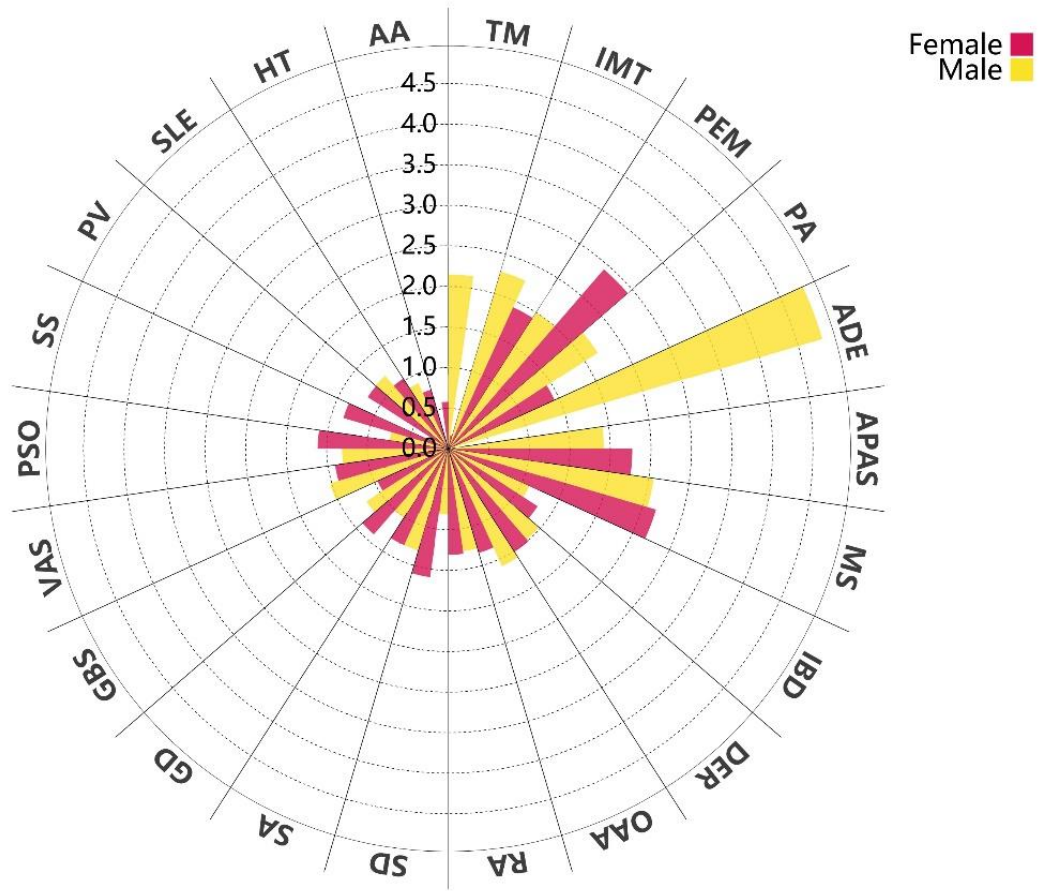


Supplementary Figure 1 Subgroup analyses by sex.

