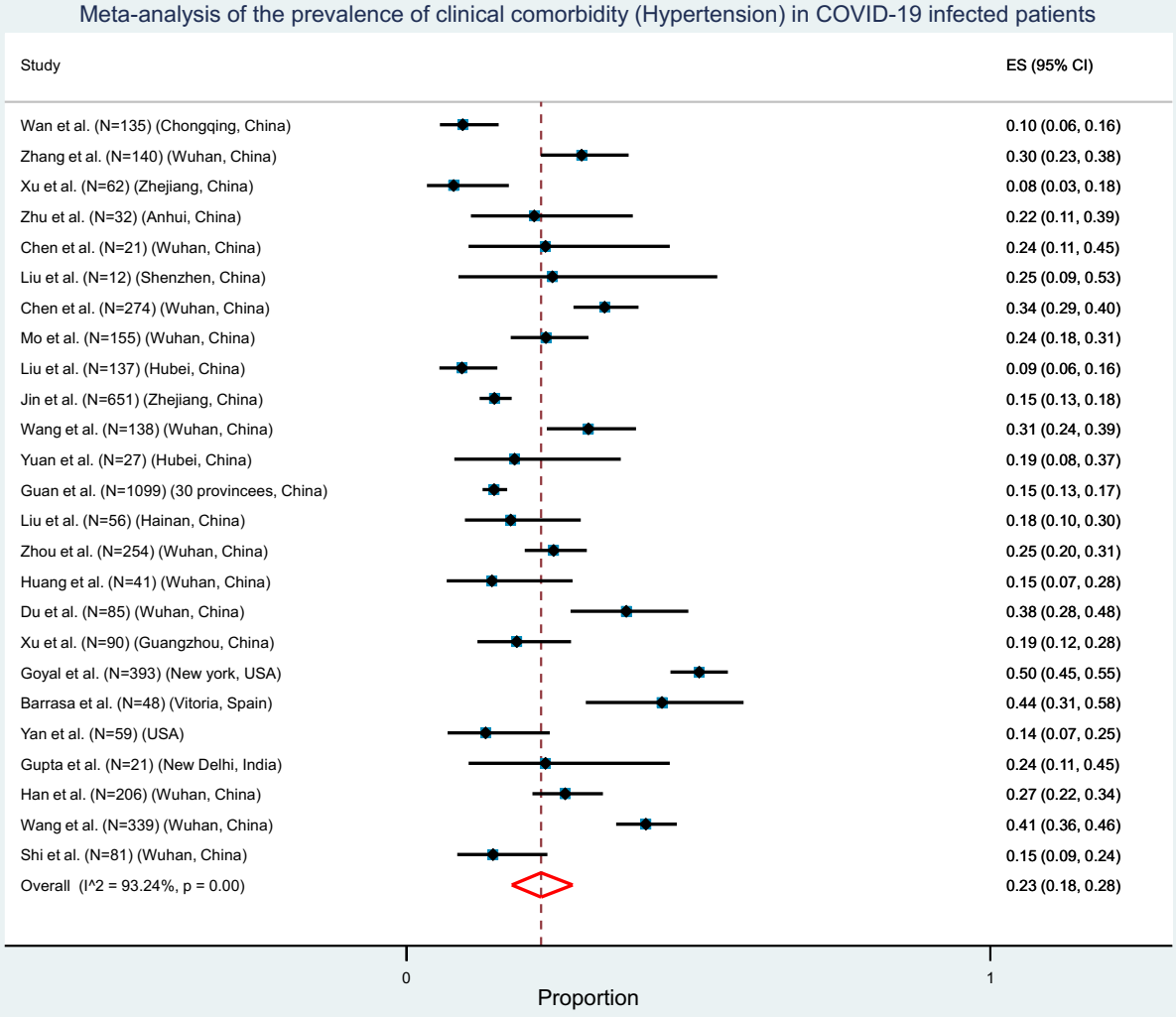


Comorbidity

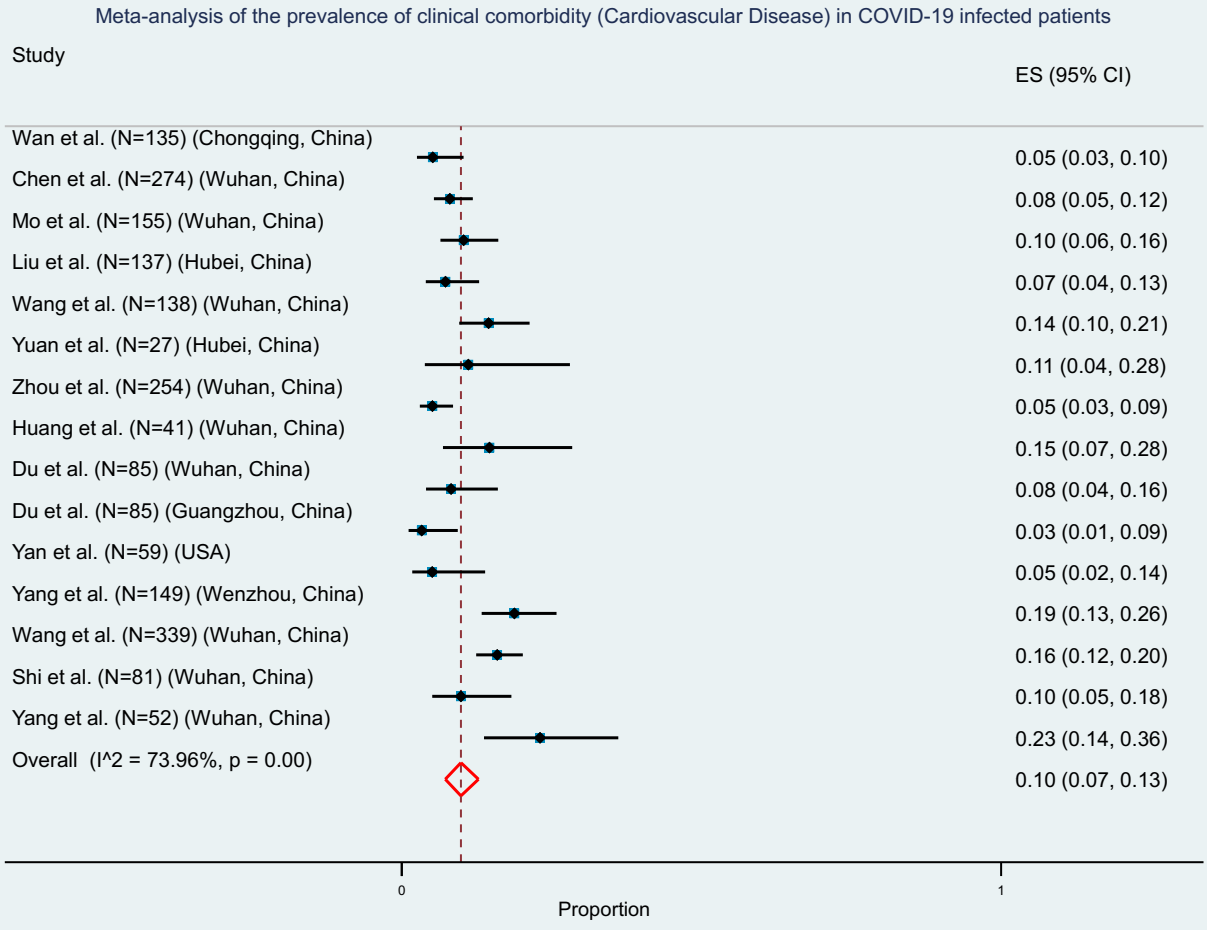
S21. Diabetes



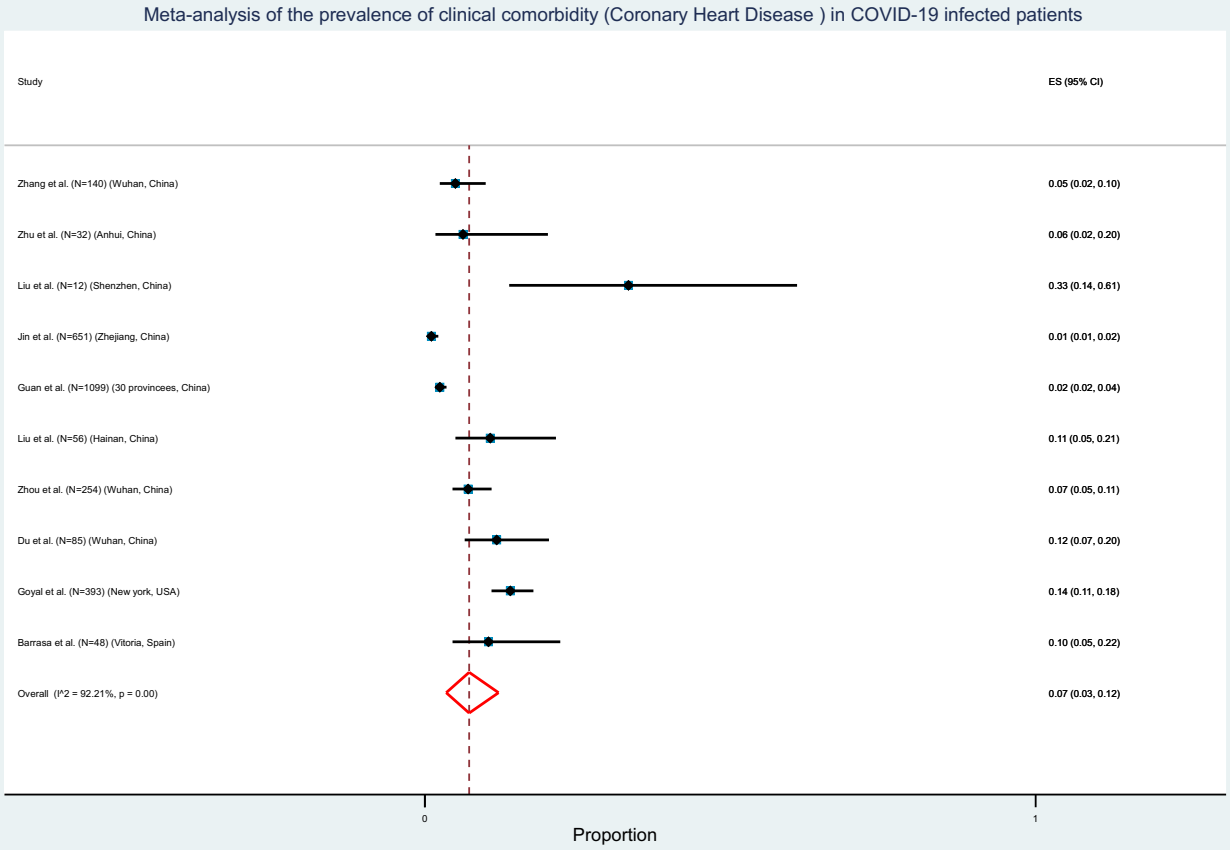
