

**Supplementary Table S1.** Patients with underlying AD included in studies describing patients hospitalised due to COVID-19 (23–30).

| First author  | Country  | COVID patients | SARS-Cov-2 diagnosis | AD patients        | IA patients        | SAD patients      | Frequency of COVID-19 |
|---------------|----------|----------------|----------------------|--------------------|--------------------|-------------------|-----------------------|
| Cheng C       | China    | 586            | PCR+                 | 5                  | 4                  | 1                 | 0.17                  |
| Huang         | China    | 2804           | PCR+                 | 17                 | 10                 | 7                 | 0.25                  |
| Ye            | China    | 2326           | PCR+                 | 21                 | 12                 | 9                 | 0.39                  |
| Zhao J        | China    | 3059           | nd                   | 29                 | 19                 | 10                | 0.33                  |
| Wan           | Malaysia | 569            | PCR+                 | 4                  | 0                  | 4                 | 0.70                  |
| Sieiro-Santos | Spain    | 3711           | PCR or serol+        | 38                 | 22                 | 16                | 0.43                  |
| Ansarin       | Turkey   | 411            | PCR or CT+           | 30                 | 18                 | 12                | 2.92                  |
| D'Silva KM    | US       | 2154           | PCR+                 | 52                 | 27                 | 25                | 1.16                  |
| <b>TOTAL</b>  |          | <b>15620</b>   |                      | <b>196 (1.25%)</b> | <b>112 (0.71%)</b> | <b>84 (0.54%)</b> |                       |

**Supplementary Table S2.** Prevalence of SARS-CoV-2 infection in individual SAD according to the data from the studies included in Table I (32–40).

| First author | Country | Patients with AD (N) | Patients with SAD (N) | Individual SAD (n)   | Patients with SAD and COVID-19 (n) | Individual SAD with COVID-19 (n) | SAD with COVID-19 (n) 2 | SLE         | GCA/TK    | Sarco     | BD        | SSc        | AAV        | Myos      | Still    | SS        | APS       | SVV      |
|--------------|---------|----------------------|-----------------------|--|------------------------------------|----------------------------------|-------------------------|-------------|-----------|-----------|-----------|------------|------------|-----------|----------|-----------|-----------|----------|
| Benucci*     | Italy   | 295                  | 26                    | SLE (8), GCA (12), IM (6)  | 2                                  | GCA (1),                         | IM (1)                  | 2           | 8         | 12        |           |            |            |           | 6        |           |           |          |
| Conticini*   | Italy   | 859                  | 103                   | TA (2), Sarco (8), BD (5), SAPHO (1), SSc (54), AAV (8), IM (5), SLE (6), Sweet (1), GCA (11), Still (1)   | 1                                  | GCA (1)                          | 1                       | 6           | 13        | 8         | 5         | 54         | 8          | 5         | 1        | 3         |           |          |
| Emmi         | Italy   | 458                  | 352                   | SLE (117), SSj (37), SSc (18), APS (17), GCA/TA (63), BD (41), EGPA/GPA/MPA (40), Cryo (3), HSP (2), FMF (15), Pericarditis (9), Uveitis (14), Retroperitoneal fibrosis (4), Sarco (4) | 1                                  | SSj (1)                          | 1                       | 117         | 63        | 4         | 41        | 18         | 40         | 10        |          | 37        | 17        | 5        |
| Favalli*     | Italy   | 955                  | 31                    | SLE (13), SSc (3), SSj (2), BD (6), Sarco (1), Still (3), AIS (4)  | 1                                  | Sarco (1)                        | 1                       | 13          | 3         | 1         | 6         | 3          |            |           | 3        | 2         |           |          |
| Michaud      | CA      | 530                  | 150                   | SLE (30), Other (120)  | 0                                  | 0                                | 0                       | 30          |           |           |           |            |            |           |          |           |           |          |
| Quartuccio   | Italy   | 1051                 | 131                   | AAV (74), SLE (38), Other CID (19)   | 0                                  | 0                                | 0                       | 38          |           |           |           |            |            |           |          |           |           |          |
| Zen          | Italy   | 916                  | 805                   | SLE (397), AAV (182), SSc (176), IM (50)   | 2                                  | SLE (1),                         | SSc (1)                 | 2           | 397       |           |           |            | 176        | 182       | 50       |           |           |          |
| Favalli      | Italy   | 123                  | 123                   | SLE (397), SSc (43), CTD (9), SSj (10)   | 1                                  | SSc (1)                          | 1                       | 61          |           |           |           | 43         |            |           |          | 10        |           |          |
| Pablos       | Spain   | 4781                 | 4781                  | SLE (2253), AI/IMID: RA, PsA, SpA, SLE, SSj, SSc, PMR-GCA and Others: AAV, BD, Sarco, IM (2528)  | 53                                 | SLE (14),                        | other SAD (39)          | 53          | 2253      |           |           |            |            |           |          |           |           |          |
| <b>TOTAL</b> |         | <b>9968</b>          | <b>6502</b>           |  | <b>61</b>                          |                                  |                         | <b>2923</b> | <b>91</b> | <b>13</b> | <b>52</b> | <b>294</b> | <b>230</b> | <b>71</b> | <b>4</b> | <b>52</b> | <b>17</b> | <b>5</b> |

