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L1: COVID-19 definition code in the present study:

- Emergency use of U07 (ICD10CM:U07)
- Post-COVID-19 condition (ICD10CM:U09)
- Pneumonia due to SARS-associated coronavirus (ICD10CM:J12.81)
- Pneumonia due to coronavirus disease 2019 (ICD10CM:J12.82)
- Other coronavirus as the cause of diseases classified elsewhere (ICD10CM:B97.29)
- Coronavirus infection, unspecified (ICD10CM:B34.2)
- Personal history of COVID-19 (ICD10CM:Z86.16)
- SARS coronavirus 2 and related RNA [Presence] (Lab Result: Positive) (TNX: 9088)
- SARS coronavirus RNA [Presence] in Specimen by NAA with probe detection (Lab Result: Positive) (LNC:41458-1)
- SARS-CoV-2 (COVID-19) RNA [Cycle Threshold #] in Specimen by NAA with probe detection (at most 40.00 {Ct_value}) (LNC:94746-5)
- SARS-CoV-2 (COVID-19) ORF1ab region [Cycle Threshold #] in Specimen by NAA with probe detection (at most 40.00 {Ct_value}) (LNC:94511-3)

L2: COVID-19-related vaccination code:

- ✓ Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (coronavirus disease [COVID-19]) vaccine, mRNA-LNP, spike protein, preservative free, 30 mcg/0.3 mL dosage, diluent reconstituted, for intramuscular use (UMLS:CPT:91300);
- ✓ Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (coronavirus disease [COVID-19]) vaccine, mRNA-LNP, spike protein, preservative free, 100 mcg/0.5 mL dosage, for intramuscular use (UMLS:CPT:91301);
- ✓ Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (coronavirus disease [COVID-19]) vaccine, DNA, spike protein, chimpanzee adenovirus Oxford 1 (ChAdOx1) vector, preservative free, 5×10^{10} viral particles/0.5 mL dosage, for intramuscular use (UMLS:CPT:91302);
- ✓ Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (coronavirus disease [COVID-19]) vaccine, DNA, spike protein, adenovirus type 26 (Ad26) vector, preservative free, 5×10^{10} viral particles/0.5 mL dosage, for intramuscular use (UMLS:CPT:91303);
- ✓ Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (coronavirus disease [COVID-19]) vaccine, mRNA-LNP, spike protein, preservative free, 30 mcg/0.3 mL dosage, tris-sucrose formulation, for intramuscular use (UMLS:CPT:91305);
- ✓ Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (coronavirus disease [COVID-19]) vaccine, mRNA-LNP, spike protein, preservative free, 50 mcg/0.25 mL dosage, for intramuscular use (UMLS:CPT:91306);
- ✓ Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (coronavirus disease [COVID-19]) vaccine, mRNA-LNP, spike protein, preservative free, 10 mcg/0.2 mL dosage, diluent reconstituted, tris-sucrose formulation, for intramuscular use (UMLS:CPT:91307).
- ✓ Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (coronavirus disease [COVID-19]) vaccine, mRNA-LNP, bivalent spike protein, preservative free, 30 mcg/0.3 mL dosage, tris-sucrose formulation, for intramuscular use (UMLS:CPT:91312).
- ✓ Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (coronavirus disease [COVID-19]) vaccine, mRNA-LNP, spike protein, bivalent, preservative free, 50 mcg/0.5 mL dosage, for intramuscular use (UMLS:CPT:91313).
- ✓ Immunization administration by intramuscular injection of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (coronavirus disease [COVID-19]) vaccine, mRNA-LNP, spike protein, preservative free, 30 mcg/0.3 mL dosage, diluent reconstituted (UMLS:CPT:1036660)

- ✓ Immunization administration by intramuscular injection of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (coronavirus disease [COVID-19]) vaccine, mRNA-LNP, spike (UMLS:CPT:1036663).

L3: List of other DMARDs, NSAIDs and steroid medications:

Medication	ATC code
abatacept	L04AA24
rituximab	L01FA01
sulfasalazine	A07EC01
minocycline	J01AA08
cyclophosphamide	L01AA01
methotrexate	L01BA01 L04AX03
cyclosporine	L04AA01
leflunomide	L04AA13
azathioprine	L04AX01
penicillamine	M01CC01
hydroxychloroquine	P01BA02
NSAIDs	M01A
systemic corticosteroids	ATC: H02

- ✓ NSAIDs, nonsteroidal anti-inflammatory drugs. DMARDs, disease-modifying antirheumatic drugs.

Supplementary Table 1: Baseline characteristics of study subjects (before propensity score matching).

