

COVID-19 Infection Among Patients with Autoimmune Rheumatic Disease (AIRD)-Single Centre Experience (Malaysia)

Kiah Loon Ng*

Department of Medicine, Malaysia

*Corresponding author:

Kiah Loon Ng,
Raja Perempuan Zainab II Hospital, Kota Bharu, Malaysia, Tel: 609-7452000;
E-mail: kiahloon1982@yahoo.com

Received: 22 Aug 2022

Accepted: 03 Sep 2022

Published: 08 Sep 2022

J Short Name: JCMJ

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Citation:

Kiah Loon Ng, COVID-19 Infection Among Patients with Autoimmune Rheumatic Disease (AIRD)-Single Centre Experience (Malaysia). J Clin Med Img. 2022; V6(16): 1-7

1. Abstract

The COVID-19 (C-19) pandemic had swiped through the globe since March 2020, claiming many lives. Patients with AIRD are at high risk for severe infection and poor outcome, due to concomitant co-morbid, disease activity and immunosuppressive (IS) therapy.

2. Methods

Cases of C-19 infection were recorded through local C-19 health database and patients' narration, from March 2020 until April 2022. Data were analysed with both parametric and non-parametric test using StatPlus.

3. Results

Total 71 cases of infection were recorded, affecting 62 patients. All were South East Asians and 95% were female. The median age was 39 years old and 53.2% were in 18-39 age group. Most had SLE (56.5%), followed by RA (27.4%). 81.7% of infection were asymptomatic and mild. 14.1% had moderate to severe infection and 4.2% in critical stage. The case fatality rate was 4.2%. 9 patients had recurrent infection.

Only 57.7% patients had complete vaccination (≥ 2 doses) prior to infection and mean 4.2 ± 1.8 months elapsed after last vaccine dose. 56.3% had at least one IS. 4 were on bDMARD — 2 on TNF- α inhibitor and 2 on RIX. 71.8% were on HCQ and 59.2% used steroid (mean dose 6.8 ± 10.5 mg OD). 54.9% patients attained remission and low disease activity.

Upon diagnosis, 73.2% had at least 1 risk factor portending severe

infection. 5 cases occurred during pregnancy, involving 4 SLE patients. All had asymptomatic/mild infection, except for one who had critical illness at second infection. Nevertheless, all recovered fully.

Univariate logistic regression (LR) analyses showed severe infection could be associated with inadequate vaccine dose [OR -0.22 (-0.42, -0.02), $p = 0.03$], activity AIRD disease [OR 0.16 (0.01, 0.32), $p = 0.04$] and certain variant type (worst with Alpha/Beta, intermediate with Delta and better with Omicron) [OR -0.52 (-0.88, -0.15), $p = 0.006$]. Better outcome and reduced fatality could be predicted with IS use [OR -0.37 (-0.60, -0.14), $p = 0.002$; OR 0.097 (0.002, 0.191), $p = 0.045$]. Yet number and type of IS did not predict the outcome in subgroup analyses of patients on IS.

Subgroup analyses of patients with complete vaccination showed active AIRD disease could predict severe infection [OR 0.20 (0.01, 0.39), $p = 0.036$] and fatality [OR -0.04 (-0.07, 0.001), $p = 0.04$]. Higher steroid dose was associated with fatality [OR -0.005 (-0.009, -0.0004), $p = 0.032$]. The outcome was better with IS use [OR: -0.295 (-0.581, -0.009), $p = 0.0433$]. It's not associated with number and type of IS used in subgroup analyses of patients with complete vaccination and on IS [IS number: OR -0.11 (-0.38, 0.15), $p = 0.38$; IS type: OR -0.04 (-0.12, 0.04), $p = 0.29$].

Overall, use of HCQ did not portend severity, outcome and fatality of C-19 infection in all group and subgroup analyses. Multivariate LR analyses did not support all the above associations/predictions, nevertheless (Table 1-4).

Table 1: Demographic data, COVID-19 infection severity and outcome

	Total (N = 71)	Asymptomatic (n = 6)	Mild (n = 52)	Moderate (n = 4)	Severe (n = 6)	Critical (n = 3)	p-value***	Recovery (n = 59)	Sequelae (n = 9)^	Fatality (n = 3)	p-value***
Median Age (Year), IQR	39, 22.5						p < 0.0001	p = 0.0000			
Age Group (Year), n (%)											
< 18	1 (1.4)	0 (0)	1 (1.9)	0 (0)	0 (0)	0 (0)	p < 0.0001	1 (1.7)	0 (0)	0 (0)	p = 0.0000
18 - 29	19 (26.8)	2 (33.3)	14 (26.9)	2 (50.0)	0 (0)	1 (33.3)		17 (28.8)	1 (11.1)	1 (33.3)	
30 - 39	18 (25.3)	2 (33.3)	16 (30.8)	0 (0)	0 (0)	0 (0)		14 (23.7)	4 (44.4)	0 (0)	
40 - 49	9 (12.7)	0 (0)	6 (11.5)	0 (0)	2 (33.3)	1 (33.3)		8 (13.6)	0 (0)	1 (33.3)	
50 - 59	14 (19.7)	1 (16.7)	10 (19.2)	1 (25.0)	1 (16.7)	1 (33.3)		11 (18.6)	2 (22.2)	1 (33.3)	
60 - 69	7 (9.9)	0 (0)	5 (9.6)	1 (25.0)	1 (16.7)	0 (0)		6 (10.2)	1 (11.1)	0 (0)	
70 - 79	3 (4.2)	1 (16.7)	0 (0)	0 (0)	2 (33.3)	0 (0)		2 (3.4)	1 (11.1)	0 (0)	
Gender, n (%)							p < 0.0001	p = 0.1862			
Female	68 (95.8)	6 (100.0)	50 (96.2)	4 (100.0)	5 (83.3)	3 (100.0)	56 (94.9)				
Male	3 (4.2)	0 (0)	2 (3.8)	0 (0)	1 (16.7)	0 (0)	3 (5.1)				
Mean Weight (kg)							p < 0.0001	p = 0.0000			
BMI*, n (%)											
Underweight	8 (11.3)	0 (0)	8 (15.4)	0 (0)	0 (0)	0 (0)	p = 0.0002	8 (13.6)	0 (0)	0 (0)	p = 0.0000
Normal Weight	19 (26.8)	2 (33.3)	12 (23.1)	4 (100.0)	0 (0)	1 (33.3)		16 (27.1)	1 (11.1)	2 (66.7)	
Overweight	9 (12.7)	1 (16.7)	6 (11.5)	0 (0)	1 (16.7)	1 (33.3)		8 (13.6)	1 (11.1)	0 (0)	
Obese	35 (49.2)	3 (50.0)	26 (50.0)	0 (0)	5 (83.3)	1 (33.3)		27 (45.8)	7 (77.8)	1 (33.3)	
Risk Factors**, n (%)								p < 0.0001	p = 0.2416		
0	19 (26.8)	1 (16.7)	14 (26.9)	3 (75.0)	0 (0)	1 (33.3)	17 (28.8)				
1	32 (45.1)	2 (33.3)	26 (50.0)	1 (25.0)	2 (33.3)	1 (33.3)	28 (47.5)				
2	17 (23.9)	3 (50.0)	10 (19.2)	0 (0)	3 (50.0)	1 (33.3)	11 (18.6)				
> 2	3 (4.2)	0 (0)	2 (3.8)	0 (0)	1 (16.7)	0 (0)	3 (5.1)				
Pregnancy, n (%)	5 (7.0)	1 (16.7)	3 (5.8)	0 (0)	0 (0)	1 (33.3)	p = 0.0000	4 (6.8)	1 (11.1)	0 (0)	p = 0.0000
Vaccine Dose, n (%)							p = 0.0003	p = 0.0565			
0	20 (28.1)	0 (0)	13 (25.0)	1 (25.0)	5 (83.3)	1 (33.3)	p = 0.0000	16 (27.0)	2 (22.2)	2 (66.7)	p < 0.0001
1	9 (12.7)	2 (33.3)	7 (13.5)	0 (0)	0 (0)	0 (0)		8 (13.6)	1 (11.1)	0 (0)	
2	33 (46.5)	2 (33.3)	26 (50.0)	2 (50.0)	1 (16.7)	2 (66.7)		27 (45.8)	5 (55.6)	1 (33.3)	
3	9 (12.7)	2 (33.3)	6 (11.5)	1 (25.0)	0 (0)	0 (0)		8 (13.6)	1 (11.1)	0 (0)	
Incomplete (< 2 doses), n (%)	30 (42.3)	2 (33.3)	21 (40.4)	1 (25.0)	5 (83.3)	1 (33.3)	25 (42.4)				
Complete (≥ 2 doses), n (%)	41 (57.7)	4 (66.7)	31 (59.6)	3 (75.0)	1 (16.7)	2 (66.7)	34 (57.6)				
Variant Dominance, n (%)							p = 0.1093	p = 0.0000			
Alpha/Beta Delta	3 (4.2)	0 (0)	0 (0)	0 (0)	3 (50.0)	0 (0)	2 (3.4)				
Omicron	42 (59.2)	2 (33.3)	33 (63.5)	2 (50.0)	3 (50.0)	2 (66.7)	36 (61.0)				
	26 (36.6)	4 (66.7)	19 (36.5)	2 (50.0)	0 (0)	1 (33.3)	21 (35.6)				

