Kidney Transplantation and Pregnancy

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Kidney Transplantation and Pregnancy

- Female Transplant Recipients **Can and Do** Become Pregnant
- Pregnancy in kidney transplant recipients is no longer considered an absolute contraindication
- Pregnancy after kidney transplantation is not a “zero-risk” choice *(Cabiddu G, et al. J Nephrol 2018)*

Important Date-March 1958

- Edith Helm and her donor (identical twin sister)
- First woman in the world-successfully gave birth in 1958 after kidney transplantation (had 2 pregnancies)
- Her donor also had 4 healthy pregnancies

- The first post-kidney transplant pregnancy- reported by Dr. Joseph Murray and colleagues in 1963 (NEJM)
- Dr. Murray was awarded the Nobel Prize for Medicine in 1990

Questions

- Is pregnancy advisable in transplant recipients?
- Will pregnancy be complicated?
- Will the baby be healthy?
- Will there be any long-term harm (mother and the baby)?

Kidney Transplantation and Pregnancy

- Registries (voluntary):
  - Transplant Pregnancy Registry International-established in 1991 at Thomas Jefferson University in Philadelphia by Dr. Vincent Armenti-per 2022 annual report, over 2,800 (US/Puerto Rico) pregnancies in 1,417 female kidney tx recipients and 1,006 pregnancies fathered by 638 kidney recipients
  - UK Transplant Pregnancy Registry-established in 1997
  - Australia/New Zealand Registry
  - EDTA European Registry
- Case reports and retrospective single center studies

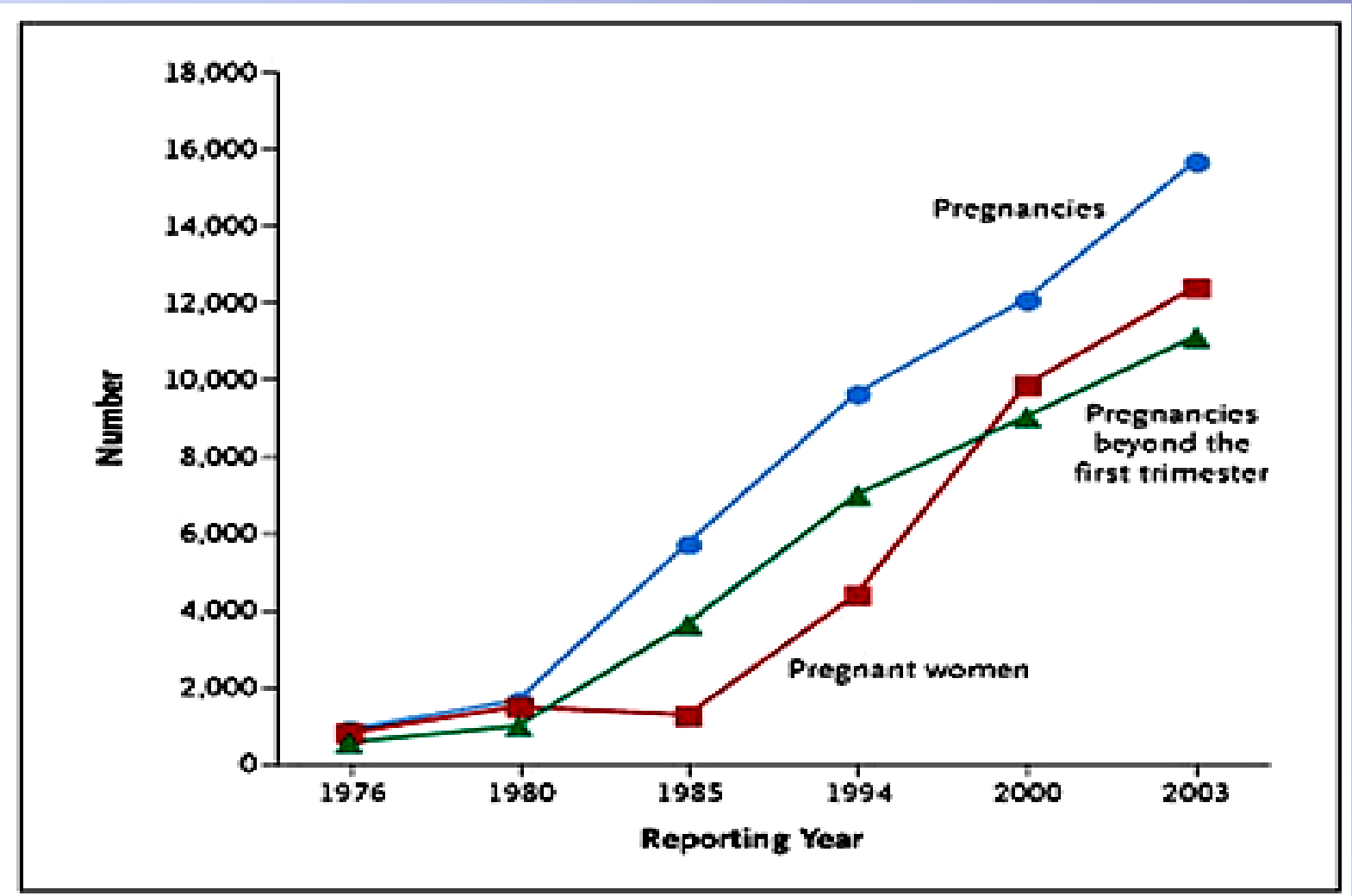
Transplant Pregnancy Registry International
A DIVISION OF GIFT OF LIFE INSTITUTE

