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Supplementary appendix

This appendix formed part of the original submission and has been peer reviewed. We post it as supplied by the authors.

Supplement to: Mao R, Qiu Y, He J-S, et al. Manifestations and prognosis of gastrointestinal and liver involvement in patients with COVID-19: a systematic review and meta-analysis. *Lancet Gastroenterol Hepatol* 2020; 5: 667–78.

This online publication has been corrected. The corrected version first appeared at [thelancet.com/gastrohep](https://www.thelancet.com/gastrohep) on June 15, 2020.

Supplementary Table 1. Characteristics of the Included Studies.

First author, Year	Design	Center	Site	No. of pts	Median Age Yrs (IQR)_or Mean \pm SD*	pediatric	Male N (%)	GI/liver Comorbidities N (%)	Liver Comorbidities N (%)
BE Young ,2020 ³¹	Retrospective	4	Singapore	18	47 (31-73)	N	9 (50)	NA	
J Cai, 2020 ³⁷	Retrospective	1	China	10	74 (48-108) mo	Y	4 (40)	0(0)	
C Huang,2020 ¹⁵	Prospective	1	Wuhan	41	49 (41–58)	N	30 (73)	1 (2)	1 (2)
C Wu,2020 ¹⁶	Retrospective	1	Wuhan	201	51 (43-60)	N	128 (63.7)	7 (3.5)	7 (3.5)
D Wang,2020 ³³	Retrospective,	1	Wuhan	138	56 (42-68)	N	75 (54.3)	4 (2.9)	4 (2.9)
D Chang,2020 ⁹	Retrospective	3	Beijing	13	34 (34-48)	Y(2) [#]	10 (77)	NA	
F Song,2020 ³⁴	Retrospective	1	Shanghai	51	49 (SD 16)*	N	25 (49)	1 (2)	1 (2)
J Wu,2020 ³⁸	Retrospective	3	Jiangsu	80	46.1 (SD 15.4)*	Y(10) [#]	39 (49)	4 (5)	1 (1.25)
J Zhang,2020 ⁴⁸	Retrospective	1	Wuhan	140	57 (25-87)	N	71 (50.7)	21 (29.6)	8 (5.7)
K Liu,2020 ³⁹	Retrospective	9	Hubei	137	57 (20–83)	N	61 (45)	NA	
M Arentz,2020 ³⁰	Retrospective	1	USA	21	70 (43-92)	N	11 (52)	1 (4.8)	1 (4.8)
M Ng,2020 ⁴¹	Retrospective	2	Shenzhen Hong Kong	18	56 (37-65)	N	13 (62)	1 (5)	1 (5)
N Chen,2020 ³²	Retrospective,	1	Wuhan	99	55.5 (SD 13.1)*	N	67 (68)	11 (11)	NA

L Pan,2020 ¹²	Retrospective	3	Hubei	204	54.9 (SD 16.0) *	N	107(52)	3 (1.5)	3 (1.5)
S Luo, 2020 ⁴⁰	Retrospective	1	Wuhan	1141	53.8	N	102 (56)	NA	
W Guan,2020 ²	Retrospective	552	China	1099	47 (35-58)	Y(9) [#]	637 (58.1)	23 (2.1)	23 (2.1)
W Yang, 2020 ⁴²	Retrospective	3	Wenzhou	149	45.11 (SD 13.35) *	N	81(54)	8 (5.37)	
X Xu,2020 ⁴⁵	Retrospective	7	Zhejiang	62	41 (32-52)	Y(2) [#]	35 (56)	7 (11)	7 (11)
X Lu, 2020 ⁴³	Retrospective	1	Wuhan	171	6.7yr (1d–15yr)	Y	104 (60.8)	NA	
Y Xu,2020 ⁸	Retrospective	1	Guangzhou	10	7.5yr (21-164 mo)	Y	6 (60)	NA	
Y Liu,2020 ⁴⁶	Retrospective	1	Shenzhen	12	62.5 (43.5-65)	Y(1) [#]	8 (67)	0 (0)	0 (0)
Z Wang,2020 ¹⁴	Retrospective	1	Wuhan	69	42 (35-62)	N	32 (46)	1 (1)	1 (1)
H Shi, 2020 ³⁶	Retrospective	2	Wuhan	81	49.5 (SD 11.0) *	N	42 (52)	7 (9)	7 (9)
X Xu,2020 ⁴⁴	Retrospective	1	Guangzhou	90	50 (18–86)	N	39 (43)	NA	
F Zhou,2020 ³⁵	Retrospective	2	Wuhan	191	56 (46–67)	N	119 (62)	NA	
Z Zhou 2020 ⁴⁷	Retrospective	1	Wuhan	254	50.6 (36-65)	N	115 (45.3)	3 (1.2)	3 (1.2)
C Han, 2020 ⁴⁹	Retrospective	1	Wuhan	206	62.5 (27-92)	N	91 (44.2)	NA	
M Du, 2020 ⁵³	Retrospective	Multi	Worldwide	398	44.5 (34.5-64.5)	Y(12) [#]	227 (58.5)	NA	
B Cao, 2020 ⁵⁰	Prospective	1	Shanghai	199	58 (49-68)	N	120 (60.3)	NA	

X Jin ⁵²	Retrospective	1	Zhejiang	651	46 (SD 14)*	N	331 (50.8)	25 (3.8)	25 (3.8)
P Wu ⁵⁶	Retrospective	1	Yichang	38	68 (53-76)	N	25 (65.8)	NA	
S Shi ⁵⁵	Retrospective	1	Wuhan	416	64 (21-95) [§]	N	205 (49.3)	4 (1.0)	4 (1.0)
W Guo ⁵¹	Retrospective	1	Wuhan	174	59 (49-67)	N	76 (43.7)	10 (5.7)	10 (5.7)
M Zheng ⁵⁷	Retrospective	1	Anhui	68	47 (11-84)	N	36 (52)	NA	
H Qiu ⁵⁴	Retrospective	3	Zhejiang	36	8.3 (SD 3.5)*	Y	23 (64)	NA	

#: The number of paediatric (age less than 18 yrs) included in the study.

