RESEARCH



Examining kidney donation in Nigeria: a mixed methods study of family members' knowledge, perceptions, information needs and decision-making

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Abstract

Background A major challenge of transplantation is the unavailability of organs. For a successful transplantation process, awareness and negative attitudes among potential donors need to be sought for and addressed. Our objective was to examine the knowledge, perception and information needs of family members of patients with chronic kidney disease (CKD) in Nigeria and factors associated with their likelihood to decide to donate a kidney.

Methods This was a convergent parallel mixed method study that obtained information from family members of patients with CKD in Nigeria. Ordinal logistic regression was used to determine factors associated with the likelihood of donation. Thematic analysis was used for the qualitative analysis.

Results Three hundred and six respondents with a mean age of 41.2 ± 12.9 years participated in the quantitative survey. About 30% of participants were not familiar with the concept of kidney donation; 63% had never sought information about kidney donation; about 75% felt inadequately informed about the risks, benefits, and requirements of kidney donation. About 26% of participants were unlikely to consider donating a kidney to a family member with CKD. The majority expressed medical risk (47%) as their primary concern with donation. The age group of respondents (OR 0.48, 95% CI 0.239–0.967, P = 0.04), parent/child relationship, (OR 2.42, 95%CI 1.198–4.886, P = 0.01), awareness of the suitable medical factors for donation (OR 2.07, 95%CI 1.127–3.796, P = 0.02), and provision of support or counsel to donors (OR 3.89, 95%CI 1.576–9.638, P = 0.003), were independently associated with decisions to donate. The qualitative analysis identified personal, socio-cultural, religious and psychological factors that could influence willingness to donate.

Conclusion This study identified factors that influenced donations and brought to the fore the need to adequately educate and provide support for potential kidney donors.

Clinical trial number Not applicable.

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Keywords Kidney donation, Family member, Awareness, Information needs, Decision-making

Introduction

End-stage kidney disease is a huge public health problem globally and is disproportionately more in low and middle-income countries.(LMIC) [1, 2]. In Nigeria, ESKD increased from 6.1–18.9% between 1989 and 2007 [2] Kidney transplantation which is the preferred and effective form of kidney replacement therapy (KRT) compared to maintenance dialysis offers improved quality of life and increased survival rates for ESKD patients [3]. In Nigeria, transplantation has evolved tremendously over the years since the year 2000 with over 2000 kidney transplants done in the country [4, 5]. As with other countries, one of the huge barriers to kidney transplantation is the shortage of organs.

In organ donation, the need for ethical and legal considerations is paramount globally. In Nigeria, the National Health act of 2015 is a vital legal framework guiding tissues and organ donation from living donors for medical use in an ethical manner. The framework prohibits any financial compensation to prevent the commercialization of organ donation. While the law supports altruistic donation, significant ethical concerns are rife regarding the motivation of living donors in a country with high poverty rates and vulnerable individuals who may feel pressure to donate due to their financial circumstances [6-8].

The practical realities of the healthcare delivery and societal challenges continue to complicate the organ donation process in Nigeria. Prospective donors may have doubts and skepticism about donating their kidneys. Ethically speaking, living donor kidney transplantation is acceptable only when the donor is willing and altruist [8]. Another major barrier especially in LMICs is the family influence. Previous studies have shown that the family plays an essential role in organ donation [9–11]. Aside from being commonly approached to serve as donors for their loved ones with ESKD, they play a crucial role in the decision-making process regarding kidney donation and transplantation [9-11]. Several factors can influence decisions on kidney donation by family members such as sociodemographic factors (age, gender, religion, race/ethnicity, education level, marital status), relationships with the patient, fears about the potential risks of donating a kidney, and lack of confidence in the health system [9– 11]. Other factors are altruism, level of knowledge about the kidney donation process, supportive social network, economic considerations, personal values and belief systems [10, 12–14].

While knowledge of kidney donation is widespread among many groups in Nigeria, there remains a significant gap among family members of CKD patients regarding the process. Also, limited research on factors influencing the decision to likely donate a kidney to relatives of CKD patients exists. Further research on this is therefore needed to address the challenge of kidney availability. Most of the studies on this topic in Nigeria were restricted to a few centers and were quantitative surveys [11, 15–17]. It is against this background that this nationwide study aimed at investigating the knowledge, perceptions, and information needs of family members of CKD patients in Nigeria, while also looking at identifying factors related to their decision to likely donate a kidney using mixed methods approach. The study contributes to the literature on kidney donation for transplant in Nigeria.

Methods

Study setting

This was a multi-centered study in major kidney centers across the six geopolitical zones and FCT in Nigeria. (see Fig. 1) Nigeria has an estimated population of almost 210 million as of March 2021 [18]. It has 36 states divided into six geopolitical zones and the Federal Capital Territory (FCT), namely, (South West-SW, South East-SE, South South-SS, North Central-NC, North West-NW and North East-NE zones). The zones vary significantly in size, population, and economic activities and they also exhibit notable differences infrastructurally and in their social, religious, and health attributes [18]. Which may contribute to varied perspectives among participants in different regions.

Study design and duration

We gathered data through a cross-sectional, descriptive and interpretative approach, drawing on grounded theory and phenomenology.

The study employed a mixed methods convergent parallel design approach which allowed for the simultaneous collection of quantitative and qualitative data with equal weighting of the two methods [19]. The two components were analysed independently and interpreted together to emphasize triangulation of the results ensuring robustness and depth of the information needed. The qualitative data contextualized the quantitative findings thereby enhancing the validity of the study. The data collection time was shortened to address practical constraints. The integration of findings provided a better understanding of the issues relevant in developing a culturally sensitive intervention to improve kidney donation rates in Nigeria.

Data collection occurred between 1st September to 31st October 2023.



Fig. 1 Map of Nigeria showing the six geopolitical zones and the distribution of participants

The study population and sampling

The study population were family members of patients with CKD stages 3, 4 to 5 and ESKD on maintenance dialysis, who were 18 years and above and consented to participate. Family members in this study referred to first degree relatives and member of the extended family. Consecutive members who fit the eligibility criteria for the quantitative arm were surveyed. For the qualitative arm of the study purposive sampling was employed [20]. One hospital was selected from each of the six geopolitical zones and the FCT to achieve geographical diversity, this selection was based on the hospital's capacity as referral kidney centers. Four participants were again purposively selected from each of the selected hospitals giving a total of 28 participants. They were selected because they understood English, were of the different cultural, religious and regional backgrounds and could provide us with relevant information and views on kidney donation. They also had some level of involvement in decision making regarding the kidney donation and were willing to participate.