S22. Hypertension



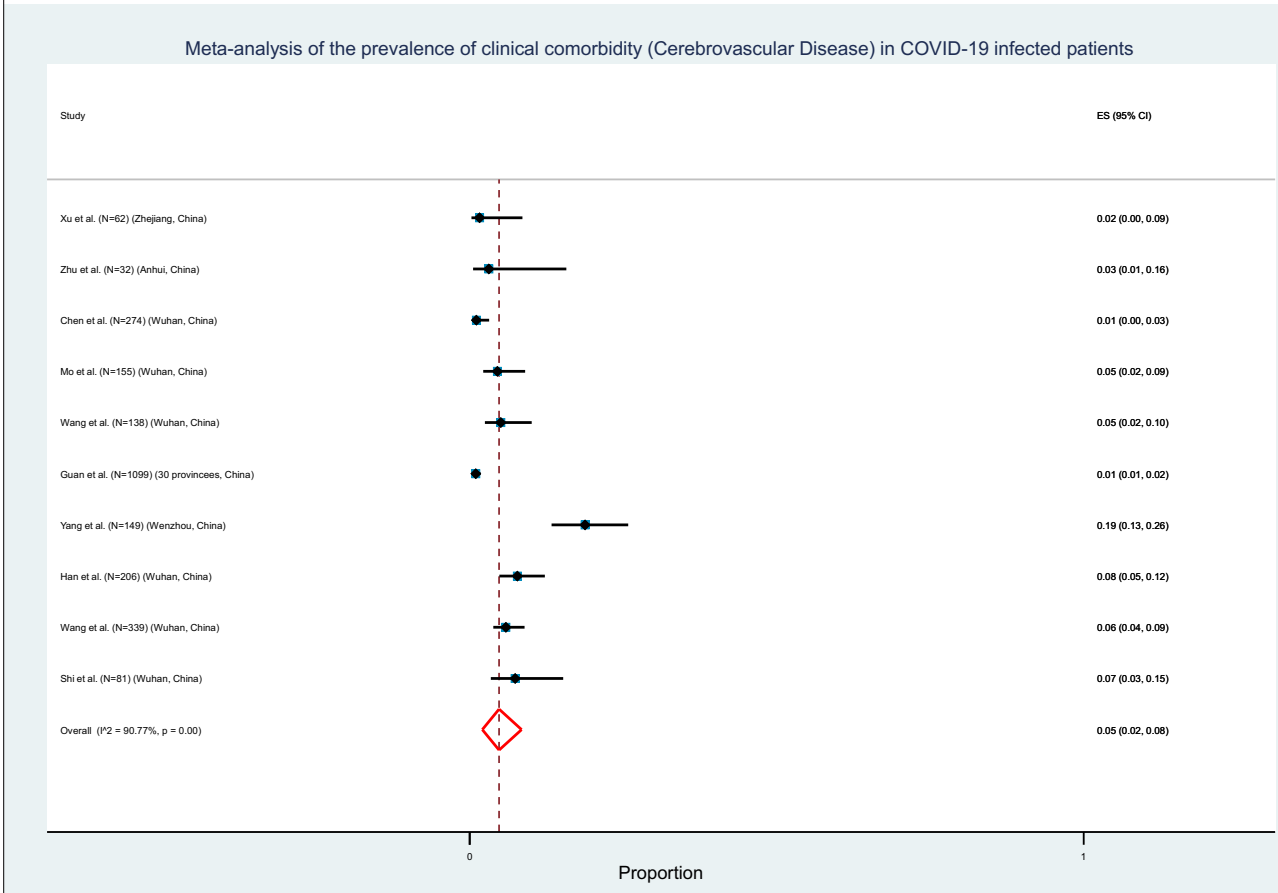
S23. Cardiovascular Disease



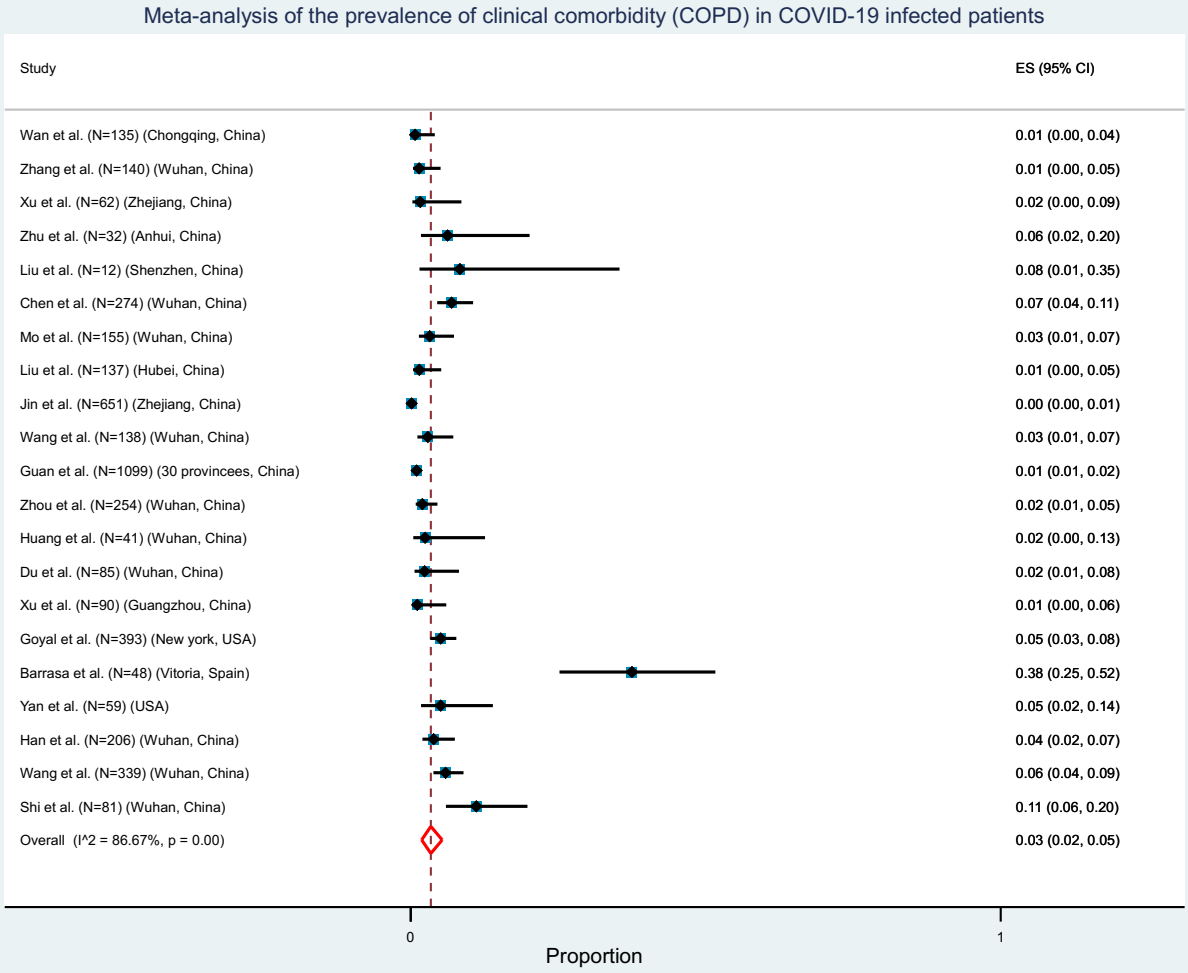