* Mean±SD

[§]Median with Range

Abbreviations: NA, not available; Y, yes; N, no; SD, standard deviation; yr, year; d, day; mo, month; Multi, multicenter

Supplementary Table 2. Quality Ratings of Included Studies According to NIH Quality Assessment Tool

First author	Question ^a									Overall Rating	
	1	2	3	4	5	6	7	8	9	Reviewer 1	Reviewer 2
	BE Young ³¹	Yes	Yes	NR	CD	NA	Yes	CD	Yes	Yes	Fair
J Cai ³⁷	Yes	Yes	NR	CD	NA	Yes	CD	NA	Yes	Fair	Fair
C Huang ¹⁵	Yes	Yes	Yes	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
C Wu ¹⁶	Yes	Yes	Yes	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
D Wang ³³	Yes	Yes	NR	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
D Chang ⁹	Yes	Yes	NR	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
F Zhou ³⁵	Yes	Yes	Yes	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
F Song ³⁴	Yes	Yes	NR	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
H Shi ³⁶	Yes	Yes	NR	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
J Wu ³⁸	Yes	Yes	NR	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
J Zhang ⁴⁸	Yes	Yes	NR	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
K Liu ³⁹	Yes	Yes	CD	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
M Arentz ³⁰	Yes	Yes	NR	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
M Ng ⁴¹	Yes	Yes	CD	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
N Chen ³²	Yes	Yes	NR	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
L Pan ¹²	Yes	Yes	NR	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
S Luo ⁴⁰	Yes	Yes	NR	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
W Guan ²	Yes	Yes	Yes	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
W Yang ⁴²	Yes	Yes	Yes	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
X Xu ⁴⁴	Yes	Yes	NR	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
X Xu ⁴⁵	Yes	Yes	NR	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
X Lu ⁴³	Yes	Yes	NR	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
Y Xu ⁸	Yes	Yes	CD	CD	NA	Yes	CD	NA	Yes	Fair	Fair
Y Liu ⁴⁶	Yes	Yes	CD	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
Z Wang ¹⁴	Yes	Yes	NR	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
Z Zhou ⁴⁷	Yes	Yes	NR	CD	NA	Yes	CD	NA	Yes	Fair	Fair
C Han ⁴⁹	Yes	Yes	Yes	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
M Du ⁵³	Yes	Yes	CD	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
B Cao ⁵⁰	Yes	Yes	Yes	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
X Jin ⁵²	Yes	Yes	NR	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
P Wu ⁵⁶	Yes	Yes	NR	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
S Shi ⁵⁵	Yes	Yes	Yes	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
W Guo ⁵¹	Yes	Yes	Yes	CD	NA	Yes	CD	Yes	Yes	Fair	Fair
M Zheng ⁵⁷	Yes	Yes	NR	CD	NA	Yes	CD	NA	Yes	Fair	Fair
H Qiu ⁵⁴	Yes	Yes	Yes	CD	NA	Yes	CD	NA	Yes	Fair	Fair

Note—NIH = National Institutes of Health, NR = not reported, CD = cannot determine, NA = not applicable.

^aThe NIH Quality Assessment Tool for Case Series Studies [12] poses nine questions:

1 = Was the study question or objective clearly stated?,

2 = Was the study population clearly and fully described, including a case definition?,

3 = Were the cases consecutive?,

4 = Were the subjects comparable?,

5 = Was the intervention clearly described?,

6 = Were the outcome measures clearly defined, valid, reliable, and implemented consistently across all study participants?,

7 = Was the length of follow-up adequate?,

8 = Were the statistical methods well-described?,

9 = Were the results well-described?

(Source: National Heart, Lung, and Blood Institute; National Institutes of Health; U.S. Department of Health and Human Services)

Supplementary Table 3. Summary of SARS-Cov-2 virus detection in stool or rectal swab in patients with COVID-19

First author [ref],Year	Design	Site	No. of pts	Median Age, yrs (Range)	M:F	Nausea / Vomiting	Abdominal pain	Diarrhoea	Respiratory symptoms	Timing of first stool/rectal swab*, days	Positive / Tested cases of stool or rectal swab	Duration of virus shedding in stool, days (SD)
JF Chan,2020 ²³	Retrospective	China	6(familial cluster)	50 (10-66)	3:3	0	0	2	5	NA	0/4	NA
J Cai,2020 ³⁷	Retrospective	China	10(paediatric)	78 (3-131) mo	4:4	0	0	0	Y	3-13 d	5/6*	18-30
BE Young,2020 ³¹	Retrospective	Singapore	18	47 (31-73)	9:9	N	N	3	N	5-11 d	4/8	NA
I Ghina,2020 ⁶⁰	Case report	USA	2(couple) [#]	60	1:1	2	1	N	2	9-16 d	1/2	14
			Wife			Y	Y	N	Y	9 d	“+”	14
T Hosoda,2020 ⁵⁹	Case report	Japan	1	81	M	N	Y	Y	N	5 d	“+”	15
MLHolshue,2020 ⁵	Case report	USA	1	35	M	Y	N	Y	Y	7 d	“+”	4
Y Xu,2020 ⁸	Retrospective	China	10(paediatric)	79.5 (2-188) mo	6:4	0	0	2	9	-1~+1 d	8/10)	21
Y Wu,2020 ⁶¹	Cohort	China	41	41.3 (3.1) [†]	17:24	11 ^{**}			Y	2-15 d	41/74	27.9 (10.7)
C Han,2020 ⁴⁹	Retrospective	Wuhan	22	39.5 (6-71)	9:13	15 [§]			17	NA	12/22	NA
ACarvalho,2020 ⁶²	Retrospective	USA	1	71	F	Y	Y	Y%	Y	9 d	“+”	NA
C Chen, 2020 ⁶³	Retrospective	Wuhan	22	36.5 (2-64)	14:8	NA	NA	NA	22	9.6 d (1 d-25 d)	13/19	13.5 (5.0)

*From symptoms onset, #The husband tested negative for stool swab, **Diarrhea/Vomit/abdominal pain, †:Mean (SD)

Abbreviations: NA, not available; Y, yes; N, no; SD, standard deviation; yr, year; d, day; mo, month.