TPRI Total 3,184 recipients as of June 1, 2024

Country	N
USA/Puerto Rico	2,896
Canada	97
UK	77
Australia	28
South Africa	8
Ireland	7
New Zealand	7
Netherlands	6
Denmark	6
India	5
Philippines	4
Czech Republic	3
France	3
Switzerland	3
Argentina, Bosnia and Herzegovina, Brazil, Finland, Germany, Mexico, Pakistan, Sweden	2 each
Austria, Bangladesh, Croatia, Cyprus, Greece, Guam, Guatemala, Hungary, Iceland, Israel, Italy, Japan, Kenya, Kuwait, Qatar, Romania, Russia, Singapore, Spain, Turkey, UAE	1 each

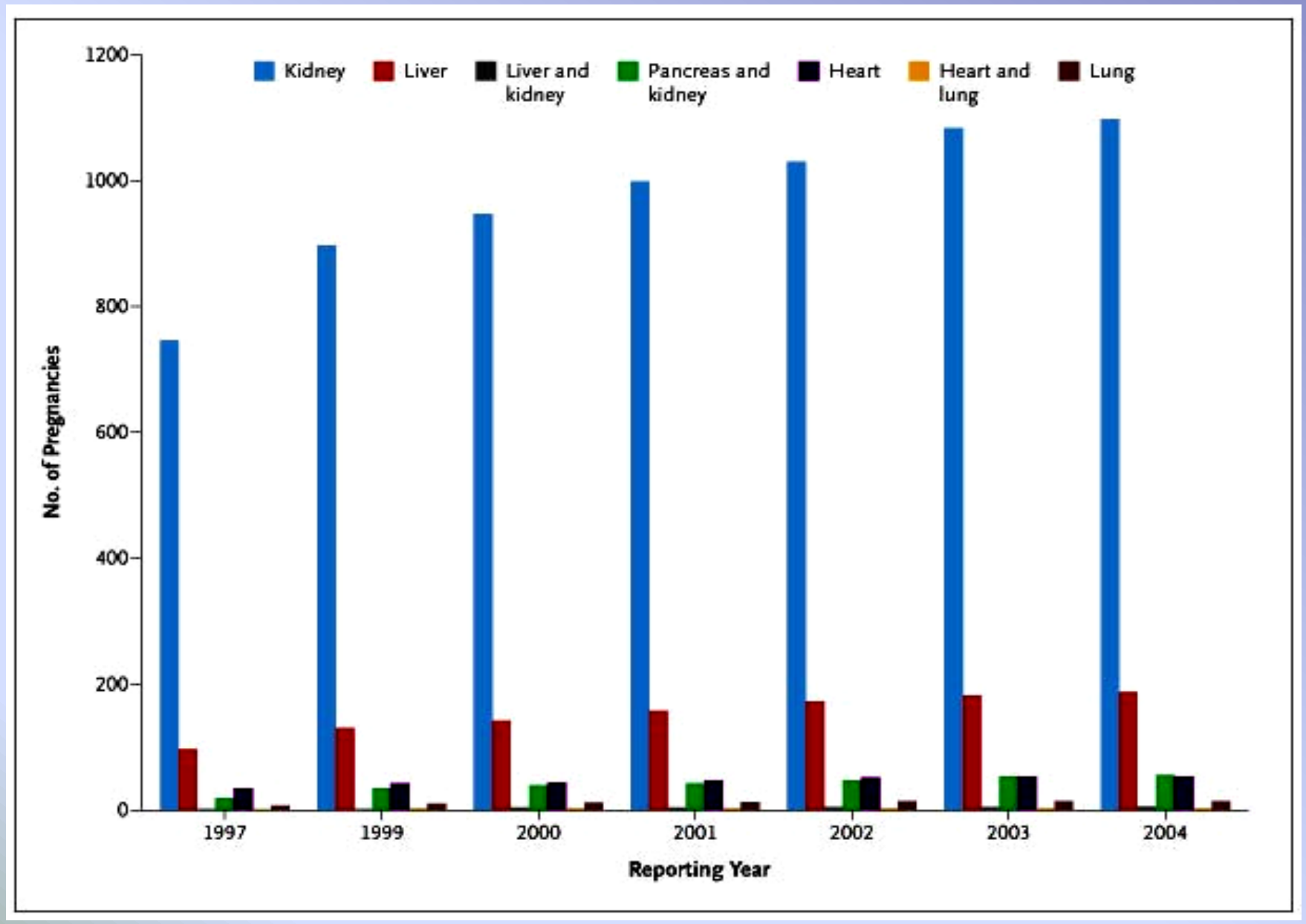
Kidney Disease-Facts

- Majority of women with CKD/ESRD are beyond childbearing age; libido decreased/not sexually active
- As renal function declines, fertility rates decline proportionately, largely due to dysregulation in the hypothalamic–pituitary–ovarian axis
- The frequency of conception is decreased in women with CKD and markedly decreased in ESRD
- **Return of fertility in 1-12 months in transplant recipients** (not known if the recovery is complete)
  - In 2022 (in the US)-approx 16,000 women had an organ transplant, 35% reproductive age
  - Study in 309 transplant recipients, 44% were not aware that a woman could become pregnant after transplantation; most pregnancies were planned
    French VA, et al. Obstet Gynecol 2013



•Pregnancies in Kidney Transplant Recipients Reported Worldwide-3 Registries

McKay D and Josephson M, NEJM 2006



McKay D and Josephson M, NEJM 2006

Baseline Evaluation Before Pregnancy-Should be Introduced During the Pretransplant Evaluation

