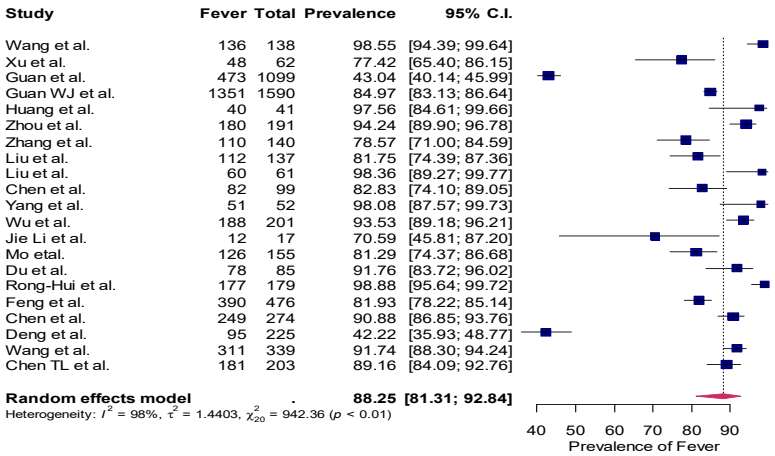
A. Fever

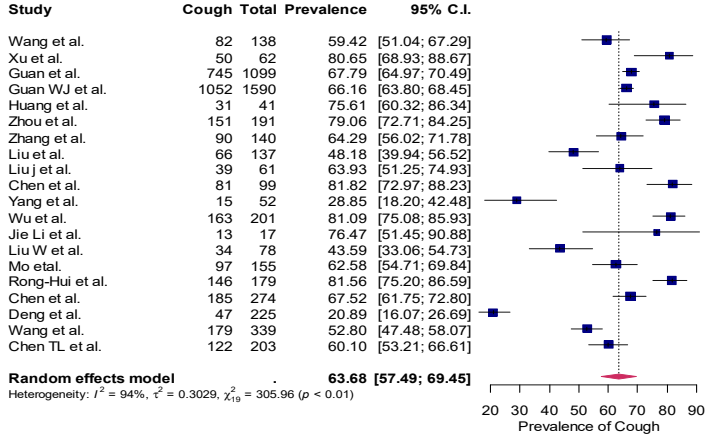


Study	Fever	Total	Prevalence	95% C.I.
Wang et al.	136	138	98.55	[94.39; 99.64]
Xu et al.	48	62	77.42	[65.40; 86.15]
Guan et al.	473	1099	43.04	[40.14; 45.99]
Guan WJ et al.	1351	1590	84.97	[83.13; 86.64]
Huang et al.	40	41	97.56	[84.61; 99.66]
Zhou et al.	180	191	94.24	[89.90; 96.78]
Zhang et al.	110	140	78.57	[71.00; 84.59]
Liu et al.	112	137	81.75	[74.39; 87.36]
Liu et al.	60	61	98.36	[89.27; 99.77]
Chen et al.	82	99	82.83	[74.10; 89.05]
Yang et al.	51	52	98.08	[87.57; 99.73]
Wu et al.	188	201	93.53	[89.18; 96.21]
Jie Li et al.	12	17	70.59	[45.81; 87.20]
Mo etal.	126	155	81.29	[74.37; 86.68]
Du et al.	78	85	91.76	[83.72; 96.02]
Rong-Hui et al.	177	179	98.88	[95.64; 99.72]
Feng et al.	390	476	81.93	[78.22; 85.14]
Chen et al.	249	274	90.88	[86.85; 93.76]
Deng et al.	95	225	42.22	[35.93; 48.77]
Wang et al.	311	339	91.74	[88.30; 94.24]
Chen TL et al.	181	203	89.16	[84.09; 92.76]
Random effects model		.	**88.25**	**[81.31; 92.84]**

Heterogeneity: I^2 = 98%, τ^2 = 1.4403, χ^2_{20} = 942.36 (p < 0.01)

40 50 60 70 80 90
Prevalence of Fever

B. Cough

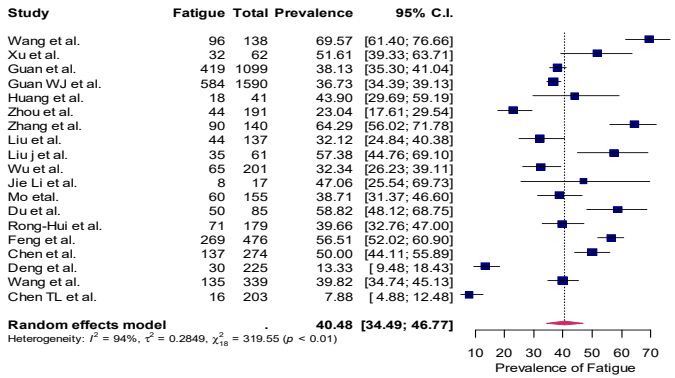


Study	Cough	Total	Prevalence	95% C.I.
Wang et al.	82	138	59.42	[51.04; 67.29]
Xu et al.	50	62	80.65	[68.93; 88.67]
Guan et al.	745	1099	67.79	[64.97; 70.49]
Guan WJ et al.	1052	1590	66.16	[63.80; 68.45]
Huang et al.	31	41	75.61	[60.32; 86.34]
Zhou et al.	151	191	79.06	[72.71; 84.25]
Zhang et al.	90	140	64.29	[56.02; 71.78]
Liu et al.	66	137	48.18	[39.94; 56.52]
Liu j et al.	39	61	63.93	[51.25; 74.93]
Chen et al.	81	99	81.82	[72.97; 88.23]
Yang et al.	15	52	28.85	[18.20; 42.48]
Wu et al.	163	201	81.09	[75.08; 85.93]
Jie Li et al.	13	17	76.47	[51.45; 90.88]
Liu W et al.	34	78	43.59	[33.06; 54.73]
Mo etal.	97	155	62.58	[54.71; 69.84]
Rong-Hui et al.	146	179	81.56	[75.20; 86.59]
Chen et al.	185	274	67.52	[61.75; 72.80]
Deng et al.	47	225	20.89	[16.07; 26.69]
Wang et al.	179	339	52.80	[47.48; 58.07]
Chen TL et al.	122	203	60.10	[53.21; 66.61]
Random effects model		.	**63.68**	**[57.49; 69.45]**

Heterogeneity: I^2 = 94%, τ^2 = 0.3029, χ^2_{19} = 305.96 (p < 0.01)

