

IMMUNOLOGICAL PHENOTYPE OF PATIENTS WITH SEVERE COVID-19 INFECTION AND SEPTIC SHOCK COMPARED



Authors: M. Tosi, E. Biagioni, E. Munari, I. Gatto, S. Busani, M. Girardis

INTRODUCTION: The etiopathogenesis of severe SARS-CoV-2 infections and septic shock is characterized by a profound alteration of immune mechanisms caused by dysregulated responses to the pathogen.

OBJECTIVES: Our study aimed to compare the immune phenotype of patients with septic shock and severe SARS-CoV-2 infection at the time of ICU admission, highlighting commonalities and differences.

METHODS: We conducted a retrospective observational study using two databases containing prospectively collected data, to gather information on the immune function of patients with septic shock and severe COVID-19 pneumonia. We compared the two populations by assessing baseline characteristics and immune variables.

RESULTS: We compared a population of 96 patients with septic shock and 186 patients with SARS-CoV-2 pneumonia. Patients with septic shock were older, had a higher proportion of women, a greater number of comorbidities and higher clinical severity scores expressed by SAPS II and SOFA scores at ICU admission. As expected, patients with septic shock showed leucocytosis with a greater proportion of Neutrophil cells and increased NLR ratios due to the difference in infectious etiology. Both populations showed severe lymphocytopenia with no differences in lymphocyte counts or lymphocytes subpopulations. At T0, patients with septic shock showed a greater depletion of circulating immunoglobulins IgG and IgM compared to patients with COVID-19.

Population description: baseline characteristics & outcomes

	TOTAL (282 pt)		Septic shock (96)		COVID-19 (186)		P-value
	Median - n	IQR - %	Median - n	IQR - %	Median - n	IQR - %	
Age	66	59 – 74	74	65 - 78	63	56 – 71	0,000
Sex F	73	25,9%	38	39,6%	35	18,8%	0,000
SAPS II score	37	31-50	57	43 – 70	33	28 – 39	0,000
SOFA score	5	4 – 9	10	8 – 12	4	3 – 5	0,000
Comorbidities							
- none	68	(24,1%)	32	33,3%	36	19,4%	0,009
- ≥1 comorbidity	214	(75,9 %)	64	66,7%	150	80,6%	
Heart failure	35	12,4%	20	20,8%	15	8,1%	0,002
BPCO or asthma	34	12,1%	19	19,8%	15	8,1%	0,004
Cancer	22	7,8%	19	19,8%	3	1,6%	0,000
IRC (requiring dialysis)	18	6,4%	13	13,5%	5	2,7%	0,000
Diabetes	56	19,9%	13	13,5%	43	23,1%	0,056
Mechanical ventilation	207	73,4%	77	80,2%	130	69,9%	0,063
CRRT	52	18,4%	43	44,8%	9	4,8%	0,000
ICU LOS, days	8	4 - 15	8	5 – 12	8	4 – 15	0,825
Hospital LOS, days	21	13 - 39	23	14 - 41	21	12 – 36	0,436
Alive at ICU discharge	204	72,3%	67	68,8%	137	73,7%	0,492
Alive at hospital discharge	178	63,1%	55	57,3%	123	66,1%	0,145

Immunological characteristics at baseline

	TOTAL (282 pt)		Septic shock (96)		COVID-19 (186)		P-value
	Median	IQR	Median	IQR	Median	IQR	
WBC	12,02	6,6 - 2,98	8,26	5,7 - 11,5	8,70	5,8 - 13,4	0.000
Neutrophil cells A.V.	10,51	6,3 - 18,7	6,88	4,7 - 10,3	7,65	4,9 - 12,1	0.000
Lymphocytes A.V.	635	390 – 985	655	490 – 930	650	450 – 940	0.512
Neutrophils-to-Lymphocytes ratio	15,67	9,02 - 28,7	9,49	6,1 - 18,0	11,50	6,7 - 21,0	0.000
CD3 Lymphocytes A.V.	358,5	242 – 596	421,5	275 – 592	414,0	262 – 592	0.679
CD4 Lymphocytes A.V.	220,5	143 – 415	265,0	180 – 431	259,5	163 – 431	0.468
CD8 Lymphocytes A.V.	133,5	77 – 198	117,0	65 – 180	120,0	69 – 188	0.311
CD16 Lymphocytes A.V.	94,0	50 – 158	70,0	36 – 113	76,0	45 – 130	0.048
CD19 Lymphocytes A.V.	148,5	78 – 219	126,0	82 – 195	128,0	82 – 202	0.434
IgG Lymphocytes A.V.	624,0	381 – 857	882,0	744 – 998	831,0	600 – 949	0.000
IgM Lymphocytes A.V.	51,5	32 – 75	78,5	53 – 113	64,0	43 – 104	0.000
IgA Lymphocytes A.V.	184,0	128 - 299	217,0	161 - 288	203,0	154 - 289	0.072

CONCLUSIONS: Patients with septic shock and severe COVID-19 pneumonia at ICU admission showed a comparable grade of severe lymphocytopenia. Additionally, patients with septic shock have a greater reduction in plasma levels of circulating immunoglobulins.