Supplementary material

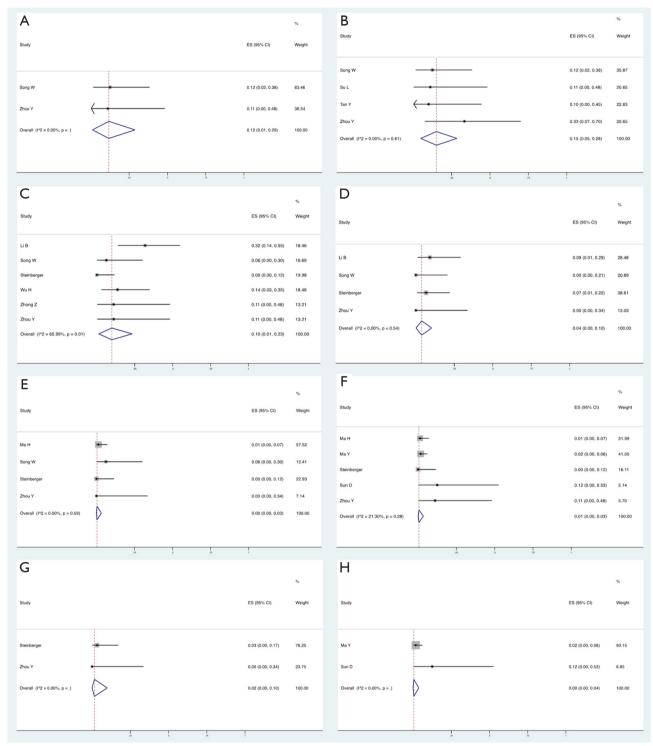
Abbreviation:

COVID-19 = coronavirus disease 2019; CT = computed tomography; GGO = ground-glass opacity.

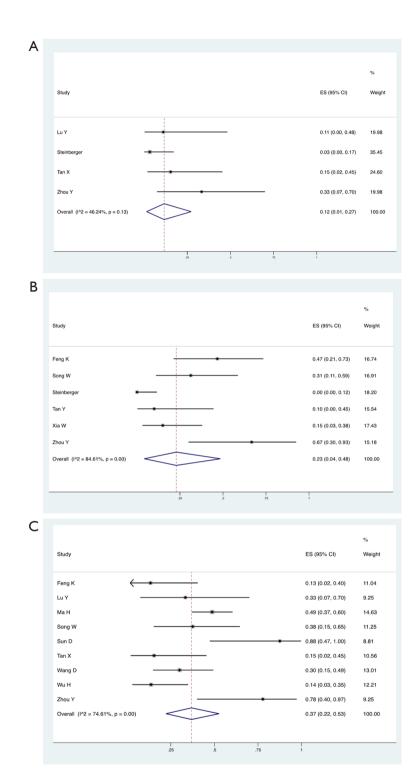
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References (same numbering as the main text)	

