

Table S1. Characteristics of studies included in the meta-analysis

Study	Study location	Total number of patients [#]	Diagnosis	Demographics of patients with autoimmune diseases							COVID-19		Demographics of patients with autoimmune diseases and COVID-19							COVID-19 outcomes ^{##}			
				Mean/Median Age (y/o)	Male (%)	Comorbidities (%)	GCs (%)	csDMARDs (%)	b/tsDMARDs monotherapy (%)	b/tsDMARDs +csDMARDs combination therapy (%)	Number of COVID-19 (n)	Number of Confirmed COVID-19 with positive PCR (n)	Mean/Median Age (y/o)	Male (%)	Comorbidities (%)	GCs (%)	csDMARDs (%)	b/tsDMARDs monotherapy (%)	b/tsDMARDs +csDMARDs combination therapy (%)	Hospitalization (n)	ICU admission (n)	Ventilation (n)	Death (n)
Rigamonti et al ¹	Italy	138	AHD	63.5	8.7	NA	NA	NA	NA	NA	5	5	51.8	20.0	60.0	100.0	60.0	0.0	0.0	2	NA	NA	0
Gerussi et al ²	Italy	NA	AHD	NA	NA	NA	NA	NA	NA	NA	10	10	56.4	30.0	NA	60.0	30.0	0.0	0.0	6	NA	3	1
Average per study			AHD	63.5	8.7	NA	NA	NA	NA	NA			54.1	25.0	60.0	80.0	45.0	0.0	0.0				
Allocca et al ³	France/Italy	6000	IBD	NA	NA	NA	NA	NA	NA	NA	15	15	39.1	26.7	60.0	13.3	20.0	60.0	13.3	5	0	NA	0
Norsa et al ⁴	Italy	522	IBD	46	58.0	NA	3.1	19.2	15.7	NA	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Taxonera et al ⁵	Spain	1918	IBD	NA	NA	NA	NA	NA	NA	NA	12	12	52.3	25.0	41.7	0.0	50.0	8.3	33.3	8	1	1	2
An et al ⁶	China	318	IBD	39.2	NA	15.4	NA	NA	NA	NA	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Grassia et al ⁷	Italy	251	IBD	NA	NA	NA	NA	NA	16.3	NA	1	NA	NA	NA	NA	NA	100.0	0.0	0.0	NA	NA	NA	NA
Gubatan et al ⁸	USA	168	IBD	47.7	47.6	NA	20.2	8.9	28.6	NA	5	5	70.6	40.0	NA	20.0	20.0	20.0	NA	1	1	1	1
Singh et al ⁹	USA	196403	IBD	NA	NA	NA	NA	NA	NA	NA	232	232	51.2	36.6	NA	47.8	14.7	15.9	NA	56	NA	NA	NA
Khan et al ¹⁰	USA	37857	IBD	NA	NA	NA	NA	NA	NA	NA	36	NA	63	NA	NA	NA	5.6	8.3	NA	NA	NA	NA	NA
Mak et al ¹¹	Hong Kong/Taiwan	5508	IBD	46.9	67.8	NA	30.6	43.4	19.2	NA	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Marafini et al ¹²	Italy	672	IBD	46	53.7	NA	4.3	6.4	35.9	NA	3	3	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	1
Turner et al ¹³	China/South Korea	272	IBD	NA	NA	NA	NA	NA	NA	NA	8	6	16.1	62.5	NA	12.5	50.0	37.5	25.0	0	0	0	0
Scalaferrri et al ¹⁴	Italy	1451	IBD	44	58.0	NA	NA	NA	85.1	NA	5	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bodini et al ¹⁵	Italy	48	IBD	NA	NA	NA	NA	NA	NA	NA	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Martinelli et al ¹⁶	Italy	180	IBD	15.3	53.3	NA	5.0	33.3	12.2	11.1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lukin et al ¹⁷	USA	1386	IBD	NA	NA	NA	NA	NA	NA	NA	80	NA	48.3	56.3	NA	12.5	NA	47.5	NA	17	3	2	0
Bezzio et al ¹⁸	Italy	NA	IBD	NA	NA	NA	NA	NA	NA	NA	79	49	47	55.7	38.0	11.4	NA	59.5	NA	22	11	11	6