Variables	Before matching					
	JAKi user (n=2701)	TNFi user (n=20419)	Std diff ¹	IL6i user (n=985)	TNFi user (n=20423)	Std diff ²
Age at index						
Mean ± SD	55.8 ± 13.6	52.9 ± 14.9	0.208	55.4 ± 16.1	52.8 ± 14.9	0.162
Sex						
Female	2206 (81.7)	15069 (73.8)	0.190	782 (79.4)	15064 (73.8)	0.133
Male	494 (18.3)	5347 (26.2)	0.191	202 (20.5)	5356 (26.2)	0.135
Race, n (%)						
White	1980 (73.3)	14796 (72.5)	0.019	720 (73.1)	14792 (72.4)	0.015
Black or African American	270 (10.0)	2214 (10.8)	0.028	108 (11.0)	2219 (10.9)	0.003
Asian	67 (02.5)	465 (02.3)	0.013	22 (02.2)	467 (02.3)	0.004
American Indian or Alaska Native	12 (00.4)	199 (01.0)	0.063	10 (01.0)	200 (01.0)	0.004
Native Hawaiian or Other Pacific Islander	10 (00.4)	31 (00.2)	0.043	10 (01.0)	32 (00.2)	0.113
Unknown race	370 (13.7)	2714 (13.3)	0.012	128 (13.0)	2713 (13.3)	0.009
Social economic status						
Persons with potential health hazards related to socioeconomic and psychosocial circumstances	16 (00.6)	153 (00.7)	0.019	10 (01.0)	153 (00.7)	0.028
Lifestyles						
Tobacco use (proxy smoking)	35 (01.3)	327 (01.6)	0.026	13 (01.3)	324 (01.6)	0.022
Nicotine dependence (proxy smoking)	131 (04.9)	1145 (05.6)	0.034	32 (03.2)	1143 (05.6)	0.114
Alcohol related disorders (proxy alcohol drinking)	14 (00.5)	172 (00.8)	0.039	10 (01.0)	172 (00.8)	0.018
Comorbidities						
Depressive episode	165 (06.1)	1263 (06.2)	0.003	74 (07.5)	1262 (06.2)	0.053
Essential (primary) hypertension	475 (17.6)	3687 (18.1)	0.012	203 (20.6)	3691 (18.1)	0.064
Ischemic heart diseases	101 (03.7)	665 (03.3)	0.026	44 (04.5)	667 (03.3)	0.062
Cerebrovascular diseases	40 (01.5)	292 (01.4)	0.004	26 (02.6)	291 (01.4)	0.086
Diabetes mellitus (DM)	194 (07.2)	1576 (07.7)	0.020	87 (08.8)	1581 (07.7)	0.040

Overweight and obesity	183 (06.8)	1557 (07.6)	0.033	84 (08.5)	1556 (07.6)	0.033
Hyperlipidemia, unspecified	232 (08.6)	1552 (07.6)	0.036	115 (11.7)	1556 (07.6)	0.138
Diseases of liver	63 (02.3)	533 (02.6)	0.018	31 (03.1)	535 (02.6)	0.032
Noninfective enteritis and colitis	60 (02.2)	784 (03.8)	0.095	15 (01.5)	781 (03.8)	0.143
Sleep disorders	186 (06.9)	1469 (07.2)	0.012	90 (09.1)	1467 (07.2)	0.071
Psoriasis	84 (03.1)	1274 (06.2)	0.149	10 (01.0)	1274 (06.2)	0.282
Chronic kidney disease (CKD)	62 (02.3)	474 (02.3)	0.002	29 (02.9)	476 (02.3)	0.038
Chronic lower respiratory diseases	235 (08.7)	1572 (07.7)	0.037	80 (08.1)	1572 (07.7)	0.016
Systemic lupus erythematosus (SLE)	74 (02.7)	240 (01.2)	0.113	24 (02.4)	243 (01.2)	0.094
Dermatopolymyositis	42 (01.6)	27 (00.1)	0.156	10 (01.0)	27 (00.1)	0.117
Sjögren syndrome	104 (03.9)	624 (03.1)	0.044	38 (03.9)	626 (03.1)	0.043
Ankylosing spondylitis	14 (00.5)	512 (02.5)	0.164	10 (01.0)	513 (02.5)	0.114
Behçet's disease	10 (00.4)	44 (00.2)	0.029	0 (00.0)	44 (00.2)	0.066
Systemic sclerosis/scleroderma	14 (00.5)	47 (00.2)	0.047	48 (04.9)	48 (00.2)	0.297
Atopic dermatitis	10 (00.4)	46 (00.2)	0.027	10 (01.0)	46 (00.2)	0.101
Medical utilization						
Hospital Inpatient Services	75 (02.8)	571 (02.8)	0.001	47 (04.8)	573 (02.8)	0.103
Preventive Medicine Services	145 (05.4)	1000 (04.9)	0.021	33 (03.4)	997 (04.9)	0.077
Emergency Department Services	225 (08.3)	1944 (09.5)	0.042	106 (10.8)	1942 (09.5)	0.042
Office or Other Outpatient Services	1551 (57.4)	12821 (62.8)	0.110	622 (63.1)	12799 (62.7)	0.010
COVID-19 vaccination						
BNT ^a	48 (01.8)	155 (00.8)	0.091	19 (01.9)	154 (00.8)	0.102
Moderna ^b	10 (00.4)	47 (00.2)	0.026	10 (01.0)	47 (00.2)	0.100
Janssen ^c	0 (00.0)	10 (00.0)	0.031	0 (00.0)	10 (00.0)	0.031
Medication						
NSAIDs	823 (30.5)	7021 (34.4)	0.084	246 (25.0)	7015 (34.3)	0.206
Corticosteroids for systemic use	1312 (48.6)	10189 (49.9)	0.027	528 (53.6)	10183 (49.9)	0.075
Other DMARDs						
Abatacept	137 (05.1)	229 (01.1)	0.230	70 (07.1)	229 (01.1)	0.305
Rituximab	39 (01.4)	42 (00.2)	0.137	16 (01.6)	42 (00.2)	0.149