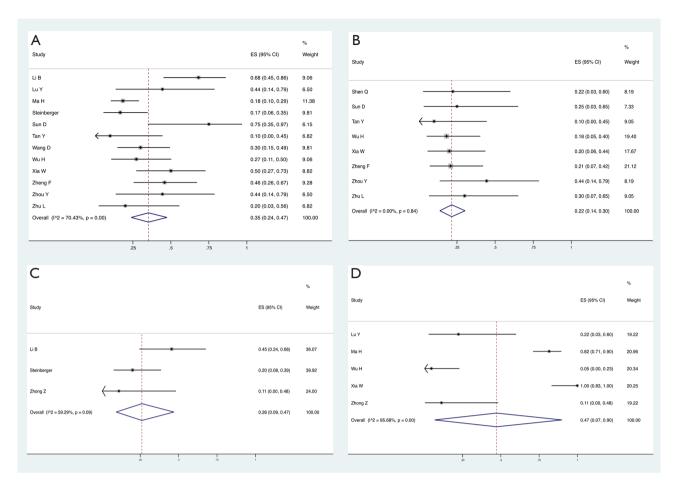
Funnel plots



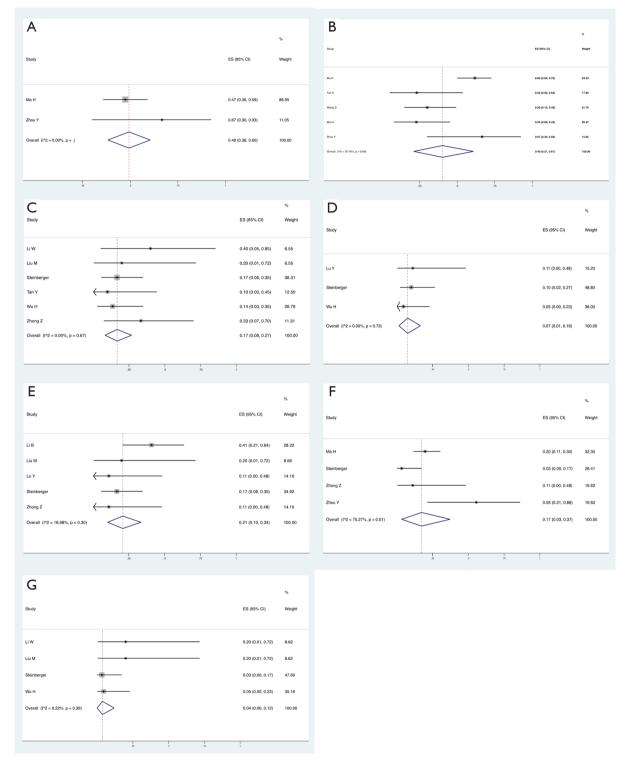
Supplementary figure 1. Forest plots of the incidence of abnormal CT findings in pediatric COVID-19 cases. The solid diamond and the corresponding line represent effect size (ES) and 95% confidence interval (CI) of each article. The bottom diamond represents the summarized incidence of abnormal CT finding. The incidences of (A) air bronchogram, (B) bronchopneumonia-like sign, (C) consolidation, (D) crazy paving sign, (E) lymphadenopathy, (F) pleural effusion, (G) reverse halo sign, and (H) white lung-like sign were 12% (95% CI: 1%–29%), 15% (95% CI: 5%–28%), 10% (95% CI: 1%–23%),4% (95% CI: 0–10%),0 (95% CI: 0–3%),1% (95% CI: 0–3%), 2% (95% CI: 0–10%), and 0 (95% CI: 0–4%), respectively.



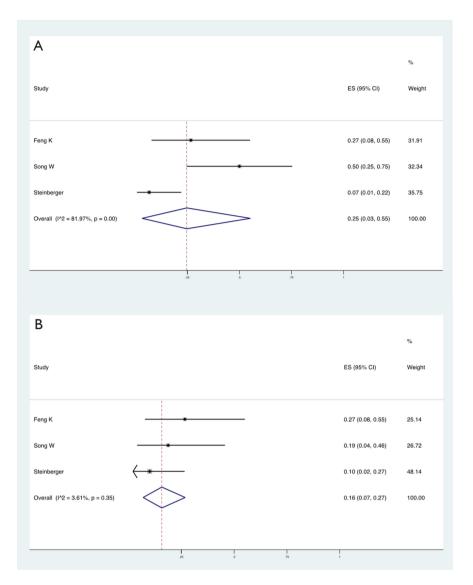
