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Supplementary Table 1: Newcastle-Ottawa quality assessment scale

	Selection				*Comparability*	*Outcome*			
Study	*Representativeness of Exposed Cohort*	*Selection of Non exposed*	*Ascertainment of Exposure*	*Outcome Not Present at Start Of study*	*Comparability of cohorts*	*Assessment of Outcome*	*Adequate Follow-Up Length*	*Adequacy of Follow-Up*	*Overall*
Zhang X[17]	1	1	1	1	1	1	1	1	8
Wu Chaomin[20]	1	1	1	1	2	0	1	1	8
Wang Z[19]	1	1	1	1	1	0	1	1	7
Wang D[11]	1	1	1	1	1	1	1	1	8
Wan S[24]	1	1	1	1	1	1	1	1	8
Chen G[25]	1	1	1	1	1	0	1	1	7
Rong Qu[26]	0	1	0	1	1	0	1	1	5
Gao Yong[27]	1	1	1	1	1	0	1	1	7
Qian Guo-Qing[28]	0	1	1	1	1	0	1	1	6
Liu Wei[18]	1	1	1	1	1	0	1	1	8
Zhang Guqin[29]	1	1	1	1	2	1	1	1	9
Hansheng Xie[30]	1	1	1	1	2	1	1	1	9
Zheng Meijuan[31]	1	1	1	1	1	0	1	1	7
Guan W[9]	1	1	1	1	1	1	1	1	8
Huang Rui[32]	1	1	1	1	1	1	1	1	8

Zhao Xin-Ying[34]	1	1	1	1	2	1	1	1	9
Hajifathalian Kaveh[16]	1	1	1	1	2	1	0	0	7
Cai Qingxian[10]	1	1	1	1	2	1	1	1	9
Fan Zhenyu[12]	1	1	1	1	2	1	1	1	9
Xiaolong Qi[33]	1	1	1	1	1	1	1	1	8
Fei Zhou[35]	1	1	1	1	2	1	1	1	8
Yang X[36]	1	1	1	1	1	0	1	1	8
Qiurong Ruan[37]	1	1	1	1	1	1	1	1	8
Chen T[38]	1	1	1	1	2	1	1	1	9
Du Rong-Hui[39]	1	1	1	1	1	1	1	1	8
Lang Wang[40]	1	1	1	1	1	0	1	1	7
TieLong Chen[41]	1	1	1	1	1	1	1	1	8
Haiying Sun[43]	1	1	1	1	2	0	1	1	8
Deng Y[42]	1	1	1	1	2	0	1	1	8
Moon	1	1	1	1	1	1	1	1	8
Xiaolong Qi 2	1	1	1	1	2	1	1	1	9
Wang Yijin	1	1	1	1	2	1	1	1	9

Supplementary Table 2a: Study characteristics included in meta-analysis

Study	Country	Study Period	Study type	Total N	Arms	n	Sex		Age (yrs)	COVID-19 diagnosis
							M	F		
Zhang X[17]	China	Jan 17 to Feb 8, 2020	Retrospective	645	Mild	72	33	39	45.33±47.42	Real-time RT-PCR
					Severe	573	295	278		
Wu Chaomin[20]	China	Dec 25, 2019, to Jan 26, 2020	Retrospective	201	Mild	117	68	49	51±2.83	Real-time RT-PCR
					Severe	84	60	24		
Wang Z[19]	China	Ja n 16 to Jan 29, 2020	Retrospective	69	Mild	55	25	30	42.0±6.75	Real-time RT-PCR
					Severe	14	7	7		
Wang D[11]	China	Jan 1 to Jan 28, 2020	Retrospective	138	Mild	102	53	49	56±4.33	Real-time RT-PCR
					Severe	36	22	14		
Wan S[24]	China	Jan 23 to Feb 8, 2020	Retrospective	135	Mild	95	52	43	47±3.16	Real-time RT-PCR
					Severe	40	21	19		
Chen G[25]	China	Dec 19, 2019 to Jan 27, 2020	Retrospective	21	Mild	11	7	4	56.3±14.3	Real-time RT-PCR
					Severe	10	10	0		
Rong Qu[26]	China	Jan 2020 to Feb 2020	Retrospective	30	Mild	27	16	14	50.5±28.28	Real-time RT-PCR
					Severe	3				
Gao Yong[27]	China	Jan 23, 2020 to Feb 2, 2020	Retrospective	43	Mild	28	17	11	43.74±36.12	Real-time RT-PCR
					Severe	15	9	6		
Qian Guo-Qing[28]	China	Jan 25 to 11 Feb 2020	Retrospective	91	Mild	82	37	54	50±3.41	Real-time RT-PCR
					Severe	9				
Liu Wei[18]	China	Dec 30, 2019, to Jan 15, 2020	Prospective	78	Mild	67	32	35	38±4	Real-time RT-PCR
					Severe	11	7	4		
Zhang Guqin[29]	China		Retrospective	221	Mild	166	73	93	55.0±4.58	

		Jan 2, 2020 to Feb 10, 2020			Severe	55	35	20		Real-time RT-PCR
Hansheng Xie[30]	China	Feb 2, 2020 to Feb 23, 2020	Retrospective	79	Mild	51	26	25	60.0±3	Real-time RT-PCR
					Severe	28	18	10		
Zheng Meijuan[31]	China	NA	Retrospective	68	Mild	55	26	29	47.13±11.84	Real-time RT-PCR
					Severe	13	10	3		
Guan W[9]	China	Dec 11, 2019, to Jan 29, 2020	Retrospective	1099	Mild	926	540	386	47.0±3.83	Real-time RT-PCR
					Severe	173	100	73		
Huang Rui[32]	China	Jan 22, 2020 to Feb 10, 2020	Retrospective	202	Mild	179	99	80	44.0±3.5	Real-time RT-PCR
					Severe	23	16	6		
Zhao Xin-Ying[34]	China	Jan 16, 2020 to Feb 10, 2020	Retrospective	91	Mild	61	35	26	46	Real-time RT-PCR
					Severe	30	14	16		
Hajifathalian Kaveh[16]	USA	March 4 to April 9, 2020	Retrospective	1059	Mild	291	145	146	61.1±18.3	Real-time RT-PCR
					Severe	768	466	302		
Cai Qingxian[10]	China	Jan 11, 2020 to Feb 21, 2020	Retrospective	417	Mild	326	NA	NA	47±4.3	Real-time RT-PCR
					Severe	97	NA	NA		
Fan Zhenyu[12]	China	Jan 20, 2020 to Jan 31, 2020	Retrospective	148	Liver Injury	55	41	14	50±4.67	Real-time RT-PCR
					Without Liver Injury	93	32	61		
Xiaolong Qi[33]	China		Retrospective	70	Liver Injury	32	23	9	41±5.6	

		Jan 23, 2020 to Feb 18, 2020			Without Liver Injury	38	16	22		Real-time RT-PCR
Fei Zhou[35]	China	Dec 29, 2019 to Jan 31, 2020	Retrospective	191	Survivor	137	81	56	56.25±6	Real-time RT-PCR
					Non-survivor	54	38	16		
Yang X[36]	China	Dec 24, 2019, to Jan 26, 2020	Retrospective	52	Survivor	20	14	6	59·7±13·3	Real-time RT-PCR
					Non-survivor	32	21	11		
Qiurong Ruan[37]	China		Retrospective	150	Survivor	82	53	29	57.7±51.36	Real-time RT-PCR
					Non-survivor	68	49	19		
Chen T[38]	China	Jan 13 to 12 Feb 2020	Retrospective	274	Survivor	161	88	73	59.5±7.48	Real-time RT-PCR
					Non-survivor	113	83	30		
Du Rong-Hui[39]	China	Dec 25, 2019 to Feb , 2020	Retrospective	179	Survivor	158	87	71	57.6±13.7	Real-time RT-PCR
					Non-survivor	21	10	11		
Lang Wang[40]	China	Jan 1 to Feb 6	Retrospective	339	Survivor	274	127	147	69.75±3.17	Real-time RT-PCR
					Non-survivor	65	39	26		
TieLong Chen[41]	China	Jan 1, 2020, to Feb 10, 2020	Retrospective	55	Survivor	36	18	18	76±7.51	Real-time RT-PCR
					Non-survivor	19	16	3		
Haiying Sun[43]	China	Jan 1, 2020 to Feb 21, 2020	Retrospective	244	Survivor	123	51	72	69.4±6.9	Real-time RT-PCR
					Non-survivor	121	82	39		
Deng Y[42]	China	Jan 1, 2020 to Feb 21, 2020	Retrospective	215	Survivor	116	51	65	54±5.2	Real-time RT-PCR
					Non-survivor	109	73	36		
Moon	UK	March 25, 2020 to	Retrospective	152	Survivor	105	61	44	61±3.83	Real-time RT-PCR
					Non-survivor	47	30	17		

		April 20, 2020								
Xiaolong Qi 2	China	Dec 31, 2019 to March 24, 2020	Retrospective	21	Survivor	16	7	9	64.5±4	Real-time RT-PCR
					Non-survivor	5	11	6		
Wang Yijin	China	Jan 20, 2020 to March 25, 2020	Retrospective	156	Liver Injury	64	38	26	51.15±49.50	Real-time RT-PCR
					Without Liver Injury	92	44	48		

Supplementary Table 2b: Study characteristics included in meta-analysis (Liver function. Abnormal Liver function tests, Liver Injury and gastrointestinal complications)

Study	Total (N)	CLD	Liver Function			Abdominal Symptoms					Treatment	Comments
			Value(M±SD	Abnormal LFTs %	Liver Injury %	Diarrhoea n(%)	Nausea n(%)	Vomiting n(%)	Abdominal Pain n(%)	Anorexia n(%)		
Zhang X[17]	645	25	ALT- 28.94±38.25 AST- 29.58±35.57 TBil- 11.02±13.45 INR-1.03±1.03 Albumin-41.18 LDH-208.7±208.89	NA	12.5%	53	22	NA	NA	NA	Anti-coronavirus treatment, Glucocorticoids, Oxygen therapy, Mechanical ventilation	Clinical features and radiograph score in COVID-19 patients can effectively predict severe/critical type.