Sulfasalazine	175 (06.5)	1542 (07.6)	0.042	37 (03.8)	1540 (07.5)	0.164
Minocycline	12 (00.4)	70 (00.3)	0.016	10 (01.0)	70 (00.3)	0.082
Cyclophosphamide	0 (00.0)	10 (00.0)	0.031	0 (00.0)	10 (00.0)	0.031
Methotrexate	701 (26.0)	7309 (35.8)	0.214	208 (21.1)	7306 (35.8)	0.329
Leflunomide	256 (09.5)	1609 (07.9)	0.057	73 (07.4)	1611 (07.9)	0.018
Azathioprine	31 (01.1)	273 (01.3)	0.017	18 (01.8)	273 (01.3)	0.039
Penicillamine	0 (00.0)	0 (00.0)	-	0 (00.0)	0 (00.0)	-
Hydroxychloroquine	486 (18.0)	3265 (16.0)	0.053	142 (14.4)	3268 (16.0)	0.044
Cyclosporine	31 (01.1)	221 (01.1)	0.006	15 (01.5)	221 (01.1)	0.039

Note:

SD, standard deviation. Std diff, Standardized mean difference. BNT, Pfizer–BioNTech. NSAIDs, nonsteroidal anti-inflammatory drugs. DMARDs, disease-modifying antirheumatic drugs.

If the patient number is less than or equal to 10, the results show the count as 10.

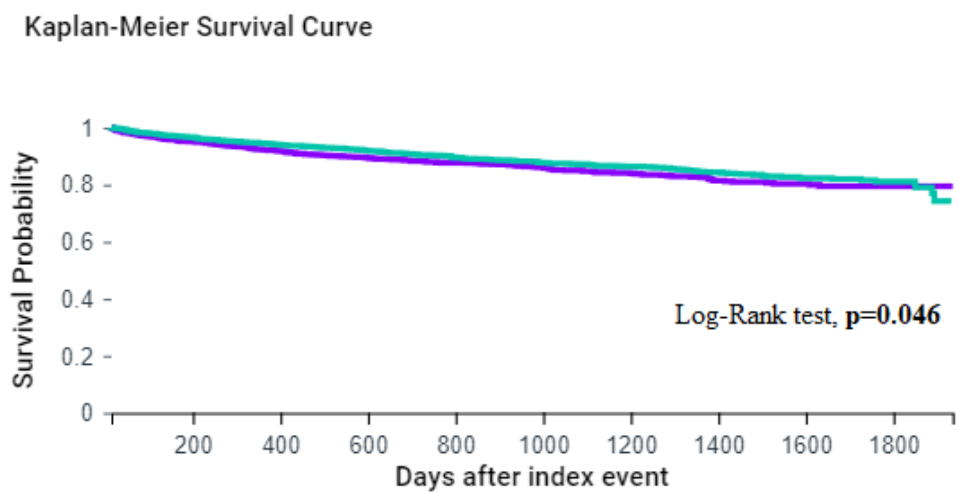
Bold font represents a standardized difference greater than 0.1.

^a Value presented here only includes severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (coronavirus disease [COVID-19] vaccine, mRNA-LNP, spike protein, preservative free, 30 mcg/0.3 mL dosage, diluent reconstituted, for intramuscular use (UMLS:CPT:91300);

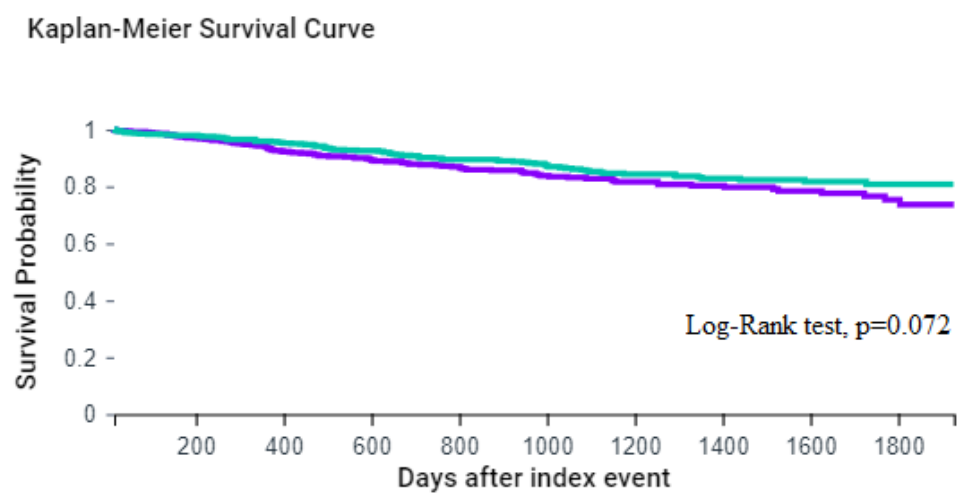
^b Value presented here only includes severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (coronavirus disease [COVID-19] vaccine, mRNA-LNP, spike protein, preservative free, 100 mcg/0.5 mL dosage, for intramuscular use (UMLS:CPT:91301);

