

Original Article

Multi National Survey of the Advice Given to Muslim Kidney Graft Recipients by Muslim Nephrologists about Lifestyle and Religious Rituals with Potential Medical Risk

Ziad M. S. Arabi¹, Elwaleed A. Elhassan², Mubarak I. Abdalla², Mahfooz A. Farooqui², Atif A. Mateen², Saleh Kaysi³, Syed A. Alam⁴, Saif A. Khan⁵, Mohamed F. Elmuzaini⁶, Mourad M Al Sabbagh⁷, Abdulrahman R. Altheaby¹

¹Adult Transplant Nephrology, Department of Organ Transplant Center, King of Abdulaziz Medical City, King Abdullah International Medical Research Center, King Saud Bin Abdulaziz University for Health Sciences; Riyadh, Saudi Arabia, ²Department of Nephrology, King of Abdulaziz Medical City, Riyadh, Saudi Arabia, ³Department of Nephrology, Orleans Regional Hospital, Orleans, France, ⁴Department of Nephrology, Khyber Teaching Hospital, Peshawar, Pakistan, ⁵Department of Nephrology, Sultan Qaboos University Hospital, Muscat, Oman, ⁶Department of Obstetrics and Gynecology, Milton Keynes, UK, ⁷Department of Nephrology, University of Texas at Rio Grande Valley, Texas, USA

ABSTRACT. Muslim renal transplant recipients often ask their physicians if performing certain lifestyles or religious obligations may be harmful to their health. Permissibility as advised by an expert Muslim physician is considered as being religiously accepted. A cross-sectional, survey-based study was conducted enquiring what nephrologists would advise their transplant recipients to do, about some lifestyles and religious duties. Fifty-eight nephrologists responded to the survey. Of these, 77% routinely follow-up post-transplant patients; 34% were from Saudi Arabia, 18% from the USA, and 20% from Pakistan. Fifty-four percent of the respondents would let patients with stable graft function fast during Ramadan, while 20% would not recommend fasting at any time following transplantation. This response did not change much if the patient was diabetic although in these patients, not recommending fasting at any time increased to 32%. For kidney donors, fasting would be allowed by 58% of the respondents once the kidney function stabilizes. About 50% would let their patients perform Omrah or obligatory Hajj any time after 12

Correspondence to:

Dr. Ziad M. S. Arabi,
Adult Transplant Nephrology,
Department of Organ Transplant Center,
King Abdulaziz Medical City,
Riyadh, Saudi Arabia.
E-mail: arabizi@ngha.med.sa

months following transplantation, and only about 3% would not recommend that at any time after transplantation. For nonobligatory Hajj, 37% and 22%, respectively, would allow. Sixty-one percent would delay the pregnancy in nullipara with stable renal function, and none of the nephrologists would deny the opportunity to pregnancy at any time.

In multiparous transplant recipients, the respective frequencies would be 45% and 20%. To our knowledge, this the first study exploring the consensus among Muslim nephrologists regarding the advice they would give on performance of potentially risky lifestyles and religious rituals by Muslim posttransplant patients.

Introduction

There is only limited data about what advise post renal transplant recipients or donors should be given regarding several important lifestyle aspects such as fluid intake, isolation, going back to work or school and when transplant recipients can resume marital relations or to plan pregnancy in different conditions. Literature is scarce when it comes to renal transplant recipients who inquire about Islamic rituals such as Ramadan fasting. Literature about Omrah or Hajj (obligatory or nonobligatory) in kidney transplant recipients is lacking. There is also no data about what to advise kidney donors regarding daily fluid intake or Ramadan fasting.

In the absences of clinical trials, experts' consensus becomes essential. To review the practice patterns, a survey was sent to the experts in this area (nephrology and transplant nephrology consultants) to explore their views about posttransplant advices they would give to the posttransplant patient.

Methodology

After the approval of the Institutional review board, a survey of 16 questions was sent through social media to the expert nephrologists. The questions were about what advice they would give to patients after kidney transplant about pregnancy (in primiparous or multiparous kidney recipients and in the presence of hypertension or proteinuria), fasting (with and without diabetes), performing Hajj (obligatory or nonobligatory) and Omrah, timing of going back to work and time to resume martial relationships. The survey also explored the opinions about mycophenolate in male renal transplant recipients who are planning to have children.

nolate in male renal transplant recipients who are planning to have children.

Five demographic questions were also included (Table 1).

Inclusion: All the nephrologists and transplant nephrologists who were willing to participate and who were recognized to practice independently in their countries were considered as experts or consultants. To be able to give informed recommendations, participant should be familiar with the Islamic rituals such as fasting, Hajj or Omrah.

Exclusion: Medical Staff or fellows in training.

The survey was created by SurveyMonkey software (San Mateo, CA, USA) and was distributed by social media to nephrology and transplant nephrology consultants who could be reached in Saudi Arabia, the United States, France, Sudan, Egypt, Oman and Pakistan, and the United Kingdom. Participation was voluntary, and there was no compensation for responding.

Results

Results of the survey are shown in Table 1.

Discussion

Ramadan fasting in renal transplant recipients

Ramadan fasting is one of the five pillars of Islam and is compulsory for all adult Muslims who have no medical or religious excuses. Ramadan fasting is defined as a complete abstinence from food, drink, and oral medications from dawn to dusk. Regarding the comprehensive Islamic religion, patients have permission to not fast according to the medical advice. However, most Muslim patients express their desire to fast during Ramadan month and they are very broken when their physicians inform them not to fast.¹

Several small studies have shown that renal transplant recipients who have stable kidney function for at least one-year posttransplantation can fast with cautious follow-up.

In a study by Qurashi et al, of 43 fasters and 37 nonfasters, fasting of Ramadan in hottest month of the year, did not adversely affect

Table 1. Survey questions and answers.

Ramadan Fasting in Renal Transplant Recipients															
<p>1. Time from transplantation to allowing fasting Ramadan in recipient with stable graft function should be:</p> <p>recipient with stable graft function should be:</p> <p>a. 6 months</p> <p>b. 1 year</p> <p>c. 2 years</p> <p>d. 3 years</p> <p>e. Not recommended at any time after transplant.</p>	<p>Q1 Time form transplantation to allowing fasting Ramadan in recipient with stable graft function should be:</p> <p>Answered: 61 Skipped: 2</p> <table border="1"> <thead> <tr> <th>ANSWER CHOICES</th> <th>RESPONSES</th> </tr> </thead> <tbody> <tr> <td>Six months.</td> <td>0.20% 5</td> </tr> <tr> <td>One year.</td> <td>54.10% 33</td> </tr> <tr> <td>Two years.</td> <td>13.11% 8</td> </tr> <tr> <td>Three years.</td> <td>3.28% 2</td> </tr> <tr> <td>No: recommended at any time after transplant.</td> <td>21.31% 13</td> </tr> <tr> <td>TOTAL</td> <td>51</td> </tr> </tbody> </table>	ANSWER CHOICES	RESPONSES	Six months.	0.20% 5	One year.	54.10% 33	Two years.	13.11% 8	Three years.	3.28% 2	No: recommended at any time after transplant.	21.31% 13	TOTAL	51
ANSWER CHOICES	RESPONSES														
Six months.	0.20% 5														
One year.	54.10% 33														
Two years.	13.11% 8														
Three years.	3.28% 2														
No: recommended at any time after transplant.	21.31% 13														
TOTAL	51														
Fasting Ramadan in Renal Transplant Patients with DM type 2															
<p>2. Time from transplantation to allowing fasting Ramadan in renal transplant patients with DM type 2 should be:</p> <p>a. 6 months</p> <p>b. 1 year</p> <p>c. 2 years n</p> <p>d. 3 years</p> <p>e. Not recommended at any time after transplant.</p>	<p>Q2 Time form transplantation to allowing fasting Ramadan in renal transplant patients with DM type 2 should be:</p> <p>Answered: 58 Skipped: 5</p> <table border="1"> <thead> <tr> <th>ANSWER CHOICES</th> <th>RESPONSES</th> </tr> </thead> <tbody> <tr> <td>Six months.</td> <td>5.17% 3</td> </tr> <tr> <td>One year.</td> <td>48.28% 23</td> </tr> <tr> <td>Two years.</td> <td>10.34% 6</td> </tr> <tr> <td>Three years.</td> <td>3.45% 2</td> </tr> <tr> <td>No: recommended at any time after transplant.</td> <td>32.76% 19</td> </tr> <tr> <td>TOTAL</td> <td>58</td> </tr> </tbody> </table>	ANSWER CHOICES	RESPONSES	Six months.	5.17% 3	One year.	48.28% 23	Two years.	10.34% 6	Three years.	3.45% 2	No: recommended at any time after transplant.	32.76% 19	TOTAL	58
ANSWER CHOICES	RESPONSES														
Six months.	5.17% 3														
One year.	48.28% 23														
Two years.	10.34% 6														
Three years.	3.45% 2														
No: recommended at any time after transplant.	32.76% 19														
TOTAL	58														

Continuation of Table 1.

Omrah, Obligator and Nonobligatory Hajj in Renal Transplant Patients																						
<p>3. Time from transplantation to allowing obligatory hajj (i.e. Hajj for 1st time): along with the precautions against airborne and foodborne infections should be:</p> <ol style="list-style-type: none"> 6 months 1 year 2 years 3 years Not recommended at any time after transplant. 	<p style="text-align: center;">Obligatory hajj (i.e. Hajj for 1st time): along with the precautions against airborne and foodborne infections.</p> <p style="text-align: center;">Answered: 58 Skipped: 5</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #d9d9d9;">ANSWER CHOICES</th> <th style="background-color: #d9d9d9;">RESPONSES</th> <th></th> </tr> </thead> <tbody> <tr> <td>Should be delayed 6 months after transplant.</td> <td>12.79%</td> <td>6</td> </tr> <tr> <td>Should be delayed for one year after transplant.</td> <td>50.00%</td> <td>29</td> </tr> <tr> <td>Should be delayed for two years after transplant.</td> <td>22.41%</td> <td>13</td> </tr> <tr> <td>Should be delayed 3 years after transplant.</td> <td>10.34%</td> <td>6</td> </tr> <tr> <td>Not recommended at any time after transplant.</td> <td>3.45%</td> <td>2</td> </tr> <tr> <td style="background-color: #d9d9d9;">TOTAL</td> <td></td> <td style="background-color: #d9d9d9;">58</td> </tr> </tbody> </table>	ANSWER CHOICES	RESPONSES		Should be delayed 6 months after transplant.	12.79%	6	Should be delayed for one year after transplant.	50.00%	29	Should be delayed for two years after transplant.	22.41%	13	Should be delayed 3 years after transplant.	10.34%	6	Not recommended at any time after transplant.	3.45%	2	TOTAL		58
ANSWER CHOICES	RESPONSES																					
Should be delayed 6 months after transplant.	12.79%	6																				
Should be delayed for one year after transplant.	50.00%	29																				
Should be delayed for two years after transplant.	22.41%	13																				
Should be delayed 3 years after transplant.	10.34%	6																				
Not recommended at any time after transplant.	3.45%	2																				
TOTAL		58																				
<p>4. Time from transplantation to allowing non-obligatory hajj: along with the precautions against airborne and foodborne infections Should be:</p> <ol style="list-style-type: none"> 6 months 1 year 2 years 3 years Not recommended. 	<p style="text-align: center;">Non Obligatory hajj: along with the precautions against airborne and foodborne infections.</p> <p style="text-align: center;">Answered: 59 Skipped: 4</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #d9d9d9;">ANSWER CHOICES</th> <th style="background-color: #d9d9d9;">RESPONSES</th> <th></th> </tr> </thead> <tbody> <tr> <td>Should be delayed 6 months after transplant.</td> <td>10.17%</td> <td>6</td> </tr> <tr> <td>Should be delayed for one year after transplant.</td> <td>37.29%</td> <td>22</td> </tr> <tr> <td>Should be delayed for two years after transplant.</td> <td>23.73%</td> <td>14</td> </tr> <tr> <td>Should be delayed 3 years after transplant.</td> <td>5.08%</td> <td>3</td> </tr> <tr> <td>Not recommended at any time after transplant.</td> <td>23.73%</td> <td>14</td> </tr> <tr> <td style="background-color: #d9d9d9;">TOTAL</td> <td></td> <td style="background-color: #d9d9d9;">59</td> </tr> </tbody> </table>	ANSWER CHOICES	RESPONSES		Should be delayed 6 months after transplant.	10.17%	6	Should be delayed for one year after transplant.	37.29%	22	Should be delayed for two years after transplant.	23.73%	14	Should be delayed 3 years after transplant.	5.08%	3	Not recommended at any time after transplant.	23.73%	14	TOTAL		59
ANSWER CHOICES	RESPONSES																					
Should be delayed 6 months after transplant.	10.17%	6																				
Should be delayed for one year after transplant.	37.29%	22																				
Should be delayed for two years after transplant.	23.73%	14																				
Should be delayed 3 years after transplant.	5.08%	3																				
Not recommended at any time after transplant.	23.73%	14																				
TOTAL		59																				