Rodriguez et al ¹⁹	Spain	NA	IBD	NA	NA	NA	NA	NA	NA	NA	40	40	58.5	60.0	62.5	10.0	32.5	17.5	5.0	21	0	0	2
Brenner et al ²⁰	International registry	NA	IBD	NA	NA	NA	NA	NA	NA	NA	525	525	42.9	52.6	33.1	7.0	NA	55.0	9.9	161	24	21	16
Axelrad et al ²¹	USA	NA	IBD	NA	NA	NA	NA	NA	NA	NA	83	45	35	53.0	NA	7.2	7.2	74.7	NA	5	1	1	1
Average per study			IBD	40.7	56.4	15.4	12.6	22.2	30.4	11.1			47.6	46.8	47.1	14.2	33.3	33.7	14.4				
Haberman et al ²²	USA	NA	IMID	NA	NA	NA	NA	NA	NA	NA	86	59	46	43.0	NA	9.3	32.6	72.1	NA	14	1	1	1
Allocca et al ²³	Italy	NA	IMID	NA	NA	NA	NA	NA	NA	NA	41	25	48	41.5	31.7	17.1	24.4	65.9	NA	14	0	10	1
Average per study			IMID	NA	NA	NA	NA	NA	NA	NA			47.0	42.2	31.7	13.2	28.5	69.0	NA				
Damiani et al ²⁴	Italy	1193	Psoriasis/AISD	55	68.0	NA	0.0	0.0	NA	NA	22	22	59	72.7	40.9	0.0	0.0	100.0	0.0	5	0	NA	0
Fougerousse et al ²⁵	France	1418	Psoriasis/AISD	NA	56.2	35.1	NA	23.0	70.9	2.5	12	12	NA	NA	NA	NA	NA	66.7	8.3	5	2	NA	0
Gisoni et al ²⁶	Italy	5206	Psoriasis/AISD	53.2	54.2	NA	NA	NA	100.0	NA	6	NA	56.3	50.0	50.0	NA	NA	100.0	NA	4	1	0	0
Di Lernia et al ²⁷	Italy	130	Psoriasis/AISD	48.4	54.6	NA	NA	NA	NA	NA	2	2	52	0.0	50.0	NA	100.0	NA	NA	0	0	0	0
Galluzzo et al ²⁸	Italy	119	Psoriasis/AISD	NA	NA	NA	NA	NA	NA	NA	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Georgakopoulos et al ²⁹	Canada	2095	Psoriasis/AISD	NA	NA	NA	NA	NA	NA	NA	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Pirro et al ³⁰	Italy	226	Psoriasis/AISD	53	61.1	NA	NA	NA	100.0	NA	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carugno et al ³¹	Italy	159	Psoriasis/AISD	51.5	71.7	NA	NA	NA	100.0	NA	29	0	46.6	62.1	13.8	NA	NA	NA	NA	1	NA	NA	NA
Kuang et al ³²	China	926	Psoriasis/AISD	33.1	63.1	NA	NA	NA	NA	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Strippoli et al ³³	Italy	139	Psoriasis/AISD	NA	NA	NA	NA	NA	NA	NA	5	3	51.8	40.0	60.0	NA	NA	100.0	NA	1	NA	0	0
Brunasso et al ³⁴	Italy	183	Psoriasis/AISD	48.3	51.9	NA	7.1	31.7	36.1	NA	3	NA	NA	NA	NA	NA	33.3	66.7	NA	NA	NA	NA	1
Magnano et al ³⁵	Italy	720	Psoriasis/AISD	NA	NA	NA	NA	NA	NA	NA	9	9	53.9	55.6	55.6	NA	NA	100.0	NA	1	1	NA	0
Balestri et al ³⁶	Italy	43	Psoriasis/AISD	NA	NA	NA	NA	NA	NA	NA	1	1	65	0.0	0.0	0.0	100.0	0.0	0.0	0	0	0	0
Di Altobrando et al ³⁷	Italy	83	Psoriasis/AISD	58.6	36.1	NA	NA	NA	NA	NA	1	1	53	100.0	NA	100.0	100.0	0.0	0.0	0	0	0	0
Kutlu et al ^{1*} ³⁸	Turkey	93	Psoriasis/AISD	NA	NA	NA	NA	NA	NA	NA	4	NA	59	50.0	NA	NA	50.0	NA	NA	1	NA	NA	0
Brownstone et al ³⁹	USA	NA	Psoriasis/AISD	NA	NA	NA	NA	NA	NA	NA	2	2	35	NA	NA	NA	NA	100.0	NA	0	0	0	0
Conti et al ⁴⁰	Italy	NA	Psoriasis/AISD	NA	NA	NA	NA	NA	NA	NA	2	2	64	100.0	100.0	0.0	0.0	100.0	0.0	1	1	NA	0
