

## Causes for exclusion of living kidney donors at the transplant service of a third-level hospital in northwestern Mexico

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### ABSTRACT

**Objective:** To identify the causes for exclusion of living kidney donors at a third-level hospital in northwestern Mexico.

**Materials and methods:** An observational, cross-sectional, descriptive and retrospective study, in which the medical records of candidates for living kidney donation were evaluated from January 1, 2019 to December 31, 2021.

**Results:** Out of the 30 selected records, only 6.6 % (2) were chosen as donors, i.e., the rejection rate of the potential candidates was 93.3 % (28). The average age was 40.7 years; when divided into age groups, it was observed that 7.44 % were  $\leq 39$  years, 5.31 % were  $\geq 50$  years and 4.25 % were in the 40-49 age range. The main pathologies that caused the rejection of living donors were chronic diseases such as unknown renal disease, obesity, diabetes mellitus, systemic hypertension and heart diseases, which accounted for 60.7 %. The desire to donate was more frequent among blood relatives than non-blood relatives. In the case of blood relatives, i.e., siblings, parents, children, uncles, aunts, etc., 64.2 % were rejected, while 34.7 % of non-blood relatives, including spouses and friends, were rejected.

**Conclusions:** Based on the body mass index (BMI), the results showed that overweight and obesity were the main causes of exclusion, a situation that is consistent with the Mexican epidemiological profile. The number of living donors at our center has been reduced because most of the population is not healthy and has obesity, which affects the willingness to be a candidate for living kidney donation.

**Keywords:** Tissue Donors; Kidney Transplantation; Chronic Disease (Source: MeSH NLM).

## Causas de exclusión de donantes renales vivos en el servicio de trasplante de un hospital de tercer nivel del noroeste de México

### RESUMEN

**Objetivo:** Identificar las causas de exclusión de los donantes renales vivos en un centro hospitalario de tercer nivel en el noroeste de México.

**Materiales y métodos:** Estudio de tipo observacional, transversal, descriptivo, retrospectivo. Se realizó la evaluación de los expedientes clínicos de los candidatos vivos para donación renal, que abarcó el periodo comprendido entre el 1 de enero de 2019 y el 31 de diciembre de 2021.

**Resultados:** De los 30 expedientes seleccionados, solo se eligieron 2 (6,6 %) donadores, es decir, existió un índice de rechazo de 28 (93,3 %) de los potenciales candidatos. La edad promedio fue de 40,7 años; al dividirlos en grupos de edad, se observó que el 7,44 % fueron  $\leq 39$  años; el 5,31 %,  $\geq 50$  años; y el 4,25 %, de 40 a 49 años. Dentro de las principales patologías que originaron el rechazo del donador vivo se encuentran las enfermedades crónicas, como afección renal desconocida, obesidad, diabetes *mellitus*, hipertensión arterial sistémica y cardiopatías, que representaron el 60,7 %. El deseo de donar es más frecuente entre consanguíneos que en no consanguíneos. En el caso de los consanguíneos, es decir, hermanos, padres, hijos, tíos, etc., el 64,2 % fue rechazado; en los no consanguíneos, el 34,7 %, que incluía a esposos y amigos.

**Conclusiones:** Los resultados obtenidos sobre el índice de masa corporal (IMC) mostraron que el sobrepeso y la obesidad fueron las principales causas de exclusión, circunstancia que es particular en nuestro país respecto a su perfil epidemiológico. La cantidad de donantes vivos en nuestro centro se redujo porque la mayor parte de la población no es sana, padece obesidad y ello repercute al momento de presentarse como candidato a donante.

**Palabras clave:** Donantes de Tejidos; Trasplante de Riñón; Enfermedad Crónica (Fuente: DeCS BIREME).

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## INTRODUCTION

In our country, the first kidney transplant from a living kidney donor was carried out by Dr. Federico Ortiz Quezada and Dr. Manuel Quijano at Instituto Mexicano del Seguro Social (IMSS, Social Security Mexican Institute) in 1963. In this case, the patient's sister donated the kidney<sup>(1-3)</sup>. Since then, in Mexico, transplant has been the answer to thousands of patients living with end-stage failures of different organs and tissues. This procedure provides the opportunity to continue living with better quality of life because to organ donation<sup>(4)</sup>. The kidney is the organ with the highest demand because of the increase of diseases that cause renal failure, such as systemic hypertension and diabetes mellitus, the latter accounting for 43 % in Mexico<sup>(5-7)</sup>.