Sample size

The quantitative study sample size was calculated using the formula, n = Z2p(1-p)/e2 [21]. So assuming a target population of CKD of 12% [22], and a margin of error of 5% at a 95% confidence interval, 163 persons with a 10% non-response was anticipated. Therefore, the minimum sample size for this study was 180.

Methods and instruments for data collection

The data for the study were collected using both qualitative and quantitative (survey) methods. The quantitative, data was collected, using a web-based survey hosted on the Google survey platform. Each survey was linked with a participant code which was saved in a secured file. The items on the survey questionnaire were divided into sections. Section A documented the demographic characteristics. Sections B and C assessed knowledge/ awareness, perception and information needed for kidney donation. Section D enquired about factors that may affect potential kidney donation. The questionnaires were self-administered, but interviewer administered when the relation could not read or write. Likelihood of donating a kidney to a family member was the participant's report of the probability of readiness or intention or decision to donate a kidney and was classified on a 5-point Likert scale as Very likely, Likely, Neutral, Unlikely, Very unlikely.

For the qualitative aspects, we conducted face-to-face in-depth-interviews (IDI) for 28 family members. The interview guide has 15 questions (see appendix). The average duration of the interview was about 30 min. All interviews were audio recorded and transcribed accordingly. The transcriber listened to the recording multiple times and reviewed the recordings to ensure there was no misrepresentation.

Validity and reliability

The research team consisted of consultants and senior residents in Nephrology many of whom are experienced in research. The validity of the instruments was ensured through a review of the literature and the input of senior colleagues and researchers. The research assistants were trained on the study objectives and on administering the questionnaire and the IDI.

Reliability was ensured by pretesting the survey questionnaire while the IDI guide was pre-tested in 1 person in each geopolitical zone. The questionnaire completeness was checked daily. Identified discrepancies or missing responses were clarified with the participants immediately.

Statistical analysis

Quantitative data was analyzed using Stata 16.1 Stata-Corp LLC. Categorical variables were presented as absolute numbers and percentages. We used Chi-square to compare categorical data and an independent t-test to compare difference between means. We used an ordinal logistic regression analysis to assess the relationship between sociodemographic and other factors, and the decision to donate a kidney to a family member. For analysis purpose, we categorized the likelihood of decision into three groups as Unlikely, Neutral, Likely. First, we performed bivariate analysis to select significant factors which were introduced into the multivariate model. In all, the level of significance of each test was set at P < 0.05.

Thematic analysis was used for analysis of the qualitative data [23]. A group of researchers reviewed the transcripts and transferred them into ATLAS.ti version 9.0.22.0 for organization and sorting to analyse the data further. The transcripts were read by 2 researchers for familiarization and codebook development. A hybrid approach was used for the development of the codebook. Before the main coding began, the researchers coded the same transcripts to ensure that the codes were consistently applied if need be. A consensus-building approach that was guided by the research objectives was used to resolve discrepancies. Thereafter, ATLAS.ti projects from different researchers were carefully reviewed through the inter-coder reliability tool to know the level at which

Table 1 Sociodemographic characteristics of study participants

Variable(n)	Freq.	%	Variable(<i>n</i>)	Freq.	%
Mean age (SD)	41.2		Religion (305)		
	(12.9)				
Age Group (303)			Christianity	175	57.4
18-30 years	71	23.4	Islam	129	42.3
31–50 years	161	53.1	Traditional	1	0.3
51-70 years	71	23.4	Tribe (306)		
Sex (306)			Bini /Esan	41	13.4
Female	148	48.4	Hausa /Fulani	47	15.4
Male	158	51.6	Igbo	47	15.4
Level of Education			Kanuri	23	7.5
(306)					
No Formal Education	25	8.2	Nupe	11	3.6
Primary	18	5.9	Yoruba	84	27.5
Secondary	61	19.9	Others	53	17.3
Tertiary	202	66.0	Started		
			Dialysis (306)		
Relationship with the			No	99	32.4
Patient (306)					
Child/parent	79	25.8	Yes	207	67.6
Sibling	47	15.4			
Spouse	84	27.5			
Nephew, Niece, Uncle	26	8.5			
Aunt, Cousin					
Other	70	22.9			

their codes agree with each other. Coding of different transcripts was subsequently done. The quotations were pulled together to understand patterns across the data. The analysis was guided by the study objective.

Ethical considerations

Approval for the study was obtained from the Nigerian National Health Research Ethics Committee, Federal Ministry of Health, Abuja. (NHREC/01/01/2007-23/08/2023). The study was conducted per the ethical principles outlined in the Declaration of Helsinki. Informed consent was obtained from all participants before their involvement in the study. A note preceded the survey stating that informed consent was acknowledged if the survey was completed and returned. Confidentiality and anonymity were ensured throughout the data collection and analysis process. Participation was voluntary and they had the right to withdraw from the study at any time without any negative consequences. The data collected were stored securely in computers and were accessible only to the lead researcher and data analysts.

Results

Quantitative survey results

Socio-demographic characteristics of respondents

A total of 306 family members were surveyed. The mean age was 41.2 ± 12.9 years. Most participants were within the 31-50 age range and had a tertiary level of education. The majority of the relationships reported were parent/ child (26%) and spousal (27%) (Table 1).

Knowledge and information about kidney donation

About a third (30%) of participants were not familiar with the concept of kidney donation, and more than 60% had never sought information or support about kidney donation. Additionally, 27% did not personally know anyone who had donated a kidney before. It is worth noting that 78% of participants were unaware of the steps involved in the kidney donation process. Only 32% had discussed the kidney donation process with healthcare professionals, two-thirds were not aware of any ethical or legal guidelines, and 75% felt inadequately informed about the risks, benefits, and requirements of kidney donation (Table 2).

Perception towards kidney donation

The majority of participants perceived kidney donation as a safe and viable treatment option.(Fig. 2a) while majority expressed medical risk (47%) and financial implications (20%) as their primary worries in donating a kidney. (Fig. 2b)

Table 2 Knowledge/ awareness and information about kidney donation

Awareness/knowledge about kidney donation and processes	Frequency	Percentage
Familiarity with the concept of kidney donation		
Very familiar	72	23.5
Somewhat familiar	142	46.4
Not familiar at all	92	30.1
Knowledge of anyone who has donated a kidney before		
Yes	222	72.6
No	84	27.4
Awareness of the steps involved in the kidney donation process		
Yes	66	21.6
No	240	78.4
Awareness of ethical or legal guidelines on donation in Nigeria		
Yes	96	31.4
No	210	68.6
Discussion of donation process with healthcare professionals or transplant coordinators		
Yes	95	31.1
No	211	68.9
Discussion of the donation process with other family members		
Yes	105	34.3
No	201	65.7
Ever sought information about kidney donation?		
Yes	113	36.9
No	193	63.1
Adequately informed about the risks, benefits, and requirements of kidney donation		
Yes	76	24.8
No	230	75.2
Provision of information/assistance on donation by support groups or organizations in your area.		
Yes	32	10.5
No	274	89.5
Ever sought support or guidance from these organizations?		
Yes	27	8.8
No	279	91.2

Likelihood of kidney donation

About 26% of participants were unlikely to consider donating a kidney to a family member with CKD. (Fig. 3a) Children and siblings were the most commonly chosen options to be the primary candidates to donate (31% and 36% respectively).