- Multidisciplinary consultation (transplant surgery, nephrology, maternal-fetal medicine)
- Identify clinical events in preceding year (acute rejection, kidney biopsy, serious infections)
- Review of current medications and identification of teratogenic risks
- Vaccination status
- Blood pressure and vital signs/exam
- Baseline Labs/allograft function/HbA1c/Echo
- Evaluation of psychosocial status

Society for Maternal-Fetal Medicine review. Am J Obstet Gynecol 2023

Pregnancy Outcomes

Pregnancy Outcomes

- Meta-analysis of articles published between 2000 and 2010 that reported pregnancy-related outcomes among kidney transplant recipients
- 50 studies: 4706 pregnancies in 3570 kidney transplant recipients
- 18 studies were from Europe, 12 from the Middle East, 8 from Asia, 6 from North America, 4 from South America and 2 from Australia

Deshpande NA, et al. Am J Transplant 2011

Table 2. Maternal [1] demographics, pregnancy outcomes, obstetric complications and delivery outcomes among kidney transplant recipients

Maternal demographics	Mean	USA, 2006 [2]
Age at pregnancy	29.0 years (28.9–29.1)	NA
Transplant-pregnancy interval	3.2 years (3.1–3.3)	NA
Pregnancy outcome	Pooled incidence	USA, 2006
Live birth	73.5% (72.1–74.9)	66.7% [3]
Miscarriage [4]	14.0% (12.9–15.1)	17.1% [3]
Abortion [5]	9.5% (8.6–10.4)	NA
Stillbirth	2.5% (2.0–3.0)	NA
Ectopic pregnancy	0.6% (0.4–0.9)	NA
Obstetric complication	Pooled incidence	USA, 2006
Hypertension [6]	54.2% (52.0–56.4)	NA
Preeclampsia	27.0% (25.2–28.9)	3.8%
Gestational diabetes	8.0% (6.7–9.4)	3.9%
Delivery outcome	Mean/Pooled incidence	USA, 2006
Cesarean section	56.9% (54.9–58.9)	31.9%
Preterm delivery [7]	45.6% (43.7–47.5)	12.5%
Gestational age	35.6 weeks (35.5–35.7)	38.7 weeks
Birth weight	2420 grams (2395–2445)	3298 grams

- Complications of **preeclampsia (27.0%), gestational diabetes (8.0%), C-section (56.9%)** and **preterm delivery (45.6%)** were higher than the general US population (3.8%, 3.9%, 31.9% and 12.5%, respectively)

Deshpande NA, et al. Am J Transplant 2011

Pregnancy Outcomes-Meta-analysis

- 87 studies; 6712 pregnancies in 4174 kidney transplant recipients
- **The live-birth rate was 72.9%**
- Induced abortions 12.4% (95% CI, 10.4–14.7)
- Miscarriages 15.4% (95% CI, 13.8–17.2)
- Stillbirths 5.1% (95% CI, 4.0–6.5)
- Ectopic pregnancies 2.4% (95% CI, 1.5–3.7)

Shah, S, et al. BMC Nephrology 2019

Pregnancy Outcomes-Meta-analysis

- Preeclampsia **21.5%** (95% CI, 18.5–24.9)
- Gestational diabetes **5.7%** (95% CI, 3.7-8.9)
- Pregnancy induced hypertension 24.1% (95% CI, 18.1–31.5)
- Cesarean section 62.6 (95% CI 57.6–67.3)
- Preterm delivery was **43.1%** (95% CI, 38.7–47.6)
- The rate of spontaneous abortion was higher in women with mean maternal age < 25 years and > 35 years as compared to women aged 25–34 years

Shah, S, et al. BMC Nephrology 2019

Pregnancy Outcomes-Meta-analysis

- 43 studies-38 reported information on graft loss (GL), 18 reported Scr postpregnancy
- **No difference in GL** compared to nulliparous KT recipients and **stable Scr up to 10 years posttransplant** (GL of 38.5% >10-year postpartum-pooled incidence of 5 studies)
- Risk factors for GL after pregnancy: hypertension (>140/90 mmHg), proteinuria (>1 g/d), transplant to conception/delivery interval (less than 1 year), and preconception graft function

Van Buren MC, et al. Transplantation 2020

Table 3. TPRI: Pregnancy after kidney, liver, or kidney-pancreas transplant									
	Kidney			**Liver**			**Kidney-Pancreas**		
Female Recipients	1367			400			83		
Mean age at 1st transplant (years)	24.0			20.4			29.4		
Pre-transplant pregnancy	28%			24%			40%		
Pregnancies	2455			801			145		
Mean transplant-conception interval (years)	5.4			8.9			4.4		
Unplanned	30%			36%			37%		
Estimated conception range	July 1967 – Sept 2022			Nov 1985 – Jan 2022			June 1989 – May 2022		
During Pregnancy									
Primary Immunosuppressant[1]	CsA	Tac	Other	CsA	Tac	Other / none	CsA	Tac	Other
	38%	40%	22%	28%	67%	5%	33%	64%	3%
MPA exposure	8%			6%			12%		
Sirolimus exposure	1%			2%			2%		
Azathioprine exposure	72%			20%			79%		
Hypertension treated	48%			21%			52%		
Diabetes insulin treated	8%			8%			3%		
Preeclampsia	30%			20%			37%		
Rejection during pregnancy[2]	8%			5%			5%		
After Pregnancy									
Graft loss within 2 years of delivery	5.5%			2.6%			10.3%		
OUTCOMES[3]	2544			821			154		
Live births	75%			73%			69%		
Neonatal deaths	1%			1%			2%		
Miscarriages	19%			23%			27%		
Stillbirths	2%			1%			0		
Ectopic pregnancies	1%			1%			1%		
Terminations	4%			3%			3%		
LIVE BIRTHS	1892			594			106		
Mean gestational age (weeks)	35.8			36.8			33.9		
Late preterm (>32-<37 weeks)	41%			29%			56%		
Very preterm (28-<32 weeks)	7%			5%			12%		
Micro preemie (<28 weeks)	4%			1%			8%		
Mean birth weight (g)	2551			2778			2128		
Low (<2500 g)	42%			29%			62%		
Very Low (<1500 g)	10%			6%			21%		
Cesarean section	51%			44%			72%		
Birth Defects	4.8%			5.5%			3.8%		
Mean child follow-up (years)	14.3			9.3			10.1		
Mean recipient follow-up (years)	14.4			9.6			10.6		
Maternal deaths any time after pregnancy	20%			15%			30%		
Mean age of children at maternal death Number of children	19.6 years 341 children			13.1 years 77 children			11.8 years 32 children		
Adequate graft function at last follow-up	67%			81%			53%		