Pursuant to Title Fourteen, Chapter II, Article 321 of the General Health Act, donation involves the tacit or express consent of people so that, alive or after their death, their bodies or any of their body parts may be used for transplants. Therefore, donation must be voluntary, altruist, uninterested and comply with the clinical and legal conditions provided by the General Health Act<sup>(8-10)</sup>. Hence, a comprehensive medical and psychological evaluation—consisting of tests and studies to determine good physical, mental and social (family) health—should be conducted. There are two types of organ donors<sup>(11,12)</sup>: living donors, in whom the removal of organs occurs while they are alive, allowing the compensation of their body functions, and donors after brain death secondary to a pathology not related to the organ to be donated. The living donor's kidney has a survival time of 10 years after the transplant, with a rate between 77 and 93 %, while recipients from donors after brain death show a rate between 64 and 80 %<sup>(5,6)</sup>, probably due to hemodynamic effects of the graft<sup>(12-15)</sup>.

Donation from a living donor is divided into direct, in which there are affectional bonds between donor and recipient, and indirect, in which there are no affectional bonds between them. Direct donation is divided into genetically related (parents, siblings and children) and unrelated (spouses).

This type of donation is a relatively safe process that benefits recipients, with low morbidity and mortality rates estimated in 8 and 0.03 %, respectively<sup>(16)</sup>.

Perioperative mortality has been between 0.01 and 0.03 %<sup>(16-20)</sup>, which suggests that it is a safe procedure; the rehospitalization rate after three years from the surgical procedure is 1.43/10,000 patients per year<sup>(16-19)</sup>. The risk of developing a chronic renal disease following a kidney donation is similar to such risk among the general population (0.04 %) <sup>(5)</sup>. Donors have a mortality risk of about 1/3,500<sup>(16)</sup>, a fact which should be clearly advised before donation.

The risk of severe morbidity includes those caused by

respiratory diseases, procedure-related bleeding, surgical injury and urinary tract infections, splenic lacerations and deep vein thrombosis, which may cause pulmonary embolism<sup>(20-22)</sup>.

The process to obtain an organ from a living donor includes medical, emotional, social and economic aspects. This donation involves huge responsibility in donor evaluation and selection because of the exposure to risks; therefore, the prior assessment should be thorough. This will allow identifying the effects of the surgical event besides the potential benefit against disadvantages, if any<sup>(23)</sup>.

The adequate selection under the strict preoperative medical evaluation of donors is the main safety measure before surgery, while the subsequent rigorous and continuous clinical follow-up is the main tool to avoid a negative outcome in donors' health in the long term.

Living donors provide a significant decrease in cold ischemia time, the selection of a better immune-compatibility profile (human leukocyte antigen [HLA] testing) between the donor-receptor pair and the early start of immunosuppression because the date and hour of the procedure are known<sup>(20)</sup>.

Donors must be of legal age, of sound mind and physically independent. Also, they must be provided with all the information about the risks of the operation and the consequences of the removal of an organ or tissue by a physician different from those who will perform the transplant. In addition, it is necessary to confirm the compatibility with the recipient. Finally, their express consent is essential.

When the internal transplant committee has favorably evaluated the donor candidate, the resolution should contain the clinical case summary, including medical, clinical and psychological evaluation<sup>(24)</sup>. Another objective is to rule out any possible unlawful conducts—trade; coercion; intermediation to get organs, tissues and cells on a payment basis—and to state that it has been verified that such conducts do not exist<sup>(25)</sup>.