20 30 40 50 60 70 80 90
Prevalence of Cough

C. Fatigue

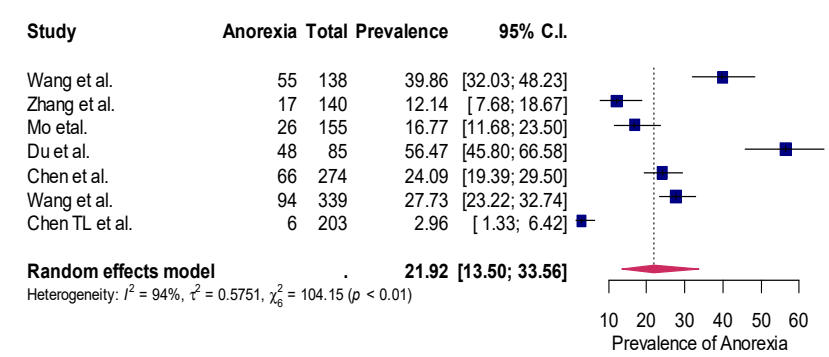


Study	Fatigue	Total	Prevalence	95% C.I.
Wang et al.	96	138	69.57	[61.40; 76.66]
Xu et al.	32	62	51.61	[39.33; 63.71]
Guan et al.	419	1099	38.13	[35.30; 41.04]
Guan WJ et al.	584	1590	36.73	[34.39; 39.13]
Huang et al.	18	41	43.90	[29.69; 59.19]
Zhou et al.	44	191	23.04	[17.61; 29.54]
Zhang et al.	90	140	64.29	[56.02; 71.78]
Liu et al.	44	137	32.12	[24.84; 40.38]
Liu j et al.	35	61	57.38	[44.76; 69.10]
Wu et al.	65	201	32.34	[26.23; 39.11]
Jie Li et al.	8	17	47.06	[25.54; 69.73]
Mo etal.	60	155	38.71	[31.37; 46.60]
Du et al.	50	85	58.82	[48.12; 68.75]
Rong-Hui et al.	71	179	39.66	[32.76; 47.00]
Feng et al.	269	476	56.51	[52.02; 60.90]
Chen et al.	137	274	50.00	[44.11; 55.89]
Deng et al.	30	225	13.33	[9.48; 18.43]
Wang et al.	135	339	39.82	[34.74; 45.13]
Chen TL et al.	16	203	7.88	[4.88; 12.48]
Random effects model		.	**40.48**	**[34.49; 46.77]**

Heterogeneity: I^2 = 94%, τ^2 = 0.2849, χ^2_{18} = 319.55 (p < 0.01)

10 20 30 40 50 60 70
Prevalence of Fatigue

D. Anorexia



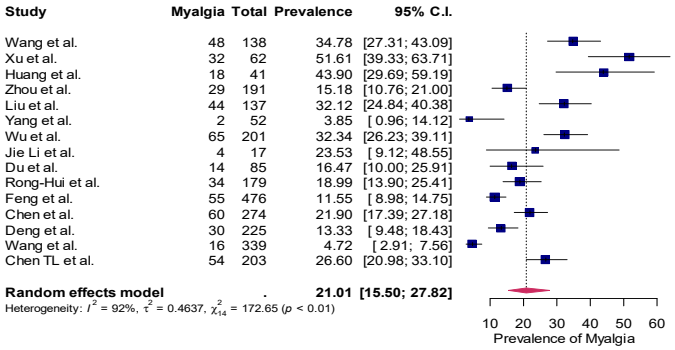
Study	Anorexia	Total	Prevalence	95% C.I.
Wang et al.	55	138	39.86	[32.03; 48.23]
Zhang et al.	17	140	12.14	[7.68; 18.67]
Mo etal.	26	155	16.77	[11.68; 23.50]
Du et al.	48	85	56.47	[45.80; 66.58]
Chen et al.	66	274	24.09	[19.39; 29.50]
Wang et al.	94	339	27.73	[23.22; 32.74]
Chen TL et al.	6	203	2.96	[1.33; 6.42]
Random effects model		.	**21.92**	**[13.50; 33.56]**

Heterogeneity: I^2 = 94%, τ^2 = 0.5751, χ^2_6 = 104.15 (p < 0.01)

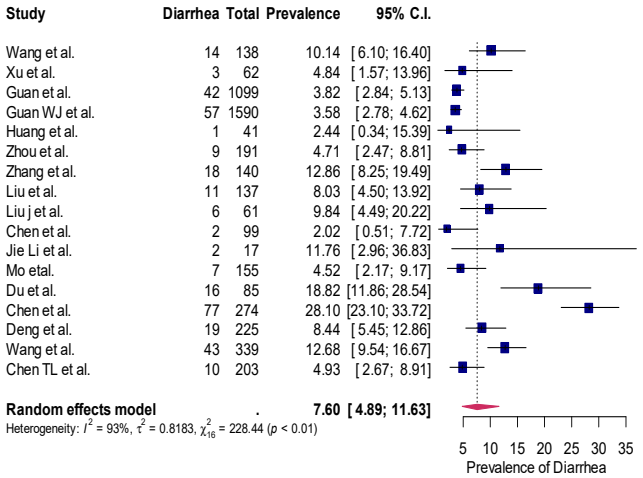
10 20 30 40 50 60
Prevalence of Anorexia