Perceptions of Family Members towards Kidney Donation.

Table 3 displays perceptions of respondents towards kidney donation. Majority of the respondents (68%) said age was a significant factor when deciding on kidney donation, (74%) agreed on the importance of emotional and psychological compatibility between the donor and recipient, majority (89%) agreed support/counseling be provided to potential donors to address emotional/psychological concerns. 55% disagreed on any ethical restrictions or limitations on who can donate a kidney to a family member.

Factors influencing kidney donation decisions

Table 4 shows factors that were found to influence the likelihood of donating a kidney. The younger age group were more likely to donate than the older group (p=0.002). Family members from the northeast, north central, and FCT were the most likely to donate (p=0.024). Being a parent or child, lack of information about the risks and benefits of kidney donation, awareness of ethical/legal regulations of kidney donation (p=0.006), awareness of medical factors determining donor suitability (p<0.001), emotional/psychological compatibility (p=0.01), and discussion of kidney donation with family members (p=0.005) significantly affected the likelihood of donation.

Factors associated with likelihood of making a Positive Decision about Kidney Donation.

The age group of respondents (OR 0.48, 95% CI 0.239-0.967, P = 0.04), parent/child relationship with the patient, (OR 2.42, 95%CI 1.198–4.886, P = 0.01), awareness of the suitable medical factors for donation (OR 2.07, 95%CI 1.127–3.796, P = 0.02), and provision of



Fig. 2 Perception towards kidney donation





Perceptions	Frequency	Percent
Age as a significant factor when deciding on a donor		
Yes	210	68.6
No	96	31.4
Importance of emotional and psychological compatibility between the donor and recipient		
Very important	125	40.9
important	103	33.7
Neutral	55	17.9
not important	23	7.5
Provision of support or counseling to potential donors to address emotional/psychological concerns		
Yes	272	88.9
No	34	11.1
Should there be any restrictions (ethical) or limitations on who can donate a kidney to a family member?		
Yes	137	44.8
No	169	55.23

support or counsel to donors (OR 3.89, 95%CI 1.576– 9.638, P=0.003), were independently associated with likelihood or decisions to donate. (Fig. 4)

Qualitative results

Sociodemographic information of interview respondents

A total of 28 family members were interviewed in this study. The age of participants ranged from 21–78years. Majority attended tertiary institutions and were Christians. The language used was English for all the respondents. Many of the respondents were children of the patients.(Table 5).

There were 6 themes and 22 subthemes that emerged on analysis as shown in Table 6.

Theme 1: knowledge of kidney donation and transplantation Most respondents displayed a good knowledge of kidney donation and transplantation, across board reiterated that kidney transplantation is the process/procedure of removal of faulty or damaged kidney and replacing it with a healthy one. Reflecting on this, one participant remarked,

... from the general perception that a layman would have is that, taking one out of two kidneys of an healthy person to donate to someone who has kidney failure; whose two kidneys have failed. That is my own understanding. (Son NC)

Kidney transplantation was also defined with regards to compatibility or kidney match where the donor's kidney has to be compatible or match with that of the recipient. As another participant said,

It is a condition whereby, maybe a patient, someone's kidney is bad and you want to put another one that matches his or her own so that the person may be able to live.(Daughter SE).

However, a few respondents were not knowledgeable about the procedures as shown.

I don't know much about it but I used to hear kidney transplant. (Brother NW)

Theme 2: willingness to donate a kidney Willingness of a relative to donate kidney to his/her patient is a factor revealed that would influence kidney donation decision among relative of CKD patients. There were mixed reactions to this. Most of the relatives publicized their willingness to donate with reasons.

Some of the respondents stated that they are willing to donate kidney to their patients because of the love they have for them as quoted,

Yes, I'm willing because I really love the person and giving my kidney to the person will be the least I can do and I can't stand the person being in pains. (Son SS).

yes of course I am willing to donate a kidney to my mother....because she is my mother, she takes care of me since I'm small. She did everything for me. How can I not give her my kidney as my mother.(Son NE).

In contrast to this, some respondents revealed they are not willing to donate their kidneys to their patients because of the patients old age, as they are much younger and having a lot of responsibilities.

my answer is No, the reason being that... my dad in question is aged and I am young and being that I'm the only child of which I have a lot of responsibilities. I don't think I will be fit enough looking at these

Table 4 Factors influencing kidney donation decisions among family members of Ckd patients

