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Exacerbation of Racial Disparities in Living Donor Kidney Transplantation During the COVID-19 Pandemic

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Key Points

- The coronavirus disease 2019 (COVID-19) pandemic profoundly impacted transplant services, with a particularly strong impact on living donor kidney transplantation.
- The COVID-19 pandemic appears to have disproportionately impacted Black patients' access to living donor kidney transplantation.
- As the pandemic evolves through surges and vaccine acceptance disparities persist, ongoing attention to transplant disparities is needed.

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Introduction

Equitable access to organ transplantation is a guiding principle of the US organ allocation system. The revision to the Kidney Allocation System in December 2014 mitigated racial disparity in access to deceased donor kidney transplantation (DDKT) from the point of listing (1), and the rate of DDKT for Black candidates after listing has been comparable with that of White candidates (2,3). However, unequal access to the waiting list for those suffering with ESKD persists and is related to multiple factors, including referral delays, and deficiencies in education and support for timely evaluation completion (4). As living donor kidneys are not allocated but rather potential living donors must be identified by transplant candidates and go through their own evaluation and surgery, it is unsurprising that racial disparity in access to living donor kidney transplantation (LDKT) has persisted. LDKT rates have remained lowest for Black patients (5).

The declaration of the coronavirus disease 2019 (COVID-19) pandemic in March 2020 profoundly impacted transplant services (6,7) because scarce hospital resources were directed to the care of COVID-19 patients. LDKT also halted initially during the pandemic to avoid risk of COVID-19 among living donors. Nevertheless, the year 2020 witnessed the largest number of DDKT compared with previous years, despite the pandemic, but a lower number of LDKT compared with previous years. Some commentators have expressed concern that the pandemic may have exacerbated inequities in transplantation for non-White patients (8). We sought to assess whether the COVID-19 pandemic disproportionately and specifically affected LDKT access according to race.

Methods

The publicly available data analyzed in this paper are Institutional Review Board exempt. This analysis used data from the Scientific Registry of Transplant Recipients (SRTR). The SRTR system includes data on all donors, waitlist candidates, and transplant recipients in the United States, submitted by the members of the Organ Procurement and Transplantation Network (OPTN). The Health Resources and Services Administration (HRSA), US Department of Health and Human Services, provides oversight to the activities of the OPTN and SRTR contractors. We compared counts of LDKT and DDKT procedures in the first year after the COVID-19 pandemic (March 2020–February 2021) with counts in the same period in the preceding 12 months according to patient race and other factors. Race and ethnicity were defined by transplant center reporting to the OPTN. Chi-squared testing was applied to examine these trends pre and