Supplementary Table 4. Summary of GI symptoms and abnormal liver function in patients with Covid-19

First author	No. of pts	Liver Function	Mean \pm SD or median (IQR)	Abnormal Liver Function* N(%)	GI Symptoms	N(%)
BE Young ³¹	18				Diarrhoea	3 (17)
J Cai ³⁷	10	ALT	8-100	1 (10)		
		AST	20-142	2 (20)		
C Huang ¹⁵	41	ALB	31 (29-36)		Diarrhoea	1/38 (3)
		ALT	32 (21-50)			
		AST	34 (26-48)	15 (37)		
		TB	12 (10-14)			
C Wu ¹⁶	198	TB	11 (9-15)	10 (5)		
		AST	33 (26-45)	59 (30)		
		ALT	31 (20-47)	43 (22)		
D Wang ³³	138			NA	Loss of appetite	55 (40)
					Diarrhoea	14 (10)
					Nausea	14 (10)
					Vomiting	5 (4)
					Abdominal pain	3 (2)
D Chang ⁹	13			NA	Diarrhoea	1 (8)
F Zhou ³⁵	191	ALB	32 (29-36)	NA	Diarrhoea	9 (5)
		ALT	30 (17-46)	59/189 (31)	Nausea or vomiting	7 (4)
F Song ³⁴	51				Loss of appetite	9 (18)
					Diarrhoea	5 (10)
					Vomiting	3 (6)
H Shi ³⁶	81	ALT	46 (30)		Loss of appetite	1 (1)
		AST	41 (18)	43 (53)	Vomiting	4 (5)
		TB	12 (4)		Diarrhoea	3 (4)
		ALB	33 (8)			
J Wu ³⁸	80	TB	7 (5-12)	1 (1)	Nausea	1 (1)
		AST	30 (19-39)	3 (4)	Diarrhoea	1 (1)
		ALT	24 (12-38)	3 (4)		
J Zhang ⁴⁸	140			NA	GI symptoms	55/139 (40)
					Nausea	24/139 (17)
					Diarrhoea	18/139 (13)
					Loss of appetite	17/139 (12)
					Abdominal pain	8/139 (6)
					Belching	7/139 (5)
					Emesis	7/139 (5)
K Liu ³⁹	137			NA	Diarrhoea	11 (8)
M Arentz ³⁰	21	ALT	108 (11-1414)	NA		

		AST	273 (14-4432)			
		TB	0.6 (0.2-1.1)			
M Ng ⁴¹	18	ALB	42 (39-46)	NA	Diarrhoea	2 (10)
		TB	7 (6-9)			
		ALT	23 (16-34)			
		AST	26 (20-35)			
N Chen ³²	99	TB	15 (7)	18 (18)	Nausea	2
		AST	34 (26-48)	35 (35)		
		ALT	39 (22-53)	28 (28)		
L Pan ¹²	103	TB	14±10		Loss of appetite	81 (79)
		AST	31±26		Diarrhoea	35 (34)
		ALT	36±36		Vomiting	4 (4)
					Abdominal pain	2 (2)
S Luo ⁴⁰	1141	AST	66±13	NA	Nausea	134 (73)
		ALT	66±13		Vomiting	119 (65)
					Abdominal pain	45 (25)
					Diarrhoea	68 (37)
					Loss of appetite	180 (98)
					Both nausea and vomiting	37 (20)
					Both abdominal pain and diarrhoea	16 (9)
					All symptoms	12 (7)
W Guan ²	1099	TB		76/722 (11)	Nausea or vomiting	55/1099 (5)
		ALT		158/741 (21)	Diarrhoea	41/1099 (4)
		AST		168/757 (22)		
W Yang ⁴²	149	ALB	42±6	9 (6)		
		TB	10±6	4 (3)		
		ALT	20±21	18 (12)		
		AST	23±16	27 (18)		
X Xu ⁴⁴	90			NA	Diarrhoea	5 (6)
					Nausea	5 (6)
					Vomiting	2 (2)
X Xu ⁴⁵	62	AST	26 (20-32)		Diarrhoea	3 (8)
		ALT	22 (14-34)	10 (16)		
X Lu ²⁸	171			NA	Diarrhoea	15 (9)
					Vomiting	11 (6)
Y Xu ⁸	10	ALB	45±3	NA	Diarrhoea	3 (30)
		ALT	34±52	1/9 (11)		
		AST	40±36	2/9 (22)		
		TB	5±2	0 (0)		

Y Liu ⁴⁶	12	AST	40±22	3 (25)	Diarrhoea	2
		ALT	32±12	2 (17)	Vomiting	2
		TB	9±2			
		ALB	41±5			
Z Wang ¹⁴	69	ALT	25 (17-40)	23/69 (33)	Diarrhoea	10 (14)
		AST	28 (22-42)	19/69 (28)	Loss of appetite	7 (10)
Z Zhou ⁴⁷	254			NA	Vomiting	3 (4)
					GI symptoms	66 (26)
					Abdominal pain	3 (1)
					Vomiting	15 (6)
C Han ⁴⁹	206			NA	Diarrhoea	46 (18)
					Nausea	21 (8)
					Poor appetite	70 (34)
					Low appetite	32 (16)
M Du ⁵³	398			NA	Vomiting	24 (12)
					Diarrhoea	67 (33)
					Abdominal pain	9 (4)
					Digestive Symptoms [§]	14 (4)
B Cao ⁵⁰	199	AST	34 (26-45)	40 (21)		
		ALT	33 (22-55)	80 (41)		
X Jin ⁵²	651					
	74(GI)	ALB	40 (36-43)		Diarrhoea	53 (8)
		ALT	25 (16-39)		Vomiting	11 (2)
		AST	29 (21-39)		Nausea	10 (2)
		TB	10 (7-14)		Diarrhoea, vomiting and nausea	3 (1)
					Nausea and vomiting	4 (1)
	577(Non GI)	ALB	42 (39-44)			
	ALT	22 (15-33)				
	AST	24 (19-32)				
	TB	10 (7-13)				
P Wu ⁵⁶	38	ALT	31 (28)			
		AST	36 (27)			
S Shi ⁵⁵	416	ALT	28 (18-46)		Diarrhoea	16 (4)
		AST	30 (22-43)			
		ALB	36 (32-38)			
W Guo ⁵¹	174	ALT	26 (21-37)		Nausea and Vomiting	17 (10)
					Diarrhoea	21 (12)

