Insuffisance rénale chronique et grossesse
CARO Lyon - 2019

Mathias Rossignol

Département d'Anesthésie-Réanimation et SMUR

Comité National d'Experts sur la Mortalité maternelle

Hôpital Lariboisière

Caro
Club Anesthésie-Réanimation en Obstétrique

Insuffisance rénale el sse

Pas de conflit d'intérêt

Thomas Rossignol

Département d'Anesthésie-Réanimation et SMUR

Comité National d'Experts sur la Mortalité maternelle

Hôpital Lariboisière

université PARIS DIDEROT PARIS 7

ASSISTANCE PUBLIQUE HÔPITAUX DE PARIS

Enquête nationale confidentielle sur les morts maternelles

Insuffisance rénale chronique et grossesse
CARO Lyon - 2019

IRC
minime ou modérée

IRC
Sévère non dialysée

Insuffisance rénale chronique et grossesse
CARO Lyon - 2019

IRC
Sévère dialysée

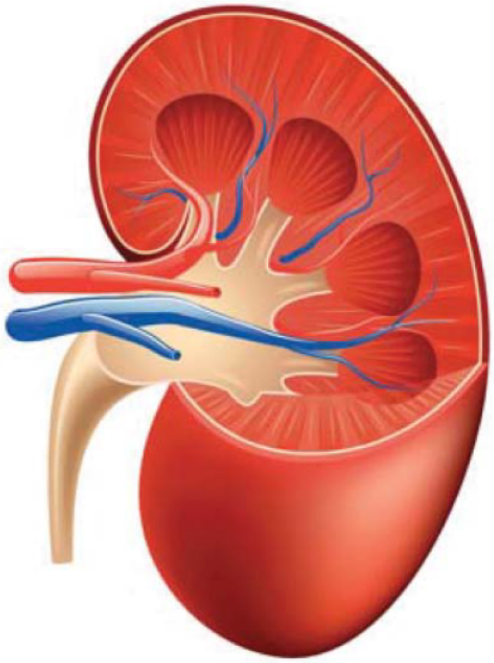
IRC
Greffée

Anatomical changes

- Dilatation of the collecting system (ureters, renal pelvis, and calyces) right>left
- Increase in renal size and volume

Clinical Implications

- Difficult to diagnose true obstruction
- Increased rates of pyelonephritis from asymptomatic bacteriuria



Physiological changes

- Systematic and renal vasodilatation
- Increased renal plasma flow
- Increased glomerular filtration rate
- Altered tubular reabsorption of glucose, amino acids, uric acid, and proteinuria

Clinical Implications

- Decreased blood pressure potentially allowing for less medication
- Decreased serum creatinine
- Mildly increased urine protein

Hui and Hladunewich. Chronic Kidney Disease in Pregnancy. Obstet Gynecol 2019.

Table 1 Renal changes during pregnancy

Function	Change	Manifestation
Acid–base regulation	Increased bicarbonate secretion	Reduced serum bicarbonate to 20–24 mEq/L
Water metabolism	Reduced plasma osmolality	Reduction of 5–10 mOsmol/kg compared to non-pregnant
Volume regulation	Increased extracellular fluid	Total body water increase by 6–8 L. Plasma volume increase by 50%
Sodium metabolism	Sodium retention, reduced serum sodium concentration	Weight gain. Normal serum sodium concentration 135 mmol/L
Tubular transport	Proteinuria and glycosuria	Normal proteinuria up to 300 mg/day. Positive glucose on urine dipstick

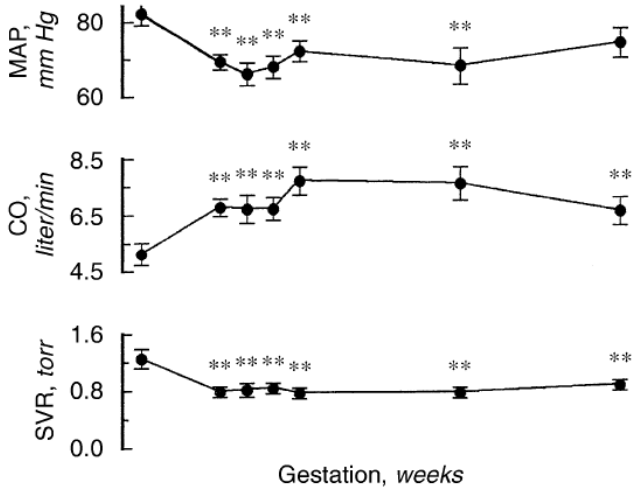


Fig. 1. Systemic hemodynamic changes throughout early human pregnancy. Ten women were studied in the mid-follicular phase of the menstrual cycle and weeks 6, 8, 10, 12, 24, and 36 gestation. Mean arterial pressure (MAP) decreased and cardiac output (CO) increased significantly by week 6 gestation in association with a decrease in systemic vascular resistance (SVR). $^{*}P < 0.05$, $^{**}P < 0.001$.

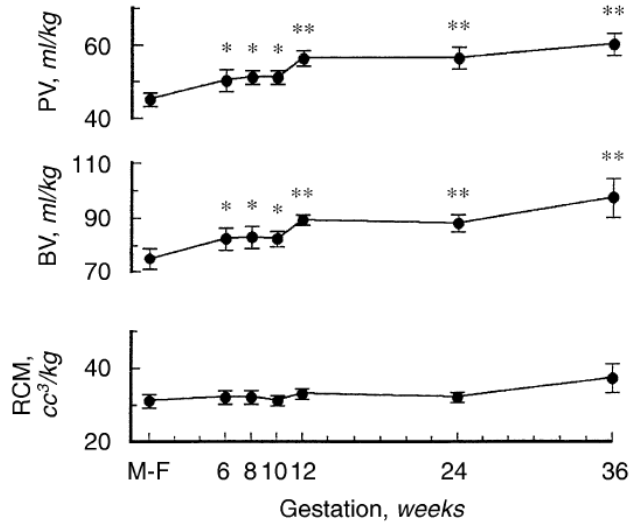


Fig. 2. Plasma volume (PV), blood volume (BV), and red cell mass (RCM) determinations in early pregnancy. Ten women were studied in the mid follicular phase of the menstrual cycle and weeks 6, 8, 10, 12, 24 and 36 gestation. Plasma and blood volume increased significantly by week 6 gestation. Red cell mass remained unchanged throughout pregnancy. $^{*}P < 0.05$, $^{**}P < 0.0001$.

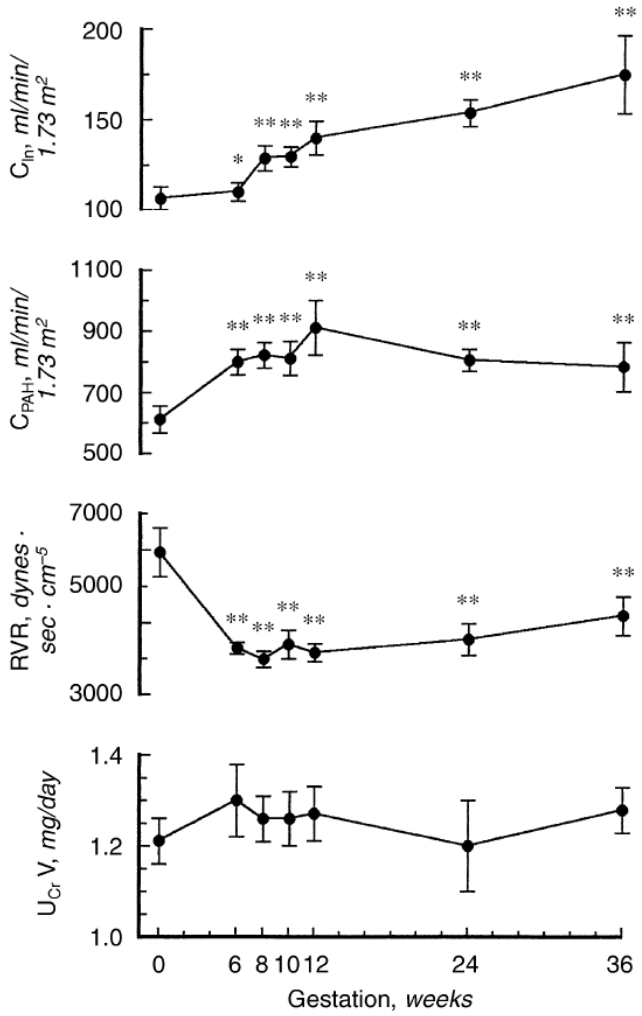
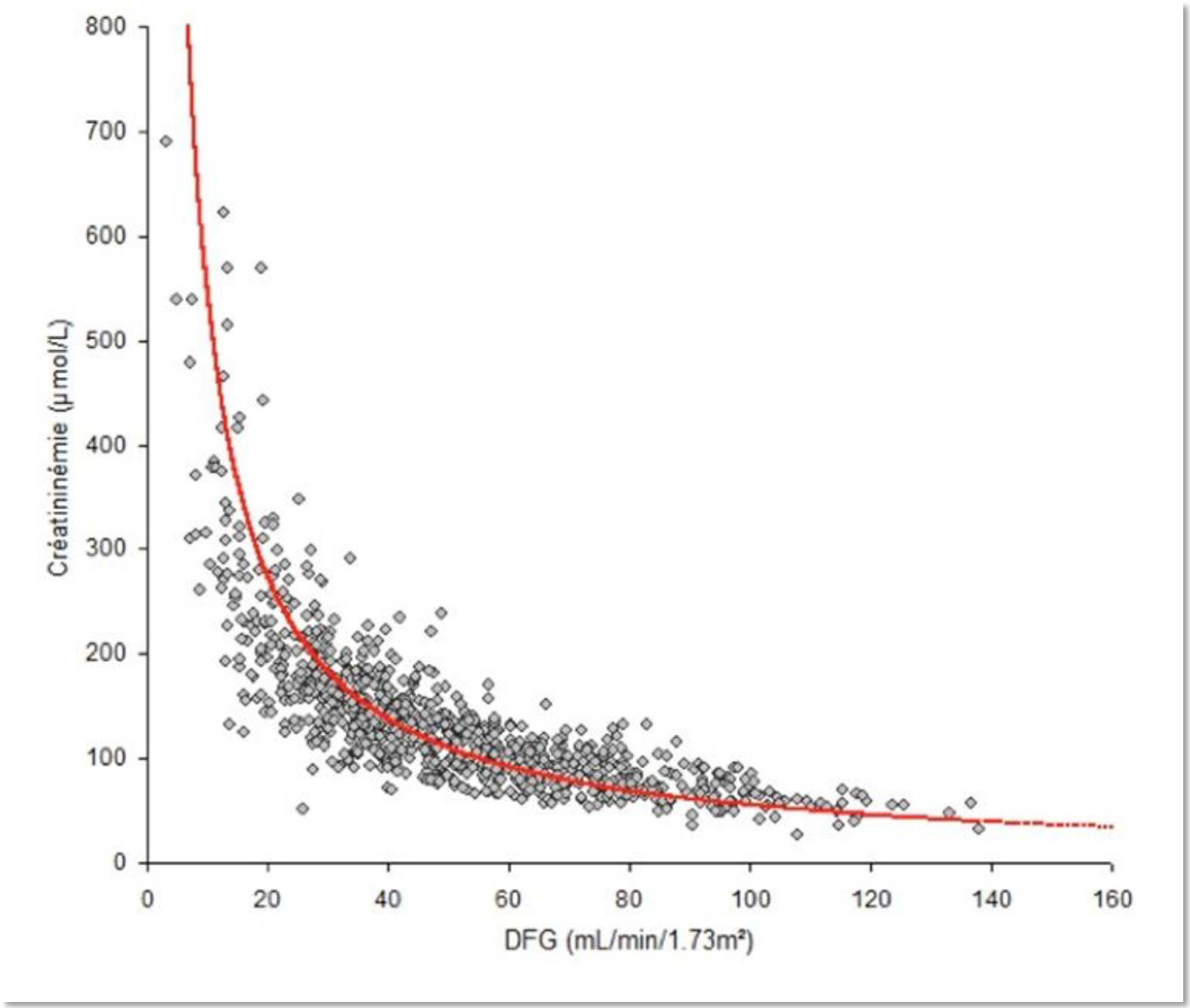


