

Table S1. Number and sex of healthy donors and COVID-19 /post-COVID-19 patients per observed cytokines.

| Cytokines | E-SELECTIN | MCP-1 | IL-10 | P-SELECTIN | ESTRADIOL | TGF- β | SHBG | INF- γ | TNF- α | VCAM-1 | ICAM-1 | IL-8 | IL-6 | IL-1 β | DHT | Testosterone | Free testosterone |
|--|------------|-------|-------|------------|-----------|--------------|------|---------------|---------------|--------|--------|------|------|--------------|-----|--------------|-------------------|
| Total At diagnosis | | | | | | | | | | | | | | | | | |
| Nº of patients | 71 | 78 | 47 | 49 | 81 | 78 | 70 | 54 | 50 | 55 | 54 | 55 | 56 | 55 | 91 | 13 | 13 |
| Female COVID-19 patients | | | | | | | | | | | | | | | | | |
| Nº of patients | 19 | 20 | 20 | 21 | 27 | 20 | 24 | 18 | 18 | 18 | 18 | 19 | 18 | 18 | 27 | 6 | 6 |
| Male COVID-19 patients | | | | | | | | | | | | | | | | | |
| Nº of patients | 52 | 58 | 27 | 28 | 54 | 58 | 46 | 36 | 32 | 36 | 36 | 36 | 38 | 36 | 64 | 7 | 7 |
| Total 2.5 months after hospital admission | | | | | | | | | | | | | | | | | |
| Nº of patients | 79 | 55 | 55 | 60 | 44 | 58 | 38 | 66 | 41 | 41 | 41 | 66 | 67 | 65 | 69 | 13 | 13 |
| Female post-COVID-19 patients | | | | | | | | | | | | | | | | | |
| Nº of patients | 27 | 16 | 28 | 28 | 17 | 17 | 15 | 27 | 15 | 15 | 15 | 27 | 27 | 26 | 17 | 6 | 6 |
| Male post-COVID-19 patients | | | | | | | | | | | | | | | | | |
| Nº of patients | 52 | 39 | 27 | 32 | 27 | 41 | 23 | 39 | 26 | 26 | 26 | 39 | 40 | 39 | 52 | 7 | 7 |
| Total 5 months after hospital admission | | | | | | | | | | | | | | | | | |
| Nº of patients | 48 | 41 | 42 | 35 | 35 | 39 | 22 | 35 | 22 | 22 | 22 | 34 | 34 | 35 | 54 | 14 | 14 |
| Female post-COVID-19 patients | | | | | | | | | | | | | | | | | |
| Nº of patients | 16 | 13 | 22 | 15 | 15 | 13 | 10 | 15 | 10 | 10 | 9 | 15 | 15 | 15 | 15 | 6 | 6 |
| Male post-COVID-19 patients | | | | | | | | | | | | | | | | | |
| Nº of patients | 32 | 28 | 20 | 20 | 20 | 26 | 12 | 20 | 12 | 12 | 13 | 19 | 19 | 20 | 39 | 8 | 8 |
| Total healthy donors | | | | | | | | | | | | | | | | | |
| Nº of donors | 17 | 18 | 18 | 25 | 8 | 19 | 8 | 16 | 19 | 8 | 8 | 22 | 21 | 18 | 8 | 10 | 10 |
| Female healthy donors | | | | | | | | | | | | | | | | | |
| Nº of donors | 10 | 10 | 10 | 14 | 4 | 10 | 4 | 9 | 11 | 4 | 4 | 12 | 11 | 10 | 4 | 5 | 5 |
| Male healthy donors | | | | | | | | | | | | | | | | | |
| Nº of donors | 7 | 8 | 8 | 11 | 4 | 9 | 4 | 7 | 8 | 4 | 4 | 10 | 10 | 8 | 4 | 5 | 5 |

Table S2. ELISA kits of applied cytokines.