[1] cyclosporine, its modified form (CsA), tacrolimus (Tac), sirolimus, everolimus, mycophenolic acid products, or belatacept (other)

Pregnancy Outcomes

- Transplants from 1971 to 2017 from Netherlands; 288 pregnancies
- Total live birth rate ≥20 weeks of gestation 93%; mean gestational age 35.6 weeks; 86% “take home baby” rate
- Neonatal death 3%, pre-term birth 50%
- **Lower pre-pregnancy eGFR categories** showed a shorter duration of pregnancy and a lower birthweight (especially <30 cc/min)
- Gestational HTN 26%; C-section 48%

Gosseling ME, et al. Kidney Int 2022

Tacrolimus-Pregnancy

- TAC highly bound to plasma proteins and erythrocytes: significant anemia and hypoalbuminemia could affect the levels
- Increase in total blood volume during pregnancy-leads to relative decrease in tac-binding sites
- Trough TAC-measured in whole blood; dosage titration to maintain trough concentrations might lead to an increase in unbound (free fraction) TAC concentrations
- Metabolism: increased due to increased maternal CYP3A4 activity
  - 20-30% dose increase might be required to maintain levels
- Monitoring plasma or unbound tacrolimus trough concentrations (more costly and not routine), might better predict drug efficacy and toxicity

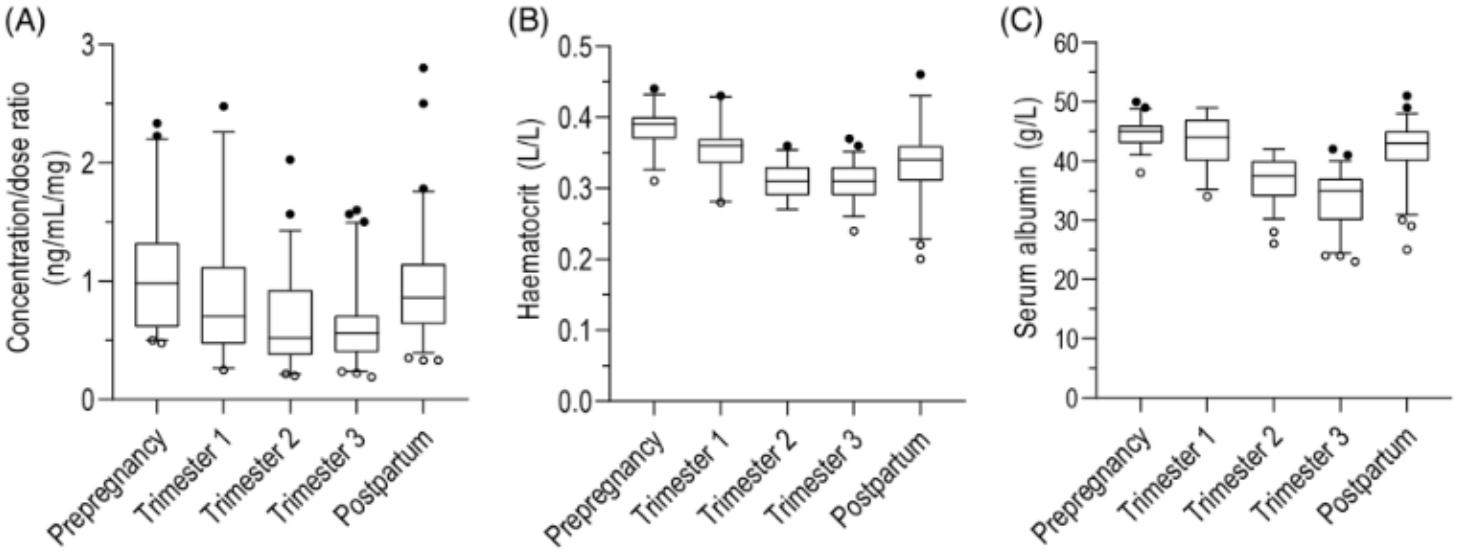


FIGURE 1 (A) Tacrolimus concentration/dose ratio (ng/mL/mg) plotted per stage of follow-up. (B) Haematocrit (L/L) plotted per stage of follow-up. (C) Serum albumin (g/L) plotted per stage of follow-up. Box plots showing the quartiles, the 5th and 95th percentiles (whiskers) and extreme values to the minimum (○) and maximum (●).