Supplementary Figure 2. Forest plots of the incidence of lesions of different shapes shown on CT images in pediatric COVID-19 cases. The solid diamond and the corresponding line represent effect size (ES) and 95% confidence interval (CI) of each article. The bottom diamond represents the summarized incidence of abnormal CT finding. The incidences of (A) linear lesion, (B) nodular lesion, and (C) patchy lesion were 12% (95% CI: 1%–27%), 23% (95% CI: 4%–48%), and 37 (95% CI: 22–53%).



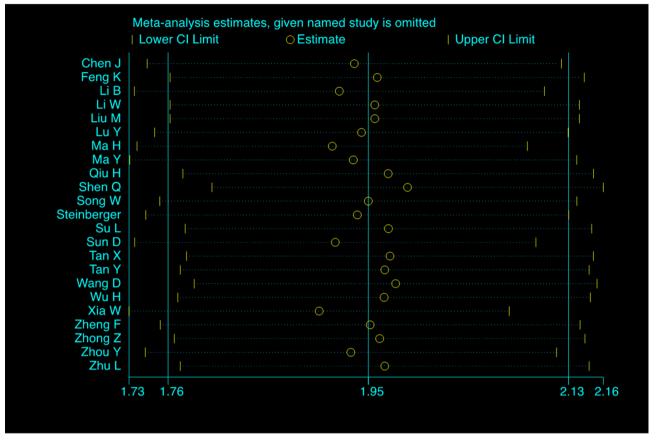
Supplementary Figure 3. Forest plots of the incidence of lesion distribution shown on CT images in pediatric COVID-19 cases. The solid diamond and the corresponding line represent effect size (ES) and 95% confidence interval (CI) of each article. The bottom diamond represents the summarized incidence of abnormal CT finding. The incidences of (A) bilateral lesion, (B) unilateral lesion, (C) peripheral lesion, and (D) subpleural lesion were 35% (95% CI: 24%–47%), 22% (95% CI: 14%–30%), 26% (95% CI: 9%–47%), and 47% (95% CI: 7%–90%), respectively.



