

Epidemiology, mortality and effectiveness of prophylaxis for *Pneumocystis jiroveci* pneumonia among rheumatic patients: a territory-wide study

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Introduction

Pneumocystis jiroveci pneumonia (PJP) is an opportunistic infection affecting immunocompromised individuals. However, evidence regarding the burden and effectiveness of prophylaxis among rheumatic patients remains limited. Delineating the epidemiology, predictors of mortality and efficacy of prophylaxis among rheumatic patients is urgently needed.

Methodology

We performed a territory-wide cohort study of rheumatic patients in Hong Kong. All patients with a diagnosis of anti-neutrophil cytoplasmic antibody-associated vasculitis (AAV), immune-mediated myositis (IMM), rheumatoid arthritis (RA), systemic lupus erythematosus (SLE), systemic sclerosis (SSc), or spondyloarthritis (SpA) between 2015-2019 were included. Prevalence, prophylaxis and mortality of PJP were calculated. Number needed to treat (NNT) analysis was also performed.

Results

Out of 21,587 patients (54% RA, 25% SLE, 13% SpA, 5% IMM, 2% AAV and 1% SSc), 1141 (5.3%) patients were prescribed PJP prophylaxis. 48/21,587 (0.2%) developed PJP. No patients who developed PJP received prophylaxis prior to infection (Table 1). The incidence of PJP was highest among SSc, AAV, and IMM patients (Figure 1). Within these diseases, the majority of PJP occurred while patients were on glucocorticoids at daily prednisolone-equivalent doses of 15mg/day (P15) or above (Figure 2). PJP prophylaxis was effective with NNT for SSc, AAV and IMM being 36, 48 and 114 respectively (Table 2). Glucocorticoid dose at time of PJP was independently associated with PJP-related mortality (OR=1.09, 95% CI=1.02-1.64, p=0.02).

Conclusion

PJP is an uncommon but important infection among rheumatic patients, Glucocorticoid dose is independently associated with PJP-related mortality. PJP prophylaxis is effective and should be considered in patients with SSc, AAV and IMM, especially those receiving glucocorticoid doses above P15.

Table 1 Baseline characteristics, frequency of PJP and prophylaxis prescription

	Total	PJP	No PJP	P value	Prophylaxis	No prophylaxis	P value
All patients	21,587	48 (0.2%)	21,539 (99.8%)		1141 (5.3%)	20,446 (94.7%)	
Age	58.1 ± 17.4	58.5 ± 18.4	58.1 ± 17.4	0.85	52.8 ± 17.7	58.3 ± 17.3	<0.01
Male	5822 (27.0%)	16 (33.3%)	5806 (27.0%)	0.32	285 (25.0%)	5537 (27.1%)	0.12
Prophylaxis	1141 (5.3%)	0	1141 (5.3%)	0.10	–	–	–
RA	11,646	13 (0.1%)	11,633 (99.9%)		72 (0.6%)	11,574 (99.4%)	
Age	63.4 ± 15.8	68.3 ± 17.3	13.4 ± 15.8	0.27	63.7 ± 14.1	63.4 ± 15.8	0.89
Male	2507 (21.5%)	5 (38.5%)	2502 (21.5%)	0.14	17 (23.6%)	2490 (21.5%)	0.67
Prophylaxis	72 (0.6%)	0	72 (0.6%)	0.78	–	–	–
SLE	5460	22 (0.4%)	5438 (99.6%)		629 (11.5%)	4831 (88.5%)	
Age	48.8 ± 16.3	46.8 ± 14.2	48.8 ± 16.4	0.57	46.4 ± 16.6	49.1 ± 16.3	<0.01
Male	551 (10.1%)	7 (31.8%)	544 (10.0%)	<0.01	73 (11.6%)	478 (9.9%)	0.18
Prophylaxis	629 (11.5%)	0	629 (11.6%)	0.09	–	–	–
SpA	2918	0	2918 (100.0%)		49 (1.7%)	2869 (98.3%)	
Age	51.8 ± 16.3	–	51.8 ± 16.3	–	60.0 ± 14.6	51.7 ± 16.3	<0.01
Male	2229 (76.4%)	–	2229 (76.4%)	–	42 (85.7%)	2187 (76.2%)	0.12
Prophylaxis	49 (1.7%)	–	49 (1.7%)	–	–	–	–
IMM	1026	7 (0.7%)	1019 (99.3%)		220 (21.4%)	806 (78.6%)	
Age	61.8 ± 15.9	66.6 ± 14.6	61.8 ± 15.9	0.43	59.7 ± 13.3	62.4 ± 16.5	0.01
Male	343 (33.4%)	2 (28.6%)	341 (33.5%)	0.78	78 (35.5%)	265 (32.9%)	0.47
Prophylaxis	220 (21.4%)	0	220 (21.6%)	0.17	–	–	–
AAV	430	6 (1.4%)	424 (98.6%)		135 (31.4%)	295 (68.6%)	
Age	65.0 ± 17.8	64.0 ± 18.0	65.0 ± 17.8	0.89	63.7 ± 18.4	65.6 ± 17.5	0.30
Male	177 (41.2%)	2 (33.3%)	175 (41.3%)	0.70	67 (49.6%)	110 (37.3%)	0.02
Prophylaxis	135 (31.4%)	0	135 (31.8%)	0.10	–	–	–
SSc	109	2 (1.8%)	107 (98.2%)		36 (33.0%)	73 (67.0%)	
Age	54.4 ± 15.9	79.0 ± 14.1	54.0 ± 15.6	0.03	52.5 ± 18.5	55.4 ± 14.4	0.37
Male	15 (13.8%)	0	15 (14.0%)	0.57	8 (22.2%)	7 (9.6%)	0.07
Prophylaxis	36 (33.0%)	0	36 (33.6%)	0.32	–	–	–