Fig. 3. Renal hemodynamic changes throughout early human pregnancy. Ten women were studied in the mid-follicular phase of the menstrual cycle and weeks 6, 8, 10, 12, 24 and 36 gestation. Renal plasma flow and glomerular filtration rate increased significantly in association with a decrease in renal vascular resistance by week 6 gestation. Twenty-four-hour urinary creatinine excretion remained unchanged throughout gestation. Abbreviations are: C_{In}, inulin clearance; C_{PAH}, para-aminohippurate clearance; RVR, renal vascular resistance; $U_{Cr}V$, urinary creatinine excretion. $^{*}P < 0.05$, $^{**}P < 0.001$


800
700
600
500
400
300
200
100
0
Créatininémie (µmol/L)
0
20
40
60
80
100
120
140
160
DFG (mL/min/1.73m²)

Course of preeclamptic glomerular injury after delivery

M. A. Hladunewich,[1] B. D. Myers,[2] G. C. Derby,[2] K. L. Blouch,[2] M. L. Druzin,[3] W. M. Deen,[4] D. M. Naimark,[1] and R. A. Lafayette[2]

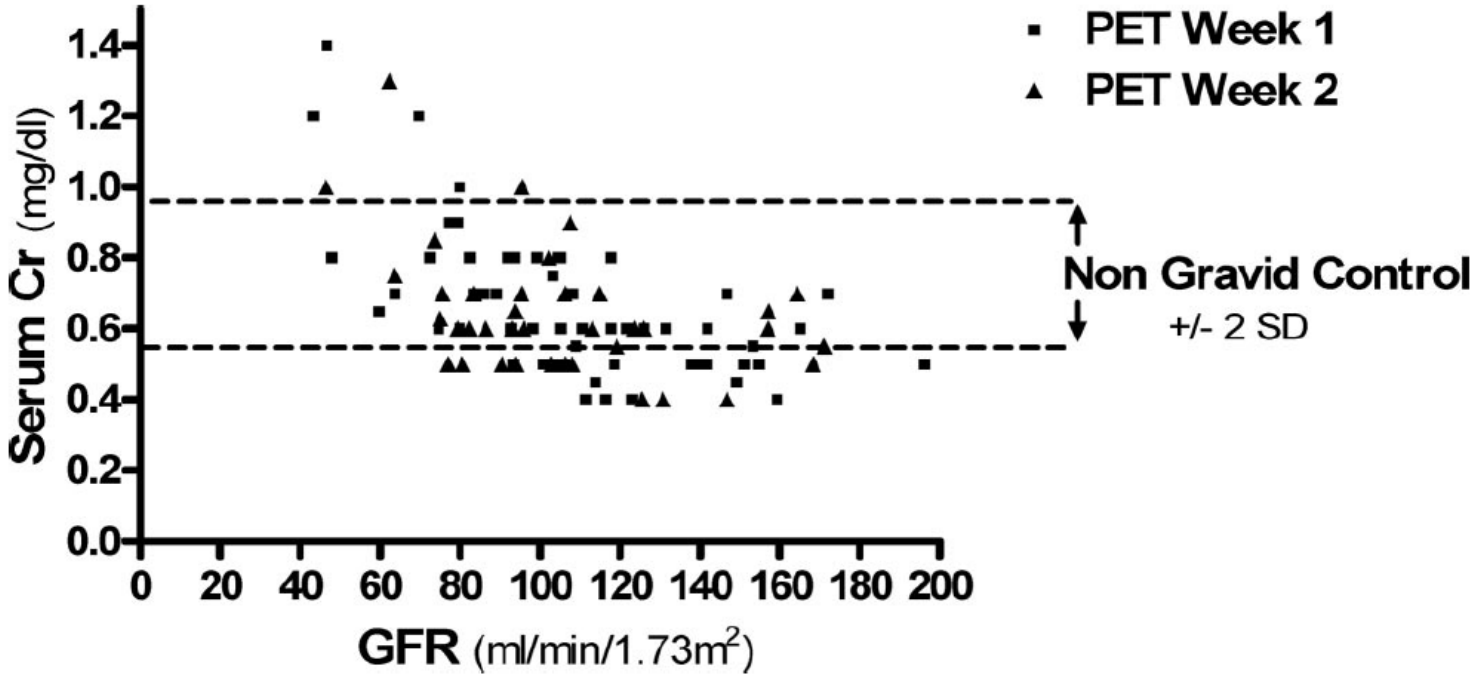


Fig. 2. Relationship between serum creatinine (Cr) and GFR in patients with preeclampsia (PET) during postpartum weeks 1 and 2. Parallel dashed lines represent 2 standard deviations above and below the mean serum Cr in healthy nongravid control subjects and serve as the reference range.

Am J Physiol Renal Physiol 294: F614–F620, 2008

A Systematic Review and Meta-Analysis of Outcomes of Pregnancy in CKD and CKD Outcomes in Pregnancy

Jing-Jing Zhang,[*†] *Xin-Xin Ma,*[*] *Li Hao,*[†] *Li-Jun Liu,*[*] *Ji-Cheng Lv,*[*] *and Hong Zhang*[*]

- Méta analyse
- 1946 à 2014…
- Plus de 500 000 patientes
- Deux objectifs:
  - Risque de complication de la grossesse chez des patients insuffisantes rénale ou non (14 études)
    - 552 patientes IRC
    - 716 patientes sans IRC
  - Risque évolutif de l'IRC chez des patientes enceintes ou non (9 études)
    - 818 patientes enceintes
    - 504 220 patientes non enceintes

Clin J Am Soc Nephrol 10: 1964–1978, 2015

A Systematic Review and Meta-Analysis of Outcomes of Pregnancy in CKD and CKD Outcomes in Pregnancy

Jing-Jing Zhang,[*†] *Xin-Xin Ma,*[*] *Li Hao,*[†] *Li-Jun Liu,*[*] *Ji-Cheng Lv,*[*] *and Hong Zhang*[*]

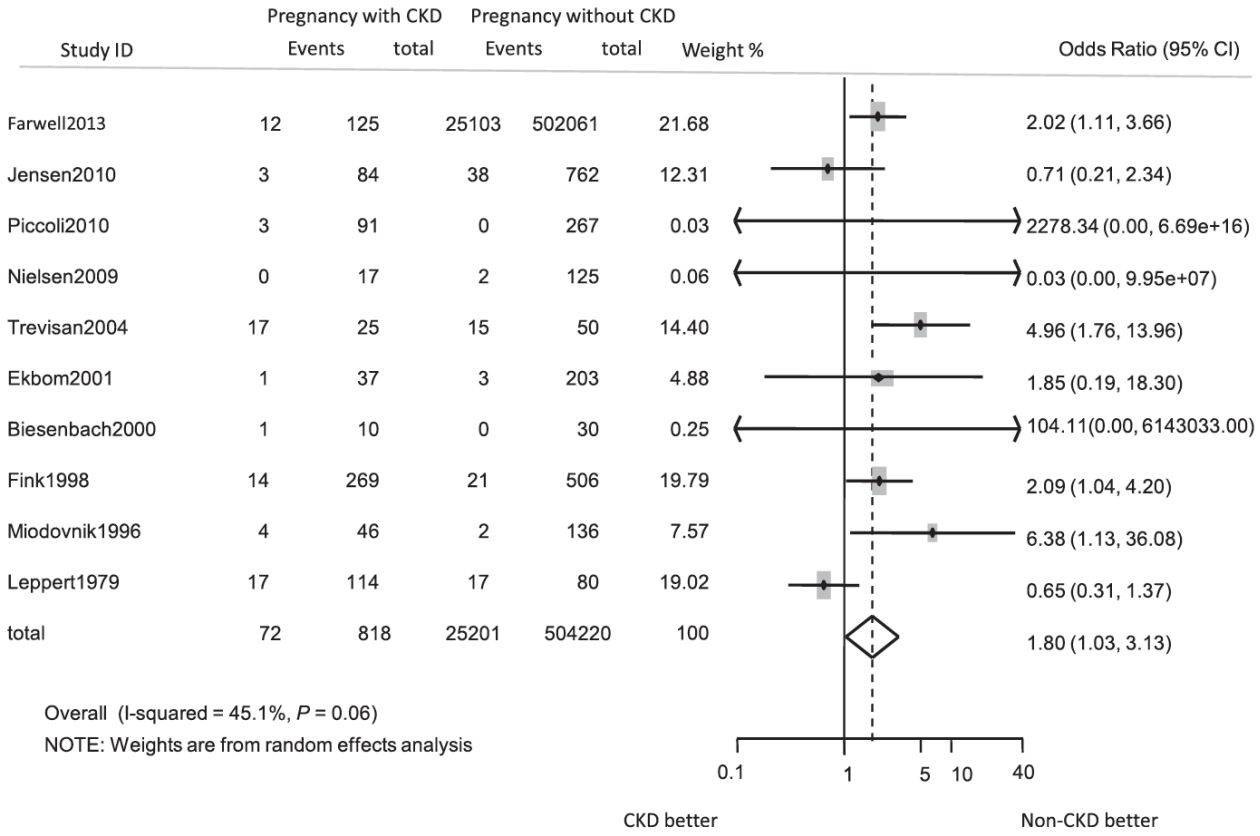


Figure 3. | Overall odds ratios of the association of CKD and failure of pregnancy (including stillbirth, fetal death, and neonatal death). 95% CI, 95% confidence interval.

Clin J Am Soc Nephrol 10: 1964–1978, 2015

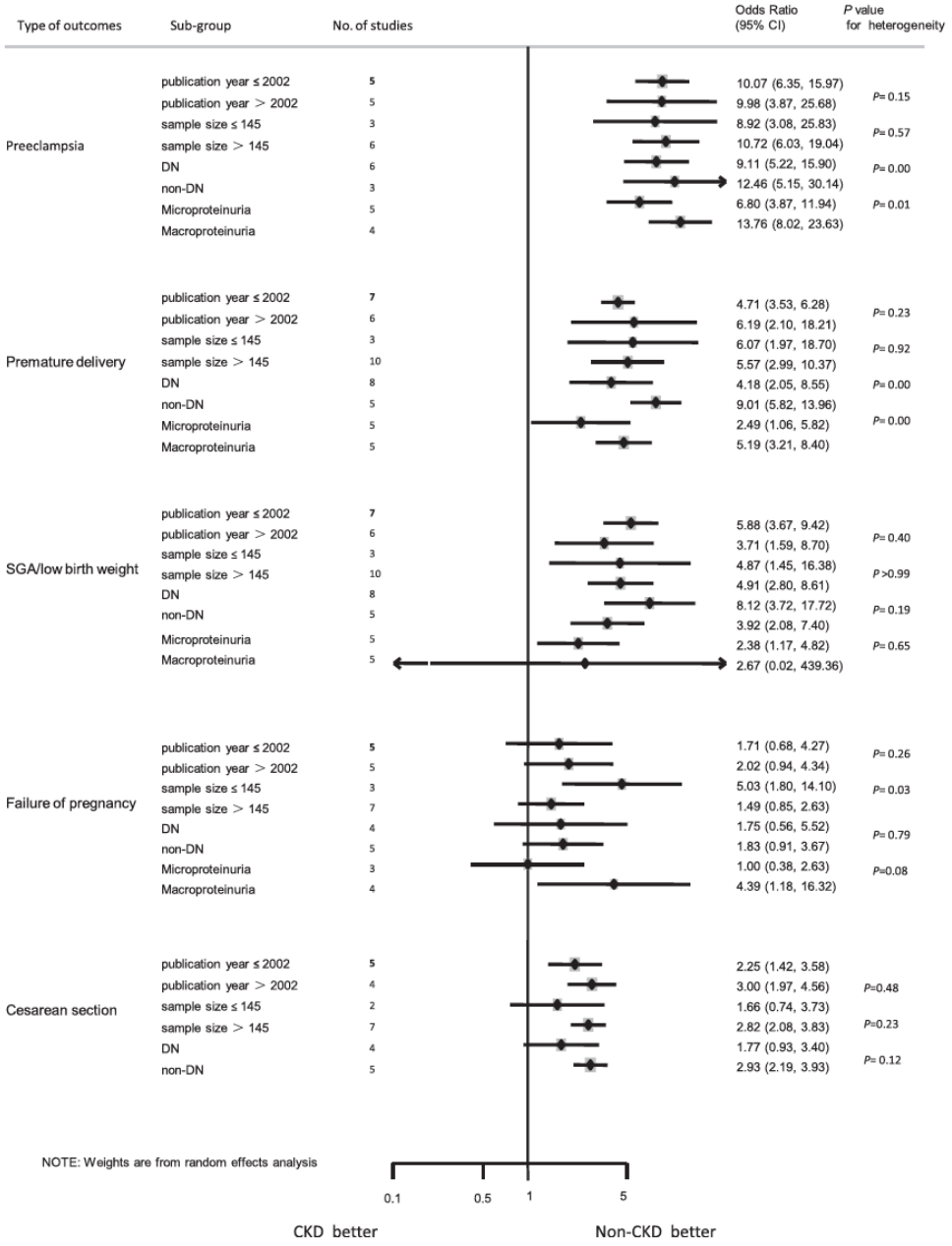


Figure 4. | Odds ratios of CKD on pregnancy complications according to subgroups of publication year, sample size, type of study population, and proteinuria. Microproteinuria indicates albuminuria 30–300 mg/24 h or total proteinuria 150–500 mg/24 h, whereas macroproteinuria indicates albuminuria ≥300 mg/24 h or total proteinuria ≥500 mg/24 h. 95% CI, 95% confidence interval; DN, diabetic nephropathy; SGA, small for gestational age.