*BMI according to Asia Pacific Classification

** Risk factors for severe COVID-19 infection as recommended by CDC (Centers for Disease Control and Prevention), US (Hypertension is excluded; bronchial asthma, overweight and obesity are included)

*** p-values were calculated by Kruskal-Wallis ANOVA (median test)

^ Sequelae include organising pneumonia, chronic lung changes (fibrosis, bronchiectasis), reduced effort tolerance IQR interquartile range, BMI body mass index

Table 2: Clinical entities, COVID-19 severity and outcome

	Total (N = 71)	Asymptomatic (n = 6)	Mild (n = 52)	Moderate (n = 4)	Severe (n = 6)	Critical (n = 3)	p-value***	Recovery (n = 59)	Sequelae (n = 9)^	Fatality (n = 3)	p-value***
Diagnosis, n (%)							p = 0.0023	p < 0.0001			
SLE	38 (53.5)	4 (66.7)	28 (53.8)	3 (75.0)	1 (16.7)	2 (66.7)	31 (52.5)				
RA	22 (31)	2 (33.3)	14 (26.9)	1 (25.0)	4 (66.7)	1 (33.3)	19 (32.2)				
SpA	3 (4.2)	0 (0)	2 (3.8)	0 (0)	1 (16.7)	0 (0)	3 (5.1)				
Other CTD	6 (8.5)	0 (0)	6 (11.5)	0 (0)	0 (0)	0 (0)	5 (8.5)				
Vasculitis	1 (1.4)	0 (0)	1 (1.9)	0 (0)	0 (0)	0 (0)	1 (1.7)				
Others	1 (1.4)	0 (0)	1 (1.9)	0 (0)	0 (0)	0 (0)	0 (0)				
Disease activity, n (%)							p = 0.4274	p < 0.0001			
Remission	20 (28.1)	3 (50.0)	14 (26.9)	1 (25.0)	1 (16.7)	1 (33.3)	17 (28.8)				
Low Disease Activity	19 (26.8)	0 (0)	17 (32.7)	1 (25.0)	1 (16.7)	0 (0)	15 (25.4)				
Mild Disease Activity	15 (21.1)	2 (33.3)	12 (23.1)	0 (0)	1 (16.7)	0 (0)	15 (25.4)				
Moderate Disease Activity	8 (11.3)	1 (16.7)	4 (7.7)	0 (0)	3 (50.0)	0 (0)	6 (10.2)				
High Disease Activity /	9 (12.7)	0 (0)	5 (9.6)	2 (50.0)	0 (0)	2 (66.7)	6 (10.2)				

Severe	p = 0.0000						p = 0.0002		
Number of IS, n (%)									
0	31 (43.7)	3 (50.0)	21 (40.4)	1 (25.0)	3 (50.0)	3 (100.0)	21 (35.6)	7 (77.8)	3 (100.0)
1	27 (38)	2 (33.3)	21 (40.4)	3 (75.0)	1 (16.7)	0 (0)	25 (42.4)	2 (22.2)	0 (0)
2	13 (18.3)	1 (16.7)	10 (19.2)	0 (0)	2 (33.3)	0 (0)	13 (22.0)	0 (0)	0 (0)
Type of IS, n (%)	p < 0.0001						p = 0.0093		
- csDMARD	32 (45.1)	3 (50.0)	24 (46.2)	2 (50.0)	3 (50.0)	0 (0)	30 (50.8)	2 (22.2)	0 (0)
Monotherapy	21 (29.6)	2 (33.3)	16 (30.8)	2 (50.0)	1 (16.7)	0 (0)	19 (32.2)	2 (22.2)	0 (0)
Combination	11 (15.5)	1 (16.7)	8 (15.4)	0 (0)	2 (33.3)	0 (0)	11 (18.6)	0 (0)	0 (0)
- bDMARD									
ADA (+SSZ)	2 (5)	0 (0)	2 (3.8)	0 (0)	0 (0)	0 (0)	2 (3.4)	0 (0)	0 (0)
RIX	2 (5)	0 (0)	1 (1.9)	1 (25.0)	0 (0)	0 (0)	2 (3.4)	0 (0)	0 (0)
- CYC	4 (10)	0 (0)	4 (7.7)	0 (0)	0 (0)	0 (0)	4 (6.8)	0 (0)	0 (0)
HQC use, n (%)	p = 0.0000						p < 0.0001		
Yes	51 (71.8)	5 (83.3)	37 (71.2)	3 (75.0)	3 (50.0)	3 (100.0)	42 (71.2)	6 (66.7)	3 (100.0)
No	20 (28.2)	1 (16.7)	15 (28.8)	1 (25.0)	3 (50.0)	0 (0)	17 (28.8)	3 (33.3)	0 (0)
Steroid use, n (%)	p = 0.0000						p < 0.0001		
Yes	42 (59.2)	4 (66.7)	31 (59.6)	2 (50.0)	2 (33.3)	3 (100.0)	33 (55.9)	6 (66.7)	3 (100.0)
No	29 (40.8)	2 (33.3)	21 (40.4)	2 (50.0)	4 (66.7)	0 (0)	26 (44.1)	3 (33.3)	0 (0)
Steroid Group, n (%)	p = 0.0269						p < 0.0001		
Low Dose	23 (32.4)	2 (33.3)	19 (36.5)	0 (0)	1 (16.7)	1 (33.3)	17 (28.8)	5 (55.6)	1 (33.3)
Medium Dose	16 (22.5)	2 (33.3)	10 (19.2)	1 (25.0)	1 (16.7)	2 (66.7)	13 (22.0)	1 (11.1)	2 (66.7)
High dose	3 (4.2)	0 (0)	2 (3.8)	1 (25.0)	0 (0)	0 (0)	3 (5.1)	0 (0)	0 (0)
Mean steroid dose (mg)	6.8 ± 10.5						p = 0.1743		