^c Value presented here only includes severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (coronavirus disease [COVID-19] vaccine, DNA, spike protein, adenovirus type 26 (Ad26) vector, preservative free, 5×10^{10} viral particles/0.5 mL dosage, for intramuscular use (UMLS:CPT:91303).

(a) JAKi vs. TNFi

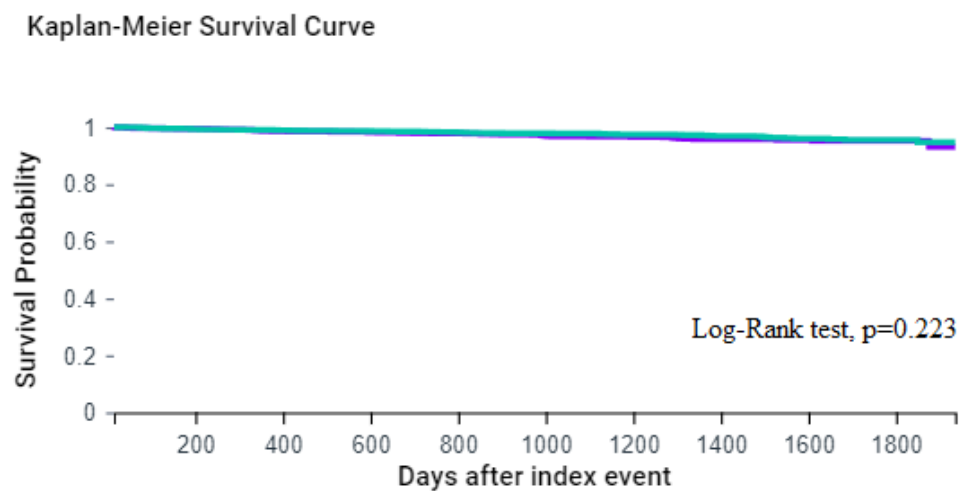


(b) IL6 vs. TNFi

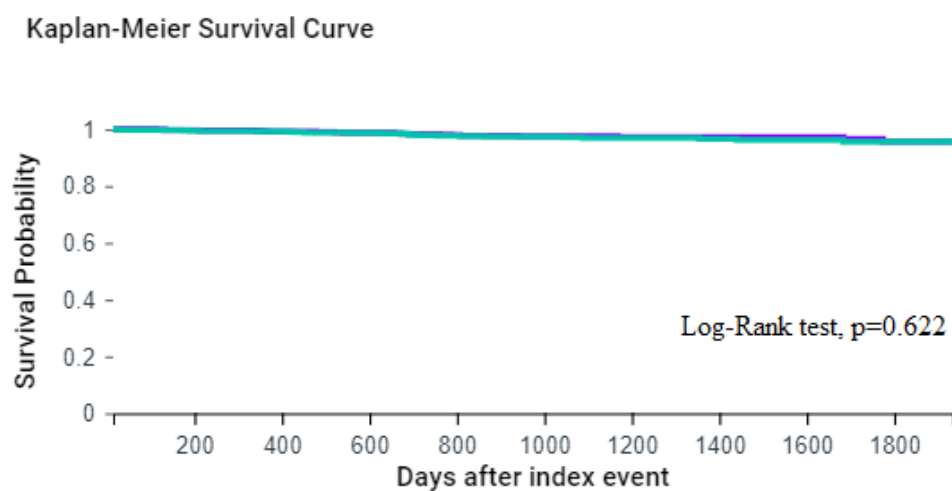


Supplementary Figure 1. Kaplan–Meier curve of hospitalization.