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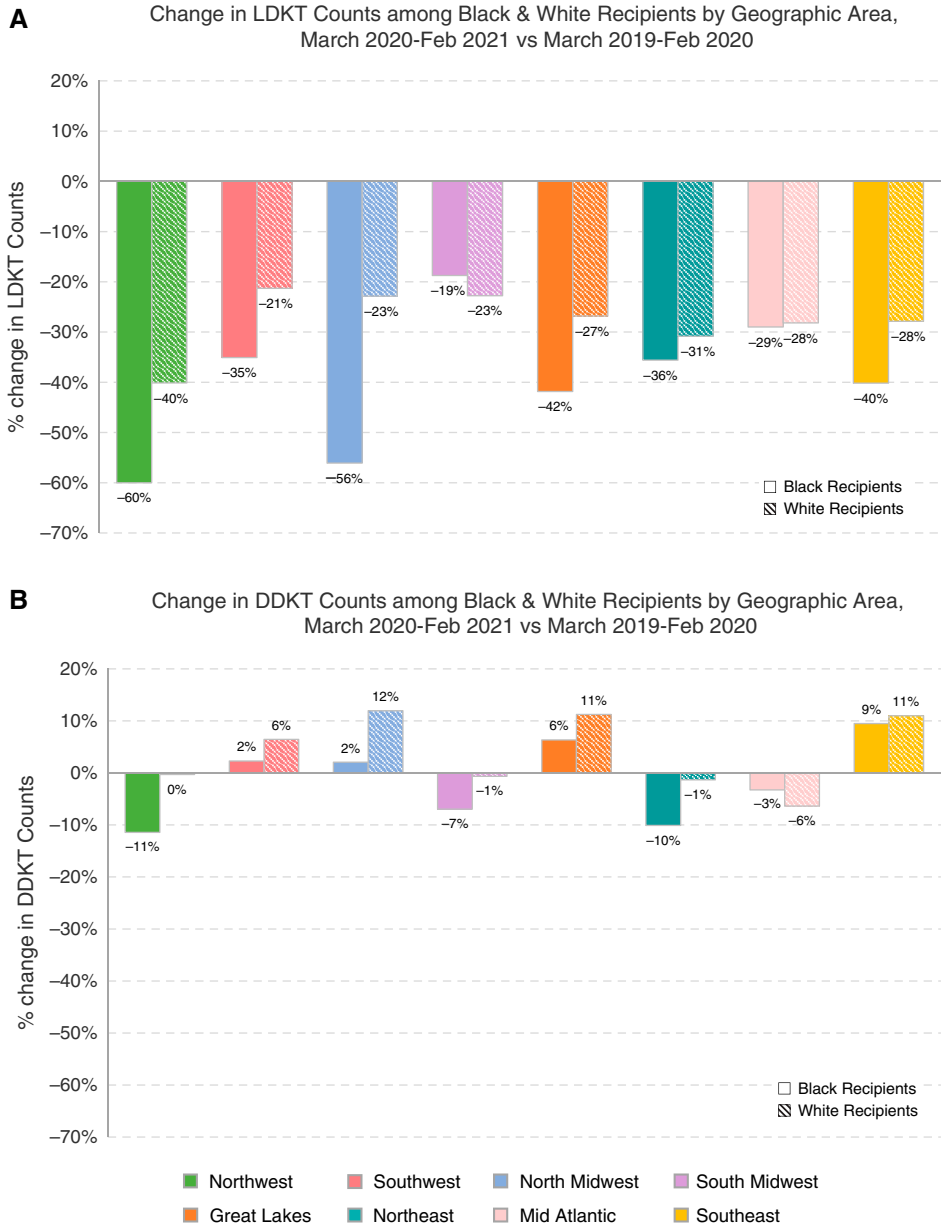

Figure 1. | Pandemic-associated changes in living donor kidney transplantation (LDKT) and deceased donor kidney transplantation (DDKT) in Black compared to White patients in the United States, across geography. Changes in volume of (A) LDKT and (B) DDKT in the post-pandemic period of March 2020–February 2021, compared with the preceding year. Geographic areas are based on UNOS COVID-19 reporting, defined as (9): Northwest (WA, OR, ID, MT, AK, HI), Southwest (CA, NV, UT, AZ, NM), North Midwest (ND, MN, SD, WY, NE, IA, CO, KS, MO), South Midwest (OK, TX), Great Lakes (WI, IL, IN, MI, OH), Southeast (KY, AR, TN, NC, MS, AL, GA, SC, LA, FL, PR), Mid Atlantic (WV, VA, PA, DC, MD, DE), and Northeast (NJ, NY, CT, RI, MA, VT, NH, ME).

post pandemic (SAS for Windows v14; SAS Institute, Cary, NC). Racial variation was also examined across geography.

Results

Counts of LDKT declined more for Black patients in the 12 months after the onset of the pandemic, compared with counts in the same period in the preceding 12 months. LDKT counts among Black patients fell by 36% compared with a 27% overall decline for White patients ($P=0.02$). This pattern of a larger decrease in LDKT counts among Black patients occurred in all areas of the country except for the South Midwest (Figure 1A). Along with recipient race, other factors associated with a significant decline in LDKT counts included public insurance and Black living donor race (Table 1).