S24. Coronary heart disease



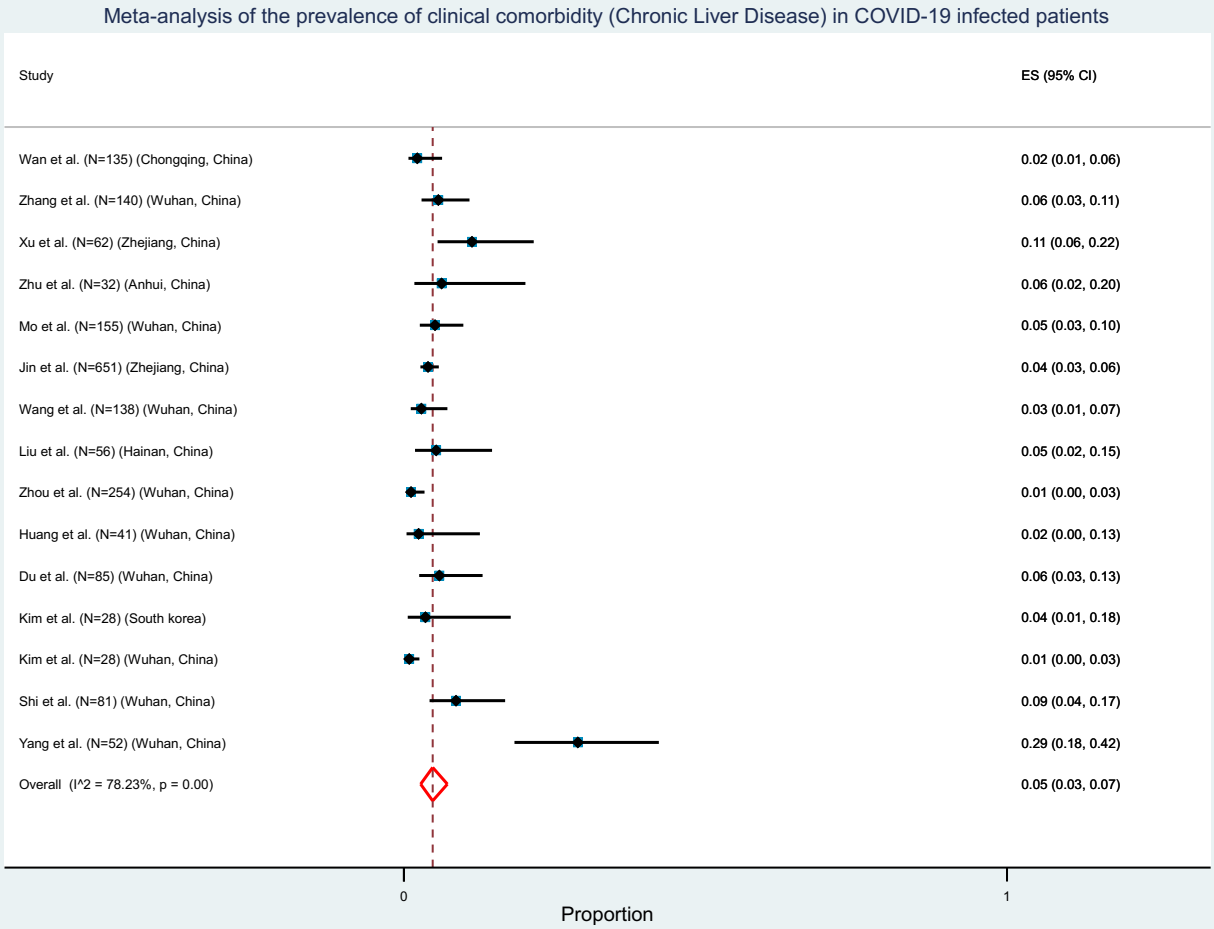
S25. Cerebrovascular disease