Supplementary Figure 4. Forest plots of the incidence of infection in each lobe shown on CT images in pediatric COVID-19 cases. The solid diamond and the corresponding line represent effect size (ES) and 95% confidence interval (CI) of each article. The bottom diamond represents the summarized incidence. The incidences of (A)upper lobe infection, (B) lower lobe infection, (C)left lower lobe infection, (D) left upper lobe infection, (E) right lower lobe infection, (F) middle lobe infection, right upper lobe infection were 49% (95% CI: 38%–60%), 40% (95% CI: 21%–61%), 17% (95% CI: 8%–27%),7% (95% CI: 1%–16%) and 21% (95% CI: 10%–34%), 17% (95% CI: 3%–37%), 4% (95% CI: 0%–12%), respectively.



Supplementary Figure 5. Forest plots of the incidence of the number of infected lobes shown on CT images in pediatric COVID-19 cases. The solid diamond and the corresponding line represent effect size (ES) and 95% confidence interval (CI) of each article. The bottom diamond represents the summarized incidence. The incidences of (A) one infected lobe, and (B) two-lobe were 25% (95% CI: 3%–55%), and 16% (95% CI: 7%–27%), respectively.



Supplementary Figure 6. Sensitivity analysis. It shows that each single included study does not affect the summarized incidence of CT abnormalities in pediatric COVID-19 cases.

Search strategies

Table 1. Search strategies for imaging characteristics of COVID-19 in pediatric cases

Database	Query	Items Found
PubMed [†]	((((((((((((((((((((((((((((((((())) CK (Abstract)) OR Chest[Title/Abstract]) OR Cine-CT[Title/Abstract]) OR Computed Tomography[Title/Abstract]) OR Computer Assisted Tomography[Title/Abstract]) OR Computerized Tomography[Title/Abstract]) OR CT[Title/Abstract]) OR Electron Beam Tomography[Title/Abstract]) OR Image[Title/Abstract]) OR Image[Title/Abstract]) OR Radiography[Title/Abstract]) OR Radiography[Title/Abstract]) OR Radiography[Title/Abstract]) OR Radiogy[Title/Abstract]) OR Radiography[Title/Abstract]) OR Radiography[Title/Abstract]) OR Roentgenography[Title/Abstract]) OR Tomodensitometry[Title/Abstract]) OR Tomography, Electron Beam[Title/Abstract]) OR Tomography, Electron Beam[Title/Abstract]) OR Tomography, Transmission Computed Tomography[Title/Abstract]) OR X Ray[Title/Abstract]) OR X Ray[Title/Abstract]) OR X ray[Title/Abstract]]) OR X ray[Title/Abstract]]) OR X ray[Title/Abstract]] OR X-Ray[Title/Abstract]] OR X-Rays[Title/Abstract]] OR Infants[Title/Abstract]] OR Newborn[Title/Abstract]] OR Newborns[Title/Abstract]] OR Neonates[Title/Abstract]] OR 2019-nCoV[Title/Abstract]] OR 2019-nCoV[Title/Abstract]] OR 2019-nCoV[Title/Abstract]] OR 2019-nCoV[Title/Abstract]] OR COVID 19[Title/Abstract]] OR COVID19[Title/Abstract]] OR AsRS CoV-2[Title/Abstract]] OR SARS-CoV-2[Title/Abstract]] OR severe acute respiratory syndrome coronavirus 2[Title/Abstract]] OR (Wuhan[Title/Abstract] AND coronavirus[Title/Abstract]]) OR (Wuhan[Title/Abstract]] AND coronavirus[Title/Abstract]])	99
Web of Science [‡]	TS=((Child OR Children OR Infant OR Infants OR Newborn OR Newborns OR Neonate OR Neo nates OR pediatric) and ((Beam Tomography, Electron) OR Chest OR (Cine-CT) OR (Computed Tomography) OR (Computer Assisted Tomography) OR (Computerized Tomography) OR CT O R (Electron Beam Tomography) OR Image OR Images OR Imaging OR Radiographic OR Radio graphy OR Radiology OR Roentgenography OR Tomodensitometry OR (Tomography, Electron Beam) OR (Tomography, Transmission Computed) OR (Transmission Computed Tomography) OR (X Ray) OR (X Rays) OR Xray OR (X-Ray) OR (X-Rays)) and ((2019 nCoV) OR 2019nCoV OR (2019- nCoV) OR (2019 novel coronavirus) OR (coronavirus disease 2019) OR (coronavirus disease-19) OR (COVID 19) OR COVID19 OR (new coronavirus) OR (novel coronavirus) OR (SARS CoV-2) OR (SARS-CoV-2) OR (severe acute respiratory syndrome coronavirus 2) OR (Wuhan AND c oronavirus))))	260
The Cochrane Library [§]	(Beam Tomography, Electron) OR Chest OR (Cine-CT) OR (Computed Tomography) OR (Computer Assisted Tomography) OR (Computerized Tomography) OR CT OR (Electron Beam Tomography) OR Image OR Images OR Imaging OR Radiographic OR Radiography OR Radiology OR Roentgenography OR Tomodensitometry OR (Tomography, Electron Beam) OR (Tomography, Transmission Computed) OR (Transmission Computed Tomography) OR (X Ray) OR (X Rays) OR Xray OR (X-Ray) OR (X-Rays) in Title Abstract Keyword AND (2019 nCoV) OR 2019nCoV OR (2019 novel coronavirus) OR (coronavirus disease-19) OR (COVID 19) OR COVID19 OR (new coronavirus) OR (novel coronavirus) OR (SARS CoV-2) OR (SARS-CoV-2) OR (severe acute respiratory syndrome coronavirus 2) OR (Wuhan AND coronavirus) in Title Abstract Keyword AND Child OR Children OR Infant OR Infants OR Newborn OR Newborns OR Neonate OR Neonates OR pediatric in Title Abstract Keyword - (Word variations have been searched)	5

