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Background

SARS-CoV-2 vaccination is one of the strategies for developing herd immunity and containing the COVID-19 viruses from the more vulnerable outcome¹. Unfortunately, only 54% of kidney transplant recipients (KTRs) have detectable antibodies after vaccination completion (second doses)². This makes the KTRs more susceptible to acquired severe COVID-19 infection.

Objective

To evaluate the clinical and biochemical factors associated with lower efficacy of SARS-CoV-2 vaccination among KTRs.

Methodology

This prospective study recruited 138 KTRs from two tertiary hospitals in Malaysia, namely University Malaya Medical Centre (UMMC) and Hospital Kuala Lumpur (HKL). The blood samples were taken pre-vaccination (before the first dose) and 28 ± 10 days after the scheduled second dose of SARS-CoV-2 vaccination. The antibody titers (pre-and post-vaccination) analysis was performed using Elecsys Anti-SARS-CoV-2 assay. The KTRs were divided into two groups, absent or low antibody response (< 50 U/mL) and moderate to high response (≥ 50 U/mL).

Results

The mean age of our 138 KTRs was 46.14 ± 12.64 and predominantly male. Their mean antibody level was 46.72 ± 86.70 U/mL. Among those only 23.9 % has moderate to a high antibody response (figure 1).

There was no statistically significant difference in patient demographic, serum creatinine, duration post-transplantation and tacrolimus level compared between the two groups' antibody responses of < 50 U/mL vs ≥ 50 U/mL. However, the median lymphocyte count in low antibody response appears to be lower, $2.06 \times 10^9/L$ IQR (1.45, 2.68) compared with moderate to high group $2.50 \times 10^9/L$ IQR (2.03, 3.41) p value = 0.01. In contrast, the median Myfortic dose was higher in low antibody response 360 mg IQR (180, 540) vs 90 mg IQR (0, 360) p value = 0.004 (table 1,2).