*** p-values were calculated by Kruskal-Wallis ANOVA (median test)

^ Sequelae include organising pneumonia, chronic lung changes (fibrosis, bronchiectasis), reduced effort tolerance

SLE systemic lupus erythematosus, RA rheumatoid arthritis, SpA spondyloarthritis, CTD connective tissue disease, IS immunosuppressant, csDMARD conventional synthetic DMARD, bDMARD biologic DMARD, ADA adalimumab, SSZ sulfasalazine, RIX rituximab, CYC cyclophosphamide, HCQ hydroxychloroquine

Table 3: Logistic regression analyses of factors associated with COVID-19 severity, outcome and fatality

	Univariate		Multivariate	
	Severity OR (95% CI), p-value	Outcome (O)* & Fatality (F) OR (95% CI), p-value	Severity OR (95% CI), p-value	Outcome (O)* & Fatality (F) OR (95% CI), p-value
All Cases (N = 71)				
Age	0.01 (-0.00, 0.03), p = 0.05	O: 0.002 (-0.01, 0.01), p = 0.67 F: 0.0003 (-0.003, 0.004), p = 0.88	0.02 (-0.07, 0.10), p = 0.72	O: -0.004 (-0.05, 0.05), p = 0.87 F: -0.004 (-0.03, 0.02), p = 0.69
Age group	0.13 (-0.00, 0.27), p = 0.06	O: 0.02 (-0.06, 0.1), p = 0.58 F: 0.0004 (-0.03, 0.03), p = 0.98	0.04 (-0.74, 0.82), p = 0.91	O: 0.09 (-0.37, 0.55), p = 0.69 F: 0.01 (-0.18, 0.21), p = 0.90
Gender	0.42 (-0.64, 1.47), p = 0.43	O: -0.22 (-0.82, 0.38), p = 0.46 F: 0.04 (-0.20, 0.28), p = 0.71	-0.16 (-1.37, 1.05), p = 0.79	O: -0.42 (-1.13, 0.29), p = 0.24 F: 0.09 (-0.21, 0.39), p = 0.56
Weight	0.00 (-0.01, 0.02), p = 0.79	O: 0.0009 (-0.007, 0.009), p = 0.83 F: 0.0005 (-0.003, 0.004), p = 0.78	0.002 (-0.03, 0.03), p = 0.88	O: -0.003 (-0.010, 0.003), p = 0.37 F: -0.003 (-0.01, 0.004), p = 0.34
BMI	0.05 (-0.14, 0.25), p = 0.55	O: 0.05 (-0.06, 0.16), p = 0.85 F: 0.01 (-0.03, 0.06), p = 0.60	0.09 (-0.30, 0.49), p = 0.64	O: 0.13 (-0.11, 0.36), p = 0.28 F: 0.01 (-0.09, 0.11), p = 0.87
Vaccine dose	-0.22 (-0.42, -0.02), p = 0.03*	O: -0.05 (-0.16, 0.07), p = 0.42 F: 0.03 (-0.02, 0.08), p = 0.19	-0.45 (-0.95, 0.05), p = 0.08	O: -0.14 (-0.43, 0.15), p = 0.34 F: 0.06 (-0.07, 0.18), p = 0.38
Complete vaccination	-0.23 (-0.66, 0.20), p = 0.29	O: -0.04 (-0.28, 0.21), p = 0.76 F: 0.04 (-0.06, 0.14), p = 0.39	0.86 (-0.09, 1.81), p = 0.08	O: 0.21 (-0.34, 0.77), p = 0.44 F: -0.03 (-0.27, 0.20), p = 0.79
AIRD Dx	-0.15 (-0.52, 0.22), p = 0.42	O: 0.03 (-0.19, 0.24), p = 0.81 F: 0.01 (-0.07, 0.10), p = 0.77	0.21 (-0.32, 0.73), p = 0.43	O: -0.0003 (-0.31, 0.31), p = 0.999 F: 0.02 (-0.11, 0.15), p = 0.72
Risk Factors (number)	0.11 (-0.14, 0.35), p = 0.39	O: 0.04 (-0.10, 0.18), p = 0.60 F: 0.023 (-0.03, 0.08), p = 0.41	-0.05 (-0.42, 0.32), p = 0.78	O: -0.07 (-0.29, 0.15), p = 0.51 F: 0.06 (-0.03, 0.15), p = 0.21
Disease activity	0.16 (0.01, 0.32), p = 0.04*	O: 0.08 (-0.04, 0.20), p = 0.21 F: -0.03 (-0.06, 0.01), p = 0.14	0.17 (-0.03, 0.38), p = 0.09	O: 0.07 (-0.05, 0.19), p = 0.23 F: -0.02 (-0.07, 0.03), p = 0.46
IS use	-0.27 (-0.69, 0.16), p = 0.21	O: -0.37 (-0.60, 0.14), p = 0.002* F: 0.097 (0.002, 0.191), p = 0.045*	-0.63 (-1.75, 0.48), p = 0.26	O: -0.36 (-1.01, 0.30), p = 0.28 F: 0.10 (-0.18, 0.39), p = 0.46
Number of IS	-0.13 (-0.42, 0.15), p = 0.36	O: -0.23 (-0.38, -0.08), p = 0.003* F: 0.06 (-0.01, 0.12), p = 0.08	0.39 (-0.42, 1.21), p = 0.34	O: 0.002 (-0.48, 0.48), p = 0.99 F: -0.02 (-0.23, 0.18), p = 0.82