sp ۱þ grapny; ۶, coronavirus 2; TS = Theme Subject.

[‡]Web of Science database website is available from https://www.webofknowledge.com.

[†]PubMed database is available from https://www.ncbi.nlm.nih.gov/pubmed.

[§]The Cochrane Library database is available from https://www.cochranelibrary.com/.

Characteristics of the 23 studies included

Table 2 Characteristics of the 23 studies included in the review and meta-analysis on chest imaging of pediatric COVID-19 cases

Study	City, province/autonomous region/municipality, country	Design	Diagnostic criteria for COVID-19	Duration	Epidemiological history (exposure to confirmed or suspected COVID-19/Wuhan/ both/uncertain
Chen J	Chongqing, China	Case series	Diagnosis and Treatment Protocol for COVID-19 (Fifth Trial Edition) ^a and experts' consensus ^b	January 28 to February 11, 2020	8/4/0/0
Feng K	Shenzhen, Guangdong, China	Case series	Diagnosis and Treatment Protocol for COVID-19 (Fifth Revised Edition) ^c	January 16 to February 6, 2020	12/3/0/0
i B	Yichang, Hubei, China	Case series	Positive SARS-CoV-2 nucleic acid test result	January 16 to March 14, 2020	0/0/0/22
i W	Zhuhai, Guangdong, China	Case series	Positive SARS-CoV-2 nucleic acid test result	January 28 to February 8, 2020	4/1/0/0
iu M	Chongqing, China	Case report	NR	NR	4/0/0/1
u Y	Guangzhou, Guangdong, China	Case series	Positive SARS-CoV-2 nucleic acid test result	January 22 to February 9, 2020	2/4/3/0
/la H	Wuhan, Hubei, China	Case series	Positive SARS-CoV-2 nucleic acid test result	January 21 to February 14, 2020	NR
/la Y	Wuhan, Hubei, China	Case series	Diagnosis and Treatment Protocol for COVID-19 (Sixth Trial Edition) ^d	NR	0/10/105/0
Qiu H	Ningbo and Wenzhou, Zhejiang, China	Cohort	Positive SARS-CoV-2 nucleic acid test	January 17 to March 1, 2020	24/4/8/0
hen Q	Changsha, Hunan, China	Case series	NR	January 30 to February 26, 2020	6/2/0/1
ong W	Xiangyang, Hubei, China	Case series	Diagnosis and treatment recommendation for pediatric coronavirus disease-19 (Second Edition) ^e	January 1 to March 17, 2020	14/1/0/1
teinberger	Bozhou, Anhui; Chengdu, Sichuan; Hangzhou, Ruian, Zhejiang; Guilin, Guangxi; Zhuhai, Guangdong; China	Case series	Positive SARS-CoV-2 nucleic acid test result	January 23 to February 8, 2020	26/3/0/1
su L	Jinan, Shandong, China	Case series	Positive SARS-CoV-2 nucleic acid test result	January 24 to February 24, 2020	9/0/0/0
Sun D	Wuhan, Hubei, China	Case series	Diagnosis and Treatment Protocol for COVID-19 (Sixth Trial Edition) ^d	January 24 to February 24, 2020	0/1/5/2
an X	Changsha, Hunan, China	Case series	Diagnosis and Treatment Protocol for COVID-19 (Sixth Trial Edition) ^d	January 17 to February 29, 2020	10/0/3/0
an Y	Changsha, Hunan, China	Case series	Diagnosis and Treatment Protocol for COVID-19 (Sixth Trial Edition) ^d	January 27 to March 10, 2020	7/3/0/0
Vang D	Shaanxi, Gansu, Ningxia, Hebei, Henan, Shandong, China	Case series	Positive SARS-CoV-2 nucleic acid test and expert consultation	January 25 to February 21, 2020	22/9/0/0
Vu H	Ganzhou, Nanchang, Yichun, Shangrao, Jiujiang, Fuzhou, and Pingxiang; Jiangxi, China	Case series	Diagnosis and Treatment Protocol for COVID-19 (Seventh Trial Edition) ^f and Diagnosis and treatment of COVID-19 in children in Hubei (Trial version 1) ^g	January 27 to March 4, 2020	16/NR/NR/0
(ia W	Wuhan, Hubei, China	Case series	Diagnosis and Treatment Protocol for COVID-19 (Fifth Revised Edition) ^c	January 23 to February 8, 2020	13/0/0/7
heng F	Wuhan, Hubei, China	Case series	Diagnosis and treatment of COVID-19 in children in Hubei (Trial version 1) ⁹	February 1 to February 10, 2020	0/5/16/4
lhong Z	Changsha, Hunan, China	Case series	Positive SARS-CoV-2 nucleic acid test result or SARS-CoV-2 gene sequencing	NR	9/0/0/0
'hou Y	Shenzhen, Guangdong, China	Case series	Diagnosis and Treatment Protocol for COVID-19 (Sixth Trial Edition) ^d	January 20 to February 10, 2020	6/0/3/0
lhu L	Three cities, Jiangsu, China	Case series	Positive SARS-CoV-2 nucleic acid test result	January 24 to February 22, 2020	7/3/0/0

COVID-19, coronavirus disease 2019, CT, computed tomography, GGO, ground-glass opacity, NR, not report, SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

a. Available from http://www.nhc.gov.cn/yzygj/s7653p/202002/3b09b894ac9b4204a79db5b8912d4440/files/7260301a393845fc87fcf6dd52965ecb.pdf.

b. Available from https://doi.org/10.1007/s12519-020-00343-7.

 $c. \ Available \ from \ http://www.nhc.gov.cn/yzygj/s7653p/202002/d4b895337e19445f8d728fcaf1e3e13a/files/ab6bec7f93e64e7f998d802991203cd6.pdf.$

d. Available from http://www.nhc.gov.cn/yzygj/s7653p/202002/8334a8326dd94d329df351d7da8aefc2/files/b218cfeb1bc54639af227f922bf6b817.pdf.

e. Available from http://kns.cnki.net/ kcms/detail/33.1248.R.20200225.1518.002.html.

 $f. Available from \ http://www.nhc.gov.cn/yzygj/s7653p/202003/46c9294a7dfe4cef80dc7f5912eb1989/files/ce3e6945832a438eaae415350a8ce964.pdf.$

g. Available from http://www.zgddek.com/CN/10.7499/j.issn.1008-8830.2020.02.003#.