Factors	Total	Unlikely (77)	Neutral (71)	Likely (158)	P-value
Age group					0.002
18–30	71	17(23.9)	10 (14.1)	44 (62)	
31–50	161	31(19.3)	45 (28.0)	85 (52.8)	
>50	71	29 (40.9)	14 (19.7)	28 (39.4)	
Religion					0.336
Islam	129	29(22.5)	29(22.5)	71(55.0)	
Christianity	175	48 (27.4)	41(23.4)	86 (49.1)	
Education					0.187
No formal	25	11(44.0)	4 (16.0)	10 (40.0)	
Primary	18	6 (33.3)	3 (16.7)	9 (50.0)	
Secondary	61	16 (26.2)	18(29.5)	27 (44.3)	
Tertiary	202	44 (21.8)	46(22.8)	112 (55.5)	
Ethnicity					0.450
Bini/Eshan	41	12 (29.3)	7 (17.1)	22 (53.7)	
Hausa/Fulani	47	16 (34.0)	11(23.4)	20 (42.6)	
Igbo	47	13 (27.7)	14(29.8)	20 (42.6)	
Kanuri	23	3(13.0)	5(21.7)	15(65.2)	
Nupe	11	2(18.2)	2(18.2)	7(63.6)	
Yoruba	84	19 (22.6)	24 (28.6)	41 (48.8)	
Others	53	12 (22.6)	8 (15.1)	33 (62.3)	
Geopolitical zones					0.024
FCT	39	7(17.9)	11(28.2)	21 (53.9	
North-central	50	9(18.0)	13(26.0)	28 (56.0)	
North-east	46	3 (6.5)	15(32.6)	28 (60.9)	
North-west	54	23 (42.6)	9(16.7)	22 (40.7)	
South-east	21	5 (23.8)	5(23.8)	11(52.4)	
South-south	46	13 (28.3)	8 (17.4)	25 (54.4)	
South-west	49	17 (34.7)	10(20.4)	22(44.9)	
Relationship with the patient					0.005
Parent	79	9(11.4)	17(21.5)	53 (67.1)	
Spouse	84	28 (28.5)	19 (22.6)	37(44.0)	
Sibling	47	14 (29.8)	12 (25.5)	21 (44.7)	
Child	70	21(30.0)	10 (14.3)	39 (55.7)	
Uncle, Aunt, Nephew, Niece, Cousin	26	5 (19.2)	13 (50.0)	8 (30.8)	
Age as a deciding factor					0.005
No	96	29 (30.2)	18 (18.8)	49 (51.0)	
Yes	210	48 (22.9)	53 (25.2)	109 (51.9)	
Informed about risks/benefits, of kidney donation					0.006
No	230	63 (27.4)	61 (26.5)	106 (46.1)	
Yes	76	14 (18.4)	10 (13.2)	52 (68.4)	
Awareness of ethical/legal regulations of kidney donation					0.006
No	210	63 (30.0)	50 (23.8)	97 (46.2)	
Yes	96	14 (14.6)	21 (21.9)	61 (63.5)	
Awareness of medical factors determining donor suitability					< 0.001
No	194	60(30.9)	49(25.3)	85(43.8)	
Yes	112	17(15.2)	22 (19.6)	73 (65.2)	
Importance of emotional/ psychological compatibility.					0.010
Not important	23	12(52.2)	1 (4.4)	10 (43.5)	
Neutral	55	18 (32.7)	15 (27.3)	22 (40.0)	
Important / Very important	228	47(20.6)	55 (24.1)	126 (55.3)	
Awareness of steps in kidney donation process					0.114
No	240	66 (27.5)	57(23.8)	117(48.8)	
Yes	66	11(16.7)	14(21.2)	41(62.1)	

Table 4 (continued)

Factors	Total	Unlikely (77)	Neutral (71)	Likely (158)	P-value
Discussion of kidney donation with family members					0.006
No	201	60(29.9)	50(24.9)	91(45.3)	
Yes	105	17(16.2)	21(20.0)	67(63.8)	
Discussion with HCP or coordinator					0.004
No	211	62(29.4)	53(25.1)	96(45.50)	
Yes	95	15(15.8)	18(18.9)	62(65.3)	
Provision of Support or counsel to donors					< 0.001
No	34	19(55.9)	7(20.6)	8(23.0)	
Yes	272	58(21.3)	64(23.5)	150(55.2)	



Fig. 4 Ordered logistic regression of factors associated with likelihood of making a positive decision

circumstances to be able to donate to my dad at this time.(Daughter FCT).

Theme 3: factors influencing willingness to donate kidney

i. Personal factors

The age of both the patient and the relative has to be considered when donating a kidney, invariably, age has a major role to play in making kidney donation decision. According to some respondents, the older the patient, the lesser the likelihood for a young relative to donate his/her kidney because of the perceived risks associated with donation, the young relatives have a bright future ahead of them which should not be hampered by any kidney donation. For instance, a participant stated that if her dad was younger she would have considered donating her kidney to him but because he is old donating kidney to him might be a waste of time because he might die soon. She says,

Well what can impact my decision as my dad, Yes for instance, if he was still in his middle age, I would have taken the risk of going further to donate...... But at the age he is now presently, I don't buy into that.(Daughter FCT).

Similarly, it was revealed by some respondents that because of the perceived associated risks of kidney donation, the older the relative is, the lesser the likelihood for such a relative to decide to donate kidney to either a younger or another older patient. Thus, many respondents said that their present age will affect their ability to donate kidney to their relative. A participant said,

ID	Age	Gender	Occupation	Education	Relationship	Religion	Center	Location
001	41	Female	Civil servant/	Tertiary	Daughter	Christianity	UATH	Abuja/FCT
002	30	Male	Unemployed	Tertiary	Son	Christianity	UATH	Abuja/FCT
003	66	Female	Retiree	Tertiary	Wife	Christianity	UATH	Abuja/FCT
004	29	Male	Not employed	Tertiary	Son	Christianity	UATH	Abuja/FCT
005	37	Male	Real Estate	Tertiary	Son	Christianity	UITH	N.Central
006	37	Female	Business	Tertiary	Wife	Christianity	UITH	N. Central
007	44	Female	Civil servant	Tertiary	Sister	Christianity	UITH	N. Central
800	55	Male	School Administrator	Tertiary	Husband	Christianity	UITH	N.Central
009	43	Male	Soldier	Tertiary	Husband	Islam	ATBUTH	N. East
010	33	Female	Principal env. Health officer	Post-Secondary	Niece	Islam	ATBUTH	N. East
011	28	Female	Business	Tertiary	Daughter	Islam	ATBUTH	N.East
012	24	Male	Student	Post-Secondary	Son	Islam	ATBUTH	N. East
013	21	Male	Student	Secondary	Son	Islam	FMC	N.West
014	29	Female	Teacher	Tertiary	Sister	Christianity	FMC	N. West
015	34	Male	Civil Servant	Tertiary	Son	Islam	AKTH	N. West
016	40	Male	Business	Tertiary	Brother	Islam	AKTH	N. West
017	59	Female	Retiree	Tertiary	Daughter	Christianity	FTH	S.East
018	52	Female	Unemployed	Secondary	Mother	Christianity	FTH	S. East
019	32	Female	Business	Tertiary	Daughter	Christianity	FTH	S. East
020	44	Female	Civil servant	Tertiary	Daughter	Christianity	FTH	S.East
021	37	Male	Technologist	Tertiary	Son	Christianity	UBTH	S. South
022	78	Male	Retiree	Tertiary	Husband	Christianity	UBTH	S. South
023	60	Female	Nursing	Tertiary	Mother	Christianity	UBTH	S. South
024	66	Male	Retiree	Tertiary	Father	Christianity	UBTH	S.South
025	56	Female	Catering	Tertiary	Wife	Christianity	UNIMED	S.West
026	28	Female	Student + business	Secondary	Sister	Christianity	UNIMED	S.West
027	33	Male	Business	Tertiary	Son	Christianity	UNIMED	S.West
028	30	Female	Business	Tertiary	Sister	Christianity	UNIMED	S.West

Table 5	Participant c	haracteristics fo	or the qual	itative stud	lv on kidn	ev donation	in Nigeria
					/		9

Note UATH- University of Abuja Teaching Hospital, UITH- University of Ilorin Teaching Hospital, ATBUTH-Abubakar Tafawa Balewa University Teaching Hospital, FMC-Federal Medical Centre, AKTH- Aminu Kano Teaching Hospital, FTH-Federal Teaching Hospital, UBTH- University of Benin Teaching Hospital, UNIMED- University of Medical Sciences

N-North, E-East, W-West, S-South. Env-environmental

like for my age now, I don't think it will be possible for me to donate again. (So you said your ability to donate might be affected by your age?) Yes I am 66years.