-14 women, on twice-daily TAC

-TAC clearance increases throughout pregnancy, largest change in the first trimester, up to 21% at the end of gestation

-Increased TAC dosing is required during pregnancy to maintain target whole-blood concentrations

Schagen MR, et al. Br J Clin Pharmacol 2024

- **Cyclosporine and tacrolimus levels** MUST be checked frequently during pregnancy-must have adequate levels to prevent rejection

Maternal Conditions/Risks

- Hypertension: might worsen (25-73%)
- Preeclampsia: 24-38% (3-4% in general population)
- Risk of ectopic pregnancy: not increased
- Worsening renal function
  - Acute rejection or obstruction
- Increased likelihood of operative delivery: 30-59% C-section
- Graft loss after delivery: 4-13% within 2 years after delivery (old data)
- **Anemia very common (75%)**
- Gestational diabetes: 8% in patients on CNI

Predictors of Pregnancy Outcomes

- Etiology of original kidney disease (recurrence?- lupus or FSGS)
- Chronic allograft dysfunction (Scr>1.5 mg/dl)
- Cardiovascular and pulmonary status
- Diabetes, hypertension, obesity and proteinuria
- Inherited diseases in mother or father
- Infections might affect the fetus: CMV, herpes simplex, toxoplasmosis, HBV, HCV, BK virus
- Unplanned pregnancy: higher risk of early termination, more acute rejection and graft loss within 2 years of pregnancy

Immunosuppressive Medications and the Fetus

Potential Risks to Children Born to Transplant Recipients

- Preterm birth (delivery at <37 weeks of gestation): 14-83% vs 5-15% in general population
- Intrauterine growth retardation (IUGR) and low birth weight (19-67% vs 5-13% in general population),
- Congenital abnormalities (no increase with CsA, chromosome aberrations with AZA)
- Adrenocortical insufficiency
- Hyperkalemia, renal dysfunction
- Immunologic abnormalities, malignancies
- Infections (CMV, hepatitis B and C-especially in liver transplant recipients, sepsis)
- **Most of the offspring seem to have normal long-term development** (TPRI Annual Report 2022)

Fetal Safety for Commonly Used Immunosuppressive Drugs

	Pregnancy Category
• Corticosteroids	B
• Cyclosporine	C
• Tacrolimus	C
• Azathioprine	D
• Rapamycin	C
• **MMF**	**D**

A-no risk, B-low risk, C-risk can not be ruled out, D-known risk, X-contraindicated

Fetal Safety for Commonly Used Immunosuppressive Drugs

	Pregnancy Category
• Daclizumab (Zenapax)	C
• Basiliximab (Simulect)	B
• OKT3	C
• Thymoglobulin	C
• ATGAM	C

A-no risk, B-low risk, C-risk can not be ruled out, D-known risk, X-contraindicated

Pregnancy Outcome

	Renal transplantation	Primary renal disease	*P* value
Pregnancies	73	59	—
Spontaneous abortions	17 (23%)	9 (15%)	NS
Therapeutic abortions	7 (9.6%)	2 (3.4%)	NS
Births	49	48	—
Neonates	50	48	—
Superimposed preeclampsia	9 (19%)	10 (21%)	NS
Preterm delivery	29 (60%)	10 (21%)	0.001
IUGR	25 (52%)	8 (17%)	0.001
Cesarean delivery	18 (37%)	13 (27%)	NS
Hospitalization in NICU	17 (35%)	3 (6%)	0.01
Stillbirths	1 (2%)[a]	0	NS

	Renal transplantation (n = 48)[a]	Primary renal disease (n = 48)[a]	*P* value
Major malformations	2 (4.2%)	2 (4.2%)	NS
Mild errors of morphogenesis	10 (20.8%)	8 (16.6%)	NS

[a]Number of live births.

