Received: 16 May 2021 | Revised: 19 May 2021 | Accepted: 20 May 2021

DOI: 10.1111/tid.13654

LETTER TO THE EDITOR

WILEY

Early experience with SARs-CoV-2 mRNA vaccine breakthrough among kidney transplant recipients

To the Editor,

The efficacy of vaccinations among vulnerable populations such as solid organ transplant recipients on chronic immunosuppression have been suboptimal compared to the general population.[1,2] Preliminary data suggest the humoral response rate for solid organ transplant patients who have received both doses of SARs-CoV-2 mRNA vaccine either mRNA-1273 (Moderna) or BNT162b2 (Pfizer-BioNTech) is roughly 54%.[3] However the clinical implications and real-life impact of this is still unknown. Here we present our early single-center experience with vaccine breakthrough and symptomatic COVID-19 (Coronavirus Disease-2019) disease hospitalization rates in fully vaccinated kidney transplant recipients.

A total of 166 kidney transplant recipients were diagnosed with symptomatic COVID-19 at our health system from March 2020 to April 2021. Of these 107 (64%) required inpatient admission and overall mortality was 11% (18/166). Three hundred and eighty (mostly age > 65 years) completed both doses of the Pfizer-BioNTech or Moderna vaccine by April 2021. From February to April there were 17/166 (10%) new positive documented COVID-19 cases. Among them 7/17 patients developed symptomatic disease despite being fully vaccinated suggesting an early breakthrough rate of 1.8% (7/380). Four out of seven were hospitalized; however only two developed severe COVID-19 symptoms requiring supplemental oxygenation redemsivir and dexamethasone. Further clinical details are provided in Table 1. These patients were predominately male (5/7) with a median age of 53 who received a deceased donor with a median time of 3 years from transplant. Majority (6/7) were maintained on triple immunosuppression with one patient taken off of anti-metabolite due to persistent BK viremia. Median time from vaccine completion to time to diagnosis was 33 days. Interestingly 3/7 patients had detectable Sars-CoV-2 spike IgG antibody while 2/7 had both spike and nucleocapsid protein IgG at the time of COVID-19 diagnosis. Unfortunately quantitative antibody levels as well as SARs-CoV-2 variant data was not available.

Our early experience suggests limited early breakthrough COVID-19 in kidney transplant recipients who completed the two-dose SARs-CoV-2 mRNA vaccine series despite a reported 54% antibody response. In patients who did experience vaccine breakthrough the majority did not develop severe symptoms that required inpatient admission. This may reflect a need for quantitative antibody disease protection threshold measurements as well as the importance of continued vaccine efforts among immunosuppressive patients despite the reported lower antibody response. Our results are further strengthened by a significant decline in the diagnosis of new COVID-19 cases since vaccinations started. Future studies are needed to assess newer strategies in vaccination to better protect immunosuppressed patients from preventable morbidity and mortality.

KEYWORDS

COVID-19, breakthrough, hospitalization, kidney transplant, vaccine

FUNDING INFORMATION

This study did not require financial funding.

ACKNOWLEDGEMENT

The authors do not have any potential conflicts of interests to disclose.

CONFLICT OF INTEREST

The authors do not have any potential conflicts of interests to disclose.

AUTHOR CONTRIBUTIONS

- Chelsey Chenxi Song is responsible for the concept/design and drafting.
  a. ORCID: 0000-0003-1943-7037
  b. Twitter Handle: @Chelsey.Song
  c. Proposed Promotional Tweet: COVID-19 Vaccine breakthrough amongst 380 kidney transplant recipients. Excited to share our clinical and real life outcomes.
- Johanna Christensen is responsible for the drafting and data collection.
  a. ORCID: 0000-0003-2389-1320
  b. Twitter Handle: None
- Dhiren Kumar is responsible for the concept/design and critical revision of article.
  a. ORCID: 0000-0002-6816-9297
  b. Twitter Handle: None
- Nicole Vissichelli is responsible for the concept/design and critical revision of article.
  a. ORCID: 0000-0002-7748-1215
  b. Twitter Handle: None