Quality assessment

Table 3 Quality assessment of case series studies included in the meta-analysis[†]

Criteria	Chen J	Feng K	Li B	Li W	Liu M	Lu Y	Ma H	Ma Y	Shen Q	Song W	Steinberger	Su L	Sun D	Tan X	Tan Y	Wang D	Wu H	Xia W	Zheng F	Zhong Z	Zhou Y	Zhu L
1. Was the study question or objective clearly stated?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Was the study population clearly and fully described, including a case definition?	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3. Were the cases consecutive?	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes
4. Were the subjects comparable?	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
5. Were the outcome measures clearly defined, valid, reliable, and implemented consistently across all study participants?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6. Was the length of follow-up adequate?	Yes	Yes	Yes	Yes	NR	Yes	Yes	NR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NR	Yes	Yes
7. Were the statistical methods well- described?	Yes	Yes	No	Yes	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	No	No	No
8. Were the results well-described?	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yse	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
The number of positive answers	7	7	6	6	4	6	6	6	5	5	6	6	6	6	7	7	6	5	7	4	6	6
Quality Rating [‡]	Good	Good	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Good	Fair	Fair	Fair	Good	Good	Good	Fair	Good	Fair	Fair	Fair

NR, not reported.

[†]Quality assessment tool for case series studies is available from https://www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools, provided by National Heart, Lung, and Blood Institute.

[‡]Positive answers from zero to three, four to six, and seven to eight indicate poor, fair, and good quality of the studies evaluated, respectively.

Table 4 Quality assessment of cohort study included in the meta-analysis[†]

Table 4 Quality assessment of conort study included in the meta-analysis	
Criteria	Qiu [35]
1. Was the research question or objective in this paper clearly stated?	Yes
2. Was the study population clearly specified and defined?	Yes
. Was the participation rate of eligible persons at least 50%?	Yes
Were all the subjects selected or recruited from the same or similar populations (including the same time period)?	Yes
Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants?	Yes
Was a sample size justification, power description, or variance and effect estimates provided?	Yes
Were the exposure measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	Yes
Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	Yes
0. Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?	No
he number of positive answers	8
Quality Rating [‡]	Good

[†]Definitions/explanations for each item of quality assessment tool for observational cohort studies is available from https://www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools, and is provided by National Heart, Lung, and Blood Institute.

⁺Positive answers from zero to three, from four to six, and from seven to nine indicate poor, fair, and good quality of the studies evaluated, respectively.

Meta-regression and subgroup analyses

0	0 1 7	1					
			D*	Heterogeneity			
	No. of studies	No. of studies Summary incidence (95% CI) P* -		l ² (%)	Р		
All	23	70% (60%–79%)	< 0.05	74.94	< 0.05		
Region					< 0.05**		
Wuhan	5	0.89 (0.75–0.98)	< 0.05	80.82	< 0.05***		
Outside Wuhan	18	0.62 (0.53–0.71)	< 0.05	48.28	< 0.05***		
Male-to-female ratio					0.44**		
≤1	10	0.59 (0.48–0.70)	< 0.05	46.76	< 0.05***		
>1	6	0.70 (0.60–0.79)	< 0.05	77.15	< 0.05***		
Number of cases					0.58**		
5–20	11	0.68 (0.53–0.82)	< 0.05	69.48	< 0.05***		
>20	5	0.71 (0.59–0.83)	< 0.05	82.55	< 0.05***		

Table 5 Meta-regression and subgroup analyses on CT abnormalities in pediatric COVID-19 cases

Abbreviations: CI = confidence interval; COVID-19 = coronavirus disease 2019; CT = computed tomography.

*Significance of summarized incidences.

**Significance of meta-regression on possible sources of heterogeneity.

***Significance of subgroup analysis on possible sources of heterogeneity.

P < 0.05 was regarded as indication of statistical significance.

Table 6 Meta-regression and subgroup analyses on GGO incidence in pediatric COVID-19 cases

	No. of studies		P*	Heterogeneity			
	No. of studies	Summary incidence (95% CI)	P.	l ² (%)	Р		
All	17	0.40 (0.29–0.51)	< 0.05	66.90	< 0.05		
Region					< 0.05**		
Wuhan	2	0.67 (0.56–0.78)	< 0.05	NA	NA		
Outside Wuhan	15	0.35 (0.26–0.45)	< 0.05	44.53	< 0.05***		
Male-to-female ratio					0.40**		
≤1	9	0.33 (0.22–0.45)	< 0.05	40.05	0.10***		
>1	8	0.49 (0.32–0.65)	< 0.05	69.71	< 0.05***		
Number of cases					0.35**		
5–20	12	0.41 (0.30–0.52)	< 0.05	27.28	0.18***		
>20	5	0.39 (0.19–0.60)	< 0.05	87.71	< 0.05***		

Abbreviations: CI = confidence interval; COVID-19 = coronavirus disease 2019; CT = computed tomography; GGO = ground-glass opacity; NA = not available.