All the donations from living subjects must come from healthy people. Therefore, not all of them are performed since the evaluation determines causes for exclusion, such as tumor processes, positive human immunodeficiency (HIV) test, positive B or C hepatitis virus tests, diabetes mellitus, hypertension, obesity (body mass index [BMI] > 30 kg/m<sup>2</sup>), pregnancy, autoimmune diseases, being underage, intellectual disability, evidence of coercion, drug abuse or cardiorespiratory disease<sup>(20)</sup>.

The following are contraindications related to metabolic syndrome: BMI > 30 kg/m<sup>2</sup>, hyperfiltration (characterized

by increased creatinine clearance > 150 ml/min, probably due to glucose intolerance), metabolic syndrome vs. history of obesity, proteinuria > 130 mg/24 h, donor > 60 years, psychiatric diseases and important anomalies of the urinary tract (vesicoureteral reflux, neurogenic bladder) or vascular tree of the donor (aneurysms, arteriovenous fistulas) <sup>(26)</sup>.

The following clinical parameters and complementary tests are used to assess living donors: weight, height, BMI, systolic and diastolic blood pressure, blood group, histocompatibility typing (HLA testing) and cross-matching with the recipient, hemogram, coagulation, hepatic function panel, uricemia, proteinogram, calcium, phosphorus, alkaline phosphatase, lactate, dehydrogenase, amylase, lipase, acid-base balance, blood urea nitrogen (BUN), urea, serum creatinine, creatinine clearance from a 24 h urine collection, quantitative assessment of proteinuria from a 24 h urine collection, microalbuminuria, urinalysis, urine sediment, glycosylated hemoglobin, chest X-ray, abdominal ultrasound, computer tomography (CT) scan of the kidney, echocardiogram, urological examination in patients over 40 years, gynecological examination and mammogram in females over 30 years <sup>(20)</sup>. After a nephrectomy, living donors are followed up to confirm the adequate recovery of renal function and its normal development in the long term, which allows identifying risk factors (hypertension, hyperlipidemias, diabetes mellitus, etc.) that may appear in order to prevent future complications. Consultations begin the first weeks after hospital discharge, with clinical and renal function controls each month and then each year.

The recovery of renal function is generally quick (within days or weeks), but in some cases it takes months to reach the appropriate baseline level. The kidney size and function increase, thereby compensating up to 70 to 80 % of the renal function prior the removal <sup>(20)</sup>.

The incidence of renal failure among living donors is very low. A study conducted by the University of Minnesota showed that the incidence of chronic renal failure among donors is lower than among the general population <sup>(20)</sup> as a result of the post-transplant care given to donors. The results of kidney donation in the long-term depend on the adherence to the strict clinical follow-up of kidney donors during the first year <sup>(27)</sup>. Living kidney donation is considered an excellent therapeutic option, with better results in survival time and rehabilitation for the patient, which is a safe option for the donor-recipient pair. The rejection rate for a living donor is very variable. Wafa et al. stated a rejection rate of 49 % in a study of 1,661 cases <sup>(28)</sup>; on the other hand, Perlis described an acceptance rate of 50.2 % in Canada <sup>(32)</sup>.

The Unidad Médica de Alta Especialidad (High Specialty Medical Unit) is a referral center for kidney transplant that

serves beneficiaries—from Baja California, Baja California Sur, Sinaloa and Sonora—who suffer from chronic renal failure and receive renal replacement therapy by means of dialysis or hemodialysis.

Patients who have a living—related or unrelated—donor come to comply with the donation protocol; nevertheless, since 2019 the number of living donors has been notably reduced compared to previous years, despite protocols have been used with potential donors, who have been found to be unsuitable.

Therefore, this research set the objective of identifying the causes for the exclusion of living kidney donors at the Kidney Transplant Service of Hospital de Especialidades No. 2, IMSS.

This research attempts to determine the direct causes that make living kidney donation impossible in the unit. This information will explain the decrease in kidney transplant from living donors in our region. Also, it will provide information about the causes for the rejection of potential living donors for kidney transplants, which will lead to make a better evaluation and selection of such donors.