This was corroborated by another who stated that,

I intentionally wanted to donate but I was advised that with my age, I cannot go for that (78) and donating for somebody of low age. it is not.... My family advised that I'm too old for that likewise my son. (Husband SS)

ii. Religious factor

Religious belief would positively impact their decisions to donate kidney to their relatives. According to the respondents, both the Christian and Muslim religions encourages kidney donation because the religion sees it as a way of saving the life of a fellow human being. According to two participants, I am from the northern part of Nigeria, going by my religion as a Muslim, I don't think there is any barrier. donating a kidney is not haram. (Son NW)

'I am a Christian, it is not out of place to donate, that is what we are taught.(Husband NC).

Contrarily according to a participant, certain Christian denominations are against the idea of kidney donation. This respondent specified that,

I am not a Jehovah witness or deeper life, I am a catholic. And it is not in our doctrine that we should not donate blood or kidney. Except the denomination I mention. Even to donate blood when the person is dying and they needed blood seriously, the person will eventually die (Husband SS).

iii. Socio-cultural factor

Table 6 Themes and subthemes of the interviews

Themes	Subthemes
1→Knowledge of kidney Donation and Transplantation	Good knowledge Poor knowledge
2→Willingness to donate a kidney	Willing to donate Unwilling to donate Undecided
3→Factors influencing willingness to donate kidney	Personal factors Religious factors Sociocultural factors Psychological factors Concerns and Fears about kidney donation Relationship with patients
4→Participation in Kidney Donation Education Program.	Absence of formal education Personal study
5→Information and Support Needed for Kidney Donation Decision.	Donation risks Chances of survival Surgery procedure Transplant team's expertise Gender eligibility Alternative to kidney donation Monetary support
6→Recommendations from family members	Early public awareness creation Provision of adequate equipment and services

From the data, there seems to be no culture that is against kidney donation as respondents across board, publicized that their various cultures do not have any taboo against kidney donation. For instance, someone said,

no I have not heard but I know that people donate in my tribe.

To confirm this, the wife to a patient from the Gbagi tribe (Abuja) revealed that.

to my knowledge, I don't' think it has ... I'm Gbagi ...

Likewise also supporting.

No, not at all we don't have any cultural taboo against kidney donation. (Son SW)

The present lifestyle of the relatives was another social factor accessed that could influence kidney donation decisions. In this vein, many of the respondents reiterated that their present lifestyle cannot affect their ability to donate a kidney because they neither smoke nor drink alcohol so their chances of kidney donation is very high. For instance,

I don't drink in the first place. I have stopped drinking for the past twenty something years. I don't smoke, So it will not affect me. I don't go to beer parlour.(Husband SS).

for now I believe the only factor that can actually affect it is the intake of alcohol. But for some times now, I've reduced it... I don't smoke (Son SS).

However, very few respondents revealed that their present lifestyle will negatively affect their chances of donating kidney because they either smoke or drink alcohol and this act is perceived to damage kidney, for instance,

I don't smoke but I drink responsibly....I think it can affect my ability to donate because they used to advise people who used to drink too.(Sister SW).

iv. Psychological factors

Most respondents publicized that they do not have any emotional or psychological challenges with regards to donating kidney to their relatives. However psychological factors such as having thoughts of being incomplete after donating organ was expressed thus,

so time to time the emotional aspect of it will be there and psychologically, it will be dawning on one as being incomplete as a result of having just one kidney. (Daughter FCT)

v. Concerns and fears about kidney donation

Fear of death of either or both the donor and recipient as a result of procedure complication, being afraid that the remaining kidney might not function optimally leading to kidney problems in the future, waste of effort if the kidney fails, inability to cope with pregnancy and delivering babies or secure some specific type of jobs and expertise of the transplant team were major concerns raised by some of the respondents, thus.

the fear of surgery, the fear of general anaesthesia and two family members undergoing surgery at the same time.(Mother SS).

what will trouble my mind is if the one kidney that is remaining did not function.(Mother SS).

With regards to Jobs and future ambition, a participant responded thus,

I think the only skepticism I have is about my future ambition. There are jobs I want to apply for, maybe uniform job and then they might not want to take you because you have just one kidney. (Son FCT) Similarly, few female relatives from the North seemed to have concerns about their ambition or ability to bear children in the future if they donated their kidney. For example, a sister relative from North West publicized that,

Yes, for me somehow because I'm not married yet and also I don't have children of my own. That is my concern.(Sister NW).

And from a daughter in the FCT.

my fear is professionalism. I believe that I will like to know if the person handling the operation is extremely professional about it.(Daughter FCT).

vi. Relationship with patient with kidney disease

The relationship and closeness between the relatives and patients was a strong factor that favoured willingness to donate kidney. Many of the respondents therefore confirmed that their relationship with the patients would positively impact their decision of kidney donation. The data further revealed that parent to children relationship is very strong due to the closeness and the love shared, this will positively influence kidney donation as heard,

... I love my mum a lot and I wouldn't mind giving a kidney for her to stay alive. (Daughter SE)

Furthermore, spouses in this study seem to view kidney donation as a risk of life as such most of them opined that they were ready to risk their lifes to donate one of their kidneys to their spouses because the relationship that exist between them is a conjugal one which is very strong. For instance, a participant said that he can risk his life for only his wife. He went further to state that if the patient were to be another person, he would not take such a risk. According to him,

it is because she is my wife. But if she is not my wife, I can't risk my life. I have the implication. But if I am donating for my wife, it's because she's my wife. (Husband SS).