E. Myalgia

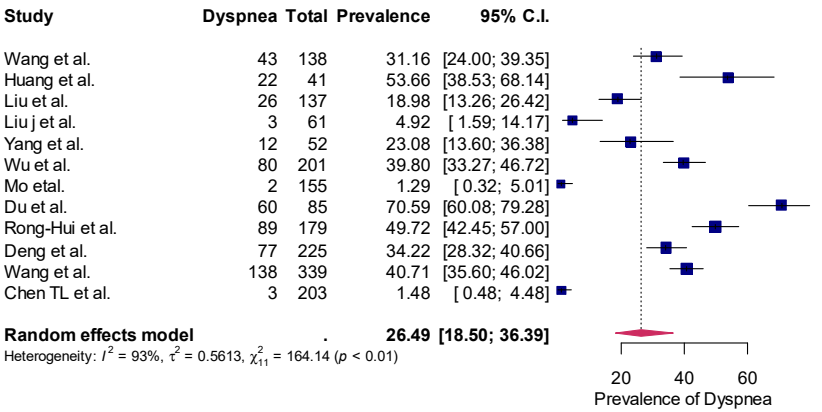
F. Dyspnea



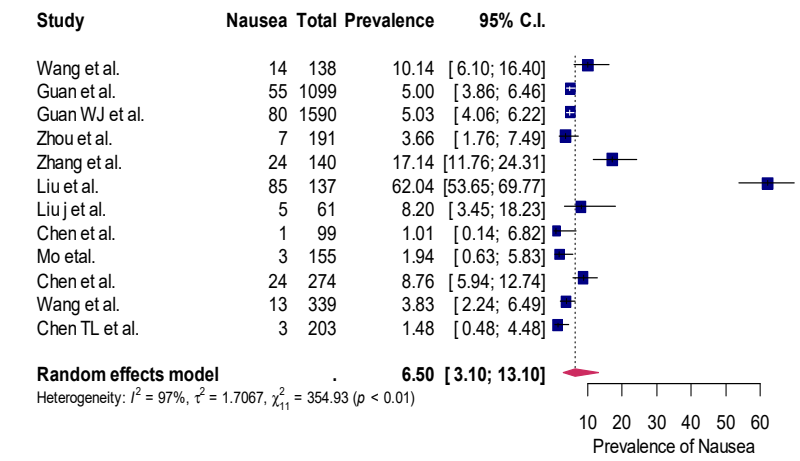
G. Diarrhea



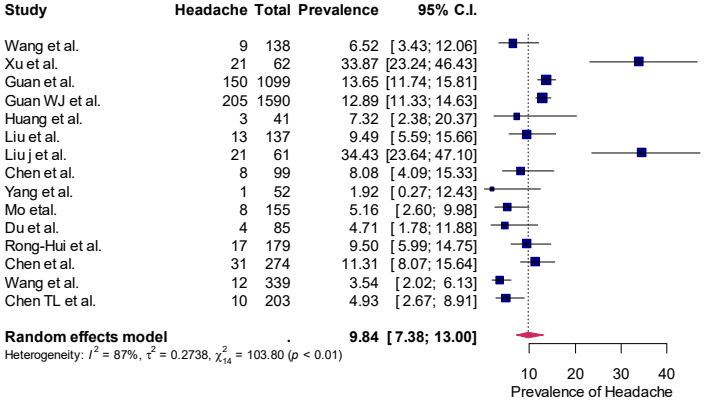
I. Headache



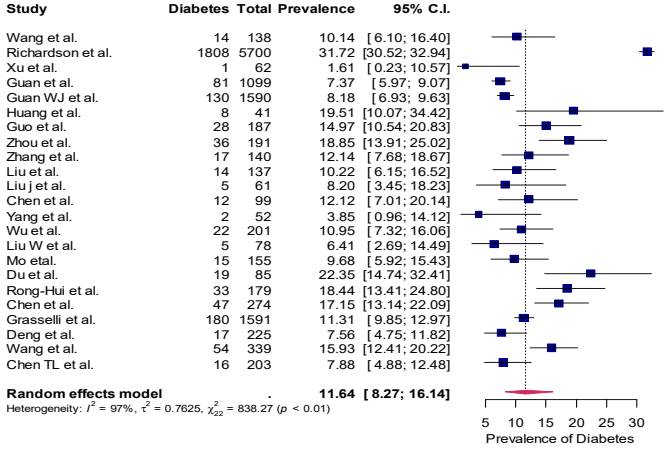
H. Nausea



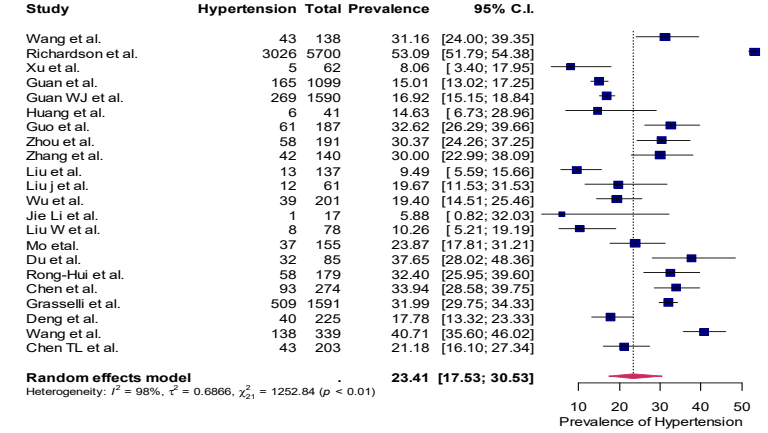
J. Hypertension



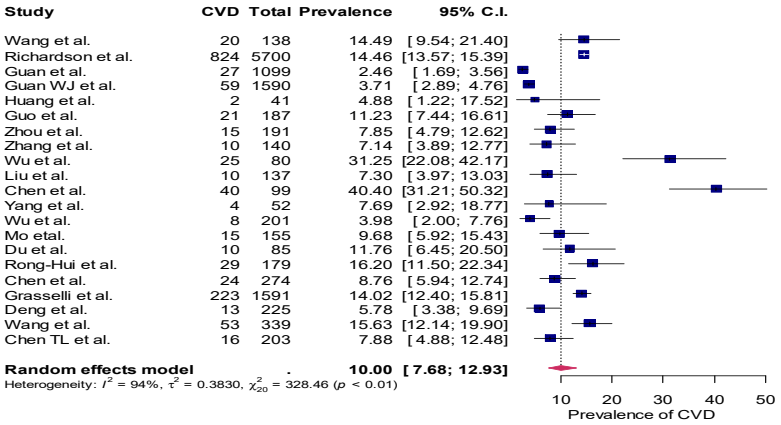
K. Diabetes



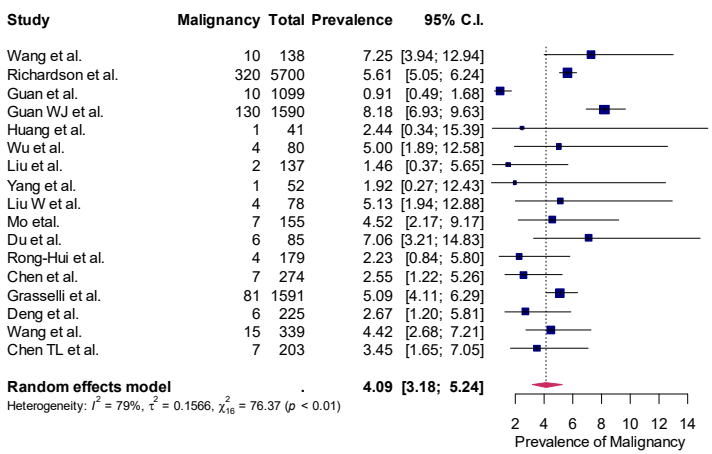
M. Malignancy



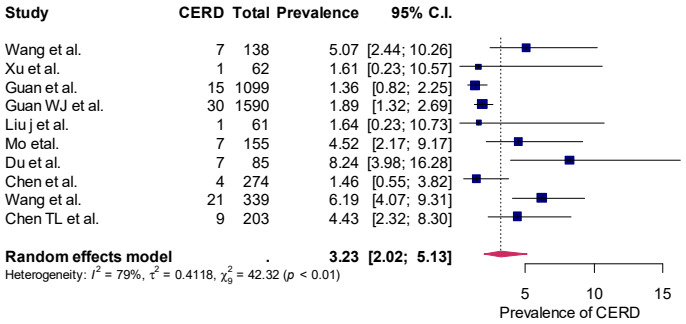
