

**Supplementary Table 1.** Characteristics of the patients at the booster dose of COVID-19 vaccine.

	All	Oncological treatment (OT)		p-value
		Non-OT group	OT group	
No.	71	20	51	
Sex (male), N (%)	24 (33.8)	7 (35)	17 (33.3)	0.894
Age (years), median (IQR)	60 (52 - 66)	57.5 (53 - 66)	60 (51 - 66)	0.908
Spanish, N (%)	60 (84.5)	18 (90)	42 (82.4)	0.423
Comorbidities, N (%)				
Hypertension	24 (33.8)	5 (25)	19 (37.3)	0.326
Dyslipidemia	15 (21.1)	2 (10)	13 (25.5)	0.150
Diabetes	12 (16.9)	5 (25)	7 (13.7)	0.254
Obesity	10 (14.1)	1 (5)	9 (17.6)	0.168
Smoker	17 (23.9)	7 (35)	10 (19.6)	0.172
HPSCT, N (%)	4 (12.1)	1 (7.1)	3 (15.8)	0.452
SARS-CoV-2 Infection, N (%)	17 (23.9)	3 (15)	14 (27.5)	0.269
Lymphocytes (10 <sup>3</sup> /μL), median (IQR)	1.6 (1.1 - 2.2)	1.8 (1.6 - 2.7)	1.4 (1 - 2.1)	<b>0.006</b>
Solid neoplasms, N (%)	38 (53.5)	6 (30)	32 (62.7)	<b>0.013</b>
Lung	5 (13.2)	1 (16.7)	4 (12.5)	0.703
Breast	16 (42.1)	3 (50)	13 (40.6)	0.981
Colorectal	7 (18.4)	1 (16.7)	6 (18.8)	0.650
Stomach	1 (2.6)	0 (0)	1 (3.1)	0.342
Esophagus	3 (7.9)	0 (0)	3 (9.4)	0.965
Pancreas	1 (2.6)	0 (0)	1 (3.1)	0.342
Uterus	1 (2.6)	0 (0)	1 (3.1)	0.342
Bladder	2 (5.3)	1 (16.7)	1 (3.1)	0.714
Others	2 (5.3)	0 (0)	2 (6.3)	0.714
Hematologic neoplasms, N (%)	33 (46.5)	14 (70)	19 (37.3)	<b>0.013</b>
Acute Lymphocytic Leukemia	1 (3)	0 (0)	1 (5.3)	0.876
Chronic Lymphocytic Leukemia	2 (6.1)	2 (14.3)	0 (0)	0.336
Multiple Myeloma and Gammopathy	5 (15.2)	1 (7.1)	4 (21.1)	0.542
Myelodysplastic syndromes	4 (12.1)	2 (14.3)	2 (10.5)	0.832
Lymphoproliferative neoplasm	9 (27.3)	5 (35.7)	4 (21.1)	0.590
Myeloproliferative neoplasm	7 (21.2)	4 (28.6)	3 (15.8)	0.648
Chronic Myeloid Leukemia	5 (15.2)	0 (0)	5 (26.3)	0.111

**Statistics:** Values are expressed as the median (P25; P75) and absolute count (percentage). P-values were calculated by the Chi-square test for categorical variables and the Mann-Whitney U-test for continuous variables. **Abbreviations:** COVID-19, coronavirus disease 2019; HPSCT, Hematopoietic stem cell transplant; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

**Supplementary Table 2.** Summary of the plasma humoral response (AUC of IgG antibody levels against SARS-CoV-2 S protein and ACE2-S inhibition titers) stratified by oncological treatment and SARS-CoV-2 variants after the second dose (A) and booster dose (B) of the COVID-19 vaccine.