In contrast, DDKT counts for both Black and White candidates declined initially during the COVID-19 pandemic and then recovered above pre-pandemic levels overall, although increases in this period were limited to half of the geographic areas (Figure 1B). DDKT counts in Black patients were 2% higher in March 2020–February 2021

versus the prior year, compared with a 5% period increase among White patients, although this difference did not reach significance (P=0.19; Table 1). Notably, Hispanic patients experienced a decline in DDKT compared with White patients (5% decline versus 5% increase; P=0.003). Other factors associated with lower overall DDKT counts

Table 1. Changes in volume of LDKT and DDKT procedures in the post-pandemic period of March 2020–February 2021, compared with the preceding year, by baseline factors

Sub-Group	Transplant Counts from 3/1/19–2/29/20	Transplant Counts from 3/1/20–2/28/21	% Change	*P* Value
LDKT recipients	*n*=6807	*n*=4952	−27	
Recipient race and ethnicity				
Black (non-Hispanic)	876	558	−36	0.02
White (non-Hispanic)	4364	3190	−27	Ref.
Hispanic	1045	824	−21	0.15
Other	522	380	−27	0.95
Recipient education level				
College and Higher	4375	3209	−27	Ref.
Grade/High School	2151	1485	−31	0.14
Unknown	281	258	−8	0.01
Recipient employment status				
Working	3150	2292	−27	0.92
Not working/unknown	3657	2660	−27	Ref.
Primary source of payment				
Private	3712	2828	−24	Ref.
Public	3095	2124	−31	0.006
Donor race and ethnicity				
White (non-Hispanic)	4830	3524	−27	Ref.
Black (non-Hispanic)	577	359	−38	0.02
Hispanic	993	754	−24	0.45
Other	407	315	−23	0.45
Location				
Northwest	191	118	−25	0.23
Southwest	980	734	−28	0.64
North Midwest	693	501	−18	Ref.
South Midwest	752	620	−30	0.1
Great Lakes	1077	758	−30	0.72
Northeast	1142	810	−25	0.8
Mid Atlantic	815	603	−29	0.77
Southeast	1157	808	−26	0.64
DDKT recipients	*N*=17,047	*N*=17,428	2	
Recipient race				
Black	5525	5633	2	0.19
White	6429	6779	5	Ref.
Hispanic	3495	3307	−5	0.003
Other	1598	1709	7	0.72
Recipient age, yr				
≤18	573	539	−6	0.01
19–30	932	1041	12	0.86
31–44	2978	3296	11	Ref.
45–59	6059	6007	−0.9	<0.001
≥60	6505	6545	0.6	0.002
Recipient education level				
College and higher	8520	8906	5	Ref.
Grade/high school	7891	7730	−2	0.003
Unknown	636	792	25	0.002
Recipient employment status				
Working	4387	4635	6	Ref.
Not working/unknown	12660	12,793	1	0.07
Primary source of payment				
Private	3941	4417	12	Ref.
Public	13,106	13,011	−0.7	<0.001
Donor type, deceased (KDPI)				
<20	3551	4618	30	<0.001
20–85	12,141	11,682	−4	Ref.
>85	1355	1128	−17	<0.001

Table 1. (Continued)

Sub-Group	Transplant Counts from 3/1/19–2/29/20	Transplant Counts from 3/1/20–2/28/21	% Change	*P* Value
Location				
Northwest	630	645	2	0.62
Southwest	2821	2856	1	0.32
North Midwest	1454	1539	6	Ref.
South Midwest	1718	1676	−2	0.1
Great Lakes	2287	2458	8	0.74
Northeast	2019	1888	−7	0.01
Mid Atlantic	2115	2005	−5	0.02
Southeast	4003	4361	9	0.5

Ref. reference; LDKT, living donor kidney transplantation; DDKT, deceased donor kidney transplantation; KDPI, kidney donor profile index.

in the pandemic period included candidate age ≤18 or ≥45 years, nonworking status, and public insurance. There were also fewer high kidney donor profile index transplants performed during the post-pandemic period.