A Systematic Review and Meta-Analysis of Outcomes of Pregnancy in CKD and CKD Outcomes in Pregnancy

Jing-Jing Zhang,[*†] *Xin-Xin Ma,*[*] *Li Hao,*[†] *Li-Jun Liu,*[*] *Ji-Cheng Lv,*[*] *and Hong Zhang*[*]

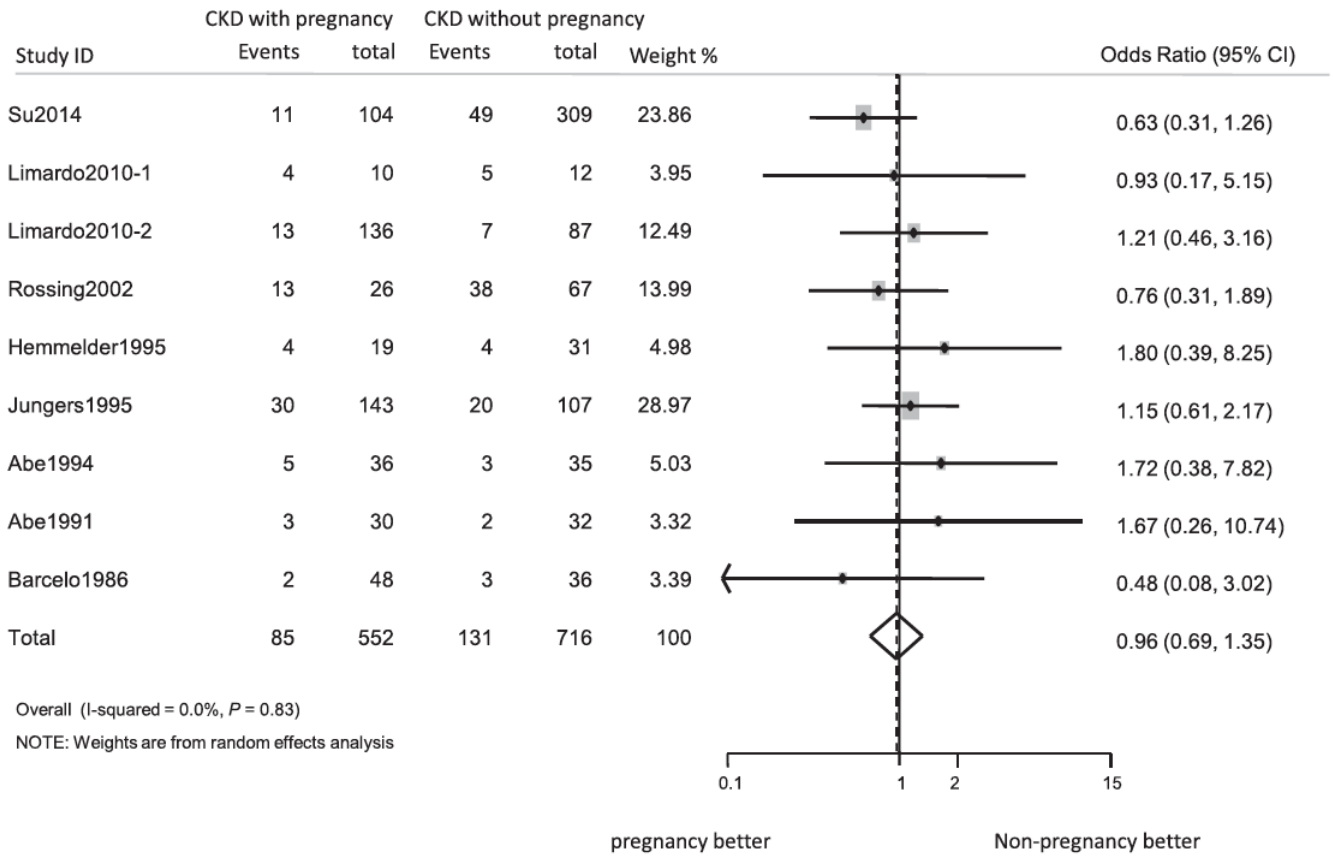


Figure 5. | **Overall odds ratios of the association of pregnancy and renal events** (including doubling of serum creatinine levels, 50% decrement of eGFR/CCr, and ESRD). 95% CI, 95% confidence interval; CCr, creatinine clearance rate.

Clin J Am Soc Nephrol 10: 1964–1978, 2015

A Systematic Review and Meta-Analysis of Outcomes of Pregnancy in CKD and CKD Outcomes in Pregnancy

Jing-Jing Zhang,[*†] *Xin-Xin Ma,*[*] *Li Hao,*[†] *Li-Jun Liu,*[*] *Ji-Cheng Lv,*[*] *and Hong Zhang*[*]

Table 4. Summary of the baseline characteristics of patients with CKD with or without pregnancy

Reference	With Pregnancy						Without Pregnancy					
	Cases (W/P)	Mean Age (yr)	Baseline eGFR/CCr (ml/min)	Baseline SCr (mg/dl)	Baseline SBP (mmHg)	Baseline Proteinuria (A/T)	Cases	Mean Age (yr)	Baseline eGFR/CCr (ml/min)	Baseline SCr (mg/dl)	Baseline SBP (mmHg)	Baseline Proteinuria (A/T)
Su *et al.*, 2014 (13)	62 (W)/69 (P)	28	97.6 (24.9)	0.85 (0.27)	109 (13.5)	0.79 (T)	65	28	99.7 (22.6)	0.83 (0.26)	111.8 (10.4)	0.80 (T)
Shimizu *et al.*, 2010 (26)	29 (W)	31	72.6 (7.8)	0.76 (0.12)	110.1 (9.1)	0.46 (T)	45	31	70.9 (20.7)	0.90 (0.15)	110.5 (13)	0.85 (T)
Limardo *et al.*, 2010 (24)	10/136 (W)	29	92 (170)/ 47.2 (14.7)	0.87 (0.15)/1.65 (0.39)	—	1.75/1.0 (T)	12/87	28	89 (18)/ 49.2 (8.4)	0.86 (0.16)/ 1.6 (0.19)	—	1.9/0.5 (T)
Rossing *et al.*, 2002 (36)	26 (W)/31 (P)	24	—	0.89 (0.26)	128 (11)	534 (279.7) (A)	67	27	—	0.89 (0.26)	133 (14)	597 (659.8) (A)
Hemmelder *et al.*, 1995 (29)	19 (W)	—	—	0.9	130	3 (T)	31	—	—	0.9	130	3 (T)
Jungers *et al.*, 1995 (31)	143 (W)	—	—	≤1.24	—	—	107	—	—	≤1.24	—	—
Abe *et al.*, 1994 (25)	36 (W)/39 (P)	25	83 (13)	0.79 (0.20)	119 (10)	0.6 (0.4) (T)	35	25	87 (15)	0.7 (0.20)	121 (17)	0.9 (0.6) (T)
Abe *et al.*, 1991 (23)	30 (W)	—	81 (13)	—	—	—	32	—	88 (16)	—	—	—
Barceló *et al.*, 1986 (34)	48 (W)/66 (P)	29	—	0.83 (0.36)	—	1.49 (0.53) (T)	36	27	—	1.01 (0.47)	—	1.03 (1.49) (T)

Dash indicates that no relevant data was provided. P, number of pregnancies; W, number of women; CCr, creatinine clearance rate; SCr, serum creatinine; A, albuminuria (mg/24 h); T, total proteinuria (g/24 h).

Clin J Am Soc Nephrol 10: 1964–1978, 2015

Stade	dénomination	DFG (ml/min)
Stade I	Marqueurs d'atteinte rénale	≥ 90 ml/mn
Stade II	IRC minime	89 - 60 ml/mn
Stade III	IRC modérée	59 - 30 ml/mn
Stade IV	IRC sévère	29 - 15 ml/mn
StadeV	IRC terminale	DFG < 15 ml/mn

Table 2. Renal and Pregnancy Outcomes According to Chronic Kidney Disease Stage

Outcome	Control Group (n=836)	Stage 1 (n=370)	Stage 2 (n=87)	Stage 3 (n=37)	Stage 4–5 (n=10)
Progressed to next stage of CKD	NA	7.6	12.6	16.2	20
New-onset HTN	5.5	7.9	17.6	47.1	50
New-onset or doubling of proteinuria	NA	20.5	37.9	86.5	70
Gestational age at delivery (wk)	39.0±1.7	37.6±2.6	35.7±3.2	34.4±2.4	32.6±4.2
Delivery at less than 37 wk of gestation	6.1	23.5	50.6	78.4	88.9
Delivery at less than 34 wk of gestation	1.0	7.3	20.7	37.8	44.4
Birth weight (g)	3,242±480	2,966±659	2,484±707	2,226±582	1,639±870
SGA less than 10%	10.3	13.3	17.9	18.9	50
NICU	1.8	10.3	27.6	44.4	70

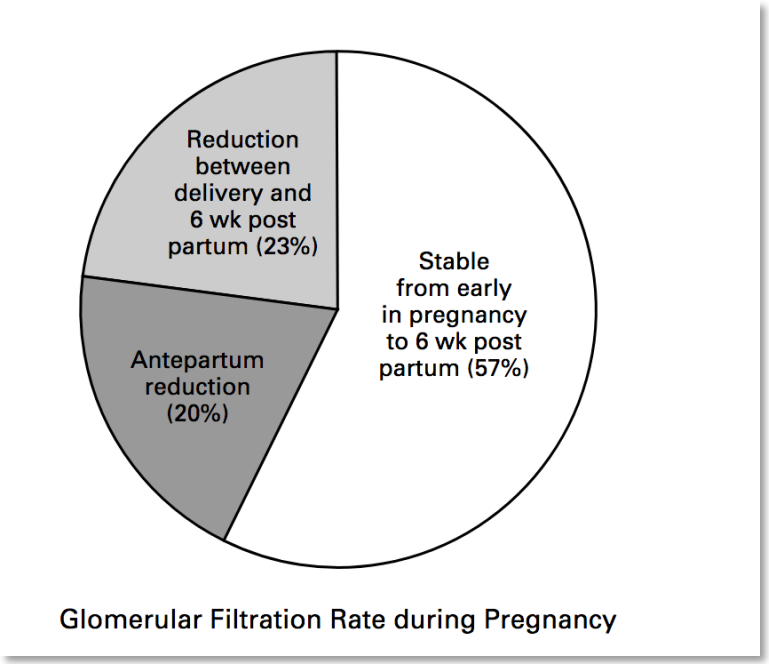
CKD, chronic kidney disease; NA, not applicable; HTN, hypertension; SGA, small for gestational age; NICU, neonatal intensive care unit. Data are % or mean±SD.

Data from Piccoli GB, Cabiddu G2, Attini R3, Vigotti FN4, Maxia S2, Lepori N, et al. Risk of adverse pregnancy outcomes in women with CKD. J Am Soc Nephrol 2015;26:2011-22.

