Commercialization of Kidney Transplants: A Systematic Review of Outcomes in Recipients and Donors

Imran Sajjad^a Lyndsay S. Baines^b Prem Patel^c Moro O. Salifu^d
Rahul M. Jindal^{c, e}

^aDepartment of Medicine, University of Wisconsin, Madison, Wisc., ^bDepartment of Psychology, Hofstra University, New York, N.Y., ^cDepartment of Surgery, Brookdale University Hospital and Medical Center, Brooklyn, N.Y.,

^dDivision of Nephrology, SUNY-Downstate Medical Center, Brooklyn, N.Y., and ^eSARCorp, Lanham, Md., USA

Key Words

Commercial kidney transplants • Commercial transplants, risks • Kidney transplantation, literature search • Kidney transplants, outcomes in recipients and donors • Medical tourism

Abstract

In this study we systematically reviewed outcomes in recipients and donors of commercial kidney transplants. Inherent in a study of this nature is the possibility of center and country bias, in particular there are no publications from China and South America. Publications also tended to report poor outcomes which may reflect bias on the part of the authors or to highlight the ethical issues in this area. We were unable to perform a meta-analysis due to variability in studies making it impossible to synthesize the data other than descriptive. Furthermore, these studies were not large or well conducted. We found that patient and graft survival was generally inferior to the data obtained from the UNOS (United Network for Organ Sharing). Some studies did achieve good outcomes, however, due to lack of details, it was not possible to infer if the donor hospital, surgical technique or immunosuppres-

sive regimen was a factor. There was a higher incidence of unconventional and life-threatening infections such as malaria, invasive fungal infections, pneumonia, HIV and hepatitis. There was also a markedly increased incidence of postoperative surgical interventions in recipients. We suggest the establishment of a database for both recipients and donors to identify unique surgical, medical, infectious and immunosuppressive protocols for the recipients and donors in these hospitals. This could lead to better liaison between the recipient and donor hospitals so that modern surgical and medical practices can be implemented. There should also be improved emotional and psychological support to both the recipient and the donor. However, these steps could be seen as condoning the reprehensible practice of commercialization of human body parts.

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Introduction

There is an increasing trend for patients from the Western countries to travel to various countries in the Eastern hemisphere for medical tourism [1, 2]. Commer-

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R.M. Jindal, MD, PhD, MBA
Department of Surgery, Brookdale University Hospital and Medical Center
1 Brookdale Plaza
Brooklyn, NY 11212 (USA)
Tel. +1 718 803 8463, Fax +1 718 803 8465, E-Mail jindalr@msn.com

cialization of body parts, in particular of kidneys, has been present for many years, but we believe this has increased due to an increase in the waiting list for kidney transplants and better hospital amenities in the countries of the Eastern hemispheres [3, 4]. Legislation and edicts from various transplant societies have failed to prevent this practice [5, 6].

There are several reports of a 'kidney bazaar' flourishing in India, Pakistan and other countries [7]. A cursory search of the Internet using a variety of search engines revealed numerous individuals and brokers willing to sell kidneys. In India, the buying and selling of kidneys was outlawed in 1994, but still thrives thanks to a '*built-in loophole in the law*' [8]. Several Indian state governments in 1995 adopted the Transplantation of Human Organs Act, 1994. This followed a well-publicized police crackdown on an organized kidney trade of alarming proportions [8]. The Act, however, is far from watertight allowing an unrelated donor, for reasons of '*affection or attachment towards the recipient*', to donate his or her kidney if approved by the 'Authorization Committee'; this clause has provided cover for hundreds of illegal cash-for-kidney deals [9].

We hope our review will educate physicians and patients on dialysis so that they can make an informed decision before they travel abroad to buy kidneys. Donors of commercial transplants should be made aware of the risks of the procedure and the possibility of acquiring unusual life-threatening infections. These patients should be followed carefully for medical, surgical complications and quality of life issues.

Strategy for Literature Search

We searched the literature using the key phrase 'commercial or paid' and 'kidney transplantation'. The databases searched were MEDLINE, The Cochrane Library, SUMSearch, CINAHL, InfoRetriever, TRIP, and World Wide Web.

Studies published before 1990 were not included. Abstracts of the retrieved articles were reviewed, and those that focused on the outcomes of commercial transplantation were obtained in full, and their reference lists were searched for further articles. Studies that focused primarily on the medical outcomes were reviewed; articles that focused on ethical aspects of commercial kidney transplantation were not included. Reviewed articles varied from single-center to multi-center studies. Case reports and reports in abstract form were not included.