\*Included only AD patients under DMARD therapies.

\*\*All confirmed by PCR (ND in the study by Michaud).

SLE: systemic lupus erythematosus; GCA: giant cell arteritis; IM: inflammatory myopathies; TA: Takayasu arteritis; Sarco: sarcoidosis; BD: Behcet disease; SAPHO: synovitis, acne, pustulosis, hyperostosis, osteitis; SSc: systemic sclerosis; AAV: associated vasculitis; Sweet: Sweet's syndrome; Still: Still disease; SSj: Sjögren syndrome; APS: antiphospholipid syndrome; EGPA: eosinophilic granulomatosis with polyangiitis; GPA: granulomatosis with polyangiitis; MPA: microscopic polyangiitis; Cryo: cryoglobulinaemia; HSP: Henoch-Schönlein purpura; FMF: familial Mediterranean fever; AIS: autoinflammatory disease; CID: chronic inflammatory diseases; AI/IMID: autoimmune or immune-mediated disease; RA: rheumatoid arthritis; PsA: psoriatic arthritis; SpA: spondyloarthritis; PMR: polymyalgia rheumatica; SAD: systemic autoimmune disease.

**Supplementary Table S3.** Main COVID-19 outcomes in studies including patients with AD: rate of pneumonia (15,18,20,21,25,40), hospitalisation rate (14,15,18-21,27,49), ICU admission (15,16,18,23,25-27,29,45,49) and mortality rate (14-21,23-27,29,45,49).

| Outcomes                      | Patients with AD (n) | Outcome (n) | Frequency (n) | Frequency range (%) | Studies including at least 10 patients with AD (first author)  |
|-------------------------------|----------------------|-------------|---------------|---------------------|--|
| Pneumonia                     | 800                  | 462         | 57.75%        | 38.2-100%           | Freites-Núñez, Fredi, Montero, Scirè, Pablos, Sieiro Santos,   |
| Hospitalisation               | 1325                 | 677         | 51.09%        | 17.6-69.8%          | Fredi, Freites-Núñez, Gianfrancesco, Montero, Nuño, Scirè, Duret, D'Silva,   |
| ICU admission                 | 796                  | 60          | 7.53%         | 0-23.3%             | Freites-Núñez, Scirè, Duret, Huang, Zhao J, Ansarin, Aries, D'Silva, Pablos, Sieiro Santos,  |
| ICU admission in hospitalised | 584                  | 57          | 9.76%         | 0-47.8%             | Freites-Núñez, Scirè, Duret, Huang, Zhao J, Ansarin, D'Silva, Pablos, Sieiro Santos,   |
| Death                         | 1874                 | 227         | 12.11%        | 0-26.7%             | Ansarin, Aries, D'Silva, Duret, Fredi, Fredi, Freites-Núñez, Gianfrancesco, Huang, Marques, Montero, Nuño, Pablos, Scirè, Sieiro Santos, Ye, Zhao J, |