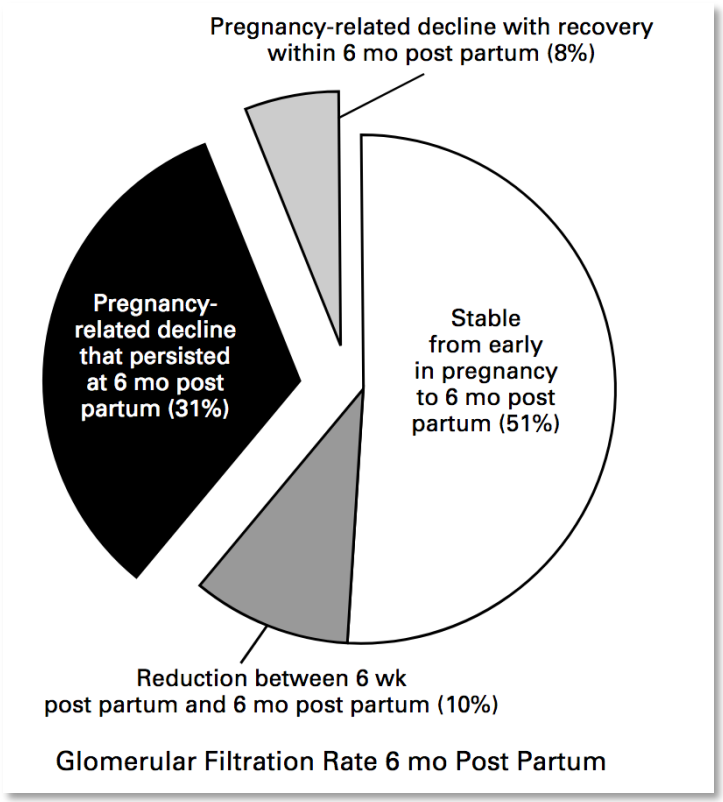
OUTCOME OF PREGNANCY IN WOMEN WITH MODERATE OR SEVERE RENAL INSUFFICIENCY

DAVID C. JONES, M.D., AND JOHN P. HAYSLETT, M.D.

- **Plus grosse étude / insuffisance rénale « sévère »**
- **67 patientes / 82 grossesse**
- **IRC préexistante**
- **Créatininémie > 125 micromoles/L**
- **Grossesse dépassant le 1er trimestre**



Glomerular Filtration Rate during Pregnancy



Glomerular Filtration Rate 6 mo Post Partum

N Engl J Med 1996;335:226-32

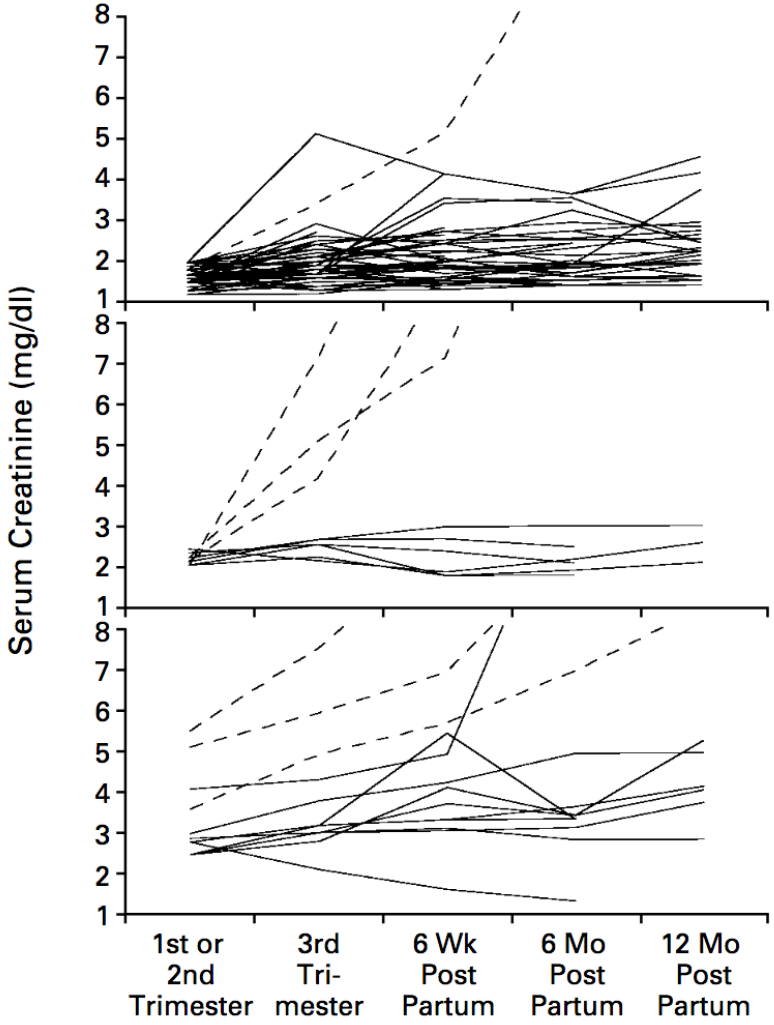


Figure 2. Serum Creatinine Concentrations in Women with Primary Renal Disease during and after Pregnancy, According to the Concentration Measured Early in Gestation.

TABLE 3. OUTCOMES OF 82 PREGNANCIES AND NEONATAL COMPLICATIONS.

VARIABLE	VALUE
Preterm delivery (<37 wks) — no. (%)	48 (59)
Induction of labor — no. (%)	8 (10)
Delivery by cesarean section — no. (%)	48 (59)
Indication	
Fetal distress	4
Intrauterine growth retardation	11
Macrosomia	1
Dystocia	2
Breech position	2
Maternal renal deterioration	5
Maternal hypertension or preeclampsia	11
None reported	12
Mean (±SD) birth weight — g*	2239±839
Small for gestational age (<10th percentile) — no. (%)*	28 (37)
Death — no. (%)	6 (7)
Stillbirth — rate per 1000 births	49
Neonatal death — rate per 1000 births	24
Admission to neonatal intensive care unit — no. (% of liveborn infants)	28 (37)
Indication	
Prematurity, intrauterine growth retardation, or both	25
Sepsis	1
Unknown	2

*Data on birth weight were available for only 76 of the 82 pregnancies.

Figure 2. Serum Creatinine Concentrations in Women with Primary Renal Disease during and after Pregnancy, According to the Concentration Measured Early in Gestation.

Dashed lines represent women who had a pregnancy-related decline in renal function and subsequent progression to end-stage renal disease within one year post partum. Data are stratified according to the serum creatinine concentration at the onset of gestation: <2.0 mg per deciliter in the top panel, 2.0 to 2.4 mg per deciliter in the middle panel, and ≥2.5 mg per deciliter in the bottom panel. To convert values for serum creatinine to micromoles per liter, multiply by 88.4.

N Engl J Med 1996;335:226-32

Stratégies d'optimisation

HTA

Protéinurie

Prévention de la pré éclampsie
Aspirine / Ca / Vit D

Autre…

HTA

Contrôle HTA en pré partum

Avec des médicaments autorisés

Contre indiqués:
IEC et ARA2

Non tératogènes
Foetotoxiques au 2 et 3 eme trimestre
(IRA, oligoamnios, hypoplasie pulmonaire)

Autorisés:
alfa methyl dopa
Nicardipine
Labetalol
Urapidil

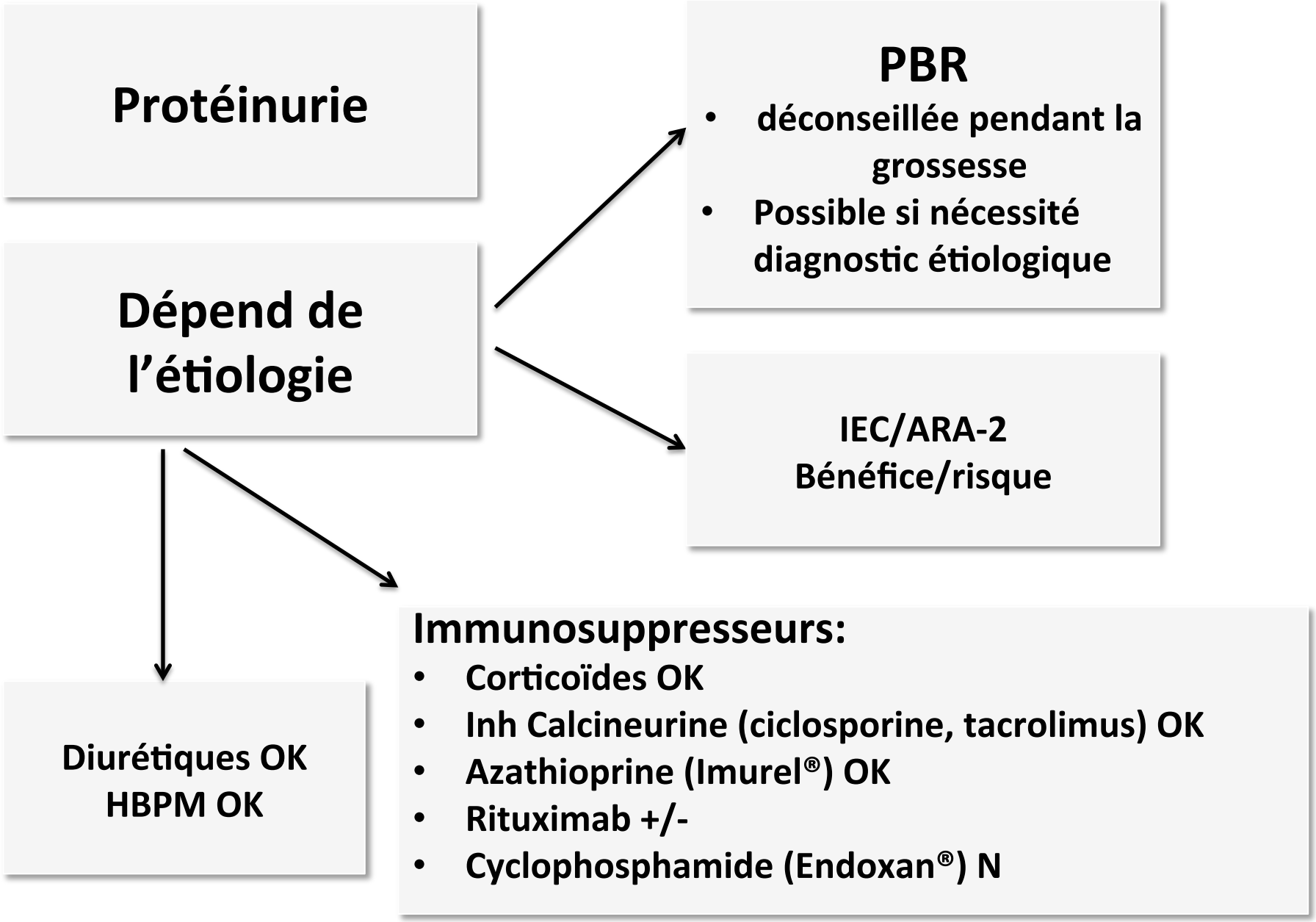
OBJECTIF ASSEZ BAS
PA < 140 / 90 mmHg

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 JANUARY 29, 2015 VOL. 372 NO. 5

Less-Tight versus Tight Control of Hypertension in Pregnancy

Laura A. Magee, M.D., Peter von Dadelszen, M.B., Ch.B., D.Phil., Evelyne Rey, M.D., Susan Ross, M.B.A., Ph.D., Elizabeth Asztalos, M.D., Kellie E. Murphy, M.D., Jennifer Menzies, M.Sc., Johanna Sanchez, M.I.P.H., Joel Singer, Ph.D., Amiram Gafni, D.Sc., Andrée Gruslin, M.D.,* Michael Helewa, M.D., Eileen Hutton, Ph.D., Shoo K. Lee, M.D., Ph.D., Terry Lee, Ph.D., Alexander G. Logan, M.D., Wessel Ganzevoort, M.D., Ph.D., Ross Welch, M.B., B.S., D.A., M.D., Jim G. Thornton, M.B., Ch.B., M.D., and Jean-Marie Moutquin, M.D.