Methods

For the purpose of this paper, we arbitrarily group outcomes in recipients according to geographical areas, i.e. recipients' country of origin. There are only reports of donor outcomes from India, Pakistan and Iran, although commercial kidney transplants are widely reported to take place in China and some South American countries.

Immunosuppressive protocols used in commercial kidney transplants have not been well documented; however, we have included these wherever available in the critique of literature.

It has been widely reported in different publications and in the lay press that the recipients of these transplants stay in the donor hospitals for a relatively short time and return to their countries of origin despite ongoing surgical and medical complications. This may be due to the cost or fear of being detained by police as these activities tend to occur in a secretive manner.

We also group good and poor outcomes according to their geographical location of the donor hospitals. It has been suggested that outcomes vary depending on the country where the transplant took place. Wherever possible, we also describe the immunosuppressive regimens.

Results

Outcomes in Recipients of Commercial Kidney Transplants (table 1) [10–38]

Outcomes of recipients from the Far East: Sun et al. [10] from Taiwan followed 31 patients who received their kidneys from China. They found no significant difference in graft survival between commercial and non-commercial renal transplant recipients. The mortality rate between the two groups was comparable at 10 years. Morad and Lim [11] in a large study of 389 patients from Malaysia showed that the patient and graft survival at 1, 3, and 5 years in recipients of commercial kidney transplantation was comparable to the recipients of living kidney transplant. There was no difference in the incidence of significant bacterial, fungal, or viral infections between the two groups.

Outcomes of recipients from Canada and USA: Prasad et al. [12] in a detailed study of 20 patients who received their kidney transplants from South Asia and Middle East reported that graft survival over 3 years was worse in the commercial renal transplant recipients. Eleven patients had serious posttransplant opportunistic infection. Canales et al. [13] described their experience of 10 patients from Minneapolis. Kidney function and graft survival were generally good after overseas kidney transplantation. Major problems included incomplete perioperative information and a high incidence of post-transplant infections.

Table 1. Outcomes of commercial kidney transplant in recipients

Group (first author)	Journal	n	Country	Country of transplant and cost	Infections	Surgical problems	Patient survival	Graft survival	Conclusion
Sun [10]	Clin Transplant 2006	31	Taiwan	China Cost = NA	HBV = 1 HBC = 1 CMV = 1	Not reported	1 year = 100% 3 years = 100% 5 years = 88.9% 10 years = 88.9%	1 year = 100% 3 years = 100% 5 years = 88.9% 10 years = 88.9%	There was no significant difference in mortality rate and graft survival between the commercial and non-commercial renal transplant recipients
Morad [11]	Transplant Proc 2000	389	Malaysia	NA Cost = NA	Significant bacterial infections = 35% Fungal infections = 7% TB = 4% CMV = 2% Malaria = 3% HBV = 11% HCV = 13%	Not reported	1 year = 93% 3 years = 88% 5 years = 82%	1 year = 90% 3 years = 81% 5 years = 72%	The patient and graft outcomes at 1, 3, and 5 years in patients who received commercial kidney transplantation were comparable to LRT recipients. There were no differences in incidence of significant bacterial, fungal, and viral infections between the three groups
Prasad [12]	Transplantation 2006	20	Canada	South Asia, East Asia, & Middle East Cost = NA	CMV = 5 TB = 3 Pyelonephritis = 8 Aspergillosis = 4	Wound infection = 5 Lymphocele = 2 Ureteric calculus = 1 Urinary leak = 1	Not reported	Not reported	Patient and graft survival at 3 years were significantly worse in recipients of commercial renal transplant compared to recipients of live biologically related (p = 0.0001) and emotionally related transplants (p = 0.01) performed in Canada
Canales [13]	Transplantation 2006	10	USA	Pakistan = 8 Iran = 1 China = 1 Cost = NA	Sepsis = 3 CMV = 1 Aspergillosis = 1	Wound infection = 1	90%	90%	Kidney function and graft survival were generally good after overseas kidney transplantation. Major problems included incomplete perioperative information and high incidence of posttransplant infections
Inston [14]	Transplant Proc 2005	23	UK	India Cost = USD 9,900–23,000	Sepsis = 4	Not reported	65%	44%	Living paid organ transplantation results in unacceptably high recipient morbidity and mortality
Higgins [15]	Nephrol Dial Transplant 2003	9	UK	India & Pakistan Cost = NA	HBV = 2 CMV = 1 HCV = 1	Vascular thrombosis = 1 Wound infection = 1	68%	Not reported	Patient survival rate was much better at 92% for the transplants performed in UK. Serious complications occurred more frequently in patients transplanted overseas
Kennedy [16]	Med J Aust 2005	16	Australia	India, China, Iraq, & Lebanon Cost = NA	HBV = 2 CMV = 3 HZV = 1 Aspergillosis = 1	<i>Pseudomonas</i> wound infection = 1	1 year = 85%	1 year = 66%	Graft and patient survival rates were significantly better in non-commercial renal transplant recipients
Frishberg [17]	J Am Soc Nephrol 1998	18	Israel	Iraq Cost = NA	Pyelonephritis = 1 HBV = 0 HCV = 0 HIV = 0	Vascular thrombosis = 2 Urinary leak = 1 Ureteral stenosis = 6	2 years = 94.4%	2 years = 83.3%	Despite severe early postoperative complications, graft function at follow-up was comparable to cadaveric renal transplantation in Israel
Friedlaender [18]	Lancet 1993	36	Israel	India Cost = NA	Sepsis = 2 Major infections (including malaria and TB) = 9	Fistula = 2 Lymphocele = 2 Wound infection = 4	1 year = 94%	1 year = 78% 2 years = 68%	Graft survival was comparable to CT but was inferior to live kidney transplant. Recipients of commercial kidney transplantation had more infectious complications including infections which were not common in Israel such as TB and malaria