Bar J, et al. Am J Med Genet 2003

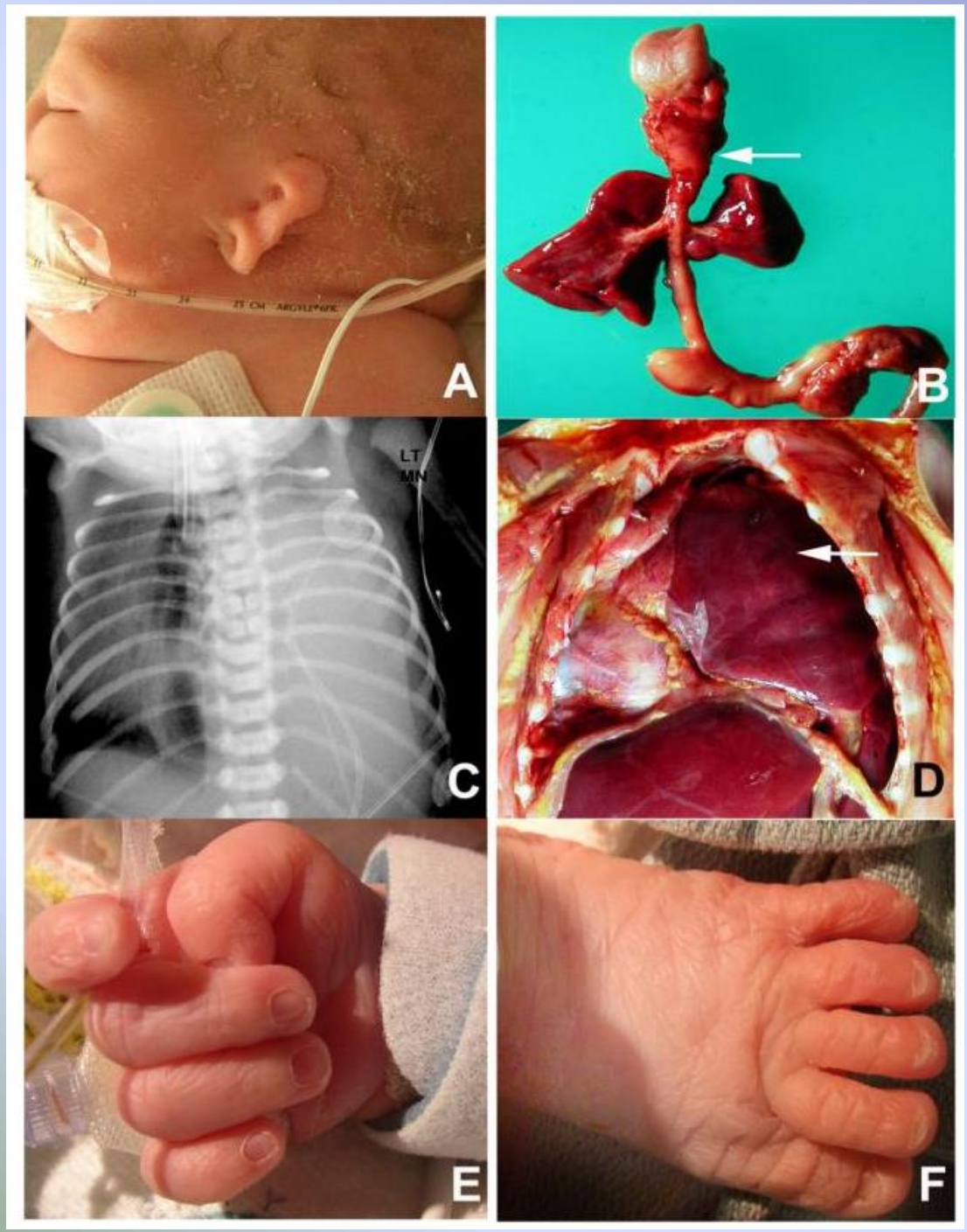
Immunosuppressive Drugs

- **Steroids:** decreased birth weight and head circumference, hyperactive behavioral problems-**OK to use**
- **CsA:** autoantibodies to gastric antigens, no increase in the incidence or pattern of specific malformations noted among the newborn with the use of CsA or azathioprine-**OK to use**

  Classen JB, et al. Transplantation 1991
- **CsA:** No teratogenic effect has been reported: 9.7% fetal loss and 3% malformations in 629 pregnancies- small fetal kidneys

Immunosuppressive Drugs

- **Tacrolimus:** toxicities dose-dependent, transient neonatal hyperkalemia, cardiomyopathy in twins-**OK to use**
- **MMF**: MMF embryopathy-hypoplastic toe nails, short fingers, cleft lip and palate, ear deformities, ocular anomalies, deformities of heart, kidneys and CNS, no chromosomal abnormalities-**NOT recommended-discontinue at least 6 weeks before pregnancy**
- **Rapamycin** : teratogenic in rats, no structural abnormalities-**NOT recommended-discontinue 12 weeks before pregnancy**



- A-Aural atresia, absent auditory canal, short neck
- B-Bilateral pulmonary hypoplasia, esophageal atresia
- C-bifid T6 and T7 vertebral bodies
- D-left chest occupied with abdominal organs
- E-right hand with short thumb and 5th digit
- F-left foot with hypoplastic toenails

Parisi MA et al. Am J Med Genet A, 2009

MYCOPHENOLATE REMS

MYCOPHENOLATE-RELATED RISK OF MISCARRIAGE AND BIRTH DEFECTS

Acceptable Contraception Methods			
Option 1 **Methods to Use Alone**	■ Intrauterine devices (IUDs) ■ Tubal sterilization ■ Patient's partner had a vasectomy		
OR			
Option 2 **Choose One Hormone Method AND One Barrier Method**	**Hormone Methods** choose 1		**Barrier Methods** choose 1
	Estrogen and Progesterone ■ Oral contraceptive pill ■ Transdermal patch ■ Vaginal ring **Progesterone-only** ■ Injection ■ Implant	AND	■ Diaphragm with spermicide ■ Cervical cap with spermicide ■ Contraceptive sponge ■ Male condom ■ Female condom
OR			
Option 3 **Choose One Barrier Method from each column (*must choose two methods*)**	**Barrier Methods** choose 1		**Barrier Methods** choose 1
	■ Diaphragm with spermicide ■ Cervical cap with spermicide ■ Contraceptive sponge	AND	■ Male condom ■ Female condom

Belatacept Exposure

- FDA has not assigned a pregnancy category to belatacept (has not been shown to be teratogenic in animals); info is limited
- 12 kidney transplant recipients and 16 pregnancy events; Pregnancy was planned in only 62% of the pregnancies; 31% were on MPA
- Tacrolimus control group: 371 recipients with 578 pregnancies (no MPA exposure); 84% were reported as planned

Coscia L, et al. Transplantation 2023

Belatacept Exposure

- Belatacept cohort: 81% live births and 19% miscarriages; 38% preeclampsia; 1 patient had AKI, early delivery at 35 weeks
- Tacrolimus cohort: 75% live births and 22% miscarriages; HTN 48%, gestational DM 11%, rejection 2% and preeclampsia 40%
- No neonatal deaths, infant complications; no birth defects on the 12 live births; no issues with breastfeeding
- Successful pregnancy and fetal outcomes in this case series; analysis of long-term outcomes underway

Coscia L, et al. Transplantation 2023

Treatment of Hypertension

- Treatment of severe HTN (systolic BP ≥160 mmHg and/or diastolic BP ≥110 mmHg) persisting for ≥15 minutes-always recommended (to reduce the risk of maternal stroke and other serious maternal complications)
- For women with chronic nonsevere HTN with comorbid conditions, drug therapy should be used to keep systolic BP <140 mmHg and diastolic BP <90 mmHg (target 120-140/80-90)
- ACE inhibitors (D) are **contraindicated** in pregnancy; less experience with ARBs-**not recommended**

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ORIGINAL ARTICLE

◄ Previous Volume 354:2443-2451 June 8, 2006 Number 23 Next ►

Major Congenital Malformations after First-Trimester Exposure to ACE Inhibitors

William O. Cooper, M.D., M.P.H., Sonia Hernandez-Diaz, M.D., Dr.P.H., Patrick G. Arbogast, Ph.D., Judith A. Dudley, B.S., Shannon Dyer, B.S., Patricia S. Gideon, R.N., Kathi Hall, B.S., and Wayne A. Ray, Ph.D.