Wu Chaomin [20]	201	7	ALT- 31±4.52 AST- 33±3.16 TBil- 11.45±0.95 Prothrombin Time- 11.1±0.28	ALT- 21.71% AST- 29.79% TBil- 5.05% PT- 2.07% Albumin- 98.48% LDH- 97.97%	NA	NA	NA	NA	NA	NA	Oxygen Therapy, Empirical Antibiotic, Antiviral (oseltamivir ganciclovir, lopinavir/ritonavir, interferon alfa), antioxidant therapy, Methylprednisolone, immunomdulators (immunoglobulin, thymosin, and recombinet human granulocyte colony stimulating factor)	Older age was associated with greater risk of development of ARDS and death while methylprednisolone was found beneficial for patients who develop ARDS.
Wang Z[19]	69	1	ALT- 25±5.75 AST- 24±6 LDH- 224±27	ALT- 33.33% AST- 27.53% LDH- 40.9%	NA	10(14%)	3(4%)	NA	NA	7(10%)	Oxygen support, Antibiotics (moxifoxacin treatment) and Antiviral therapy (interferon	Older patients or those with underlying comorbidities are at higher risk of death.

											therapy), antifungal drugs, corticosteroids	
Wang D[11]	138	NA	ALT- 24±4 AST- 31±4.5 TBil.- 9.8±0.95 Prothrombin-13±0.23 LDH-261±36.83	NA	NA	14 (10.1%)	14 (10.1%)	5 (3.6%)	3 (2.2%)	NA	Antiviral therapy, Glucocorticoid therapy, Oxygen inhalation, CRRT, ECMO	Hospital-related transmission of 2019-nCoV was suspected in 41%of patients,
Wan S[24]	95	2	ALT-26±3.37 AST- 33.4±2.65 TBil.- 8.6±1.3 Prothrombin Time-10.9±0.15 Albumin- 40.5±1.06 LDH- 320.5±18.3	AST-22.22% LDH-42.96%	NA	18 (13.3%)	NA	NA	NA	NA	Oxygen support, Antiviral therapy, Antibiotic therapy, corticosteroid, Traditional Chinese medicine, CRRT,	Traditional Chinese Medicine play an important role in the treatment of covid-19 patients
Chen G[25]	21	NA	ALT- 30±16.5 AST- 38.2±24.6 TBil. 9.8±5.6 Prothrombin Time-13.8±1.0 Albumin-34.4±5.7 LDH- 408.1±231	AST-28.6%	4.76%	NA	NA	NA	NA	NA	Oxygen Therapy, Antiviral therapy (oseltamivir and ganciclovir), ECMO, antimicrobial treatment	SARS-CoV-2 infection may affect primarily T lymphocytes, especially CD4+T cells, resulting in significant decrease in

											(moxifloxacin or cefoperazone-sulbactam), corticosteroids (methylprednisolone)	number as well as IFN-γ production, which may be associated with disease severity.
Rong Qu[26]	30	NA	ALT- 35.73±40.86 AST- 45.13±47.04 LDH- 745.07±798.84	NA	NA	NA	NA	NA	NA	NA	Hormones, Supportive treatments	Patient with markedly elevated platelets and longer average hospitalization days may be related to the cytokine storm.
Gao Yong[27]	43	NA	ALT- 28.4±30.81 AST- 26.72±27.08 PT- 11.34±11.36	NA	NA	NA	NA	NA	NA	NA	NA	IL-6 and D-dimer levels can be used to estimate the severity of COVID-19
Qian Guo-Qing[28]	91	NA	ALT- 18.92±16.71 AST- 21.59±10.78 Albumin- 43±47.25	NA	NA	NA	NA	6(6.59 %)	NA	23(25.27 %)	NA	Early diagnosis, early isolation and early management all contributed to reducing transmission and mortality

Liu Wei[18]	78	NA	ALT- 18.1±2.83 AST-20.5±3.28 Albumin-40.47±5.21	NA	NA	NA	NA	NA	NA	NA	Ribavirin, lopinavir Cephalosporins, quinolone, Glucocorticoids, gamma globulin, thymosins,	Several factors including age, history of smoking, maximum body temperature at admission, respiratory failure, albumin, and C-reactive protein led to the progression of COVID-19
Zhang Guqin[29]	221	7	ALT-23±3.83 AST-29±4.5 TBil- 10±1.03 PT- 12.9±0.25 LDH-227±32.16	NA	NA	25 (11.3%)	NA	NA	5 (2.3%)	80 (36.2%)	Oxygen Therapy, Antiviral therapy, Glucocorticoid, CRRT, ECMO	Covid-19 patients with older age and chronic comorbidities, developed more than one complication.
Hansheng Xie[30]	79	NA	ALT- 34±8.16 AST- 30±4.5 GGT- 31.5±10.38 TBil- 13.61±1.46	NA	36.70%	7(8.9%)	NA	NA	NA	NA	NA	The close monitoring and evaluation of liver function in

												COVID-19 patients with severe pulmonary imaging lesions should be considered.
Zheng Meijuan[3] [1]	68	NA	ALT- 24.17±19.75 AST- 14.92±10.77 TBil- 14.927(4.7-47.8) PT- 11.713(9.7-17.7)	NA	NA	3/68(4.41 %)	55	NA	NA	NA	Oxygen Therapy, Hydroxychloroquine/ Chloroquine, Interferon therapy, Antibiotic therapy,	Targeting NKG2A may prevent the functional exhaustion of cytotoxic lymphocytes and consequently contribute to virus elimination in the early stage of SRAS-CoV-2 infection.
Guan W[9]	1099	NA	NA	ALT: 21.32% AST- 22.19% TBil- 10.52% LDH- 41.03%	NA	42	55	NA	NA	NA	Oxygen therapy, Antibiotics, Antiviral, Corticosteroids, Intravenous immunoglobin, ECMO.	Some patients with Covid-19 do not have fever or radiological abnormalities on initial presentation, which has

												complicated the diagnosis and hence cause rapid spread.
Huang Rui[32]	202	4	ALT- 25±2.66 TBil- 9.9±1.16 PT - 12.8±0.23 LDH-236.5±32.41	NA	NA	13	NA	4	NA	NA	Oxygen therapy, Antiviral therapy (Atomized inhalation of interferon α-2b, Lopinavir/ritonavir, Arbidol, Oseltamivir,), Antibiotic therapy, corticosteroid, gamma globulin,	A BMI > 28 kg/m2 and a history of type 2 diabetes are independent risk factors for severe illness of COVID-19

Zhao Xin-Ying[34]	91	NA	NA	ALT- 12.01% AST- 19.78% PT- 20.87%	19.7%	14	11	NA	2	11	Oxygen therapy, antibacterial (cephalospori, fluoroquinolones, carbapenems), Immunoglobulin, antiviral therapy (oseltamivir, lopinavir/ritonavir, umifenovir), glucocorticoid	Besides respiratory problem, liver, kidney, digestive tract, and heart injuries are common in COVID-19 patients.
Hajifathalian Kaveh[16]	1059	32	ALT- 49.5±64.9 AST-59.5±78.5 TBil-11.97±10.26 INR-1.3±0.8 Albumin-33±6	NA	NA	234	168	91	72	240	NA	In COVID-19 patients liver injury is commonly seen on initial presentation, and is independently associated with poor clinical outcomes

Cai Qingxian[10]	417	21	ALT- 46±8.16 AST-38±4 GGT-47.5±9.16 TBil- 20±2.16	AST– 58.80% AST- 47.16% GGT- 48.74% TBil- 64.15%	21.5%	NA	NA	NA	NA	NA	Antibiotics, NSAIDs,Ribavirin, Oseltamivir, Herbal medications, Interferon, Lopinavir/ritonavir	Patients with abnormal liver tests had significantly higher odds of developing severe pneumonia. Moreover, antiviral (lopinavir/ritonavir) used in treatment for COVID-19 increased the risk of liver injury.
Fan Zhenyu[12]	148	9	NA	NA	52%	6	3	NA	NA	NA	Supportive treatments like fluid electrolyte and acid-base homeostasis, oxygen therapy, Antiviral therapy (lopinavir/litonavir, umifenovir and darunavir),	Patients with SARS-CoV-2 infection who have received Lopinavir/ritonavir have abnormal liver function, and this is associated with longer hospital stay.

											and antibiotics.	
Xiaolong Qi[33]	70	NA	NA	ALT- 21.43% AST- 7.14% TBil- 35.71%	45.7%	7	NA	NA	NA	NA	Antiviral treatment with interferon inhalation, lopinavir and ritonavir, combined with probiotics.	Dynamic monitoring the liver function of patients with liver injury is recommended as hospital stay of patient with liver injury is not statically different that of without liver injury.
Fei Zhou[35]	191	NA	ALT- 30·0± 4.83 PT- 11·6 ±0.4 LDH- 300·0±28.83 Albumin- 32·3± 1.11	AST- 31% PT- 6% LDH- 67%	NA	9 (5%)	NA	7 (4%)	NA	NA	Oxygen therapy, Antibiotics, Antiviral, Corticosteroids, Intravenous immunoglobin, ECMO.	The potential risk factors of older age, high SOFA score, and d-dimer greater than 1 µg/mL could help clinicians to identify patients with poor prognosis at an early stage.
Yang X[36]	52	NA	ALT- 59·7±13·3 TBil- 17.03±19.20	NA	28.8%	NA	NA	2 (4%)	NA	NA	Oxygen Therapy,	The survival time of

			PT- 12.13±11.8727								Antiviral, Antibacterial, Glucocorticoids, Immunoglobulin, Vasoconstrictive agents, CRRT, ECMO	The non-survivors is likely to be within 1–2 weeks after ICU admission. Older patients (>65 years) with comorbidities and ARDS are at increased risk of death.
Qiu Rong Ruan[37]	150	4	ALT- 104.04±678.08 AST- 153.21±1273.5 TBil- 15.2±16.34 Albumin- 30.93±25.68 LDH- 573.48±1867.55	NA	NA	NA	NA	NA	NA	NA	NA	The predictors of a fatal outcome in COVID-19 cases included age, the presence of underlying diseases, the presence of secondary infection and elevated inflammatory indicators in the blood.
Chen T[38]	274	15	ALT- 23±3.83 AST- 30±4	ALT- 22% AST- 31%	4.7%	77 (28%)	24 (9%)	16 (6%)	19 (7%)	66 (24%)	Oxygen treatment,	Acute respiratory

			GGT- 33±5 TBil- 9.6±1.13 PT- 14.3±0.33 Albumin- 33.9±1.21 LDH- 321.5±43.45	Albumin- 35% LDH- 42%							Antiviral therapy, Glucocorticoid therapy, Antibiotics, Intravenous immunoglobulin, Interferon inhalation, CRRT, ECMO	distress syndrome and respiratory failure, sepsis, acute cardiac injury, and heart failure were the most common critical complications during exacerbation of covid-19.
Du Rong-Hui[39]	179	21	ALT- 22±4.16 AST- 30±4 GGT- 29±5.91 TBil- 8.9±0.98 PT- 13.7±0.5 Albumin- 33.2±0.95	NA	NA	39 (21.8%)	NA	NA	NA	NA	Oxygen therapy,antibiotics, antiviral drug,glucocorticoids,γ-globulin,mechanical ventilation	Four risk factors, age ≥ 65 years, preexisting concurrent cardiovascular or cerebrovascular diseases, CD3+CD8+ T cells ≤ 75 cell/μL, and cardiac troponin I ≥ 0.05 ng/mL, especially the latter two factors, were

												predictors for mortality of COVID-19 patients.
Lang Wang[40]	339	2	ALT- 27±4.5 AST- 32±3.83 PT- 12.1±0.18 LDH- 301±34.16	NA	28.3%	43 (12.7%)	13 (3.8%)	NA	NA	94 (27.8%)	NA	Rapid disease progress was noted in the dead with a median survival time of 5 days after admission. Dyspnea, lymphocytopenia, comorbidities including cardiovascular disease and chroni obstructive pulmonary disease, and acute respiratory distress syndrome were predictive of poor outcome
TieLong Chen[41]	55	NA	ALT- 41.3±67.75 AST- 63.1±47.75	NA	NA	4	NA	4	4	5	Antiviral (arbidol,	Patients aged 65 and older

			Albumin- 33.3±4.5 LDH- 395±155.5								interferon-alpha inhalation, lopinavir and ritonavir), corticosteroids, gamma globulin, Quinolones and second-generation beta-lactams	had greater initial comorbidities, more severe symptoms, and were more likely to experience multi-organ involvement and death.
Haiying Sun[43]	244	NA	ALT- 24.97±22.93 AST- 36.43±35.01	NA	NA	72	NA	NA	10	NA	Antiviral drugs, glucocorticoid and traditional Chinese medicine	Older age and lower lymphocyte count on admission were associated with death in hospitalized COVID-19 patients. Stringent monitoring and early intervention are needed to reduce mortality in these patients.