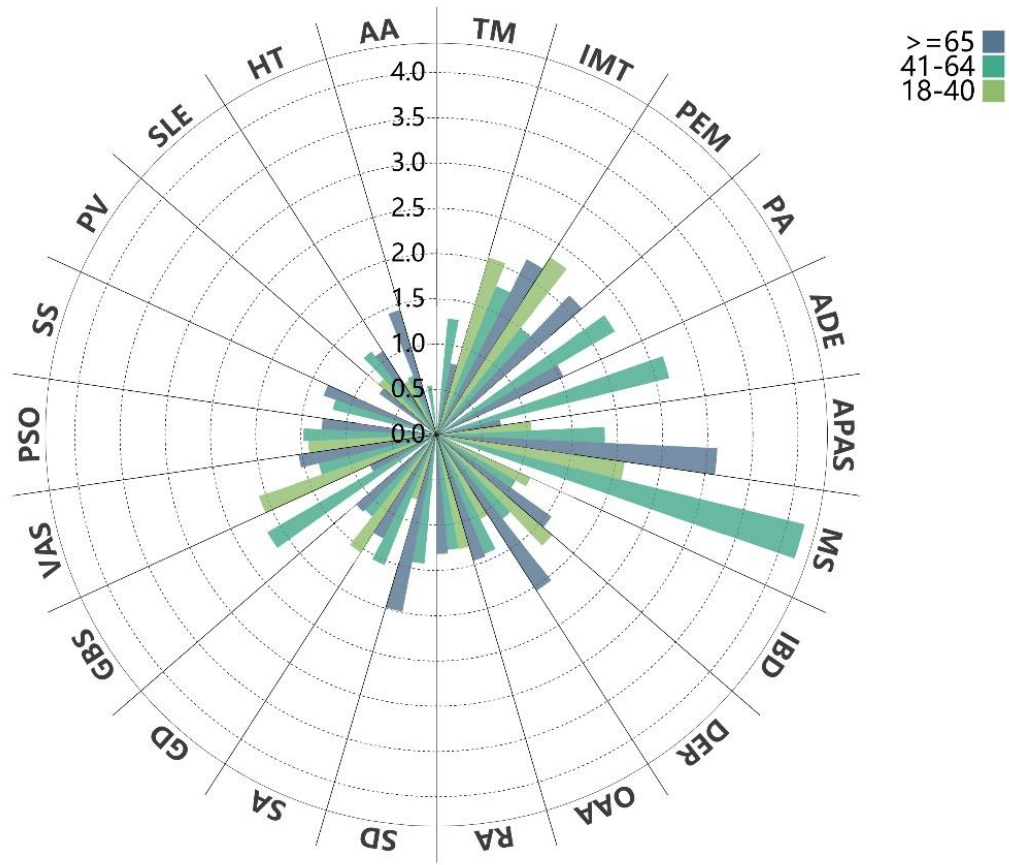
A



Y axis represent the hazard ratio associated with COVID-19 infection. Abbreviation: IBD: Inflammatory bowel diseases; PA: Pernicious anaemia; SA: Spondyloarthritis; RA: Rheumatoid arthritis; DER: Dermatopolymyositis; OAA: Other autoimmune arthritis; PSO: Psoriasis; AA: Alopecia areata; PV: Pemphigus vulgaris; PEM: Pemphigoid; VAS: Vasculitis; HT: Hashimoto's thyroiditis; GD: Graves' disease; IMT: Immune mediated thrombocytopenia; APAS: Anti-phospholipid antibody syndrome; GBS: Guillain barre syndrome, ADE: Acute disseminated encephalomyelitis; TM: transverse myelitis; SLE: Systemic lupus erythematosus, SD: Sjogren disease; SS: Systemic sclerosis; MS: Multiple sclerosis.

Supplementary Figure 2 Subgroup analyses by age group.