Average per study			Psoriasis/AISD	50.1	57.4	35.1	3.6	18.2	81.4	2.5			54.1	53.0	46.3	25.0	54.8	73.3	1.7				
Michelena et al ⁴¹	Spain	959	RD	NA	NA	NA	NA	NA	NA	NA	11	11	46.2	54.5	45.5	45.5	45.5	45.5	45.5	6	1	NA	0
Quartuccio et al ⁴²	Italy	1051	RD	58.4	33.1	NA	13.9	40.6	86.4	NA	4	4	60.3	50.0	100.0	50.0	50.0	50.0	50.0	3	0	0	0
Conticini et al ⁴³	Italy	859	RD	NA	NA	NA	NA	NA	NA	NA	2	2	69	0.0	50.0	0.0	0.0	100.0	0.0	1	0	0	0
Jovani et al ⁴⁴	Spain	1037	RD	NA	NA	NA	NA	NA	NA	NA	3	NA	65	33.3	66.7	0.0	33.3	66.7	33.3	3	0	0	0
Favalli et al ¹ ⁴⁵	Italy	530	RD	50.1	29.8	NA	NA	NA	100.0	NA	3	3	55	66.7	NA	0.0	0.0	100.0	0.0	1	0	0	0
Monti et al ⁴⁶	Italy	320	RD	55	31.9	NA	NA	NA	100.0	NA	8	4	57	12.5	100.0	25.0	100.0	100.0	NA	1	0	0	0
Santos-Moreno et al ⁴⁷	USA	3503	RD	NA	17.8	NA	NA	NA	NA	NA	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Michaud et al ⁴⁸	USA	530	RD	65	15.7	NA	18.1	52.6	46.0	NA	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Favalli et al ³ ⁴⁹	Italy	955	RD	52.8	32.7	NA	28.3	52.7	97.1	NA	6	6	NA	NA	66.7	0.0	66.7	33.3	66.7	3	0	0	0
Zhong et al ⁵⁰	China	6228	RD	45.9	13.0	NA	19.2	42.2	1.5	NA	27	20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cuceoglu et al ⁵¹	Turkey	173	RD	13.3	53.2	NA	NA	20.8	100.0	NA	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mukusheva et al ⁵²	Kazakhstan	600	RD	NA	NA	NA	NA	NA	NA	NA	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Favalli et al ⁴ ⁵³	Italy	914	RD	55.9	31.7	NA	35.3	NA	71.7	NA	6	6	NA	NA	NA	NA	NA	NA	NA	4	NA	NA	1
Benucci et al ⁵⁴	Italy	295	RD	NA	NA	NA	NA	NA	NA	NA	4	4	60	0.0	50.0	50.0	75.0	25.0	75.0	4	1	NA	0
Zomalheto et al ⁵⁵	Benin	68	RD	49.9	4.4	NA	75.0	NA	NA	NA	1	1	NA	NA	NA	NA	100.0	NA	NA	0	0	0	0
Seyahi et al ⁵⁶	Turkey	771	RD	42	31.8	NA	44.1	NA	39.6	NA	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Salvarani et al ⁵⁷	Italy	1195	RD	NA	43.8	NA	NA	NA	NA	NA	9	9	NA	NA	NA	NA	NA	100.0	NA	4	NA	NA	1
Fragoulis et al ⁵⁸	Greece	500	RD	53.7	26.8	NA	46.6	73.4	NA	NA	39	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tomelleri et al ⁵⁹	Italy	162	RD	61	27.2	NA	62.3	42.6	54.9	4.9	4	4	57.3	50.0	100.0	100.0	50.0	0.0	50.0	2	NA	0	0
Macias et al ⁶⁰	Spain	722	RD	57	17.2	NA	NA	NA	NA	NA	10	3	NA	NA	NA	NA	NA	NA	NA	3	0	NA	0
Zhang et al ⁶¹	China	157	RD	38.4	33.1	NA	NA	NA	NA	NA	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cavagna et al ⁶²	Italy	53	RD	61	28.3	NA	NA	NA	NA	NA	6	0	57	33.3	NA	NA	NA	NA	NA	0	0	0	0
Emmi et al ^{***63}	Italy	458	RD	56	26.0	NA	55.5	49.1	41.3	NA	13	1	42	15.4	NA	69.2	69.2	53.8	NA	1	1	0	0
Zen et al ^{***64}	Italy	916	RD	53.6	21.4	NA	9.9	83.3	18.7	NA	2	2	NA	0.0	NA	0.0	100.0	0.0	0.0	2	0	0	0
Fernandez-Gutierrez et al ^{***65}	Spain	3951	RD	61.8	27.7	NA	45.7	75.2	20.3	NA	54	41	NA	NA	NA	59.3	75.9	14.8	NA	54	NA	NA	NA