Discussion

Racial disparities in access to LDKT are well known (5) but, despite recognition, have worsened over time. The 2-year cumulative incidence rates of LDKT after waitlisting in 2014 versus 1995 by race and ethnicity were: White, 11% versus 7%; Black, 2.9% versus 3.4%; Hispanic, 6% versus 7%; and Asian, 6% versus 5%, and the relative likelihood of LDKT in Black versus White candidates worsened from 65% lower compared with White patients in 1995–1999 to 73% lower in 2010–2014 (10). Our analysis of a contemporary patient cohort demonstrates that one consequence of the COVID-19 pandemic has been an exacerbation of these long-standing disparities. We observed that LDKT counts among Black patients declined further with the onset of the COVID-19 pandemic compared with LDKT counts among White patients.

The causes of a more pronounced decline in LDKT among Black Americans during the pandemic are likely multifactorial. The pandemic affected regions across the nation at varying time points. As a result, LDKT programs resumed their activities asynchronously, which in turn adversely affected the number of kidney paired donations. Previous reports have found Black patients to be less certain about their preference for kidney transplantation (11). Uncertainty towards pursuit of transplantation might have been intensified during the pandemic, especially for LDKT, which was often regarded as "elective" and possible to delay at the start of the pandemic. The economic impact of the pandemic disproportionately impacted Black families (12), which may have reduced the number of potential Black living donors with adequate financial security to pursue donation because the financial impacts of living donation are a concern among potential donors (13) and transplant candidates. Importantly, financial repercussions of the pandemic are expected to persist after the end of the public health emergency, which may have sustained implications for the trends reported in this study.

The relative decrease in LDKT counts trended higher among Black compared to White patients in all parts of the country except for the South Midwest. For DDKT, only the Northwest, South Midwest and Northeast witnessed a higher drop in transplant counts for Black compared with White patients. Although reasons for regional variation in racial disparities in kidney transplantation are speculative, local and regional COVID-19 surge conditions had, and continue to have, variable effects. Initially, the Northeast (particularly New York City) and some urban cities in the Midwest (particularly Detroit) were affected. Because both donors and recipients are affected by local hospital resources in the context of local surge conditions, it is conceivable that living donor-recipient pairs are differentially impacted by such a surge, especially if hospital resources are reallocated from transplant activities to COVID-19 support and related care. This hypothesis is supported by the lower overall impact of the pandemic on DDKT counts. Furthermore, LDKT is more likely to occur within a year of waitlisting, whereas DDKT typically transpires after years on the waiting list. Given the time required to conduct recipient candidate evaluations for new listings, and donor evaluations prior to LDKT, the observed lag in LDKT is not surprising, particularly in regions where the health care systems were completely overwhelmed—nor is the worsened disparity surprising.

This study has limitations. This was a retrospective, observational study identifying associative rather than causal relationships that is subject to potenial unobserved confounding. We sought to examine and quantify reduced use of LDKT among Black patients during the pandemic as a point of fact to stimulate discussions of disparities. It is possible that additional explanatory variables (measured or unmeasured) are colinear with the observed disparities by race, which should be a topic of ongoing study. We examined data from the national transplant registry. Although the SRTR database has many advantages including national capture, it lacks granular information including on social determinants of health.

In summary, the COVID-19 pandemic appears to have exacerbated challenges in access to LDKT for Black patients. Although the current rate of DDKT procedures recovered, LDKT in 2021 continued to lag behind 2019 levels (14), and it is unclear when LDKT rates will recover to

parity, especially as the pandemic evolves through new surges, and disparities in vaccine acceptance and utilization persist (15). Ongoing attention to transplant disparities during the course and aftermath of the public health emergency is warranted.