| ELISA Assay | Units | Cat. No. | Manufacturer |
|---|--------------|-----------------|--|
| Dihydrotestosterone (DHT) | pg/ml | E-EL-0031 | Elabsciences Biotechnology Inc., Houston, Tx, USA |
| E2 (Estradiol) | pg/ml | E-OSEL-H0005 | Elabsciences Biotechnology Inc. |
| Sex hormone binding globulin (SHBG) | pmol/ml | E-EL-H6100 | Elabsciences Biotechnology Inc. |
| Interleukin – 6 (IL-6) | pg/ml | E-EL-H0102 | Elabsciences Biotechnology Inc. |
| Interleukin – 10 (IL-10) | pg/ml | E-EL-H0103 | Elabsciences Biotechnology Inc. |
| Interleukin – 1β (IL-1β) | pg/ml | E-EL-H0149 | Elabsciences Biotechnology Inc. |
| Interleukin – 8 (IL-8) | pg/ml | E-EL-H6008 | Elabsciences Biotechnology Inc. |
| Interferon gamma (IFN-γ) | μ g/ml | E-EL-H0108 | Elabsciences Biotechnology Inc. |
| Transforming growth factor beta (TGF-β) | ng/ml | E-EL-0162 | Elabsciences Biotechnology Inc. |
| Tumor necrosis factor alpha (TNF-α) | pg/ml | E-EL-H0109 | Elabsciences Biotechnology Inc. |
| Monocyte chemoattractant protein-1 (MCP-1) | pg/ml | E-EL-H6005 | Elabsciences Biotechnology Inc. |
| Intercellular Adhesion Molecule 1 (ICAM-1) | pg/ml | E-EL-H6114 | Elabsciences Biotechnology Inc. |
| Vascular Cell Adhesion Molecule (VCAM-1) | μ g/ml | E-EL-H5587 | Elabsciences Biotechnology Inc. |
| P-selectin | ng/ml | E-EL-H0917 | Elabsciences Biotechnology Inc. |
| E-selectin | pg/ml | E-EL-H0876 | Elabsciences Biotechnology Inc. |

Table S3. Concentration values for all examined sex hormones, cytokine/chemokines and adhesion molecules in healthy donors, COVID-19 and post-COVID-19 patients.