Type of IS	-0.07 (-0.22, 0.09), $p = 0.41$	O: -0.11 (-0.19, -0.02), $p = 0.01^*$ F: 0.02 (-0.01, 0.06), $p = 0.16$	-0.03 (-0.28, 0.22), $p = 0.82$	O: -0.01 (-0.16, 0.14), $p = 0.92$ F: 0.01 (-0.06, 0.07), $p = 0.83$
HCQ use	-0.05 (-0.51, 0.43), $p = 0.85$	O: 0.09 (-0.18, 0.35), $p = 0.53$ F: -0.06 (-0.17, 0.05), $p = 0.27$	0.11 (-0.47, 0.69), $p = 0.70$	O: -0.06 (-0.40, 0.29), $p = 0.75$ F: -0.04 (-0.18, 0.11), $p = 0.60$
Steroid use	-0.01 (-0.45, 0.42), $p = 0.95$	O: 0.18 (-0.06, 0.42), $p = 0.14$ F: -0.07 (-0.17, 0.03), $p = 0.15$	0.10 (-0.98, 1.18), $p = 0.85$	O: 0.44 (-0.20, 1.07), $p = 0.17$ F: -0.14 (-0.41, 0.13), $p = 0.31$
Steroid group	0.05 (-0.19, 0.29), $p = 0.67$	O: 0.06 (-0.07, 0.20), $p = 0.36$ F: -0.04 (-0.09, 0.01), $p = 0.13$	-0.14 (-1.05, 0.77), $p = 0.77$	O: -0.21 (-0.74, 0.33), $p = 0.44$ F: 0.06 (-0.16, 0.29), $p = 0.58$
Steroid dose	0.01 (-0.01, 0.03), $p = 0.25$	O: 0.003 (-0.01, 0.1), $p = 0.58$ F: -0.003 (-0.01, 0.01), $p = 0.17$	0.02 (-0.02, 0.07), $p = 0.33$	O: 0.01 (-0.02, 0.03), $p = 0.62$ F: -0.004 (-0.02, 0.01), $p = 0.47$
Variant dominance	-0.52 (-0.88, -0.15), $p = 0.006^*$	O: 0.02 (-0.06, 0.1), $p = 0.58$ F: -0.001 (-0.09, 0.09), $p = 0.98$	-0.38 (-0.93, 0.17), $p = 0.17$	O: 0.06 (-0.26, 0.39), $p = 0.69$ F: -0.04 (-0.18, 0.09), $p = 0.53$
Severity: $R2 = 0.33$, $F(18, 70) = 1.41$, $p = 0.17$; Outcome: $R2 = 0.27$, $F(18, 70) = 1.08$, $p = 0.398$ Fatality: $R2 = 0.19$, $F(18, 70) = 0.67$, $p = 0.83$				
Subgroup analyses (Patients with complete vaccination, N = 41)				
Duration from last vaccine dose	-0.09 (-0.23, 0.05), $p = 0.21$	O: -0.03 (-0.11, 0.05), $p = 0.42$ F: 0.02 (-0.01, 0.04), $p = 0.24$	-0.01 (-0.24, 0.22), $p = 0.93$	O: 0.05 (-0.7, 0.17), $p = 0.40$ F: -0.01 (-0.05, 0.03), $p = 0.72$
Disease activity	0.20 (0.01, 0.39), $p = 0.036^*$	O: 0.08 (-0.04, 0.20), $p = 0.21$ F: -0.04 (-0.07, 0.001), $p = 0.04^*$	0.38 (-0.004, 0.77), $p = 0.05$	O: 0.21 (0.008, 0.404), $p = 0.04^*$ F: -0.07 (-0.14, -0.002), $p = 0.04^*$
IS use	-0.13 (-0.68, 0.42), $p = 0.63$	O: -0.30 (-0.58, -0.01), $p = 0.04^*$ F: 0.07 (-0.04, 0.16), $p = 0.22$	-0.91 (-2.38, 0.56), $p = 0.21$	O: -0.20 (-1.66, -0.15), $p = 0.02^*$ F: 0.26 (-0.002, 0.52), $p = 0.05$
Number of IS	-0.07 (-0.44, 0.30), $p = 0.71$	O: -0.20 (-0.40, -0.01), $p = 0.04^*$ F: 0.03 (-0.03, 0.11), $p = 0.28$	1.24 (0.05, 2.44), $p = 0.04^*$	O: 0.69 (0.08, 1.30), $p = 0.03$ F: -0.20 (-0.41, 0.01), $p = 0.06$
Steroid dose	0.02 (-0.002, 0.045), $p = 0.07$	O: 0.006 (-0.007, 0.199), $p = 0.34$ F: -0.005 (-0.009, -0.0004), $p = 0.032^*$	0.004 (-0.08, 0.08), $p = 0.92$	O: 0.03 (-0.01, 0.07), $p = 0.16$ F: -0.02 (-0.03, -0.002), $p = 0.02^*$
Severity: $R2 = 0.48$, $F(18, 40) = 1.15$, $p = 0.37$; Outcome: $R2 = 0.56$, $F(18, 40) = 1.52$, $p = 0.17$ Fatality: $R2 = 0.54$, $F(18, 40) = 1.43$, $p = 0.21$ #Residuals Plot/Test Error - MSE = 0 or d.f. = 0 (in all analyses)				
Subgroup analyses (Patients on IS, N = 40)				
Number of IS	0.12 (-0.34, 0.58), $p = 0.599$	O: -0.07 (-0.22, 0.07), $p = 0.33$	0.32 (-0.55, 1.19), $p = 0.46$	O: -0.12 (-0.46, 0.21), $p = 0.45$
Type of IS	0.007 (-0.16, 0.17), $p = 0.94$	O: -0.028 (-0.08, 0.03), $p = 0.31$	-0.02 (-0.28, 0.25), $p = 0.89$	O: -0.02 (-0.13, 0.08), $p = 0.63$
#Fatality was not analysed due to absent variable (no fatal cases) #Fatality was not analysed due to absent dependent variable (no fatal cases)				
Subgroup analyses (Patients on IS and with complete vaccination, N = 25)				
Number of IS	0.03 (-0.53, 0.60), $p = 0.91$	O: -0.11 (-0.38, 0.15), $p = 0.38$	1.20 (-1.63, 4.04), $p = 0.35$	O: -0.55 (-1.92, 0.82), $p = 0.37$
Type of IS	0.02 (-0.16, 0.20), $p = 0.84$	O: -0.04 (-0.12, 0.04), $p = 0.29$	-0.63 (-2.64, 1.37), $p = 0.48$	O: 0.14 (-0.83, 1.11), $p = 0.33$
#Fatality was not analysed due to absent variable (no fatal cases) #Fatality was not analysed due to absent dependent variable (no fatal cases)				

*Outcome analysis included recovery, Sequelae and fatality; BMI body mass index, AIRD autoimmune inflammatory rheumatic diseases, Dx diagnosis, IS immunosuppressant, HCQ hydroxychloroquine