PJP *Pneumocystis jiroveci* pneumonia; SSc systemic sclerosis; AAV ANCA-associated vasculitis; IMM immune-mediated myositis; SLE systemic lupus erythematosus; RA rheumatoid arthritis; SpA spondyloarthritis

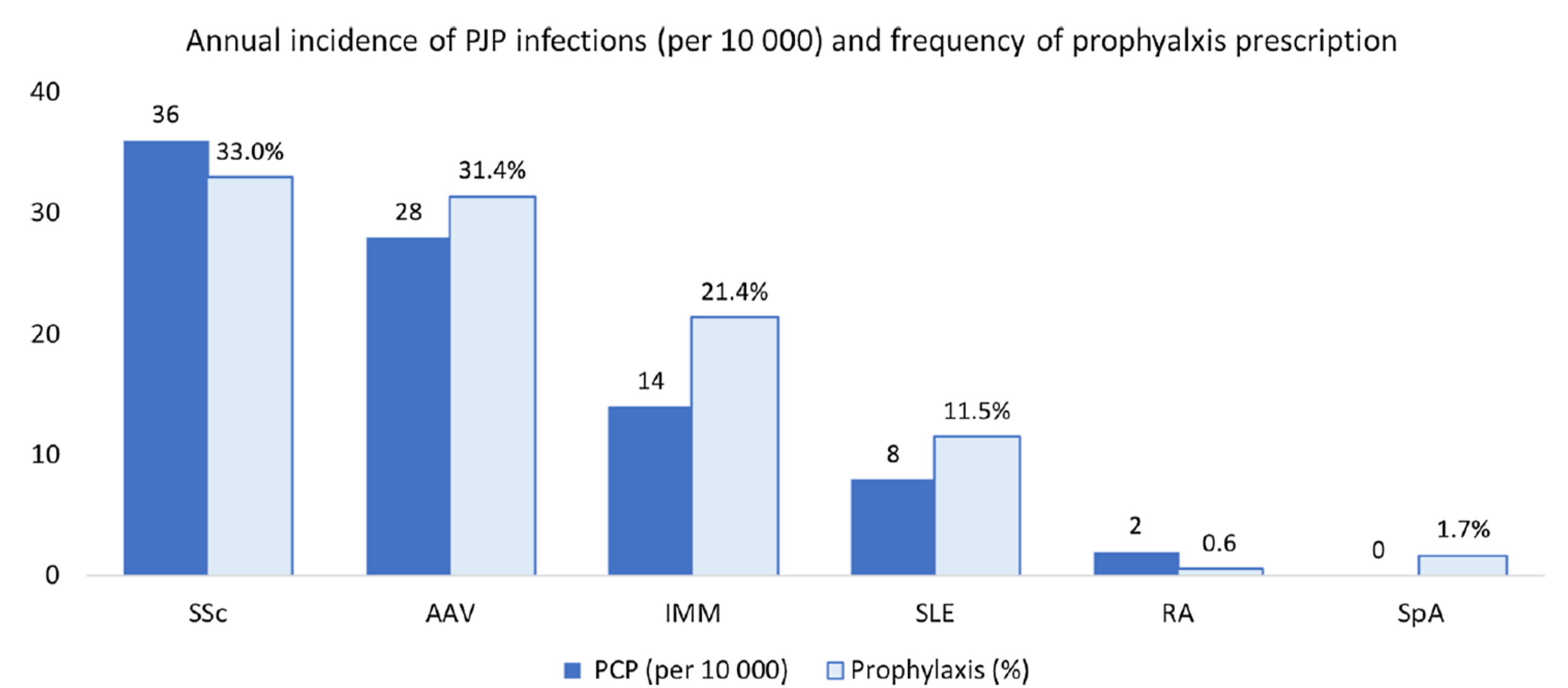


Fig. 1 Annual incidence of PJP and prophylaxis prescriptions among different rheumatic disease categories

Table 2 Effectiveness of PJP prophylaxis among different rheumatic diseases

Diagnosis	Total	Ever PJP	No PJP	ARR (%)	NNT
All patients	21,587	48	21,540		435
Prophylaxis	0	1142	0.23		
No prophylaxis	48	20,398			
RA	11,646	13	11,633		909
Prophylaxis	0	72	0.11		
No prophylaxis	13	11,561			
SpA	2918	0	2918	–	–
Prophylaxis	0	49			
No prophylaxis	0	2869			
SLE	5460	22	5438		217
Prophylaxis	0	629	0.46		
No prophylaxis	22	4809			
IMM	1026	7	1019		114
Prophylaxis	0	220	0.88		
No prophylaxis	7	799			
AAV	430	6	424		48
Prophylaxis	0	135	2.08		
No prophylaxis	6	289			
SSc	109	2	107		36
Prophylaxis	0	36	2.81		
No prophylaxis	2	71			