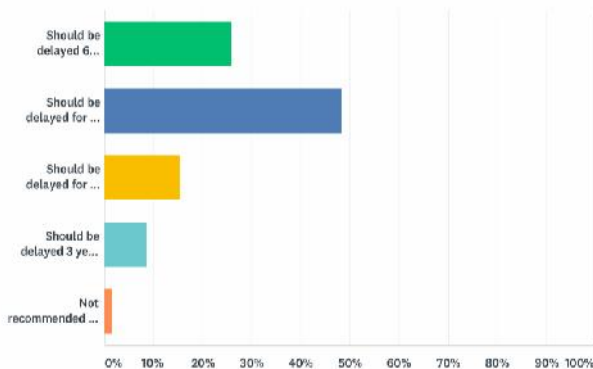
Continuation of Table 1.

5. Time from transplantation to allowing Omrah: along with the precautions against airborne and food borne infections
Should be:

- 6 months
- 1 year
- 2 years
- 3 years
- Not recommended

Omrah (along with the precautions against airborne and foodborne infections).

Answered: 58 Skipped: 5



ANSWER CHOICES	RESPONSES	Count
Should be delayed 6 months after transplant.	25.86%	15
Should be delayed for one year after transplant.	48.28%	28
Should be delayed for two years after transplant.	15.52%	9
Should be delayed 3 years after transplant.	8.62%	5
Not recommended at any time after transplant.	1.72%	1
TOTAL		58

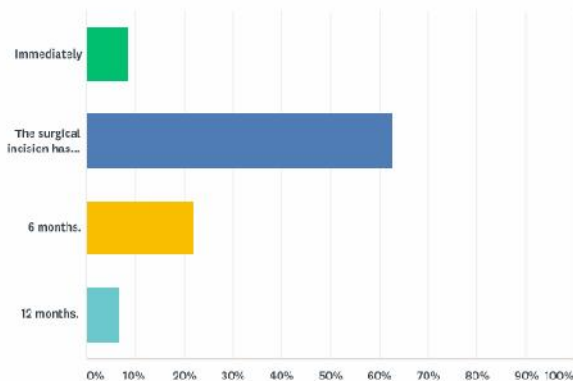
Marital Relations after Renal Transplantation

6. Marital relations, after renal transplantation, most of the patients can resume marital relations:

- Immediately
- The surgical incision has healed, and the urinary stent is removed.
- 6 months.
- 12 months.

Marital relations: In 2-3 months post-transplant, most of the patients can resume marital relations once:

Answered: 59 Skipped: 4



ANSWER CHOICES	RESPONSES	Count
Immediately	8.47%	5
The surgical incision has healed and the urinary stent is removed.	62.71%	37
6 months.	22.03%	13
12 months.	6.76%	4
TOTAL		59

Continuation of Table 1.

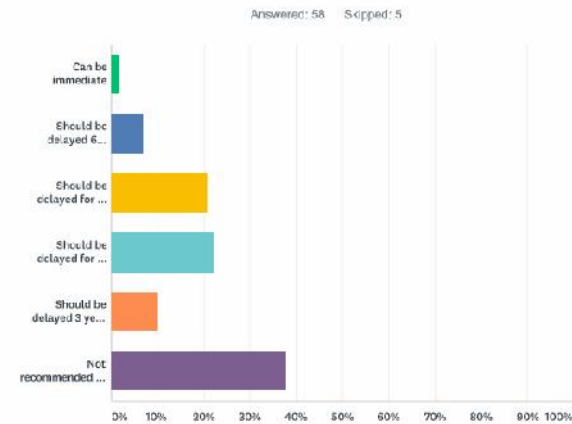
Pregnancy after Renal Transplant															
<p>7. Pregnancy after renal transplant in primiparous recipient with stable renal function and no proteinuria or hypertension:</p> <p>a. Can be immediate</p> <p>b. Should be delayed 6 months after transplant.</p> <p>c. Should be delayed for 1 year.</p> <p>d. Should be delayed for 2 years.</p> <p>e. Not recommended at any time after transplant for any primiparous recipient.</p>	<p style="text-align: center;">Pregnancy after renal transplant in primiparous recipient with stable renal function and no proteinuria or hypertension:</p> <p style="text-align: center;">Answered: 59 Skipped: 4</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #d9d9d9;">ANSWER CHOICES</th> <th style="background-color: #d9d9d9;">RESPONSES</th> </tr> </thead> <tbody> <tr> <td>Can be immediate</td> <td>3.39% 2</td> </tr> <tr> <td>Should be delayed 6 months after transplant.</td> <td>6.78% 4</td> </tr> <tr> <td>Should be delayed for one year after transplant.</td> <td>61.02% 36</td> </tr> <tr> <td>Should be delayed for two years after transplant.</td> <td>28.81% 17</td> </tr> <tr> <td>No. recommended at any time after transplant for any primiparous recipient .</td> <td>0.00% 0</td> </tr> <tr> <td style="background-color: #d9d9d9;">TOTAL</td> <td style="background-color: #d9d9d9;">59</td> </tr> </tbody> </table>	ANSWER CHOICES	RESPONSES	Can be immediate	3.39% 2	Should be delayed 6 months after transplant.	6.78% 4	Should be delayed for one year after transplant.	61.02% 36	Should be delayed for two years after transplant.	28.81% 17	No. recommended at any time after transplant for any primiparous recipient .	0.00% 0	TOTAL	59
ANSWER CHOICES	RESPONSES														
Can be immediate	3.39% 2														
Should be delayed 6 months after transplant.	6.78% 4														
Should be delayed for one year after transplant.	61.02% 36														
Should be delayed for two years after transplant.	28.81% 17														
No. recommended at any time after transplant for any primiparous recipient .	0.00% 0														
TOTAL	59														
<p>8. Pregnancy after renal transplant in multiparous renal transplant recipients with stable renal function and no proteinuria or hypertension:</p> <p>a. Can be immediate.</p> <p>b. Should be delayed 6 months after transplant.</p> <p>c. Should be delayed for 1 year.</p> <p>d. Should be delayed for 2 years.</p> <p>e. Not recommended at any time after transplant for multiparous recipient.</p>	<p style="text-align: center;">Pregnancy after renal transplant in multiparous renal transplant recipients with stable renal function and no proteinuria or hypertension:</p> <p style="text-align: center;">Answered: 59 Skipped: 4</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #d9d9d9;">ANSWER CHOICES</th> <th style="background-color: #d9d9d9;">RESPONSES</th> </tr> </thead> <tbody> <tr> <td>Can be immediate</td> <td>3.39% 2</td> </tr> <tr> <td>Should be delayed 6 months after transplant.</td> <td>5.78% 3</td> </tr> <tr> <td>Should be delayed for one year after transplant.</td> <td>45.76% 27</td> </tr> <tr> <td>Should be delayed for two years after transplant</td> <td>25.42% 15</td> </tr> <tr> <td>Not recommended at any time after transplant for multiparous recipient.</td> <td>20.34% 12</td> </tr> <tr> <td style="background-color: #d9d9d9;">TOTAL</td> <td style="background-color: #d9d9d9;">59</td> </tr> </tbody> </table>	ANSWER CHOICES	RESPONSES	Can be immediate	3.39% 2	Should be delayed 6 months after transplant.	5.78% 3	Should be delayed for one year after transplant.	45.76% 27	Should be delayed for two years after transplant	25.42% 15	Not recommended at any time after transplant for multiparous recipient.	20.34% 12	TOTAL	59
ANSWER CHOICES	RESPONSES														
Can be immediate	3.39% 2														
Should be delayed 6 months after transplant.	5.78% 3														
Should be delayed for one year after transplant.	45.76% 27														
Should be delayed for two years after transplant	25.42% 15														
Not recommended at any time after transplant for multiparous recipient.	20.34% 12														
TOTAL	59														

Continuation of Table 1.

9. Pregnancy after transplant in in patients with stable renal function and no hypertension but with proteinuria of < 2 g/day

- a. Can be immediate
- b. Should be delayed 6 months after transplant.
- c. Should be delayed for 1 year.
- d. Should be delayed for 2 years.
- e. Should be delayed 3 years.
- f. Not recommended at any time after transplant

Pregnancy after transplant in in patients with stable renal function and no hypertension but with proteinuria of < 2 gms/day:

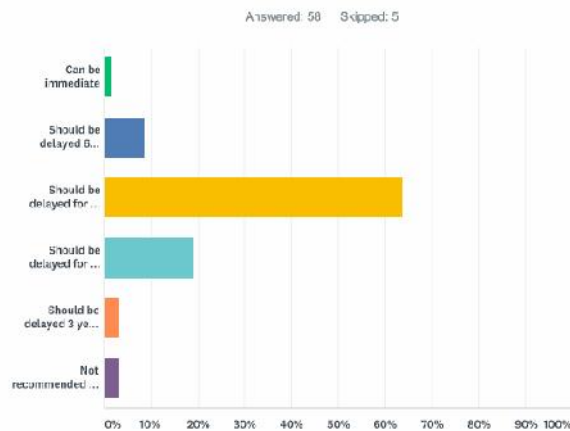


ANSWER CHOICES	RESPONSES
Can be immediate	1.72% 1
Should be delayed 6 months after transplant.	6.30% 4
Should be delayed for one year after transplant.	20.69% 12
Should be delayed for two years after transplant.	22.41% 13
Should be delayed 3 years after transplant.	10.34% 6
Not recommended at any time after transplant.	37.03% 22
TOTAL	58

10. Pregnancy after transplant in patients with stable normal renal function and no proteinuria but with controlled hypertension

- a. Can be immediate
- b. Should be delayed 6 months after transplant.
- c. Should be delayed for 1 year after transplant.
- d. Should be delayed for 2 years.
- e. Should be delayed 3 years.
- f. Not recommended at any time after transplant

Pregnancy after transplant in in patients with stable renal function and no proteinuria but with controlled hypertension



ANSWER CHOICES	RESPONSES
Can be immediate	1.72% 1
Should be delayed 6 months after transplant.	8.62% 5
Should be delayed for one year after transplant.	63.76% 37
Should be delayed for two years after transplant.	18.07% 11
Should be delayed 3 years after transplant.	3.45% 2
Not recommended at any time after transplant.	3.45% 2
TOTAL	58

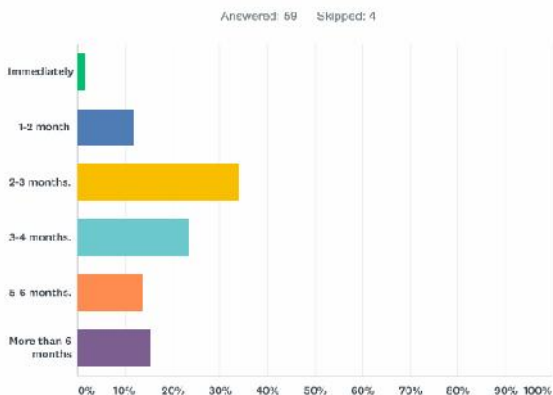
Continuation of Table 1.