*Significance of summarized incidences.

**Significance of meta-regression on possible sources of heterogeneity.

[§]Significance of subgroup analysis on possible sources of heterogeneity.

P < 0.05 was regarded as indication of statistical significance.

	No. of studies	Summary incidence (95% CI)	D *	Heterogeneity			
			P* —	l ² (%)	Р		
All	9	0.37 (0.22–0.53)	< 0.05	74.61	< 0.05		
Region					0.28**		
Wuhan	2	0.53 (0.41–0.64)	< 0.05	NA	NA		
Outside Wuhan	7	0.28 (0.15–0.43)	< 0.05	59.40	< 0.05***		
Male-to-female ratio					0.93**		
≤1	6	0.27 (0.13–0.45)	< 0.05	64.12	< 0.05***		
>1	3	0.54 (0.32–0.76)	< 0.05	NA	NA		
Number of cases					0.32**		
5–20	6	0.42 (0.18–0.67)	< 0.05	76.07	< 0.05***		
>20	3	0.31 (0.13–0.53)	< 0.05	NA	NA		

Table 7 Meta-regression and subgroup analyses on the incidence of patchy lesions in pediatric COVID-19 cases

Abbreviations: CI = confidence interval; COVID-19 = coronavirus disease 2019; NA = not available.

*Significance of summarized incidences.

**Significance of meta-regression on possible sources of heterogeneity.

***Significance of subgroup analysis on possible sources of heterogeneity.

P < 0.05 was regarded as indication of statistical significance.

Table 8 Meta-regression and subgroup analyses on the incidence of bilateral lesions in pediatric COVID-19 cases

	No. of charles		P* —	Heterogeneity			
	No. of studies	Summary incidence (95% CI)	P* —	l ² (%)	Р		
All	12	0.35 (0.24–0.47)	< 0.05	70.43	< 0.05		
Region					0.31**		
Wuhan	9	0.43 (0.12–0.77)	< 0.05	61.89	< 0.05***		
Outside Wuhan	3	0.33 (0.21–0.47)	< 0.05	NA	NA		
Male-to-female ratio					0.07**		
≤1	8	0.32 (0.19–0.46)	< 0.05	63.86	< 0.05***		
>1	4	0.43 (0.20–0.68)	< 0.05	83.14	< 0.05***		
Number of cases					0.35**		
5–20	9	0.45 (0.31–0.60)	< 0.05	54.30	< 0.05***		
>20	3	0.21 (0.15–0.28)	< 0.05	0	0.48***		

Abbreviations: CI = confidence interval; COVID-19 = coronavirus disease 2019; NA = not available.

*Significance of summarized incidences.

**Significance of meta-regression on possible sources of heterogeneity.

***Significance of subgroup analysis on possible sources of heterogeneity.

 $\mathsf{P}<0.05$ was regarded as indication of statistical significance.

	No of studios	Summer incidence (OE0/ CI)	P*	Heterogeneity		
	No. of studies	Summary incidence (95% CI) -		l ² (%)	Р	
All	8	0.22 (0.14–0.30)	< 0.05	0	0.84	
Region					0.92**	
Wuhan	2	0.21 (0.07–0.39)	< 0.05	NA	NA	
Outside Wuhan	7	0.22 (0.13–0.32)	< 0.05	0	0.65***	
Male-to-female ratio					0.63**	
≤1	5	0.22 (0.12–0.35)	< 0.05	0	0.51***	
>1	3	0.21 (0.10–0.34)	< 0.05	NA	NA	
Number of cases					0.50**	
5–20	7	0.23 (0.14–0.33)	< 0.05	0	0.79***	
>20	1	0.18 (0.05–0.40)	< 0.05	NA	NA	

Abbreviations: CI = confidence interval; COVID-19 = coronavirus disease 2019; NA = not available.

*Significance of summarized incidences.

**Significance of meta-regression on possible sources of heterogeneity.

***Significance of subgroup analysis on possible sources of heterogeneity.

P < 0.05 was regarded as indication of statistical significance.

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