Theme 4: participation in kidney donation education program Majority of the respondents had not participated in a formal kidney donation education program. The information they had about kidney donation program was mainly from personal study specifically through the internet. According to two participants,

No, I have never participated in any kidney donation education program.... I learnt from it when my father developed kidney failure. I did my own research. (Son FCT)

No at all. But being an elite, have been online and *I've researched more about it.(Son SW).*

Theme 5: information and support needed for kidney donation decision There were mixed responses to information needed by relatives of CKD patients to make a concise kidney donation decision. Some of the responses were donation risks, chances of survival, surgical procedure, relative's present health status, gender eligibility, donation alternative, and surgeon's expertise. (Fig. 5) Support needed according to the respondents included getting alternative donors and monetary support.

Theme 6: recommendations from family members Recommendations provided by respondents were early public awareness/enlightenment about kidney health is key in preventing kidney diseases and provision of adequate equipment to aid the success of transplant surgeries. In their words,

to start creating awareness of kidney health as early as possible through radio, jingle so that people will know what they will be doing to avoid kidney diseases. (Daughter SE)

they should have the equipment ready so that the operation will be successful so that no one will lose his or her life during the process. They should have enough equipment for the work.(Wife SE).

Discussion

This study assessed the knowledge, perception and information needs on kidney donation of family members of patients with CKD in Nigeria and factors associated with their decision to donate a kidney for transplantation. In the quantitative study, a relatively high awareness of kidney donation was observed with about 70% of the respondents being familiar with the concept. This is comparable with previous research by Adejumo et al. where 63.4% of caregivers of CKD patients were aware [15]. However, it also highlighted existing gaps such as a huge proportion (78%) being unaware of the specific steps involved in kidney donation and a significant number (63%) lacking awareness of the risks involved. Iliayasu et al. reported higher knowledge of organ donation (79.6%) in Kano metropolis [17]. Still higher figures were demonstrated in Healthcare workers (HCW) with 93.3%, and 99.7% knowing about it [16]. This is not surprising as better awareness and knowledge of kidney donation in HCWs



Fig. 5 Information needed for kidney donation decision

compared to family members is expected. Other differences in the knowledge and awareness of organ donation across studies may be attributed to variations in survey questions to assess knowledge and the specific focus on kidney donation in this study. Therefore, agreeing on a need for further educational campaigns on the process of kidney donation targeting family members of CKD patients. From the quantitative study, about three quarter of the participants expressed positive likelihood of donating a kidney to a family member with CKD. The findings from the qualitative interviews further revealed a likelihood of positive decision with different reasons proffered. Similar findings were observed in southern Nigeria where 77% of the relatives [11] and from northern Nigeria where 79% of the general population were willing to donate an organ [17] also in a LMIC higher rate of 87% was recorded in students [24]. Contrarily lower Fig. (59%) were reported by Esezobor in a study conducted among HCWs and by Bunori conducted among caregivers in Kenya which reported 54% willingness to donate [13, 25]. Further lower rates (<30%) were reported from Western Nigeria in HCWs and caregivers [16, 26] while 26% of students in Ethiopia agreed that they intended to donate a kidney in the future [24]. Addressing misconceptions and dispelling common myths through education could play a crucial role in improving and reinforcing positive attitudes and encouraging more family members to make the positive decision to donate a kidney.

Various factors significantly influenced willingness to donate a kidney among family members in this study. The age of respondents, their relationship with the patient, awareness of the suitable medical factors for donation and availability of support or counsels to potential donors were independently associated with likelihood of donation. Age was significant in influencing the decision or willingness to donate a kidney, with older individuals > 50 years having a lower likelihood of donation. Many of the IDI respondents attested to this fact highlighting age as a significant factor. This finding is similar to previous reports in Nigeria and other LMIC [17, 25–29]. Donors age may impact the success rates and long-term outcomes of the transplant as older donors may have a higher risk of surgical complications and the kidneys may be associated with shorter graft survival when transplanted [27, 28].

Awareness of medical factors, risks and benefits of kidney donation emerged as a significant factors in decision making in this study. Majority of respondents in the survey lacked awareness of the risks involved in kidney donation (63%). Similarly, Oluyombo et al. [17] reported three quarters of their respondents lacked awareness and felt inadequately informed about the risks of donation. Other reports corroborated similar fears among their respondents on organ donation [25, 30]. Deeper insights into the fears and concerns of donation were expressed in the IDI. Fears of medical risk involved in the donation process was the most common expressed, others were fears of surgical process complications, some health issues preventing donation, incompatibility issues, and concerns of losing job opportunities. Lack of awareness

could create unnecessary fears and concerns that can affect the donation decisions. These fears may stem from a lack of information or understanding about the potential risks and actual implications of donating a kidney while having certain health conditions. The importance of considering individual health factors and seeking medical advice when making decisions about organ donation should be emphasized [31]. Potential donors should undergo thorough medical evaluations to assess their suitability for donation and to ensure the safety and wellbeing of both the donor and the recipient. Addressing awareness of these factors and the concerns expressed empowers individuals to weigh the risks against the benefits and allows for informed choices based on personal values, health status and understanding of the potential outcomes regarding donation.

Religious affiliation, education level, and ethnicities which are generally considered important factors did not significantly impact the likelihood of donation in this study though, interestingly, the Kanuri and Nupe ethnicities in North East and North Central Nigeria exhibited a higher inclination towards positive responses compared to southern ethnicities and notably there was a significantly higher proportion of likely donors from NE and NC. This is at variance with other local studies which had shown the importance of educational attainment, religion and ethnicity as significant predictors of willingness to donate an organ [11, 16, 17, 25, 26, 32]. However many family members interviewed asserted religious beliefs would positively impact their decisions to donate a kidney. Even though controversies exist, most religions in Nigeria and globally do not formally condemn organ donation [16, 17, 32, 33]. Culture did not significantly influence likelihood of kidney donation in this study unlike as reported in other studies [9, 34, 35, 36]. It will be strategic to collaborate with the religious and cultural stakeholders in educational interventions aimed towards promoting kidney donation [36].

Potential donors were 2.4 times more likely to be parents or children. This finding was also corroborated by the responses from the interviewee. Their readiness to risk their lives to donate one of their kidneys was based on the closeness and the love shared. This is similar to reports of some previous studies where donation decisions were based on love and closeness to family members [11, 26]. Relationships play a pivotal role in shaping attitudes, motivations, and behaviours towards organ donation. They promote trust and credibility and at the same time evoke feelings or a sense of obligation or loyalty, that further drives donors to action [37].

The importance of emotional and psychological factors, such as potential guilt, anxiety, and fear, during the kidney donation process, was highlighted by respondents. Donors may need to prepare emotionally and psychologically for the surgery, recovery, and potential changes in their relationship with the recipient. Providing support for this is therefore critical. As evidenced in this study, positive donation decisions were almost four times more likely in individuals who received support or counselling. About 64% of respondents believed that discussing kidney donation with family members should be prioritized. This is a valuable way to provide support and ensure a positive perception of psychological and emotional health for both donors and recipients. Families can play a significant role in decision-making, agreeing with or overriding the donor's choice [13, 38].