Erikoğlu [19]	Transplant Proc 2004	6	Turkey	Iraq & India Cost = USD 20,000	Soft tissue infection = 3 Liver cirrhosis = 1	Not reported	Not reported	Not reported	The authors concluded that LNRD organ transplantation is unethical and unsuitable because of significant medical complications facing both the recipients and the donors
Sever [20]	Kidney Int 2001	115	Turkey	India, Iraq, & Iran Cost = NA	Malaria = 10 Fungal infections = 5 PCP = 3 CMV = 1 TB = 5 HBV = 2 HCV = 3 Pyelonephritis = 5	Wound infection = 5 Lymphocele = 6 Renal artery thrombosis = 1 Urinary fistula = 3 Hydrocele = 5 Urethral stenosis = 2	2 years = 90% 5 years = 80% 7 years = 74%	2 years = 84% 5 years = 66% 7 years = 53%	Commercial transplantation carries a high risk of unconventional complications. Even though the patient survival was comparable, the graft survival was worse than conventional LRT at midterm
Sever [21]	Nephrol Dial Transplant 1994	34	Turkey	India Cost = USD 10,000-12,000 (USD 1,000 paid to recipients)	Malaria = 3 Mucormycosis = 1 Aspergillosis = 1 HBV = 2 Pneumonia = 1	Urinary fistula = 2 Lymphocele = 3 Urinary tract obstruction = 2	Not reported	Not reported	Paid kidney transplantation carried a high risk of medical and surgical complications
Ivanovski [22]	Transplant Proc 2005	16	Macedonia & Kosovo	India & Nepal Cost = NA	CMV = 2 Kalazar = 1 Perirenal abscesses = 2 HBV = 2 HCV = 2 Pulmonary infection = 2	Wound infection = 3 Peri-renal hematoma = 2 Partial iliac artery thrombosis = 1 Urinary leak = 2 Lymphocele = 1	1 year = 78% 3 years = 70% 5 years = 70% 10 years = 52.3%	1 year = 78% 3 years = 50.2% 5 years = 33.3% 10 years = 18.8%	1-, 3-, and 5-year graft survival in non-commercial kidney transplant was 100, 88, and 78%, respectively, a highly significant difference. The patient survival rate at 1, 3, and 5 years in the non-commercial group was also better at 100, 93 and 86%, respectively
Ivanovski [23]	Transplant Proc 1997	14	Macedonia	India Cost = NA	<i>Pseudomonas</i> infection = 3 Severe pulmonary infection = 1 Sepsis = 1	Urinary leak = 2 Perirenal hematoma = 2	Not reported	1 year = 78.58% 2 years = 64.3%	Commercial kidney transplantation was not recommended because of frequent medical complications that were sometimes life-threatening
Qunibi [24]	Clin Transplant 1997	540	Saudi Arabia	India Cost = NA	HBV = 40 HIV = 23	Vascular thrombosis = 6 Urologic complications = 4	1 year = 97% 3 years = 94% 5 years = 92%	1 year = 90% 3 years = 81% 5 years = 72%	Patient and graft survival rate in recipients of commercial renal transplantation were similar to those of LRT. The incidence of HIV and HBV was higher in recipients of commercial renal transplant
Mansy [25]	Nephron 1996	12	Saudi Arabia	India Cost = USD 300-1,300 (amount received by donor)	CMV = 4 Septic shock = 2 HBV = 0 HCV = 0 HIV = 0	Urinary leak = 2 Renal artery stenosis = 1	Not reported	2 years = 70%	2-year graft survival was much better at 88% in recipients of non-commercial renal transplantation
Ghods [26]	Clin J Am Soc Nephrol 2006	1,499	Iran	Iran Cost = USD 1,200 + gift from government or charitable organizations	Not reported	Not reported	1 year = 93.9% 5 years = 87.1% 10 years = 72.2%	1 year = 90.5% 5 years = 74.4% 10 years = 48.8%	There were no significant differences in graft survival rates between recipients of one HLA haplo-type-matched living-related donor and recipients of paid regulated LURD transplant