L. CVD



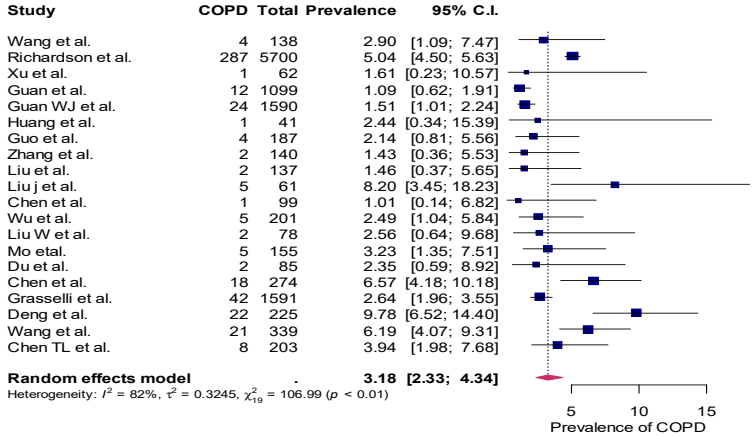
N. COPD



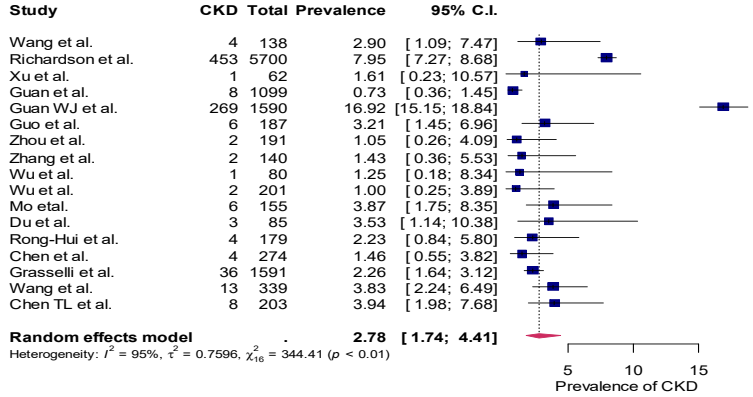
O. CERD



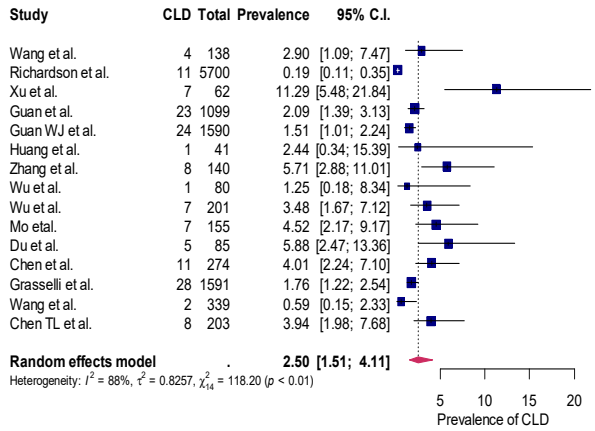
Q. CLD

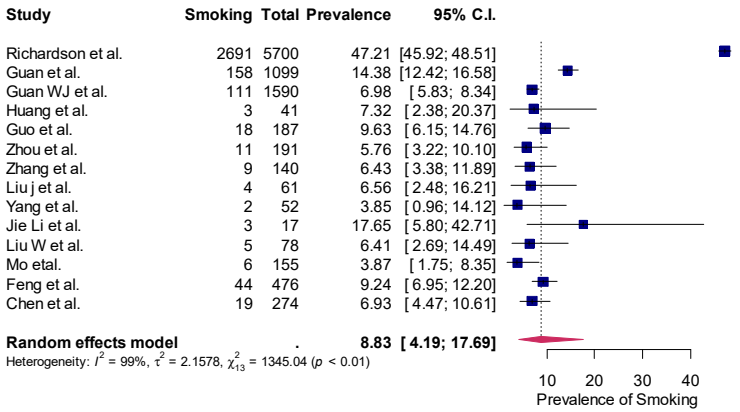


P. CKD



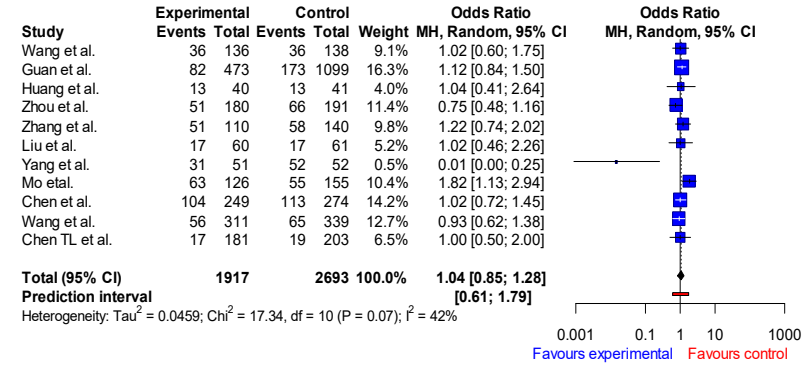
R. Smoking



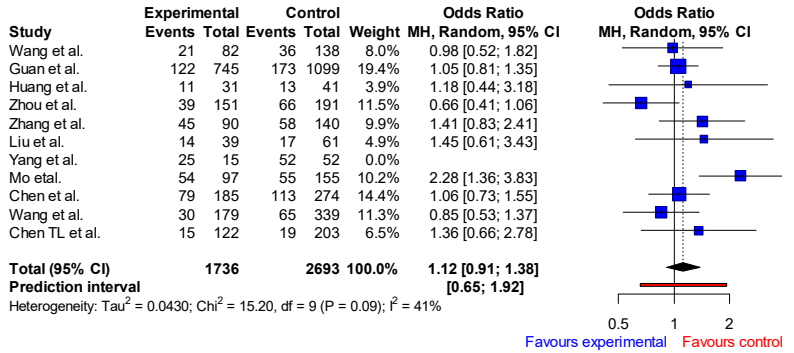


Supplementary Figure S1: Meta-analysis of prevalence of comorbidities and symptoms COVID-19 fatalities.