Pablos et al ²⁶⁶	Spain	26131	RD	65	44.0	NA	NA	NA	NA	NA	199	199	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
D'Silva et al ⁶⁷	USA	2154	RD	NA	NA	NA	NA	NA	NA	NA	52	52	62.5	30.8	NA	36.5	48.1	36.5	NA	23	11	11	3	
Zhao et al ⁶⁸	China	3059	RD	NA	NA	NA	NA	NA	NA	NA	29	NA	61	13.8	100.0	24.1	NA	3.4	NA	29	1	2	1	
So et al ⁶⁹	Hong Kong	1016	RD	NA	NA	NA	NA	NA	NA	NA	5	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Benoy et al ⁷⁰	Italy	7600	RD	NA	NA	NA	NA	NA	NA	NA	27	19	68	63.0	44.4	22.2	88.9	18.5	NA	14	2	2	6	
Queiro Silva et al ⁷¹	Spain	NA	RD	NA	NA	NA	NA	NA	NA	NA	7	NA	49.3	57.1	NA	0.0	0.0	57.1	0.0	5	2	NA	0	
Sanchez-Piedra et al ⁷²	Spain	NA	RD	NA	NA	NA	NA	NA	NA	NA	41	31	59.4	39.0	NA	48.8	56.1	53.7	56.1	28	6	NA	3	
Nuno et al ⁷³	Spain	NA	RD	NA	NA	NA	NA	NA	NA	NA	122	100	58.3	34.4	NA	39.3	86.9	34.4	NA	69	6	NA	14	
Gianfrancesco et al ⁷⁴	International registry	NA	RD	NA	NA	NA	NA	NA	NA	NA	600	548	57.5	29.5	NA	31.5	45.3	17.8	20.7	277	NA	NA	55	
Brito et al ⁷⁵	Brazil	NA	RD	NA	NA	NA	NA	NA	NA	NA	3	3	55	33.3	66.7	0.0	0.0	100.0	NA	0	0	0	0	
Wallace et al ⁷⁶	USA	NA	RD	NA	NA	NA	NA	NA	NA	NA	31	NA	61	29.0	NA	38.7	77.4	NA	NA	20	NA	6	4	
Pablos et al ⁷⁷	Spain	NA	RD	NA	NA	NA	NA	NA	NA	NA	228	228	63	38.2	NA	39.9	68.9	23.2	NA	162	15	19	41	
Freites et al ⁷⁸	Spain	NA	RD	NA	NA	NA	NA	NA	NA	NA	123	58	59.9	30.1	NA	49.6	84.6	22.0	NA	54	2	2	12	
Marques et al ⁷⁹	Brazil	NA	RD	NA	NA	NA	NA	NA	NA	NA	130	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	12	
Average per study			RD	52.4	28.1	NA	37.8	53.3	59.8	4.9			58.3	32.5	71.8	31.7	57.5	46.3	33.1					
Favalli et al ²⁸⁰	Italy	123	SLE/SjS/SSc	49.3	10.6	NA	64.2	59.3	20.3	NA	1	1	32	0.0	NA	0.0	100.0	0.0	100.0	1	1	1	1	
Cassione et al ⁸¹	Italy	165	SLE/SjS/SSc	52.5	32.1	NA	56.4	NA	0.0	0.0	12	4	43.3	8.3	NA	33.3	NA	0.0	0.0	1	1	1	0	
Favalli et al ⁵⁸²	Italy	62	SLE/SjS/SSc	44.1	9.7	NA	74.2	80.6	51.6	NA	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Cheng et al ²⁸³	China	101	SLE/SjS/SSc	42	11.9	NA	94.1	83.2	0.0	0.0	2	2	24	0.0	NA	100.0	100.0	0.0	0.0	2	0	0	0	
Holubar et al ⁸⁴	France	120	SLE/SjS/SSc	47.1	8.3	NA	41.7	52.5	0.0	0.0	8	0	NA	NA	25.0	NA	NA	NA	NA	0	0	0	0	
Gendebien et al ⁸⁵	Belgium	225	SLE/SjS/SSc	51.7	7.1	NA	25.3	30.7	3.6	NA	18	5	NA	NA	NA	NA	NA	NA	NA	2	0	0	0	
Goyal et al ⁸⁶	India	845	SLE/SjS/SSc	34.8	8.0	NA	66.2	96.2	NA	NA	17	2	29.3	0.0	NA	82.4	100.0	17.6	NA	1	NA	NA	0	
Gartsheyn et al ⁸⁷	USA	1285	SLE/SjS/SSc	NA	NA	NA	NA	NA	NA	NA	18	10	44.3	11.1	NA	38.9	NA	16.7	NA	7	NA	3	0	
Mathian et al ⁸⁸	France	NA	SLE/SjS/SSc	NA	NA	NA	NA	NA	NA	NA	17	17	53.5	23.5	NA	70.6	100.0	0.0	0.0	14	7	5	2	
Avouac et al ⁸⁹	Italy/France	NA	SLE/SjS/SSc	NA	NA	NA	NA	NA	NA	NA	3	2	66.3	33.3	100.0	100.0	66.7	33.3	66.7	3	2	2	0	
Average per study			SLE/SjS/SSc	45.9	12.5	NA	60.3	67.1	12.6	0.0			41.8	10.9	62.5	60.7	93.3	9.7	33.3					

