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Characteristics of kidney donors and recipients in Iranian kidney market: Evidence from Mashhad

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Abstract

The Iranian model of kidney transplantation is an example of a regulated living unrelated renal donation. In this paper, we collected and analyzed a unique dataset of 436 paired kidney donors and recipients, including their characteristics and the realized price of a kidney in Mashhad. As opposed to the global picture of kidney donation, we find that women are less likely to donate and more likely to receive a kidney. Moreover, the average price of a kidney amounts less than 2 years of work with the minimum level of wage.

KEYWORDS
compensated donation, kidney market, live kidney transplantation, organ sales

1 | INTRODUCTION

Kidney transplantation is based on altruistic donation worldwide, except for a few countries, including Iran. The insufficient philanthropic supply of kidney has led to numerous transplant waiting lists and consequently the death of a large number of renal patients throughout the world. None of the new approaches to expand the kidney donor pool in developed countries, for example, expanding the deceased donation, introducing some kidney exchange programs, and optimizing the allocation algorithms, has the potential to eliminate the drastic shortage of transplantable kidneys.

The prohibition of organ sales brings about underground organ trade, strengthens the role of organ brokers, and also lessens the bargaining power of organ vendors, leaving the transplant patients exposed to even higher levels of exploitation than a regulated organ market.[1] Regulating the market minimizes harm by making it possible to scrutinize the market, enforce compliance with standards protecting both donors and recipients, and remove the middlemen, thus enabling the poor to receive transplants on an equal footing with the rich.[2] Regulated and incentivized systems may raise donation and reduce the unregulated markets and their related harms. Critical components of such a donation mechanism are protection, regulation, oversight, and transparency under the auspices of an appropriate government or a recognized body of the government.[3]

The Iranian model of kidney transplant established in 1988 is an example of a compensated and regulated living unrelated renal donation. Every few years, the Iranian Kidney Foundation (IKF) located in Tehran announces the new official price for kidney which each of the IKF branches in every province is obligated to follow. However, they mostly recognize this official price as a floor price and accept an extra payment, discussed directly between the patient and donor, above this threshold.

The compensation for donors formally includes an agreed upon kidney price, typically higher than the official price, with an additional reward of 10 million IRR (ie, around 240 USD) from the government called the *gift of altruism*. The IKF in Mashhad is the only branch in Iran which documents the realized price of a kidney exchanged between a donor and a recipient. For the first time, we collected the data of all paired kidney donors and recipients from April 2011 up to March 2018 at the IKF in Mashhad.

In this paper, after an overview of the background and typical procedure of the kidney market in Mashhad, we explore the descriptive statistics of kidney donors and recipients and then discuss intuitions and insights from analyzing their characteristics.

2 | KIDNEY MARKET IN MASHHAD

Since the first live kidney transplant in Mashhad on 2 April 1985 until December 2017, more than 2500 people have had a kidney

transplant in the *Montaserie Organ Transplantation Hospital*. It is operating as a center for dialysis and the only center in Mashhad and neighboring regions for transplantation of kidney, liver, and bone marrow. According to the latest reports, more than 7000 people from different age groups are now waiting for a kidney in Mashhad.

In Mashhad, approximately 60 individuals refer to the IKF every week to sell their kidney. Of these donors, about 15 individuals are actively pursuing the process, while the rest are dissuaded due to various reasons. Out of these individuals, about one-fifth are medically approved for kidney donation, after the 3 or 4 weeks of examinations.

From the demand perspective, every end stage renal disease (ESRD) patient aged below 70 in Khorasan Razavi Province without having a willing related donor is referred through a nephrologist's letter to the IKF in Mashhad to enter the kidney waiting list according to their blood type. These patients can be entered in the waiting list of hospitals to receive a kidney from a deceased donor as well.

From the supply perspective, each potential kidney donor, between 22 and 40 years old, should register at the IKF after undergoing the preliminary medical tests and bringing the notarized consent of him/herself and his/her family, including both parents for singles, only the spouse for married men, and the spouse and both parents for married women. This requirement is not the lone biased law that favors men in Iran. There is a notable gender disparity under Iranian laws in criminal law (eg, age of criminal responsibility and testimony), and family law (eg, divorce and custody of children).

There are four different matching lines for each blood type, and the IKF usually pair each donor with a renal patient with the matching blood type in the waiting list based on a first come, first-served basis. Nevertheless, this is not the only way of matching, and both sides can also publically advertise and find each other outside the IKF matching system. However, they have to register there and do the required paperwork and medical tests, as the transplantation centers only accept donors referred by the IKF, as a market maker.