Table 4: Logistic regression analysis of factors associated with COVID-19 severity, outcome and fatality (FULL)

	Univariate		Multivariate	
	Severity	Outcome (O) & Fatality (F)	Severity	Outcome (O) & Fatality (F)
All Cases (N = 71)	OR (95% CI), p-value	OR (95% CI), p-value	OR (95% CI), p-value	OR (95% CI), p-value
Age	0.01 (-0.00, 0.03), <i>p</i> = 0.05	O: 0.002 (-0.01, 0.01), <i>p</i> = 0.67 F: 0.0003 (-0.003, 0.004), <i>p</i> = 0.88	0.02 (-0.07, 0.10), <i>p</i> = 0.71	O: -0.004 (-0.05, 0.05), <i>p</i> = 0.88 F: -0.004 (-0.03, 0.02), <i>p</i> = 0.69
Age group	0.13 (-0.00, 0.27), <i>p</i> = 0.06	O: 0.02 (-0.06, 0.1), <i>p</i> = 0.58 F: 0.0004 (-0.03, 0.03), <i>p</i> = 0.98	0.03 (-0.75, 0.82), <i>p</i> = 0.93	O: 0.09 (-0.37, 0.54), <i>p</i> = 0.71 F: 0.01 (-0.18, 0.21), <i>p</i> = 0.88
Gender	0.42 (-0.64, 1.47), <i>p</i> = 0.43	O: -0.22 (-0.82, 0.38), <i>p</i> = 0.46 F: 0.04 (-0.20, 0.28), <i>p</i> = 0.71	-0.17 (-1.38, 1.04), <i>p</i> = 0.78	O: -0.42 (-1.13, 0.29), <i>p</i> = 0.24 F: 0.09 (-0.21, 0.39), <i>p</i> = 0.55
Weight	0.00 (-0.01, 0.02), <i>p</i> = 0.79	O: 0.0009 (-0.007, 0.009), <i>p</i> = 0.83 F: 0.0005 (-0.003, 0.004), <i>p</i> = 0.78	0.003 (-0.02, 0.03), <i>p</i> = 0.83	O: 0.0003 (-0.02, 0.02), <i>p</i> = 0.97 F: -0.003 (-0.01, 0.004), <i>p</i> = 0.34
BMI	0.05 (-0.14, 0.25), <i>p</i> = 0.55	O: 0.05 (-0.06, 0.16), <i>p</i> = 0.85 F: 0.01 (-0.03, 0.06), <i>p</i> = 0.60	0.04 (-0.35, 0.41), <i>p</i> = 0.85	O: 0.09 (-0.13, 0.32), <i>p</i> = 0.41 F: 0.02 (-0.08, 0.11), <i>p</i> = 0.71
Vaccine dose	-0.22 (-0.42, -0.02), <i>p</i> = 0.03*	O: -0.05 (-0.16, 0.07), <i>p</i> = 0.42 F: 0.03 (-0.02, 0.08), <i>p</i> = 0.19	-0.47 (-0.97, 0.03), <i>p</i> = 0.06	O: -0.15 (-0.45, 0.14), <i>p</i> = 0.30 F: 0.06 (-0.07, 0.18), <i>p</i> = 0.35
Complete vs incomplete vaccination	-0.23 (-0.66, 0.20), <i>p</i> = 0.29	O: -0.04 (-0.28, 0.21), <i>p</i> = 0.76 F: 0.04 (-0.06, 0.14), <i>p</i> = 0.39	0.81 (-0.13, 1.76), <i>p</i> = 0.09	O: 0.18 (-0.37, 0.74), <i>p</i> = 0.51 F: -0.02 (-0.26, 0.21), <i>p</i> = 0.84
AIRD Dx	-0.15 (-0.52, 0.22), <i>p</i> = 0.42	O: 0.03 (-0.19, 0.24), <i>p</i> = 0.81 F: 0.01 (-0.07, 0.10), <i>p</i> = 0.77	0.15 (-0.37, 0.65), <i>p</i> = 0.58	O: -0.04 (-0.34, 0.26), <i>p</i> = 0.81 F: 0.03 (-0.09, 0.16), <i>p</i> = 0.59
Risk Factors (number)	0.11 (-0.14, 0.35), <i>p</i> = 0.39	O: 0.04 (-0.10, 0.18), <i>p</i> = 0.60 F: 0.023 (-0.03, 0.08), <i>p</i> = 0.41	0.005 (-0.35, 0.36), <i>p</i> = 0.98	O: -0.04 (-0.25, 0.17), <i>p</i> = 0.80 F: 0.05 (-0.04, 0.14), <i>p</i> = 0.26
IS use				
Disease activity	0.16 (0.01, 0.32), <i>p</i> = 0.04*	O: 0.08 (-0.04, 0.20), <i>p</i> = 0.21 F: -0.03 (-0.06, 0.01), <i>p</i> = 0.14	0.18 (-0.02, 0.38), <i>p</i> = 0.08	O: 0.05 (-0.03, 0.14), <i>p</i> = 0.22 F: -0.02 (-0.07, 0.03), <i>p</i> = 0.43
Number of IS	-0.13 (-0.42, 0.15), <i>p</i> = 0.36	O: -0.23 (-0.38, -0.08), <i>p</i> = 0.003* F: 0.06 (-0.01, 0.12), <i>p</i> = 0.08	0.02 (-0.46, 0.49), <i>p</i> = 0.94	O: -0.21 (-0.49, 0.07), <i>p</i> = 0.14 F: 0.04 (-0.08, 0.16), <i>p</i> = 0.52
Type of IS	-0.07 (-0.22, 0.09), <i>p</i> = 0.41	O: -0.11 (-0.19, -0.02), <i>p</i> = 0.01* F: 0.02 (-0.01, 0.06), <i>p</i> = 0.16	-0.05 (-0.3, 0.20), <i>p</i> = 0.67	O: -0.02 (-0.17, 0.13), <i>p</i> = 0.78 F: 0.01 (-0.05, 0.07), <i>p</i> = 0.72
HCQ use	-0.05 (-0.51, 0.43), <i>p</i> = 0.85	O: 0.09 (-0.18, 0.35), <i>p</i> = 0.53 F: -0.06 (-0.17, 0.05), <i>p</i> = 0.27	0.13 (-0.46, 0.71), <i>p</i> = 0.67	O: -0.05 (-0.39, 0.30), <i>p</i> = 0.78 F: -0.04 (-0.18, 0.10), <i>p</i> = 0.58
Steroid use	-0.01 (-0.45, 0.42), <i>p</i> = 0.95	O: 0.18 (-0.06, 0.42), <i>p</i> = 0.14 F: -0.07 (-0.17, 0.03), <i>p</i> = 0.15	0.09 (-0.99, 1.18), <i>p</i> = 0.86	O: 0.43 (-0.20, 1.07), <i>p</i> = 0.18 F: -0.14 (-0.41, 0.13), <i>p</i> = 0.31
Steroid group	0.05 (-0.19, 0.29), <i>p</i> = 0.67	O: 0.06 (-0.07, 0.20), <i>p</i> = 0.36 F: -0.04 (-0.09, 0.01), <i>p</i> = 0.13	-0.22 (-1.12, 0.68), <i>p</i> = 0.63	O: -0.25 (-0.78, 0.27), <i>p</i> = 0.34 F: 0.08 (-0.15, 0.30), <i>p</i> = 0.49
Steroid dose	0.01 (-0.01, 0.03), <i>p</i> = 0.25	O: 0.003 (-0.01, 0.1), <i>p</i> = 0.58 F: -0.003 (-0.01, 0.01), <i>p</i> = 0.17	0.03 (-0.02, 0.07), <i>p</i> = 0.26	O: 0.01 (-0.02, 0.04), <i>p</i> = 0.53 F: -0.005 (-0.02, 0.01), <i>p</i> = 0.41