H Qiu ⁵⁴	36	ALT		2 (6)	Vomiting or Diarrhoea	2 (6)
		AST		3 (8)		
M Zheng ⁵⁷	68	ALT	30 (7-167)		Diarrhoea	3 (4)
		AST	24 (10-89)			
		TB	15 (5-48)			
		ALB	38 (10-47)			

*: Abnormal liver function was defined as ALT>40U/L, AST>40U/L, TBIL>17.1µmol/L or ALB<30g/L.

[§]: Digestive symptoms include diarrhoea, nausea, vomiting, and loss of appetite.

Abbreviations: GI, gastrointestinal symptoms; ALT, Alanine aminotransferase, AST, Aspartate aminotransferase, TB, total bilirubin; CI, confidence intervals; ALB, albumin; NA, not applicable.

Supplementary Table 5. Subgroup analysis of GI and Liver manifestations in COVID-19 (Hubei vs outside Hubei; adult vs paediatric)

Factors	Subgroup	Study(n)	Rates(%)	95%CI		F(%)	P*
				upper	lower		
Comorbidity							
<i>GI comorbidity</i>	Hubei	11	4	2	7	81	0.943
	outside Hubei	10	4	3	6	49	
<i>Liver comorbidity</i>	Hubei	9	3	2	5	64	0.767
	outside Hubei	8	3	2	6	57	
GI symptoms							
a) <i>Diarrhea</i>	Adult	19	11	7	15	91	< 0.0001
	Paediatric	2	10	6	15	0	
	Mixed#	5	4	3	5	0	
	Hubei	13	11	7	18	94	0.132
	outside Hubei	13	7	5	10	66	
	Adult	14	7	5	11	89	0.1862
Paediatric	1	6	4	11	NA		
Mixed#	3	5	4	6	0		
b) <i>Nausea and/or Vomiting</i>	Hubei	12	8	5	11	88	0.045
	outside Hubei	6	4	3	7	50	
c) <i>Loss of appetite</i>	Hubei	7	22	8	48	99	0.708
	outside Hubei	1	18	9	31	NA	
Liver function injury							
a) <i>Elevated ALT</i>	Adult	7	24	17	33	88	0.0171
	Paediatric	3	7	3	18	0	
	Mixed#	4	13	7	24	76	
	Hubei	4	25	17	35	90	0.069
	outside Hubei	10	15	9	23	81	
	Adult	8	27	19	36	89	0.0089
Paediatric	3	13	6	24	0		
Mixed#	3	10	5	19	73		
b) <i>Elevated AST</i>	Hubei	5	30	18	46	92	0.053
	outside Hubei	9	16	11	24	85	
c) <i>Elevated TB</i>	Hubei	1	18	12	27	NA	0.0014
	outside Hubei	4	4	2	9	43	

*comparison between Hubei and Outside Hubei, and comparison between adult and paediatric cohorts

#Mixed: Studies included analysis consisted of both adults and paediatric patients.

Abbreviations: GI, gastrointestinal; ALT, Alanine aminotransferase, AST, Aspartate aminotransferase, TB, total bilirubin; CI ,confidence intervals; ALB, albumin; NA, not available.

Supplementary Figure Legends

Supplementary Figure 1. Pooled estimate of digestive system comorbidities rate in patients with COVID-19.

Supplementary Figure 2. The pooled estimate of GI symptoms as initial presenting symptoms in patients with COVID-19.

Supplementary Figure 3. Pooled estimate of GI symptoms rate in patients with COVID-19.

Supplementary Figure 4. Estimated incidence of liver injury in patients with COVID-19.