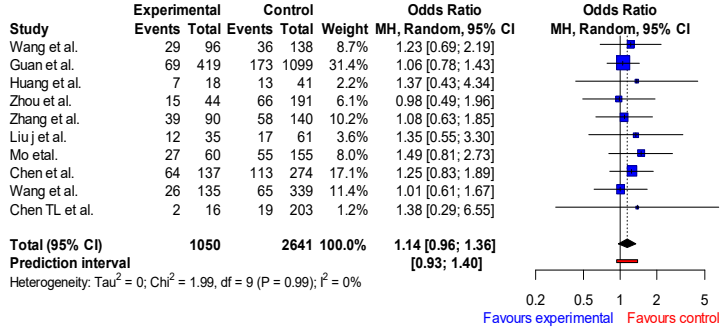
A. Fever **B. Cough**



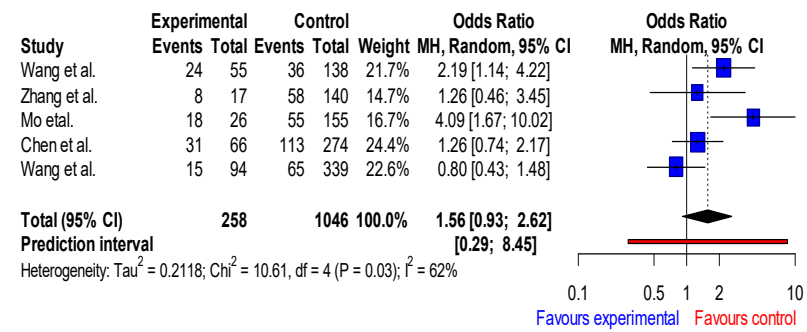
C. Fatigue



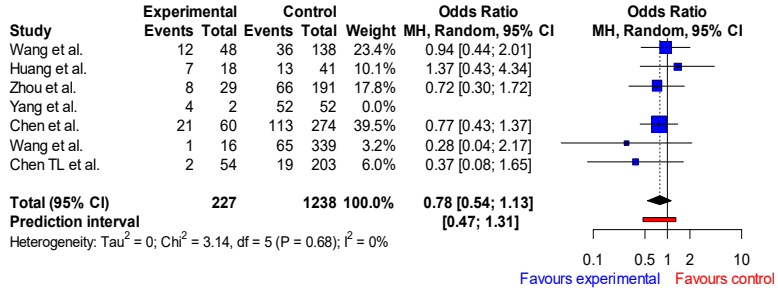
D. Anorexia



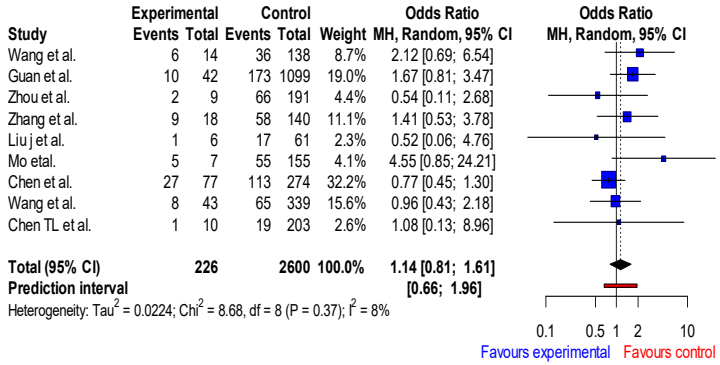
E. Myalgia



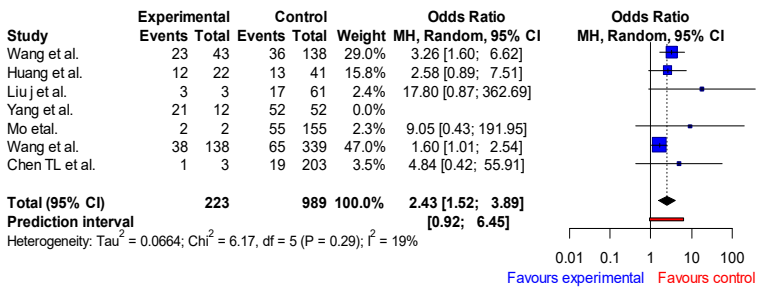
F. Dyspnea



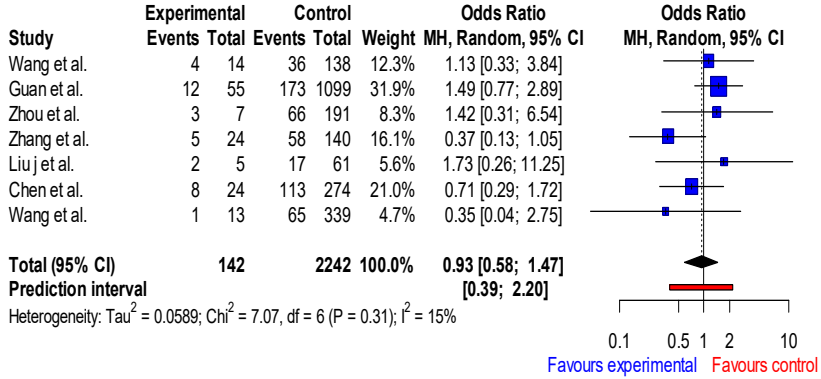
G. Diarrhea



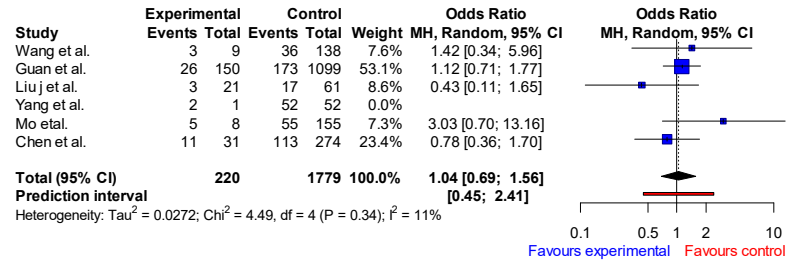
I. Headache



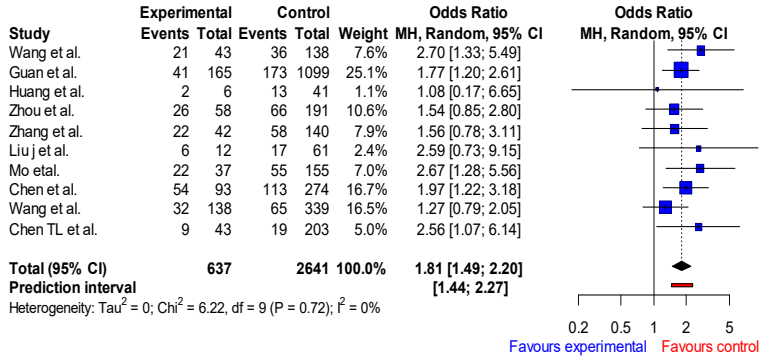
H. Nausea



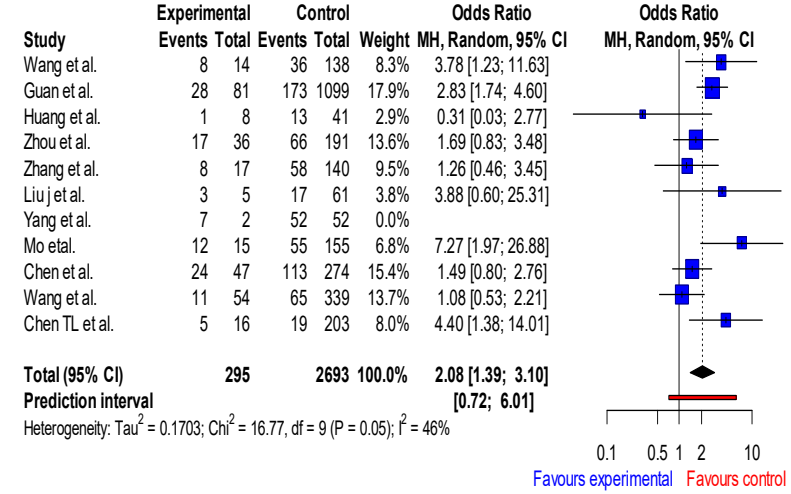
J. Hypertension



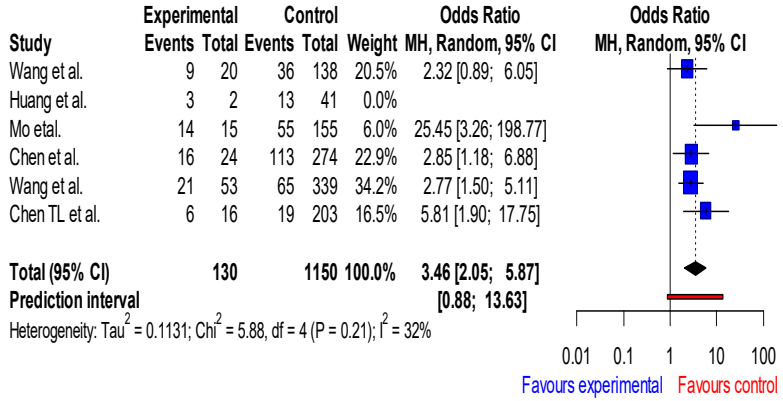
K. Diabetes