Table 1 (continued)

Group (first author)	Journal	n	Country	Country of transplant and cost	Infections	Surgical problems	Patient survival	Craft survival	Conclusion
Ghods [27]	Nephrol Dial Transplant 2002	942	Iran	Iran	Not reported	Not reported	1 year = 92.8% 5 years = 83.7% 10 years = 73.3%	1 year = 87.1% 5 years = 64.2% 10 years = 43.7%	Results of paid controlled LURD renal transplants were comparable with the results of other transplant centers but were inferior to the results reported by UNOS transplant registry
Ben Hamida [28]	Transplant Proc 2001	20	Tunisia	Iraq, Egypt, & Pakistan Cost = USD 10,000	CMV = 2 TB = 2 UTI = 11 Septicemia = 3	Wound infection = 4 Ureteral necrosis = 2 Lymphocele = 1 Arterial stenosis = 3	4 years = 93.1%	4 years = 85.4%	Graft survival rates were comparable to those of LRT (88%) and better than those of CT (75%) in Tunisia
Hussein [29]	Transplant Proc 1996	56	Saudi Arabia	India Cost = NA	HIV = 5 TB = 3 Pneumonia = 12 Malaria = 1 Septicemia = 2	Urinary leak = 2 Lymphocele = 9	1 year = 96% 2 years = 96%	1 year = 92% 2 years = 87%	Despite having a reasonable patient and graft survival rate, commercial kidney transplantation was associated with serious complications especially in the first 6 months
Colakoglu [30]	Nephron 1998	127	Turkey	India Cost = NA	Pneumonia = 5 TB = 2 Malaria = 2 UTI = 23 <i>Listeria</i> meningitis = 1 HBV = 3 HCV = 32	Ureteral dysfunction = 5 Lymphocele = 4 Perirenal hematoma = 4 Wound infection = 1 Renal artery stenosis = 1	1 year = 93% 2 years = 92% 5 years = 92%	1 year = 83% 2 years = 73% 5 years = 57%	Medical and surgical complications occurred more frequently in paid kidney transplantation
Al-Shohaib [31]	Nephron 1996	8	Saudi Arabia	India Cost = NA	HIV = 1 HCV = 1 TB = 1 CMV = 1	Not reported	50%	Only 2 patients are left with functioning graft after 3 years	Organ trading was found to be medically and ethically wrong resulting in disastrous complications for the patient
Odum [32]	Lancet 1994	5	UK	India Cost = GBP 7,500–10,000	UTI = 2 CMV = 1	Not reported	1 year = 100% 3 years = 100% 43 months = 100%	Not reported	Despite early complications, commercial kidney transplantation had good patient survival rate
Onwubalili [33]	Transpl Int 1994	16	Saudi Arabia	India Cost = USD 7,372	HIV = 1 HBV = 1 HCV = 6 TB = 2 UTI = 2	Transplant obstruction = 1	5 years = 75%	5 years = 43%	Patient and graft survival rates were similar to the recipients of 24 cadaver grafts obtained in the USA, 67 and 55% respectively, but overseas kidney transplant had a risk of dangerous infections
Kazim [34]	Transplant Proc 1992	89	UAE	India Cost = NA	Pneumonia = 10 CMV = 5 TB = 3 Malaria = 3 Septicemia = 2 HIV = 1 HBV = 3	Wound infection = 1	6 months = 96% 1 year = 94% 3 years = 84%	6 months = 94% 1 year = 92% 3 years = 83%	Patient and graft survival was comparable to LRD transplant. Patients who died peri- and postoperatively were not included (10) which would have altered the figures downward drastically