## MATERIALS AND METHODS

### *Study design and population*

An observational, cross-sectional, descriptive and retrospective study was conducted. For that purpose, a series of medical records of candidates for living kidney donation were selected using a non-probability convenience sampling method from January 1, 2019 to December 31, 2021 at the Kidney Transplant Service of our hospital, which is the only IMSS hospital in the northwestern region that performs kidney transplants from living or cadaveric donors.

### *Variables and measurements*

The demographic variables are age, sex, relationship between donor and recipient; and the clinical variables are BMI, blood type and main causes for rejection.

### *Statistical analysis*

The quantitative and qualitative variables were recorded on the data collection form, then transferred to a Microsoft Excel 2019 for Windows spreadsheet, and encoded and analyzed with IBM SPSS Statistics V24 for Windows in Spanish. Descriptive statistics with measures of central tendency and dispersion as well as graphs and tables for their interpretation were used.

### *Ethical considerations*

This study was evaluated, revised and authorized by the Research Ethics Committee and the Health Research Committee of Hospital de Especialidades No. 2, IMSS, under registration number R: 2022-2602-012.

## RESULTS

Out of a total of 31 assessed records, 30 complied with the selection criteria and only 6.67 % (2) of these were chosen as donors, i.e., the rejection rate was 93.33 % (28), out of whom 53.51 % (15) were males and 46.42 % (13) females (Table 1). The average age was 40.72 years (in the 23-58 age range); when divided into age groups, it was observed that 44.21 % (7) were  $\leq 39$  years, 31.20 % (5) were  $\geq 50$  years and 25.01 % (4) were in the 40-49 age range (Table 1).

Concerning the blood group, there were 22 candidates (78.51 %) with group O+, 4 (14.28 %) with group A+ and 2 (7.12 %) with group B+ (Table 1).

The average BMI among the excluded cases was 27.01 (in the 18.61-33.33 range). The BMI comprised three categories: normal in 7 cases (25 %), overweight in 11 (39.01 %) and obesity in 10 (36.20 %) (Table 1).

As to the relationship of rejected donors, there were 64 (2.1 %) blood relatives, including siblings, parents, children, uncles, aunts, etc., and 34 (7.2 %) non-blood relatives, including spouses and friends (Table 1).

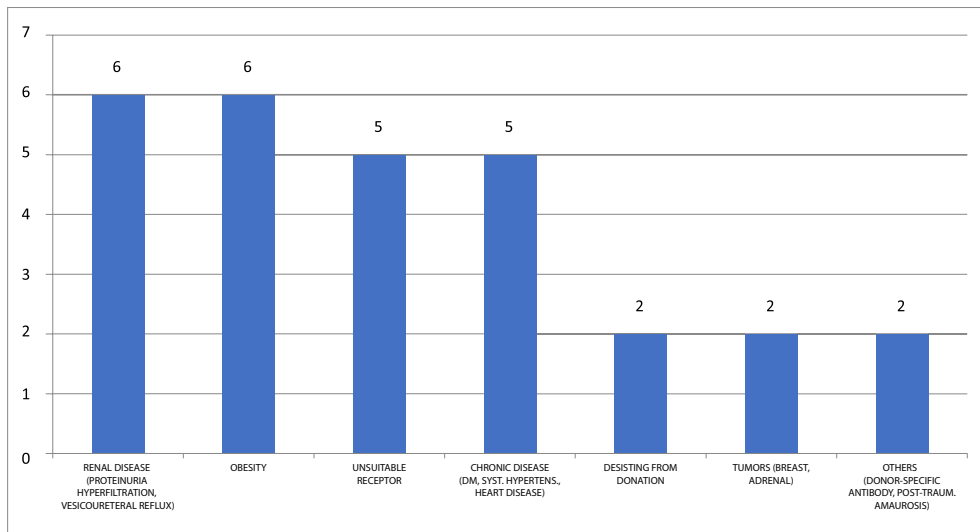
**Table 1.** Demographic and clinical variables of candidates for living kidney donation