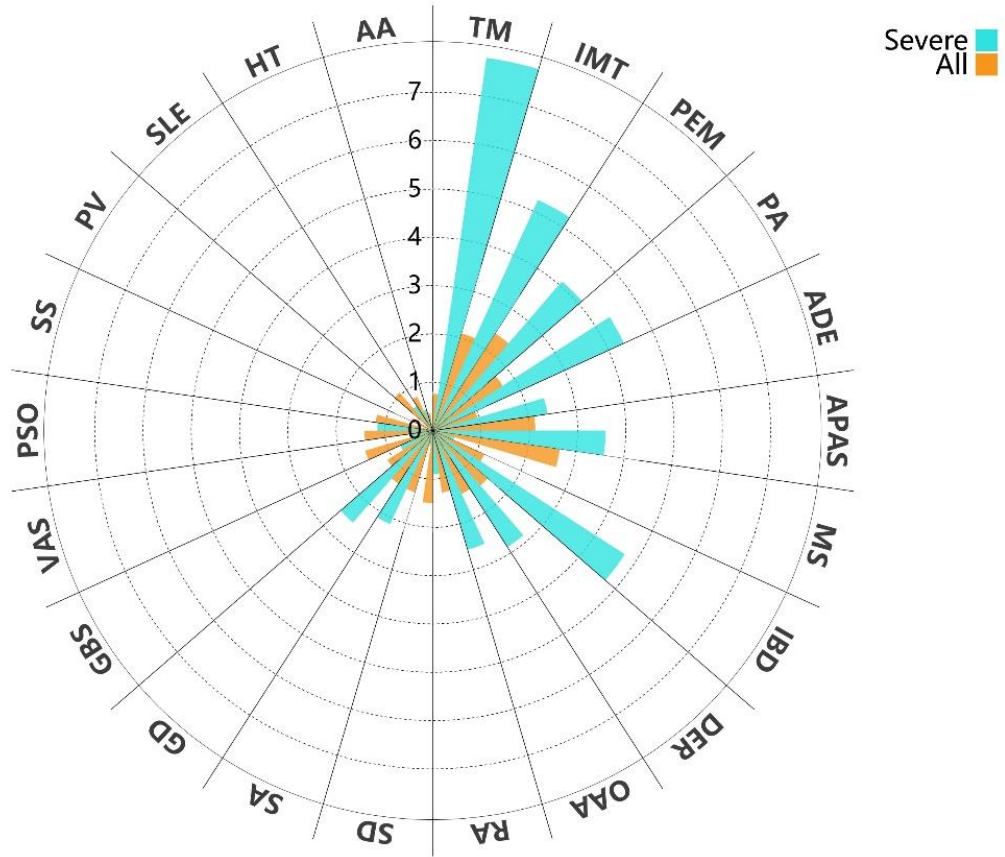
B



Y axis represent the hazard ratio associated with COVID-19 infection. Abbreviation: IBD: Inflammatory bowel diseases; PA: Pernicious anaemia; SA: Spondyloarthritis; RA: Rheumatoid arthritis; DER: Dermatopolymyositis; OAA: Other autoimmune arthritis; PSO: Psoriasis; AA: Alopecia areata; PV: Pemphigus vulgaris; PEM: Pemphigoid; VAS: Vasculitis; HT: Hashimoto's thyroiditis; GD: Graves' disease; IMT: Immune mediated thrombocytopenia; APAS: Anti-phospholipid antibody syndrome; GBS: Guillain barre syndrome, ADE: Acute disseminated encephalomyelitis; TM: transverse myelitis; SLE: Systemic lupus erythematosus, SD: Sjogren disease; SS: Systemic sclerosis; MS: Multiple sclerosis.

Supplementary Figure 3 Subgroup analyses by COVID severity.