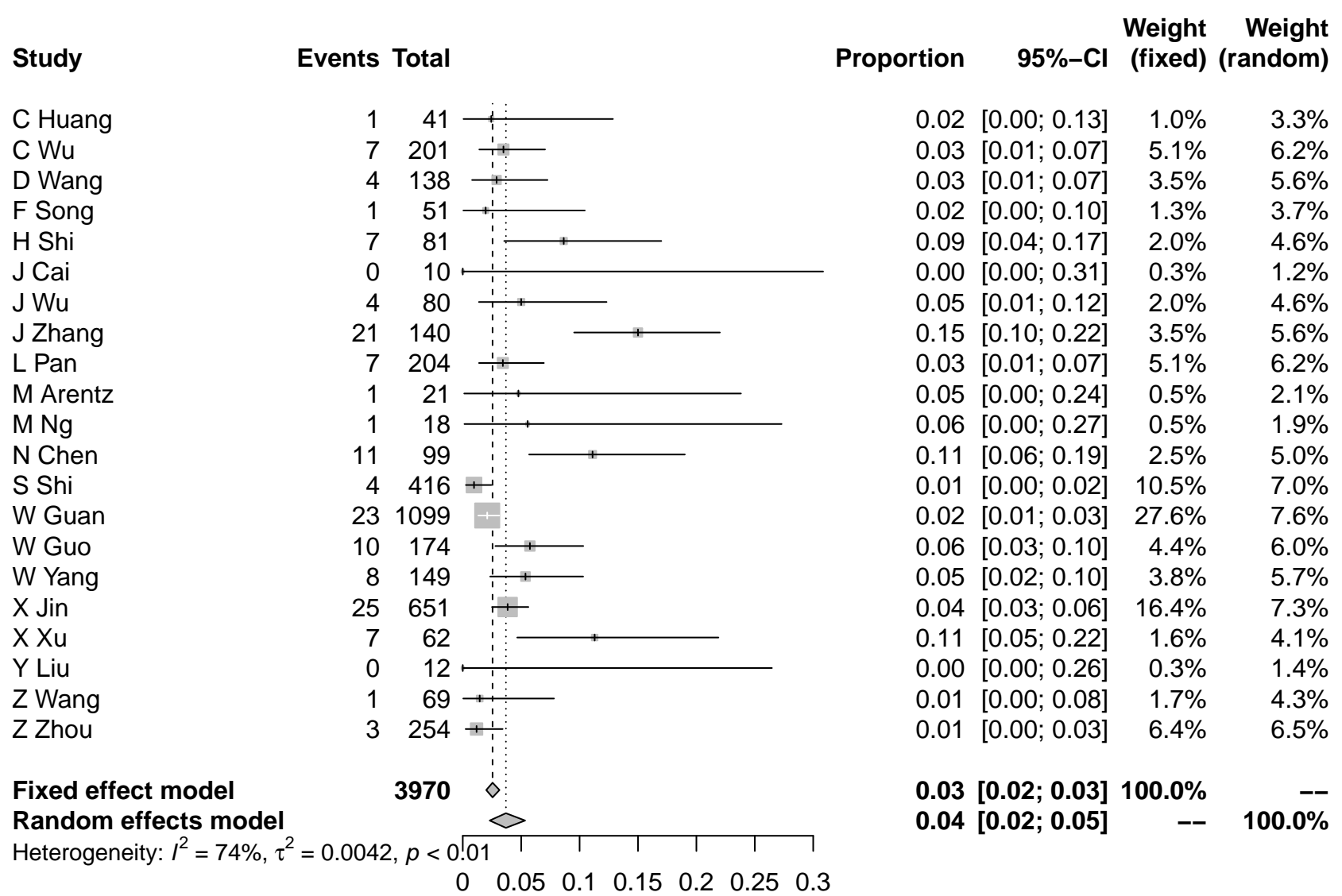
Supplementary Figure 5. Estimated incidence of severe case stratified by digestive/liver-related comorbidities

Supplementary Figure 6. The pooled estimate of complications in patients with COVID-19 stratified by GI system involvement

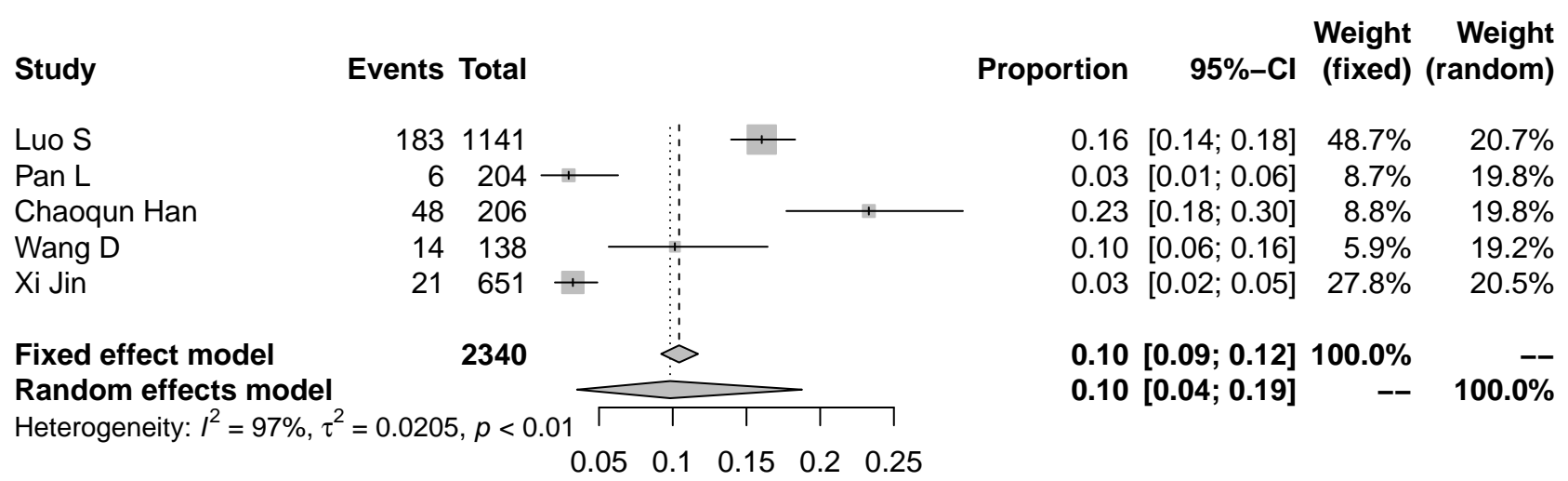
Supplementary Figure 7. Forrest plot of meta-analysis of standardized mean differences (SMD) of liver chemistry according to patients' disease severity (severe vs. non-severe).

Supplementary Figure 8. Begg's funnel plot for publication bias for incidence of digestive symptoms. Studies (circles) within the projected 95% CI (diagonal lines) should have complementary areas on the opposite side of the dashed line (estimated risk ratio). Gaps in the funnel patterns indicate possible areas of publication bias.

