

SUPPLEMENTAL DIGITAL CONTENT

Table S1: Baseline features, baseline immunosuppression and outcomes of solid organ transplant recipients diagnosed with COVID-19 during 2020 in Spain. Global and according to transplant type.

	GLOBAL (N=1634)	KIDNEY (N=1063)	LIVER (N=280)	HEART (N=149)	LUNG (N=112)	PANCREAS (N=27)	MULTIVISCERAL (N=3)
Baseline features							
Sex male, n (%)	1075 (65,8%)	680 (64,0%)	195 (69,6%)	111 (74,5%)	70 (62,5%)	17 (63.0%)	2 (66.7%)
Age at diagnosis							
Years, median (IQR)	61 (51-69)	60 (50-69)	64 (56-71)	62 (50-70)	61 (55-65)	48 (42-53)	13 (11-31)
>60 years, n (%)	829 (50.7%)	516 (48.5%)	172 (61.4%)	83 (55.7%)	57 (50.9%)	1 (3.7%)	0 -
Hospital-acquired COVID-19, n (%)	177 (10.9%)	112 (10.6%)	38 (13.6%)	13 (8.7%)	10 (8.9%)	3 (11.1%)	1 (33.3%)
Time since transplantation							
Months, median (IQR)	71 (27-145)	69 (28-138)	80 (29-180)	118 (34-186)	40 (15-79)	101 (38-152)	77 (20-104)
Diagnosis within the first month, n (%)	39 (2.4%)	25 (2.4%)	7 (2.5%)	4 (2.7%)	3 (2.7%)	0 -	0 -
Diagnosis beyond the first year, n (%)	1417 (86.9%)	930 (87.6%)	241 (86.4%)	130 (87.2%)	88 (79.3%)	25 (92.6%)	3 (100.0%)
Baseline immunosuppression							
	N=1627	N=1057	N=279	N=149	N=112	N=27	N=3
Corticosteroids, n (%)	1174 (72.2%)	876 (82.9%)	47 (16.8%)	112 (75.2%)	110 (98.2%)	26 (96.3%)	3 (100.0%)
Calcineurin inhibitor, n (%)	1468 (90.2%)	988 (93.5%)	200 (71.7%)	138 (92.6%)	112 (100.0%)	27 (100.0%)	3 (100.0%)
Antimetabolite, n (%) ^a	1209 (74.3%)	816 (77.2%)	161 (57.7%)	122 (81.9%)	85 (75.9%)	25 (92.6%)	0 -
mTOR inhibitor, n (%)	299 (18.4%)	187 (17.7%)	58 (20.8%)	25 (16.8%)	28 (25.0%)	1 (3.7%)	0 -
Outcomes							
	N=1510	N=955	N=270	N=149	N=112	N=21	N=3
Hospital admission, n (%)	1061 (70.4%)	696 (72.9%)	160 (59.5%)	97 (65.5%)	96 (85.7%)	12 (57.1%)	0 -
ICU admission, n (%)	205 (13.8%)	145 (15.4%)	20 (7.5%)	15 (10.3%)	23 (20.7%)	2 (9.5%)	0 -
Invasive mechanical ventilation, n (%)	155 (10.7%)	106 (11.5%)	14 (5.7%)	11 (7.6%)	22 (19.8%)	2 (9.5%)	0 -
ARDS, n (%)	394 (26,6%)	261 (27.7%)	46 (18.0%)	31 (20.9%)	52 (46.8%)	4 (19.0%)	0 -
Septic shock, n (%)	106 (7.2%)	74 (7.9%)	13 (5.1%)	7 (4.8%)	11 (10.3%)	1 (4.8%)	0 -
Multiorgan failure (%)	151 (10.2%)	92 (9.8%)	25 (9.7%)	10 (6.8%)	23 (21.3%)	1 (4.8%)	0 -
Death, n (%)	311 (20.6%)	193 (20.2%)	47 (17.4%)	25 (16.8%)	45 (40.2%)	1 (4.8%)	0 -

ARDS: Acute Respiratory Distress Syndrome; ICU: Intensive Care Unit

Table S2. Baseline features, treatment and outcomes of solid organ transplant recipients diagnosed with COVID-19 during 2020 in Spain who required hospital admission. Global and by period of diagnosis.