Disclosures

T. Alhamad reports consultancy for CareDx, Mallinckrodt, and Veloxis; research funding from Angion, CareDx, Europhines, and Natera; honoraria from CareDx, Sanofi, and Veloxis; an advisory or leadership role for CareDx, Europhines, and QSANT; and participation in a speakers' bureau for CareDx, Sanofi, and Veloxis. D.A. Axelrod reports consultancy for CareDx and Talaris; ownership interest in CareDx; and service on the NKF policy committee. M. Cooper reports consultancy for CareDx, Natera, and Specialist Direct; honoraria from CareDx; and an advisory or leadership role for the American Foundation for Donation and Transplant, Angion Pharmaceuticals, Donate Life America, International Pancreas and Islet Cell Transplant Association, National Kidney Foundation, National Kidney Registry, Quark Pharmaceuticals, Transplant Genomics, and UNOS. B.E. Hippen reports being employed by Fresenius Medical Care; ownership interest in Interwell Health; prior service on the board of directors for InterWell Health, and currently an (uncompensated) scientific advisory board member of eGenesis Bio. K.L. Lentine reports consultancy for CareDx; participation in a speakers' bureau for Sanofi; service on the ASN Policy and Advocacy Committee, and the NKF Transplant Advisory Committee; and is chair of the AST Living Donor Community of Practice, and a senior scientist of the SRTR. R.B. Mannon reports consultancy for Scientific Advisory Committee and Verici DX; research funding from Astellas, CareDx, CSL Behring, Mallinckrodt, Quark Pharmaceuticals, Transplant Genomics, and Verici DX; honoraria from CSL Behring, Hansa, Novartis, Sanofi, and Vitaerris; patents or royalties from Eurofins; an advisory or leadership role with the Steering Committee of Vitaerris VKTX01 IMAGINE Trial; and is chair of the DSMB, NIDDK/NIH, ASN Policy and Advocacy Committee, Women in Transplantation, on the Program Committee for TTS 2020 and 2022, and is co-chair of the SRTR Review Committee. M. Schnitzler reports consultancy for CareDx and honoraria from OPTUM. N. Singh reports consultancy for CareDx, Mallinckrodt, Natera, Transplant Genomics, and Veloxis Pharmaceutics; research funding from CareDx and Transplant Genomics; honoraria from CareDx, Mallinckrodt, Natera, Transplant Genomics, and Veloxis; is co-chair of AST KPCOP; and participated in a speakers' bureau for CareDx, Mallinckrodt, Natera, Transplant Genomics, and Veloxis Pharmaceutics. J. Snyder reports research funding from Astellas, Atara Biotherapeutics, CSL Behring, Novartis, and Vertex; is a board member of the Organ Donation and Transplantation Alliance and Donate Life America, and on the Clinical Policy Board LifeSource; is associate editor of Transplantation and statistical editor of American Journal of Transplantation; and is director of the Registry of Transplant Recipients (RTR). K.J. Woodside reports consultancy for Laminate; ownership interest in Nephrodite; research funding from Laminate; and an advisory or leadership role for the Gift of Life Michigan-Organ Committee. All remaining authors have nothing to disclose.

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Author Contributions

R. Li was responsible for the formal analysis and visualization; N. Singh, M.A. Schnitzler, R.B. Mannon, M.D. Doshi, K.J. Woodside, B.E. Hippen, D.A. Axelrod, and K.L. Lentine, were responsible for the investigation and the methodology; M.A. Schnitzler, D.A. Axelrod, and K.L. Lentine, were responsible for supervision; K.L. Lentine and M.A. Schnitzler were responsible for project administration and validation; N. Singh and K.L. Lentine wrote the original draft of the manuscript; and all authors reviewed and edited the manuscript, contributed to the study design, data interpretation, and critical editing of the manuscript, and approved and agreed to be accountable for ensuring the accuracy and integrity of the final manuscript.

Data Sharing Statement

SRTR data are publicly available. Anonymized data created for the study are or will be available in a persistent repository upon publication: Aggregated Data, Scientific Registry of Transplant Recipients (SRTR), https://www.srtr.org/about-the-data/the-srtr-database/.

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