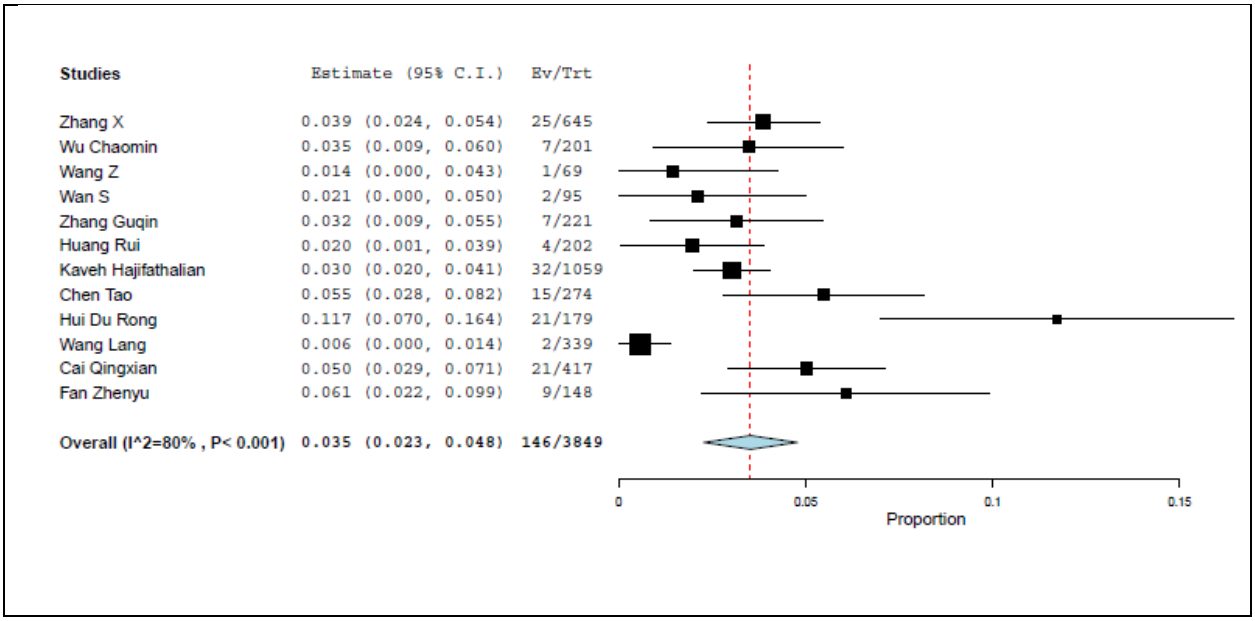
Deng Y[42]	215	NA	ALT- 25.04±22.53 AST- 27.18±27.01	NA	NA	33	NA	NA	NA	NA	Intravenous corticosteroids, intravenous gammaglobulin (IVIG), antiviral drugs,antibiotics, antifungal drugs,and respiratory supports	Non+survivor patients had higher complications such as ARDS, acute cardiac injury, acute kidney injury, shock, and DIC.
Moon	152	21	TBil- 18.81±3.7 PT- 13±0.01 Albumin- 34±9.33	NA	25.7%	NA	NA	NA	NA	NA	Chloroquine/hydroxychloroquine,Lopinovir/ritonavir,Tocilizumab,and Interferon-alpha	Baseline liver disease severity is strongly associated with COVID-19-related morbidity and mortality.
Xiaolong Qi 2	21	21	ALT- 30±5.5 AST- 39.5±7 GGT- 31.25±9.75 TBil- 15.52±2.97 PT- 13±0.7 Albumin- 33.47±2.92 LDH- 319.75±47.75	NA	4.8%	2	NA	NA	NA	NA	Antiviral treatment, Antibiotic treatment, Glucocorticoids, Intravenous immunoglobulin	The cause of death in most patients was respiratory failure rather than progression of liver disease (ie, development of ACLF).

Wang Yijin	156	NA	ALT- 31.71±29.13 AST- 32.82±29.31 GGT- 31.43±29.22 TBil- 9.91±9.10 PT- 11.92±10.87 Albumin- 36.94±34.44 LDH- 243.02±219.33	NA	41%	18	5	NA	NA	NA	PEG-Interferon, Lopinavir/Ritonavir, Antibiotic treatment Corticosteroid Intravenous immunoglobulin therapy	Hepatic impairment in COVID-19 patients is caused by SARS-CoV-2 infection of the liver

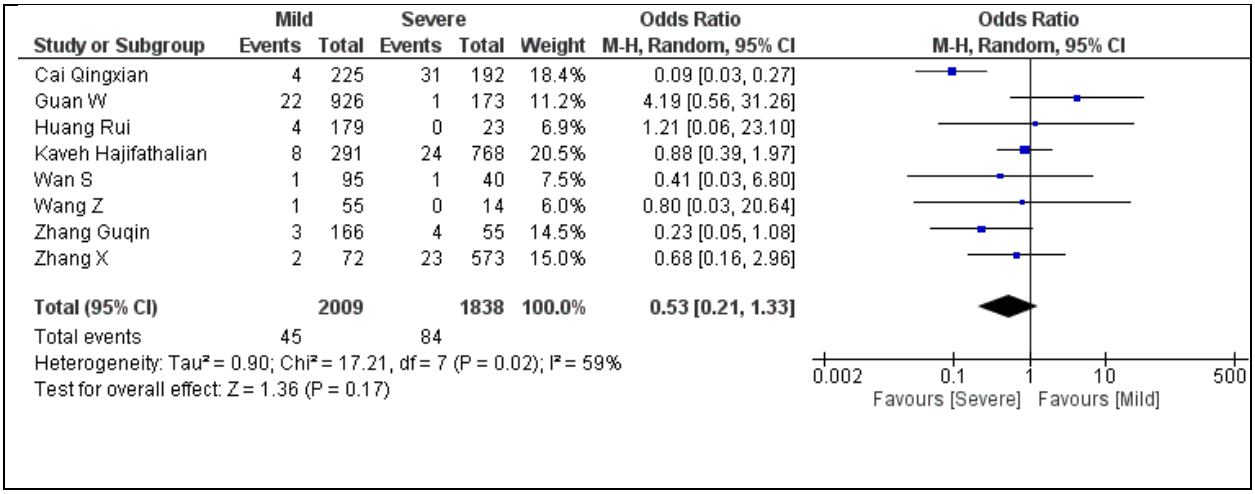
ABBREVIATIONS: ALP- Alkaline phosphatase; ALT- Alanine aminotransferase; AST- Aspartate aminotransferase; GGT- Gamma-glutamyltransferase; PT- Prothrombin time; TBil- Total bilirubin; LDH- Lactate dehydrogenase; ACLF- Acute-on-chronic liver failure

Supplementary figure 1: Forest plot for COVID-19 patients with underlying chronic liver disease (CLD) in COVID-19 patients

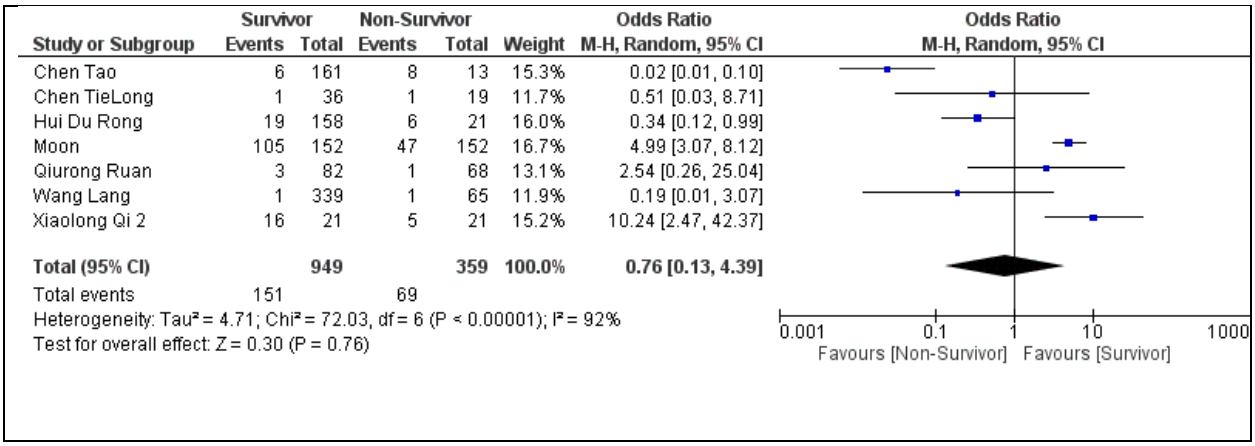
Forest plot for pooled estimate of the prevalence of chronic liver disease in COVID-19 patients



Forest plot for prevalence of chronic liver disease in COVID-19 patients between mild and severe group

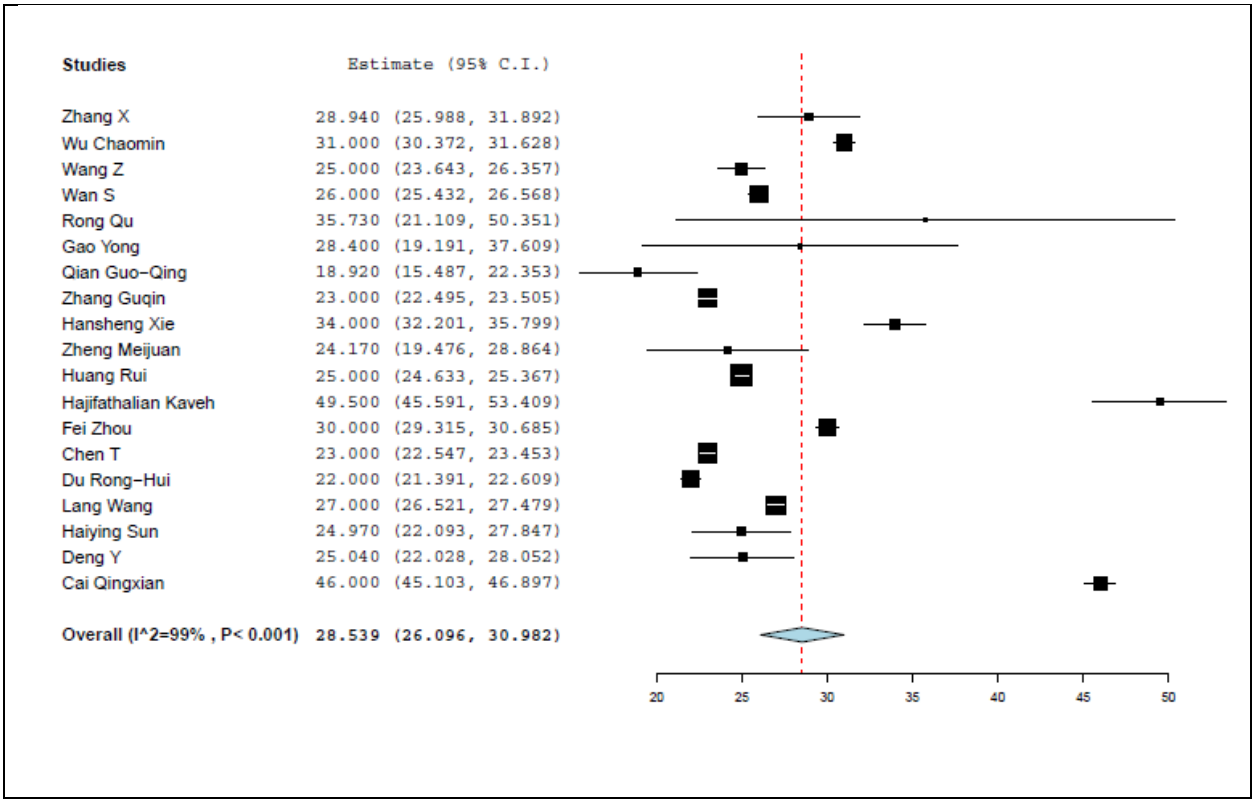


Forest plot for prevalence of chronic liver disease in COVID-19 patients between survivor and non-survivor group