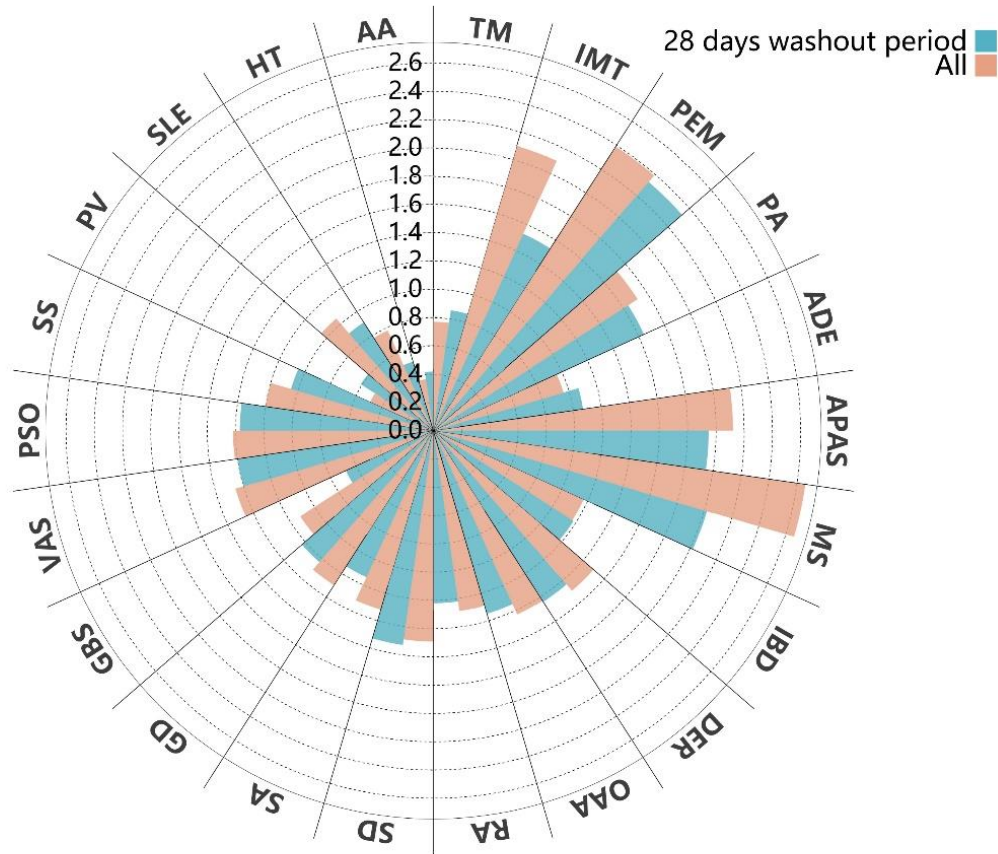
C



Y axis represent the hazard ratio associated with COVID-19 infection. Abbreviation: IBD: Inflammatory bowel diseases; PA: Pernicious anaemia; SA: Spondyloarthritis; RA: Rheumatoid arthritis; DER: Dermatopolymyositis; OAA: Other autoimmune arthritis; PSO: Psoriasis; AA: Alopecia areata; PV: Pemphigus vulgaris; PEM: Pemphigoid; VAS: Vasculitis; HT: Hashimoto's thyroiditis; GD: Graves' disease; IMT: Immune mediated thrombocytopenia; APAS: Anti-phospholipid antibody syndrome; GBS: Guillain barre syndrome, ADE: Acute disseminated encephalomyelitis; TM: transverse myelitis; SLE: Systemic lupus erythematosus, SD: Sjogren disease; SS: Systemic sclerosis; MS: Multiple sclerosis.

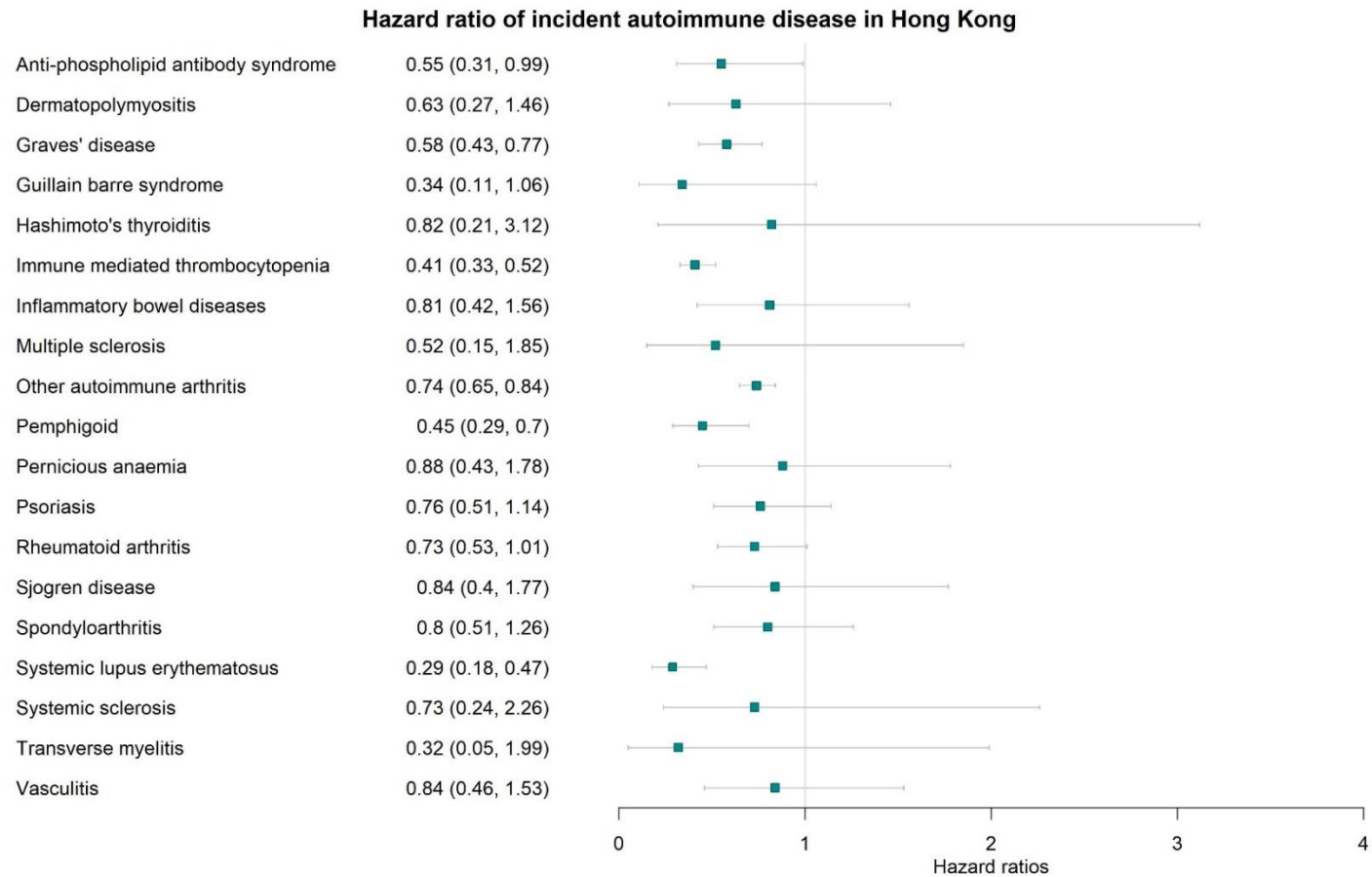
Supplementary Figure 4 Sensitivity analyses applying 28-day washout period.