Variant dominance	-0.52 (-0.88, -0.15), <i>p</i> = 0.006*	O: 0.02 (-0.06, 0.1), <i>p</i> = 0.58 F: -0.001 (-0.09, 0.09), <i>p</i> = 0.98	-0.30 (-0.82, 0.23), <i>p</i> = 0.26	O: 0.11 (-0.20, 0.42), <i>p</i> = 0.48 F: -0.06 (-0.19, 0.07), <i>p</i> = 0.39
			<i>Severity: R2 = 0.31, F(17, 70) = 1.41, p = 0.17</i> <i>Outcome: R2 = 0.26, F(17, 70) = 1.07, p = 0.41</i> <i>Fatality: R2 = 0.18, F(17, 70) = 0.68, p = 0.81</i>	
Completed vaccine (N = 41)	OR (95% CI), p-value	OR (95% CI), p-value	OR (95% CI), p-value	OR (95% CI), p-value
Age	-0.003 (-0.02, 0.02), <i>p</i> = 0.78	O: 0.001 (-0.01, 0.01), <i>p</i> = 0.92 F: -0.0003 (-0.003, 0.003), <i>p</i> = 0.87	0.02 (-0.10, 0.14), <i>p</i> = 0.75	O: -0.04 (-0.10, 0.03), <i>p</i> = 0.26 F: -0.004 (-0.03, 0.02), <i>p</i> = 0.74
Age group	-0.04 (-0.21, 0.14), <i>p</i> = 0.68	O: 0.01 (-0.09, 0.11), <i>p</i> = 0.86 F: -0.001 (-0.03, 0.03), <i>p</i> = 0.95	-0.16 (-1.21, 0.89), <i>p</i> = 0.75	O: 0.37 (-0.22, 0.96), <i>p</i> = 0.21 F: 0.02 (-0.18, 0.22), <i>p</i> = 0.82
Gender	-0.18 (-1.90, 1.55), <i>p</i> = 0.84	O: -0.20 (-1.15, 0.75), <i>p</i> = 0.67 F: 0.03 (-0.30, 0.35), <i>p</i> = 0.88	1.22 (-1.61, 4.05), <i>p</i> = 0.38	O: 0.12 (-1.47, 1.70), <i>p</i> = 0.88 F: -0.17 (-0.70, 0.35), <i>p</i> = 0.50
Weight	-0.01 (-0.03, 0.01), <i>p</i> = 0.17	O: -0.002 (-0.01, 0.008), <i>p</i> = 0.65 F: 0.002 (-0.001, 0.006), <i>p</i> = 0.17	-0.01 (-0.05, 0.02), <i>p</i> = 0.43	O: -0.01 (-0.03, 0.01), <i>p</i> = 0.43 F: 0.001 (-0.01, 0.01), <i>p</i> = 0.74
BMI	-0.11 (-0.35, 0.13), <i>p</i> = 0.35	O: 0.03 (-0.10, 0.17), <i>p</i> = 0.63 F: 0.02 (-0.03, 0.06), <i>p</i> = 0.40	0.23 (-0.29, 0.74), <i>p</i> = 0.37	O: 0.27 (-0.02, 0.55), <i>p</i> = 0.07 F: -0.03 (-0.13, 0.06), <i>p</i> = 0.49
Vaccine dose	-0.36 (-0.99, 0.27), <i>p</i> = 0.26	O: -0.11 (-0.46, 0.25), <i>p</i> = 0.54 F: 0.03 (-0.09, 0.15), <i>p</i> = 0.60	-0.31 (-1.43, 0.81), <i>p</i> = 0.57	O: -0.01 (-0.64, 0.61), <i>p</i> = 0.96 F: 0.07 (-0.14, 0.28), <i>p</i> = 0.50
Duration after last vaccine dose	-0.09 (-0.23, 0.05), <i>p</i> = 0.21	O: -0.03 (-0.11, 0.05), <i>p</i> = 0.42 F: 0.02 (-0.01, 0.04), <i>p</i> = 0.24	-0.04 (-0.27, 0.2), <i>p</i> = 0.75	O: 0.02 (-0.11, 0.15), <i>p</i> = 0.73 F: 0.001 (-0.04, 0.04), <i>p</i> = 0.98
AIRD Dx	0.06 (-0.39, 0.52), <i>p</i> = 0.78	O: 0.15 (-0.09, 0.40), <i>p</i> = 0.22 F: -0.02 (-0.10, 0.07), <i>p</i> = 0.65	0.27 (-0.44, 0.98), <i>p</i> = 0.44	O: 0.20 (-0.20, 0.60), <i>p</i> = 0.31 F: -0.01 (-0.15, 0.12), <i>p</i> = 0.82
Risk Factors (number)	-0.27 (-0.61, 0.08), <i>p</i> = 0.12	O: -0.01 (-0.20, 0.19), <i>p</i> = 0.93 F: 0.04 (-0.02, 0.11), <i>p</i> = 0.17	0.007 (-0.57, 0.58), <i>p</i> = 0.98	O: 0.03 (-0.29, 0.35), <i>p</i> = 0.84 F: 0.01 (-0.10, 0.11), <i>p</i> = 0.90
Disease activity	0.20 (0.01, 0.39), <i>p</i> = 0.036*	O: 0.08 (-0.04, 0.20), <i>p</i> = 0.21 F: -0.04 (-0.07, 0.001), <i>p</i> = 0.04*	0.34 (-0.04, 0.73), <i>p</i> = 0.08	O: 0.17 (-0.05, 0.38), <i>p</i> = 0.12 F: -0.06 (-0.13, 0.01), <i>p</i> = 0.10
IS use				
Number of IS	-0.07 (-0.44, 0.30), <i>p</i> = 0.71	O: -0.20 (-0.40, -0.01), <i>p</i> = 0.04* F: 0.03 (-0.03, 0.11), <i>p</i> = 0.28	0.73 (-0.14, 1.60), <i>p</i> = 0.097	O: 0.18 (-0.31, 0.66), <i>p</i> = 0.46 F: -0.06 (-0.22, 0.11), <i>p</i> = 0.49
Type of IS	-0.02 (-0.20, 0.16), <i>p</i> = 0.83	O: -0.09 (-0.18, 0.006), <i>p</i> = 0.07 F: 0.01 (-0.02, 0.05), <i>p</i> = 0.41	-0.41 (-0.88, 0.05), <i>p</i> = 0.08	O: -0.23 (-0.49, 0.03), <i>p</i> = 0.08 F: 0.07 (-0.02, 0.15), <i>p</i> = 0.13
HCQ use	0.25 (-0.32, 0.82), <i>p</i> = 0.38	O: 0.06 (-0.25, 0.38), <i>p</i> = 0.70 F: -0.04 (-0.14, 0.07), <i>p</i> = 0.50	0.16 (-0.61, 0.93), <i>p</i> = 0.67	O: -0.20 (-0.63, 0.23), <i>p</i> = 0.34 F: -0.01 (-0.16, 0.13), <i>p</i> = 0.85
Steroid use	0.19 (-0.35, 0.73), <i>p</i> = 0.48	O: 0.13 (-0.16, 0.43), <i>p</i> = 0.37 F: -0.04 (-0.14, 0.06), <i>p</i> = 0.41	-1.51 (-3.38, 0.36), <i>p</i> = 0.11	O: -0.24 (-1.29, 0.80), <i>p</i> = 0.63 F: -0.002 (-0.35, 0.35), <i>p</i> = 0.99
Steroid group	0.23 (-0.07, 0.52), <i>p</i> = 0.13	O: 0.07 (-0.097, 0.237), <i>p</i> = 0.40 F: -0.04 (-0.09, 0.02), <i>p</i> = 0.19	0.95 (-0.81, 2.71), <i>p</i> = 0.28	O: 0.001 (-0.98, 0.98), <i>p</i> = 0.999 F: 0.13 (-0.20, 0.45), <i>p</i> = 0.43
Steroid dose	0.02 (-0.002, 0.045), <i>p</i> = 0.07	O: 0.006 (-0.007, 0.199), <i>p</i> = 0.34 F: -0.005 (-0.009, -0.0004), <i>p</i> = 0.032*	-0.004 (-0.084, 0.076), <i>p</i> = 0.92	O: 0.02 (-0.02, 0.07), <i>p</i> = 0.35 F: -0.01 (-0.03, 0.001), <i>p</i> = 0.06