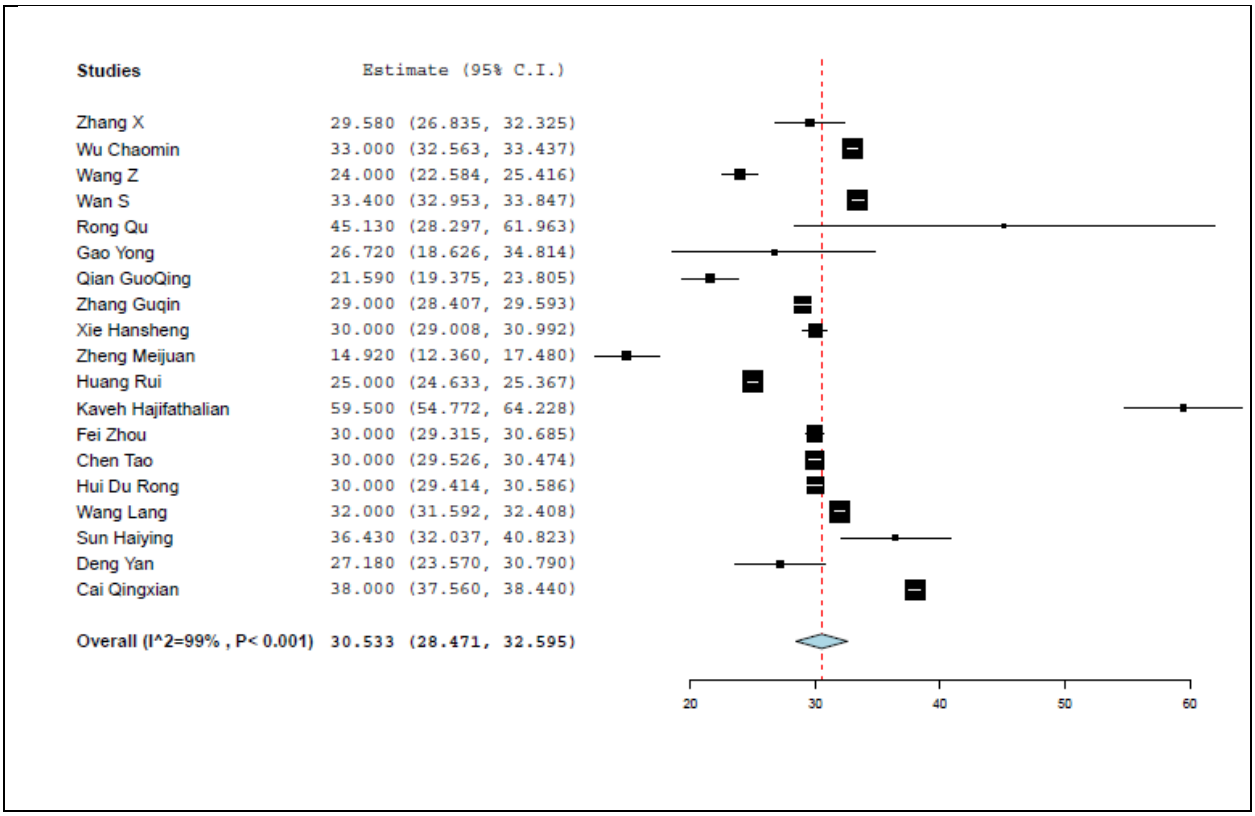


Supplementary figure 2: Forest plot for pooled results of liver function related indexes