Protéinurie
Dépend de l'étiologie
PBR
• déconseillée pendant la grossesse
• Possible si nécessité diagnostic étiologique
IEC/ARA-2
Bénéfice/risque
Diurétiques OK
HBPM OK
Immunosuppresseurs:
• Corticoïdes OK
• Inh Calcineurine (ciclosporine, tacrolimus) OK
• Azathioprine (Imurel®) OK
• Rituximab +/-
• Cyclophosphamide (Endoxan®) N

Prévention de la pré éclampsie

Prévention de la pré éclampsie

Aspirine systématique

150 mg / j ?

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 AUGUST 17, 2017 VOL. 377 NO. 7

Aspirin versus Placebo in Pregnancies at High Risk for Preterm Preeclampsia

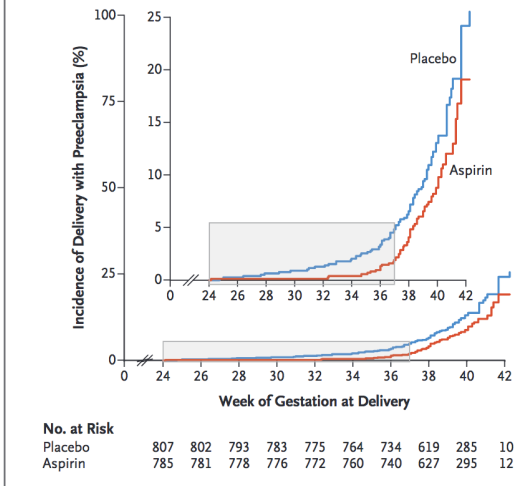


Figure 2. Kaplan–Meier Plot of Incidence of Delivery with Preeclampsia.
The gray box highlights the rate of preeclampsia before 37 weeks of gestation. Data were censored after deliveries not associated with preeclampsia. The inset shows the same data on an enlarged y axis.

Prévention de la pré éclampsie

Aspirine systématique 150 mg / j ?

The NEW ENGLAND JOURNAL of MEDICINE
ESTABLISHED IN 1812 AUGUST 17, 2017 VOL. 377 NO. 7

Aspirin versus Placebo in Pregnancies at High Risk for Preterm Preeclampsia

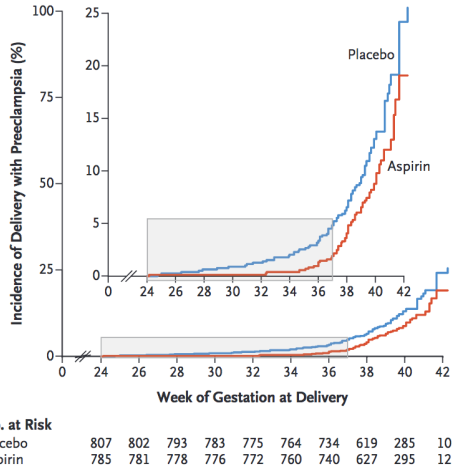


Figure 2. Kaplan–Meier Plot of Incidence of Delivery with Preeclampsia.
The gray box highlights the rate of preeclampsia before 37 weeks of gestation. Data were censored after deliveries not associated with preeclampsia. The inset shows the same data on an enlarged y axis.

Apport Calcique 1 à 2 g/j

DOI: 10.1111/j.1471-0528.2007.01389.x
www.blackwellpublishing.com/bjog
Systematic review

Dietary calcium supplementation for prevention of pre-eclampsia and related problems: a systematic review and commentary

GJ Hofmeyr,[a] L Duley,[b] A Atallah[c]

BJOG 2007;114:933–943

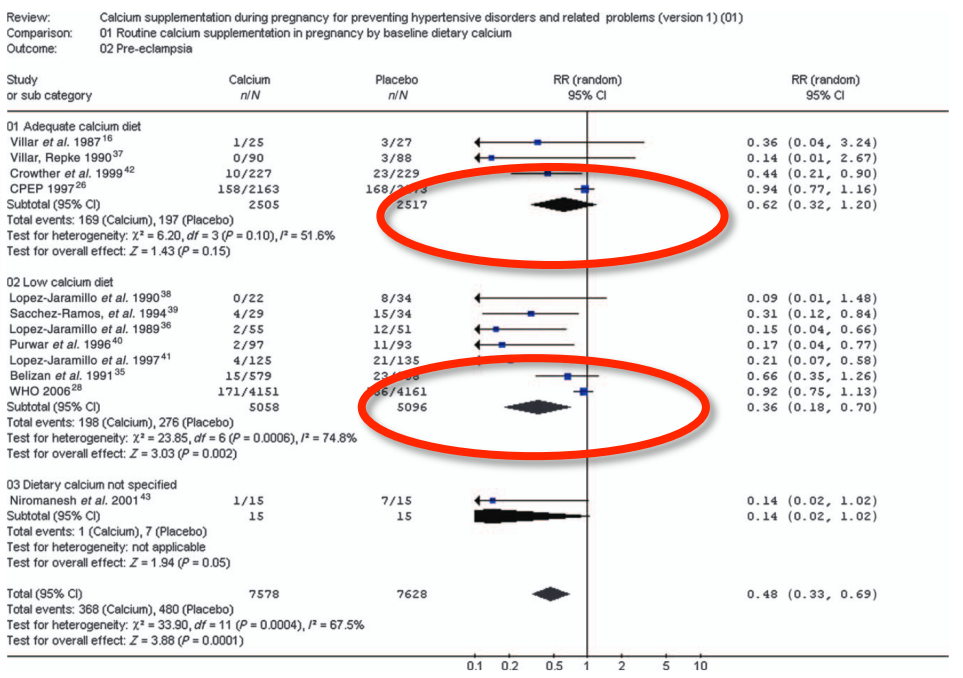


Figure 1. Effect of calcium supplementation during pregnancy on pre-eclampsia, subgrouped by dietary calcium intake.

Prévention de la pré éclampsie

Aspirine systématique
150 mg / j ?

The NEW ENGLAND JOURNAL of MEDICINE
ESTABLISHED IN 1812 AUGUST 17, 2017 VOL. 377 NO. 7

Aspirin versus Placebo in Pregnancies at High Risk for Preterm Preeclampsia

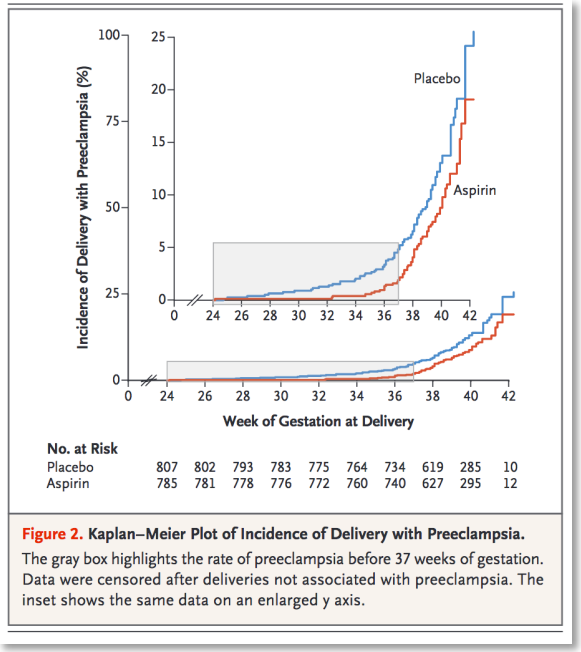


Figure 2. Kaplan–Meier Plot of Incidence of Delivery with Preeclampsia.
The gray box highlights the rate of preeclampsia before 37 weeks of gestation. Data were censored after deliveries not associated with preeclampsia. The inset shows the same data on an enlarged y axis.

Apport Calcique 1 à 2 g/j

DOI: 10.1111/j.1471-0528.2007.01389.x
www.blackwellpublishing.com/bjog

Systematic review

Dietary calcium supplementation for prevention of pre-eclampsia and related problems: a systematic review and commentary

GJ Hofmeyr,[a] L Duley,[b] A Atallah[c]

BJOG 2007;114:933–943

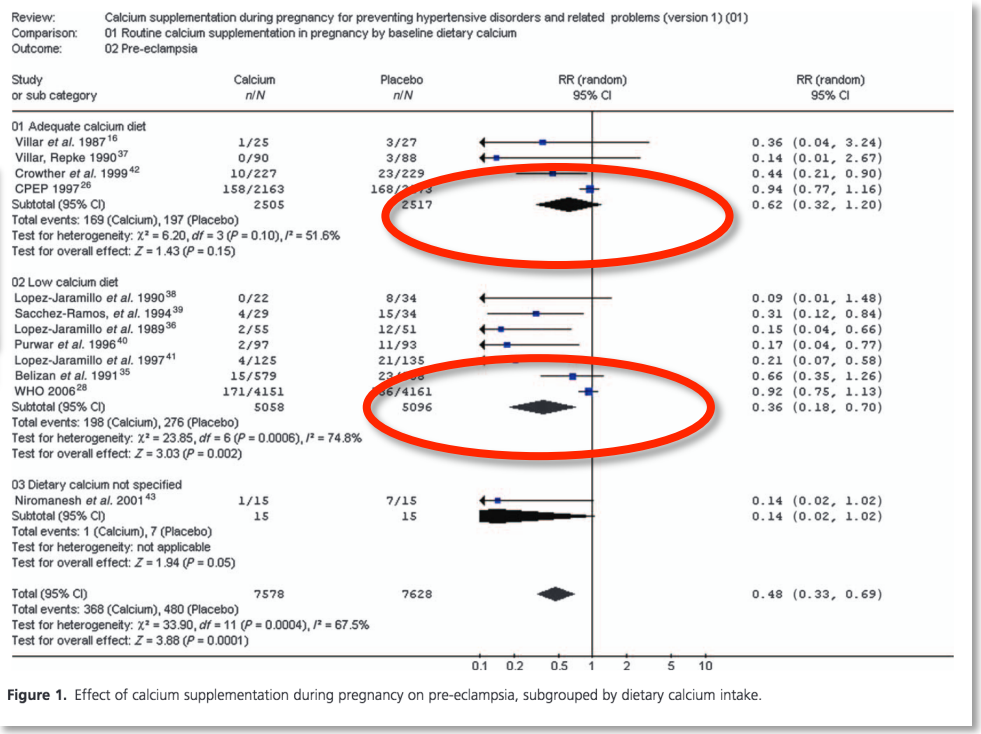


Figure 1. Effect of calcium supplementation during pregnancy on pre-eclampsia, subgrouped by dietary calcium intake.