Average age 40.7 years (23-58 age range)				$\leq 39$	40 to 49	$\geq 50$
				7 (25.00 %)	16 (57.14 %)	5 (17.85 %)
Rejection rate				28/30 (93.33 %)		
				N	%	
Males				15	54.00	
Females				13	46.00	
Total				28	100.00	
Blood type	Group O+	Group A+	Group B+	Total		
Total	22 (78.57 %)	4 (14.28 %)	2 (7.14 %)	28 (100 %)		
Excluded BMI (Average 27.01 [range: 18.6-33.3])				Normal	Overweight	Obesity
				7 (25.00 %)	11 (39.28 %)	10 (35.71 %)
Relationship between donors and recipients				Blood relatives	Non-blood relatives	
				65.30 %	34.70 %	
Main causes for rejection				Chronic diseases	Unsuitable recipient	Other causes
				17/28 60.71 %	5/28 17.85 %	6/28 21.42 %

**Source:** Clínica de Trasplante (Transplant Center), Hospital de Especialidades No. 2, IMSS, Ciudad Obregón, Sonora, January 2019 to December 2021.

The main causes for rejection were chronic diseases in 17 cases (60.7 %): unknown renal disease, obesity, diabetes mellitus, systemic hypertension and heart diseases were found out. Other causes were an unsuitable recipient in 5 cases (17.85 %) as well as desisting from donation, (kidney and breast) tumors and other causes, with 2 cases each (Figure 1).

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**Figure 1.** Causes for rejection among 28 patients evaluated for kidney donation from 2019 to 2021 at Hospital de Especialidades No. 2, IMSS  
**Source:** Clínica de Trasplante, Hospital de Especialidades No. 2, IMSS, Ciudad Obregón, Sonora, from January 2019 to December 2021.

### DISCUSSION

Organ donation is a rigorous process that deserves a comprehensive analysis of each candidate to get the best benefit for recipients and the lowest risk for donors.

The present study established a rejection rate of 93.33 %, which is much higher than that found by Wafa et al., whose study among 1,661 cases in 2004 showed a rejection rate of 49 %<sup>(28)</sup>. In our analysis, 54.00 % were male and 46.00 % female donors, percentages that are contrary to those of other research studies. For example, the research conducted by Ezzaki et al. in 2019 in Casablanca, Morocco, showed 58.31 % of female and 41.72 % of male donors<sup>(29)</sup>. Such percentages are similar to those obtained by Lapasia et al. (Department of Medicine at Stanford School of Medicine), which accounted for 59.21 % of female and 41.31 % male donors<sup>(30)</sup>.

The analysis performed in our unit determined an average age of 40.7 years, slightly under that found by Ezzaki et al., who reported an average of 43.9 years<sup>(29)</sup>. Blood type O+ was the largest, with 78.51 %. The BMI results evidenced overweight and obesity as the main causes for exclusion, with 21.4 %, a finding similar to that of Lapasia et al., who described obesity as the main cause for rejection, which accounted for almost 40.00 % of donors<sup>(30)</sup>. Ezzaki et al. also mentioned obesity as a cause for exclusion. In our opinion, the foregoing is related with the epidemiological problem that obesity represents worldwide. Renal disease—including hyperfiltration and proteinuria—showed the same rate as obesity (21.41 %). This is higher than the result found by Ezzaki et al. (9.33 %) but similar to that described

by Moore et al. (21.91 %)<sup>(31)</sup>.

Concerning the relationship between donors and recipients, blood relatives were found in 65.30 %, including siblings, parents, children, etc., which is lower than the result determined by Wafa et al. (89.42 %) and Ezzaki et al.<sup>(28,30)</sup>.

In conclusion, the study showed that the main causes for exclusion among potential living donors were undiagnosed obesity, renal dysfunction, diabetes and hypertension, which led to the exclusion of more than half of the prospective donors that came to our transplant center. The BMI estimation evidenced that overweight and obesity were the main causes for exclusion, a situation that is consistent with the Mexican epidemiological profile. The number of living donors at our center has been reduced because most of the population is not healthy and has obesity, besides the consequences resulting from this problem which affects the willingness to donate.

These results show that a large number of people consider themselves “healthy,” but a comprehensive evaluation reveals that they suffer from undiagnosed chronic diseases. One of our limitations was underreported data on potential donor records.

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