Abouna [35]	Transplant Proc 1990	59	Kuwait	India Cost = USD 18,000–22,000	HBV, malaria and TB = 7	Wound infections, 6 patients Urinary fistula, Ureteral obstruction, Renal artery thrombosis = 14	19 graft failure	The practice of trading in human organs was found to be medically, morally, and ethically objectionable
Salahudeen [36]	Lancet 1990	122	UAE & Oman	India Cost = USD 2,600–3,300	Pneumonia = 3 Septicemia = 4 TB = 1 HIV = 5 HBV = 3 Fungaemia = 1	Renal artery stenosis = 1	1 year = 81.5% 45 months = 80.7% 1 year = 76.9% 45 months = 74.7%	Recipients of commercial kidney transplant had an unusually high early mortality rate. With 16 of the 25 deaths occurring before the end of 3 months and a further 4 by the end of 6 months. Infections were the most common cause of death
Al-Khader [37]	Lancet 1990	90	Saudi Arabia	India Cost = NA	HIV = 6	Not reported	1 year = 95% 1 year = 85%	Despite improved patient and graft survival the recipients of a commercial kidney transplant had a higher incidence of HIV
Abu-Romeh [38]	Lancet 1990	42	Qatar	India Cost = NA	Septicemia = 2	Not reported	5 patient died within 3 months 11 patients lost their graft function	Recipients of non-related living transplant had increased early mortality

HBV = Hepatitis B virus; HCV = hepatitis C virus; CMV = cytomegalovirus; NA = not available; TB = tuberculosis; HZV = herpes zoster virus; PCP = *Pneumocystis carinii* pneumonia; LNRD = living-non-related donors; LRT = living-related transplant; CT = cadaver transplant.

Outcomes of recipients from the UK: Inston et al. [14] in 2005 reported a study of 23 patients from the UK, he found that 8 patients (35%) died shortly after their return and 5 more (21%) lost their kidneys. The overall rate of successful transplants from this group of patients was only 44% (overall graft loss was 56%) in the short term. The information from the transplant centers was inadequate in all cases. In an earlier study, Higgins et al. [15] found that the survival rate was 68 and 92% in commercial and non-commercial renal transplant recipients, respectively. Serious complications occurred more frequently in patients transplanted in India and Pakistan than in Coventry, 8 complications in 6 patients and 11 complications in 28 patients, respectively.

Outcomes of recipients from Australia: Kennedy et al. [16] in a study of 16 patients showed that the overall 1-year patient survival rate was 85%. One-year graft survival rate was 66% compared with the Australian survival rate of 90% at 1 year. Two patients contracted HBV, which led to their death. Three patients were admitted soon after their return to Sydney with serious cytomegalovirus infection. One patient returned from Lebanon with *Aspergillus* infection of the kidney graft and required nephrectomy.

Outcomes of recipients from Israel: In a small study of 18 patients who received their kidneys from Iraq, Frishberg et al. [17] found a higher incidence of urologic problems, mainly as a result of inadequate ureterovesical anastomosis. Calculated creatinine clearance at 6, 12, 18, 24, and 30 months was 84.7 ± 6.4 , 91.0 ± 6.8 , 90.8 ± 6.2 , 82.5 ± 9.5 , and 77.7 ± 8.2 ml/min per 1.73 m^2 , respectively, representing excellent graft function in 13 patients and slightly compromised function in 2 children. One- and 2-year patient survival was 94.4%, with a graft survival of 83.3%. Graft function at follow-up was comparable to deceased donor kidney transplantation in Israel. Friedlaender et al. [18] in 1993, in a study of 36 patients who received their kidneys in India, found that overall graft survival was 78 and 68% at 1 and 2 years, respectively.

Outcomes of recipients from Turkey: Erikoğlu et al. [19] in 2004, in a small study of commercially obtained kidney transplants, found numerous postoperative complications including death from liver cirrhosis after 13 months. Sever et al. [20, 21] in 115 and 34 patients respectively, who received their kidneys in India, Iraq or Iran, found that the posttransplant course was complicated by numerous surgical and/or medical complications. Unconventional infections included malaria, invasive fungal infections, and pneumonia.