| | Sex | Age | TT nmol/l | Free TT pg/ml | DHT pg/ml | SHBG pmol/ml | EST pg/ml | IL8 pg/ml | IL6 pg/ml | TNFα pg/ml | INFγ μg/ml | IL10 pg/ml | ICAM1 μg/ml | VCAM1 μg/ml | E-sel pg/ml | P-sel pg/ml | IL1β pg/ml | TGFβ ng/ml | MCP1 pg/ml | |
|----------------|--------|-----|--------------|------------------|--------------|-----------------|--------------|--------------|--------------|---------------|---------------|---------------|----------------|----------------|----------------|----------------|---------------|---------------|---------------|--------|
| Diagnosis | Male | AV | 54.91 | 6.27 | 8.31 | 139.35 | 10.14 | 11.39 | 16.33 | 66.83 | 10.84 | 11.05 | 13.17 | 9.39 | 57.72 | 1430.24 | 8.00 | 9.75 | 3.83 | 586.59 |
| | | SD | 14.38 | 2.58 | 4.44 | 87.63 | 6.50 | 2.42 | 7.76 | 46.65 | 6.71 | 2.41 | 14.56 | 3.51 | 25.76 | 586.06 | 1.25 | 2.11 | 0.98 | 383.16 |
| | | M* | 55 | 6.18 | 8.10 | 122.50 | 7.56 | 11.42 | 14.44 | 55.79 | 9.49 | 10.08 | 9.28 | 8.06 | 55.28 | 1433.57 | 7.84 | 9.74 | 3.93 | 455.71 |
| | Female | AV | 61.29 | 0.97 | 1.82 | 111.54 | 22.20 | 10.96 | 19.71 | 49.05 | 41.98 | 12.35 | 17.00 | 12.09 | 64.78 | 1740.26 | 6.77 | 11.4 | 3.67 | 612.93 |
| | | SD | 13.87 | 0.28 | 0.22 | 55.88 | 11.72 | 2.32 | 7.48 | 26.33 | 40.91 | 4.96 | 31.40 | 5.20 | 33.37 | 1187.39 | 1.11 | 3.58 | 0.98 | 402.20 |
| | | M* | 62 | 0.98 | 1.80 | 103.60 | 22.18 | 11.42 | 17.94 | 64.11 | 21.84 | 11.82 | 8.17 | 9.72 | 57.81 | 1661.30 | 7.10 | 10.89 | 3.80 | 567.79 |
| 2.5 months | Male | AV | 55.85 | 13.81 | 19.25 | 96.61 | 6.72 | 12.62 | 17.17 | 36.66 | 9.22 | 11.15 | 5.71 | 18.58 | 75.42 | 1766.87 | 6.50 | 9.63 | 4.06 | 563.52 |
| | | SD | 14.30 | 4.31 | 6.87 | 66.48 | 8.54 | 2.78 | 7.31 | 46.35 | 0.91 | 1.49 | 4.71 | 3.59 | 34.28 | 792.66 | 2.03 | 0.82 | 2.70 | 270.44 |
| | | M* | 55.5 | 13.55 | 19.75 | 105.00 | 3.09 | 12.70 | 15.24 | 26.87 | 9.35 | 11.44 | 4.28 | 18.73 | 73.52 | 1524.17 | 6.43 | 9.79 | 3.66 | 528.71 |
| | Female | AV | 61.28 | 0.84 | 2.00 | 81.86 | 27.17 | 12.73 | 14.69 | 48.82 | 9.19 | 5.36 | 7.51 | 23.13 | 54.48 | 2761.94 | 5.51 | 9.49 | 3.70 | 899.58 |