**Supplementary Table S4.** Rates of the main COVID-19 outcomes (hospitalisation, ICU admission, poor outcomes and death) in case-control studies comparing patients with and without AD (20,26,27,40,45,50).

| Rate of hospitalisation (first author, reference)   | Patients with AD (%)         | Controls (%)         | Comparison group (controls)                                  | Results                           |
|---|------------------------------|----------------------|--|-----------------------------------|
| Pablos  | 71.1%                        | 77.1%                | Sex-age matched non-rheumatic patients                       | No significant differences        |
| Ansarin   | 36.7%                        | 40.7%                | Consecutive patients not treated with immunomodulatory drugs | No significant differences        |
| D'Silva   | 44%                          | 40%                  | Sex-age matched non-rheumatic patients                       | No significant differences        |
| Siso  | 8.9%                         | 4.3%                 | Primary care population                                      | No significant differences        |
| Duration of hospital stay (first author, reference) | Patients with AD (mean days) | Controls (mean days) | Comparison group (controls)                                  | Results                           |
| Pablos  | 12.0                         | 12.6                 | Sex-age matched non-rheumatic patients                       | No significant differences        |
| Fredi   | 15                           | 14                   | Sex-age matched non-rheumatic patients                       | No significant differences        |
| Rate of ICU admission (first author, reference)     | Patients with AD (%)         | Controls (%)         | Comparison group (controls)                                  | Results                           |
| Aries   | 10%                          | 4.4%                 | General population (regional estimation)                     | No significant differences        |
| Pablos  | 6.7%                         | 7.1%                 | Sex-age matched non-rheumatic patients                       | No significant differences        |
| Ansarin   | 23.3%                        | 23.4%                | Consecutive patients not treated with immunomodulatory drugs | No significant differences        |
| D'Silva   | 48%                          | 18%                  | Sex-age matched non-rheumatic patients                       | <b>Higher rate in AD patients</b> |
| Rate of poor outcomes (first author, reference)     | Patients with AD (%)         | Controls (%)         | Comparison group (controls)                                  | Results                           |
| Pablos  | 31.6%                        | 28.1%                | Sex-age matched non-rheumatic patients                       | No significant differences        |
| Rate of death (first author, reference)             | Patients with AD (%)         | Controls (%)         | Comparison group (controls)                                  | Results                           |
| Ansarin   | 26.7%                        | 26.9%                | Consecutive patients not treated with immunomodulatory drugs | No significant differences        |
| D'Silva   | 6%                           | 4%                   | Sex-age matched non-rheumatic patients                       | No significant differences        |
| Fredi   | 15%                          | 10%                  | Sex-age matched non-rheumatic patients                       | No significant differences        |

**Supplementary Table S5.** Estimated risk for the main COVID-19 outcomes (hospitalisation, ICU admission, poor outcomes and death) in patients with AD in comparison with patients without AD (10,16,18,27,50).

| Risk of hospitalisation (first author, reference) | OR   | 95% CI    | Comparison group (controls)                          | Differences  |
|---|------|-----------|--|--|
| D'Silva   | 1.1  | 0.51-2.38 | Sex-age matched non-rheumatic patients               | No significant differences                                   |
| Freites   | 3.55 | 1.30-9.67 | Patients with chronic inflammatory arthritis         | <b>Higher risk in SAD patients</b>                           |
| Risk of ICU admission (first author, reference)   | OR   | 95% CI    | Comparison group (controls)                          | Differences  |
| D'Silva   | 2.92 | 1.00-8.94 | Sex-age matched non-rheumatic patients               | <b>Higher risk in AD patients</b>                            |
| Risk of poor outcomes (first author, reference)   | OR   | 95% CI    | Comparison group (controls)                          | Differences  |
| Pablos  | 1.13 | 0.84-1.49 | Sex-age matched non-rheumatic patients               | No significant differences                                   |
| Pablos  | 1.82 | 1.00-3.30 | Sex-age matched non-rheumatic patients               | <b>Higher risk in SAD patients</b>                           |
| Siso  | 2.82 | 1.00-7.84 | Primary care population                              | <b>Higher risk in AD patients</b>                            |
| Risk of death (first author, reference)           | OR   | 95% CI    | Comparison group (controls)                          | Differences  |
| D'Silva   | 1.58 | 0.31-8.03 | Risk study   | No significant differences                                   |
| Williamson  | 1.19 | 1.11-1.27 | Risk factors for infection in population-based study | <b>Higher risk in patients with SLE, RA, Psor</b>            |
| Williamson  | 2.21 | 1.68-2.90 | Risk factors for infection in population-based study | <b>Higher risk in patients with other immune suppression</b> |