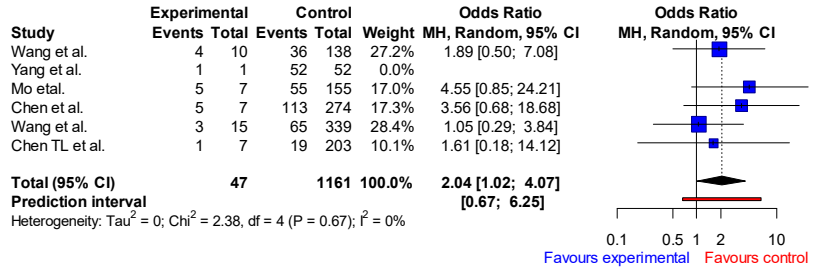
L. CVD



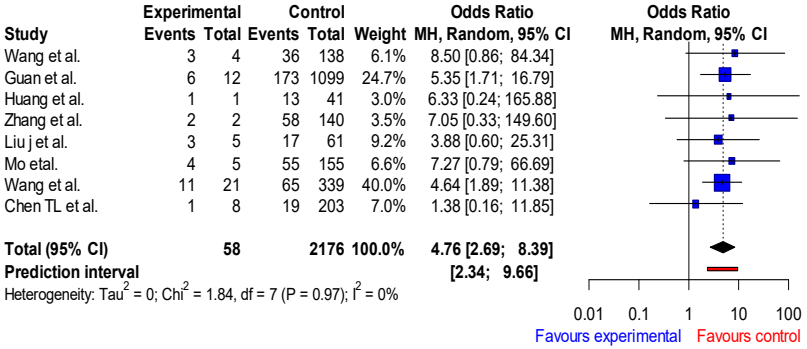
M. Malignancy



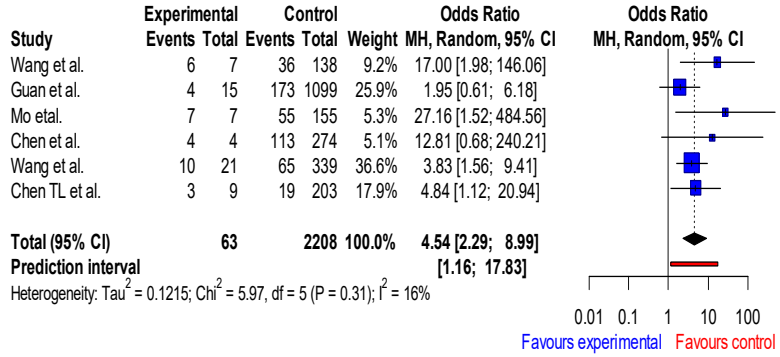
N. COPD



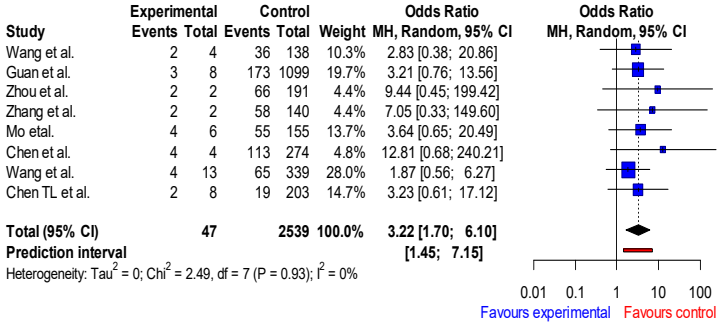
O. CERD

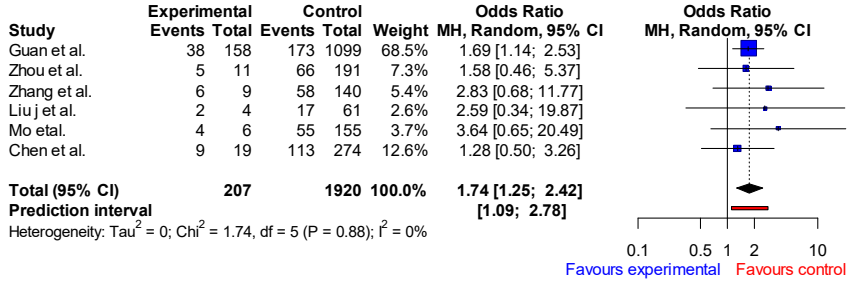


P. CKD



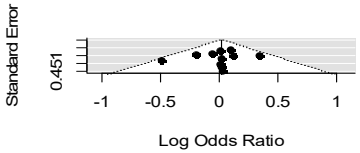
Q. Smoking



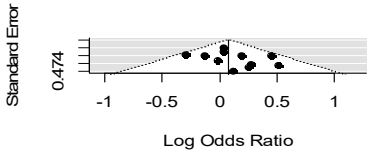


Supplementary Figure S2: Meta-analysis of severity of comorbidities and symptoms in COVID-19 fatalities

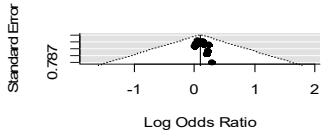
A. Fever **B. Cough** **C. Fatigue** **D. Dyspnea**