Table 2. Outcomes of commercial kidney transplant in donors

Group (first author)	Year	n	Country	Average amount received	Outcomes
Naqvi [39]	2007	239	Pakistan	USD 1,377	88% of the donors had no economic improvement in their lives and 98% reported deterioration in general health status. Future vending was encouraged by 35% to pay off debts and freedom from bondage
Goyal [40]	2002	305	India	USD 1,070	Average family income declined by one-third after nephrectomy. 86% reported deterioration in their health status. 79% would not recommend others to sell a kidney
Zargooshi [41]	2001	300	Iran	USD 160	Poverty prevented 79% of vendors from attending follow-up visits, and vending caused negative effects on employment in 65%. 71% had severe de novo postoperative depression and 60% anxiety. Vending caused somewhat (20%) to very (66%) negative financial effects. It also had negative effects on the physical abilities in 60% of vendors who were mainly unskilled laborers, and 80% were dissatisfied with postoperative physical stamina, which was decreased mostly by depression. Of the vendors, 37% concealed the truth about the sale of their kidney from everyone, 14% disclosed it only to spouses, 43% to first-generation relatives and 94% were unwilling to be known as donors
Zargooshi [42]	2001	100	Iran	USD 1,219	51% of donors hated the recipients and 82% were unsatisfied with their behavior. Motivations for donating were purely financial in 43% of cases and mainly financial with a minor altruistic component in another 40%. Of the donors, 76% agreed that kidney sale should be banned and if there was another chance they would prefer to beg (39%) or obtain a loan from usurers (60%)

Outcomes of recipients from Macedonia and Kosovo: Ivanovski et al. [22] in a study of 16 patients showed that 1-, 3-, 5-, and 10-year graft survival was 78, 50.2, 33.3, and 18.8%, respectively. The main reasons for death were severe pulmonary infections with sepsis, hepatitis B with liver cirrhosis, CMV, and cancer of the colon. In another study, they found that those patients who received their kidneys in India had a graft survival rate of 78.58% at the end of the first year and 64.3% the second year [23].

Outcomes of recipients from the Middle East: Qunibi et al. [24] in a large study of 540 patients found that 1-, 3-, and 5-year patient survival rates in the commercial renal transplant recipients were 97, 94, and 92%, and in the emotionally related transplant recipients 95, 91, and 91%, respectively ($p = 0.4921$). The corresponding rates for graft survival were 90, 81, and 72%, and 90, 86, and 83%, respectively ($p = 0.5336$). A higher incidence of HIV (4.6 vs. 0%) and hepatitis B (8.1 vs. 1.4%) was seen in commercial renal transplant recipients. Mansy et al. [25] in a study of 12 patients in 1996 found that 2-year graft survival rate was 70% compared to 88% survival rate of non-commercial renal transplant. 4 patients had CMV, 2 cases developed surgical complications. Similar results were reported from others in the Middle East.

Outcomes of recipients from Iran: Ghods and Savaj [26] showed no significant differences in graft survival between the recipients of one HLA haplotype-matched living-related donor and the recipients of paid regulated liv-

ing-unrelated donor transplant. In another study [27] the patient survival rates were 92.8, 83.7, and 73.3% and the graft survival rates were 87.1, 64.2, and 43.7% at 1, 5 and 10 years, respectively, in the recipients of paid unrelated donor transplant.

Outcomes in Donors (table 2) [39–42]

Outcomes of donors in Pakistan: Naqvi et al. [39] from Pakistan in a large study of 239 donors reported that the vast majority of the donors (88%) had no economic improvement in their lives and 98% reported deterioration in their general health status. Future vending was encouraged by 35% to pay off debts and economic freedom.

Outcomes of donors in India: Goyal et al. [40] in a seminal study of 305 commercial kidney donors in India reported that average family income declined by one-third after nephrectomy. 86% reported deterioration in their health status. 79% would not recommend others to sell a kidney.

Outcomes of donors in Iran: Zargooshi [41] from Iran in 300 commercial kidney donors found that poverty prevented 79% of vendors from attending follow-up visits, and vending caused negative effects on employment in 65%. 71% had severe de novo postoperative depression and 60% complained of anxiety. Vending caused somewhat (20%) to very (66%) negative financial effects. It also had negative effects on the physical abilities in 60% of

vendors who were mainly unskilled laborers, and 80% were dissatisfied with postoperative physical stamina, which was decreased mostly by depression. Of the vendors, 37% concealed the truth of kidney sale, 14% disclosed it only to spouses, 43% to first-generation relatives, and 94% were unwilling to be known as donors. In another study [42] he found that in 100 commercial kidney donors, 51% of donors hated the recipients and 82% were unsatisfied with their behavior. The goals of vending were not achieved by 75% of the donors.

Critique of Literature

There is a center and country bias in reporting the results of commercial kidney outcomes, in particular there are no publications from China and South America. Also, inherent in a study of this nature is a preponderance of reports with poor outcomes. Although majority of commercial kidney transplants occur secretly, there are two interesting models where commerce in kidney transplants is 'controlled' at the local or national level.