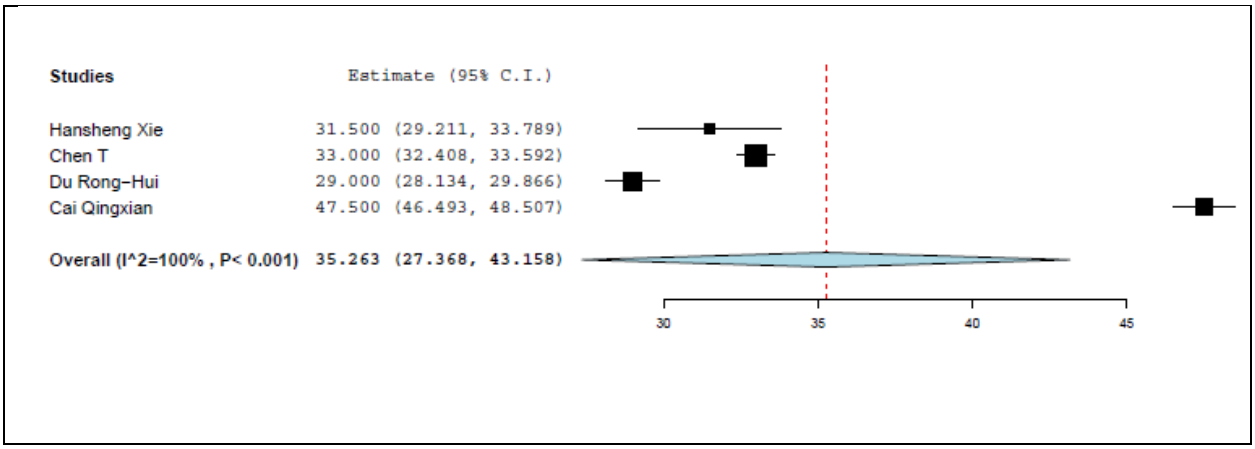
Forest plot for pooled result ALT



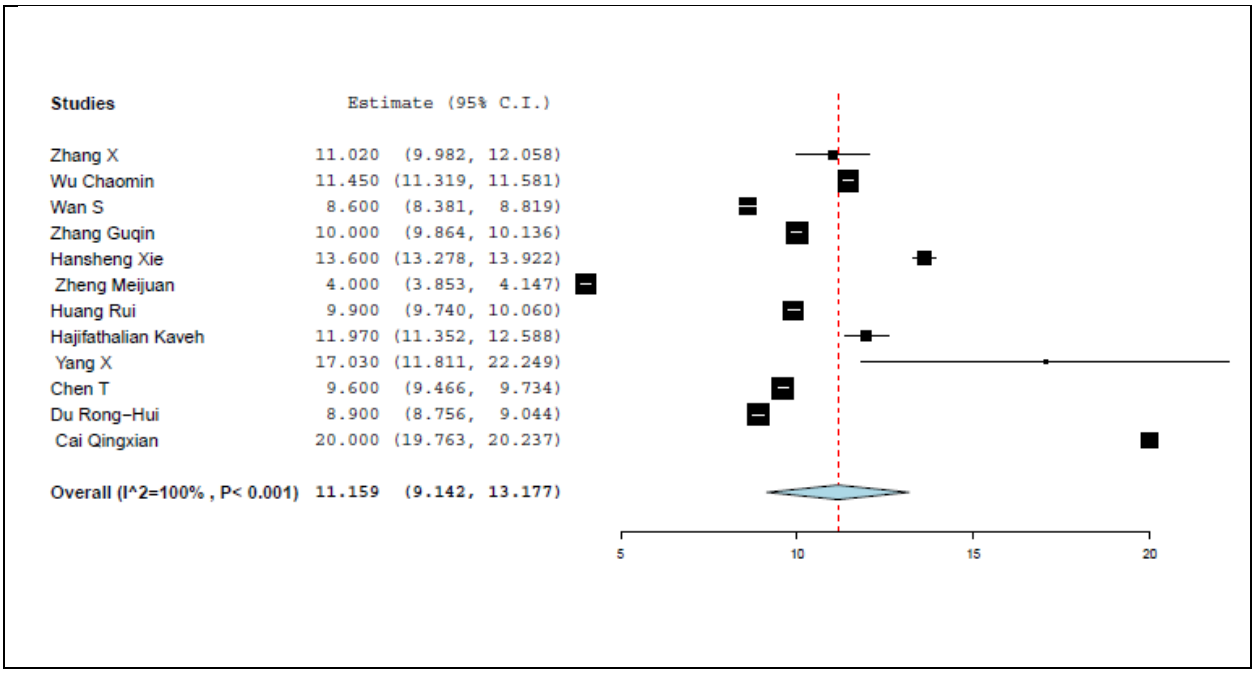
Forest plot for pooled result of AST



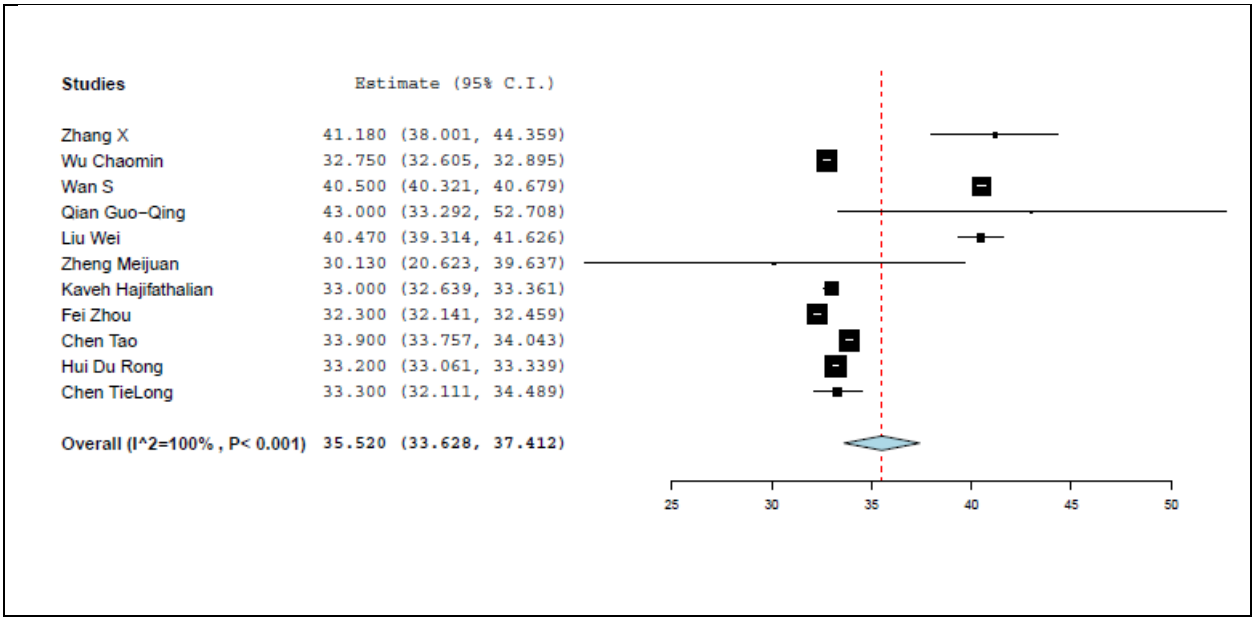
Forest plot for pooled result of GGT



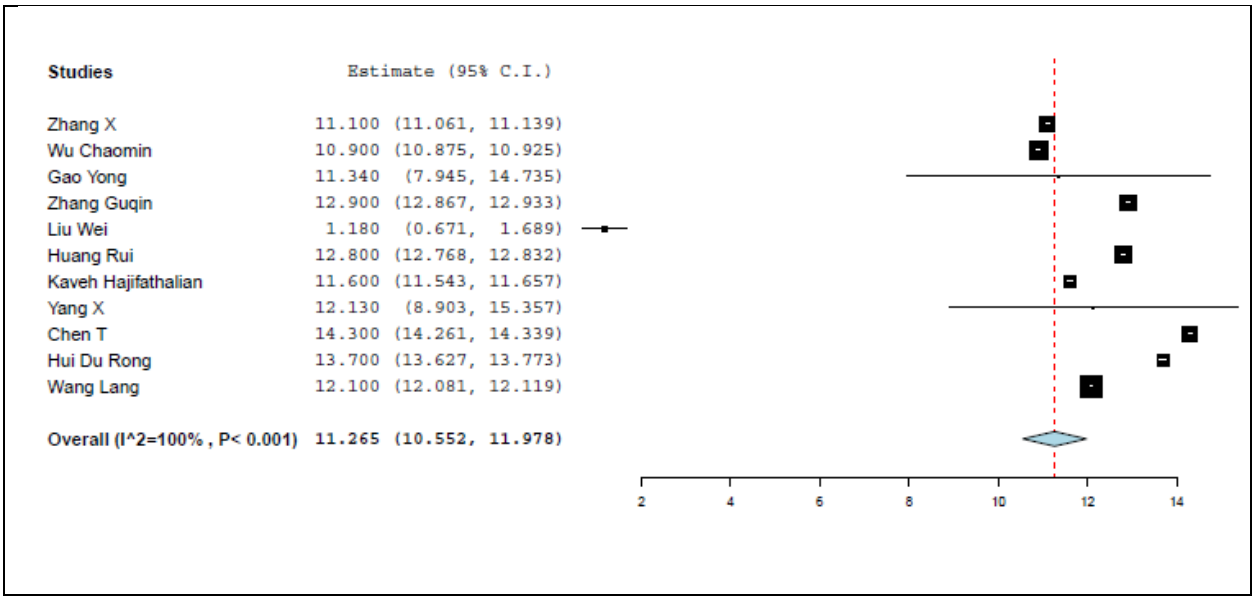
Forest plot for pooled result of TBil



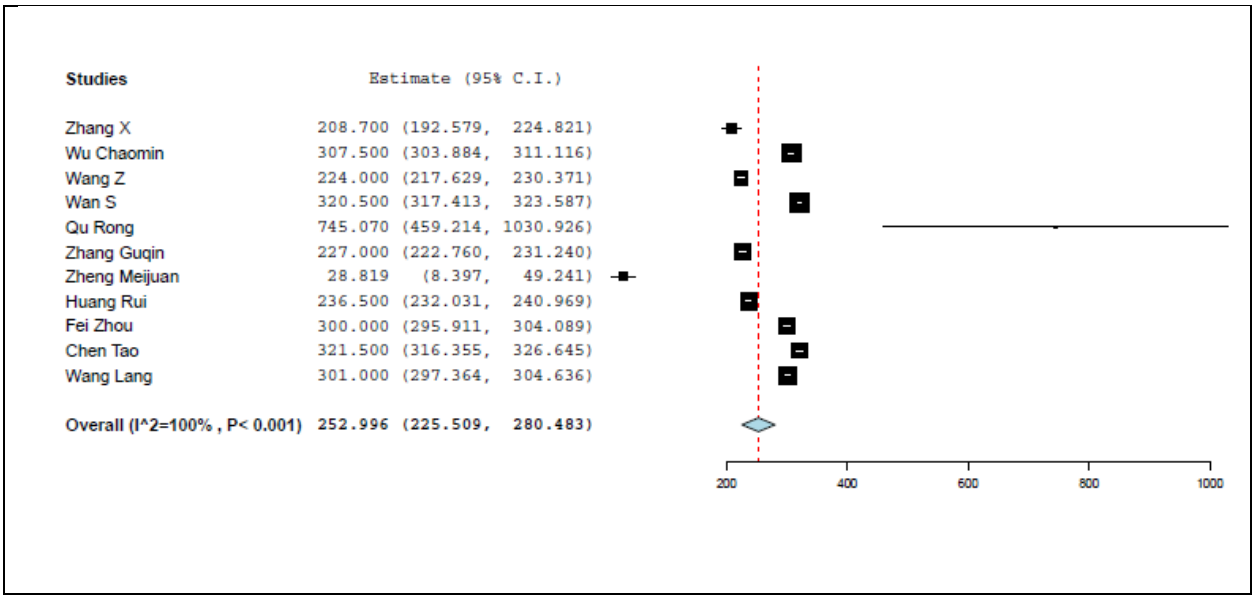
Forest plot for pooled result of Albumin



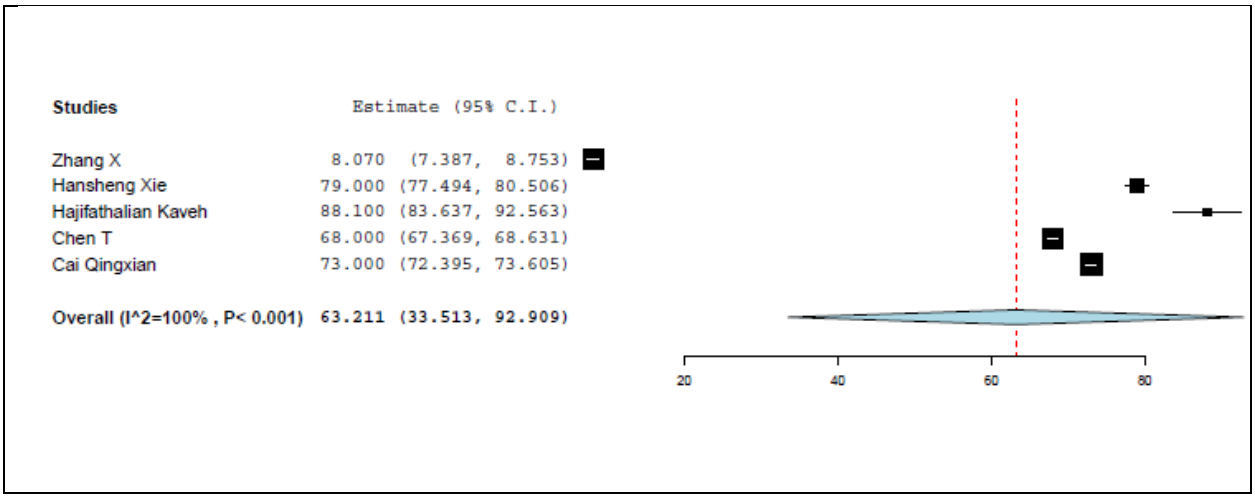
Forest plot for pooled result of PT



Forest plot for pooled result of LDH

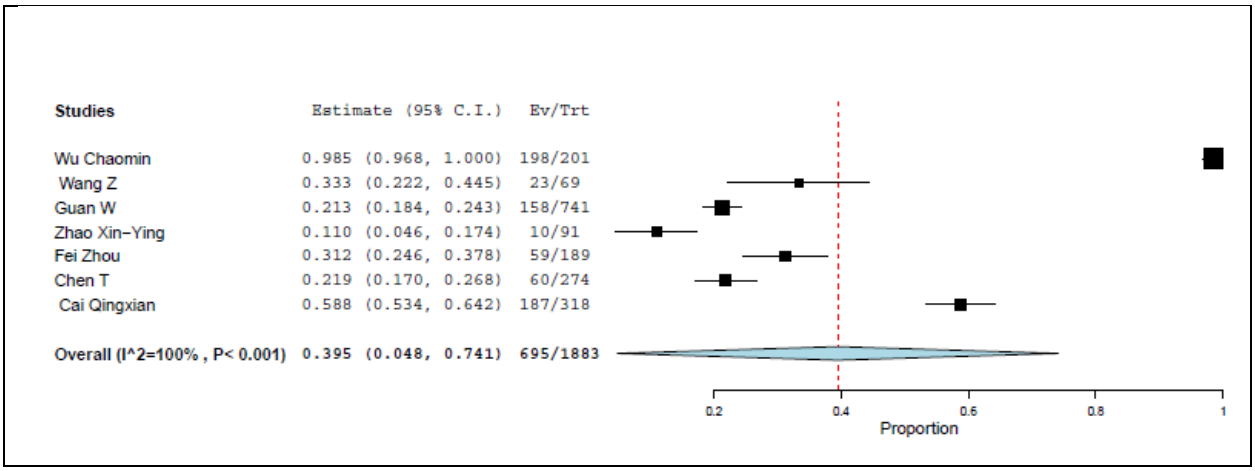


Forest plot for pooled result of ALP

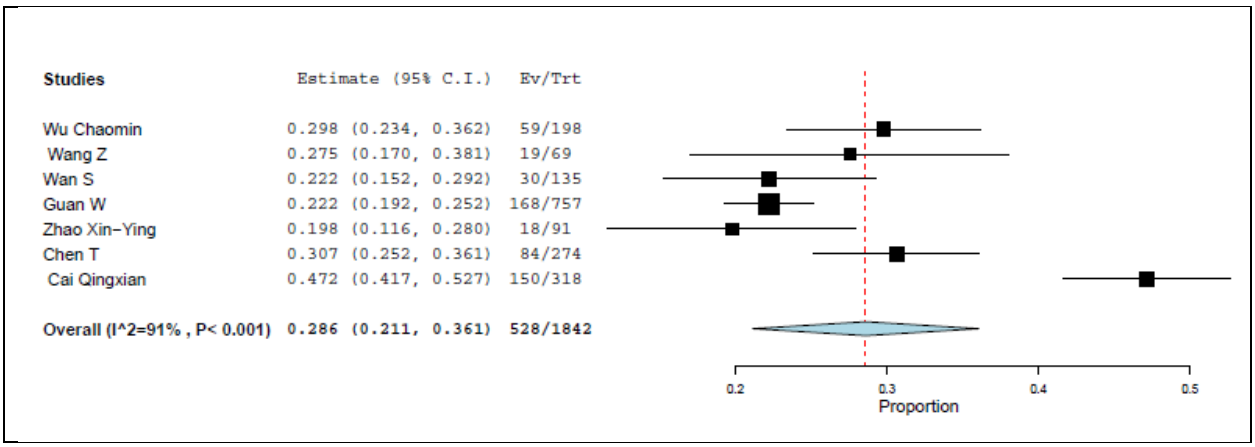


Supplementary figure 3: Forest plot for pooled prevalence of abnormal liver function related indexes