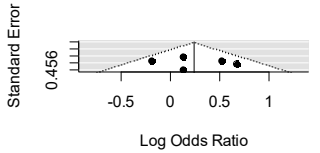
Egger's test: p= 0.479



Egger's test: p= 0.354

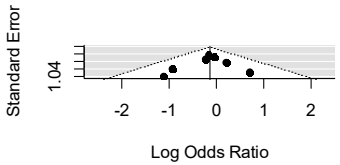


Egger's test: p=0.183



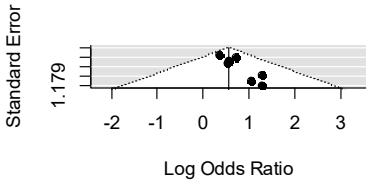
Egger's test: p= 0.774

E. Myalgia



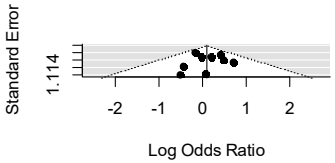
Egger's test: p= 0.685

F. Anorexia



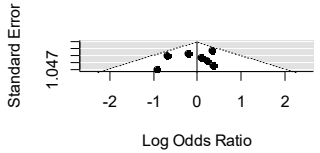
Egger's test: p=0.018

G. Diarrhea



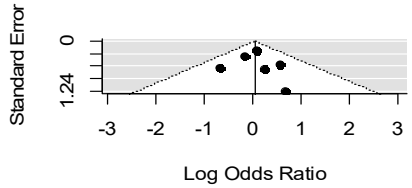
Egger's test: p= 0.731

H. Nausea



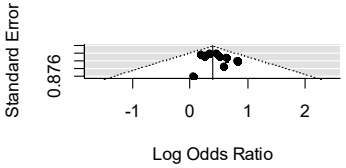
Egger's test: p= 0.458

I. Headache



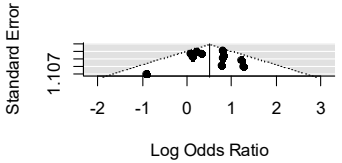
Egger's test: p= 0.832

J. Hypertension



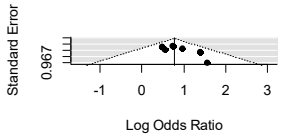
Egger's test: p=0.551

K. Diabetes



Egger's test: p= 0.949

L. CVD

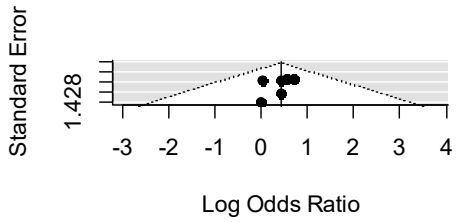


Egger's test: p= 0.141

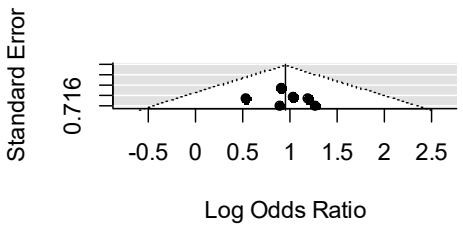
M. Malignancy

N. CRED

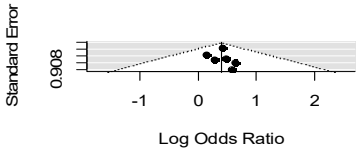
O. Smoking



Egger's test: p=0.466

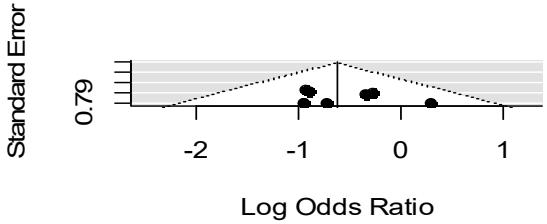


Egger's test: p= 0.633



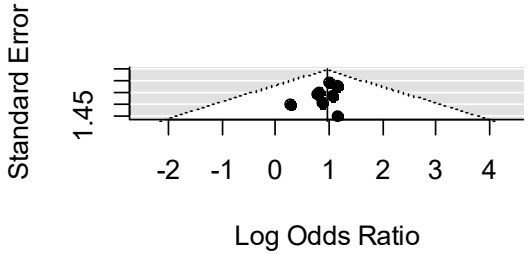
Egger's test: p=0.916

P. CKD



Egger's test: p= 0.593

Q. COPD



Egger's test: p=0.235

Supplementary Figure S3: Assessment of publication bias using funnel plot and Egger's test

Supplementary Table S1: Accuracy and Evaluation matrices for symptoms data in ML analysis

Algorithms	Accuracy	Precision	Recall	f1 Score	AUC	Log loss
Random Forest	0.87	0.89	0.93	0.91	0.83	4.52
Decision Tree	0.87	0.9	0.93	0.91	0.84	4.37
XGB	0.89	0.92	0.93	0.92	0.87	3.77
GBM	0.9	0.93	0.94	0.93	0.88	3.32
SVM	0.89	0.93	0.91	0.92	0.87	3.92
Light GBM	0.9	0.94	0.91	0.93	0.89	3.47

Note: XGB= XGBoost; GBM= Gradient Boosting Machine; SVM= Support Vector Machine

Supplementary Table S2: Accuracy and Evaluation matrices for comorbidity data in ML analysis

Algorithms	Accuracy	Precision	Recall	F1 Score	AUC	Log loss
Random Forest	0.87	0.89	0.93	0.91	0.82	4.52
Decision Tree	0.83	0.85	0.92	0.88	0.76	5.88
XGB	0.86	0.89	0.92	0.9	0.82	4.83
GBM	0.84	0.92	0.86	0.89	0.83	5.43
SVM	0.87	0.91	0.91	0.91	0.84	4.52
Light GBM	0.88	0.9	0.93	0.92	0.84	4.22

Note: XGB= XGBoost; GBM= Gradient Boosting Machine; SVM= Support Vector Machine

Supplementary Table S3: Coefficient values for each symptom applying after ML methods

Algorithms	Headache	Fever	Cough	Fatigue	Nausea	Diarrhea	Myalgia	Dyspnea	Pneumonia	ARDS	Septic Shock
Random Forest	0.3	1.89	1.74	0.61	0.18	0.16	0.71	2.94	76.62	4.77	0.69
Decision Tree	0.28	2.19	1.28	0.9	0.4	0.07	0.68	1.78	4.3	3.66	0.17
XGB	0	6.67	6.74	3.81	0	0	3.2	13.34	19.7	25.4	1.92
GBM	0.74	1.6	0.95	0.34	0.07	0.04	0.56	3.07	9.18	7.22	0.8
SVM	0	24.53	25.3	10.7	10.7	10.7	8.22	21.74	58.67	42.5	5.52
Light GBM	0	39.77	21.02	0	0	0	0	34.84	95.68	37.7	0.16

Note: ARDS= Acute respiratory distress syndrome

Supplementary Table S4: Coefficient values for each comorbidity applying after ML methods

Algorithms	Gender	Age	Hypertension	CVD	CEVD	Chronic Lung Disease	Malignancy	Diabetes and Metabolic Disease	CLD	CKD	Neuro degenerative Disease	Infectious Disease	Surgical History	COPD	Asthma
Random Forest	2.56	82.9	5.53	1.06	0.27	0.35	0.65	3.67	0.13	1.13	0.27	0.03	0.43	0.82	0.19
Decision Tree	4.05	85.51	2.57	0.49	0.28	0.45	0.88	3.77	0	0.81	0	0.007	0.55	0.52	0.1
XGB	9.37	20.77	14.84	5.98	0	2.9	7.37	14.21	0	7	0	0	0	5.77	11.8
GBM	2.19	77.78	6.48	1.37	0.27	0.23	0.73	7.72	0.09	0.87	0.46	0.05	0.64	1.02	0.09
SVM	4.07	169.3	34	10.18	23.89	11.66	0	33.58	22.7	29.2	14	15.78	8.34	25.4	24.15
Light GBM	54.6	1448.16	114.62	0.81	0	0	0	46.38	0	3.53	0	0	0	0	0