(1) *Indian model*: There are some reports where physicians controlled the commerce at hospital level. Thiagarajan et al. [43] from India report their experience of 546 kidney transplants, of which 303 were live unrelated and 153 related donors. They reported excellent graft and patient survival with 100% follow-up for the first 6 months. They describe the process of accepting commercial donors by fixing the expenses and compensation, auditing the hospital accounts, psychiatric evaluation of donors and medical insurance policy for the donors for 3 years. They described some cases where the donors were dissuaded from donating by finding them jobs or tuition fees. Of particular interest was their commitment to close follow-up and zero donor mortality; however, their commercial donors were poor with follow-up and 30–40% squandered their compensation.

(2) *Iranian model*: In this model there is acceptance of payment to kidney donors at the national level. This has been extensively reported and debated. Ghods is the main proponent of the so-called *Iranian model*, where kidney donation is legalized, compensated and controlled by a charitable organization [26, 44]. Essentially, foreigners are not allowed to donate, there is no middle person and the government of Iran pays all the expenses [27]. However, despite all the efforts at the national level, Iran does not have a national registry of recipients or donors [45]. According to 'Organs Watch', which is the only truly independent organization allowed access in Iran, *regula-*

tion in Iran has not ended the black market, it has simply made it an official policy [45]. Furthermore, the Iranian model has eroded the development of a deceased donor system and also eroded the living kidney donation among loving family members [45]. Despite claims to the contrary [26], the Iranian model has not completely eliminated the waiting list for kidney transplants [45]. Furthermore, it has been reported that almost all donors in Iran are desperately poor people who do not want to be identified due to social stigma; women are more likely to be donors than recipients and are frequently unemployed [42].

Good Outcomes after Commercialization of Kidney Transplants

Patient and graft survival rates between commercial and non-commercial kidney transplants were found to be comparable in a few instances. However, due to the limited number of well-controlled studies, it was difficult to predict good outcomes based on the country where the transplant took place or the immunosuppressive regimen used.

Sun et al. [10] found no significant difference in graft survival between commercial and non-commercial renal transplant recipients. The mortality rate between the two groups was comparable at 10 years. Details regarding immunosuppressive protocols used were not available. Canales et al. [13] described their experience of 10 patients from Minneapolis; 8 were transplanted in Pakistan, 1 each in China and Iran. Kidney function and graft survival were generally good after overseas kidney transplantation. Ghods and Savaj [26] showed no significant differences in graft survival between the recipients of 1 HLA haplotype-matched living-related donor and recipients of paid regulated living-unrelated donor transplant. Cyclosporine, azathioprine, and prednisone were used for immunosuppression before 1996; later, MMF was used instead of azathioprine. Induction therapy with antithymocyte globulin and rarely with IL-2 receptor antibodies was reserved for high-risk cases.

Ben Hamida et al. [28] studied 20 patients who received renal transplant overseas; 14 patients received their transplant in Iraq and 3 each in Egypt and Pakistan. Graft survival rates were comparable to those of living-related transplant and better than those of cadaveric transplant in Tunisia. All patients initially received a combination of cyclosporine A (8 mg/kg per day) and steroids (1 mg/kg per day). After arrival in Tunisia, azathioprine was added to this regimen and cyclosporine decreased to 5 mg/kg per day. Morad and Lim [11] in a study

of 389 patients showed that the patient and graft survival at 1, 3, and 5 years of commercial kidney transplantation was comparable to the recipients of living-related kidney transplant. There was no difference in the incidence of bacterial, fungal, or viral infections between the two groups. Most patients were on cyclosporine, azathioprine, and prednisone. In another study of 56 patients, Hussein et al. [29] found an acceptable rate of patient and graft survival despite early infectious and urologic complications. 73% of their patients were on triple therapy with cyclosporine, prednisone, and azathioprine, while 23% were on cyclosporine and prednisone.

Poor Outcomes after Commercialization of Kidney Transplants

The majority of studies showed inferior patient and graft survival rates in recipients of a commercial kidney transplant. However, due to lack of details, it was not possible to evaluate the variables leading to poor outcomes.

Prasad et al. [12] in a study of 20 patients who received their kidney transplants from South Asia and the Middle East reported that graft survival over 3 years was worse in commercial transplant recipients. All patients at the time of arrival at their hospital were already on triple drug immunosuppressive regimen, with cyclosporine in 17, tacrolimus in 5, MMF in 15, azathioprine in 7, and steroids in 22. One patient received intravenous thymoglobulin and 2 received anti-CD25 antibodies for induction therapy. In a small study of 18 patients who received their kidneys from Iraq, Frishberg et al. [17] found a higher incidence of urologic problems, mainly as a result of inadequate ureterovesical anastomosis. They all initially received a combination of cyclosporine and steroids. After arrival in Israel, azathioprine was added to this regimen to provide the standard triple immunosuppressive therapy.