D



Y axis represent the hazard ratio associated with COVID-19 infection. Abbreviation: IBD: Inflammatory bowel diseases; PA: Pernicious anaemia; SA: Spondyloarthritis; RA: Rheumatoid arthritis; DER: Dermatopolymyositis; OAA: Other autoimmune arthritis; PSO: Psoriasis; AA: Alopecia areata; PV: Pemphigus vulgaris; PEM: Pemphigoid; VAS: Vasculitis; HT: Hashimoto's thyroiditis; GD: Graves' disease; IMT: Immune mediated thrombocytopenia; APAS: Anti-phospholipid antibody syndrome; GBS: Guillain barre syndrome, ADE: Acute disseminated encephalomyelitis; TM: transverse myelitis; SLE: Systemic lupus erythematosus, SD: Sjogren disease; SS: Systemic sclerosis; MS: Multiple sclerosis.

Supplementary Figure 5 Protective effect of COVID-19 vaccine among COVID-19 patients (≥ 2 doses versus 0-1 dose) *



*COVID-19 vaccinated (2/3/4 dose) population versus COVID-19 unvaccinated (0/1 dose) population, adjusting for age, sex, Charlson comorbidity index

Supplementary Table 1 International Classification of Diseases, Ninth Revision (ICD-9) codes used to identify autoimmune diseases and other comorbidities

Description		ICD9 codes
Digestive system		
Inflammatory bowel diseases		555-556
Pernicious anaemia		281.0
Musculoskeletal system		
Rheumatoid arthritis		714
Dermatopolymyositis		710.3-710.4
Spondyloarthritis	Ankylosing spondylitis	720
	Reiter's disease	099.3
	Arthropathy associated with Reiter's disease and nonspecific urethritis	711.1
	Postdysenteric arthropathy	711.3

Other	Arthropathy associated with other viral diseases	711.5
autoimmune	Transient arthropathy	716.4
arthritis	Unspecified polyarthropathy or polyarthrititis	716.5
	Unspecified monoarthritis	716.6
	Unspecified arthropathy	716.9
	Pain in joint	719.4
Integumentary system		
Psoriasis		696
Alopecia areata		704.01
Pemphigus vulgaris		694.4
Pemphigoid		694.5, 694.6
Endocrine system		
Hashimoto's thyroiditis		245.2

Graves' disease		242.0
Haematological system		
Anti-phospholipid antibody syndrome	Other and unspecified nonspecific immunological findings	795.79
	Haemorrhagic disorder due to intrinsic circulating anticoagulants	286.5
	Other specified diseases of blood and blood-forming organs	289.89
Immune mediated thrombocytopenia	Primary immune mediated thrombocytopenia	287.3
	Secondary immune mediated thrombocytopenia	287.4
	Immune mediated thrombocytopenia, unspecified	287.5
	Wiskott-Aldrich syndrome	279.12
	Haemolytic-uremic syndrome	283.11
	Pancytopenia	284.1
	Thrombotic microangiopathy	446.6
Transient neonatal immune mediated thrombocytopenia	776.1	