Note: CVD= Cardiovascular disease; COPD=Chronic obstructive pulmonary disease; CEVD= Cerebrovascular disease; CKD=Chronic Kidney Disease; CLD= Chronic lung disease;

Supplementary Table S5: Assessing association between comorbidity and symptoms using Fisher's exact test of deceased patients

Comorbidity	Symptoms	P value	Comorbidity	Symptoms	P value
Hypertension	Headache	0.232	**CEVD**	Headache	1.00
	Fever	0.423		Fever	0.408
	Cough	0.823		Cough	0.318
	Fatigue	0.665		Fatigue	1.00
	Nausea or vomiting	0.232		Nausea or vomiting	1.00
	Diarrhea	1.00		Diarrhea	1.00
	Myalgia or arthralgia	1.00		Myalgia or arthralgia	0.037
	Dyspnea	<0.001		Dyspnea	1.00
	Pneumonia	<0.001		Pneumonia	0.191
	ARDS	<0.001		ARDS	1.00
	Septic Shock	<0.001		Septic Shock	0.187
Diabetes	Headache	0.179	**CLD**	Headache	1.00
	Fever	0.374		Fever	1.00
	Cough	0.444		Cough	0.008
	Fatigue	0.613		Fatigue	1.00
	Nausea or vomiting	1.00		Nausea or vomiting	1.00
	Diarrhea	0.179		Diarrhea	1.00
	Myalgia or arthralgia	0.447		Myalgia or arthralgia	1.00
	Dyspnea	<0.001		Dyspnea	0.022
	Pneumonia	<0.001		Pneumonia	1.00
	ARDS	<0.001		ARDS	1.00
	Septic Shock	0.047		Septic Shock	1.00
CVD	Headache	1.00	**Malignancy**	Headache	1.00
	Fever	0.117		Fever	1.00
	Cough	0.169		Cough	1.00
	Fatigue	1.00		Fatigue	0.085
	Nausea or vomiting	1.00		Nausea or vomiting	1.00
	Diarrhea	1.00		Diarrhea	1.00
	Myalgia or arthralgia	1.00		Myalgia or arthralgia	1.00
	Dyspnea	0.075		Dyspnea	1.00
	Pneumonia	0.001		Pneumonia	0.191
	ARDS	0.017		ARDS	0.567
	Septic Shock	0.039		Septic Shock	0.187

Supplementary Table S5: Assessing association between comorbidity and symptoms using Fisher's exact test of deceased patients (continued…)

Comorbidity	Symptoms	P value	Comorbidity	Symptoms	P value
Liver Disease	Headache	1.00	Surgical History	Headache	1.00
	Fever	1.00		Fever	1.00
	Cough	0.008		Cough	1.00
	Fatigue	1.00		Fatigue	0.022
	Nausea or vomiting	1.00		Nausea or vomiting	1.00
	Diarrhea	1.00		Diarrhea	1.00
	Myalgia or arthralgia	1.00		Myalgia or arthralgia	1.00
	Dyspnea	0.022		Dyspnea	1.00
	Pneumonia	1.00		Pneumonia	1.00
	ARDS	1.00		ARDS	1.00
	Septic Shock	1.00		Septic Shock	1.00
COPD	Headache	0.019	Asthma	Headache	1.00
	Fever	0.546		Fever	0.481
	Cough	0.438		Cough	0.381
	Fatigue	0.126		Fatigue	1.00
	Nausea or vomiting	1.00		Nausea or vomiting	1.00
	Diarrhea	1.00		Diarrhea	1.00
	Myalgia or arthralgia	1.00		Myalgia or arthralgia	1.00
	Dyspnea	0.224		Dyspnea	0.1645
	Pneumonia	0.018		Pneumonia	0.062
	ARDS	0.083		ARDS	<0.001
	Septic Shock	0.268		Septic Shock	0.2281
Neurodegenerative Disease	Headache	1.00	CKD	Headache	0.056
	Fever	0.015		Fever	0.708
	Cough	0.008		Cough	1.00
	Fatigue	0.043		Fatigue	0.337
	Nausea or vomiting	1.00		Nausea or vomiting	1.00
	Diarrhea	1.00		Diarrhea	1.00
	Myalgia or arthralgia	1.00		Myalgia or arthralgia	1.00
	Dyspnea	0.022		Dyspnea	0.164
	Pneumonia	1.00		Pneumonia	<0.001
	ARDS	1.00		ARDS	<0.001
	Septic Shock	1.00		Septic Shock	0.0087

Supplementary Table S6: The distribution of patients' according to countries

Country	Count
Italy	158090
USA	122453
China	42531
Russia	32761
UK	17837
Spain	16273
Ecuador	10947
France	10160
South Korea	7198
Iran	7044
Germany	6684
Egypt	4636

South Africa	4542
Austria	4242
Netherlands	4150
Brazil	4021
Belgium	3747
Chile	2739
Mexico	2112
Portugal	2063
Japan	2035
Canada	1721
Philippines	1512
Algeria	1268
Argentina	1137
Cuba	854
Niger	766
Switzerland	732
Nigeria	668
Norway	658
Sweden	637
Australia	561
Singapore	430
Uruguay	415
Colombia	377
Ghana	367
Kenya	337
Poland	325
Kazakhstan	302
Denmark	250
Thailand	119
Paraguay	113
Hong Kong	102
Ethiopia	98
Kuwait	93
Bahrain	85
Bolivia	81
Puerto Rico	69
Georgia	68
United Arab Emirates	61
Malaysia	57

Oman	55
Rwanda	54
Vietnam	50
Guatemala	50
Malta	49
India	40
Iraq	36
Taiwan	34
Iceland	34
Zimbabwe	30
Greece	29
Romania	25
Israel	23
Qatar	18
Reunion	18
Ireland	14
Namibia	14
Lebanon	13
Pakistan	12
Senegal	12
Peru	10
New Zealand	10
Afghanistan	9
Finland	8
Saudi Arabia	8
Croatia	7
Gambia	6
Azerbaijan	6
Guyana	5
Kosovo	5
Benin	5
Czech Republic	4
Morocco	4
Maldives	4
Cameroon	4
Burkina Faso	4
Nepal	3
Sri Lanka	3
Ukraine	3

Luxembourg	3
Cambodia	3
San Marino	2
Tunisia	2
Jordan	2
Bosnia	2
Congo	2
Venezuela	2
Sudan	2
Guinea	2
Armenia	2
Bhutan	2
Panama	2
Mongolia	2
Virgin Islands, U.S.	2
Moldova	1
North Macedonia	1
Estonia	1
Lithuania	1
Latvia	1
Andorra	1
Liechtenstein	1
Serbia	1
Gibraltar	1
Slovenia	1
Saint Vincent	1