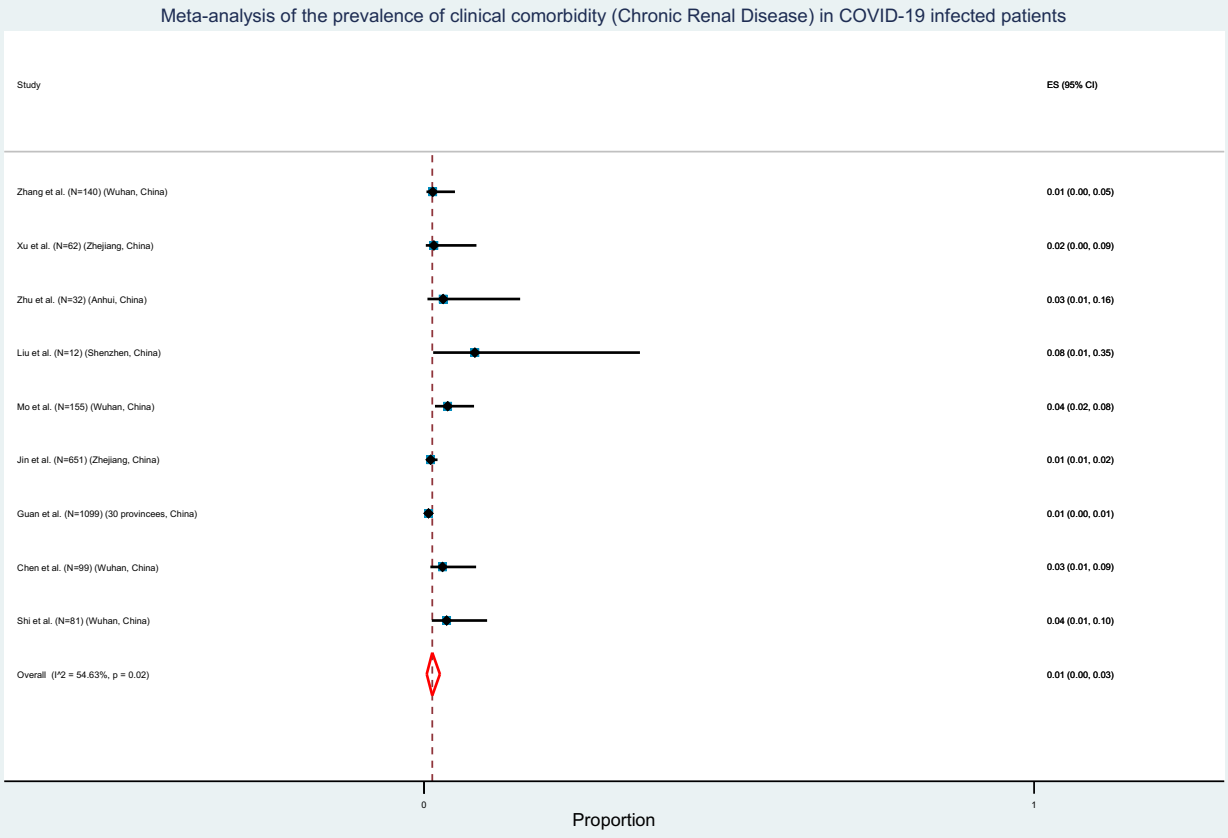
S26. COPD/Lung disease



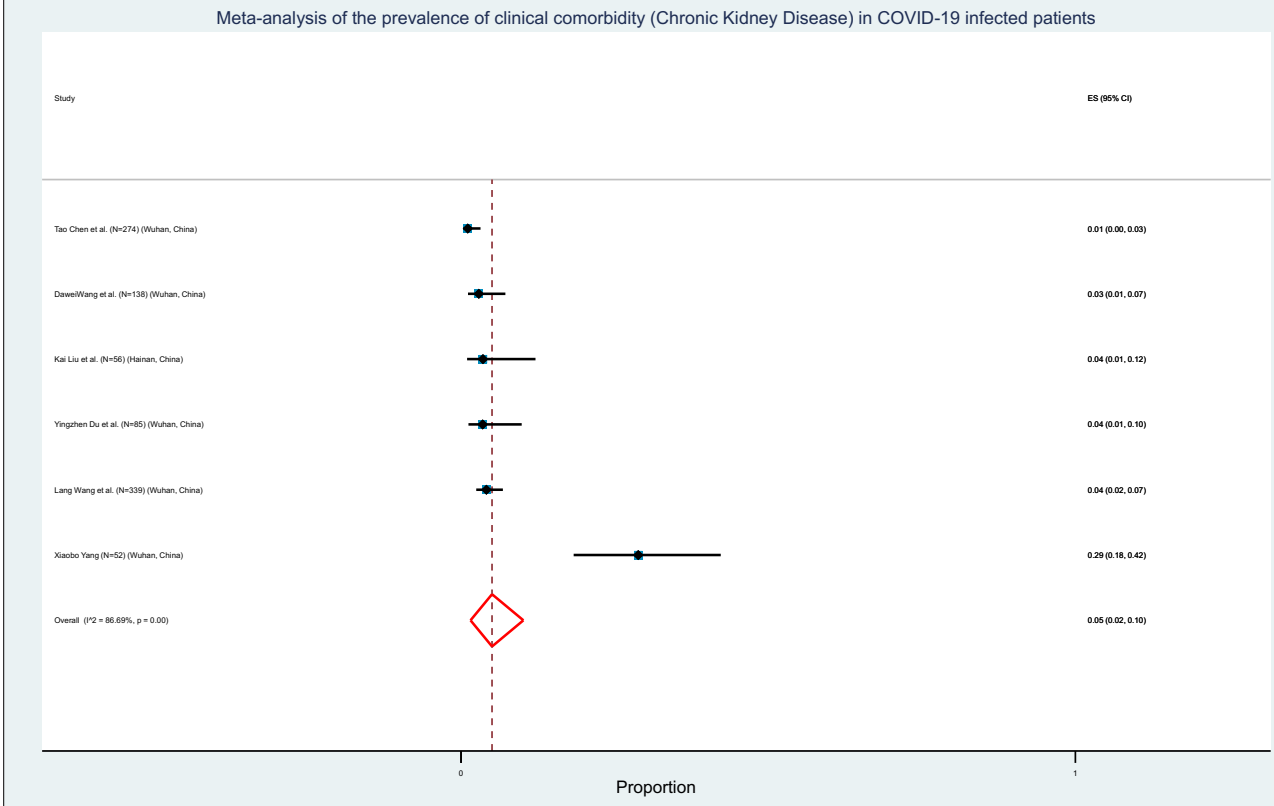
S27. Chronic liver disease