A Male Renal Transplant Recipient Taking Cellcept															
<p>11. A male renal transplant recipient taking cellcept</p> <p>a. Can safely have children.</p> <p>b. The risk of teratogenic effect unknown. I would discuss with the patient to weigh the risks of rejection versus benefits of avoiding any potential teratogenic effects.</p> <p>c. Must have CellCept stopped 3 months before conception.</p>	<p style="text-align: center;">The use of Cellcept in male renal transplant recipient who is hoping to have new children:</p> <p style="text-align: center;">Answered: 57 Skipped: 6</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #d9d9d9;">ANSWER CHOICES</th> <th style="background-color: #d9d9d9;">RESPONSES</th> </tr> </thead> <tbody> <tr> <td>Mycophelate can be teratogenic in female recipients but not male recipients.</td> <td style="text-align: right;">31.58% 18</td> </tr> <tr> <td>The risk of teratogenic effect unknown. I would discuss with the patient to weigh the risks of rejection versus benefits of avoiding any potential teratogenic effects.</td> <td style="text-align: right;">33.33% 19</td> </tr> <tr> <td>Mycophelate must be stopped 3 months before conception.</td> <td style="text-align: right;">35.09% 20</td> </tr> <tr> <td style="background-color: #d9d9d9;">TOTAL</td> <td style="text-align: right; background-color: #d9d9d9;">57</td> </tr> </tbody> </table>	ANSWER CHOICES	RESPONSES	Mycophelate can be teratogenic in female recipients but not male recipients.	31.58% 18	The risk of teratogenic effect unknown. I would discuss with the patient to weigh the risks of rejection versus benefits of avoiding any potential teratogenic effects.	33.33% 19	Mycophelate must be stopped 3 months before conception.	35.09% 20	TOTAL	57				
ANSWER CHOICES	RESPONSES														
Mycophelate can be teratogenic in female recipients but not male recipients.	31.58% 18														
The risk of teratogenic effect unknown. I would discuss with the patient to weigh the risks of rejection versus benefits of avoiding any potential teratogenic effects.	33.33% 19														
Mycophelate must be stopped 3 months before conception.	35.09% 20														
TOTAL	57														
Strict Isolation															
<p>12. Strict isolation in single room is required after renal transplantation for:</p> <p>a. Not at all</p> <p>b. 1–2 month</p> <p>c. 3 months</p> <p>d. 6 months</p> <p>e. 12 months</p>	<p style="text-align: center;">Isolation: Beside avoiding contact with the sick , crowded areas and practicing frequent hands washing , strict isolation in single room is required for:</p> <p style="text-align: center;">Answered: 59 Skipped: 4</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #d9d9d9;">ANSWER CHOICES</th> <th style="background-color: #d9d9d9;">RESPONSES</th> </tr> </thead> <tbody> <tr> <td>Not at all</td> <td style="text-align: right;">69.49% 41</td> </tr> <tr> <td>1-2 month</td> <td style="text-align: right;">6.78% 4</td> </tr> <tr> <td>3 months</td> <td style="text-align: right;">11.86% 7</td> </tr> <tr> <td>6 months</td> <td style="text-align: right;">10.17% 6</td> </tr> <tr> <td>12 months</td> <td style="text-align: right;">1.69% 1</td> </tr> <tr> <td style="background-color: #d9d9d9;">TOTAL</td> <td style="text-align: right; background-color: #d9d9d9;">59</td> </tr> </tbody> </table>	ANSWER CHOICES	RESPONSES	Not at all	69.49% 41	1-2 month	6.78% 4	3 months	11.86% 7	6 months	10.17% 6	12 months	1.69% 1	TOTAL	59
ANSWER CHOICES	RESPONSES														
Not at all	69.49% 41														
1-2 month	6.78% 4														
3 months	11.86% 7														
6 months	10.17% 6														
12 months	1.69% 1														
TOTAL	59														

Continuation of Table 1.

- 13. Most of the renal transplant will be able to go back to school/ work in:**
- a. Immediately
 - b. 1–2 month
 - c. 2–3 months
 - d. 3–4 months
 - e. 5–6 months
 - f. More than 6 months

Work/ School: Most of the renal transplant will be able to go back to school / work in:

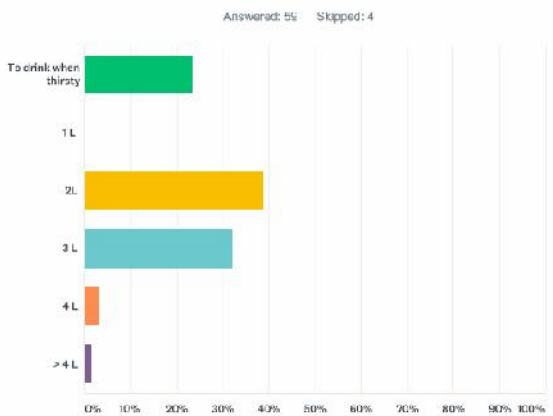


ANSWER CHOICES	RESPONSES	
Immediately	1.69%	1
1-2 month	11.86%	7
2-3 months	35.90%	20
3-4 months	20.73%	14
5-6 months	13.56%	8
More than 6 months	15.25%	9
TOTAL		59

Daily Fluid Intake Post Renal Transplant for Recipients

- 14. Recommended amount of daily fluid intake post renal transplant for recipients is:**
- a. To drink when thirsty
 - b. 1 L
 - c. 2L
 - d. 3 L
 - e. 4 L
 - f. 4 L

Q14 Fluid intake: recommended amount of daily fluid intake post renal transplant for recipients:



ANSWER CHOICES	RESPONSES	
To drink when thirsty	23.73%	14
1L	0.00%	0
2L	33.98%	23
3L	32.20%	19
4L	3.39%	2
>4L	1.69%	1
TOTAL		59

Continuation of Table 1.

Recommended Amount of Daily Fluid Intake Post Renal Transplant for Donors:																									
<p>15. Recommended amount of daily fluid intake post renal transplant for donors:</p> <ul style="list-style-type: none"> a. To drink when thirsty b. 1 L c. 2L d. 3 L e. 4 L f. >4 L 	<p>Fluid intake: recommended amount of daily fluid intake post renal transplant for donors:</p> <p>Answered: 59 Skipped: 4</p> <table border="1"> <thead> <tr> <th>ANSWER CHOICES</th> <th>RESPONSES</th> <th></th> </tr> </thead> <tbody> <tr> <td>To drink when thirsty</td> <td>36.60%</td> <td>21</td> </tr> <tr> <td>1 L</td> <td>0.00%</td> <td>0</td> </tr> <tr> <td>2L</td> <td>42.37%</td> <td>25</td> </tr> <tr> <td>3 L</td> <td>16.95%</td> <td>10</td> </tr> <tr> <td>4 L</td> <td>3.35%</td> <td>2</td> </tr> <tr> <td>>4 L</td> <td>1.65%</td> <td>1</td> </tr> <tr> <td>TOTAL</td> <td></td> <td>59</td> </tr> </tbody> </table>	ANSWER CHOICES	RESPONSES		To drink when thirsty	36.60%	21	1 L	0.00%	0	2L	42.37%	25	3 L	16.95%	10	4 L	3.35%	2	>4 L	1.65%	1	TOTAL		59
ANSWER CHOICES	RESPONSES																								
To drink when thirsty	36.60%	21																							
1 L	0.00%	0																							
2L	42.37%	25																							
3 L	16.95%	10																							
4 L	3.35%	2																							
>4 L	1.65%	1																							
TOTAL		59																							
Fasting in Kidney Donors																									
<p>16. Kidney donors can fast</p> <ul style="list-style-type: none"> a. once their renal function stabilizes in. b. One month after transplant. c. 2–3 months after transplant d. months after transplant e. 1 year after transplant 	<p>Q16 Fasting in kidney donors: Donors can fast Immediately</p> <p>Answered: 59 Skipped: 4</p> <table border="1"> <thead> <tr> <th>ANSWER CHOICES</th> <th>RESPONSES</th> <th></th> </tr> </thead> <tbody> <tr> <td>Once their renal function stabilize.</td> <td>50.35%</td> <td>30</td> </tr> <tr> <td>One month after transplant.</td> <td>5.03%</td> <td>3</td> </tr> <tr> <td>2- 3 months after transplant</td> <td>16.95%</td> <td>10</td> </tr> <tr> <td>5 months after transplant</td> <td>11.36%</td> <td>7</td> </tr> <tr> <td>1 year after transplant</td> <td>15.25%</td> <td>9</td> </tr> <tr> <td>TOTAL</td> <td></td> <td>59</td> </tr> </tbody> </table>	ANSWER CHOICES	RESPONSES		Once their renal function stabilize.	50.35%	30	One month after transplant.	5.03%	3	2- 3 months after transplant	16.95%	10	5 months after transplant	11.36%	7	1 year after transplant	15.25%	9	TOTAL		59			
ANSWER CHOICES	RESPONSES																								
Once their renal function stabilize.	50.35%	30																							
One month after transplant.	5.03%	3																							
2- 3 months after transplant	16.95%	10																							
5 months after transplant	11.36%	7																							
1 year after transplant	15.25%	9																							
TOTAL		59																							

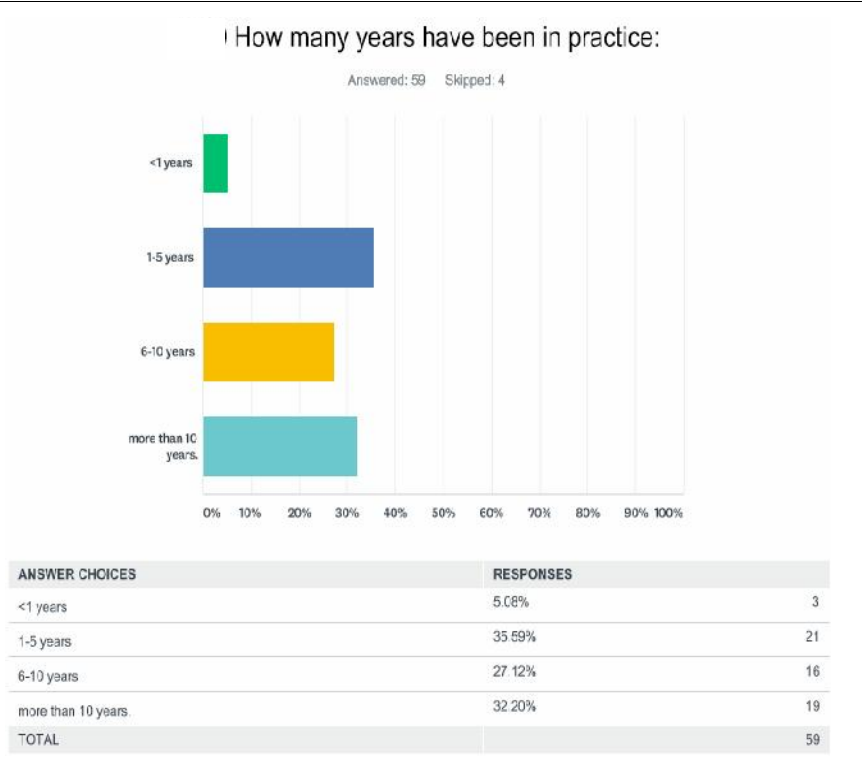
Continuation of Table 1.