In the study, 65% of those likely to donate indicated that discussions with HCPs were important. Interviews further revealed that education on the donation process was vital in influencing positive donation decisions. Open communication with HCPs, including mental health providers and support groups, cannot be overemphasized as this can help alleviate fears, misconceptions and potentially expanding the donor pool [39]. Additional forms of support, such as finding alternative donors and providing monetary assistance to cover the patient's treatment, may also be needed as highlighted in the interviews. Donors should be assisted by a multidisciplinary team and receive ongoing support throughout the process.

The study revealed an expressed desire by the family members for more information needed to make decisions. The IDI gave insights into the information needs including information on medical donation risks, chances of survival, surgery procedure, surgeon expertise, donor present health status and gender eligibility.

Transplant programs have an ethical obligation, to ensure that potential donors receive and understand information about all issues in living kidney donation before deciding to donate as information on these is critical [33]. Also, structured education should be done during counselling for living kidney donation. Informed consent processes must, therefore, incorporate the specific topics with the mode of communication when considering living donation [33].

With regards to the sources of information about the donation process, HCP were the main source. About 90% had not come in contact with any organizations to provide assistance and information on kidney donation. The interviews revealed the internet as a major source of information for some respondents. This is consistent with findings from previous studies which reported that information was primarily from HCPs especially doctors, electronic media, newspapers and a combination of other sources such as television and radio (67.4%) [15–17]. It must, however, be noted that only a third (32%) of the family members had discussed the kidney donation process with HCPs in this study. To facilitate informed decisions on kidney donation in family members, this lack of

information must be addressed carefully by HCP with targeted discussions to allay unnecessary fears.

The strength of this study lies in the fact that it is a mixed method design and being multicentered provides a representative sample, a diversity of perspectives, and variations in attitudes. By utilizing a mixed methods approach, the study also provided a better understanding of the complexities surrounding kidney donation within the family context that can influence the likelihood of kidney donation, providing a balanced perspective of the dynamics in the Nigerian context. However, caution should be applied when interpreting the results. The reliance on self-reported likelihood of donation is subjective and is based on perception and not on real-life situations or behaviour. This is prone to bias specifically social desirability bias where answers are provided that align with social expectations rather than true beliefs. We did not access knowledge using vignettes to assess applied understanding so our ability to gauge how well they can apply their knowledge was limited. This calls for further research using vignettes and other methods beyond selfreported data.

Conclusion

This research demonstrated fair knowledge, awareness and need for information by potential donors. The age group of respondents, relationship with the patient, awareness of the medical factors determining donor, and provision of support or counsel to donors were independently associated with donation decisions. Additionally, the influence of religion, concerns and fears, lack of knowledge about the donation process and family approval were demonstrated. The integrated findings from both quantitative and qualitative analyses highlight the importance of addressing the above issues and the need to provide support and education to potential kidney donors and their families to enable them make informed decisions. Policymakers should work with relevant stakeholders to design culturally sensitive and region-specific educational campaigns to address the misconceptions and fears identified in the study.

Abbreviations

CI	Confidence interval
CKD	Chronic kidney disease
ESKD	End stage kidney disease
FCT	Federal capital territory
HCP	Healthcare provider
HCW	Healthcare workers
IDI	In-Depth interviews
KRT	Kidney replacement therapy
LMIC	Low middle income country
NC	North central
NE	North east
NHREC	National health research ethics committee
NW	North west
OR	Odds ratio
SD	Standard deviation

SE	South east
SW	South west
SS	South south
StataCorp-LLC	Limited liability company

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Author contributions

MM Conceptualized research idea, designed study, did some statistical analysis, manuscript preparation, and supervision.OA participated in designing study, data management, manuscript preparation, and review. DO, RE participated in writing manuscript, in data review, in reviewing manuscript, Data were acquired by CM, AF, UL, and LA, MT, AA, SN, DO, and RE, who also reviewed manuscript.IU participated in manuscript preparation, reviewing manuscript, editing, and supervision. All authors contributed significant intellectual content to the revision of the manuscript. All authors read and approved final manuscript.

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Data availability

The data that support the findings of this study are not openly available due to reasons of sensitivity. The authors will provide the raw data upon request, without any unwarranted delays or restrictions. For additional questions or inquiries, please contact the corresponding author.

Declarations

Ethical approval

The study was approved by the Nigerian National health research Ethics Committee (NHREC) (reference number NHREC/01/01/2007-23/08/2023)The study was conducted in accordance with the ethical standards of the NHREC and with the 1964 Helsinki Declaration and its later amendments. Informed consent was obtained from all participants included in this study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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References