(a) JAKi vs. TNFi

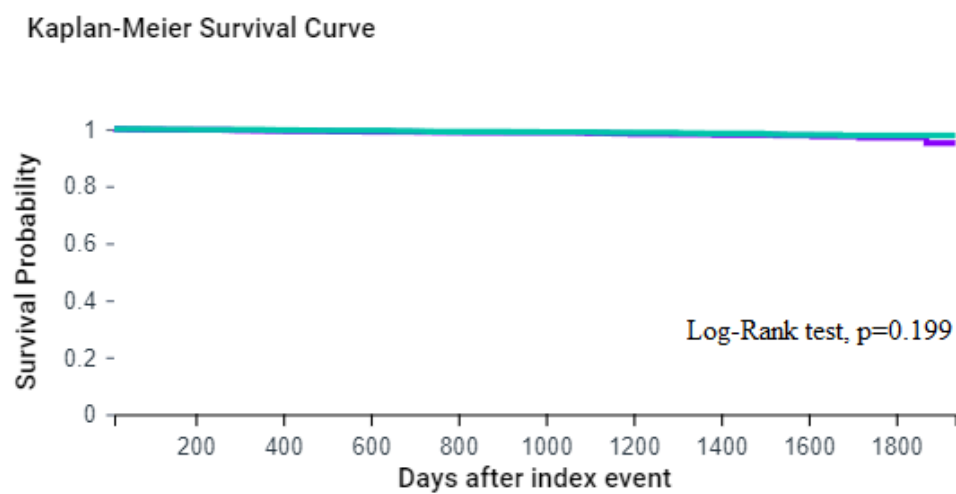


(b) IL6 vs. TNFi

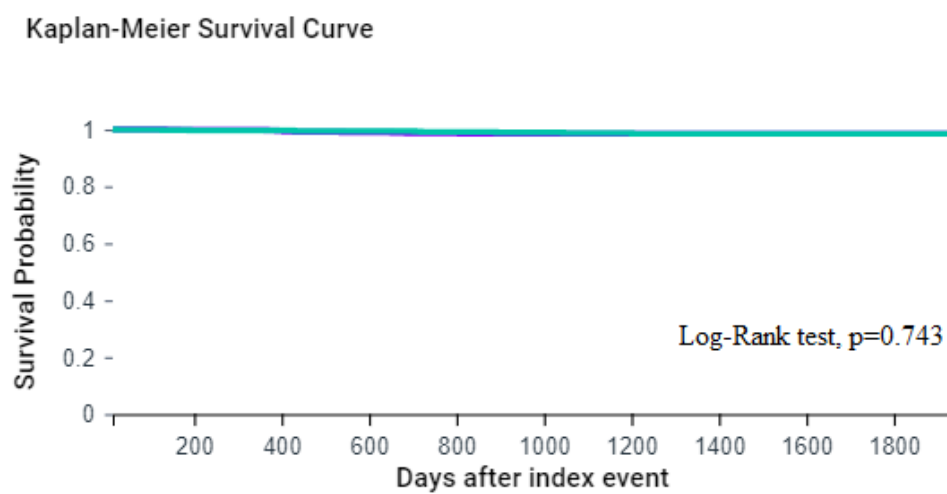


Supplementary Figure 2. Kaplan–Meier curve of critical care services.

