

# Acute kidney Injury in pregnancy

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- Why AKI during pregnancy is important?
- Definition of AKI during pregnancy
- Causes of AKI
- Case report



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## PREGNANCY OUTCOME IN PATIENTS WITH AKI DURING PREGNANCY



Research strategy: ("pregnancy" OR"pregnant")AND (" acute renal insufficiency",OR "acute kidney injury",OR "acute renal failure").

845 pregnancies in 834 women with PR-AKI versus 5387 pregnancies in 5334 women without AKI

BMC Pregnancy and Childbirth (2017) 17:235



## MATERNAL OUTCOMES



### **OTHER MATERNAL OUTCOMES:**

- Cesarean deliveries OR 1.49 (95% CI 1.37 to 1.61, P < 0.001)
- Hemorrhage OR 1.26 (95% CI 1.02 to 1.56, P=0.03)
- HELLP syndrome OR 1.86 (95% CI 1.41 to 2.46, P < 0.001)
- Placental abrution OR 3.13 (95% CI 2 to 5.02, P < 0.001)
- Eclampsia OR 0.53 (95% CI 0.34 to 0.83, P = 0.006)



## FETAL OUTCOME



### **OTHER FETAL OUTCOMES**

DEATH

- Gestational age mean difference -0.7week (95%CI-1.21 to 0.19, p=0.007)
- Baby birth weight mean difference -740g (95%CI-1180 to -310, p<0.001)</li>



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## KIDNEY CHANGES DURING PREGNANCY



### ANATOMIC CHANGES:

- Increased volume size by 1-1.5 cm (about 30%), due to an increase in renal vascular and interstitial volume. No change in number of nephron
- Pelvis and caliceal system may be dilated as result of progesteron.

FUNCTIONAL CHANGES:

- Increased GFR, related with hemodynamic changes, with peaks of 40-50% above baseline levels at 2 T
  - Hyponeatriemia 4-5 mEq/l below baseline levels
  - Hypoosmolality fall to a new set point 270 mmOsm/Kg
  - Increased protein excretion (180-200 mg/die in the 3T)
  - Hypouricemia (2-3 mgdl by 22-24 wG)



## CREATININE LEVELS DURING PREGNANCY



A 95<sup>th</sup>-percentile SCr concentration may suggest impaired kidney function and prompt further investigation or specialty referral.

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### ESTIMATION OF GFR DURING PREGNANCY

	n	GFR (C <sub>in</sub> )	eGFR (MDRD)	Bias
Nonpregnant	23	97.6 (22.2)	85.7 (11.3)	11.9 (19.1)
Normal pregnancy	48	153.2 (24.2)	111.6 (19.6)	41.1 (27.7)
Early Pregnancy	24	150.6 (22.5)	117.5 (20.1)	32.6 (23.6)
Late pregnancy	24	162.8 (41.9)	105.1 (16.9)	50.72 (29.1)
Pre-eclampsia	10	104 (19.8)	86.5 (12.4)	23.3 (21.8)
Renal disease	15	91.1 (32.0)	63.8 (14.9)	27.3 (29.8)

BJOG 115 : 109–112, 2008

CURRENT eGFR EQUATIONS BASED ON SERUM CREATININE VALUES ARE NOT RELIABLE MEASURES OF RENAL FUNCTION DURING PREGNANCY: CHANGE IN GFR ARE BEST IDENTIFIED BY MONITORING CREATININE

24 HOUR URINE COLLECTION PRESENTS A LIMITED ACCURACY DURING PREGNANCY, DUE TO URINARY STASIS FROM DILATATION OF LOWER URINARY TRACT



## AKI DEFINITION in PREGNANCY: ARE STANDARD CRITERIA RELIABLE?

### **RIFLE CRITERIA**

### **AKI NETWORK CRITERIA**



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## CAUSES OF ACUTE KIDNEY INJURY IN PREGNANCY

Stage	Cause		
Prerenal	Hyperemesis gravidarum Hemorrhage		
	Early pregnancy: miscarriage, ectopic pregnancy or abnormal pathology of the genital tract (eg, polyps, inflammation/infection, trophoblastic disease)		
•	Late pregnancy: placenta previa, placenta abruption, uterine rupture, vasa previa		
Renal	Acute tubular necrosis (medications, sepsis, or acute cortical necrosis)		
	Thrombotic thrombocytopenic purpura/hemolytic uremic syndrome		
	Preeclampsia/hemolysis-elevated liver enzymes-low platelets syndrome		
	Acute fatty liver of pregnancy		
	Acute glomerulonephritis		
Postrenal			
-	Nephrolithiasis		
	Bilateral ureteral obstruction (gravid uterus, polyhydramnios, uterine fibroids)		