**Supplementary Table S6.** Studies evaluating baseline features associated with an increased risk of hospitalisation for COVID-19 in patients with AD. (14,18-21).

|                 |                        | First author (ref) | Univariate OR | 95% CI     | Multivariate OR | 95% CI            |                  |
|-----------------|------------------------|--------------------|---------------|------------|-----------------|-------------------|------------------|
| Epidemiological | Female sex             | Freites            | 0.4           | 0.18-0.99  | NA              | NA                |                  |
|                 | Male sex               | Montero            | 4.4           | 1.25-15.39 | <b>7.4</b>      | <b>1.58-34.90</b> |                  |
|                 | Mean age               | Freites            | 1.09          | 1.05-1.14  | <b>1.08</b>     | <b>1.04-1.13</b>  |                  |
|                 |                        | Nuño               | 1.34          | 1.17-1.55  | NA              | NA                |                  |
|                 |                        | Gianfrancesco      | 4.02          | 2.74-5.89  | <b>2.56</b>     | <b>1.62-4.04</b>  |                  |
|                 |                        | Montero            | 5.5           | 1.13-27.10 | 2.6             | 0.42-16.21        |                  |
| Comorbidities   | Hypertension           | Gianfrancesco      | 2.83          | 1.01-4.0   | <b>1.86</b>     | <b>1.23-2.81</b>  |                  |
|                 |                        | Freites            | 3.64          | 1.65-8.06  | NA              | NA                |                  |
|                 |                        | Nuño               | 4.06          | 1.79-9.19  | NA              | NA                |                  |
|                 |                        | Montero            | 5.41          | 1.53-19.12 | 6.21            | 0.58-66.62        |                  |
|                 | Diabetes               | Gianfrancesco      | 3.01          | 1.76-5.18  | <b>2.61</b>     | <b>1.39-4.88</b>  |                  |
|                 |                        | Freites            | 5.15          | 1.5-16.8   | NA              | NA                |                  |
|                 | Cardiovascular disease | Montero            | 3.89          | 1.23-12.29 | 0.73            | 0.12-4.54         |                  |
|                 | Kidney disease         | Gianfrancesco      | 6.11          | 2.66-14.04 | <b>3.02</b>     | <b>1.21-7.54</b>  |                  |
|                 | Chronic lung disease   | Gianfrancesco      | 2.71          | 1.80-4.08  | <b>2.48</b>     | <b>1.55-3.98</b>  |                  |
|                 |                        | Freites            | 3.32          | 1.17-9.45  | NA              | NA                |                  |
|                 |                        | Nuño               | 5.34          | 1.47-19.35 | NA              | NA                |                  |
|                 |                        | Montero            | 9.14          | 1.10-75.98 | <b>8.93</b>     | <b>1.25-63.48</b> |                  |
|                 | Therapies              | NSAIDs             | Freites       | 0.37       | 0.15-0.91       | NA                | NA               |
|                 |                        |                    | Gianfrancesco | 0.55       | 0.35-0.84       | 0.64              | 0.39-1.06        |
| Glucocorticoids |                        | Freites            | 2.01          | 0.97-4.13  | NA              | NA                |                  |
|                 |                        | Nuño               | 2.55          | 1.07-5.59  | NA              | NA                |                  |
|                 |                        | Gianfrancesco      | 3.05          | 1.74-5.32  | <b>2.05</b>     | <b>1.06-3.96</b>  |                  |
|                 |                        | Montero            | 4.84          | 1.38-16.95 | <b>5</b>        | <b>1.08-23.15</b> |                  |
| TNF             |                        | Freites            | 0.13          | 0.03-0.63  | NA              | NA                |                  |
| Only DMARDs     |                        | Gianfrancesco      | 0.35          | 0.20-0.63  | <b>0.46</b>     | <b>0.22-0.93</b>  |                  |
| Methodretaxate  |                        | Nuño               | 2.06          | 1.01-5.29  | NA              | NA                |                  |
| Other           |                        | SAD                | Freites       | NA         | NA              | <b>3.55</b>       | <b>1.30-9.67</b> |