A renal patient should pledge in cash half the official price of a kidney to the IKF following the initial registration of the waiting list. Once a patient is matched to a donor and they both agree upon a price, the patient pays the remaining price of a kidney to the IKF via a cheque. After carrying out the transplantation, the IKF transfers all the amount of money received from the patient to the donor. However, the IKF neither receives any financial interest nor benefits from any monetary transactions, as it is a charity after all. Although there is no official ceil price, the IKF in Mashhad informally tries its best to convince and incentivize the donor not to ask a high price. For instance, in case of high willingness to accept from the donor, the IKF might not introduce the donor to the secretary of state to get his/her gift of altruism.

The patients, with a letter from the IKF, can also switch to the insurance for specific diseases by which all dialysis costs become free. However, donors have to pay all these costs out of their own pocket. Albeit, some supplementary insurances pay the kidney price for the insured. Some government organizations also provide a significant portion of the cost of purchasing a kidney for patients affiliated with them.

Almost all kidney donors mostly face severe and urgent financial needs, for example, paying off debts (especially home rentals and *blood money*) and even living expenses, especially for single-mother households. Thus, financial issues constitute the most frequent and primary motive for living unrelated donors in Iran.[4,5] Since donors generally do not have appropriate access to financial resources, they have no other alternative than vending their organ. Few kidney vendors who had reasserted their decision to donate affirmed that they would donate again even with the high risk of dying because there was utterly no other way to provide short-term support for their urgent financial needs.[6]

Since the normal size of a kidney in men is naturally greater than that of women, generally there is no gender restriction in kidney transplantation for female patients. However, male patients are more likely to receive a kidney from a male donor, as a normal size kidney for women might not be laid in the suitable kidney range for men. The available data from the kidney market in Mashhad also clearly illustrate the impact on this gender restriction. Moreover, the IKF in Mashhad, especially since early 2016, imposes a constraint on the similarity of blood type, while in other cities, the primary criterion for kidney transplantation is the blood type compatibility, rather than similarity.

To prevent kidney tourism, kidney donors and recipients in Iran need to share nationality in common. On August 15, 2015, the *Supreme Council for Transplantation* in Iran approved that "From now on, organ transplantation is prohibited for non-Iranian citizens in any circumstances in Iran." According to this law, compensated kidney donation in Iran is only possible between two individuals from the same nationality with the legal residence permits, especially refugees in Iran from Afghanistan.

Since there is a large number of Afghan refugees in Mashhad, the IKF has formed a limited market for them. At the main kidney market for Iranians, donors do not have to wait to find a match, as there are always patients looking for a compatible kidney, especially those with a rare blood type such as AB. However, at the kidney market for Afghans, there is no patient in a queue to get a kidney and donors have to stay on the waiting list to find a suitable recipient.

Moreover, for Afghan citizens, the amount of money a patient should pay to compensate a donor is determined not based on the official price of a kidney in Iran, but rather in a wholly agreed manner. In 2014, the total cost of kidney transplantation was about 6329 USD.[7] While the government pays all kidney transplantation costs for Iranian patients and donors, Afghan renal patients should pay the hospital fees and other costs related to transplantation, which is estimated about 350 million IRR, almost 8650 USD, and reaches about 800 million IRR, almost 19 775 USD, with the cost of kidney purchase.

3 | DATA AND METHOD

We collected a dataset of all kidney transplantations conducted from April 2011 (the beginning of 1390 in the Iranian calendar) to March

2018 (the end of 1396 in the Iranian calendar) at the *Montaserie Organ Transplantation Hospital* in Mashhad. It includes the characteristics of 524 paired kidney donors and recipients, such as gender, age, blood type, level of education, as well as the realized price of a kidney.

However, as we did not expect to gain an interesting finding by assessing the uncompensated donors, who were mostly happened to be relatives medically matched to their patient, we only considered 436 pairs with compensated donors. Iran is the only country in the world with a legal kidney market, and Mashhad is the only city in Iran where the realized price of a kidney exchanged between a donor and a patient is documented; therefore, our dataset is truly unique in this sense.

4 | RESULTS

In our dataset, almost 85% of the donors are male and 79% are married, while only about 65% of the recipients are male and 74% are married. Interestingly, the gender of donors and recipients is matched in almost 70% of the pairs. Not only donors tend to be financially motivated for donation, but also recipients are not wealthy, as 47% of them are unemployed.