TABLE 1 Patient characteristics

Patient	Age	Time of transplant	Vaccine type	Vaccine Dose 1	Vaccine Dose 2	Time from vaccine completion to diagnosis (days)	Nucleocapsid protein[a] IgG titer detection	Spike protein[b] IgG titer detection	Mycophenolate equivalent dose at the time of diagnosis (mg/day)	Hospital admission	Supplemental oxygen	COVID-19 treatment received
1	49	6/15/2018	mRNA-1273	2/18/21	3/18/21	18	N/A	N/A	1500	No	No	None
2	68	2/6/2015	BNT162b2	1/22/21	2/12/21	28	+	+	1500	Yes	Yes	Remdesivir, dexamethasone
3	77	7/24/2015	BNT162b2	1/22/21	2/12/21	33	–	+	500	Yes	Yes	Remdesivir, dexamethasone, convalescent plasma
4	53	9/9/2015	mRNA-1273	1/28/21	2/26/21	68	N/A	N/A	1500	No	No	None
5	71	1/9/2019	BNT162b2	1/21/21	2/11/21	75	N/A	–	500	Yes	No	None
6	70	7/26/2019	BNT162b2	1/25/21	2/15/21	40	+	+	0	No	No	Non
7	53	6/11/2018	BNT162b2	2/25/21	3/15/21	16	–	–	2000	Yes	No	Remdesivir

[a]Nucleocapsid IgG antibody detection is indicative of past infection and cannot be generated from current vaccinations.
[b]Spike protein igG antibody detection is indicative of either past infection or successful vaccination.

- Megan Morales is responsible for the concept/design and critical revision of article.
  a. ORCID ID: 0000-0001-5840-6124
  b. Twitter Handle: @TIDinRVA
- Gaurav Gupta
- MD[1] (Concept/Design
- data Analysis
- approval of Article)
  a. ORCID: 0000-0003-1919-1970
  b. Twitter Handle: None

Chelsey Chenxi Song
Johanna Christensen
Dhiren Kumar
Nicole Vissichelli
Megan Morales
Gaurav Gupta

Virginia Commonwealth University Health, Richmond, VA, USA

Correspondence
Chelsey Chenxi Song, PharmD, BCPS, Virginia Commonwealth University Health System, 401 North 12th Street, P.O.Box 980042, Richmond, VA 23298, USA.
Email: Chelsey.Song@vcuhealth.org

ORCID

Chelsey Chenxi Song https://orcid.org/0000-0001-9353-5466
Johanna Christensen https://orcid.org/0000-0003-2389-1320
Dhiren Kumar https://orcid.org/0000-0002-6816-9297
Nicole Vissichelli https://orcid.org/0000-0002-7748-1215
Megan Morales https://orcid.org/0000-0001-5840-6124
Gaurav Gupta https://orcid.org/0000-0003-1919-1970

REFERENCES

1. Salles MJC, Sens YAS, Boas LSV, Machado CM. Influenza virus vaccination in kidney transplant recipients: serum antibody response to different immunosuppressive drugs. *Clin Transpl*. 2010;24(1):E17-23. https://doi.org/10.1111/j.1399-0012.2009.01095
2. Mulley WR, Visvanathan K, Hurt AC, et al. Mycophenolate and lower graft function reduce the seroresponse of kidney transplant recipients to pandemic H1N1 vaccination. *Kidney Int*. 2012;82:212-219.
3. Boyarsky BJ, Werbel WA, Avery RK, et al. Immunogenicity of a single dose of SARS-CoV-2 messenger RNA vaccine in solid organ transplant recipients. *JAMA*. 2021;325(21):2204-2206. https://doi.org/10.1001/jama.2021.7489

How to cite this article: Chenxi Song C, Christensen J, Kumar D, Vissichelli N, Morales M, Gupta G. Early experience with SARs-CoV-2 mRNA vaccine breakthrough among kidney transplant recipients. *Transpl Infect Dis*. 2021;23:e13654. https://doi.org/10.1111/tid.13654