-ACEi restricted to the first trimester of pregnancy, an exposure that was previously considered to be safe, was associated with a risk of a major congenital malformation that was **2.7 times as great as the risk** with no fetal exposure to ACE inhibitors or other antihypertensive medications

-Prespecified subgroup analyses identified significantly increased **risks of malformations of the cardiovascular and central nervous systems.** In a post hoc analysis, significantly **increased risk of kidney malformations was found.**

BP Medications

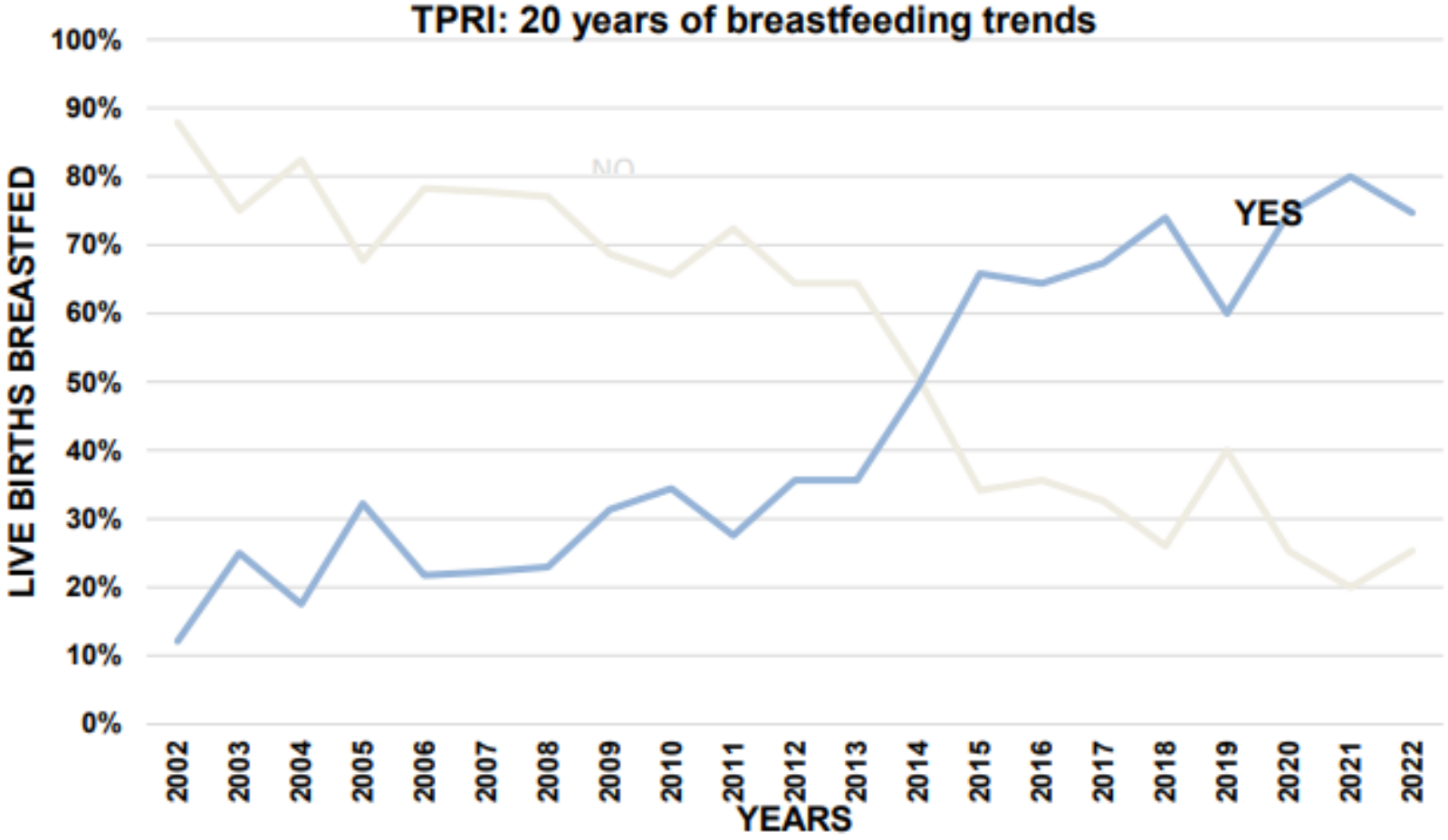
- **Methyldopa (C):** safe
- **Labetalol (C):** safe, less bradycardia than beta blockers
- **Calcium channel blockers (C):** safe in general, profound hypotension when used with magnesium, reserve for severe hypertension
- **Hydralazine (C):** safe, no increase in birth defects
- **Beta blockers(C):** probably safe, fetal bradycardia, respiratory depression at birth
- **Minoxidil (C):** limited experience, hypertrichosis in the infant

Breast-Feeding

- Recent studies have shown that transplant recipients taking prednisone, azathioprine, cyclosporine, and tacrolimus need not be discouraged from breast-feeding-appears to be safe
- There are limited data regarding breast-feeding while on mycophenolic acid products, sirolimus, everolimus, and belatacept

TPRI Annual Report 2022

Figure 3.