- 1. Wetmore JB, Collins AJ. Global challenges posed by the growth of end-stage renal disease. Ren Replace Therapy. 2016;2(1):15.
- Arogundade FA, Omotoso BA, Adelakun A, Bamikefa T, Ezeugonwa R, Omosule B, et al. Burden of end-stage renal disease in sub-Saharan Africa. Clin Nephrol. 2020;93(1):3–7.
- Tonelli M, Wiebe N, Knoll G, Bello A, Browne S, Jadhav D, et al. Systematic review: kidney transplantation compared with Dialysis in clinically relevant outcomes. Am J Transpl. 2011;11(10):2093–109.
- 4. Arogundade FA. Kidney transplantation in a low-resource setting: Nigeria experience. Kidney Int Supplements. 2013;3(2):241–5.
- Amira C, Busari A, Bello B. Challenges accessing kidney transplantation in Lagos, Nigeria. Nigerian J Health Sci. 2017;17(1):20–4.
- Emmanuel EH, Nabena IF. Legal and ethical developments in the regulation of organ donation and transplantation in Nigeria. Nnamdi Azikiwe Univ J Int Law Jurisprud. 2020;11:122–6.
- Dariyem NK, Yirvoms OAAG, Orifunmishe V, Hwyere Yashim C, Agogo-Amara IM. A critical appraisal of organ donation and transplantation in Nigeria: comparative analysis with United Kingdom (UK). Int J Res Publication Reviews January. 2024;5(1):3081–95.
- Ajayi SO, Raji Y, Salako BL. Ethical and legal issues in renal transplantation in Nigeria. Saudi J Kidney Dis Transpl. 2016;27(1):125–8.
- Luo A, He H, Xu Z, Ouyang W, Chen Y, Li K, et al. A qualitative study in family units on organ donation: attitude, influencing factors and communication patterns. Transpl Int. 2022;35:10411.
- Siminoff LA, Gordon N, Hewlett J, Arnold RM. Factors influencing families' consent for donation of solid organs for transplantation. JAMA. 2001;286(1):71–7.
- Bello BT, Raji YR. Knowledge, attitudes and beliefs of first-degree relatives of patients with chronic kidney disease toward kidney donation in Nigeria. Saudi J Kidney Dis Transpl. 2016;27(1):118–24.
- Kurleto P, Tomaszek L, Milaniak I, Mędrzycka-Dąbrowska W. Factors associated with the willingness to become a living kidney donor: A National Cross-Sectional study. Int J Environ Res Public Health. 2022;19(3).
- Bunori H, Izudi J, Alege JB, Bajunirwe F. Willingness of caregivers to donate a kidney to a patient with end-stage renal disease: findings from four Dialysis providing health facilities in Uganda. PLOS Glob Public Health. 2022;2(4):e0000287.
- Barnieh L, Collister D, Manns B, Lam NN, Shojai S, Lorenzetti D, et al. A scoping review for strategies to increase living kidney donation. Clin J Am Soc Nephrol. 2017;12(9):1518–27.
- Adejumo OA, Solarin AU, Abiodun MT, Akinbodewa AA. Knowledge of kidney donation among care givers in two tertiary hospitals in Southwest Nigeria. Artif Organs. 2017;41(5):446–51.
- Oluyombo R, Fawale MB, Ojewola RW, Busari OA, Ogunmola OJ, Olanrewaju TO, et al. Knowledge regarding organ donation and willingness to donate among health workers in South-West Nigeria. Int J Organ Transpl Med. 2016;7(1):19–26.
- Iliyasu Z, Abubakar IS, Lawan UM, Abubakar M, Adamu B. Predictors of public attitude toward living organ donation in Kano, Northern Nigeria. Saudi J Kidney Dis Transplantation. 2014;25(1):196–205.
- EUAF. 2021 [1st/febuary/2025]. Available from: https://euaa.europa.eu/countr y-guidance-nigeria-2021/general-remarks#reciteEnable
- 19. Dawadi S, Shrestha S, Giri R, Mixed-Methods Research. A discussion on its types, challenges, and criticisms. J Stud Educ. 2021;2:25–36.
- 20. Palinkas LA, Horwitz SM, Green CA, Wisdom JP, Duan N, Hoagwood K. Purposeful sampling for qualitative data collection and analysis in

mixed method implementation research. Adm Policy Ment Health. 2015;42(5):533–44.

- 21. Naing L, Winn T, Nordin R. Pratical issues in calculating the sample size for prevalence studies. Archives Orofac Sci. 2006;1.
- 22. Olanrewaju TO, Aderibigbe A, Popoola AA, Braimoh KT, Buhari MO, Adedoyin OT, et al. Prevalence of chronic kidney disease and risk factors in North-Central Nigeria: a population-based survey. BMC Nephrol. 2020;21(1):467.
- Clarke V, Braun V, Hayfield N. Thematic analysis. In Smith JAe. editor. London: SAGE; 2015.
- 24. Tesema B, Bogale EK, Wasihun Y, Anagaw TF. Intention to donate kidney and associated factors among students in Bahir Dar University: application of theory of planned behavior. Int J Gen Med. 2023;16(null):5363–76.
- Esezobor CI, Disu E, Oseni SB. Attitude to organ donation among healthcare workers in Nigeria. Clin Transpl. 2012;26(6):E612–6.
- Abiodun MT, Solarin AU, Adejumo OA, Akinbodewa AA. Caregivers and healthcare workers' willingness to donate kidney in three tertiary institutions in Southern Nigeria. Transpl Proc. 2015;47(10):2810–5.
- Englum BR, Schechter MA, Irish WD, Ravindra KV, Vikraman DS, Sanoff SL, et al. Outcomes in kidney transplant recipients from older living donors. Transplantation. 2015;99(2):309–15.
- Massie AB, Leanza J, Fahmy LM, Chow EK, Desai NM, Luo X, et al. A risk index for living donor kidney transplantation. Am J Transpl. 2016;16(7):2077–84.
- Sadagah LF, Makeen A, Alharthi M, Almalki AH. Willingness of Hemodialysis Patient's Family Members Toward Kidney Donation: A Cross-Sectional Study. Transplantation Proceedings. 2020;52(10):2996–3001.
- Chijioke A, Okoro E, Makusidi M. Factors influencing attitude towards kidney donation for transplantation in Ilorin. Sahel Med J. 2011;13.
- Mamven M, Adejumo OA, Edeki IR, Oyedepo DS, Ngoka SC, Ummate I, et al. Perspectives of relatives of patients with end-stage kidney disease on kidney sources, commercial kidney donation, and barriers to living kidney donation in Nigeria: a qualitative study. J Nephrol. 2024;37(6):1669–77.
- Bakari AA, Abbo Jimeta US, Abubakar MA, Alhassan SU, Nwankwo EA. Organ transplantation: legal, ethical and Islamic perspective in Nigeria. Niger J Surg. 2012;18(2):53–60.
- Cotrau P, Hodosan V, Vladu A, Daina C, Daina LG, Pantis C. [Not Available] Maedica (Bucur). 2019;14(1):12–4.
- 34. Ayinde J. Organ donation in an African culture. Bangladesh J Bioeth. 2020;10.
- Doerry K, Oh J, Vincent D, Fischer L, Schulz-J
 ürgensen S. Religious and cultural aspects of organ donation: narrowing the gap through Understanding different religious beliefs. Pediatr Transplant. 2022;26(7):e14339.
- Krupic F. The impact of religion and provision of information on increasing knowledge and changing attitudes to organ donation: an intervention study. J Relig Health. 2020;59(4):2082–95.
- Martínez-López MV, McLaughlin L, Molina-Pérez A, Pabisiak K, Primc N, Randhawa G, et al. Mapping trust relationships in organ donation and transplantation: a conceptual model. BMC Med Ethics. 2023;24(1):93.
- Ralph AF, Butow P, Craig JC, Wong G, Chadban SJ, Luxton G, et al. Living kidney donor and recipient perspectives on their relationship: longitudinal semi-structured interviews. BMJ Open. 2019;9(4):e026629.
- Pistorio P ML, Veroux M, Trigona C, Patanè M, Lo Bianco S, Cirincione G, et al. Psychological and emotional aspects in living donor kidney transplantation. Transpl Proc. 2019;51(1):124–7.

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