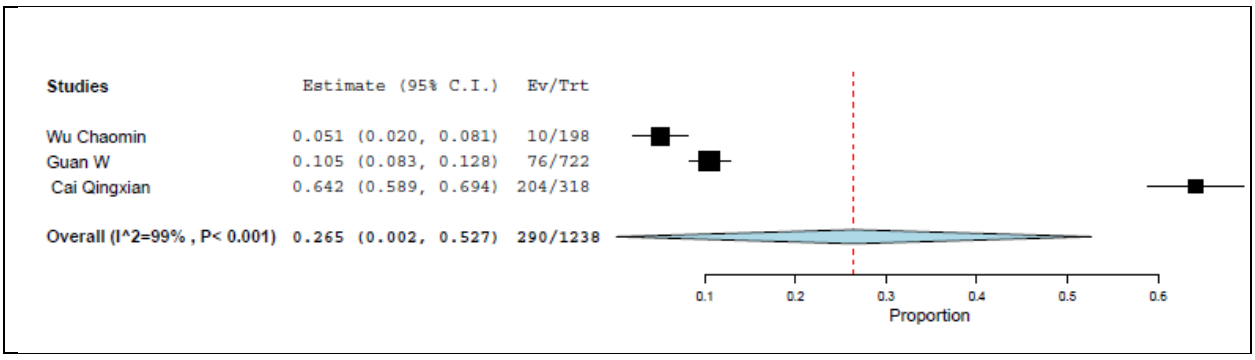
Forest plot for pooled prevalence of increased ALT



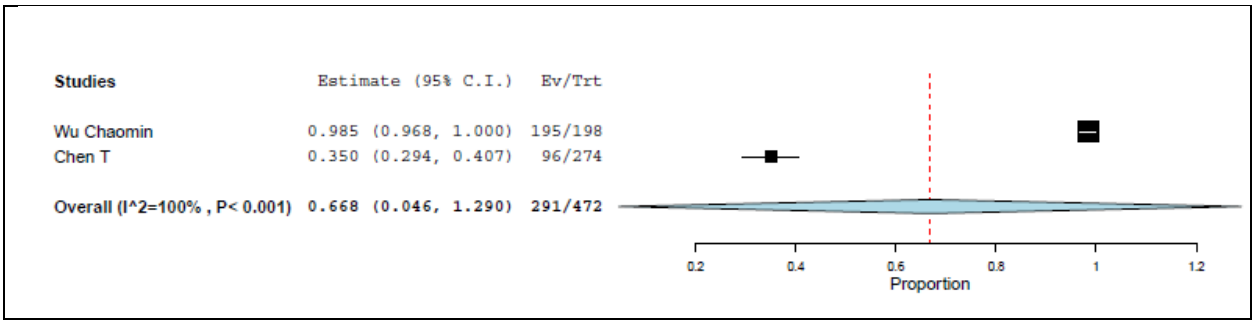
Forest plot for pooled prevalence of increased AST



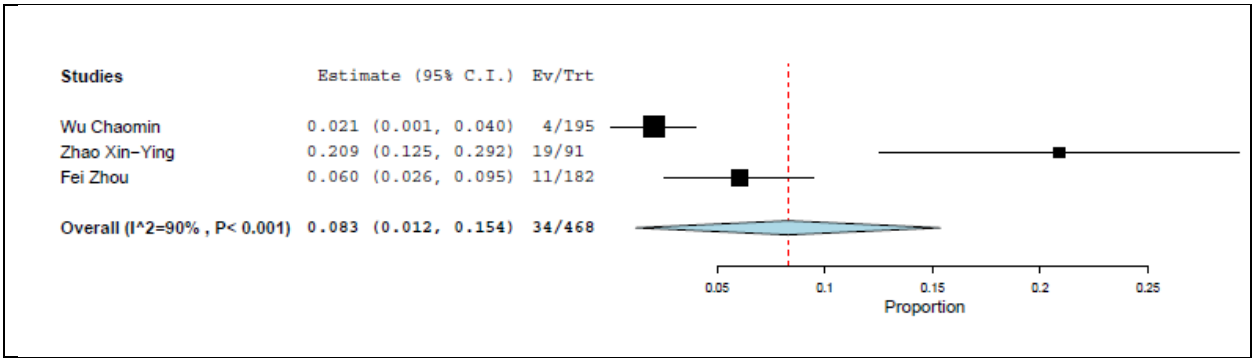
Forest plot for pooled prevalence of increased TBil



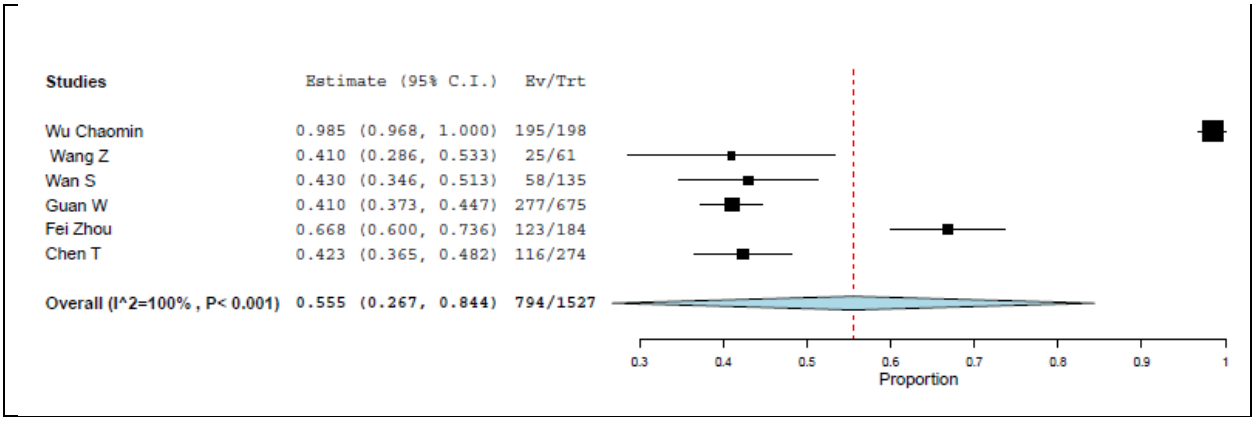
Forest plot for pooled prevalence of decreased Albumin



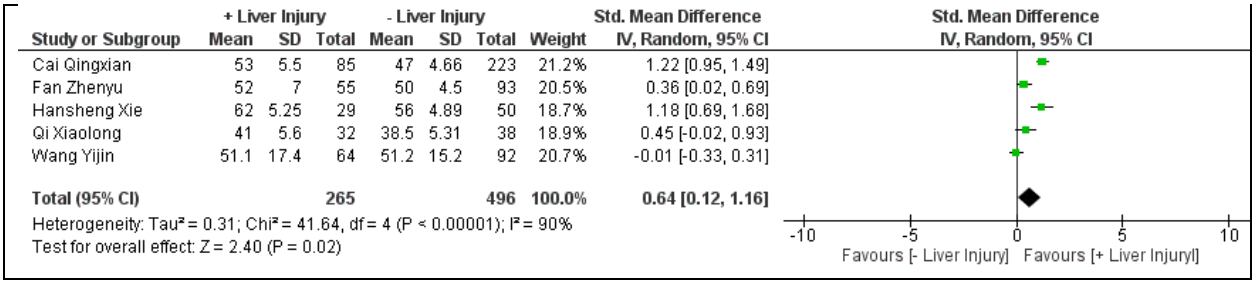
Forest plot for pooled prevalence of prolonged PT



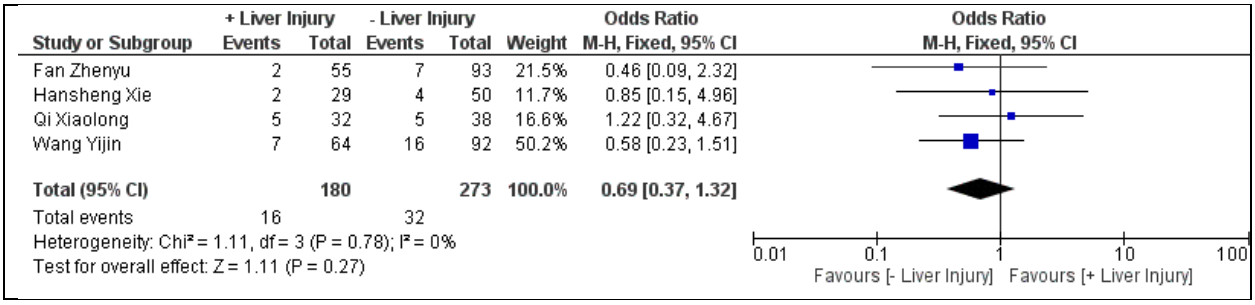
Forest plot for pooled prevalence of increased LDH



Supplementary figure 4: Forest plot for age between patients with liver injury and patients without liver injury

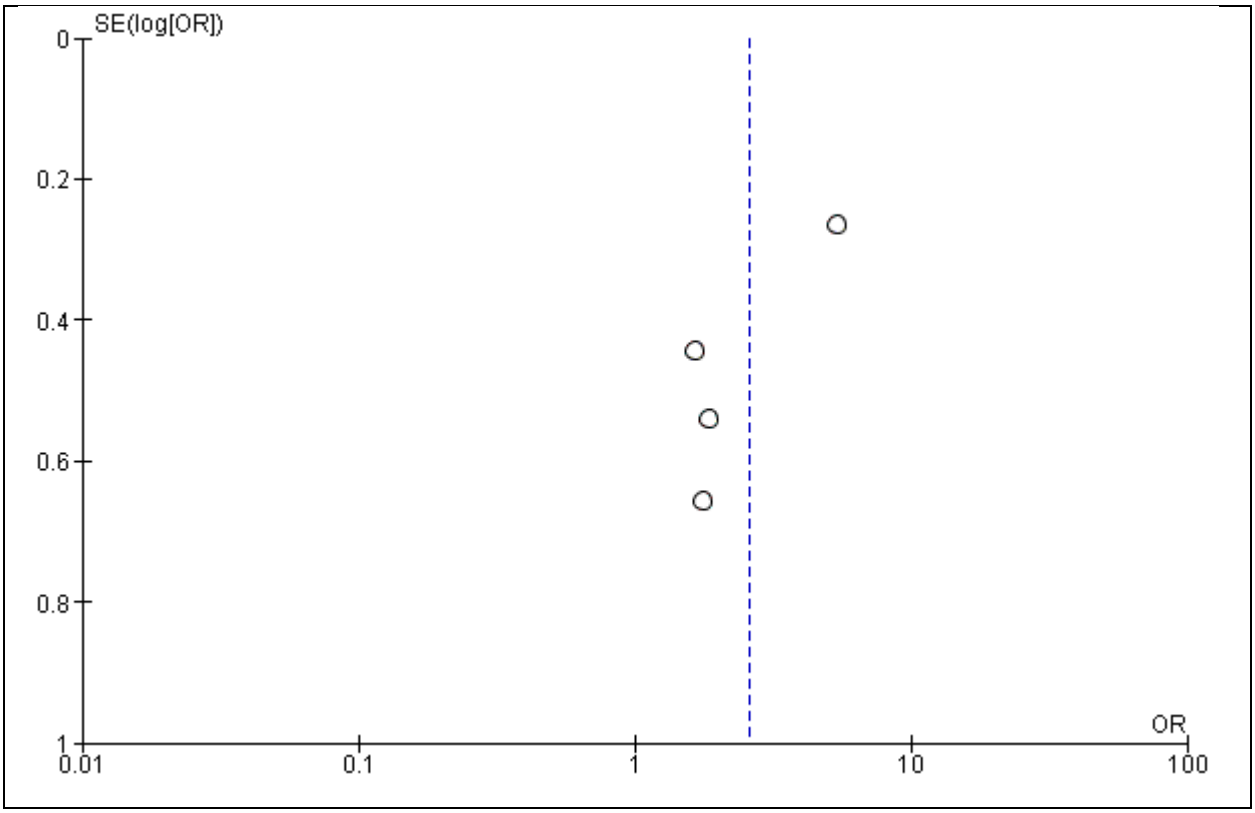


Supplementary figure 5: Forest plot for association between liver injury and gastrointestinal symptoms