Demographic Questions													
<p>17. Your position:</p> <p>a. Transplant Nephrology Consultant.</p> <p>b. Nephrology consultant.</p>	<p style="text-align: center;">Q17 Your position:</p> <p style="text-align: center;">Answered: 57 Skipped: 6</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #d9d9d9;">ANSWER CHOICES</th> <th style="background-color: #d9d9d9;">RESPONSES</th> </tr> </thead> <tbody> <tr> <td>Transplant Nephrology Consultant.</td> <td>31.58% 18</td> </tr> <tr> <td>Nephrology consultant.</td> <td>68.42% 39</td> </tr> <tr> <td style="background-color: #d9d9d9;">TOTAL</td> <td style="background-color: #d9d9d9;">57</td> </tr> </tbody> </table>	ANSWER CHOICES	RESPONSES	Transplant Nephrology Consultant.	31.58% 18	Nephrology consultant.	68.42% 39	TOTAL	57				
ANSWER CHOICES	RESPONSES												
Transplant Nephrology Consultant.	31.58% 18												
Nephrology consultant.	68.42% 39												
TOTAL	57												
<p>18. Type of renal transplant practice:</p> <p>a. My center does not perform renal transplantation and I do not follow immediate – post transplant patients.</p> <p>b. My center does not perform renal transplant, but I follow immediate – post transplant patients who are transplanted outside.</p> <p>c. My center performs renal transplant, but I do not follow immediate – post transplant patients.</p> <p>d. My center performs renal transplant and I follow immediate – post transplant patients</p>	<p style="text-align: center;">Q18 Type of renal transplant practice:</p> <p style="text-align: center;">Answered: 58 Skipped: 5</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #d9d9d9;">ANSWER CHOICES</th> <th style="background-color: #d9d9d9;">RESPONSES</th> </tr> </thead> <tbody> <tr> <td>My center does not perform renal transplantation and I do not follow immediate – post transplant patients.</td> <td>22.41% 13</td> </tr> <tr> <td>My center does not perform renal transplant, but I follow immediate – post transplant patients who are transplanted outside.</td> <td>22.41% 13</td> </tr> <tr> <td>My center performs renal transplant, but I do not follow immediate – post transplant patients.</td> <td>15.52% 9</td> </tr> <tr> <td>My center performs renal transplant and I follow immediate – post transplant patients</td> <td>39.66% 23</td> </tr> <tr> <td style="background-color: #d9d9d9;">TOTAL</td> <td style="background-color: #d9d9d9;">58</td> </tr> </tbody> </table>	ANSWER CHOICES	RESPONSES	My center does not perform renal transplantation and I do not follow immediate – post transplant patients.	22.41% 13	My center does not perform renal transplant, but I follow immediate – post transplant patients who are transplanted outside.	22.41% 13	My center performs renal transplant, but I do not follow immediate – post transplant patients.	15.52% 9	My center performs renal transplant and I follow immediate – post transplant patients	39.66% 23	TOTAL	58
ANSWER CHOICES	RESPONSES												
My center does not perform renal transplantation and I do not follow immediate – post transplant patients.	22.41% 13												
My center does not perform renal transplant, but I follow immediate – post transplant patients who are transplanted outside.	22.41% 13												
My center performs renal transplant, but I do not follow immediate – post transplant patients.	15.52% 9												
My center performs renal transplant and I follow immediate – post transplant patients	39.66% 23												
TOTAL	58												

Continuation of Table 1.

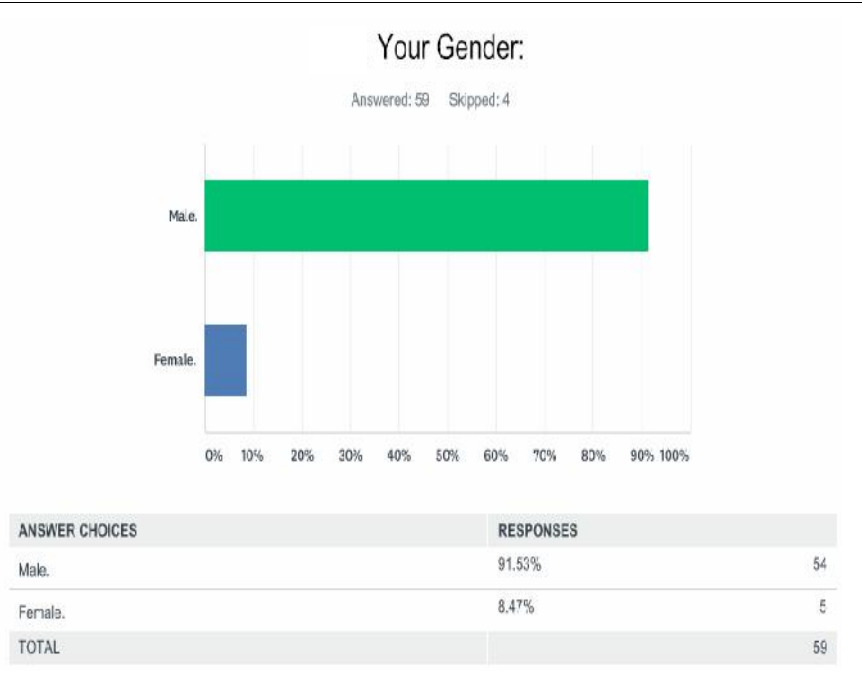
19. How many years have been in practice:

- a. <1 year
- b. 1–5 years
- c. 6–10 years
- d. More than 10 years.

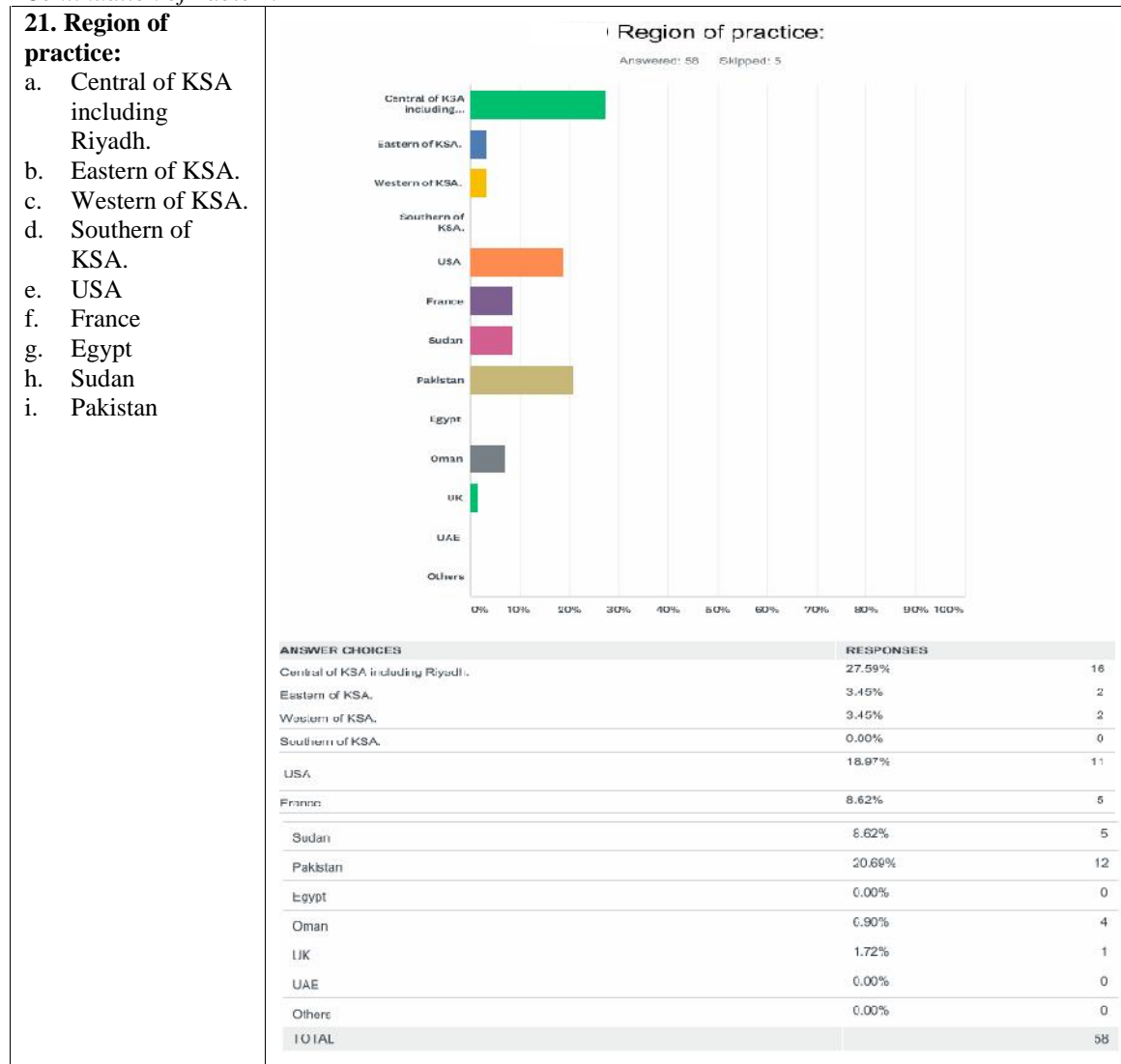


20. Your Gender:

- a. Male
- b. Female



Continuation of Table 1.



graft function. No significant differences were seen in the subgroup analysis of recipients with low, moderate, and high glomerular filtration rates (GFRs) at baseline.²

Similar findings were observed in a larger and more recent study by Ibrahim et al, where 280 kidney transplant recipients chose to fast during the Ramadan month (June–July 2014) and 285 recipients who did not fast.³

Ramadan fasting had no adverse effects on allograft function of renal transplant recipients with normal to mild-to-moderate renal impairment (41 fasters and 41 nonfasters).⁴

Ramadan fasting in recipients after the 1st

year of renal transplantation with impaired graft function (plasma creatinine levels not exceeding 300 mmol/L) had no change in urinary and serum biochemical parameters, cyclosporine A level, and hematocrit (a small study of 23 renal transplant recipients with six patients having creatinine not exceeding 300 mmol/L).⁵

Repeated Ramadan fasting for two or three consecutive years did not affect renal functions.^{6,7}

Several reviews concluded that Ramadan fasting causes no major adverse impact on kidney allografts in kidney transplant recipients.¹

Ramadan fasting in patients with CKD in general (nonrenal transplant recipients) has been shown to be safe according to several studies.