Vitamine D ?
Non démontré mais logique dans l'IRC ou si carence

Autre…

Correction de l'anémie

- Fer per os ou IV
- Erythropoïétine

Maniement des médicaments

- Drogues néphro-toxiques:
  - AINS
    - Tocolytiques (indométacine)
    - Antalgiques en post partum (kétoprofen)
  - Aminosides
- Maniement prudent du Sulfate de Mg
  - Effet curare like => détresse respiratoire
  - Effet anti-Ca => Cardio-toxicité
- Ajustement des doses d'AB
- HBPM

Correction des troubles hydro-électrolytiquees

- Acidose (alcalinisation) => Acidose foetale
- Régime pauvre en potassium

Autre…

Correction de l'anémie

- Fer per os ou IV
- Erythropoïétine

Maniement des médicaments

- Drogues néphro-toxiques:
  - AINS
    - Tocolytiques (indométacine)
    - Antalgiques en post partum (kétoprofen)
  - Aminosides
- Maniement prudent du Sulfate de Mg
  - Effet curare like => détresse respiratoire
  - Effet anti-Ca => Cardio-toxicité
- Ajustement des doses d'AB
- HBPM

Correction des troubles hydro-électrolytiquees

- Acidose (alcalinisation) => Acidose foetale
- Régime pauvre en potassium

Autre…

Correction de l'anémie

- Fer per os ou IV
- Erythropoïétine

Maniement des médicaments

- Drogues néphro-toxiques:
  - AINS
    - Tocolytiques (indométacine)
    - Antalgiques en post partum (kétoprofen)
  - Aminosides
- Maniement prudent du Sulfate de Mg
  - Effet curare like => détresse respiratoire
  - Effet anti-Ca => Cardio-toxicité
- Ajustement des doses d'AB
- HBPM

Correction des troubles hydro-électrolytiquees

- Acidose (alcalinisation) => Acidose foetale
- Régime pauvre en potassium

Autre…

Correction de l'anémie

- Fer per os ou IV
- Erythropoïétine

Maniement des médicaments

- Drogues néphro-toxiques:
  - AINS
    - Tocolytiques (indométacine)
    - Antalgiques en post partum (kétoprofen)
  - Aminosides
- Maniement prudent du Sulfate de Mg
  - Effet curare like => détresse respiratoire
  - Effet anti-Ca => Cardio-toxicité
- Ajustement des doses d'AB
- HBPM

Correction des troubles hydro-électrolytiquees

- Acidose (alcalinisation) => Acidose foetale
- Régime pauvre en potassium

Autre…

Correction de l'anémie

- Fer per os ou IV
- Erythropoïétine

Maniement des médicaments

- Drogues néphro-toxiques:
  - AINS
    - Tocolytiques (indométacine)
    - Antalgiques en post partum (kétoprofen)
  - Aminosides
- Maniement prudent du Sulfate de Mg
  - Effet curare like => détresse respiratoire
  - Effet anti-Ca => Cardio-toxicité
- Ajustement des doses d'AB
- HBPM

Correction des troubles hydro-électrolytiquees

- Acidose (alcalinisation) => Acidose foetale
- Régime pauvre en potassium

Autre…

Correction de l'anémie

- Fer per os ou IV
- Erythropoïétine

Maniement des médicaments

- Drogues néphro-toxiques:
  - AINS
    - Tocolytiques (indométacine)
    - Antalgiques en post partum (kétoprofen)
  - Aminosides
- Maniement prudent du Sulfate de Mg
  - Effet curare like => détresse respiratoire
  - Effet anti-Ca => Cardio-toxicité
- Ajustement des doses d'AB
- HBPM

Correction des troubles hydro-électrolytiquees

- Acidose (alcalinisation) => Acidose foetale
- Régime pauvre en potassium

IRC terminale dialysée…

- C’est assez rare (hypofertilité), mais pas exceptionnel...
- Surtout compliqué en cas de dialyse en urgence sur désilet (compression cave)
- Moins de problème sur fistule
- Mortalité fœtale élevée mais amélioration de la survie 40% => 80%
- Intérêt d’augmenter la dose de dialyse ?

Intensive Hemodialysis Associates with Improved Pregnancy Outcomes: A Canadian and United States Cohort Comparison

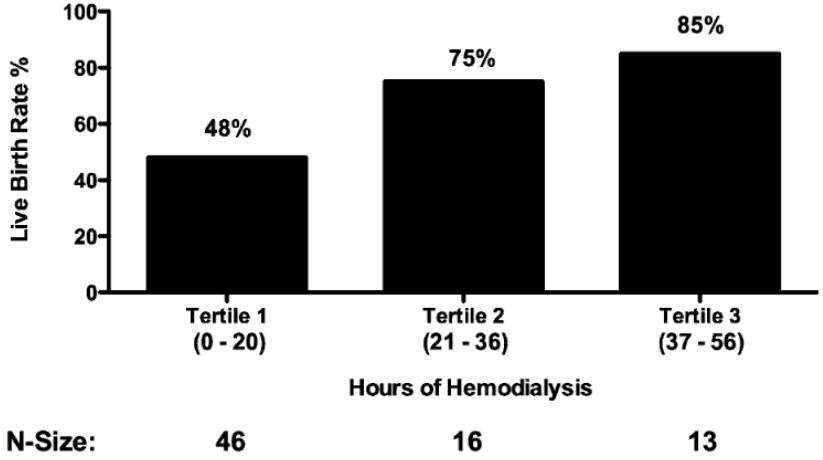


Figure 1. Live birth rates by dialysis intensity. In women with established ESRD, there is a significant dose-response relationship between hemodialysis intensity and the live birth rate (P=0.02), improving from 48% in women receiving ≤20 hours to 75% in women receiving between 21 and 36 hours to 85% in women receiving ≥37 hours of hemodialysis weekly.

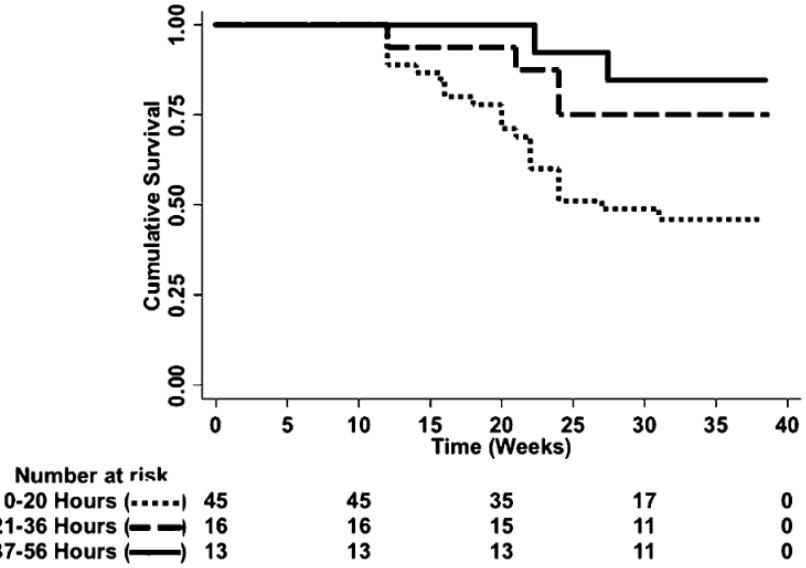
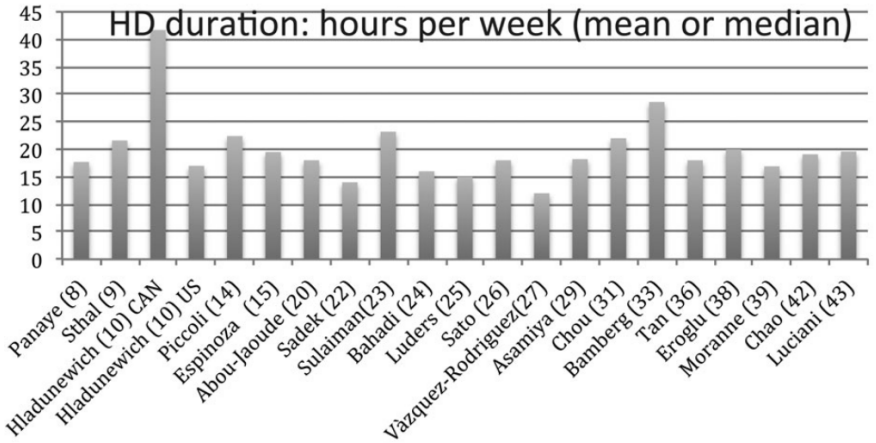


Figure 2. Time-to-event analysis by dialysis intensity. In women with established ESRD, there is a significant pregnancy survival advantage among women with high delivered doses of dialysis (log-rank test; P=0.01).

J Am Soc Nephrol 25: 1103–1109, 2014

Pregnancy in dialysis patients in the new millennium: a systematic review and meta-regression analysis correlating dialysis schedules and pregnancy outcomes

Nephrol Dial Transplant (2016) 31: 1915–1934



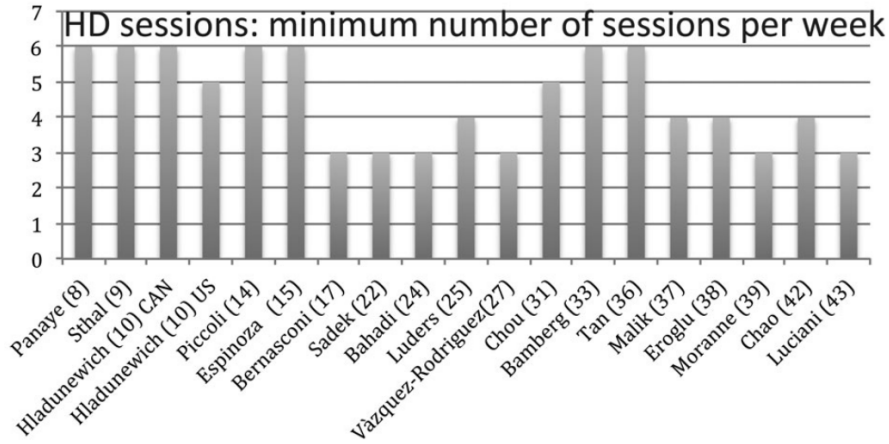
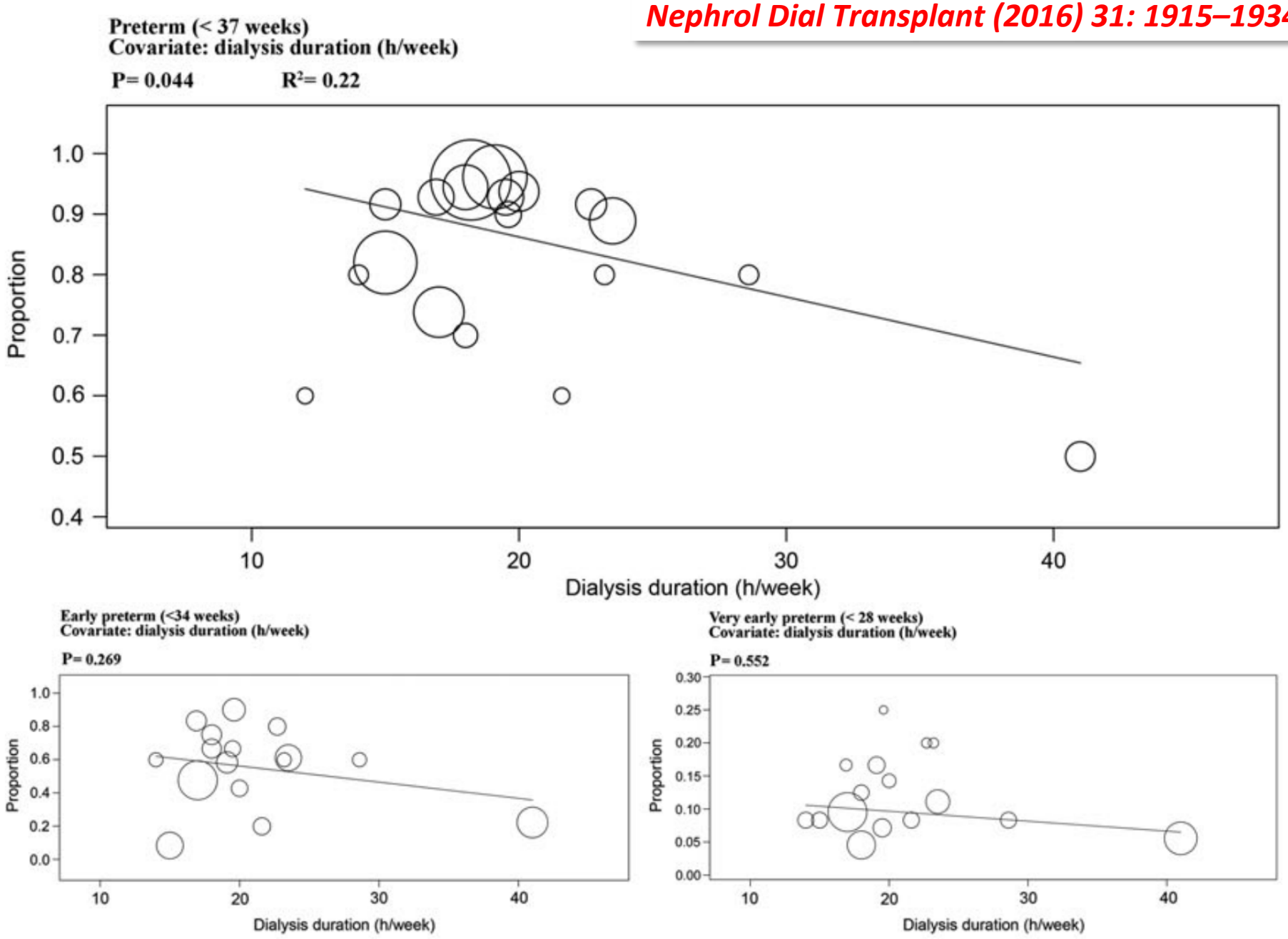
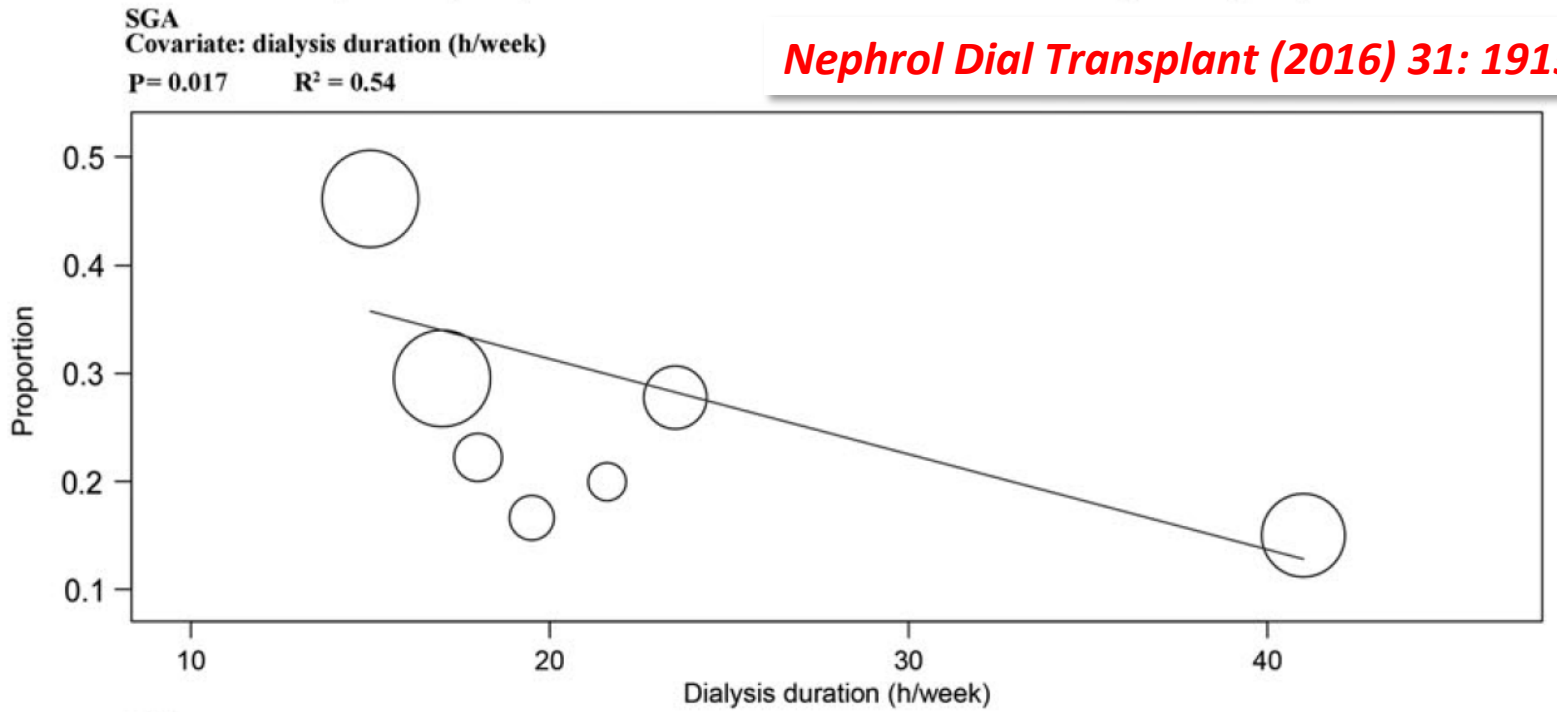