Variant dominance	-0.39 (-0.91, 0.13), <i>p</i> = 0.14	O: -0.15 (-0.44, 0.14), <i>p</i> = 0.31 F: 0.06 (-0.04, 0.15), <i>p</i> = 0.26	-0.58 (-1.66, 0.50), <i>p</i> = 0.28	O: -0.36 (-0.97, 0.24), <i>p</i> = 0.23 F: 0.05 (-0.15, 0.26), <i>p</i> = 0.58
			Severity: R2 = 0.45, F(17, 40) = 1.09, <i>p</i> = 0.42 Outcome: R2 = 0.43, F(17, 40) = 1.02, <i>p</i> = 0.47 Fatality: R2 = 0.45, F(17, 70) = 1.11, <i>p</i> = 0.40	
Patients on IS, (N = 40)	OR (95% CI), <i>p</i>-value	OR (95% CI), <i>p</i>-value	OR (95% CI), <i>p</i>-value	OR (95% CI), <i>p</i>-value
Age	0.005 (-0.09, 0.02), <i>p</i> = 0.46	O: 0.002 (-0.003, 0.006), <i>p</i> = 0.53	-0.02 (-0.11, 0.08), <i>p</i> = 0.71	O: -0.01 (-0.05, 0.02), <i>p</i> = 0.50
Age group	0.06 (-0.08, 0.20), <i>p</i> = 0.40	O: 0.02 (-0.03, 0.06), <i>p</i> = 0.86	0.29 (-0.55, 1.12), <i>p</i> = 0.49	O: 0.099 (-0.22, 0.42), <i>p</i> = 0.53
Gender	-0.16 (-1.14, 0.83), <i>p</i> = 0.75	O: -0.05 (-0.38, 0.28), <i>p</i> = 0.75	-0.37 (-1.75, 1.00), <i>p</i> = 0.58	O: 0.01 (-0.51, 0.54), <i>p</i> = 0.96
Weight	-0.002 (-0.02, 0.01), <i>p</i> = 0.81	O: -0.0003 (-0.005, 0.005), <i>p</i> = 0.90	-0.004 (-0.04, 0.03), <i>p</i> = 0.76	O: -0.002 (-0.01, 0.01), <i>p</i> = 0.70
BMI	0.002 (-0.20, 0.21), <i>p</i> = 0.98	O: -0.007 (-0.08, 0.06), <i>p</i> = 0.84	-0.097 (-0.55, 0.36), <i>p</i> = 0.67	O: -0.09 (-0.27, 0.08), <i>p</i> = 0.29
Vaccine dose	-0.13 (-0.34, 0.07), <i>p</i> = 0.19	O: 0.02 (-0.05, 0.09), <i>p</i> = 0.58	-0.45 (-0.97, 0.08), <i>p</i> = 0.09	O: -0.01 (-0.22, 0.19), <i>p</i> = 0.88
Complete vs incomplete vaccination	-0.08 (-0.52, 0.36), <i>p</i> = 0.72	O: 0.08 (-0.07, 0.23), <i>p</i> = 0.27	0.92 (-0.06, 1.90), <i>p</i> = 0.06	O: 0.199 (-0.18, 0.57), <i>p</i> = 0.28
AIRD Dx	0.06 (-0.26, 0.39), <i>p</i> = 0.69	O: -0.02 (-0.13, 0.09), <i>p</i> = 0.75	0.52 (-0.04, 1.08), <i>p</i> = 0.07	O: 0.005 (-0.21, 0.05), <i>p</i> = 0.96
Risk Factors (number)	0.1 (-0.13, 0.32), <i>p</i> = 0.40	O: 0.02 (-0.05, 0.10), <i>p</i> = 0.55	0.30 (-0.14, 0.74), <i>p</i> = 0.17	O: 0.15 (-0.01, 0.32), <i>p</i> = 0.07
Disease activity	-0.01 (-0.18, 0.15), <i>p</i> = 0.86	O: -0.03 (-0.08, 0.02), <i>p</i> = 0.28	0.03 (-0.21, 0.26), <i>p</i> = 0.82	O: -0.03 (-0.12, 0.06), <i>p</i> = 0.51
Number of IS	0.12 (-0.34, 0.58), <i>p</i> = 0.599	O: -0.07 (-0.22, 0.08), <i>p</i> = 0.33	0.32 (-0.55, 1.19), <i>p</i> = 0.46	O: -0.12 (-0.46, 0.21), <i>p</i> = 0.45
Type of IS	0.007 (-0.16, 0.17), <i>p</i> = 0.94	O: -0.028 (-0.08, 0.03), <i>p</i> = 0.31	-0.02 (-0.28, 0.25), <i>p</i> = 0.89	O: -0.02 (-0.13, 0.08), <i>p</i> = 0.63
HQC use	-0.01 (-0.46, 0.45), <i>p</i> = 0.98	O: -0.04 (-0.19, 0.11), <i>p</i> = 0.60	0.17 (-0.44, 0.77), <i>p</i> = 0.58	O: -0.08 (-0.31, 0.15), <i>p</i> = 0.49
Steroid use	-0.35 (-0.77, 0.07), <i>p</i> = 0.096	O: -0.02 (-0.16, 0.13), <i>p</i> = 0.83	0.19 (-1.31, 1.69), <i>p</i> = 0.80	O: 0.02 (-0.55, 0.60), <i>p</i> = 0.93
Steroid group	-0.13 (-0.37, 0.10), <i>p</i> = 0.26	O: -0.02 (-0.10, 0.06), <i>p</i> = 0.56	-0.63 (-1.85, 0.58), <i>p</i> = 0.29	O: -0.03 (-0.50, 0.43), <i>p</i> = 0.89
Steroid dose	0.0001 (-0.02, 0.02), <i>p</i> = 0.99	O: -0.001 (-0.008, 0.006), <i>p</i> = 0.71	0.06 (-0.001, 0.12), <i>p</i> = 0.05	O: 0.003 (-0.02, 0.03), <i>p</i> = 0.79
Variant dominance	-0.34 (-0.78, 0.11), <i>p</i> = 0.13	O: -0.07 (-0.22, 0.08), <i>p</i> = 0.33	-0.50 (-1.28, 0.29), <i>p</i> = 0.20	O: -0.15 (-0.45, 0.14), <i>p</i> = 0.31
	#Fatality was not analysed due to absent variable (no fatal cases)		Severity: R2 = 0.48, F(17, 39) = 1.19, <i>p</i> = 0.35 Outcome: R2 = 0.31, F(17, 39) = 0.59, <i>p</i> = 0.86 #Fatality was not analysed due to absent dependent variable (no fatal cases)	
Patients on IS and complete vaccine, N = 25				
Number of IS	0.03 (-0.53, 0.60), <i>p</i> = 0.91	O: -0.11 (-0.38, 0.15), <i>p</i> = 0.38	1.20 (-1.63, 4.04), <i>p</i> = 0.35	O: -0.55 (-1.92, 0.82), <i>p</i> = 0.37
Type of IS	0.02 (-0.16, 0.20), <i>p</i> = 0.84	O: -0.04 (-0.12, 0.04), <i>p</i> = 0.29	-0.63 (-2.64, 1.37), <i>p</i> = 0.48	O: 0.14 (-0.83, 1.11), <i>p</i> = 0.33
	#Fatality was not analysed due to absent variable (no fatal cases)		Severity: R2 = 0.50, F(17, 24) = 0.42, <i>p</i> = 0.93 Outcome: R2 = 0.45, F(17, 24) = 0.34, <i>p</i> = 0.97 #Fatality was not analysed due to absent dependent variable (no fatal cases)	
All Cases (N = 71)				
Disease activity + variant			Severity: R2 = 0.1693, F(2, 70) = 6.9313, <i>p</i> = 0.018 Outcome: R2 = 0.0214, F(2, 70) = 0.74, <i>p</i> = 0.48. Fatal: R2 = 0.0314, F(2, 70) = 1.1028, <i>p</i> = 0.34	
Disease activity			Severity: 0.17 (0.02, 0.32) Outcome: 0.05 (-0.03, 0.14) Fatality: -0.03 (-0.06, 0.01)	<i>p</i> = 0.023 <i>p</i> = 0.23 <i>p</i> = 0.14
Variant			Severity: -0.53 (-0.89, -0.18) Outcome: 0.002 (-0.22, -0.22) Fatality: 0.001 (-0.09, 0.09)	<i>p</i> = 0.004 <i>p</i> = 0.98 <i>p</i> = 0.99
All Cases (N = 41)				
Disease activity + variant			Severity: R2 = 0.2426, F(2, 40) = 6.0858, <i>p</i> = 0.0051 Fatal: R2 = 0.1932, F(2, 40) = 4.5509, <i>p</i> = 0.0169 Outcome: NS	
Disease activity			Severity: 0.28 (0.096, 0.47) Fatal: -0.05 (-0.08, -0.01)	<i>p</i> = 0.004 <i>p</i> = 0.0089
Variant			Severity: -0.65 (-1.15, -0.14) Fatal: 0.10 (0.003, 0.198)	<i>p</i> = 0.0132 <i>p</i> = 0.0437
			All Cases (N = 71)	All Cases (N = 41)
			Outcome Severity, fatal	
Disease activity + steroid use			S, O, F: NS	S, O, F: NS
Disease activity + steroid group			S, O, F: NS	S, O, F: NS
Disease activity + steroid dose			S, O, F: NS	S, O, F: NS
No of IS + steroid use + steroid group + steroid dose			Only outcome: R2 = 0.1323, F(2, 70) = 5.1858, <i>p</i> = 0.008 R2 = 0.1218, F(2, 70) = 4.7150, <i>p</i> = 0.0121 R2 = 0.1204, F(2, 70) = 4.6543, <i>p</i> = 0.0128 *Only No of IS: <i>p</i> < 0.05	S, O, F: NS