Erkoc et al showed that fasting of Ramadan in patients with autosomal dominant polycystic kidney disease with normal or near-normal GFR did not affect renal function negatively, and there were no significant changes in acute renal failure markers.⁸

In patients with CKD stages 2–4, Hassan et al compared hydration status and blood analysis of urea, creatinine, and BNP levels before and eight weeks after Ramadan. There was no significant difference between the two groups (31 fasters, 26 nonfasters).⁹

In a prospective observational study of stage 3–5 CKD patients with stable renal function, Kara et al found that fasting in Ramadan is not associated with deterioration of chronic kidney disease. However, elderly patients were at a higher risk of GFR deterioration.¹⁰

In a mini meta-analysis by Bragazzi et al, CKD patients can safely fast during Ramadan since the GFR does not change in a statistically significant way and, even though most studies have been carried out during Ramadan falling in cold seasons, the sensitivity analysis did not reveal any seasonal impact.¹¹

On the other hand, several small studies suggest that Ramadan fasting in patients with CKD may be detrimental. Mbarki et al showed that fasting may increase the risk of acute kidney injury (AKI) in CKD patients (10% of patients may have developed AKI).¹² In more advanced CKD stage, higher baseline systolic blood pressure, and younger age were independent risk factors.¹³

While the elevation of serum creatinine during the month of fasting is mostly transient, it is accentuated by the intake of renin angiotensin aldosterone (RAAS) blockers. Fasting during the month of Ramadan may be hazardous for CKD patients with preexisting cardiovascular disease as it is associated with a high risk of acute cardiovascular events according to a study by Nasr Allah and Osman.¹⁴

Ramadan fasting also seems to not increase the risk of renal colic.^{15,16} For fasting in hemo-

dialysis patients, readers are referred to the references 17 and 18.^{17,18}

In summary, the results of the survey reflect the available (although limited) studies in this area. Most of the surveyed consultants felt that renal transplant recipients who have stable kidney function for at least one-year post-transplantation can fast with cautious follow-up. Dehydration and debility due to fasting for long periods especially in the summer season are the main concern. Alteration of medications schedule, potential interactions with food or drug-to-drug (tacrolimus, Cellcept, and Magnesium) and the difficulty to obtain trough drug levels are also other concerns.

Although not clinically tested yet, urinary osmolality can be checked at the end of a day's fast to assess the ability of the transplanted kidney to concentrate urine. If the patient can concentrate urine normally, then fasting can be assumed to be safe for him/her¹⁹ (Table 2). We feel that fasting in renal transplant recipients with CKD stage 3A is considered a moderate risk category

Ramadan fasting in renal transplant patients with type-2 diabetes mellitus

In view of lack of previous studies that address fasting in renal transplant recipients, we review here fasting in patients with diabetes in general and fasting in patients with diabetes and renal disease.

Many patients with diabetes choose to fast during Ramadan (43% of Type-1 and 79% of Type-2 diabetics chose to fast at least 15 days during Ramadan).²⁰

Hypoglycemic episodes can be more frequent during Ramadan compared with other months (type-1 diabetes, 0.14 vs. 0.03 episode/month; type-2 diabetes, 0.03 vs. 0.004 episode/month).²⁰

With appropriate diabetic education, out of 1046 patients with diabetes, 998 patients fasted successfully without any episodes of hypoglycemia. Forty-eight patients (4.58%) experienced hypoglycemia. Hence, CKD was a risk factor for hypoglycemia ($P < 0.001$).²¹

In a study by Alawadi et al (2017) about fasting in patients with CKD in Dubai during

Table 2. Recommendations about fasting in renal transplant recipients.

1. It is an individualized patient's decision to fast or not.
2. For kidney recipients who choose to fast it is recommended to delay until the completion of the 1st-year post transplant.
3. Kidney recipients may try to intermittent fast for few days in the month before Ramadan.
4. Kidney recipients may also try to fast intermittent days during Ramadan.
5. Kidney recipients are advised to take plenty of fluid before starting the fast (Suhoor time).
6. Kidney recipients will be required to break their fast if they miss the pre-down meal (Suhoor), miss taking medications or if they feel exhausted from fasting.
7. Kidney recipients will be encouraged to limit their salt intake and to divide their food intake over the night.
8. To ensure 12 h dosing (as much as possible), Tacrolimus should be taken right after breaking fast (Iftar time) and Just before starting fast (Imsak time). The role of extended forms of Tacrolimus (once daily) seems appealing but has not been studied yet. Tacrolimus can be taken with or without food (immediate release) but in a consistent manner. Administer extended release on an empty stomach. Avoid concurrent use of grapefruit juice.
9. Cellcept ideally to be taken on an empty stomach (at least 1 h before or 2 h after meals). This might be difficult due to the limited duration of night time in Ramadan. Cellcept should not be taken with magnesium at the same time if possible.

Ramadan 2016, they used continuous glucose monitoring device in 19 patients aged between 18 and 70 years with diabetes and CKD stage 3. Patients with DM and moderate renal impairment experienced prolonged and more frequent chemical hypoglycemia during Ramadan compared to non-Ramadan period (80 vs. 42 events). However, no severe hypoglycemia or hospitalization or deterioration in renal functions was observed.²²

The length of fasting hours varies according to the geographical locations and can reach up to 15 h or more. Longer fasts can increase the risk of hypoglycemia and dehydration, and this should be taking in consideration. Detailed risk stratification of fasting in patients with diabetes and recommendations about management are given in reference 23.²³

Our study presents the first published guidelines about fasting in renal transplant recipients with diabetes. In our survey, most of the nephrologists (48%) said that they might allow fasting of these patients after one year. However, about 33% (as opposed to 20% for those without DM) will recommend against fasting any time after transplantation. We recommend that patients with type 2 DM should follow the same precautions and recommendations of patients with diabetes in general and those specifically with DM and CKD. Renal transplant recipients with Type-1 DM should

seek an endocrinology advice about the decision to fast. Larger studies addressing fasting in this distinct group of patients and describing more precisely the fasting process of patients are required (Table 3).

Omrah, obligatory and nonobligatory Hajj in renal transplant patients

Performing of pilgrimage to Mecca (Hajj) once in a lifetime (unless unable to do so) is an obligatory ritual for Muslims. Doing Omrah or doing more than one pilgrimage in a lifetime are non-obligatory but strongly favored and highly rewarded. Hajj is associated with massive crowding of more than 2 million people during the days of Hajj. Hajj can also be involved with an excessive physical exertion. There no published studies about the effect on Hajj in renal transplant patients or in patients with CKD in general. General risks include fatigue, exhaustion and less likely, dehydration. Risk of acquiring infections remains a major concern in immunosuppressed patients. Respiratory tract infection during Hajj is a common illness, and is responsible for most of the hospital admissions. It has been estimated that one in three pilgrims will experience respiratory symptoms.^{24,25} Typical symptoms include cough, sputum production, sore throat, hoarseness of voice, rhinorrhea, fever, and malaise. Several transmissible viral respiratory infections have

Table 3. Recommendations about fasting in renal transplant recipients with diabetes.

<p>We recommend renal transplant recipients with Type 2 DM to follow the same precautions and recommendations of patients with diabetes in general and those specifically with DM and CKD. Renal recipients with Type1 DM should seek an endocrinology advice about the decision of fasting.</p>
--

been reported to cause these illnesses such as Influenza viruses, respiratory syncytial viruses (RSV), adenoviruses, and *Rhinovirus* infection.^{24,25} Middle East Respiratory Syndrome Corona Virus (MERS Cov) has been reported in Saudi Arabia but not in Hajj. It is thought to originate in camels and can spread to people who encounter camels or who eat or drink camel products. MERS can spread between people, but in most reported cases this has happened in hospitals rather than in the community.²⁶

Renal transplant recipients (along with all other visitors) are recommended to take the meningococcal vaccine before traveling to Saudi Arabia for pilgrimage of Hajj/Umrah.^{27,28} Renal transplant patients are recommended to comply with general recommendations about Influenza and pneumonias vaccinations²⁹ (Table 4).

Resuming marital relations after renal transplantation

There is no specific data published but most centers advice their renal transplant recipients that they can resume their marital relations once the wound is healed and the urinary stent is removed.³⁰⁻³³

Pregnancy after transplant

The survey reviews the consultants' opinions about pregnancy in renal transplant recipients regarding the ideal time for planning pregnancy in primiparous or multiparous and in the presence of hypertension or proteinuria.

Potential risks to mother, fetus, and graft in renal transplant recipients

Pregnancy can carry risk to the mother, fetus,

and the graft. Risks to the mother include hypertension during pregnancy, pre-eclampsia or eclampsia, pregnancy-induced diabetes, and possibly more UTIs. Rejection can occur as a result of alteration of drug metabolism or dose minimization during pregnancy. Risks to the fetus include exposure to immunosuppressive therapy, fetal growth restriction, and prematurity.³⁴⁻³⁷

In a meta-analysis by Deshpande et al of 4706 pregnancies in 3570 kidney transplant (KT) recipients, the overall post-KT live birth rate of 73.5% was higher than the general US population (66.7%); similarly, the overall post-KT miscarriage rate of 14.0% was lower (17.1%). However, complications of pre-eclampsia (27.0%), gestational diabetes (8.0%), need for cesarean section (56.9%) and pre-term delivery (45.6%) were higher than the general US population (3.8%, 3.9%, 31.9%, and 12.5%, respectively). Obstetrical complications were higher with shorter mean interval between KT and pregnancy.³⁸

In single center study from KSA by Al-Khader et al, 113 pregnancies in 73 renal transplant recipients were studied.³⁹ The duration between the transplant surgery and conception averaged 19.9 months with a range of one month to 72 months. The mean age was 28 years. Fifty recipients had one pregnancy each, but two women had five children each and one had seven children. Only 12 (11.5%) out of the 113 pregnancies had spontaneous abortions. The maternal medical problems encountered were reversible rejection in 11%, hypertension in 43%, UTI in 17% and gestational diabetes in 21%. It was noted that there was high incidence of pre-term delivery in 64% of the

Table 4. Recommendations about Omrah, obligatory and nonobligatory Hajj in renal transplant recipients.