	GLOBAL (N=1,061)	First wave (before 13 July, 2020) (N=560)	Second wave (after 13 July, 2020) (N=501)	p
Baseline features				
Sex male, n (%)	719 (67.8%)	381 (68.0%)	338 (67.5%)	0.843
Age at diagnosis				
Years, median (IQR)	62 (53-70)	63 (54-71)	62 (52-69)	0.008
>60 years, n (%)	601 (56.6%)	334 (59.6%)	267 (53.3%)	0.037
Type of transplant				
Kidney	696 (65.6%)	352 (62.9%)	344 (68.7%)	0.364
Liver	160 (15.1%)	90 (16.1%)	70 (14.0%)	
Heart	97 (9.1%)	56 (10.0%)	41 (8.2%)	
Lung	96 (9.0%)	56 (10.0%)	40 (8.0%)	
Pancreas	12 (1.1%)	6 (1.1%)	6 (1.2%)	
Hospital-acquired COVID-19, n (%)	143 (13.6%)	70 (12.6%)	73 (14.6%)	0.334
Time since transplantation				
Months, median (IQR)	72 (26-145)	73 (26-150)	70 (26-144)	0.418
Diagnosis within the first month, n (%)	31 (2.9%)	15 (2.7%)	16 (3.2%)	0.626
Diagnosis beyond the first year, n (%)	903 (85.3%)	481 (86.2%)	422 (84.2%)	0.367
Baseline immunosuppression				
	N=1057	N=559	N=498	
Corticosteroids, n (%)	806 (76.3%)	410 (73.3%)	396 (79.5%)	0.019
Calcineurin inhibitor, n (%)	952 (90.1%)	489 (87.5%)	463 (93.0%)	0.003
Antimetabolite, n (%) ^a	790 (74.7%)	403 (72.1%)	387 (77.7%)	0.036
mTOR inhibitor, n (%)	195 (18.4%)	121 (21.6%)	74 (14.9%)	0.005
Anti SARS-CoV-2 treatment				
	N=1061	N=560	N=501	
Any treatment, n (%)	567 (53.4%)	502 (89.6%)	65 (13.0%)	<0.001
Hydroxichloroquine, n (%)	484 (45.6%)	483 (86.3%)	1 (0.2%)	<0.001
Azithromycin, n (%)	338 (31.9%)	314 (56.1%)	24 (4.8%)	<0.001
Protease inhibitors, n (%)	191 (18.0%)	190 (33.8%)	1 (0.2%)	<0.001
Remdesivir, n (%)	46 (4.3%)	5 (0.9%)	41 (8.2%)	<0.001
Other antivirals, n (%) ^b	8 (0.8%)	4 (0.7%)	4 (0.8%)	1.000
Interferon- β , n (%)	26 (2.5%)	26 (4.6%)	0-	<0.001
Immunomodulatory treatment				
	N=1061	N=560	N=501	
Any treatment, n (%)	670 (63.1%)	297 (53.0%)	373 (74.5%)	<0.001
Corticosteroids, n (%) ^c	633 (59.7%)	263 (47.0%)	370 (73.9%)	<0.001
Tocilizumab, n (%)	156 (14.7%)	121 (21.6%)	35 (7.0%)	<0.001
Anakinra, n (%)	17 (1.6%)	10 (1.8%)	7 (1.4%)	0.615
Outcomes				
	N=1061	N=560	N=501	
ICU admission, n (%)	205 (19.7%)	90 (16.4%)	115 (23.4%)	0.004
Invasive mechanical ventilation, n (%)	155 (15.5%)	64 (12.6%)	91 (18.6%)	0.008
ARDS, n (%)	392 (37.7%)	215 (39.1%)	177 (36.0%)	0.312
Septic shock, n (%)	105 (10.2%)	47 (8.6%)	58 (11.9%)	0.080
Multiorgan failure (%)	151 (14.6%)	68 (12.4%)	83 (17.0%)	0.036
Death, n (%)	301 (28.4%)	162 (28.9%)	139 (27.7%)	0.669

^aMainly mycophenolate.

^bGancyclovir (n=3), ribavirine (n=2), oseltamivir (n=2), raltegravir (n=1).

^cIncludes corticosteroid boluses, initiation of low-to-moderate doses or increase of baseline dose.

ARDS: Acute Respiratory Distress Syndrome, ICU: Intensive Care Unit, IQR: Interquartile range, mTOR: mammalian target of rapamycin.

Table S3. Baseline features, treatment and outcomes of solid organ transplant recipients diagnosed with COVID-19 during 2020 in Spain who required ICU admission. Global and by period of diagnosis.