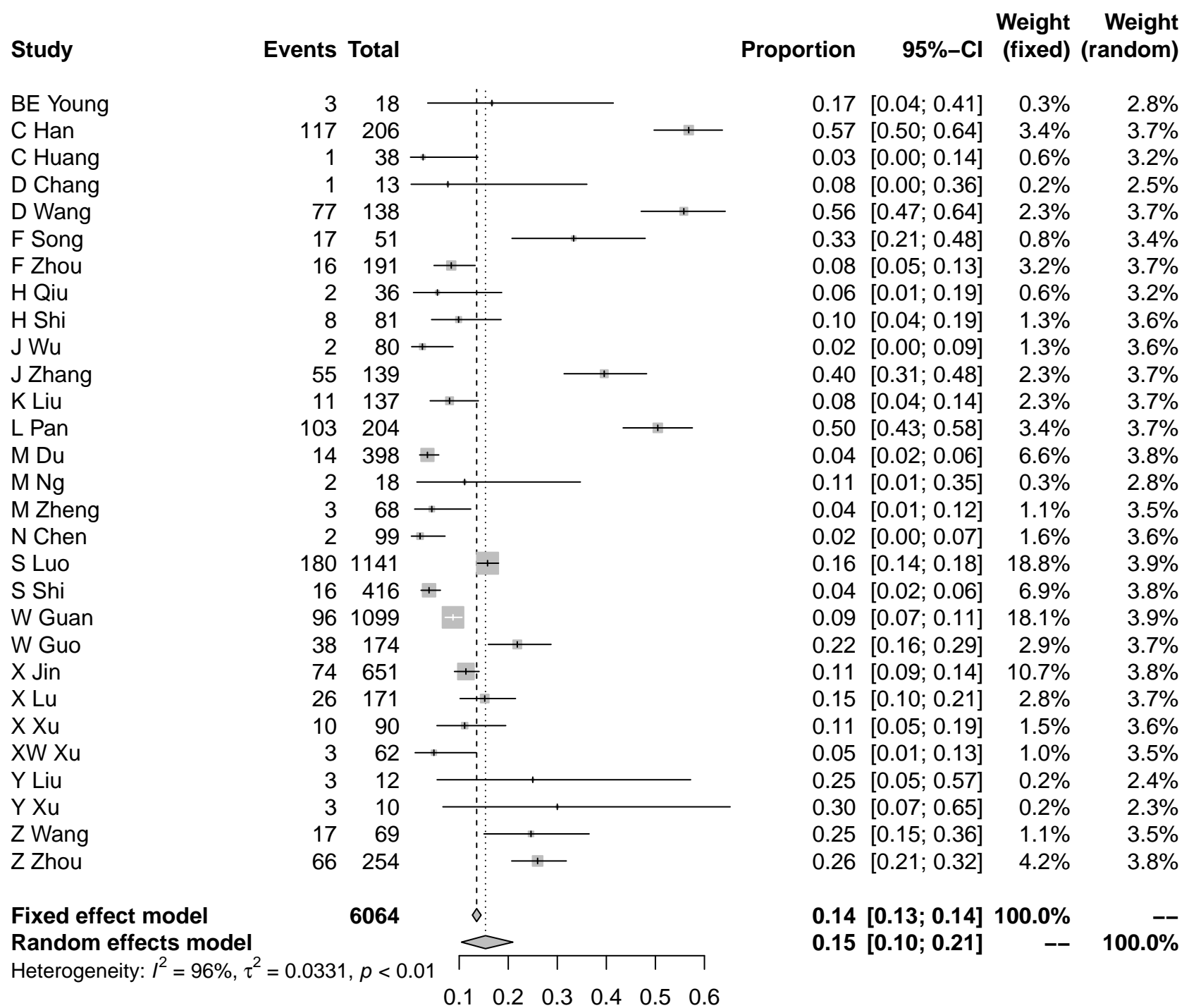
Supplementary Figure 1. Pooled estimate of digestive system comorbidities rate in patients with COVID-19.



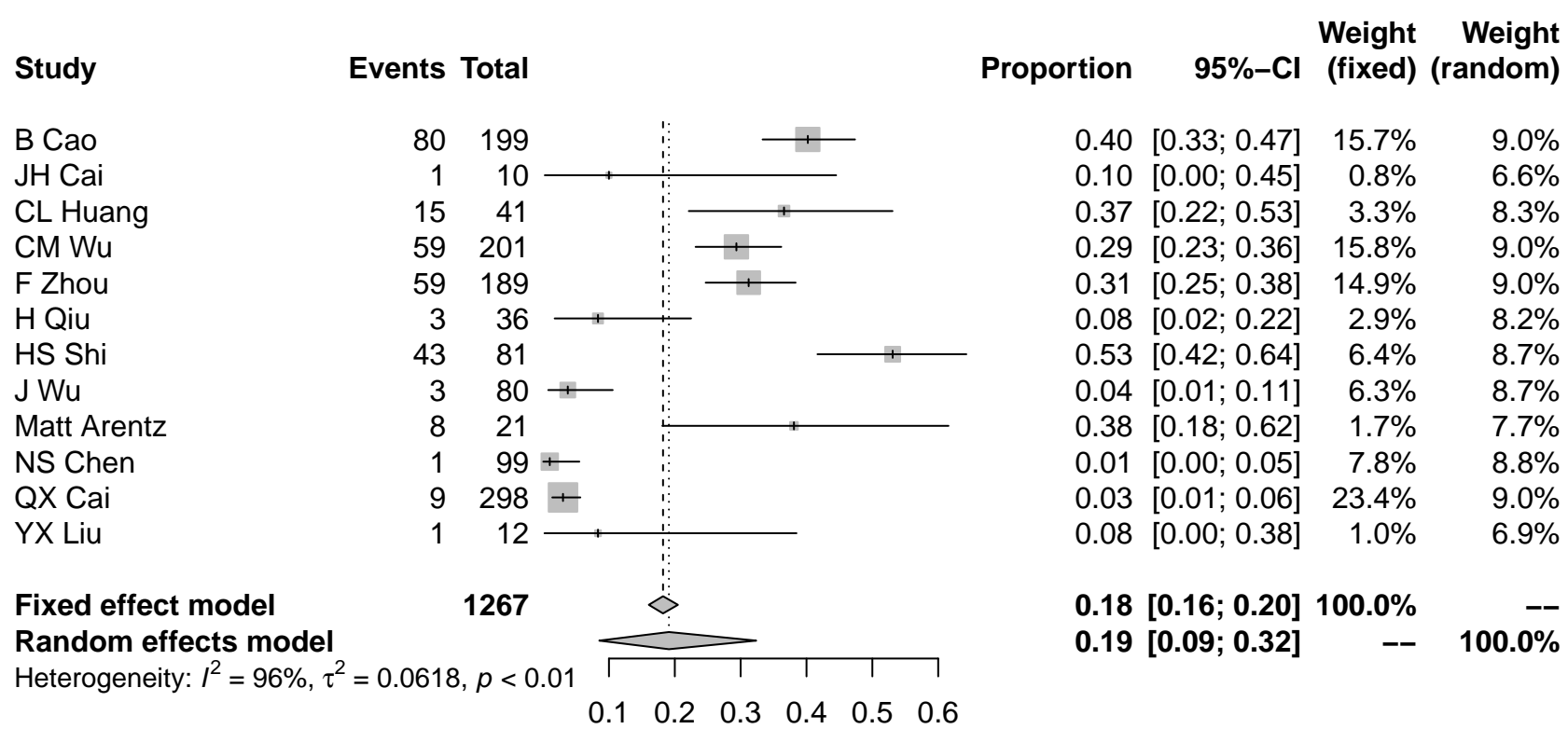
Supplementary Figure 2. The pooled estimate of GI symptoms as initial presenting symptoms in patients with COVID-19.