<p>Most of the nephrologists (75%) feel that Omrah can be allowed after 6 or 12 months of transplantation. Obligatory Hajj is to be postponed for at least 1 year and for non-obligatory hajj to be delayed for 1 or 2 years or even not to be performed due to the above-mentioned risks.</p>
--

pregnancies; cesarean section was required in 72% of the cases. Al-Khader et al concluded that in post-renal transplant pregnancies, there is a high prevalence of successful pregnancies with no adverse effect on the allograft function but higher obstetrical complications.³⁹

Regarding the fetal outcomes in the same study, the birth weights were less than that observed in the general population. Eighty-four percent was under 50th percentile for weight with 19% being under the 10th percentile (Saudi growth chart, KACST). The mean hospital stay was 18 days (2–44). The Apgar score was less than seven in only 10% of the cases and 10 in 50.9%. The incidence of congenital defects was low and not different than the general population (only 4 cases with minor defects). Despite exposure to cyclosporine throughout the pregnancy and having reduced nephron mass by virtue of their low birth weight, no glomerular or tubular defects, hypertension or proteinuria was observed in 41 children with a mean age of 52 months.⁴⁰

In a multi-center study from five different Middle Eastern countries, the outcome of 234 pregnancies in 140 renal transplant recipients was studied; the overall pregnancies (74.4%) were successful albeit with high prevalence of pre-term and cesarean deliveries (40% and 50%, respectively). The mean serum creatinine did not rise significantly during pregnancy in the group but did so in patients who had serum creatinine above 150 $\mu\text{mol/L}$ at the beginning of their pregnancies. The mean birth weight was 2458 g with 41.3% of the newborns being of low birth weight (<2,500 g). The prevalence of stillbirths was 7.3% and of spontaneous abortion was 19.3%. Pre-eclampsia and gestational diabetes were observed in 26.1% and 2% of pregnancies, respectively. Al Duraihimi et al concluded that in the presence of good allograft function, most pregnancies in renal transplant recipients have a good outcome but with increased incidence of preeclampsia, reduced gestational age and low birth weight. Patients with baseline serum creatinine of above 150 $\mu\text{mol/L}$ have an increased risk of allograft dysfunction resulting from the pregnancy.⁴¹

The optimal timing of pregnancy in renal transplant recipients

The optimal timing of pregnancy after kidney transplantation remains uncertain. The level of immunosuppression is typically more intense during the 1st year because of the induction therapy and higher levels of calcineurin inhibitors. The risk of rejection is also higher during the 1st year.

Rose et al reviewed the risk of allograft failure among women who became pregnant within the first three post-transplant years. Pregnancy leads to a higher incidence of allograft failure [hazard ratio: 1.26; 95% confidence interval (CI) 1.06, 1.50], and this risk extends into the second posttransplant year. Pregnancy in the third posttransplant year was not associated with an increased risk.⁴²

Current guidelines in the United States recommend delaying pregnancy till after the 1st year posttransplantation, whereas the European guidelines recommend waiting for two years.^{35,36,43}

Degree of chronic kidney disease, proteinuria or hypertension and pregnancy in renal transplant recipients

There are few published data in KTRs on which to base a safe recommended GFR before pregnancy.

Generally, in women with renal insufficiency (nonrenal transplant recipients), the presence of both GFR <40 mL/min/1.73 m² and proteinuria with protein >1 g/d before conception predicts poor maternal and fetal outcomes.⁴⁴

According to the UK National Cohort Study of Pregnancy in Renal Transplant Recipients, the potential predictive factors for poor pregnancy outcome included >1 previous kidney transplant, first trimester serum creatinine >125 $\mu\text{mol/L}$, and diastolic BP >90 mm Hg in the second and third trimesters.⁴⁵

Al Duraihimi et al suggest that patients with baseline serum creatinine of above 150 $\mu\text{mol/L}$ have an increased risk of allograft dysfunction resulting from the pregnancy.⁴¹

European best practice guidelines for renal transplantation suggests that in women with

normal graft function, pregnancy usually has no adverse effect on graft function and survival.⁴³

The consensus AST conference 2005 recommends “kidney recipients to have adequate and stable graft function before attempting pregnancy (e.g., creatinine <1.5 mg/dL but true GFR needs to be defined in prospective studies) or no or minimal proteinuria (level needs to be defined).”³⁶

KDIGO 2009 guidelines suggests waiting for at least one year after transplantation before becoming pregnant, and only attempting pregnancy when kidney function is stable with <1 g/d proteinuria.⁴⁶

Pregnancy in multiparous versus nulliparous renal transplant recipients:

Kidney recipients (nulliparous or multiparous) may wish to have an additional child (or children) post-renal transplant. In a study from KSA of 73 recipients, 50 had one pregnancy each, but two women had five children each and one had seven children.³⁹

In the general population, the relationship between parity and birth outcome is bimodal (not linear). The risk of pregnancy complications was highest in nulliparas, lowest in multiparas who had one to three deliveries, and intermediate in multiparas with four or more deliveries.⁴⁷

To our knowledge, there is no specific study to address the risk of pregnancy in multiparous versus nulliparous renal transplant recipients. However, it is important to keep in mind the high prevalence of potential risks of post-renal transplant in general. For example, the incidence of posttransplant diabetes (PTDM) can be up 10%–75%,⁴⁸ hypertension, 50 to 70%, pre-eclampsia 25% and 40% with a 6-fold higher risk compared to incidence of 4-5% in general population.⁴⁹ Prevalence of pre-term and cesarean deliveries was 40% and 50%, respectively with 40% of the newborns being of low birth weight (<2,500 g).⁴⁵ Women who undergo multiple repeat cesarean deliveries are at increased risk of maternal morbidity, particularly placenta previa and accreta.⁴⁷

In our survey, none of the consultants felt that pregnancy is not recommended at any

time in primiparous recipient but up 20% of the consultants did not recommend pregnancy in multiparous renal transplant recipients. This is likely due to that most of the renal transplant recipients will be willing to take the risks associated with pregnancy if they had no previous children, however more consultants will advise renal transplant recipients who already have children to carefully weigh in the risk of each subsequent pregnancy since this risk can be additive.

Summary of international guidelines about pregnancy in renal transplant recipients

KDIGO 2009 suggests waiting for at least one year after transplantation before becoming pregnant, and only attempting pregnancy when kidney function is stable with <1 g/d proteinuria.⁵⁰

The European best practice guidelines for renal transplantation recommendations

- A. In women with normal graft function, pregnancy usually has no adverse effect on graft function and survival.
- B. Pregnancy could be considered safe about two years after transplantation in women with good renal function, without proteinuria, without arterial hypertension, with no evidence of ongoing rejection and with normal allograft ultrasound.
- C. Immunosuppressive therapy based on cyclosporine or tacrolimus with or without steroids and azathioprine may be continued in renal transplant women during pregnancy. Other drugs, such as mycophenolate mofetil and sirolimus, are not recommended.

Mycophenolate has been reported to cause severe structural malformations (including cleft lip and palate, microtia, and absence of external auditory canals). Thus, MMF should generally be changed to azathioprine at least 6-weeks before pregnancy is attempted.^{43,50} Azathioprine is rated by the FDA as category ‘D’ (i.e. there is evidence of human fetal risk, but the benefits from use in pregnant women may be acceptable despite the risk). Despite the FDA category D, azathioprine has been

used safely over the years in pregnant transplant recipients. It is considered an acceptable immunosuppressant to use in this clinical setting⁵⁰ (Table 5).

Male renal transplant recipient planning to have children while on mycophenolate (Cellcept or Myfortic)

According to animal studies, genotoxic effects have been observed at exposures exceeding the human therapeutic exposures by approximately 2.5 times.⁵¹ Thus, the risk of genotoxic effects on sperm cells cannot be excluded. Based on this potential risk, sexually active male patients and/or their female partners are recommended to use effective contraception during treatment of the male patient and for at least 90 days after cessation of treatment.⁵¹

The package insert of CellCept also recommends that all sexually active male patients and/or their female partners to use effective contraception during treatment of the male patient and for at least 90 days after cessation of treatment.⁵² However, there is no human evidence that mycophenolate (MPA) impacts male patients' fertility or contributes to birth defects in their offspring.⁵³

According to the data from The National Transplantation Pregnancy Registry in USA, of 150 male transplant recipients with exposure to mycophenolic acid products fathered 205 pregnancies (208 outcomes), no pattern of malformations was identified, and the outcomes of pregnancies fathered by transplant recipients treated with mycophenolic acid products appear similar to outcomes in the general population.⁵⁴

Similar findings were observed from Medical Birth Registry of Norway of all renal transplanted men alive between 1995 and 2015.

During the given time, 230 immunosuppressed renal transplanted males fathered 350 children (155 on MPA/195 not on MPA). There was no significant increased risk of malformation in MPA exposed vs unexposed cohorts of children.⁵⁵

These results are reassuring and support the continuation of paternal MPA treatment before, during and after conception. Of note, KDIGO 2009 did not list any specific recommendation about male kidney recipient trying to have children while using Mycophenolate.⁴⁶

The Renal Association, Pregnancy and Kidney Disease and UK Renal Pharmacy Group collectively recommend for men taking mycophenolate derivatives to be informed of the theoretical risks of mycophenolate exposure to a fetus and be made aware of the contraceptive advice. The three groups collectively advise that these theoretical risks should be balanced against the risks of conversion to alternative immunosuppressive regimes on their kidney transplant status in an individualized discussion⁵⁶ (Table 6).

Strict isolation in single room after renal transplantation

Many renal transplant recipients are under the misconception that strict isolation (in a room) is required for three to six months post-transplantation. However, this misconception is not supported.

The National Kidney Foundation advises kidney transplant recipients to stay away from people who may have an infection, but it does not recommend isolating them in a room.^{57,58} "Kidney recipients are generally discharged from the hospital within three to five days and may live at home with a family but avoid

Table 5. Recommendations about pregnancy in renal transplant recipients.

<p>Renal transplant recipients should be fully aware of the potential risks to the mother, fetus, and graft. Pregnancy should be delayed after the first or preferably the second-year post transplant. Renal function should be normal or close to normal. Graft function should be stable and without recent rejection. Blood pressure must be controlled. Proteinuria should be absent or at minimal. Medications must be reviewed and monitored carefully. Other factors should be reviewed carefully. It is individualized recommendations "Case by case".</p>

Table 6. Recommendations about male renal transplant recipients planning to have new children while on Mycophenolate.

Male renal transplant recipient who is planning to have new children should be made aware of the above facts including the theoretical risk of teratogenic effects of Mycophenolate. Patients need to weigh in the risks of rejection versus benefits of avoiding any theoretical possibility of teratogenic effects.

contact with people who may harbor an infection. Infection is a common complication in the first six months after receiving a kidney transplant.”^{57,58} At the University of Columbia, New York, USA, patients are advised to resume “normal living” after returning home. “If you want to go to a movie or a social occasion and feel up to it, DO IT! If you’d like to have friends visit you at home, that’s OK too! Try as much as possible to return to your normal routine”.⁵⁹

Patients at Kansas University, USA are advised not to have large numbers of houseguests during the first six to eight weeks after surgery. “Ask family members and friends who may have colds or infections to stay away. Keep pre-school children at arm’s length, especially if they are in daycare where other children may be sick or infected. Avoid eating from salad bars or buffets as they can harbor bacteria”⁶⁰ (Table 7).

Going back to school/work in renal transplant recipients

Most of the centers advise renal transplant recipients to return to work/school within three months or less depending on the profession/occupation.^{31-33,61}

Patients are advised to exercise daily but not to resume strenuous exercise or lifting weights until they have been cleared to do so by the transplant team.⁵⁹

Supervised exercise training was shown to significantly improve exercise tolerance and quality of life according to meta-analysis of six randomized control trials.⁶²

Most of the patients will be able to drive once

the surgical pain resolves in two to four weeks post-transplant⁵⁹ (Table 8).

Daily fluid intake in renal transplant recipients

Generous and even excessive fluid intake is routinely recommended to kidney transplant recipients despite minimal evidence to support this practice.