<p>Type of IS + steroid use + steroid group + steroid dose</p>			<p>Only outcome: $R^2 = 0.1246, F(2, 70) = 4.8372, p = 0.0109$ $R^2 = 0.1144, F(2, 70) = 4.3900, p = 0.0161$ $R^2 = 0.1060, F(2, 70) = 4.0300, p = 0.0222$ *Only Type of IS: $p < 0.05$</p>	<p>Outcome vs Type + steroid gp $R^2 = 0.1506, F(2, 40) = 3.3694, p = 0.045$ Type: $-0.12 (-0.22, -0.02), p = 0.0196$ Steroid gp: NS</p> <p>Outcome vs Type + steroid dose $R^2 = 0.1761, F(2, 40) = 4.0624, p = 0.025$ Type: $-0.13 (-0.23, -0.03), p = 0.0116$ Steroid dose: $0.01 (0.0003, 0.0279), p = 0.0457$</p> <p>Fatal vs Type + Steroid dose $R^2 = 0.2043, F(2, 40) = 4.8784, p = 0.013$ Type: $0.0349 (0.0012, 0.0687), p = 0.0428$ Steroid dose: $-0.0068 (-0.01, -0.002), p = 0.0049$</p>
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4. Conclusion

This study showed that AIRD patients are potentially at risk of severe C-19 infection and poor outcome especially in active disease state. IS use may have better outcome, perhaps through immunomodulatory effect. In patients with complete vaccination, active disease and high steroid dose could be the confounding factors.

The limitations of this study are small sample size, and potential bias and error.