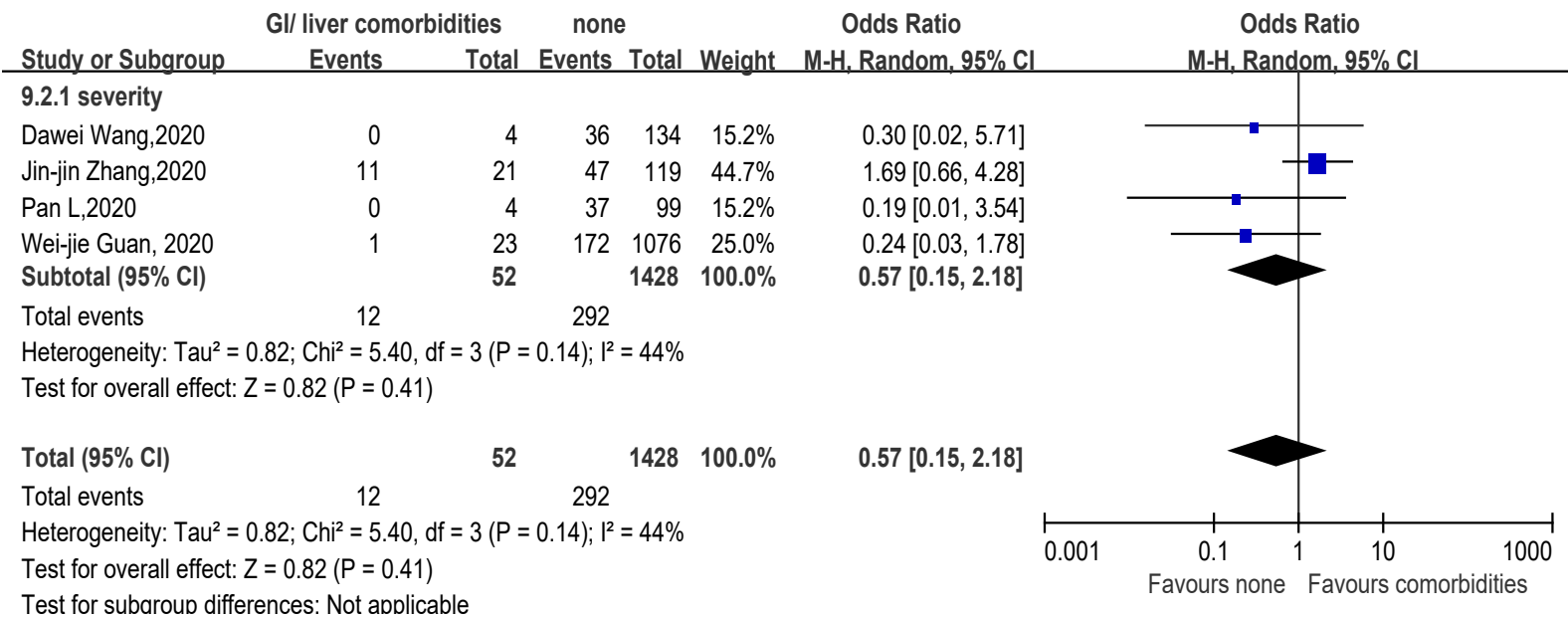
Supplementary Figure 3. Pooled estimate of GI symptoms rate in patients with COVID-19.



