

Trends in COVID-19 Mortality Among Solid Organ Transplant Recipients: Implications for Prevention

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To investigate the trends in burden of death during the ongoing pandemic, we evaluated direct COVID-related and all-cause mortality among all adult solid organ transplant recipients (SOTRs) from March 2020 to December 2021 using the United Network for Organ Sharing database. We compared mortality during the first year of the pandemic (early COVID period, March 2020 to February 2021), to the late COVID period, March 2021 to December 2021). Crude odds ratio of COVID-19 deaths between early (reference) and late COVID periods was calculated. A chi-square or Fisher exact test was performed. $P < 0.05$ was considered as statistically significant. Our results show that, during the pandemic, deaths directly from COVID-19 were the leading cause of mortality among SOTRs. Direct COVID deaths and all-cause deaths were seen in 288 of 1002 (28.7%) kidney transplant recipients (KTRs), 36 of 141 (25.5%) living-donor KTRs, 55 of 611 (9.0%) liver transplant recipients (LTRs), 6 of 40 (15%) living-donor LTRs, 28 of 272 (10.3%) lung transplant recipients, and 23 of 247 (9.3%) heart transplant recipients. When comparing early COVID (March 2020 to February 2021) to late COVID (March 2021 to December 2021) periods, these deaths decreased significantly but remained high among living-donor KTRs (from 34.6% to 13.3%) and increased in living-donor LTRs (from 10.7% to 25%) (Table 1). This decrease in mortality over time is multifactorial likely associated with the availability of COVID vaccination and improvement in therapeutics with use of antiviral agents and antispikes monoclonal antibodies.

Our data show that, despite of the improvements in trend of mortality, COVID-19 may still be one of the most common preventable causes of early death among SOTRs.

Current data suggest that protection offered by vaccination alone in SOTRs is variable and vaccine effectiveness (VE) may be impacted by the type of vaccine, intensity of immunosuppression, waning immunity over time, receipt of additional doses, and/or the circulating viral variants. In a large registry study from England, vaccination in SOTRs showed a 20% reduction in risk of death within 28 d of its receipt.¹ Similarly, during a median follow-up of 4.4 mo, there was a 71% reduction in the risk of symptomatic COVID-19 among fully vaccinated SOTRs²; however, in a 17-center study, breakthrough COVID-19 was seen in 0.23% to 2.52% of SOTRs, compared with 0.01% in immunocompetent vaccinated hosts, with a mortality rate of 9.3%.³ Therefore, interventions to improve VE in SOTRs are needed, which may include administration of additional doses of vaccine, use of modified vaccination protocols, or, when possible, vaccination before initiation of immunosuppression. Potential benefits of pretransplant vaccination were shown in a study of 3100 participants, where dialysis patients showed a significantly higher serologic response 4 wk after 2 doses of messenger RNA vaccination (>95%) than KTRs (42%).⁴ Now, with 35.7% of the US transplant centers implementing a COVID-vaccine mandate, it offers an important opportunity to prospectively study the impact of pretransplant vaccination on posttransplant mortality in SOTRs.⁵

Protection of our vulnerable SOTRs from morbidity and mortality from COVID-19 may require an individualized approach using a combination of interventions to improve VE and decrease vaccine hesitancy, continuous adherence to nonpharmacologic methods of prevention, and, when available, consideration of use of preexposure prophylaxis with a long-acting antispikes monoclonal antibody.

Received 7 March 2022. Revision received 1 April 2022.

Accepted 4 April 2022.

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A.D. received an institutional research grant from Regeneron outside this work. The other authors declare no conflicts of interest.

K.O. and A.D. were involved in study design, data analysis, interpretation of data, and writing of the article. S.N. was involved in data analysis, interpretation of data, and critical revision of the article. All authors approve the final version of the article.

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ISSN: 0041-1337/20/1068-e380

DOI: 10.1097/TP.00000000000004170

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TABLE 1.**Deaths in adult solid organ transplant recipients during the COVID pandemic**

Type of transplant	All-cause deaths, N (%)			COVID deaths, N (%)			% Deaths from COVID			Odds ratio ^a (95% CI)	P	Days from transplant to COVID death, median (IQR)
	Total	Early COVID period	Late COVID period	Total	Early COVID period	Late COVID period	Total	Early COVID period	Late COVID period			
Kidney, N = 26 798	3.7% 1002	5.8% (724/12 502)	1.9% (278/14 296)	1.1% 288	2.0% (251/12 502)	0.26% (37/14 296)	28.7%	34.6%	13.3%	0.05 (0.03-0.07)	<0.001	179 (91-314)
Kidney living donor, N = 9433	1.5% 141	2.5% (110/4470)	0.6% (31/4963)	0.3% 36	0.74% (33/4470)	0.06% (3/4963)	25.5%	30%	9.7%	0.48 (0.09-1.75)	0.30	182 (9-356)
Liver, N = 11 208	5.5% 611	7.4% (388/5262)	3.8% (223/5946)	0.5% 55	0.97% (51/5262)	0.07% (4/5946)	9.0%	13.1%	1.7%	0.14 (0.04-0.38)	<0.001	142 (73-313)
Liver living donor, N = 822	4.7% 40	6.9% (28/405)	2.9% (12/417)	0.7% 6	0.74% (3/405)	0.72% (3/417)	15%	10.7%	25%	2.29 (0.27-19.7)	0.38	184 (45-354)
Heart, N = 3342	7.4% 247	8.5% (146/1714)	6.2% (101/1628)	0.6% 23	1.2% (21/1714)	0.12% (2/1618)	9.3%	14.4%	1.9%	0.14 (0.02-0.59)	0.002	181 (45-355)
Lung, N = 2429	11.2% 272	15% (183/1217)	7.3% (89/1212)	1.1% 28	2.1% (25/1217)	0.25% (3/1212)	10.3%	13.7%	3.4%	0.25 (0.05-0.84)	0.017	182 (50.5-354.5)

Bold values are the primary results; unbold values are secondary results.

^aReference: early COVID period.

CI, confidence interval; COVID, coronavirus disease; IQR, interquartile range.