| | | SD | 12.57 | 0.58 | 0.49 | 39.31 | 9.23 | 2.68 | 4.80 | 49.42 | 0.43 | 3.70 | 11.98 | 5.03 | 26.75 | 992.75 | 1.44 | 0.83 | 2.48 | 481.34 |
| | | M* | 62 | 0.84 | 2.00 | 101.16 | 26.21 | 12.54 | 15.15 | 21.72 | 9.26 | 2.99 | 4.72 | 23.28 | 44.12 | 2781.67 | 5.20 | 9.78 | 2.97 | 789.26 |
| 5 months | Male | AV | 54.54 | 14.47 | 26.46 | 129.78 | 6.24 | 12.26 | 15.02 | 32.53 | 8.79 | 10.73 | 4.77 | 18.12 | 71.23 | 2118.53 | 6.56 | 9.49 | 3.88 | 575.00 |
| | | SD | 17.10 | 5.17 | 9.84 | 78.64 | 6.54 | 3.15 | 5.25 | 33.20 | 1.15 | 2.01 | 2.02 | 3.96 | 39.31 | 1100.43 | 2.44 | 0.89 | 2.88 | 388.97 |
| | | M* | 56.5 | 14.79 | 22.40 | 113.11 | 4.97 | 11.96 | 13.85 | 25.29 | 9.14 | 11.59 | 4.53 | 18.50 | 57.62 | 1770.88 | 6.08 | 9.79 | 2.79 | 456.00 |
| | Female | AV | 61.36 | 0.56 | 1.63 | 76.52 | 21.51 | 13.90 | 17.00 | 18.70 | 9.23 | 10.89 | 4.68 | 21.31 | 34.29 | 2829.51 | 5.42 | 9.81 | 3.52 | 528.71 |
| | | SD | 10.65 | 0.30 | 0.29 | 36.29 | 7.51 | 2.25 | 5.22 | 21.27 | 0.32 | 1.51 | 2.02 | 4.29 | 36.47 | 1013.05 | 1.57 | 1.18 | 2.41 | 182.02 |
| | | M* | 62 | 0.58 | 1.70 | 85.23 | 23.79 | 13.59 | 16.81 | 9.58 | 9.29 | 11.61 | 4.72 | 21.44 | 23.94 | 2627.67 | 4.88 | 9.79 | 2.75 | 599.33 |
| Healthy donors | Male | AV | 41.18 | 19.53 | 29.84 | 169.76 | 3.20 | 12.28 | 8.39 | 12.25 | 5.90 | 8.45 | 6.97 | 7.38 | 36.48 | 1927.14 | 5.25 | 15.18 | 9.98 | 449.25 |
| | | SD | 12.39 | 9.09 | 7.61 | 68.13 | 0.95 | 1.22 | 2.77 | 3.85 | 0.93 | 0.51 | 7.18 | 1.66 | 6.84 | 617.61 | 1.85 | 17.17 | 5.26 | 194.25 |
| | | M* | 41 | 17.60 | 29.48 | 170.24 | 2.82 | 12.23 | 7.82 | 13.66 | 5.83 | 8.37 | 5.00 | 7.42 | 34.85 | 2049 | 4.00 | 9.56 | 11.58 | 478.86 |
| | Female | AV | 35.15 | 1.10 | 2.13 | 62.38 | 14.11 | 11.48 | 10.86 | 20.44 | 7.49 | 9.01 | 4.41 | 7.13 | 49.98 | 1514.40 | 5.40 | 9.55 | 9.29 | 313.80 |
| | | SD | 10.10 | 0.37 | 0.60 | 26.62 | 9.50 | 0.94 | 4.68 | 19.93 | 2.85 | 0.91 | 1.20 | 0.81 | 13.24 | 787.98 | 1.94 | 1.68 | 3.65 | 112.11 |
| | | M* | 35 | 1.17 | 1.99 | 56.08 | 10.24 | 11.23 | 9.26 | 13.95 | 6.07 | 9.13 | 4.37 | 7.07 | 48.90 | 1520.17 | 5.64 | 8.97 | 9.96 | 289.50 |