If the parent population of autoimmune diseases was not available, an analysis for the prevalence of COVID-19 was not conducted. ## If all of clinical outcomes regarding COVID-19 were not available, we declined an analysis of COVID-19 outcomes. * These studies were excluded for an analysis of the prevalence as all of included patients were COVID-19. ** This study was excluded for an analysis of COVID-19 outcomes as only hospitalized patients of COVID-19 were included. *** In these studies, the parent populations were categorized into RD but patients with COVID-19 were in the subgroup of SLE/SjS/SSc.

AHD, autoimmune hepatic diseases; AISD, autoimmune skin diseases; b/tsDMARDs, biologic or targeted synthetic DMARDs (abatacept, belimumab, CD-20, IL-1, IL-6, IL-12/23, IL-23, IL-17, $\alpha 4\beta 7$ integrin, TNF, and Janus kinase (JAK) inhibitors); csDMARDs, conventional synthetic disease-modifying antirheumatic drugs (hydroxychloroquine, chloroquine, thiopurines, cyclophosphamide, cyclosporine, tacrolimus, leflunomide, methotrexate, mycophenolate mofetil/mycophenolic acid, and sulfasalazine); GCs, glucocorticoids; IBD, inflammatory bowel disease; ICU, intensive care unit; IMID, immune-mediated inflammatory disease; NA, not available; RD, rheumatic diseases; SjS, Sjögren's syndrome; SLE, systemic lupus erythematosus; SSc, systemic sclerosis.

