

Renal Diseases in Pregnancy: A clinical review and appraisal

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THE HUMAN FEMALE presents with the problem of higher risk of developing renal tract infections than her male counterpart. This has been primarily incriminated to the alterations in the renal tract resulting from the effects of pregnancy.

Renal Function in Pregnancy — A Physio-Anatomical Consideration

The physiological and anatomical changes that occur in the cardio-vascular and renal systems during pregnancy and puerperium can confuse the picture sufficiently to render it difficult to evaluate renal function tests in these patients. Further, the close proximity of the parturient canal to the renal tract renders the latter highly susceptible to infection, with resultant impairment of renal function, during or following pregnancy.

The salient physio-anatomical considerations with reference to renal functions in pregnancy are as follows:

(i) The progressive haemo-dilution, occurring after the first trimester of pregnancy, results in the fact that the level of blood urea during pregnancy remains much lower than in a non-pregnant adult. Blood urea concentrations of 15 to 25 mgm.% are the normal expected values during pregnancy and early puerperium, whereas a blood urea level of 30 mgm.% which is normal for a non-pregnant patient, is abnormal during pregnancy.

(ii) In pregnancy, the renal blood flow levels are increased by as much as 40 to 50% above the non-pregnant value of about 1 to 1.2 litres per minute. This will result in increased urinary output, which is one of the physiological causes for increased frequency of micturition in pregnancy. Further, the haemodilution and increased urinary output can contribute to difficulties in the interpretation of the results of renal clearance tests, i.e. urea clearance, inulin clearance and creatinine clearance tests, in pregnancy.

(iii) The significance of albuminuria in pregnancy can be difficult to evaluate as this could be due to toxæmia of pregnancy, renal tract diseases, postural albuminuria, or to contamination of the urine by the increased vaginal discharge (normal or abnormal) in pregnancy and puerperium.

(iv) In pregnancy, the renal threshold for glucose is lowered, and the evaluation of the significance of glycosuria is thereby rendered difficult.

(v) In pregnancy, especially after the fourth month, there is progressive dilatation of the renal collecting systems, viz calyces, renal pelvis and ureters, resulting in about 3-fold increase in the storage capacity, and subsequent urinary stasis. This renal dilatation is the result of two main factors, viz: (a) compression effect of the gravid uterus upon the ureters at the pelvic brim, and (b) passive relaxation effect on the ureteric musculature by progesterone and "relaxin" like substances. The dilatation of the renal tract

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results in urinary stasis, which can predispose to ascending urinary tract infection.

(vi) The increased lymphatic connections between the bladder and kidneys, and between the colon and the kidneys, are incriminated as factors predisposing to the spread of infection from the bladder and colon (*E. Coli*) to the kidneys.

(vii) The short length of the female urethra (in contrast to the male) results in a close anatomical proximity of the urine in the bladder to the skin of the external genitalia, perineum, vaginal and ano-rectal contents. This state increases the risk of the urine in the bladder becoming infected from pathogenic bacteria from these secondary sources.

(viii) The extremely close proximity of the urethra, bladder and ureters to the parturient canal, especially the vaginal and the gravid lower uterine cavity, renders the lower renal tract highly susceptible to trauma during the intrapartum period. Such trauma is especially liable to occur during manipulative vaginal delivery, such as forceps, ventouse and destructive operations, Caesarean section delivery and prolonged labour. Trauma, in its turn, will predispose to renal tract infections.

Routine Screening of Urine in Asymptomatic Pregnant Patients

(i) **Albumin:** Routine testing of urine for albuminuria in pregnant patients is undertaken at all antenatal visits, as a screening test for toxæmia of pregnancy. However, the presence of albuminuria could indicate urinary tract infection or other forms of renal pathology. It is also essential to exclude postural albuminuria and albuminuria from contamination by vaginal discharge before evaluating the significance of albuminuria.

(ii) **Glycosuria:** Routine testing of urine for glycosuria in pregnant patients is undertaken at all antenatal visits, as a screening test for diabetes mellitus. However, glycosuria could be physiological, such as would be the result of lowered renal threshold ("renal glycosuria") or lactosuria of late pregnancy and puerperium. Incidence of physiological renal glycosuria and lactosuria have been reported to occur to as high a frequency as 30 to 35% of pregnant patients. Hence, to confirm the diagnosis of diabetes mellitus, the detection of glycosuria should be followed-up by a glucose tolerance test.