PJP *Pneumocystis jiroveci* pneumonia; SSc systemic sclerosis; AAV ANCA-associated vasculitis; IMM immune-mediated myositis; SLE systemic lupus erythematosus; RA rheumatoid arthritis; SpA spondyloarthritis; ARR absolute risk reduction; NNT number needed to treat

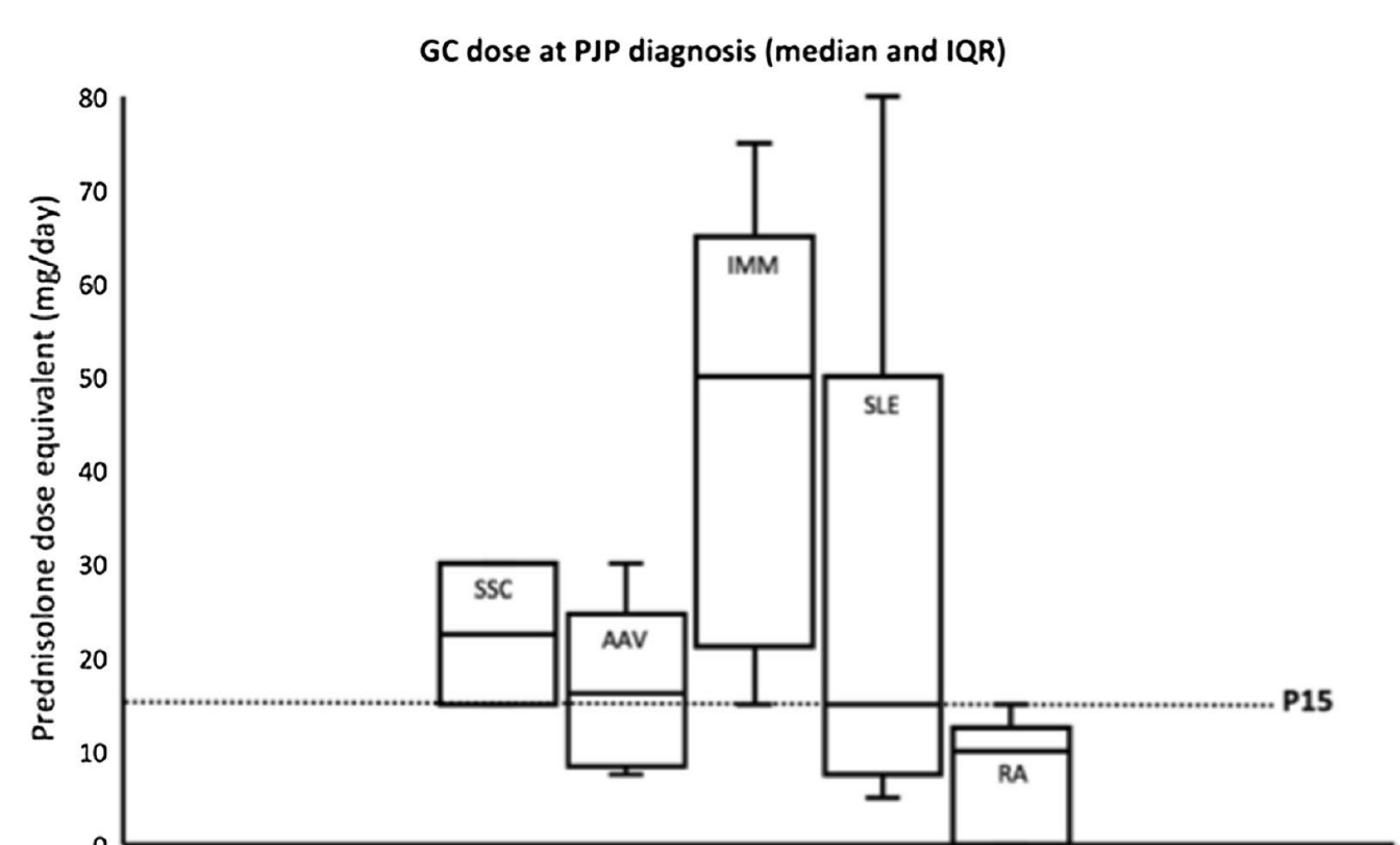


Fig. 2 Box-and-whisker plot of GC dose (median and interquartile range) at PJP diagnosis. GC glucocorticoid; PJP *Pneumocystis jiroveci* pneumonia; IQR interquartile range; P15 glucocorticoid at 15 mg daily prednisolone-equivalent dose; SSc systemic sclerosis; AAV ANCA-associated vasculitis; IMM immune-mediated myositis; SLE systemic lupus erythematosus; RA rheumatoid arthritis