	Non-oncological treatment	Oncological Treatment	Unadjusted logistic regression analysis		Adjusted logistic regression analysis		
	Med (P25; P75)	Med (P25; P75)	OR (95%CI)	p-value	aOR (95%CI)	p-value	q-value
<b>A) Second vaccine dose</b>							
<b>Wuhan (B.1)</b>							
IgG antibody titers	4734.8 (2436.9; 11516.9)	3652.7 (709.7; 8928)	0.64 (0.39; 1.06)	0.083	0.47 (0.25; 0.87)	<b>0.015</b>	<b>0.031</b>
Inhibition ACE2-S titer	8852.5 (5569.6; 35372.3)	6448.2 (0.1; 25475.9)	0.67 (0.51; 0.89)	<b>0.006</b>	0.57 (0.4; 0.81)	<b>0.002</b>	<b>0.007</b>
<b>Omicron</b>							
IgG antibody titers	1365.3 (648.6; 3325.9)	1297.4 (168.3; 3013)	0.68 (0.44; 1.05)	0.080	0.47 (0.27; 0.84)	<b>0.011</b>	<b>0.029</b>
Inhibition ACE2-S titer	87.2 (0.1; 1495.3)	0.1 (0.1; 177.4)	0.75 (0.61; 0.93)	<b>0.007</b>	0.63 (0.48; 0.82)	<b>0.001</b>	<b>0.006</b>
<b>B) Booster vaccine dose</b>							
<b>Wuhan (B.1)</b>							
IgG antibody titers	3785.6 (1654.8; 5321.8)	2291 (947.1; 5390.3)	0.45 (0.14; 1.41)	0.170	0.4 (0.12; 1.31)	0.131	0.175
Inhibition ACE2-S titer	12727 (6538.2; 23199.1)	10434.8 (3080.6; 26883.2)	0.81 (0.52; 1.28)	0.371	0.77 (0.5; 1.2)	0.249	0.285
<b>Omicron</b>							
IgG antibody titers	2089.3 (1467.7; 2615.6)	1146.1 (635.2; 2649.9)	0.4 (0.13; 1.28)	0.122	0.17 (0.04; 0.84)	<b>0.039</b>	0.063
Inhibition ACE2-S titer	7075.1 (183.9; 19320.3)	2368.3 (75.4; 15119.1)	0.96 (0.75; 1.23)	0.760	0.93 (0.71; 1.21)	0.581	0.581

**Statistics:** Values are expressed as median (P25th, P75th) and odds ratio (95% confidence interval). Data were calculated using logistic regression analysis, which was adjusted by the most relevant clinical and epidemiological characteristics (see Statistical analysis section). Significant differences are shown in bold. **Abbreviations:** Med, median; P25, 25th percentile; P75, 75th percentile; OR, odds ratio; aOR, adjusted OR; 95% CI, 95% confidence interval; AUC, Area under the Curve; IgG, immunoglobulin G; ACE2, angiotensin-converting enzyme 2; S, Spike glycoprotein.

**Supplementary Table 3.** Summary of the plasma humoral response (AUC of IgG antibody levels against SARS-CoV-2 S protein and ACE2-S inhibition titers) stratified by SARS-CoV-2 variants and oncological treatment after the second dose (A) and booster dose (B) of the COVID-19 vaccine.

	Wuhan (B.1)	Omicron	GLMM regression analysis		
	Med (P25; P75)	Med (P25; P75)	GMR (95%CI)	p-value	q-value
<b>A) Second vaccine dose</b>					
<b>Non-oncological treatment</b>					
IgG antibody titers	4734.8 (2436.9; 11516.9)	1334.9 (648.6; 3325.9)	0.6 (0.56 - 0.64)	<b>&lt;0.001</b>	<b>&lt;0.001</b>
Inhibition ACE2-S titer	8852.5 (5569.6; 35372.3)	87.2 (0.1; 1495.3)	0.11 (0.06 - 0.19)	<b>&lt;0.001</b>	<b>&lt;0.001</b>
<b>Oncological treatment</b>					
IgG antibody titers	3652.7 (709.7; 8928)	1241.8 (148.9; 3013)	0.57 (0.5 - 0.65)	<b>&lt;0.001</b>	<b>&lt;0.001</b>
Inhibition ACE2-S titer	6448.2 (0.1; 25475.9)	0.1 (0.1; 177.4)	0.13 (0.08 - 0.22)	<b>&lt;0.001</b>	<b>&lt;0.001</b>
<b>B) Booster vaccine dose</b>					
<b>Non-oncological treatment</b>					
IgG antibody titers	3785.6 (1654.8; 5321.8)	1979.8 (1449.2; 2537.5)	0.8 (0.71 - 0.9)	<b>&lt;0.001</b>	<b>0.001</b>
Inhibition ACE2-S titer	12727 (6538.2; 23199.1)	7075.1 (0.1; 17920.3)	0.3 (0.15 - 0.63)	<b>0.001</b>	<b>0.001</b>
<b>Oncological treatment</b>					
IgG antibody titers	2291 (947.1; 5390.3)	1146.1 (635.2; 2649.9)	0.78 (0.74 - 0.84)	<b>&lt;0.001</b>	<b>&lt;0.001</b>
Inhibition ACE2-S titer	10434.8 (3080.6; 26883.2)	2368.3 (75.4; 15119.1)	0.36 (0.25 - 0.52)	<b>&lt;0.001</b>	<b>&lt;0.001</b>

**Statistics:** Values are expressed as median (P25th, P75th) and odds ratio (95% confidence interval). Data were calculated using Generalized Linear Mixed Models adjusted (GLMM, see Statistical analysis section). Significant differences are shown in bold. **Abbreviations:** Med, median; P25, 25th percentile; P75, 75th percentile; GMR, geometric mean ratio; 95% CI, 95% confidence interval; AUC, Area under the Curve; IgG, immunoglobulin G; ACE2, angiotensin-converting enzyme 2; S, Spike glycoprotein.