**Supplementary Table S7.** Mortality rate in patients with SAD and COVID-19: individual disease-by-disease rates.

| SAD                             | Patients with COVID-19 (n) | Death (n) | Mortality rate (%) | Studies (first author)   |
|---------------------------------|----------------------------|-----------|--------------------|--|
| Systemic lupus erythematosus    | 639                        | 65        | 10.17%             | Bozzalla Cassione, Chen, Cho, Fernandez-Ruiz, Fredi, Freites-Nuñez, Gartshteyn, Gendebien, Han, He, Huang, Kondo, Mathian, Montero, Nuño, Romao, Sharmeen, Sieiro Santos, Strangfeld, Teh, Wallace, Wan, Ye, Zen, Zhao J |
| Sjögren syndrome                | 66                         | 5         | 7.6%               | Duret, Freites-Nuñez, Huang, Sieiro Santos, Zhao J, Ramos-Casals,  |
| Polymyalgia rheumatica          | 19                         | 5         | 26.3%              | Fredi, Freites-Nuñez, Huang, Sieiro Santos   |
| Behçet disease                  | 15                         | 1         | 6.6%               | Huang, Espinosa, Yurtass   |
| Systemic sclerosis              | 12                         | 3         | 25%                | Favalli EG, Fredi, Freites-Nuñez, Siero Santos, Wan  |
| Giant cell arteritis            | 11                         | 0         | 0%                 | Benucci, Conticini E, Fredi, Pablos, Sieiro Santos, Tomelleri,   |
| Mixed connective tissue disease | 6                          | 0         | 0%                 | Freites-Nuñez  |
| Still disease                   | 4                          | 0         | 0%                 | Duret, Fredi   |
| Vasculitis                      | 3                          | 1         | 33.3%              | Freites-Nuñez, Sharmeen  |
| Myositis                        | 3                          | 0         | 0%                 | Freites-Nuñez, Wan, Zhao J   |
| Sarcoidosis                     | 1                          | 0         | 0%                 | Favalli EG   |
| Polychondritis                  | 1                          | 0         | 0%                 | Freites-Nuñez  |

**Supplementary Table S8.** Total number of reported patients with COVID-19 for each individual SAD.

| SAD                | n   | References (first author)   |
|--------------------|-----|---|
| SLE                | 639 | Ansarin, Benezit, Bozzalla Cassione, Chen, Chen, Cho, D'Silva, Espinosa, Fernandez-Ruiz, Fredi, Freites-Nuñez, Gartshteyn, Gendebien, Gianfrancesco, Guilpain, Gyorfí, Hakroush, Han, He, Huang, Kondo, Mathian, Montero, Nuño, Pablos, Pablos, Padala, Romao, Sharmeen, Shenavandeh, Sieiro Santos, Strangfeld, Suarez-Diaz, Teh, Tomelleri, Wallace, Wallace, Wan, Ye, Yurttas, Zen, Zhao J, Zhong, |
| Vasculitis         | 133 | Ansarin, Benezit, Benucci, Coticini E, D'Silva, Espinosa, Fredi, Freites-Nuñez, Gianfrancesco, Gyofri, Nuño, Pablos, Padala, Scirè, Sharmeen, Sieiro Santos, Tomelleri, Tomelleri, Yurttas, Guilpain, Shenavandeh, Suarez-Diaz  |
| Sjögren            | 118 | Benucci, Duret, Emmi G, Freites-Nuñez, Gianfrancesco, Huang, Nuño, Pablos, Ramos-Casals, Sieiro Santos, Wallace, Ye, Zhao J, Zhong  |
| Polymyalgia        | 80  | D'Silva, Fredi, Fredi, Freites-Nuñez, Gianfrancesco, Guilpain, Hakroush, Huang, Nuño, Pablos, Shenavandeh, Sieiro Santos, Suarez-Diaz, Ye   |
| Sarcoidosis        | 62  | D'Silva, Favalli EG, Gianfrancesco, Nuño, Pablos, Gianfrancesco, Benezit, Gyorfí, Padala  |
| Systemic sclerosis | 48  | Ansarin, Avouac, Bellan, Cheng C, Favalli EG, Fredi, Freites-Nuñez, Gianfrancesco, Mihai, Nuño, Pablos, Sieiro Santos, Wan, Zen   |
| Myositis           | 40  | Ansarin, Benucci, D'Silva, Freites-Nuñez, Gianfrancesco, Nuño, Pablos, Wallace, Wan, Zhao J   |
| Behçet             | 19  | Brito, Huang, Nuño, Pablos, Espinosa, Yurtass   |
| Still disease      | 11  | Duret, Fredi, Fredi, Nuño   |
| Overlap/UCTD       | 10  | Nuño, Pablos, Ye, Zhao J  |
| MCTD               | 8   | Freites-Nuñez, Nuño   |
| APS                | 6   | Pablos  |
| IgG4-RD            | 3   | Chen, Pablos  |
| Polychondritis     | 1   | Freites-Nuñez   |
| Not specified      | 170 | Fredi, Fredi, Freites-Nuñez, Gianfrancesco, Montero, Pablos, Scirè, Wallace, Zhong  |