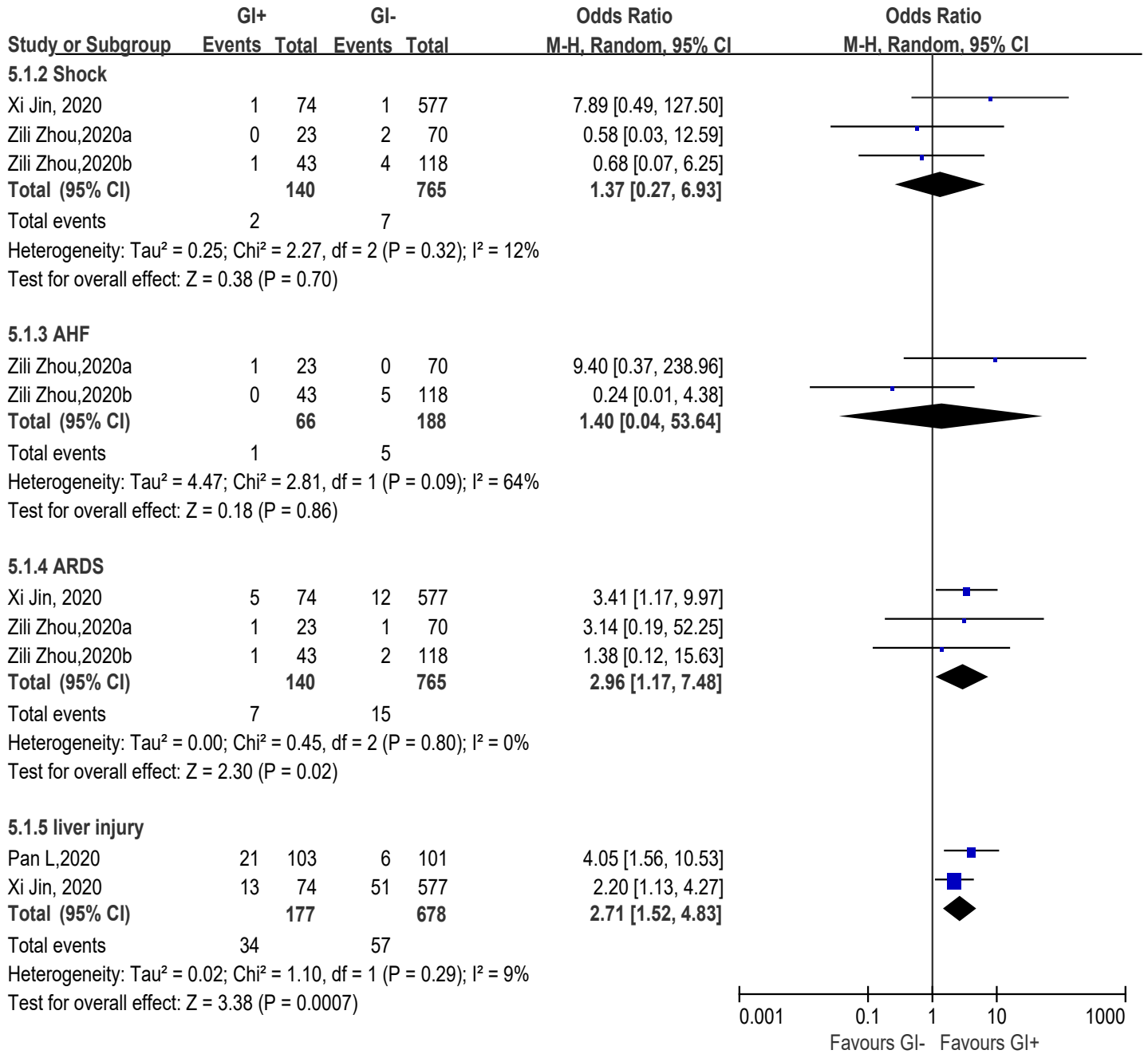
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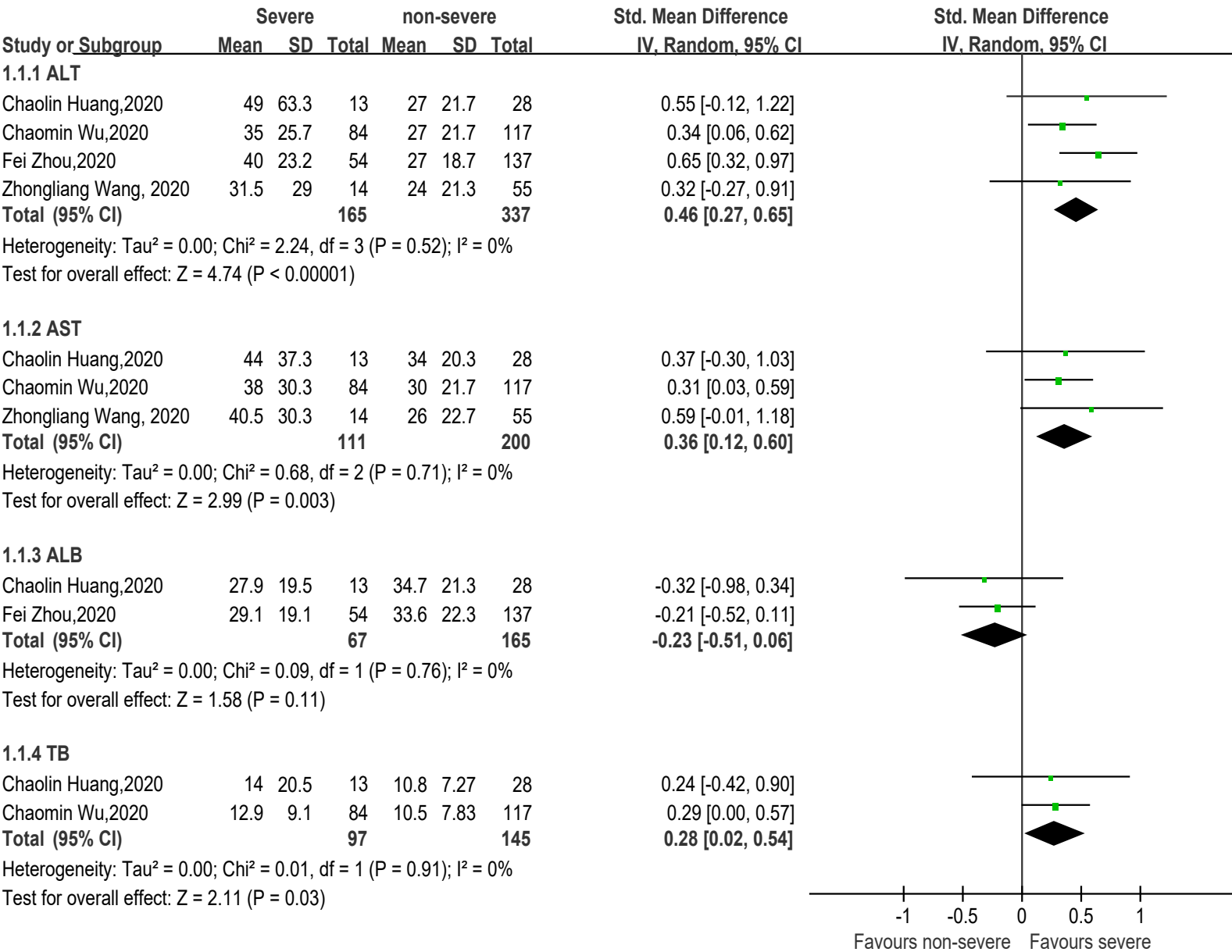
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Supplementary Figure 8. Begg's funnel plot for publication bias for incidence of digestive symptoms. Studies (circles) within the projected 95% CI (diagonal lines) should have complementary areas on the opposite side of the dashed line (estimated risk ratio). Gaps in the funnel patterns indicate possible areas of publication bias.