The impact of water intake on urolithiasis, urinary tract infections (UTIs), autosomal dominant polycystic kidney diseases and bladder cancer has been studied. It remains controversial whether increased water intake slows the progression of CKD or not. However, high water intake suppresses plasma levels of arginine vasopressin (AVP), which was proposed to be beneficial for the preservation of the kidney function.⁶³

Fluid intake and preserving renal function in general chronic kidney disease patients

In an observational study of 2148 subjects with preserved renal function (GFR >60), Clark et al reported an inverse relationship between 24-h urine volume and rate of eGFR decline. Those with a urine volume ≥ 3 L/day were less likely to have GFR decline over a median of 5.7 years.⁶⁴

In another observational study (self-reported daily fluid intake), Strippoli et al examined the role of water intake in CKD progression and found that high fluid intakes were associated with the preservation of renal function.⁶⁵

Most recently, Sontrop et al conducted a cross-sectional analysis of the 2005–2006 U.S. National Health and Nutrition Examination Survey and found higher CKD prevalence

Table 7. Recommendations about Isolation post renal transplant.

Standards hygiene habits are advised but not strict isolation in a single room.

Table 8. Recommendations about returning to school or work post renal transplant.

Most of the post renal transplant patients can return to school or work in 2–3 months.

among those with the lowest fluid intake (<2 L/day) versus highest total fluid intake (>4.3 L/day). Interestingly, when stratified by intake of (1) plain water and (2) other beverages, CKD was associated with low intake of plain water but not other beverages.⁶⁶ However, contradictory findings were also reported by Herbert et al⁶⁷ in a retrospective analysis of 581 CKD patients with eGFR 25–55 mL/min in the Modification of Diet in Renal Disease cohort A. eGFR was repeatedly determined in 442 ADPKD patients and 139 patients with CKD from other causes over an average interval of 2.3 years. Contrary to the prevailing view that water is beneficial in CKD, the authors reported that individuals in the highest quartile of urine volume (>2.85 L/day) showed a faster eGFR decline than individuals in the lowest quartile of urine volume (<2 L/day). The authors concluded that sustained high urine volume and low Uosm are independent risk factors for faster GFR decline in patients with chronic renal insufficiency. Herbert et al concluded that high fluid intake does not appear to slow renal disease progression in humans. It is possible that patients with progressive CKD have higher urine output due to inability to concentrate their urine. Herbert et al suggested that until better evidence becomes available, patients with chronic renal insufficiency should generally let their thirst guide fluid intake.⁶⁷

In another study, Clark et al coached adults with CKD stage 3 (nonrenal recipients) to increase water intake by 1–2 cups/d (0.25–0.5 L/day) and compared results to patients who coached to maintain the same water intake. Increased water intake did not significantly slow the decline in kidney function after one year. However, the study may have been underpowered to detect a clinically important difference.⁶⁸

In conclusion, despite the encouraging association between high water intake and preserved eGFR in the above mentioned large observational studies, causal relationships between increased water intake and reduced GFR loss among individuals with CKD remain speculative.⁶³ It is also important to keep in

mind the inherent differences between kidney recipients who have half the number of functioning nephrons and the studied populations with near normal renal function or even patients with CKD.

Fluid intake and preserving renal function in renal transplant recipients

In renal transplant patients with baseline eGFR of 46 mL/min, the renal function decline was not different after 12 months between patients who were prescribed a daily fluid intake of 4L compared with patients who were prescribed 2 L daily. Magpantay et al concluded that recommendation of higher fluid intake does not seem to improve chronic kidney transplant failure. However, results from this study were hindered by small sample size, short follow-up, self-reporting and non-adherence to the assigned fluid volume intake in many recipients. Also, of note, patients in the normal fluid intake group were significantly older and had transplants of longer duration possibly putting this group at higher risk for worse outcomes.⁶⁹

Gordon et al interviewed 88 recipients who were recommended to drink >3 L/day fluid intake. There was no relationship between high fluid intake and eGFR at both 6- and 12-months post-transplant. This study had a 43% recruitment attrition rate making the practice of recommending high fluid intake questionable from a practical stand point, above and beyond the finding that high fluid intake had no impact on change in eGFR in the first year after transplantation.⁷⁰

Weber et al, showed that high urine volume (up to 2.56 L/day), a reasonable but imperfect surrogate of fluid intake, has neither a favorable nor adverse impact on multiple functional and structural end points (including IF/TA, all-cause ESRD, doubling serum creatinine, all cause ESRD, or death) in kidney transplant recipients within the first five years of receiving their allograft.⁷¹

In these studies of renal transplant recipients, increasing the water intake to 2.5, 3 or 4 L/day was not of added benefit to slow the decline of renal function. However, these studies are

Table 9. Recommendations about fluid intake in renal transplant recipients.

Excessive fluid intake >3 L post renal transplantation is generally not indicated and restricting fluid intake (less than 1 L /day) is not advisable.

Table 10. Recommendations for kidney donors about fluid intake.

Post kidney donation, drinking to thirst or 2-3 L /day is likely to be adequate.
--

Table 11. Recommendations for kidney donors about fasting.

Most of the donors are likely able to fast once their renal functions stabilize.
--

small in number and adherence to high fluid intake 3 L/day⁷⁰ or 4 L/day⁶⁹ was practically difficult to maintain for many recipients.

Excessive fluid intake in renal transplant recipients can also lead to hyponatremia once fluid intake exceeds the diluting capacity of the transplanted kidney⁷² (Table 9).

Daily fluid intake for kidney donors

Kidney donors invariably ask what to eat and drink to protect the remaining kidney.⁷³ However, there are no specific guidelines. Patients post-nephrectomy (from other indications) receive variable instructions about fluid intake ranging from drinking to thirst, to drink 2–3 L or 3 L.⁷⁴ In our survey, nephrologists advise donors against restricting fluid intake (less than 1 L/day) and the vast majority feels that excessive fluid intake >3 L is not indicated. Drinking to thirst or 2–3 L/day is likely to be adequate (Table 10).

Fasting in kidney donors

There is no data about Ramadan fasting post-kidney donation nor about fasting post-nephrectomy for other reasons.

In our survey, most of the nephrologists would allow kidney donors to fast once their renal functions stabilize. Only 15% will advise to wait for one year before allowing fasting (Table 11).

Conclusion

This study addresses post-renal transplant instructions about lifestyles and Islamic rituals, areas which were never or very little been addressed before. The recommendations drawn for this survey is considered valid and

reliable because all participating nephrologists were familiar with the studied lifestyles and rituals, and the survey included a reasonable number of expert nephrologists from multiple countries and with different geographical distribution. The available literature also is in support of the survey findings.

While this study is based on Experts' opinions, it presents the highest level of evidence that can be reached based on the limited available data. Of note, less than 10% of the participants were female nephrologists. This is likely due that there are less women than men nephrologists worldwide.⁷⁵

At the end, lifestyles and rituals are personal choice, and it is crucial for the renal transplant recipients to consult with the health-care team before making these choices to make sure that they can look after themselves properly. The health-care team will provide the best advice based on the review of each individualized care.

To our knowledge this the first study exploring the consensus among Muslim nephrologists regarding the advice they would give regarding performance of potentially risky lifestyles and religious rituals by Muslim post-transplant patents.

Conflict of interest: None declared.

References

1. Matter Y, Sheashaa H, Refaie A. Effect of Ramadan fasting on patients with different kidney diseases: An updated review. *J Egypt Soc Nephrol Transplant* 2018;18:1-5.
2. Qurashi S, Tamimi A, Jaradat M, Al Sayyari A. Effect of fasting for Ramadan on kidney

- graft function during the hottest month of the year (August) in Riyadh, Saudi Arabia. *Exp Clin Transplant* 2012;10:551-3.
3. Ibrahim IA, Hassan EA, Alkhan AM, et al. Ramadan fasting in kidney transplant recipients: A single-centre retrospective study. *J Transplant* 2018;2018:4890978.
 4. Einollahi B, Lessan-Pezeshki M, Pourfarziani V, et al. Ramadan fasting in kidney transplant recipients with normal renal function and with mild-to-moderate renal dysfunction. *Int Urol Nephrol* 2009;41:417-22.
 5. Abdalla AH, Shaheen FA, Rassoul Z, et al. Effect of Ramadan fasting on Moslem kidney transplant recipients. *Am J Nephrol* 1998;18:101-4.
 6. Hejaili F, Qurashi S, Binsalih S, Jaradt M, Al Sayyari A. Effect of repeated ramadan fasting in the hottest months of the year on renal graft function. *Nephrourol Mon* 2014;6:e14362.
 7. Ghalib M, Qureshi J, Tamim H, et al. Does repeated Ramadan fasting adversely affect kidney function in renal transplant patients? *Transplantation* 2008;85:141-4.
 8. Ekinici I, Erkoç R, Gursu Met al. Effects of fasting during the month of Ramadan on renal function in patients with autosomal dominant polycystic kidney disease. *Clin Nephrol* 2018; 89:103-12.
 9. Hassan S, Hassan F, Abbas N, et al. Does Ramadan fasting affect hydration status and kidney function in CKD patients? *Ann Nutrit Metabol* 2018;72:241-7.
 10. Kara E, Sahin OZ, Kizilkaya B, et al. Fasting in Ramadan is not associated with deterioration of chronic kidney disease: A prospective observational study. *Saudi J Kidney Dis Transpl* 2017;28:68-75.
 11. Bragazzi NL. Ramadan fasting and chronic kidney disease: Does estimated glomerular filtration rate change after and before Ramadan? Insights from a mini meta-analysis. *Int J Nephrol Renovasc Dis* 2015;8:53-7.
 12. Mbarki H, Tazi N, Najdi A, Tachfouti N, Arrayhani M, Sqalli T. Effects of fasting during Ramadan on renal function of patients with chronic kidney disease. *Saudi J Kidney Dis Transpl* 2015;26:320-4.
 13. Bakhit AA, Kurdi AM, Wadera JJ, Alsuwaida AO. Effects of Ramadan fasting on moderate to severe chronic kidney disease. A prospective observational study. *Saudi Med J* 2017; 38:48-52.
 14. NasrAllah MM, Osman NA. Fasting during the month of Ramadan among patients with chronic kidney disease: Renal and cardiovascular outcomes. *Clin Kidney J* 2014;7:348-53.
 15. Cevik Y, Corbacioglu SK, Cikrikci G, Oncul V, Emektar E. The effects of Ramadan fasting on the number of renal colic visits to the emergency department. *Pak J Med Sci* 2016; 32:18-21.
 16. Al Mahayni AO, Alkhateeb SS, Abusaq IH, Al Mufarrih AA, Jaafari MI, Bawazir AA. Does fasting in Ramadan increase the risk of developing urinary stones? *Saudi Med J* 2018;39:481-6.
 17. Imtiaz S, Salman B, Dhrolia MF, Nasir K, Abbas HN, Ahmad A. Clinical and Biochemical Parameters of Hemodialysis Patients Before and During Islamic Month of Ramadan. *Iran J Kidney Dis* 2016;10:75-8.
 18. https://www.daralliance.org/daralliance/wp-content/uploads/2018/01/IDF-DAR-Practical-Guidelines_15-April-2016_low_5.pdf risk starisk risk. Last accessed date March 6, 2019.
 19. Al-Khader AA. Ramadan fasting and renal transplantation. *Saudi J Kidney Dis Transpl* 1994;5:463-5.
 20. Salti I, Bénard E, Detournay B, et al. A population-based study of diabetes and its characteristics during the fasting month of Ramadan in 13 countries: Results of the epidemiology of diabetes and Ramadan 1422/2001 (EPIDIAR) study. *Diabetes Care* 2004; 27:2306-11.
 21. Aziz KM. Effect of fasting ramadan in diabetes control status - application of extensive diabetes education, serum creatinine with HbA1c statistical ANOVA and regression models to prevent hypoglycemia. *Recent Pat Endocr Metab Immune Drug Discov* 2013;7: 233-51.
 22. Alawadi F, Rashid R, Bashier A, et al. The Impact of Ramadan fasting on Glycemic Control and Kidney Function in Patients with Diabetes and Chronic Kidney Disease stage; 2017.
 23. Hassanein M, Al-Arouj M, Hamdy O, et al. Diabetes and ramadan: Practical guidelines. *Diabetes Res Clin Pract* 2017;126:303-16.
 24. Alzeer AH. Respiratory tract infection during Hajj. *Ann Thorac Med* 2009;4:50-3.
 25. Rashid H, Shafi S, Haworth E, et al. Viral respiratory infections at the Hajj: Comparison between UK and Saudi pilgrims. *Clin Microbiol Infect* 2008;14:569-74.
 26. Health. Travelling for Hajj or Umrah; 2018.