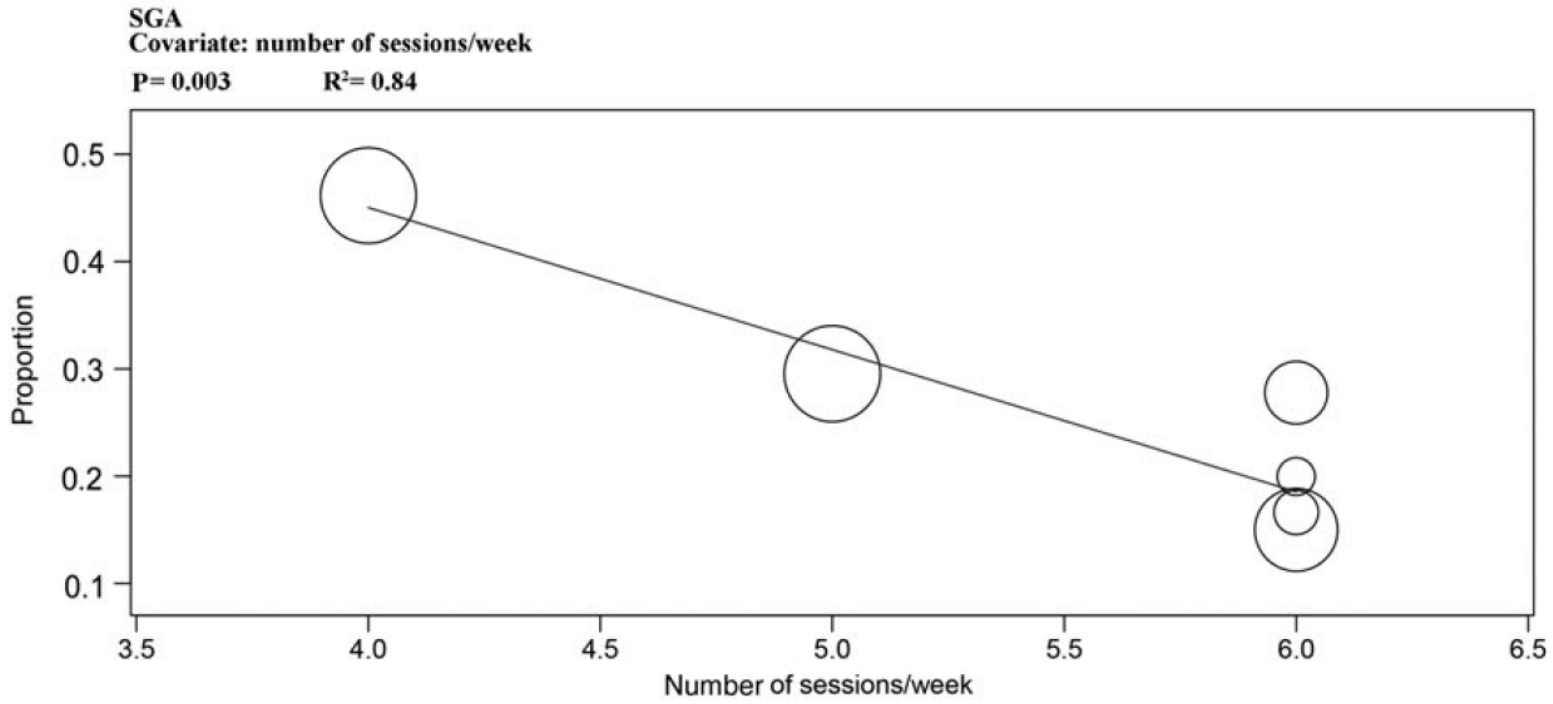
FIGURE 2: The distribution of hours of HD per week, and of minimum number of dialysis sessions, as measured in the papers reporting on them.

Nephrol Dial Transplant (2016) 31: 1915–1934



Nephrol Dial Transplant (2016) 31: 1915–1934





Pregnancy and Maternal Outcomes Among Kidney Transplant Recipients

Vicki Levidiotis,*†‡ Sean Chang,* and Stephen McDonald*§‖

- Registre Australien et Néozélandais sur 40 ans.
- 577 grossesse
- 97% plus d'un an après la greffe
- 444 naissances vivantes

J Am Soc Nephrol20:2433–2440, 2009

Pregnancy and Maternal Outcomes Among Kidney Transplant Recipients

Vicki Levidiotis,*†‡ Sean Chang,* and Stephen McDonald*§‖

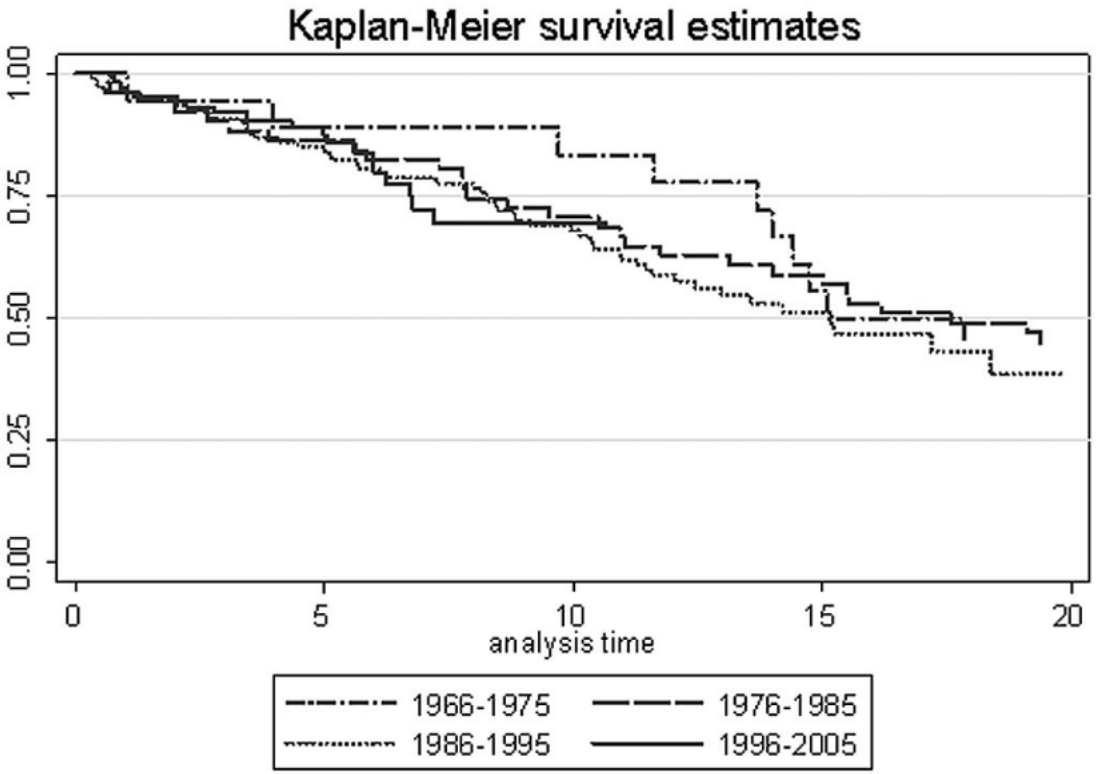


Figure 2. Kaplan-Meier kidney graft survival estimates after a live birth by decade are shown.

- Registre Australien et Néozélandais sur 40 ans.
- 577 grossesse
- 97% plus d'un an après la greffe
- 444 naissances vivantes

J Am Soc Nephrol20:2433–2440, 2009

Pregnancy and Maternal Outcomes Among Kidney Transplant Recipients

Vicki Levidiotis,*†‡ Sean Chang,* and Stephen McDonald*§‖

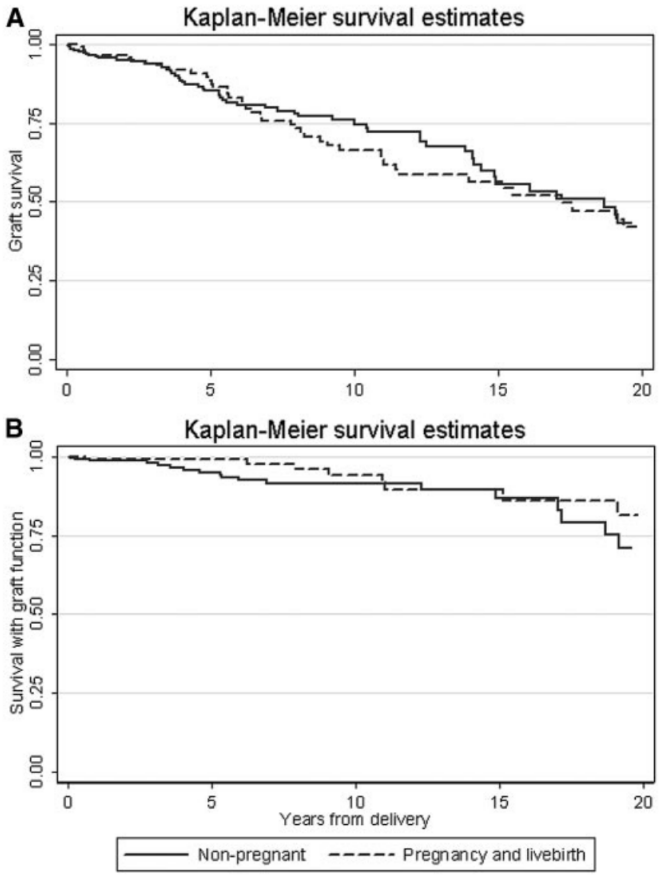


Figure 3. Kaplan-Meier graft survival estimates in nulliparous and parous women with a kidney graft are shown. (A) Graft survival. (B) Survival with graft function.