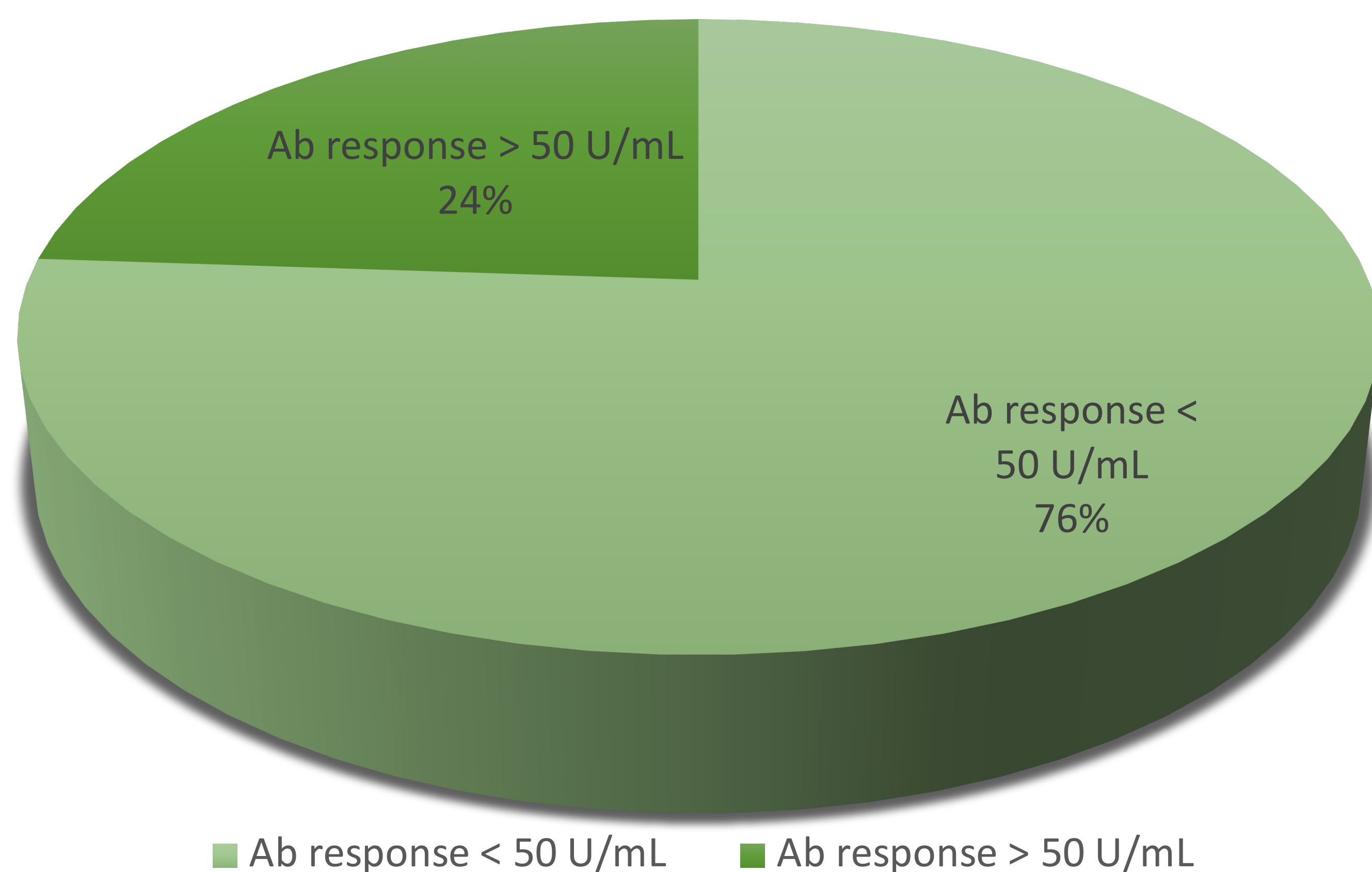


Figure 1: Antibody responses among KTRs

%, median (IQR)	Overall (n=138)	< 50 U/mL	≥ 50 U/mL	P value
Age (years)	46.14 (23.00, 77.00)	48.00 (23.00, 77.00)	42.00 (26.00, 73.00)	0.436
Gender				
Male	59.4%	57.1%	66.7%	0.331
Female	40.6%	42.9%	33.3%	
Race				
Malay	37.7%	37.1%	39.4%	0.271
Chinese	49.3%	51.4%	42.4%	
Indian	12.3%	11.4%	15.2%	
Others	0.7%	0.0%	3.0%	
Diabetes Mellitus (Yes)	21.2%	23.1%	21.2%	0.538
Duration post transplantation (months)	40.00 (19.50, 96.50)	38.00 (4.00, 360.00)	47.50 (6.00, 216.00)	0.322
Myfortic dose	360 (180,530)	360 (180, 540)	90 (0, 360)	0.004*

Table 1: Demographic characteristics among KTRs with low antibody response and moderate to high response.

Median (IQR)	Overall (n=138)	< 50 U/mL	≥ 50 U/mL	P value
Creatinine (umol/L)	108 (55, 499)	108.5 (55, 434)	100 (56, 499)	0.453
Albumin (g/L)	40 (38,42)	40 (27, 49)	39 (34, 44)	0.228
WCC (x10 ⁹ /L)	7.49 (6.43, 9.25)	7.78 (2.90, 15.10)	8.20 (4.40, 12.80)	0.880
Lymphocyte (x 10 ⁹ /L)	2.16 (0.48, 8.12)	2.06 (1.45, 2.68)	2.50 (2.03, 3.41)	0.010*
Tacrolimus level	5.90 (4.80, 7.10)	6.00 (0.00, 25.50)	5.60 (3.70, 9.00)	0.677

Table 2: Laboratory parameters among KTRs with low antibody response and moderate to high response.

Median (IQR)	Overall (n=29)	< 50 U/mL	≥ 50 U/mL	P value
CD3+	854 (628, 1926)	801 (295, 2502)	2191.5 (667, 3235)	0.032*
CD4+	477 (277, 754.5)	375 (118, 1285)	709.5 (296, 1388)	0.103
CD8+	394 (324, 944)	392 (148, 1160)	944 (321, 2269)	0.075
NK cells	251 (128, 432)	241 (66, 546)	325.5 (113, 950)	0.153
CD19+	116 (68, 201)	90 (7, 456)	122.5 (62, 469)	0.582

Table 3: Lymphocyte subsets panel among 29 KTRs.

Conclusions

Lower lymphocyte counts and higher myfortic dose were significant factors associated with low antibody response towards SARS-CoV-2 vaccination.

References

- COVID-19 Antibody Testing of Recipients of Solid Organ Transplants. Johns Hopkins Institutional Review Board. 2021.
- Boyarsky BJ, et al. Antibody Response to 2-Dose SARS-CoV-2 mRNA Vaccine Series in Solid Organ Transplant Recipients. JAMA. 2021.

Lessons learned

Low COVID-19 Ab responses were prevalent among KTRs (after two doses of vaccination).
Higher Myfortic doses and lymphopenia were associated with poorer antibody responses