(a) JAKi vs. TNFi

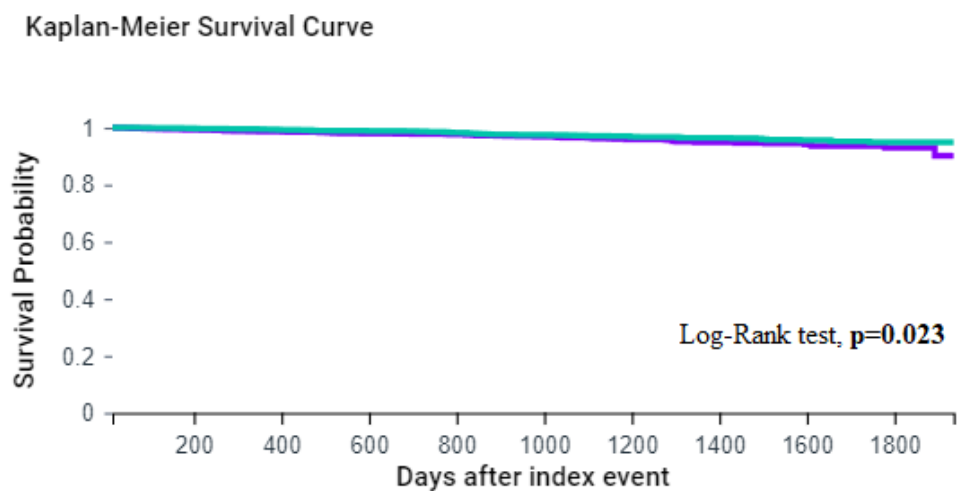


(b) IL6 vs. TNFi

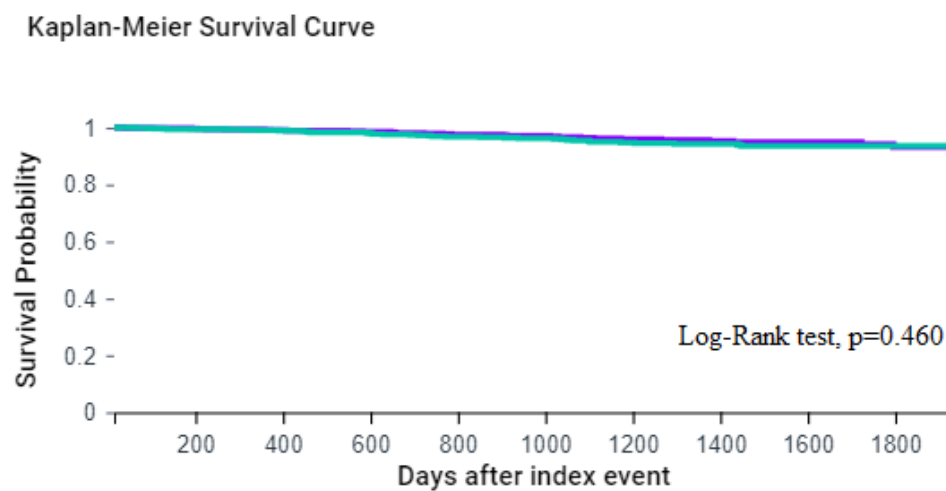


Supplementary Figure 3. Kaplan–Meier curve of mechanical ventilation.

(a) JAKi vs. TNFi



(b) IL6 vs. TNFi



Supplementary Figure 4. Kaplan–Meier curve of mortality.

Supplementary Table 2: The risk of outcomes stratified by sex.

Outcomes	Adjusted Hazard Ratios (95% CI)			
	Male		Female	
	JAKi vs. TNFi (n=481) ^a	IL6i vs. TNFi (n=194) ^a	JAKi vs. TNFi (n=2181) ^a	IL6i vs. TNFi (n=766) ^a
Disease incidence				
COVID-19	0.925 (0.631-1.354)	0.816 (0.412-1.618)	1.117 (0.928-1.345)	0.978 (0.724-1.321)
Medical utilization				
Hospitalization	0.812 (0.559-1.178)	1.821 (0.976-3.398)	1.149 (0.947-1.393)	1.217 (0.874-1.696)
Critical care services	1.495 (0.779-2.868)	1.731 (0.487-6.152)	1.826 (1.156-2.884)	0.806 (0.401-1.622)
Mechanical ventilation	0.806 (0.344-1.889)	4.149 (0.464-37.12)	1.724 (0.948-3.135)	1.203 (0.404-3.580)
Mortality				
Deceased	1.147 (0.616-2.134)	1.279 (0.493-3.321)	1.395 (0.977-1.991)	0.848 (0.471-1.527)
Adverse outcomes^b	0.831 (0.584-1.181)	1.740 (0.974-3.108)	1.204 (1.001-1.447)	1.171 (0.852-1.610)

Note:

CI: Confidence interval; JAKi: Janus-associated kinase inhibitors; TNFi: Tumor necrosis factor alpha inhibitors; IL6i: Interleukin-6 inhibitors; COVID-19: Coronavirus Disease 2019;

^a Patients in each cohort after propensity score matching were stratified by age at index, sex, race, socioeconomic status, lifestyles, comorbidities, medical utilization, COVID-19 vaccination and medication usage.^b Including hospitalization, critical care services, mechanical ventilation, or deceased.

Supplementary Table 3: The risk of outcomes stratified by age.

Outcomes	Adjusted Hazard Ratios (95% CI)			
	19-64y		≥ 65y	
	JAKi vs. TNFi (n=1951) ^a	IL6i vs. TNFi (n=643) ^a	JAKi vs. TNFi (n=838) ^a	IL6i vs. TNFi (n=345) ^a
Disease incidence				
COVID-19	1.036 (0.852-1.259)	0.955 (0.691-1.318)	1.313 (0.959-1.798)	0.839 (0.502-1.403)
Medical utilization				
Hospitalization	1.004 (0.810-1.246)	1.495 (1.031-2.166)	1.008 (0.781-1.302)	0.930 (0.613-1.412)
Critical care services	1.267 (0.778-2.064)	0.849 (0.367-1.966)	1.268 (0.798-2.016)	0.580 (0.268-1.257)
Mechanical ventilation	1.405 (0.721-2.738)	2.771 (0.735-10.44)	1.201 (0.629-2.291)	0.531 (0.160-1.763)
Mortality				
Deceased	1.358 (0.833-2.214)	1.171 (0.541-2.535)	1.150 (0.790-1.672)	0.551 (0.301-1.007)
Adverse outcomes^b	1.021 (0.829-1.257)	1.490 (1.040-2.136)	1.005 (0.794-1.273)	0.866 (0.585-1.281)

Note:

CI: Confidence interval; JAKi: Janus-associated kinase inhibitors; TNFi: Tumor necrosis factor alpha inhibitors; IL6i: Interleukin-6 inhibitors; COVID-19: Coronavirus Disease 2019;

^a Patients in each cohort after propensity score matching were stratified by age at index, sex, race, socioeconomic status, lifestyles, comorbidities, medical utilization, COVID-19 vaccination and medication usage.^b Including hospitalization, critical care services, mechanical ventilation, or deceased.

Supplementary Table 4: The risk of outcomes stratified by race.