TT – testosterone, EST – Estradiol, sel – selectin, M* - Median

Table S4. The complete blood count test of COVID-19 patients at diagnosis and clinical follow-up.

| COVID19 | Sex | | RBC x10 ¹² /L | HGB g/L | HCT L/L | MCV fL | MCH pg | MCHC g/L | RDW % | WBC x10 ⁹ /L | LYMPH % | NEUT % | MONO % | MPV fL | PLT x10 ⁹ /L |
|--------------|--------|----|-----------------------------|---------------------|-------------------|--------------------|-----------|--------------------|-------------------|----------------------------|--------------------|--------------------|-------------------|-------------------|----------------------------|
| Diagnosis | Male | AV | 4.79 | 143.79 | 0.42 | 87.87 | 29.94 | 340.79 | 12.70 | 7.31 | 17.72 | 73.88 | 7.70 | 9.99 | 219.74 |
| | | SD | 0.57 | 13.03 | 0.04 | 4.24 | 1.55 | 8.75 | 1.20 | 3.52 | 9.77 | 11.91 | 4.92 | 0.68 | 106.39 |
| | | M* | 4.84 | 145.00 | 0.43 | 87.90 | 29.90 | 340.00 | 12.40 | 6.50 | 15.90 | 73.9 | 6.4 | 10.05 | 194 |
| | Female | AV | 4.40 | 130.10 | 0.61 | 87.98 | 29.65 | 336.85 | 13.07 | 6.01 | 21.67 | 70.60 | 6.75 | 9.96 | 216.54 |
| | | SD | 0.49 | 13.06 | 1.42 | 3.72 | 1.57 | 8.57 | 1.78 | 2.65 | 9.48 | 10.77 | 2.87 | 0.96 | 86.74 |
| | | M* | 4.43 | 130 | 0.383 | 87.65 | 29.7 | 336.5 | 12.8 | 5.55 | 19.75 | 72.15 | 6.35 | 9.75 | 212.5 |
| 2.5 months | Male | AV | 4.83 | 145.83 | 0.43 | 89.38 ¹ | 30.34 | 339.4 ² | 13.3 ³ | 7.06 | 29.7 ³ | 57.25 ³ | 8.74 ² | 11.26 | 255.64 ² |
| | | SD | 0.50 | 11.64 | 0.03 | 4.60 | 1.70 | 10.55 | 1.18 | 2.46 | 9.56 | 10.65 | 2.27 | 10.92 | 149.00 |
| | | M* | 4.86 | 146.00 | 0.43 | 89.05 | 30.15 | 338.00 | 13.15 | 6.60 | 30.05 | 56.65 | 8.70 | 9.85 | 233.50 |
| | Female | AV | 4.44 | 133.19 | 0.40 | 90.36 ¹ | 30.09 | 332.9 ¹ | 13.33 | 6.22 | 32.74 ³ | 55.91 ³ | 8.19 ¹ | 10.03 | 284.19 ³ |
| | | SD | 0.44 | 9.89 | 0.03 | 4.05 | 1.46 | 7.08 | 1.06 | 1.65 | 7.10 | 8.06 | 1.76 | 0.84 | 96.33 |
| | | M* | 4.55 | 135.00 | 0.40 | 90.70 | 30.20 | 332.00 | 13.10 | 6.50 | 32.90 | 56.00 | 8.00 | 10.10 | 264.00 |
| 5 months | Male | AV | 5.03 ¹ | 150.42 ² | 0.44 ² | 88.73 | 30.03 | 338.19 | 12.95 | 6.82 | 31.84 ³ | 56.17 ³ | 8.91 ² | 9.92 ³ | 232.7 ³ |
| | | SD | 0.51 | 11.63 | 0.03 | 4.16 | 1.70 | 10.00 | 1.84 | 1.41 | 9.38 | 9.54 | 2.51 | 0.83 | 56.67 |
| | | M* | 5.04 | 150.00 | 0.45 | 88.30 | 29.85 | 338.00 | 12.75 | 6.65 | 30.65 | 57.75 | 9.05 | 9.70 | 232.7 |
| | Female | AV | 4.65 ¹ | 137.72 ¹ | 0.41 | 88.54 | 29.62 | 334.56 | 13.00 | 6.53 | 31.13 ³ | 59.02 ³ | 7.11 | 9.96 ³ | 257.1 ³ |
| | | SD | 0.39 | 11.57 | 0.03 | 3.39 | 1.40 | 7.82 | 0.98 | 2.30 | 7.28 | 8.51 | 1.78 | 0.85 | 62.84 |
| | | M* | 4.73 | 137.50 | 0.41 | 88.40 | 29.60 | 334.50 | 12.75 | 6.10 | 31.80 | 57.25 | 7.20 | 9.75 | 257.12 |
| Normal range | | | 4.34-5.72 | 138-175 | 0.415-0.53 | 80-100 | 27.4-33.9 | 320-360 | 12-15.5 | 3.4-9.7 | 20-46 | 44-72 | 2-12 | 6.8-10.4 | 158-424 |

¹p<0.05; ²p<0.01; ³p<0.001 vs. values at diagnosis, M* - Median

Table S5. Spearman correlation of biochemical parameters with the levels of inflammatory cytokines, chemokines, cell adhesion factors and sex hormones in the examined COVID-19 and post-COVID-19 male and female patients.