	GLOBAL (N=205)	First wave (before 13 July, 2020) (N=90)	Second wave (after 13 July, 2020) (N=115)	p
Baseline features				
Sex male, n (%)	141 (68.8%)	58 (64.4%)	83 (72.2%)	0.236
Age at diagnosis				
Years, median (IQR)	62 (53-67)	61 (52-66)	63 (54-68)	0.293
>60 years, n (%)	113 (55.1%)	48 (53.3%)	65 (56.5%)	0.649
Type of transplant				
Kidney	145 (70.7%)	64 (71.1%)	81 (70.4%)	0.364
Liver	20 (9.8%)	8 (8.9%)	12 (10.4%)	
Heart	15 (7.3%)	7 (7.8%)	8 (7.0%)	
Lung	23 (11.2%)	9 (10.0%)	14 (12.2%)	
Pancreas	2 (1.0%)	2 (2.2%)	0-	
Hospital-acquired COVID-19, n (%)	34 (16.7%)	15 (17.0%)	19 (16.5%)	0.921
Time since transplantation				
Months, median (IQR)	55 (18-121)	55 (20-132)	60 (17-115)	0.517
Diagnosis within the first month, n (%)	11 (5.4%)	4 (4.4%)	7 (6.1%)	0.759
Diagnosis beyond the first year, n (%)	161 (78.5%)	74 (82.2%)	87 (75.7%)	0.256
Baseline immunosuppression				
	N=205	N=90	N=115	
Corticosteroids, n (%)	167 (81.5%)	74 (82.2%)	93 (80.9%)	0.805
Calcineurin inhibitor, n (%)	194 (94.6%)	82 (91.1%)	112 (97.4%)	0.062
Antimetabolite, n (%) ^a	160 (78.0%)	67 (74.4%)	93 (80.9%)	0.270
mTOR inhibitor, n (%)	30 (14.6%)	20 (22.2%)	10 (8.7%)	0.007
Anti SARS-CoV-2 treatment				
	N=205	N=90	N=115	
Any treatment, n (%)	99 (48.3%)	82 (91.1%)	17 (14.8%)	<0.001
Hydroxychloroquine, n (%)	77 (37.6%)	76 (84.4%)	1 (0.9%)	<0.001
Azithromycin, n (%)	61 (29.8%)	57 (63.3%)	4 (3.5%)	<0.001
Protease inhibitors, n (%)	48 (23.4%)	48 (53.3%)	0-	<0.001
Remdesivir, n (%)	14 (6.8%)	2 (2.2%)	12 (10.4%)	0.021
Other antivirals, n (%) ^b	4 (2.0%)	2 (2.2%)	2 (1.7%)	1.000
Interferon- β , n (%)	12 (5.9%)	12 (13.3%)	0-	<0.001
Immunomodulatory treatment				
	N=205	N=90	N=115	
Any treatment, n (%)	169 (82.4%)	61 (67.8%)	108 (93.9%)	<0.001
Corticosteroids, n (%) ^c	156 (76.1%)	50 (55.6%)	106 (92.2%)	<0.001
Tocilizumab, n (%)	60 (29.3%)	39 (43.3%)	21 (18.3%)	<0.001
Anakinra, n (%)	6 (2.9%)	3 (3.3%)	3 (2.6%)	1.000
Outcomes				
	N=205	N=90	N=114	
Invasive mechanical ventilation, n (%)	151 (74.4%)	62 (69.7%)	89 (78.1%)	0.173
ARDS, n (%)	175 (86.6%)	75 (85.2%)	100 (87.7%)	0.606
Septic shock, n (%)	82 (41.4%)	36 (41.4%)	46 (41.4%)	0.993
Multiorgan failure (%)	98 (49.2%)	42 (48.3%)	56 (50.0%)	0.809
Death, n (%)	125 (61.0%)	49 (54.4%)	76 (66.1%)	0.090

^aMainly mycophenolate.

^bGancyclovir (n=2), ribavirine (n=1), raltegravir (n=1).

^cIncludes corticosteroid boluses, initiation of low-to-moderate doses or increase of baseline dose.

ARDS: Acute Respiratory Distress Syndrome, ICU: Intensive Care Unit, IQR: Interquartile range, mTOR: mammalian target of rapamycin.

Table S4. Univariate and multivariate (logistic regression) models of factors associated with mortality in the ICU cohort of solid organ transplant recipients diagnosed with COVID-19 during 2020 in Spain. (N=205).

		Univariate			Multivariate		
		Total cases	n %	p	p	OR (IC 95%)	
Type of transplant	Kidney	145	85 (58.6%)	0.030	0.254	1.76 (0.66-4.64)	
	Liver	20	10 (50.0%)		Ref.		
	Heart	15	12 (80.0%)		0.081	4.03 (0.84-19.35)	
	Lung	23	18 (78.3%)		0.033	4.38 (1.12-17.09)	
	Pancreas	2	0 -				
Age at diagnosis	≤60 years	92	47 (51.1%)	0.009	Ref.		
	>60 years	113	78 (69.0%)		0.007	2.30 (1.25-4.22)	
Sex	Male	141	86 (61.0%)	0.994			
	Female	64	39 (60.9%)				
Time since transplantation	≤ 1 year	44	32 (72.7%)	0.071	0.093	1.95 (0.89-4.29)	
	> 1 year	161	93 (57.8%)		Ref.		
Type of infection	Community	169	101 (59.8%)	0.590			
	Hospital	34	22 (64.7%)				
Period of diagnosis	First wave (before 13 July, 2020)	90	49 (54.4%)	0.090	0.157	0.65 (0.35-1.18)	
	Second wave (after 13 July, 2020)	115	76 (66.1%)		Ref.		
Baseline calcineurin inhibitor	Yes	194	117 (60.3%)	0.534			
	No	11	8 (72.7%)				
Baseline antimetabolite	Yes	160	100 (62.5%)	0.399			
	No	45	25 (55.6%)				
Baseline mTOR inhibitor	Yes	30	18 (60.0%)	0.906			
	No	175	107 (61.1%)				