Outcomes	Adjusted Hazard Ratios (95% CI)			
	White		Black/African American	
	JAKi vs. TNFi (n=1960) ^a	IL6i vs. TNFi (n=712) ^a	JAKi vs. TNFi (n=263) ^a	IL6i vs. TNFi (n=94) ^a
Disease incidence				
COVID-19	1.213 (0.997-1.476)	0.869 (0.629-1.199)	0.833 (0.480-1.446)	1.119 (0.419-2.983)
Medical utilization				
Hospitalization	0.969 (0.801-1.173)	1.009 (0.745-1.367)	1.241 (0.727-2.120)	0.716 (0.282-1.814)
Critical care services	1.392 (0.927-2.092)	0.961 (0.495-1.866)	0.953 (0.345-2.629)	0.583 (0.053-6.445)
Mechanical ventilation	1.307 (0.765-2.234)	0.747 (0.301-1.859)	1.643 (0.274-9.860)	1.262 (0.079-20.23)
Mortality				
Deceased	1.477 (1.035-2.107)	0.813 (0.465-1.422)	1.402 (0.521-3.773)	0.777 (0.130-4.651)
Adverse outcomes^b	1.003 (0.837-1.203)	0.997 (0.747-1.331)	1.239 (0.740-2.077)	0.653 (0.263-1.624)

Note:

CI: Confidence interval; JAKi: Janus-associated kinase inhibitors; TNFi: Tumor necrosis factor alpha inhibitors; IL6i: Interleukin-6 inhibitors; COVID-19: Coronavirus Disease 2019;

^a Patients in each cohort after propensity score matching were stratified by age at index, sex, race, socioeconomic status, lifestyles, comorbidities, medical utilization, COVID-19 vaccination and medication usage.^b Including hospitalization, critical care services, mechanical ventilation, or deceased.

Supplementary Table 5: The risk of outcomes stratified by corticosteroid usage.

Outcomes	Adjusted Hazard Ratios (95% CI)			
	With corticosteroids ^a		Without corticosteroids ^b	
	JAKi vs. TNFi (n=1541) ^c	IL6i vs. TNFi (n=596) ^c	JAKi vs. TNFi (n=1091) ^c	IL6i vs. TNFi (n=367) ^c
Disease incidence				
COVID-19	1.099 (0.882-1.369)	0.868 (0.620-1.214)	1.076 (0.822-1.408)	1.084 (0.682-1.722)
Medical utilization				
Hospitalization	0.903 (0.721-1.132)	1.087 (0.752-1.570)	1.044 (0.811-1.342)	1.159 (0.747-1.798)
Critical care services	0.886 (0.584-1.343)	0.663 (0.348-1.263)	1.576 (0.894-2.779)	1.265 (0.339-4.727)
Mechanical ventilation	1.217 (0.698-2.123)	0.811 (0.302-2.179)	1.008 (0.435-2.340)	0.781 (0.209-2.917)
Mortality				
Deceased	1.257 (0.875-1.805)	0.713 (0.409-1.240)	1.215 (0.697-2.118)	0.946 (0.384-2.329)
Adverse outcomes^d	0.976 (0.790-1.207)	0.980 (0.691-1.390)	1.054 (0.826-1.345)	1.214 (0.798-1.846)

Note:

CI: Confidence interval; JAKi: Janus-associated kinase inhibitors; TNFi: Tumor necrosis factor alpha inhibitors; IL6i: Interleukin-6 inhibitors; COVID-19: Coronavirus Disease 2019;

^a Subjects were prescribed corticosteroids (ATC code H02) within 1 year on or before the index date.^b Subjects never been prescribed corticosteroids (ATC code H02) within 1 year on or before the index date documented in their health records.^c Patients in each cohort after propensity score matching were stratified by age at index, sex, race, socioeconomic status, lifestyles, comorbidities, medical utilization, COVID-19 vaccination and medication usage.^d Including hospitalization, critical care services, mechanical ventilation, or deceased.

Supplementary Table 6: Sensitivity analysis deal with competing risk.

Outcomes	Patients with outcome		Hazard ratio (95% CI) ^a	Patients with outcome		Hazard ratio (95% CI) ^a
	JAKi (n=2676)	TNFi (n=2676)		IL6i (n=967)	TNFi (n=967)	
Disease incidence						
COVID-19	335	346	1.122 (0.965-1.305)	126	134	0.992 (0.778-1.265)
Medical utilization						
Hospitalization	292	264	1.242 (1.051-1.468)	111	102	1.220 (0.932-1.596)
Critical care services	126	111	1.297 (1.004-1.675)	41	50	0.855 (0.566-1.293)
Mechanical ventilation	98	85	1.327 (0.992-1.776)	36	40	0.955 (0.609-1.498)
Mortality						
Deceased	87	69	1.440 (1.049-1.976)	30	38	0.835 (0.517-1.348)
Adverse outcomes^b	292	264	1.242 (1.051-1.468)	111	103	1.209 (0.924-1.581)

Note: CI: Confidence interval; JAKi: Janus-associated kinase inhibitor; TNFi: Tumor necrosis factor alpha inhibitors; IL6i: Interleukin-6 inhibitors; COVID-19: Coronavirus Disease 2019;

^a Patients in each cohort after propensity score matching performed on age at index, sex, race, socioeconomic status, lifestyles, comorbidities, medical utilization, COVID-19 vaccination and medication usage.