We considered the average years of education (3, 7, and 10 years of educations for primary, secondary, and high school levels of education, respectively) for those who claimed to be educated up to that level. On average, donors are mostly literate with 8 years of education, that is, secondary school.

Among the donors, the frequency of the blood type O is almost 42%, the blood group A is 28%, the blood group B is 25%, and the blood group AB is 6%, while we have similar ratios for the patients except for the blood type O and the blood type AB with 39% and 8% frequencies, respectively.

5 | DISCUSSION

Much of the available literature[8-11] documents that the majority of donors are female, while the majority of recipients are male. The potential reasons behind the gender disparity among living kidney donors are still obscure; however, it can be primarily attributed to an overwhelming predominance of wives among spousal donors.[12] Nevertheless, the situation is reversed in Iran where the kidney market favors women in the sense that they are less likely to donate and more likely to receive a kidney.

These descriptive statistics confirm a similar picture already illustrated in the literature. In Iran, out of 478 unrelated living donors from 30 transplant centers from October 2005 to March 2006, 85% were men, 82% were married, 29% were unemployed, and more than 97% were literate with a mean age of 27.[5] Recent statistics of the Iranian kidney market have shown a similar pattern where 39% of the recipients and about 16% of the donors are females,[13] while almost 80% of donors are married, and the majority of them have at least high school education.[14]

As it is distinct from Table 1, on average, the donors, compared to the recipients, tend to be about 1 year less educated, and 8 years younger. However, the patients have higher variations in their age, as it is not restricted and the ESRD could happen at any age, particularly for elders, whereas donors' age has much less variance, as it is restricted by law.

The frequency of the blood types in our data is quite similar to the blood type distribution in Iran in other studies which already signifies that our sample is a representative one. Among approximately 1.6 million Iranian blood donors in 2017, recent statistics from the Iranian Blood Transfusion Organization (IBTO) confirm that the blood group O is the most abundant blood group with almost 38% frequency followed by the blood group A with 30% frequency. Furthermore, a study revealed that among the blood donors' population in different geographical regions of Iran, the frequency of the blood group O was 37.62%, the blood group A was 30.25%, the blood group B was 24.36%, and the blood group AB was 7.77%.[15]

According to one study, a price of 15 000 USD per living donor would be enough to eliminate the shortage of kidneys and the waiting list in the US.[16] In a cross-sectional survey, 10 000 USD is the median lowest monetary compensation which would urge strangers to donate.[17] Table 1 shows that the average price of a kidney in our dataset is about 134.5 million IRR, almost 4365 USD, with the minimum of 50 million IRR, almost 3685 USD, which has been the official price until April 2012.

These amounts have not been attractive enough to eradicate the deficiency of kidneys in Iran, as we still have waiting lists especially for patients with a rare blood type such as AB. Even the maximum price of a kidney, 450 million IRR, almost 11 125 USD, is lower than the proposed price[16] which was supposed to be enough to incentivize donors to sell their kidney in a way that abolishes the kidney transplant waiting lists.

In order to put these prices in context, one could compare them with other indices. For instance, the minimum monthly wage for 2017/2018 was 9 299 310 IRR, almost 230 USD, while the average monthly cost of living in Mashhad was about 20 280 000 IRR, almost 500 USD, from which about 44% belongs to the housing expenditure. Based on our data, as it appears from Table 2, the official price of a kidney was about less than one and a half years of work with

TABLE 1 Descriptive statistics of the kidney market in Mashhad, 2011-2018

Variables	Mean	SD	Min	Max
Price (USD)	4365	1860	3685	11 125
Price (million IRR)	134.52	57.29	50	450
Donor age	29.91	4.78	20.00	40.00
Patient age	37.94	13.46	8.00	68.00
Donor years of education	8.04	3.71	0.00	16.00
Patient years of education	9.09	5.07	0.00	22.00

TABLE 2 Average price of a kidney and its official price in comparison with the minimum wage

Year	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018
Year (Iranian Calendar)	1390	1391	1392	1393	1394	1395	1396
Average nominal price of a kidney (USD)	4997.05	3469.05	3731.27	4664.49	4843.34	4991.77	5304.92
Average nominal price of a kidney (million IRR)	67.8	90.4	118.8	153	167.1	181.9	214.6
Official nominal price of a kidney (USD)	3685.14	2302.47	2512.64	3963.29	3768.01	3567.51	4202.41
Official nominal price of a kidney (million IRR)	50	60	80	130	130	130	170
Minimum monthly wage (USD)	243.44	149.55	153.00	185.64	206.49	222.88	229.88
Minimum monthly wage (IRR)	3 303 000	3 897 000	4 871 250	6 089 100	7 124 250	8 121 660	9 299 310
Official nominal price of a kidney/minimum monthly wage (mo)	15.14	15.40	16.42	21.35	18.25	16.01	18.28
Average nominal price of a kidney/minimum monthly wage (mo)	20.53	23.20	24.39	25.13	23.46	22.40	23.08
Exchange rate (USD/IRR)	13 568	26 059	31 839	32 801	34 501	36 440	40 453

the minimum wage while the average price of a kidney amounted <2 years of work with that level of wage.