| Spearman's r | Sex | INR | PTS | UREA | Creatinine | CK | D-dimer | CRP | AST | ALT | GGT | Fibrinogen | LDH | Vaccine | CO | Co-M |
|---------------|-----|--------------------|-------------------|--------------------|--------------------|-----------------------------|--------------------|--------------------|-------------------|--------------------|--------------------|--------------------|--|--|-------------------|--|
| E-SELEKTIN | F | -.758 ² | | | | -.762 ¹ | | | | | | | -.490 ² -.875 ² | .563 | | |
| | M | | | | | | | | .543 ² | | | | | .407 ² | | |
| | T | | | | | -.246 | | | -.314 | | -.29 | | -.301 | .267 | | .272 .274 ¹ |
| P-SELEKTIN | F | | | | .586 ¹ | | | | .486 | .655 | .514 | -.627 | | | | |
| | M | | | | | | | | | | | | | -.462 ² | | -.503 ² |
| | T | | | | | .523 ² | | | | .326 | | | | | | |
| VCAM-1 | F | | | | | | | | | .567 ¹ | | | -.731 ² | | | .529 |
| | M | | | | .639 ² | | | | | | .762 ² | .383 ² | | .606 ¹ | .457 ¹ | |
| | T | | | | .569 ² | | | | .569 ² | .573 ² | .589 ² | | | | .417 ¹ | |
| ICAM-1 | F | | | | | | | | | | | | | -.554 ¹ | | |
| | M | | .576 | | | | | | | | | | | .45 ¹ | | |
| | T | | | | -.451 ¹ | | | | | | | | | | | |
| ESTRADIOL | F | .634 ¹ | .659 ¹ | .672 ¹ | .620 ¹ | .636 ¹ | | | | | | | | | | |
| | M | | | .754 ² | | | | | | | | | | | | .526 ¹ .522 ² |
| | T | | | | | .350 ¹ | | | | | | | | | | |
| DHT | F | | | | | .473 | | | | | | | .447 | | .439 | |
| | M | | | | -.269 | | | | | | | | | | | .281 |
| | T | | | | | .309 .365 ² | -.349 ² | -.283 ² | | | | | | .349 ¹ | | |
| SHBG | F | -.545 | | | -.496 ¹ | -.489 | | | | | | | -.568 ¹ | | | |
| | M | | | | -.311 | | | | | | | -.778 ² | | | | |
| | T | | | | | -.386 -.396 ¹ | | | | | -.472 ¹ | | | | | .362 |
| INF- γ | F | | | -.762 ² | .535 ¹ | | | | | | | .486 ¹ | | | | |
| | M | | | | | -.407 | -.626 ² | | | | | | | -.338 ¹ -.451 ² | | |
| | T | | | | .405 ¹ | -.337 | | | | | | | | | | .34 |
| TNF- α | F | | | | | | | | | | -.74 ¹ | | | | | |
| | T | | | | | | | | | -.398 ¹ | | | | | | |
| IL-10 | F | | | .683 ¹ | | | .857 ² | | | | | | | .596 ² | | |
| | T | | | | | | | | | -.518 ² | | | | | | |

| | | | | | | |
|-------|---|--------------------|--------------------------------------|-------------------------|--|--|
| IL-6 | F | .518 | | | | |
| | M | -.594 ² | | | | |
| | T | .529 ² | -.553 ² .489 ² | | | |
| IL-1β | F | .571 ¹ | | | | |
| | M | -.546 ¹ | .364 ¹ | | | |
| | T | -.463 ¹ | | | | |
| MCP-1 | F | .604 | | | | |
| | M | .390 ¹ | 0.497 ² | | | |
| | T | .425 ¹ | 0.483 ² .389 ² | | | |
| TGF-β | M | -.466 | | | | |
| | T | .40 ² | .453 ² | .288 ¹ -.243 | | |
| IL-8 | F | -.52 | | | | |
| | M | -.381 | -.449 ² | | | |
| | T | -.381 ² | .368 .289 | | | |

¹After first control (2.5 months); ²After second control (5 months) of hospital admission; No superscript (at diagnosis). F-female, M-male, T-total.
CO – Clinical outcome, Co-M – Comorbidities.