Table S2. Subgroup meta-analysis according to comorbidities in patients with autoimmune diseases diagnosed with COVID-19

Subgroup	Outcomes	Number of studies	Event (n)	Total (n)	Event rate	95% CI	I^2 (%)	Q	P-value
Age \geq 64	Hospitalization	11	193	300	0.632	0.506-0.742	39.6	16.6	0.085
	ICU	8	13	124	0.128	0.078-0.201	0	4.74	0.692
	Ventilation	8	13	118	0.135	0.082-0.213	0	6.39	0.495
	Death	10	14	130	0.134	0.084-0.207	0	6.18	0.722
Age < 64	Hospitalization	22	300	959	0.339	0.271-0.414	34.5	32.1	0.057
	ICU	16	17	509	0.059	0.038-0.092	2.58	15.4	0.423
	Ventilation	14	13	474	0.049	0.031-0.076	0	12.9	0.452
	Death	21	5	529	0.045	0.027-0.074	0	17.8	0.600
Male	Hospitalization	24	272	680	0.405	0.306-0.513	66.0	67.6	< 0.001
	ICU	19	22	491	0.094	0.053-0.161	31.6	26.3	0.092
	Ventilation	15	14	444	0.061	0.035-0.102	9.0	15.4	0.353
	Death	25	28	524	0.101	0.066-0.150	18.7	29.5	0.201
Female	Hospitalization	34	382	1074	0.338	0.267-0.417	58.2	79.0	<0.001
	ICU	27	17	560	0.063	0.044-0.091	0	18.5	0.855
	Ventilation	23	17	515	0.067	0.046-0.098	0	20.5	0.55
	Death	35	16	615	0.067	0.047-0.094	0	20.7	0.964
HTN	Hospitalization	15	224	368	0.579	0.488-0.664	31.0	20.3	0.121
	ICU	12	4	45	0.173	0.086-0.317	0	4.5	0.952
	Ventilation	9	1	32	0.127	0.054-0.272	0	0.26	1.00
	Death	16	14	108	0.188	0.125-0.273	0	4.96	0.992
No HTN	Hospitalization	21	268	834	0.313	0.235-0.403	65.6	58.2	<0.001
	ICU	15	4	268	0.066	0.034-0.127	7.75	15.2	0.366
	Ventilation	11	3	188	0.080	0.036-0.168	8.97	11.0	0.359
	Death	22	5	386	0.058	0.034-0.095	0	14.9	0.827
DM	Hospitalization	8	88	125	0.698	0.611-0.773	0	4.78	0.687
	ICU	4	1	12	0.191	0.052-0.502	0	1.58	0.664
	Ventilation	3	0	9	0.131	0.026-0.459	0	0.18	0.912
	Death	5	2	26	0.139	0.047-0.345	0	2.35	0.672
No DM	Hospitalization	27	445	1195	0.351	0.274-0.437	73.9	99.6	<0.001
	ICU	18	25	364	0.101	0.054-0.180	46.2	31.6	0.017
	Ventilation	16	25	335	0.116	0.069-0.190	30.8	21.7	0.117
	Death	24	24	519	0.081	0.058-0.112	0	14.0	0.927
BMI \geq 30	Hospitalization	4	28	51	0.486	0.229-0.751	33.9	4.54	0.209
	ICU	3	1	9	0.182	0.046-0.508	0	0.020	0.99
	Ventilation	0	0	4	NA	NA	NA	NA	NA
	Death	5	9	65	0.156	0.087-0.264	0	0.29	0.99