Multi system		
Systemic lupus erythematosus		710.0
Multiple sclerosis		340
Sjogren disease		710.2
Systemic sclerosis		710.1
Nervous system		
Guillain barre syndrome	Acute infective polyneuritis	357.0
	Other inflammatory and toxic neuropathy	357.8
	Unspecified inflammatory and toxic neuropathy	357.9
Acute disseminated encephalomyelitis	Postinfectious encephalitis, myelitis, and encephalomyelitis	323.6
	Other causes of encephalitis, myelitis, and encephalomyelitis	323.8
Transverse	Acute (transverse) myelitis	341.2

myelitis	Encephalitis, myelitis, and encephalomyelitis in viral diseases classified elsewhere	323.0
	Other encephalitis, myelitis, and encephalomyelitis due to infection classified elsewhere	323.4
	Encephalitis, myelitis, and encephalomyelitis following immunization procedures	323.5
	Postinfectious encephalitis, myelitis, and encephalomyelitis	323.6
	Other causes of encephalitis, myelitis, and encephalomyelitis	323.8
Vasculitis		
Cutaneous vasculitis		709.1
Isolated aortitis		709.3
Polyarteritis nodosa		446.0
Giant cell arteritis		446.5
Allergic purpura		287.0
ANCA positive vasculitis		447.6

Charlson Comorbidity Index	
Myocardial infarction	410
Peripheral vascular disease	441, 443.9, 785.4, V43.4
Cerebrovascular disease	430-438
Chronic obstructive pulmonary disease	490-496, 500-505, 506.4
Dementia	290
Paralysis	342, 344.1
Chronic renal failure	582, 585, 586, 588, 583.0-583.2, 583.4, 583.6, 583.7
Mild liver disease	571.2, 571.4, 571.5, 571.6
Moderate-Severe COVID liver disease	456.0, 456.1, 456.2, 572.2, 572.3, 572.4, 572.8
Peptic ulcers	531-534

Diabetes without chronic complication	250.0, 250.1, 250.2, 250.3, 250.7
Diabetes with chronic complication	250.4, 250.5, 250.6
Acquired Immune Deficiency Syndrome (AIDS)	042
Malignancy	140-149, 150-159, 180-189, 170, 171, 172, 174, 175, 176, 179, 160-165, 190-195, 200-208
Metastatic solid tumour	196-199

Supplementary Table 2 Risk of newly diagnosed systemic/organ-specific autoimmune disease after COVID-19

Description	Hazard ratio	P value
Organ-specific autoimmune diseases	1.41 (1.28, 1.55)	<0.001
Systemic autoimmune diseases	1.49 (1.41, 1.58)	<0.001

Organ-specific autoimmune diseases: Inflammatory bowel diseases; Spondyloarthritis; Psoriasis; Hashimoto's thyroiditis; Graves' disease; Alopecia areata; Pemphigus vulgaris; Pernicious anaemia; Pemphigoid; Guillain barre syndrome; Isolated aortitis; Cutaneous vasculitis; Acute disseminated encephalomyelitis; Transverse myelitis.

Systemic autoimmune diseases: Systemic lupus erythematosus; Rheumatoid arthritis; Sjogren disease; Systemic sclerosis; Dermatopolymyositis; Multiple sclerosis; Polyarteritis nodosa; Giant cell arteritis; Allergic purpura; ANCA positive vasculitis; Anti-phospholipid antibody syndrome; Immune mediated thrombocytopenia; Other autoimmune arthritis.

Supplementary Table 3 Hazard ration of COVID-19 estimated by flexible parametric survival model and Cox survival model

Outcomes	HR (95% CI) estimated by flexible parametric survival model	HR (95% CI) estimated by Cox survival model
Spondyloarthritis	1.31 (1.1,1.56)	1.32 (1.03,1.69)
Rheumatoid arthritis	1.29 (1.14,1.45)	1.29 (1.09,1.54)
Other autoimmune disease	1.43 (1.36,1.51)	1.43 (1.33,1.54)
Alopecia areata	0.35 (0.11,1.1)	0.35 (0.05,2.96)
Hashimoto's thyroiditis	0.77 (0.5,1.21)	0.78 (0.4,1.54)
Immune mediated thrombocytopenia	2.09 (1.88,2.32)	2.1 (1.82,2.43)
Systemic lupus erythematosus	1.05 (0.87,1.26)	1.05 (0.79,1.39)
Multiple sclerosis	2.66 (1.4,5.03)	2.66 (1.17,6.05)
Guillain barre syndrome	1.13 (0.72,1.76)	1.12 (0.58,2.19)