A large number of commercial kidney transplants with inferior outcomes were performed in India. Ivanovski et al. [22] in a study of 16 patients showed that 1-, 3-, 5-, and 10-year graft survival was 78, 50.2, 33.3, and 18.8%, respectively. In another study, they found a graft survival rate of 78.58% at the end of the first year and 64.3% the second year [23]. All patients received cyclosporine, prednisone and azathioprine or MMF. Inston et al. [14] in a study of 23 patients from the UK found an overall success rate of only 44%. In an earlier study, Higgins et al. [15] found that the survival rate was 68 and 92% in commercial and non-commercial renal transplant recipients, respectively. Induction immunosuppression was either tacrolimus or cyclosporine; 2 cases had IL-2 recep-

tor monoclonal antibody treatment. Mansy et al. [25] in a study of 12 patients in 1996 found that 2-year graft survival rate was 70 versus 88% for non-commercial renal transplants. All patients received conventional immunosuppressive treatment with cyclosporine, azathioprine, and prednisone.

Discussion

The ongoing negative medical, socioeconomic and emotional impact of renal failure upon patients and their families and the financial incentives for donors appears to be driving the commercialization of organs for transplant [46]. However, research suggests that medical, socioeconomic and emotional outcomes for both recipients and donors are poor [47]. While recipients are exposed to the risks of surgery in poorly equipped unsanitary clinics thereby increasing the risk of infection, donors are, in the main, drawn from the lower socioeconomic groups from developing countries, who do not have access to follow-up healthcare, or worse, they are carrying infectious diseases, such as TB, AIDS or hepatitis [48].

Despite donors being motivated by the opportunity to improve their financial status, research has suggested that there is little or no economic improvement following donation [39]. Indeed, in some cases (86% of those surveyed) the average family income actually declined by as much as one-third after donation [40]. These findings have been attributed to the deterioration in the donor's postoperative physical (lack of stamina) and emotional health status (anxiety and depression) due to difficulty gaining access to follow-up healthcare and subsequent ability to gain paid employment [41].

The reported deterioration in physical stamina could be linked to the emotional issues of depression and anxiety. However, further studies have suggested that despite motivations for donation being financial, the negative behavior and apparent lack of gratitude of the recipients towards the donor could be a major contributing factor [42]. It may be that the poor donor may be hoping not only to improve his financial position but also elevate his social standing in the eyes of the recipient. But in reality, the negative behavior of the more affluent and socially elevated recipient just serves to reinforce the donor's lowly social status further contributing to his emotional issues [49].

Despite the act of donation having being viewed as a business transaction, there still appears to be a stigma attached to organ donation with one study suggesting that

94% of the donors were unwilling to identify themselves as donors, even to close relatives [41].

Commercialization of organs in developing countries works against the philosophy in developed countries of organs being allocated on the basis of medical need [50, 51]. However, despite medical need not being compatible with the rules of commercialization, the long wait for kidneys in developed countries is often a motivating factor in prompting these patients to travel to developing countries for transplants. In short, the commercialization of kidneys is feeding into the negative socioeconomic issues prevalent in developing countries.

According to surveys compiled by the 'Coalition for Organ-Failure Solutions', which combats the trafficking of human organs, 48–86% of kidney donors in Egypt, Iran, India and the Philippines reported a deterioration in their health, such as being tired more easily and not being able to carry heavy loads as before [52, 53].

While the arguments for and against a free market for kidneys is unavoidable and continues [51], the first step, in our view, could be the establishment of a database in

the Western countries of patients who have obtained their kidneys through commercial transaction. This could lead to identification of centers where these kidneys were obtained. A database would also identify surgical, medical and immunosuppressive protocols for recipients and donors in these hospitals. Another step would be to create liaison between the recipient and donor hospitals so that modern surgical and medical practices can be implemented. There should also be improved emotional and psychological support to both the recipient and the donor [54, 55]. However, establishment of a database, may perhaps lead to an erroneous impression the academic community is condoning this practice.

The recent scandal in which a number of physicians in India were arrested while in the process of forcibly removing kidneys from poor donors for recipients from the Western countries suggest that this practice is still widespread and may represent just the tip of iceberg [56, 57]. As long as the vast majority of people in Asia oppose donating organs for transplantation, commerce in organs for transplantation is likely to continue.

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