- Available from: <https://www.health.govt.nz/your-health/healthy-living/travelling/travelling-hajj-or-umrah>. Last accessed date March 11, 2019.
27. Patel RR, Liang SY, Koolwal P, Kuhlmann FM. Travel advice for the immunocompromised traveler: Prophylaxis, vaccination, and other preventive measures. *Ther Clin Risk Manag* 2015;11:217-28.
 28. Kotton CN, Hibberd PL, AST Infectious Diseases Community of Practice. Travel medicine and transplant tourism in solid organ transplantation. *Am J Transplant* 2013;13 Suppl 4:337-47.
 29. Saleh SB; 2018. Available from: <https://www.archyworldys.com/safe-hajj-for-kidney-patients/>. Last accessed date March 5, 2019.
 30. Hopkins. Hopkin Patient Information/Kidney-Transplant-Handbook; 2017. Available from: https://www.hopkinsmedicine.org/transplant/patient_information/resources/kidney-transplant-handbook.pdf. Last accessed date February 1, 2019.
 31. Kidney & Pancreas Transplant Program California Pacific Medical Center; 2018. Available from: <https://www.slideshare.net/ringer21/kidney-pancreas-transplant-at-california-pacific-medical-center>. Last accessed date February 1, 2019.
 32. Kidney Transplantation - After Your Kidney Transplant Patient Teaching Manual; 2018. Available from: <https://devbmc.org/transplant-surgery/patient-education>. Last accessed date March 1, 2019.
 33. Guide to Kidney Transplantation. Available from <http://www.beaumontie/kidneycentre-for-patients>. Last accessed date March 11, 2019.
 34. UNOS. Pregnancy after Transplant; 2018. Available from: <https://transplantliving.org/children/pregnancy-after-transplant/risks/>. Last accessed date March 1, 2019.
 35. Chittka D, Hutchinson JA. Pregnancy after renal transplantation. *Transplantation* 2017; 101:675-8.
 36. McKay DB, Josephson MA, Armenti VT, et al. Reproduction and transplantation: Report on the AST consensus conference on reproductive issues and transplantation. *Am J Transplant* 2005;5:1592-9.
 37. McKay DB, Josephson MA. Pregnancy after kidney transplantation. *Clin J Am Soc Nephrol* 2008;3 Suppl 2:S117-25.
 38. Deshpande NA, James NT, Kucirka LM, et al. Pregnancy outcomes in kidney transplant recipients: A systematic review and meta-analysis. *Am J Transplant* 2011;11:2388-404.
 39. Al-Khader AA, Al-Ghamdi, Basri N, et al. Pregnancies in renal transplant recipients-with a focus on the maternal issues. *Ann Transplant* 2004;9:62-4.
 40. Al-Khader AA, Basri N, Al-Ghamdi, et al. Pregnancies in renal transplant recipients-with a focus on babies. *Ann Transplant* 2004;9:65-7.
 41. Al Duraihimh H, Ghamdi G, Moussa D, et al. Outcome of 234 pregnancies in 140 renal transplant recipients from five middle eastern countries. *Transplantation* 2008;85:840-3.
 42. Rose C, Gill J, Zalunardo N, Johnston O, Mehrotra A, Gill JS. Timing of Pregnancy After Kidney Transplantation and Risk of Allograft Failure. *Am J Transplant* 2016; 16:2360-7.
 43. EBPG Expert Group on Renal Transplantation. European best practice guidelines for renal transplantation. Section IV: Long-term management of the transplant recipient. *Nephrol Dial Transplant* 2002;17 Suppl 4:1-67.
 44. Imbasciati E, Gregorini G, Cabiddu G, et al. Pregnancy in CKD stages 3 to 5: Fetal and maternal outcomes. *Am J Kidney Dis* 2007; 49:753-62.
 45. Bramham K, Nelson-Piercy C, Gao H, et al. Pregnancy in renal transplant recipients: A UK national cohort study. *Clin J Am Soc Nephrol* 2013;8:290-8.
 46. Kasiske BL, Zeier MG, Chapman JR, et al. KDIGO clinical practice guideline for the care of kidney transplant recipients: A summary. *Kidney Int* 2010;77:299-311.
 47. Sara Simonsen MWV. Grand Multiparity. Available from: <https://www.uptodate.com/contents/grand-multiparity>. [Last accessed on 2018 Dec 21].
 48. Shivaswamy V, Boerner B, Larsen J. Post-Transplant Diabetes Mellitus: Causes, Treatment, and Impact on Outcomes. *Endocr Rev* 2016; 37:37-61.
 49. Shah S, Verma P. Overview of pregnancy in renal transplant patients. *J Int J Nephrol* 2016; 2016:7.
 50. Special Issue: KDIGO Clinical Practice Guideline for the Care of Kidney Trans Recip 2009;9:S1-S155.
 51. Highlights of Prescribing Information of Cellcept; 2018. Available from: https://www.genec.com/download/pdf/cellcept_prescribing.pdf. Last accessed date March 7, 2019.
 52. CellCept [package insert]. San Francisco CGU, Inc 2012. CellCept [package insert]. San

- Francisco, CA: Genentech USA, Inc.; 2012. Available from: <https://www.genecom/medical-professionals/medicines/cellcept>. [Last accessed on 2018 Dec 21].
53. Kim M, Rostas S, Gabardi S. Mycophenolate fetal toxicity and risk evaluation and mitigation strategies. *Am J Transplant* 2013;13:1383-9.
 54. Jones A, Clary MJ, McDermott E, et al. Outcomes of pregnancies fathered by solid-organ transplant recipients exposed to mycophenolic acid products. *Prog Transplant* 2013;23:153-7.
 55. Midtvedt K, Bergan S, Reisæter AV, Vikse BE, Åsberg A. Exposure to Mycophenolate and Fatherhood. *Transplantation* 2017;101:e214-e217.
 56. Morlidge MHGLCAC. Recommendations for Men Taking Mycophenolate Derivatives and Pregnancy Following MHRA Recommendations; 2016. Available from: <http://rarerenalorg/wp-content/uploads/2016/05/Mycophenolate-and-fathers-to-be-letter-May-2016pdf>. Last accessed date March 5, 2019.
 57. NKF. After Kidney Transplant, do Patients Require Complete Isolation for 3 Months? 2012. Available from: <https://www.kidneyorg/blog/ask-doctor/after-kidney-transplant-do-patients-require-complete-isolation-3-months>. [Last accessed on 2018 Dec 25].
 58. NKF. Care After Kidney Transplant. Available from: <https://www.kidneyorg/atoz/content/immunosuppression>. [Last accessed on 2018 Dec 25].
 59. Resuming Life After Kidney Transplantation. Available from: <http://columbia.surgery.org/kidney-transplant/resuming-life-after-kidney-transplantation>. [Last accessed on 2018 Dec 25].
 60. Recovery After Transplant Surgery. Available from: <https://www.kansas.healthsystem.com/transplant/kidney/recovery-followup>. [Last accessed on 2018 Dec 25].
 61. Your Guide to Kidney Transplantation. Available from: <https://www.guysandstthomas.nhs.uk/resources/patient-information/kidney/kidney-transplantation-guidepdf>. Last accessed date March 1, 2019.
 62. Oguchi H, Tsujita M, Yazawa M, et al. The efficacy of exercise training in kidney transplant recipients: A meta-analysis and systematic review. *Clin Exp Nephrol* 2019;23:275-84.
 63. Choi HY, Park HC, Ha SK. High water intake and progression of chronic kidney diseases. *Electrolyte Blood Press* 2015;13:46-51.
 64. Clark WF, Sontrop JM, Macnab JJ, et al. Urine volume and change in estimated GFR in a community-based cohort study. *Clin J Am Soc Nephrol* 2011;6:2634-41.
 65. Strippoli GF, Craig JC, Rochtchina E, Flood VM, Wang JJ, Mitchell P. Fluid and nutrient intake and risk of chronic kidney disease. *Nephrology (Carlton)* 2011;16:326-34.
 66. Sontrop JM, Dixon SN, Garg AX, et al. Association between water intake, chronic kidney disease, and cardiovascular disease: A cross-sectional analysis of NHANES data. *Am J Nephrol* 2013;37:434-42.
 67. Hebert LA, Greene T, Levey A, Falkenhain ME, Klahr S. High urine volume and low urine osmolality are risk factors for faster progression of renal disease. *Am J Kidney Dis* 2003;41:962-71.
 68. Clark WF, Sontrop JM, Huang SH, et al. Effect of coaching to increase water intake on kidney function decline in adults with chronic kidney disease: The CKD WIT randomized clinical trial. *JAMA* 2018;319:1870-9.
 69. Magpantay L, Ziai F, Oberbauer R, Haas M. The effect of fluid intake on chronic kidney transplant failure: A pilot study. *J Ren Nutr* 2011;21:499-505.
 70. Gordon EJ, Prohaska TR, Gallant MP, et al. Longitudinal analysis of physical activity, fluid intake, and graft function among kidney transplant recipients. *Transpl Int* 2009;22:990-8.
 71. Weber M, Berglund D, Reule S, Jackson S, Matas AJ, Ibrahim HN. Daily fluid intake and outcomes in kidney recipients: Post hoc analysis from the randomized ABCAN trial. *Clin Transplant* 2015;29:261-7.
 72. Musso CG, Castañeda A, Giordani M, et al. Hyponatremia in kidney transplant patients: Its pathophysiologic mechanisms. *Clin Kidney J* 2018;11:581-5.
 73. Kalantar-Zadeh K. What not to eat after nephrectomy. *Renal Urol News* 2017. Available from: <https://www.renalandurologynews.com/home/news/urology/kidney-cancer/what-not-to-eat-after-nephrectomy/>.
 74. Fluids Intake with One Kidney. Available from: <https://cscncancerorg/node/220718>. [Last accessed on 2018 Dec 25].
 75. AAMC Physician Specialty Data Book; 2012. Available from: <https://www.aamc.org/download/313228/data/2012physicianspecialtydatabookpdf>. [Last accessed on 2019 Feb 10].