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### AKI IN HYPEREMESIS GRAVIDARUM: case report

#### • At 15 weeks gestation

- Healthy 21-year-old, multiparous woman presented to the emergency department reported nausea and vomiting for the past 6 weeks. She denied any fever, chills, rash, or sore throat.
- **Physical examination**: agitated, pulse of 130 beats per minute, blood pressure of 89/43 mm Hg, and temperature of 37.4C. Oliguria.
- Blood examination at admission: creatinine of 10.7 mg/dL and blood urea 171 mg/dL., sodium 131 mmol/L, potassium 4.4 mmol/L, and chloride 71 mmol/L, U-sodium 97 mmol/l, Fractional excretion of sodium 9%
- **Renal ultrasound** revealed normal-sized kidneys with parenchymal echogenicity and no evidence of hydronephrosis, obstruction, or calculi



### ABOUT HYPEREMESIS GRAVIDARUM

- **Definition**: excessive nausea and vomiting with loss of 5% or more of body weight
- Frequency 0.5-1 %
- Usually between 8<sup>th</sup> and 12<sup>th</sup> weeks of pregnancy
- It may result in acute renal failure, hydration is the standard therapy



### AKI IN THROMBOTIC THROMBOCYTOPENIC PURPURA : CASE REPORT

- A 21-year-old at 22 wks of her first pregnancy suffered severe back pain.
  BP 140/90 mmHg and proteinuria.
  General Practitioner treated a presumed urinary tract infection with Nitrofurantoin.
- Two days later, this patient attended the Emergency Department with worsening confusion. She was irritable with a Glasgow Coma Scale (GCS) of 10/15, no evidence of seizure activity. She was hypertensive (135/90 mmHg), with a temperature of 37.7°C. Rapidly expanding facial and peripheral oedema was noted.
- Blood tests demonstrated severe thrombocytopenia (platelets 9 × 109/L), elevated lactate dehydrogenase (LDH) > 5000 U/L (<425), hemoglobin 61 g/L) and acute kidney injury (creatinine 140 µmol/L (<97).</li>



presence of ADAMTS13 antibodies →the diagnosis of acquired TTP in pregnancy →Treatment with Prednisolone, Rituximab

### THROMBOTIC MICROANGIOPATHIES (TMA) IN PREGNANCY

- Definition: development of fibrin and/or platelet thrombi in microcirculation in multiple organs and include thrombotic thrombocytopenic purpura and hemolytic uremic syndrome (HUS)
- 1/25000 pregnancy
- Usually appeared in 2-3° trimester
- TTP is characterized by a **severe deficiency (<5%) of ADAMTS13**, which is required to break down ultra large von Willebrand factor multimers (ULVWFM), which increase platelet adhesion and capillary occlusion. Acquired TTP is caused by ADAMTS13 antibodies (anti-ADAMTS13 immunglobulin G). Variable ADAMTS13 activity and antibody levels can be found in secondary causes of TTP such as human immunodeficiency virus infection, hepatitis B and C virus, drugs or **pregnancy.**
- Symptoms: fever, thrombocytopenia, micronangiopatic hemolytic anemia, neurologic symptoms and AKI
- High maternal mortality 10-20%, high risk of maternal ESRD



### AKI POSTRENAL IN PREGNANCY: case report

- A 33-year-old G1P0 at 27.5 weeks of gestation with a twin pregnancy presented left abdominal pain
- The pain was severe, colicky
- Blood examination: normal liver function, uric acid, and complete blood count. Creatinine was 0.7 mg/dL.
- A urinalysis showed microscopic hematuria and no proteinuria.
- A renal ultrasound showed a normal right kidney with no hydronephrosis; there was mild left hydronephrosis but no nephrolithiasis.



### ABOUT POST RENALA AKI IN PREGENCY

- Functional hydronephrosis is the most common physiologic change of the urinary tract during pregnancy, and it is usually more pronounced on the right side
- AKI due to obstruction by the gravid uterus is rare
- Twin gestation, polyhydramnios, and obstruction of a solitary kidney increase the risk of AKI in pregnancy
- Optimal treatment is aimed at relief of the obstruction by stenting the ureters or diversion of urinary flow via nephrostomy tubes, but treatment of the underlying cause via delivery or amnioreduction may be needed in extreme cases.



# Thanks your attention