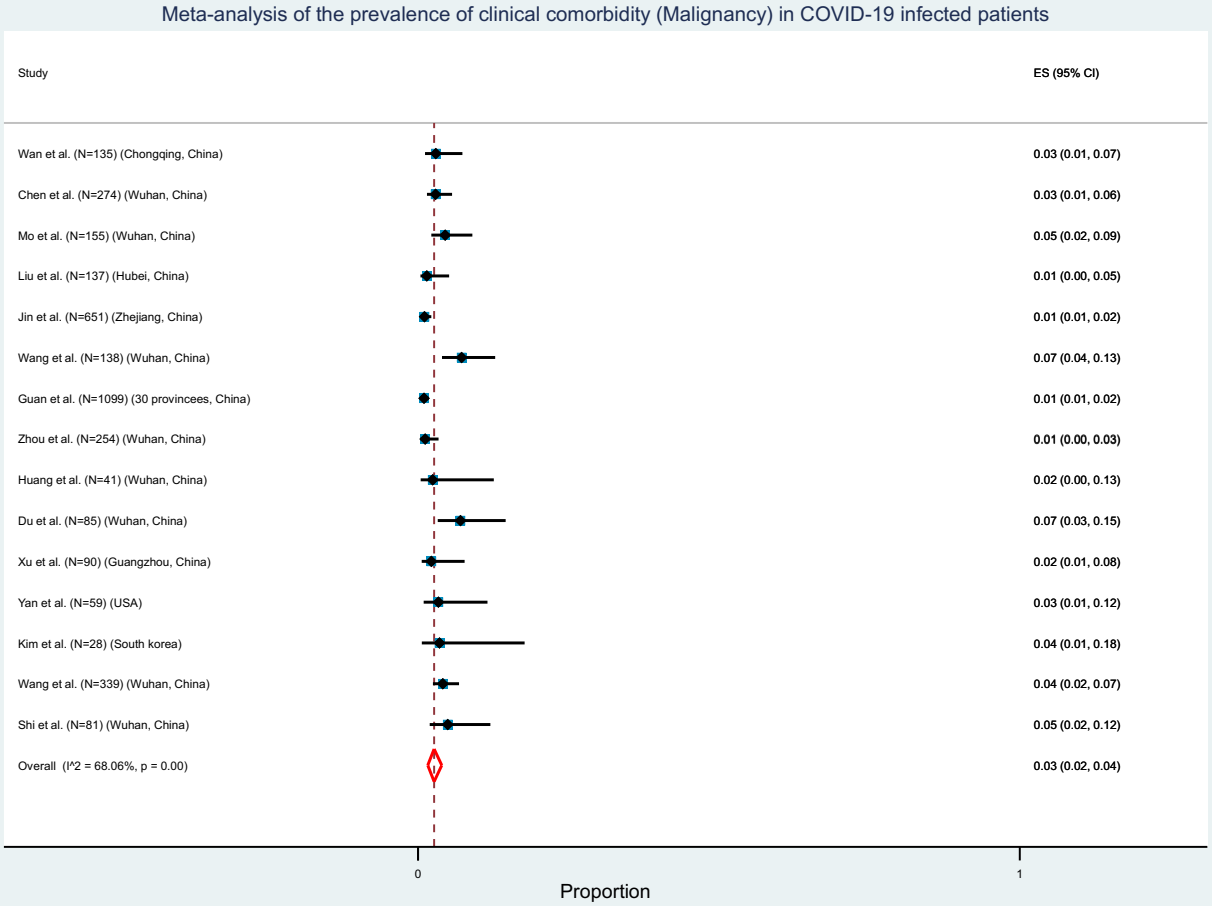
S28. Chronic Renal disease



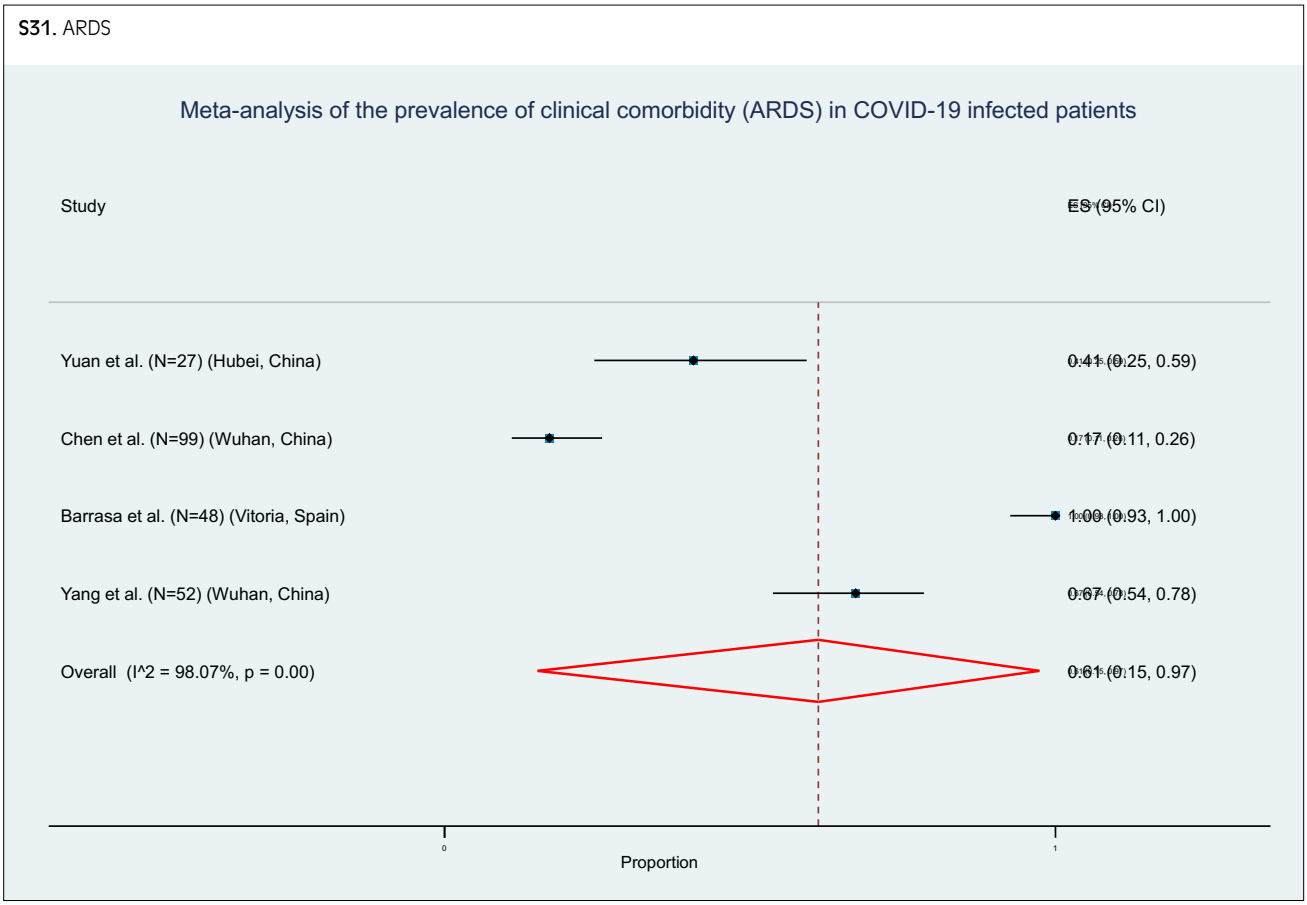
S29. Chronic Kidney disease



S30. Malignancy



S31. ARDS


Meta-analysis of the prevalence of clinical comorbidity (ARDS) in COVID-19 infected patients
Study
ES (95% CI)
Yuan et al. (N=27) (Hubei, China)
0.41 (0.25, 0.59)
Chen et al. (N=99) (Wuhan, China)
0.17 (0.11, 0.26)
Barrasa et al. (N=48) (Vitoria, Spain)
1.00 (0.93, 1.00)
Yang et al. (N=52) (Wuhan, China)
0.67 (0.54, 0.78)
Overall (I^2 = 98.07%, p = 0.00)
0.61 (0.15, 0.97)
0
1
Proportion