BMI < 30	Hospitalization	19	108	267	0.418	0.305-0.542	50.6	36.4	0.006
	ICU	15	19	175	0.141	0.094-0.206	0	10.1	0.752
	Ventilation	11	15	129	0.140	0.089-0.212	0	5.16	0.881
	Death	20	19	280	0.104	0.072-0.148	0	9.66	0.961
Comorbidity (≥ 1)	Hospitalization	19	145	274	0.518	0.370-0.662	40.8	30.4	0.034
	ICU	19	21	306	0.105	0.069-0.158	3.50	18.7	0.413
	Ventilation	14	17	268	0.087	0.058-0.13	0	8.82	0.786
	Death	23	23	328	0.105	0.074-0.147	0	19.8	0.596
No comorbidity	Hospitalization	11	93	402	0.237	0.192-0.289	1.03	10.1	0.431
	ICU	12	12	443	0.043	0.027-0.068	0	6.34	0.850
	Ventilation	7	9	386	0.048	0.022-0.102	14.7	7.04	0.318
	Death	15	5	462	0.041	0.023-0.074	2.33	14.3	0.425

BMI, body mass index; DM, diabetes; HTN, hypertension; ICU, intensive care unit.

Table S3. Subgroup meta-analysis according to medical therapies in patients with autoimmune diseases diagnosed with COVID-19

Subgroup	Outcomes	Number of studies	Event (n)	Total (n)	Event rate	95% CI	I^2 (%)	Q	P-value
Glucocorticoids	Hospitalization	20	241	421	0.560	0.462-0.653	43.4	33.5	0.021
	ICU	16	13	161	0.143	0.089-0.221	0	13.3	0.578
	Ventilation	14	11	155	0.126	0.076-0.202	0	11.1	0.603
	Death	22	19	190	0.147	0.102-0.206	0	6.89	0.998
csDMARDs	Hospitalization	23	297	616	0.440	0.351-0.533	49.2	43.3	0.004
	ICU	18	8	213	0.101	0.057-0.171	1.18	17.2	0.441
	Ventilation	16	6	197	0.097	0.051-0.179	10.0	16.7	0.339
	Death	24	20	266	0.120	0.085-0.168	0	8.96	0.996
b/tsDMARDs (Monotherapy)	Hospitalization	28	153	755	0.249	0.186-0.325	54.7	59.6	<0.001
	ICU	24	12	574	0.058	0.037-0.091	3.20	23.8	0.417
	Ventilation	18	5	495	0.041	0.024-0.070	0	15.2	0.583
	Death	30	5	645	0.054	0.034-0.085	0	27.5	0.544
b/tsDMARDs + csDMARDs (Combination)	Hospitalization	10	78	198	0.409	0.309-0.518	15.5	10.6	0.301
	ICU	10	8	78	0.141	0.076-0.245	0	7.73	0.561
	Ventilation	8	4	70	0.130	0.051-0.295	18.1	8.55	0.287
	Death	11	2	80	0.093	0.045-0.184	0	2.88	0.984
b/tsDMARDs (Monotherapy or Combination)	Hospitalization	32	237	958	0.291	0.223-0.370	61.4	80.2	<0.001
	ICU	27	22	657	0.085	0.053-0.133	22.2	33.4	0.151
	Ventilation	21	10	568	0.060	0.035-0.102	13.0	23.0	0.290
	Death	34	8	730	0.048	0.032-0.073	0	27.5	0.736
Anti-TNF drugs (Monotherapy)	Hospitalization	18	53	362	0.191	0.126-0.278	33.8	25.7	0.080
	ICU	19	5	340	0.060	0.034-0.102	0	17.0	0.523
	Ventilation	14	1	306	0.053	0.026-0.105	0	11.8	0.542
	Death	22	2	374	0.062	0.035-0.108	0	15.7	0.785
Anti-TNF drugs + csDMARDs (Combination)	Hospitalization	5	25	61	0.408	0.291-0.536	0	3.22	0.522
	ICU	4	5	59	0.108	0.049-0.222	0	2.07	0.559
	Ventilation	3	2	56	0.061	0.020-0.175	0	1.51	0.471
	Death	5	2	61	0.075	0.028-0.186	0	2.12	0.714
Anti-TNF drugs (Monotherapy or combination)	Hospitalization	22	83	429	0.246	0.166-0.349	44.6	37.9	0.013
	ICU	22	10	406	0.062	0.039-0.096	0	16.8	0.724
	Ventilation	17	3	368	0.049	0.027-0.087	0	13.8	0.617
	Death	26	5	442	0.057	0.035-0.091	0	17.9	0.847
Non-TNF drugs (Monotherapy)	Hospitalization	18	56	246	0.284	0.181-0.415	49.1	33.4	0.010
	ICU	16	6	224	0.069	0.039-0.118	0	11.0	0.752