**Supplementary Table 4.** Summary of the cellular response (number of spots per 10<sup>6</sup> PBMCs) stratified by oncological treatment and SARS-CoV-2 variants after the second dose of the COVID-19 vaccine.

	Non-oncological treatment	Oncological Treatment	Unadjusted logistic regression analysis		Adjusted logistic regression analysis		
	Med (P25; P75)	Med (P25; P75)	OR (95%CI)	p-value	aOR (95%CI)	p-value	q-value
<b>Wuhan (B.1)</b>							
IFN- $\gamma$	50 (25; 255)	53.3 (10; 141.7)	0.8 (0.49; 1.31)	0.381	0.9 (0.54; 1.51)	0.694	0.939
IL-2	145 (40; 228.3)	78.3 (35; 236.7)	0.75 (0.47; 1.19)	0.216	0.82 (0.51; 1.33)	0.420	0.939
IFN- $\gamma$ + IL-2	21.7 (8.3; 70)	18.3 (5; 53.3)	0.82 (0.48; 1.4)	0.467	0.98 (0.55; 1.73)	0.939	0.939
<b>Omicron</b>							
IFN- $\gamma$	35 (16.7; 145)	41.7 (11.7; 111.7)	0.87 (0.5; 1.5)	0.610	0.95 (0.55; 1.66)	0.863	0.939
IL-2	96.7 (25; 225)	75 (35; 218.3)	0.97 (0.59; 1.59)	0.903	1.12 (0.67; 1.88)	0.674	0.939
IFN- $\gamma$ + IL-2	20 (8.3; 66.7)	15 (6.7; 48.3)	0.81 (0.47; 1.4)	0.452	0.89 (0.51; 1.55)	0.670	0.939

**Statistics:** Values are expressed as median (P25th, P75th) and odds ratio (95% confidence interval). Data were calculated using logistic regression analysis, which was adjusted by the most relevant clinical and epidemiological characteristics (see Statistical analysis section). Significant differences are shown in bold. **Abbreviations:** Med, median; P25, 25th percentile; P75, 75th percentile; OR, odds ratio; aOR, adjusted OR; 95% CI, 95% confidence interval; PBMCs, peripheral blood mononuclear cells; IFN, interferon; IL-2, interleukin 2.

**Supplementary Table 5.** Summary of the cellular response (number of spots per 10<sup>6</sup> PBMCs) stratified by SARS-CoV-2 variants and oncological treatment after the second dose of the COVID-19 vaccine.

	Wuhan (B.1)	Omicron	GLMM regression analysis		
	Med (P25; P75)	Med (P25; P75)	GMR (95%CI)	p-value	q-value
<b>Non-oncological treatment</b>					
IFN- $\gamma$	50 (25; 255)	37.5 (16.7; 145)	0.86 (0.74 - 1)	<b>0.049</b>	0.228
IL-2	145 (40; 228.3)	104.2 (25; 231.7)	0.88 (0.74 - 1.05)	0.152	0.228
IFN- $\gamma$ + IL-2	21.7 (8.3; 70)	22.5 (8.3; 68.3)	0.99 (0.86 - 1.14)	0.853	0.853
<b>Oncological treatment</b>					
IFN- $\gamma$	53.3 (10; 141.7)	41.7 (11.7; 111.7)	0.92 (0.84 - 1.02)	0.102	0.228
IL-2	78.3 (35; 236.7)	77.5 (35; 218.3)	1.1 (0.98 - 1.25)	0.119	0.228
IFN- $\gamma$ + IL-2	18.3 (5; 53.3)	16.7 (6.7; 48.3)	0.98 (0.88 - 1.1)	0.742	0.853

**Statistics:** Values are expressed as median (P25th, P75th) and odds ratio (95% confidence interval). Data were calculated using Generalized Linear Mixed Models adjusted (GLMM, see Statistical analysis section). Significant differences are shown in bold. **Abbreviations:** Med, median; P25, 25th percentile; P75, 75th percentile; GMR, geometric mean ratio; 95% CI, 95% confidence interval; PBMCs, peripheral blood mononuclear cells; IFN, interferon; IL-2, interleukin 2.

**Supplementary Figure 1.** Comparison of the non-responder rate for plasma IgG antibody levels against SARS-CoV-2 S protein and ACE2-S inhibition titers stratified by SARS-CoV-2 variants and oncological treatment after the second dose (A) and booster dose (B) of the COVID-19 vaccine. **Statistics:** P-values were calculated using the Chi-square test. **Abbreviations:** OT, oncological treatment; IgG, anti-SARS-CoV-2 S IgG; AUC, Area under the ROC curve.