^b Including hospitalization, critical care services, mechanical ventilation, or deceased.
If the patient number is less than or equal to 10, the results show the count as 10.

Supplementary Table 7: Sensitivity analysis of newly diagnosed RA patients.

Outcomes	Patients with outcome		Hazard ratio (95% CI) ^a	Patients with outcome		Hazard ratio (95% CI) ^a
	JAKi (n=1588)	TNFi (n=1588)		IL6i (n=556)	TNFi (n=556)	
Disease incidence						
COVID-19	152	147	1.112 (0.886-1.396)	62	45	1.361 (0.927-1.998)
Medical utilization						
Hospitalization	170	182	0.992 (0.805-1.223)	61	59	0.991 (0.692-1.417)
Critical care services	41	27	1.650 (1.012-2.689)	13	10	1.266 (0.555-2.887)
Mechanical ventilation	23	22	1.138 (0.632-2.049)	10	10	1.287 (0.446-3.710)
Mortality						
Deceased	44	35	1.347 (0.863-2.105)	15	14	1.057 (0.510-2.190)
Adverse outcomes^b	185	191	1.031 (0.842-1.262)	66	60	1.059 (0.746-1.503)

Note: CI: Confidence interval; JAKi: Janus-associated kinase inhibitor; TNFi: Tumor necrosis factor alpha inhibitors; IL6i: Interleukin-6 inhibitors; COVID-19: Coronavirus Disease 2019;

^a Patients in each cohort after propensity score matching performed on age at index, sex, race, socioeconomic status, lifestyles, comorbidities, medical utilization, COVID-19 vaccination and medication usage.

^b Including hospitalization, critical care services, mechanical ventilation, or deceased.

If the patient number is less than or equal to 10, the results show the count as 10.

Supplementary Table 8: Sensitivity analysis focusing on four RA-licensed JAK inhibitors.

Outcomes	Patients with outcome		Hazard ratio (95% CI) ^a
	JAKi (n=2676)	TNFi (n=2676)	
Disease incidence			
COVID-19	266	292	1.080 (0.915-1.276)
Medical utilization			
Hospitalization	259	276	1.058 (0.892-1.254)
Critical care services	70	56	1.425 (1.002-2.027)
Mechanical ventilation	36	28	1.477 (0.900-2.423)
Mortality			
Deceased	87	70	1.447 (1.056-1.984)
Adverse outcomes^b	290	298	1.104 (0.939-1.299)

Note: CI: Confidence interval; JAKi: Janus-associated kinase inhibitor; TNFi: Tumor necrosis factor alpha inhibitors; IL6i: Interleukin-6 inhibitors; COVID-19: Coronavirus Disease 2019;

^a Patients in each cohort after propensity score matching performed on age at index, sex, race, socioeconomic status, lifestyles, comorbidities, medical utilization, COVID-19 vaccination and medication usage.

^b Including hospitalization, critical care services, mechanical ventilation, or deceased.
If the patient number is less than or equal to 10, the results show the count as 10.

Supplementary Table 9: Sensitivity analysis – exclude subjects comorbid with other autoimmune diseases.

Outcomes	Patients with outcome		Hazard ratio (95% CI) ^a	Patients with outcome		Hazard ratio (95% CI) ^a
	JAKi (n=2222)	TNFi (n=2222)		IL6i (n=808)	TNFi (n=808)	
Disease incidence						
COVID-19	216	196	1.254 (1.034-1.522)	82	86	0.988 (0.730-1.338)
Medical utilization						
Hospitalization	229	227	1.108 (0.922-1.332)	89	82	1.110 (0.822-1.499)
Critical care services	62	36	1.935 (1.283-2.920)	19	19	1.040 (0.551-1.965)
Mechanical ventilation	31	14	2.487 (1.322-4.679)	11	10	1.878 (0.695-5.079)
Mortality						
Deceased	75	56	1.495 (1.057-2.114)	24	28	0.878 (0.508-1.515)
Adverse outcomes^b	256	248	1.138 (0.956-1.356)	96	93	1.057 (0.795-1.406)

Note: CI: Confidence interval; JAKi: Janus-associated kinase inhibitor; TNFi: Tumor necrosis factor alpha inhibitors; IL6i: Interleukin-6 inhibitors; COVID-19: Coronavirus Disease 2019;

^a Patients in each cohort after propensity score matching performed on age at index, sex, race, socioeconomic status, lifestyles, comorbidities, medical utilization, COVID-19 vaccination and medication usage.

^b Including hospitalization, critical care services, mechanical ventilation, or deceased.

If the patient number is less than or equal to 10, the results show the count as 10.