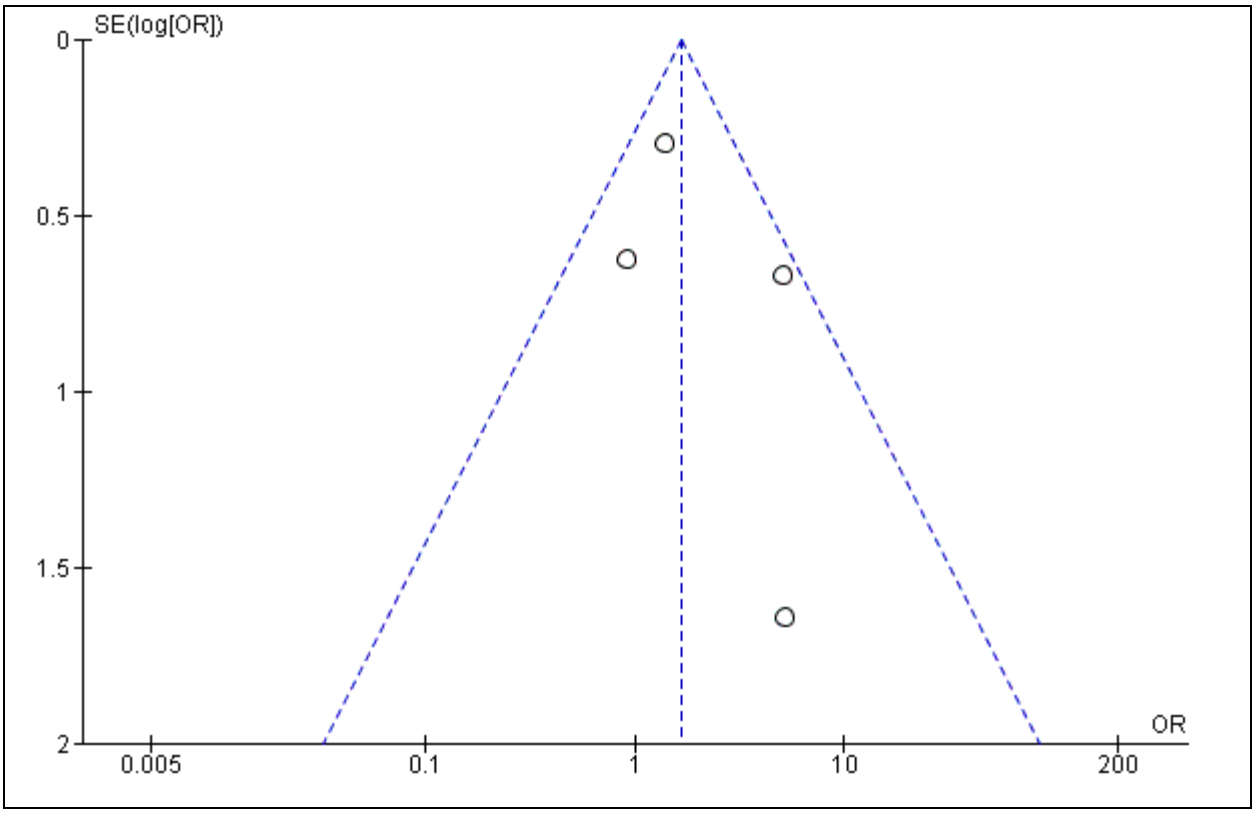


Supplementary figure 6: Funnel Plot for Publication bias

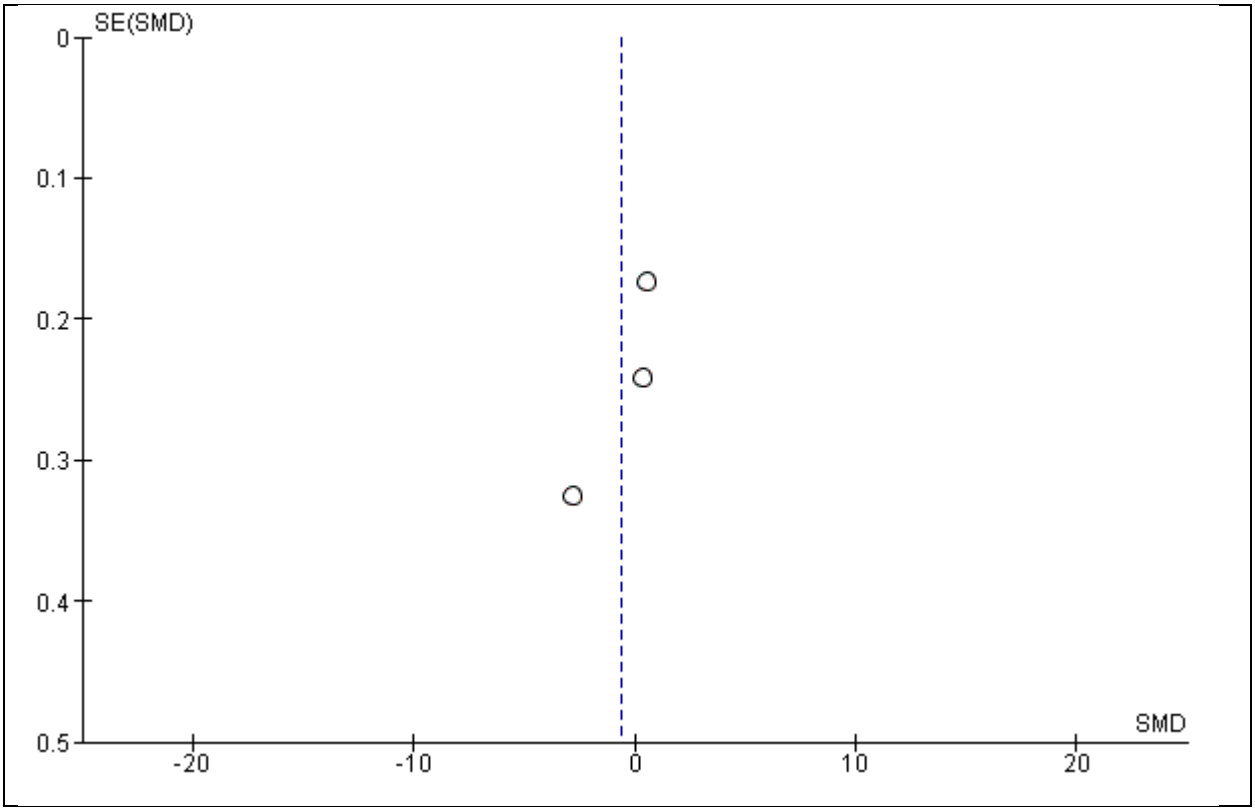
A. Funnel Plot for severity of COVID-19 patients stratified according to liver injury



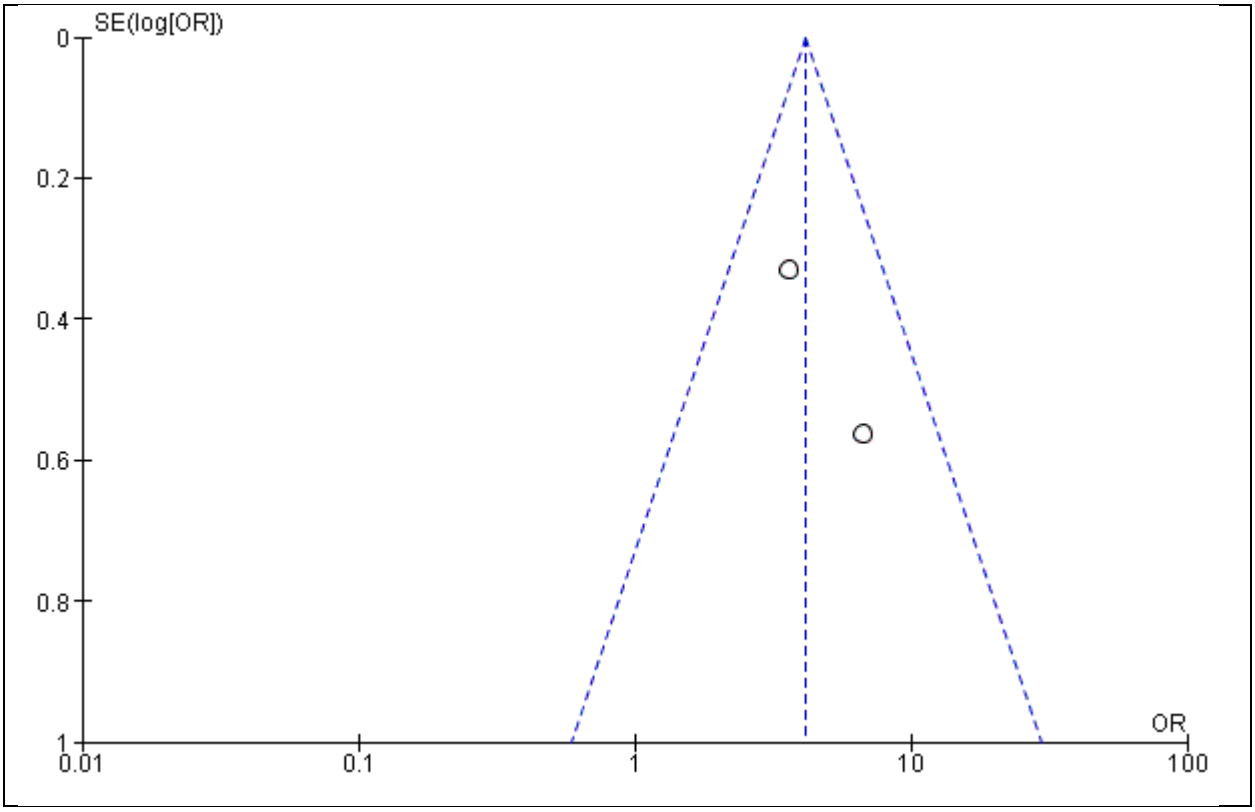
B. Funnel Plot for mortality of COVID-19 patients stratified according to liver injury