6 | CONCLUSION

We collected and analyzed a very unique dataset of paired kidney donors and recipients, including their characteristics such as gender, age, blood type, level of education, and the realized price of a kidney, from April 2011 to March 2018 at the IKF in Mashhad. We reviewed the background and typical procedure of the kidney market in Mashhad and demonstrated that women are less likely to donate and more likely to receive a kidney in the Iranian model, as opposed to the global picture of kidney donation. More particularly, in most cases of kidney transplantations in Mashhad, the gender of donors and recipients is similar. However, as it is expected, the kidney donors tend to be relatively less educated and younger than the recipients. Finally, our results show that the average price of a kidney amounts to 2 years of earnings for a minimum wage worker, which is much less than the average cost of living, and therefore not motivating enough to eliminate the shortage of kidneys in Iran.

CONFLICTS OF INTEREST

None.

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REFERENCES

1. Columb S. Excavating the organ trade: an empirical study of organ trading networks in Cairo, Egypt. *Br J Criminol*. 2017;57(6):1301-1321.
2. Daar AS. The case for a regulated system of living kidney sales. *Nat Clin Pract Nephrol*. 2006;2(9):466-467.
3. Working Group on Incentives for Living Donation. Incentives for organ donation: proposed standards for an internationally acceptable system. *Am J Transplant*. 2012;12(2):306-312.
4. Zargooshi J. Iranian kidney donors: motivations and relations with recipients. *J Urol*. 2001;165(2):386-392.
5. Malakoutian T, Hakemi MS, Nassiri AA, et al. Socioeconomic status of Iranian living unrelated kidney donors: a multicenter study. *Transplant Proc*. 2007;39(4):824-825
6. Zargooshi J. Quality of life of Iranian kidney "donors". *J Urol*. 2001;166(5):1790-1799.
7. Salamzadeh J, Foroutan N, Jamshidi HR, et al. Costs of treatment after renal transplantation: is it worth to pay more? *Iran J Pharm Res*. 2014;13(1):271.
8. Bloembergen WE, Port FK, Mauger EA, Briggs JP, Leichtman AB. Gender discrepancies in living related renal transplant donors and recipients. *J Am Soc Nephrol*. 1996;7(8):1139-1144.
9. Kayler LK, Rasmussen CS, Dykstra DM, et al. Gender imbalance and outcomes in living donor renal transplantation in the United States. *Am J Transplant*. 2003;3:452-458.
10. Oien CM, Reisaeter AV, Leivestad T, Pfeffer P, Fauchald P, Os I. Gender imbalance among donors in living kidney transplantation: the Norwegian experience. *Nephrol Dial Transplant*. 2005;20:783-789.
11. Peracha J, Hayer MK, Sharif A. Gender disparity in living-donor kidney transplant among minority ethnic groups. *Exp Clin Transplant*. 2016;14(2):139-145.
12. Zimmerman D, Donnelly S, Miller J, Stewart D, Albert SE. Gender disparity in living renal transplant donation. *Am J Kidney Dis*. 2000;36:534-540.

13. Taheri S, Alavian SM, Einollahi B, Nafar M. Gender bias in Iranian living kidney transplantation program: a national report. *Clin Transplant*. 2010;24:528-534.
14. Ghahramani N, Rizvi SA, Padilla B. Paid donation: a global view. *Adv Chronic Kidney Dis*. 2012;19(4):262-268.
15. Pourfatollah AA, Oody A, Honarkaran N. Geographical distribution of ABO and Rh (D) blood groups among Iranian blood donors in 1982 as compared with that of 2001. *Sci J Iran Blood Transfus Org*. 2004;1(1):11-17.
16. Becker GS, Elias JJ. Introducing incentives in the market for live and cadaveric organ donations. *J Econ Perspect*. 2007;21(3):3-24.
17. Gordon EJ, Patel CH, Sohn MW, Hippen B, Sherman LA. Does financial compensation for living kidney donation change willingness to donate? *Am J Transplant*. 2015;15(1):265-273.

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