J Am Soc Nephrol20:2433–2440, 2009

Pregnancy and Maternal Outcomes Among Kidney Transplant Recipients

Vicki Levidiotis,*†‡ Sean Chang,* and Stephen McDonald*§‖

Table 2. Pregnancy outcomes in women with a functioning kidney transplant in Australia and New Zealand, 1966 through 2005

Era	Terminations	Transplant Pregnancy Outcomes			
		Spontaneous Abortions	Stillbirths	Live Births	Total
1966 to 1975	10 (30%)	3 (9%)	0 (0%)	21 (62%)	34
1976 to 1985	21 (18%)	10 (9%)	5 (4%)	80 (69%)	116
1986 to 1995	35 (15%)	15 (7%)	8 (3%)	171 (75%)	229
1996 to 2005	10 (5%)	24 (12%)	1 (0.5%)	172 (83%)	207
All eras	76 (13%)	52 (9%)	14 (2%)	444 (76%)	586

Spontaneous abortion was defined as delivery of a nonviable fetus ≤20 wk of gestation. Stillbirth was defined as delivery of a nonviable fetus >20 wk of gestation.

J Am Soc Nephrol20:2433–2440, 2009

Pregnancy in Renal Transplant Recipients: A UK National Cohort Study

Kate Bramham, Cathy Nelson-Piercy,*† Haiyan Gao,‡ Matthias Pierce,‡ Naomi Bush,‡ Patsy Spark,‡ Peter Brocklehurst,‡§ Jennifer J. Kurinczuk,‡ and Marian Knight‡*

Table 2. Drugs taken before and during pregnancy

Drug	Total, *n* (%)
Azathioprine	61 (60)
Cyclosporine	22 (21)
Prednisolone	56 (53)
Mycophenolate mofetil	4 (4)
Tacrolimus	65 (62)
Rapamycin	2 (2)
Aspirin	32 (30)
Calcium supplements	10 (10)
Erythropoietin	3 (3)
Anticoagulants	3 (3)
Folic acid (at conception)	62 (64)

- **UKOSS 2007 – 2009**
- **105 grossesses**
- **Créatininémie moyenne 118 micromoles/L**
- **Aucune mort maternelle**
- **20% d'admission en réanimation ou en USC**

Clin J Am Soc Nephrol8: 290–298, 2013

Pregnancy in Renal Transplant Recipients: A UK National Cohort Study

Kate Bramham, Cathy Nelson-Piercy,*† Haiyan Gao,‡ Matthias Pierce,‡ Naomi Bush,‡ Patsy Spark,‡ Peter Brocklehurst,‡§ Jennifer J. Kurinczuk,‡ and Marian Knight‡*

Table 3. Pregnancy complications in women with a renal transplant and an ongoing pregnancy in the third trimester compared with the comparison cohort

Outcome	Renal Transplant Recipients (n=95)[a]	Comparison Cohort (n=1360)	Unadjusted Odds Ratio	Adjusted Odds Ratio[b]
Preeclampsia in this pregnancy[c]		n=477		
Yes	23 (24)	17 (4)	7.59 (3.87–14.9)	6.31 (2.97–13.4)
No	72 (76)	460 (96)	1	1
Gestational diabetes in this pregnancy				
Yes	3 (3)	26 (2)	1.5 (0.45–5.04)	1.21 (0.35–4.25)
No	91 (97)	1324 (98)	1	1
Induced delivery				
Yes	42 (44)	300 (22)	2.79 (1.82–4.29)	2.67 (1.73–4.13)
No	53 (56)	1057 (78)	1	1
Delivery by caesarean section				
Yes	61 (64)	326 (24)	5.69 (3.64–8.89)	4.57 (2.83–7.35)
No	34 (36)	1034 (76)	1	1

Data are shown as n (%) or odds ratios (95% confidence intervals).
[a]Ten women whose pregnancies did not continue into the third trimester are excluded from this table.
[b]Adjusted for woman's age, parity, and smoking status. Woman's age and parity are treated as continuous linear terms in the model.
[c]Including only a subset of the comparison group with data about preeclampsia.

Clin J Am Soc Nephrol8: 290–298, 2013

Pregnancy in Renal Transplant Recipients: A UK National Cohort Study

Kate Bramham, Cathy Nelson-Piercy,*† Haiyan Gao,‡ Matthias Pierce,‡ Naomi Bush,‡ Patsy Spark,‡ Peter Brocklehurst,‡§ Jennifer J. Kurinczuk,‡ and Marian Knight‡*

Table 4. Pregnancy outcomes comparing to comparison cohort and national data

Outcome	Renal Transplant Cohort (n=108)[a]	Comparison Cohort (n=1375)[a]	Unadjusted Odds Ratio	Adjusted Odds Ratio[b]	National Data	Unadjusted Odds Ratio
Pregnancy outcome						
First or second trimester loss or termination	10 (9)	NA	NA	NA	NA	NA
Live birth	98 (91)	1366 (99)			NA	NA
Premature birth (<37 wk)						NA
Yes	51 (52)	114 (8)	11.7 (7.57–18.3)	12.7 (8.05–20.1)	36,558 (8)[c]	12.57 (8.48–18.6)
No	47 (48)	1235 (92)	1	1	423,475 (92)	
Very preterm birth (<32 wk)						
Yes	9 (9)	27 (2)	4.95 (2.26–10.9)	6.64 (2.88–15.3)	10,932 (2)[c]	4.15 (2.12–8.14)
No	89 (91)	1322 (98)	1	1	449,101 (98)	
Low birthweight (<2.5 kg)						
Yes	47 (48)	109 (8)	10.48 (6.73–16.3)	12.11 (7.60–19.3)	57,072 (7)	11.52 (7.77–17.1)
No	51 (52)	1239 (92)	1	1	713,201 (93)	
Very low birthweight (<1.5 kg)						
Yes	9 (9)	24 (2)	5.58 (2.52–12.4)	7.76 (3.29–18.3)	10,955 (1)	7.01 (3.58–13.7)
No	89 (91)	1324 (98)	1	1	759,318 (99)	
Small for gestational age						
Yes	24 (24)	99 (7)	4.07 (2.46–6.73)	4.87 (2.87–8.26)	10% (assumed)	2.92 (1.85–4.61)
No	74 (76)	1242 (93)	1	1		
Congenital anomaly						
Yes	4 (5)	NA	NA	NA	4308 (2)	2.46 (0.94–6.44)
No	94 (95)	NA			248,644 (100)	
Perinatal mortality						
Yes	1 (1)	10 (1)	1.38 (0.17–10.86)	1.57 (0.19–12.9)	6025 (1)	1.36 (0.00–7.74)
No	97 (99)	1335 (99)	1	1	793,022 (99)	
Neonatal unit admission						
Yes	37 (38)	NA	NA	NA	NA	NA
No	61 (62)	NA			NA	NA

Includes all fetuses/infants (N=108). Data are shown as n (%) or odds ratios (95% confidence intervals). NA, not available.
[a]Includes 3 pairs of twins in the renal transplant cohort and 15 in the comparison cohort.
[b]Adjusted for woman's age and smoking status. Woman's age was treated as a continuous linear term in the model. Parity was dropped from the model due to multicollinearity.
[c]Data from hospital episode statistics 2008–2009 (England and Wales only).

Clin J Am Soc Nephrol8: 290–298, 2013

Prise en charge anesthésique

Table 2 Systemic involvement in chronic kidney disease

	Pathological changes
Cardiovascular	Hypertension, left ventricular hypertrophy, accelerated atherosclerosis, uremic pericarditis, cardiomyopathy, fluid overload, pulmonary edema
Neurological	Autonomic neuropathy, mental status changes, peripheral neuropathy, seizures
Pulmonary	Increased risk of difficult airway, recurrent pulmonary infections
Gastrointestinal	Delayed gastric emptying, increased gastric acidity, malnutrition
Hematological	Anemia, thrombocytopenia, platelet dysfunction, decreased coagulation factors
Metabolic	Hyperkalemia, metabolic acidosis, hyponatremia, hypocalcemia, hypermagnesemia, decreased protein binding of drugs

Prise en charge anesthésique

Evaluation:

Cardiovasculaire:

- **HTA chronique et ses conséquences**
- **Cardiopathie urémique**
- **Echographie cardiaque**
  - **HVD**
  - **Cardiopathie dilatée**
  - **Bio-marqueurs**

Hématologique

- **Saignement clinique (thrombopathie)**
- **Anémie**
- **Anticoagulants**

Monitorage:

Monitorage non invasif habituel

- **Suffisant si HTA équilibrée**
- **Protéger la FAV**

Curarimètre (MgSO4)

Pression artérielle invasive

- **Si HTA non contrôlée**
- **Si insuffisance rénale sévère**

Monitorage hémodynamique

- **Pas de validation spécifique des technique de mesure du DC**
- **Intérêt des pression de remplissage en particulier si anurie**

Contrôle hémodynamique
Hypotension artérielle est néphrotoxique

Prise en charge anesthésique

Anesthésie générale

- Insuffisance rénale modérée, diurèse conservée, non dialysée, normo-volémique, HTA contrôlée
- Insuffisance rénal sévère ou terminale , dialysée, HTA non contrôlée
  - Néphrotoxicité du sévoflurane ?
  - Propofol /AIVOC / BIS
  - Atracrium
  - Célocurine / kaliémie
  - Rocuronium / Sugamadex
  - Dérivés du fentanyl
  - Morphine
  - HBPM / HNF
- Eviter nephrotoxiques
  - AINS
  - Aminosides
  - Sevoflurane

ALR

- Dysfonction plaquettaire…
- Attention à l'association:
  - HBPM et / ou aspirine…
  - Urémie
  - Anémie
- Post dialyse
  - Recirculation anticoagulants
  - Hypovolémie
- Diurèse conservée ?
- Gestion de l'hémodynamique…
  - Quelle catécholamine ?
  - Quel remplissage ?
  - Hypotension et insuffisance rénale
- Peu recommandé en chirurgie mais le bénéfice/risque n'est pas le même (déclenchement)

Le plus compliqué

- **IRC dialysée anurique**
- **Qui débarque en urgence à 5 heures du matin**
- **3 heures avant sa dialyse…**
  - **Volémie ?**
  - **Déséquilibre acido-basique ?**
  - **Troubles électrolytiques ?**

  => Biologie + BNP + Echo de débrouillage
  (FEVG visuelle, VCI, poumon +/- fonction diastolique)
- **Terme ?**
- **En travail ou non ?**
- **ARCF ou non ?**
- **Dialyse avant ou après ?**
- **Monitorage invasif ou non ?**
- **ALR ou non ?**

Conclusion

- **Pronostic fœtal et néonatal engagé**
- **Gestion HTA / pré éclamspie**
- **Aspirine préventif**
- **Peu de problème pour les IRC minimes ou modérées**
- **Bonne tolérance des greffons (2 – 4 ans)**
- **Dosage anti rejets**
- **Pronostic plus réservé chez les IRC dialysées**
- **Intérêt d'augmenter la « dose » et la fréquence des dialyse ?**
- **Médicaments nephro-toxiques**
- **Hémodynamique / ALR**
- **Thrombopathie + aspirine / ALR**