	Ventilation	11	4	187	0.055	0.028-0.102	0	4.20	0.938
	Death	21	3	260	0.074	0.042-0.127	0	13.7	0.846
Non-TNF drugs + csDMARDs (Combination)	Hospitalization	3	4	6	0.631	0.173-0.933	30.5	2.88	0.237
	ICU	3	2	6	0.369	0.067-0.827	30.5	2.88	0.237
	Ventilation	2	2	4	0.500	0.041-0.959	53.7	2.16	0.142
	Death	3	0	6	0.167	0.033-0.536	0	0.00	1.000
Non-TNF drugs (Monotherapy or combination)	Hospitalization	21	64	256	0.331	0.218-0.467	51.7	41.4	0.003
	ICU	19	10	235	0.102	0.059-0.172	11.0	20.2	0.320
	Ventilation	13	7	193	0.078	0.043-0.139	2.26	12.3	0.424
	Death	24	3	271	0.077	0.045-0.129	0	14.0	0.928

b/tsDMARDs, biologic or targeted synthetic DMARDs (abatacept, belimumab, CD-20, IL-1, IL-6, IL-12/23, IL-23, IL-17, $\alpha 4\beta 7$ integrin, TNF, and Janus kinase (JAK) inhibitors); csDMARDs, conventional synthetic disease-modifying antirheumatic drugs (hydroxychloroquine, chloroquine, thiopurines, cyclophosphamide, cyclosporine, tacrolimus, leflunomide, methotrexate, mycophenolate mofetil,/mycophenolic acid, and sulfasalazine); HTN, hypertension; ICU, intensive care unit; TNF, tumor necrosis factor.

Table S4. Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) criteria for studies included in the meta-analysis

(A) Meta-analysis of observational studies

Number of participants	Starting Level of Evidence	Quality assessment					Reasons to increase level of evidence (Large magnitude of effect; Dose-response gradient; Potential confounding)	Overall quality of evidence
		Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication bias		
319,025	High	Not serious	Serious ¹	Not serious	Not serious	Not serious	N/A	Moderate

1. due to heterogeneity

(B) Meta-analysis of case-controlled studies

Number of participants	Starting Level of Evidence	Quality assessment					Reasons to increase level of evidence (Large magnitude of effect; Dose-response gradient; Potential confounding)	Overall quality of evidence
		Risk of Bias	Inconsistency	Indirectness	Imprecision	Publication bias		
30,771 (case) and 24,511,773 (control)	High	Not serious	Serious ¹	Not serious	Not serious	Not serious	N/A	Moderate

1. due to heterogeneity

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