Supplementary material

Dębska-Ślizień A, Muchlado M, Ślizień Z, et al. Significant humoral response to mRNA COVID-19 vaccine in kidney transplant recipients with prior exposure to SARS-CoV-2: the COViNEPH Project. Pol Arch Intern Med. 2022; 132: 16142. doi:10.20452/pamw.16142

Anti-SARS-CoV-2 antibodies measurement

Quantitative measurement of specific IgG antibodies against trimeric S-protein was performed with a commercial chemiluminescent immunoassay (The LIAISON® SARS-CoV-2 Trimetric-S IgG test, Diasorin, Italy) with a detection range of 1.85-800AU/mL. Values over 800 were diluted to 1:20 to obtain an exact value. Samples were interpreted as positive or negative with a cutoff index value of >12 AU/ml. A conversion of AU/mL to binding antibody units (BAU/mL) that correlates with the WHO standard is possible using the following equation: BAU/mL = 2.6*AU/mL. Nucleocapsid (N)-specific IgG antibodies were assessed with a commercial Abbott Architect SARS-CoV-2 IgG 2 step chemiluminescent immunoassay. Samples were interpreted as positive or negative with a cutoff index value s/c index of 1.4.

Statistical analysis

Data was presented as a number (percent) for categorical variables, median (interquartile range; IQR) for continuous variables. A Chi-square test was used for categorical variables. Continuous variables were first tested for normal distribution using Shapiro-Wilk, and then compared by the Mann-Whitney test (not-normally distributed data). Differences in variables measured more than twice were assessed using Kruskal-Wallis H-test with multiple rang test for paired comparisons. All data was obtained using the software Statistica 13. $P<0.05$ was considered significant.

Patient characteristics

The most common underlying renal diseases in the whole cohort of KTR included chronic glomerulonephritis (38/26.2%), adult dominant polycystic kidney disease (20/13.4%), diabetic nephropathy (8/5.4%), hypertensive nephropathy (8/5.4%). In 37/24.8% of patients, primary nephropathy was not known. The modality of renal replacement therapy before transplantation was hemodialysis (112/75.2%) or peritoneal dialysis (37/24.8%). Twenty three patients had had a second kidney transplant, three subjects had had their third transplant. Fourteen patients received kidneys from living donors, and the others received kidneys from deceased donors. The majority of recipients (148/149) were after only a kidney transplant, one of them had undergone a previous lung transplant. At the time of vaccination, protocol with tacrolimus (Tac), mycophenolate mofetil/Na (MMF/MPS), and prednisone (P) were the most common (74/49.7%). 11/7.4% patients received P free protocol, 36/24% patients were maintained without MMF/MPS. Induction with polyclonal (Thymoglobulin/ATG) or monoclonal antibody (basiliximab/Simulect) was used in 16/10.7% and 32/21.5% of patients respectively. 15/149 patients were transplanted in the last 12 months prior to vaccination, 3 of them in the last 3 months. The subgroups of KTR(-) and KTR(+) did not differ in age, gender, diagnosis of underlying kidney disease, time since the last transplant, graft function, Charlson comorbidity index (CCI) and immunosuppression. CONTROL(+) and CONTROL(-) groups did not differ in age, gender from KTR(-) and KTR(+). Patients from the control subgroups had a significantly lower CCI than KTR. Details are presented in Table 1S (Supplementary Material)

Table 1S. Characteristics of the studied groups of patients after kidney transplantation and the controls.

Variable	KTR (-) n = 103	KTR (+) n = 46	CONTROL (-) n = 15	CONTROL (+) n = 15	*P* - value
Age years *median (IQR)*	55 (43-63)	50.5 (39-61)	47 (45-69)	50 (42-69)	0.56
Male gender *n (%)*	58 (56.3)	29 (63.04)	8 (53.3)	12 (80)	0.32
Time since last KTx years *median (IQR)*	8 (3.3-13)	9.31 (3-13)	NA	NA	0.96
Deceased donor *n (%)*	95 (92.2)	40 (87.0)	NA	NA	0.31
Primary nephropathy *n (%)*			NA	NA	
Unknown	28 (27.2)	9 (19.6)			0.32
Glomerulonephritis	27 (26.2)	11 (23.9)			0.77
ADPKD	14 (13.6)	6 (13.0)			0.93
Other	25 (24.3)	14 (30.4)			0.43
Immunosuppression protocol *n (%)*			NA	NA	
Protocol without steroids	32 (31.1)	15 (32.6)			0.85
Protocol without MMF/MPS	23 (22.3)	13 (28.3)			0.43
Protocol with induction	32 (31.1)	16 (34.8)			0.65
Serum creatinine mg/dl *median (IQR)*	1.36 (1.12-1.68)	1.54 (1.06-1.8)	NA	NA	0.50
Charlson comorbidity index	4 (2-5)	4 (2-5)	0 (0-2)	1 (0-2)	<0.001

MMF/MPS - mycophenolate mofetil/Na,, KTR – kidney transplant recipients, ADPKD- autosomal dominant polycystic kidney disease , KTx- kidney transplantation, NA- not applicable, NS – non significant.

Table 2S. Response to mRNA vaccine BNT162b2 in the studied groups of patients after kidney transplantation and in the controls.

	KTR (-) n = 103	KTR (+) n = 46	CONTROL (-) n = 15	CONTROL (+) n=15	*P*- value
Responders n (%)	49 (47.6)	46 (100)	15 (100)	15 (100)	*P*<0.001
	KTR (-) RESPONDERS n=49	KTR (+) n = 46	CONTROL (-) n = 15	CONTROL (+) n=15	
T0 AU/ml *median (IQR)*	1.85 (1.85-1.85)	36.6 (10.7-107)	1.85 (1.85-1.85)	33.5 (18.4-144)	*P*<0.001 Kruskal-Wallis **
T1 AU/ml *median (IQR)*	82 (31.2-172)	540 (351-752)	800 (782-1670)	2060 (1250-3230)	*P*<0.001 Kruskal-Wallis *
(T1-T0) AU/ml *median (IQR)*	80 (29-169)	502 (268-669)	798 (780-1668)	2035 (1248-3200)	*P*<0.001 Kruskal-Wallis *

T0- before vaccination, T1 - 14-21 days following the second BNT162b2 vaccine, KTR – kidney transplant recipients

*** *P*<0.001:** KTR(-) vs KTR(+); KTR(-) vs. CONTROL(-); KTR(-) vs. CONTROL(+); and CONTROL(-) vs. CONTROL(+).
***P*=0.002:** KTR(+) vs. CONTROL(+).

**** *P*<0.001**: KTR(-) vs KTR(+); KTR(-) vs. CONTROL(+); CONTROL(-) vs. CONTROL(+); CONTROL(-) vs. KTR(+)