TPRI: 20 years of breastfeeding trends
LIVE BIRTHS BREASTFED
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
NO
YES
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
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2015
2016
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2019
2020
2021
2022
YEARS

Transplantation and Pregnancy-Recommendations

- High-risk pregnancy; good general health for at least 1 year posttransplant
- **Good prognosis if:**
  - ✓ **1-2 years** waiting time posttransplant
  - ✓ Scr<1.5 mg/dl and stable
  - ✓ Normal/well-controlled blood pressure (target level?) on medication safe for pregnancy
  - ✓ No proteinuria or minimal proteinuria (below 300-500 mg/d), normal glucose level
  - ✓ No recent acute rejection episode or UTI
  - ✓ Low-dose prednisone (≤7.5 mg/d)
  - ✓ No recent infections especially CMV-viral prophylaxis has been completed

Consensus Group Recommendations

- Counseling at the pretransplant evaluation and posttransplant; close maternal medical management and correct use of drugs to prevent fetal toxicity
- Vaccination: pre-transplant or pre-pregnancy (influenza, Hepatitis B, HPV, tetanus)
- Follow-up with high-risk OB team
- MUST be screened for cervical dysplasia and gynecologic/skin cancers
- **MMF/MPA should be stopped at least 6 weeks and sirolimus for at least 12 weeks before pregnancy; OK to switch to azathioprine**
- Close follow-up for acute rejection

Recommendations

- Generally considered “safe”: cyclo, tacrolimus, prednisone, azathioprine
- Clinic visits every 2-4 weeks
- Frequent blood work for Cyclo/TAC level-every 2-3 weeks and also CMV blood PCR every trimester
- Good blood pressure and glucose control
- Treatment of anemia (OK to use EPO and iron) and UTIs
- Fetal surveillance: close follow-up
- C-section for usual indications; successful vaginal delivery 70%
- **Breast-feeding**: not absolutely contraindicated, recent reports: most likely OK with CNIs/AZA and pred

Pregnancy after Living Kidney Donation

TABLE 2 Outcomes and certainty of evidence

Maternal outcomes	Effect	Number of pregnancies/events overall/events in donors	Number of studies	Certainty in the evidence
Pre-eclampsia	The occurrence of pre-eclampsia was more common in LKD after donation, compared to before donation or in the general population.	27904/812/56	5	Low ⊕⊕◯◯◯
Gestational hypertension	The occurrence of gestational hypertension was more common in LKD after donation, compared to before donation or in the general population.	27904/464/55	5	Low ⊕⊕◯◯
Fetal outcomes	**Effect**	**Number of pregnancies/ events overall/events in donor pregnancies**	**Number of studies**	**Certainty in the evidence**
Gestation <37 weeks	The occurrence of delivery <37/40 weeks gestation appears to be more common in LKD after donation, compared to before donation or in the general population.	27904/1728/90	5	Very low ⊕◯◯◯ due to imprecision and inconsistency
Birthweight <2500 g	The occurrence of a birthweight <2500 g appears to be more common in LKD after donation, compared to before donation or in the general population.	27904/1221/22	3	Very low ⊕◯◯◯ due to imprecision and inconsistency

-16 studies, 35-year follow-up, 1399 post-donation pregnancies; absolute risk of pregnancy complications remain low post-donation
-Hypertension: 1-9% pre-donation or in non-donors to 4-12% post-donation
-Preeclampsia: 1-3% pre-donation or in non-donors to 4-10% post-donation
-The risk to babies: mainly premature delivery, low birth weight, and transfer to ICU or death; no significant differences compared to general population
-Preeclampsia-associated with a greater than two-fold risk of death from CV disease, a 5-9-fold increased risk of ESKD and an increased risk of diabetes-in general population

Pipias M, et al. AJT 2022

In Vitro Fertilization (IVF) TPRI 2022 Annual Report

- 33 kidney transplant recipients; 42 pregnancies with 46 outcomes, 4 twins
- Chronic HTN 45%, preeclampsia 29%, and diabetes 14%; 1 rejection
- 36 live births, 4 spontaneous abortion, 1 ectopic, 1 stillbirth, and 57% c-section
- Last follow up at an average age 7.6 years, 39 children: healthy and developing well
- Successful pregnancies via IVF reported

Questions-Answers

- Is pregnancy advisable in transplant recipients? **YES in certain conditions and lots of counseling needed**
- Will pregnancy be complicated? **DEPENDS (Scr/HTN/proteinuria)**
- Will the baby be healthy? **YES**
- Will there be any long-term harm (mother and the baby)? **NO/BUT long-term studies still needed**

Review Papers

- **A best-practice position statement on pregnancy after kidney transplantation: focusing on the unsolved questions. The Kidney and Pregnancy Study Group of the Italian Society of Nephrology** ***Cabiddu G, et al J Nephrol 2018***
- **UptoDate: Sexual and reproductive health after kidney transplantation** ***Rojas R and Palmer BF***
- **Society for Maternal-Fetal Medicine Consult Series #66: Prepregnancy evaluation and pregnancy management of patients with solid organ transplants** ***Irani RA, et al. Am J Obstet Gynecol 2024***

Transplant Pregnancy Registry International

How to reach the TPRI to report pregnancies or request information:

Email:
TPR@TransplantPregnancyRegistry.org

Outside US: 01-215-599-2078

Website:
TransplantPregnancyRegistry.org