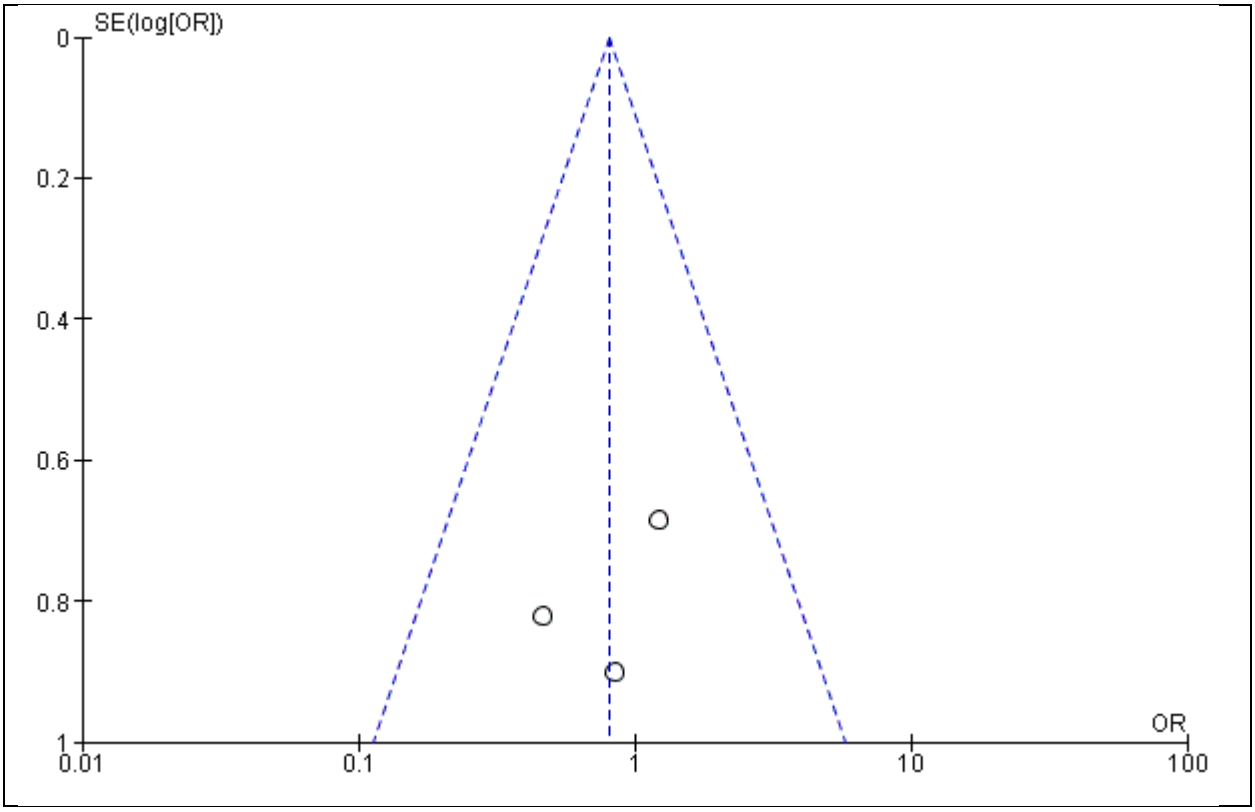
C. Funnel Plot for length of hospital stay of COVID-19 patients stratified according to liver injury



D. Funnel Plot for for the use of Lopinavir/ritonavir stratified according to liver injury



E. Funnel Plot for gastrointestinal symptoms stratified according to liver injury



Supplementary Table 4. Subgroup analysis of liver function and Liver injury in COVID-19.

4a. Pooled results of liver function related indexes in COVID-19 patients.

Factors	Pooled results
ALT level from 19 studies(1, 2, 10, 13, 14, 16, 19-26, 31-33, 35, 36)	28.53 U/L (95% CI: 26.90–30.98; I^2= 99%)
AST level from 17 studies(1, 2, 13, 14, 16, 19-25, 31-33, 35, 36)	30.53 U/L (95% CI: 28.47–32.59; I^2= 99%)
GGT level from 4 studies(13, 24, 31, 32)	35.27 U/L (95% CI: 27.37–43.16; I^2= 100%)
TBil level from 12 studies(1, 2, 13, 14, 19, 23, 24, 29, 31, 32)	11.16 μmol/L (95% CI: 9.14–13.18; I^2= 100%)
Albumin from 11 studies(1-3, 14, 15, 19, 22, 25, 31, 32, 34)	35.52 g/L (95% CI: 33.63–37.41; I^2= 100%)
PT from 11 studies(1, 2, 14, 15, 21, 23, 26, 29, 31-33)	11.27s (95% CI: 10.55–11.98; I^2= 100%)
LDH level from 11 studies(1-3, 16, 19, 20, 23, 25, 26, 31, 33)	252.99 U/L (95% CI: 225.51–280.48; I^2= 100%)
ALP level from 5 studies(1, 13, 14, 24, 31)	63.21 U/L (95% CI: 33.51–92.91; I^2= 100%)

4b. Liver Function related indexes based on the severity (Mild versus Severe) in COVID-19 patients.

Factors	Arms	Patients (N)	SMD	95%CI	I2(%)	P-value
ALT(1, 2, 11, 13-16, 19-26)	Mild	1528	-1.43	2.29 to -0.57	98%	0.001
	Severe	1743				
AST(1, 2, 11, 13-16, 19-25)	Mild	1350	-4.43	-2.29 to -0.57	98%	0.001
	Severe	1709				
GGT(13, 24)	Mild	283	-4.53	-5.36 to -3.72	69%	< 0.00001
	Severe	114				
TBil(1, 2, 11, 13, 14, 19, 23-26)	Mild	1270	-0.76	-1.29 to -0.22	96%	0.005
	Severe	1679				
Albumin(1, 2, 11, 14, 15, 19, 22, 25)	Mild	806	3.12	1.92 to 4.32	98%	< 0.00001
	Severe	1501				
PT(2, 11, 19, 21, 23, 25, 26)	Mild	651	-1.35	-3.27 to 0.58	99%	0.17
	Severe	249				
ALP(13, 14, 24)	Mild	575	-0.44	-1.67 to 0.79	98%	0.48
	Severe	881				
LDH(1, 2, 11, 16, 19, 20, 23, 25, 26)	Mild	777	-4.46	-5.98 to -2.93	98%	< 0.00001
	Severe	815				

4c. Liver function related indexes based on the outcome (Survivor Versus Non-Survivor) in COVID-19 patients.

Factors	Arms	Patients (N)	SMD	95%CI	I2(%)	P-value
ALT(3, 30-36)	Survivor	1087	-0.73	-1.38 to -0.08	97%	0.03
	Non-Survivor	570				
AST(30-36)	Survivor	950	-3.02	-4.55 to -1.49	99%	0.0001
	Non-Survivor	516				
GGT(31, 32)	Survivor	319	-0.74	-4.10 to 2.63	99%	0.67
	Non-Survivor	134				
TBil(29-32)	Survivor	421	-1.54	-3.23 to -0.15	98%	0.07
	Non-Survivor	234				
Albumin(3, 30-32, 34)	Survivor	574	2.47	0.07 to 4.88	88%	0.04
	Non-Survivor	275				
PT(3, 29, 31-33)	Survivor	750	-2.32	-3.95 to -0.69	99%	0.005
	Non-Survivor	285				
LDH(3, 30, 31, 33, 34)	Survivor	690	-4.84	-8.20 to -1.48	99%	0.005
	Non-Survivor	319				

4d. Pooled prevalence of abnormal liver function related indexes in COVID-19 patients.

Factors	Pooled results
ALT level from 7 studies(2, 3, 8, 13, 16, 28, 31)	39.5% (95% CI: 4.8–74.1; I^2= 100%)
AST level from 7 studies(2, 8, 13, 16, 19, 28, 31)	28.6% (95% CI: 21.1–36.1; I^2= 91%)
TBil level from 3 studies(2, 8, 13)	26.5% (95% CI: 0.2–52.7; I^2= 99%)
Albumin level from 2 studies(2, 31)	66.8% (95% CI: 4.6–129; I^2= 100%)
PT from 3 studies(2, 3, 28)	8.3% (95% CI: 1.2–15.4; I^2= 90%)
LDH level from 6 studies(2, 3, 8, 16, 19, 31)	55.5% (95% CI: 26.7–84.4; I^2= 100%)

4e. Prevalence of abnormal liver function related indexes based on the severity (Mild versus Severe) in COVID-19 patients.

Factors	Arms	Patients (N)	ORs	95%CI	I2(%)	P-value
ALT(8, 13, 16, 28)	Mild	259	0.42	0.22 to 0.81	63%	0.009
	Severe	119				
AST(8, 11, 13, 16, 19, 28)	Mild	236	0.31	0.24 to 0.41	44%	< 0.00001
	Severe	115				
TBil(8, 13)	Mild	199	0.58	0.39 to 0.87	0%	0.008
	Severe	81				
LDH(8, 16, 19)	Mild	248	0.21	0.08 to 0.56	76%	0.002
	Severe	112				

4f. Prevalence of abnormal liver function related indexes based on the outcome (Survivor Versus Non-Survivor) in COVID-19 patients

Factors	Arms	Patients (N)	ORs	95%CI	I2(%)	P-value
ALT(3, 31)	Survivor	63	0.49	0.32 to 0.06	47%	0.001
	Non-Survivor	56				
LDH(3, 31)	Survivor	93	0.03	0.02 to 0.06	0%	< 0.00001
	Non-Survivor	146				

4g. Drugs used in the treatment of COVID-19 patients

Factors	Arms	Patients (N)	ORs	95%CI	I2(%)	P-value
Lopinavir/ritonavir(10, 13, 37)	With liver injury	142	2.64	0.83 to 8.39	85%	0.10
	Without liver injury	282				
Oseltamivir(10, 13)	With liver injury	37	1.17	0.32 to 4.27	82%	0.82
	Without liver injury	72				
Antibiotics(10, 13, 37)	With liver injury	85	1.87	0.26 to 13.45	95%	0.53
	Without liver injury	85				
Nonsteroidal anti-inflammatory drugs (NSAIDs)(10, 13)	With liver injury	60	1.27	0.06 to 26.89	94%	0.88
	Without liver injury	89				

3e. Prognosis of COVID- 19 patients with liver injury

Factors	Arms	Patients (N)	ORs/SMD	95%CI	I2(%)	P-value
Severity	With liver	130	OR: 2.57	1.25 to 5.26	62%	0.01

	injury					
	Without liver injury	572				
Mortality	With liver injury	42	OR: 1.66	1.04 to 2.64	35%	0.03
	Without liver injury	169				
Length of Hospital Stay	With liver injury	116	SMD: -0.61	2.37 to 1.15	98%	0.50
	Without liver injury	181				

ABBREVIATIONS: ALP- Alkaline phosphatase; ALT- Alanine aminotransferase; AST- Aspartate aminotransferase; GGT- Gamma-glutamyltransferase; PT- Prothrombin time; TBil- Total bilirubin;LDH- Lactate dehydrogenase; ORs- Odds ratios; SMD- Standardised mean difference