**Supplementary Table S9.** Data about COVID-19 outcomes in SLE patients detailed in 25 studies (18,19,43,51,53-60,20,61-65,21,23-25,29,30,38).

| First author      | Country       | SLE patients with COVID-19 (n) | Pneumonia (n) | Hospitalisation (n) | ICU admission (n) | Death (n) |
|-------------------|---------------|--------------------------------|---------------|---------------------|-------------------|-----------|
| Bozzalla Cassione | Italy         | 12                             | 1 of 4        | 1                   | 1                 | 0         |
| Chen              | China         | 2                              | ND            | 2                   | 0                 | 0         |
| Cho               | Asia          | 3                              | 2             | 2                   | 0                 | 1         |
| Fernandez-Ruiz    | US            | 41                             | ND            | 24                  | 4                 | 4         |
| Fredi             | Italy         | 12                             | ND            | ND                  | ND                | 1         |
| Freites-Nuñez     | Spain         | 8                              | ND            | ND                  | ND                | 0         |
| Gartshteyn        | US            | 18                             | ND            | 7                   | 1                 | 0         |
| Gendebien         | Belgium       | 18                             | ND            | 2                   | 0                 | 0         |
| Han               | China         | 1                              | 1             | 1                   | 0                 | 0         |
| He                | China         | 1                              | 1             | 1                   | 0                 | 0         |
| Huang             | China         | 3                              | ND            | ND                  | ND                | 1         |
| Kondo             | Japan         | 1                              | 1             | 1                   | 0                 | 0         |
| Mathian           | France        | 17                             | 13            | 14                  | 7                 | 2         |
| Montero           | Spain         | 9                              | ND            | ND                  | ND                | 2         |
| Nuño              | Spain         | 13                             | ND            | ND                  | ND                | 3         |
| Romao             | Portugal      | 2                              | 0             | 0                   | 0                 | 0         |
| Sharmeen          | US            | 1                              | ND            | ND                  | ND                | 0         |
| Sieiro Santos     | Spain         | 5                              | ND            | ND                  | ND                | 1         |
| Teh               | Malaysia      | 5                              | 5             | 5                   | 1                 | 1         |
| Wallace           | US            | 5                              | ND            | ND                  | ND                | ND        |
| Wallace           | US            | 5                              | ND            | 4                   | 3                 | 1         |
| Wan               | Malaysia      | 2                              | ND            | ND                  | ND                | 1         |
| Ye                | China         | 4                              | ND            | ND                  | ND                | 0         |
| Zen               | Italy         | 1                              | ND            | ND                  | ND                | 0         |
| Zhao J            | China         | 6                              | ND            | ND                  | ND                | 1         |
| Strangfeld        | International | 391                            | ND            | ND                  | ND                | 36        |