(iii) **Pus cells:** In most clinics, the presence of more than five pus cells per micro-litre or per "high-power field" of urine is considered as diagnostic of urinary tract infection and is used as a screening index.

(iv) **E. Coli:** *E. Coli* is the commonest organism being held responsible for more than 95% of urinary tract infections in pregnancy, (Pinkerton et al, 1967). However, most pregnant women excrete some *E. Coli* in their urine, even without evidence of urinary tract infection. Pinkerton et al (1967) advocated the use of the T.T.C. (Triphenyl Tetrazolium Chloride) Test, as a screening test, to detect the presence of a significant number (100,000 or more per ml. urine) of *E. Coli* in the urine that will constitute evidence of urinary tract infection. However, this test does not seem to have come into wider useage despite its strong advocacy by Pinkerton et al (1967) at the Fifth World Congress of Gynaecology and Obstetrics, held in Sydney in September 1967.

Renal Diseases in Pregnancy

In Table I is presented the common types of renal diseases that may be seen in pregnant patients. Of all the renal diseases seen in pregnancy, pyelonephritis, both acute and chronic, and acute renal failure are the most commonly associated renal complications of pregnancy. In fact, pregnancy and its complications can predispose, in their turn, to pyelonephritis and acute renal failure in the obstetric patient. A fuller discussion of their inter-relationships is not possible in this review paper. The other six renal conditions, listed in Table I, are relatively unrelated to the pregnancy state, and are coincidental associations. However, such cases invariably create their individual problems in diagnosis and management, discussion of which is again limited in this paper. Further, there is little doubts that the pregnancy state can have adverse effects on the pre-existent renal disease process, as well as the fact that the pre-existent renal disease state can have adverse effects on the pregnancy.

Acute Renal Failure in Obstetrics and Gynaecology

In obstetrics and gynaecology, there seems to be a higher predisposition to the occurrence of acute renal failure. In Table II (above) is presented a comprehensive list of all the common clinical causes of acute renal failure that can be encountered in obstetrical and gynaecological practice. Severe and prolonged state of shock, irrespective of the cause, can readily result in acute renal failure from renal ischaemia, due to inadequate renal perfusion. Fulminating septicaemia, especially following septic abortions, fulminating toxæmia of pregnancy including eclampsia, and severe concealed accidental haemorrhage are, by far,

RENAL DISEASES IN PREGNANCY

the three major causes of acute renal failure in modern obstetrical and gynaecological practice. Fulminating infections of the renal tract and severe intravascular haemolysis from mis-matched blood transfusions, bacterial septicaemia (*Cl. Welchii*) and chemical agents, are at present less commonly encountered in good obstetrical and gynaecological practice. Acute urinary tract obstruction and nephrotoxic agents are rarely encountered as causes of acute renal failure in present-day obstetrical and gynaecological practice.

Pathology of Acute Renal Failure

The pathology of acute renal failure, irrespective of the clinical aetiology, may be schematically presented as shown in **Figure 1**, which is self-explanatory. In obstetrics and gynaecology, acute renal circulatory insufficiency is the commonest and most important of the mechanisms of acute renal failure; and acute tubular necrosis, which is usually secondary to a state of acute renal circulatory insufficiency, is the second common mechanism of acute renal failure. However, most of the obstetrical and gynaecological aetiological factors of acute renal failure can also become operative by directly precipitating acute tubular necrosis. Acute bilateral cortical necrosis is a rare pathological cause of acute renal failure, and is classically seen in cases of severe concealed accidental haemorrhage (Bourne et al, 1962 and MacGillivray, 1950).

It is not possible to discuss the management of acute renal failure in full in this paper. The salient aspects of the management should inco-operate the following:-

- (i) Treat and alleviate the underlying cause of acute renal failure.
- (ii) Maintenance and control of fluid and electrolyte balance.
- (iii) Control of blood non-protein nitrogenous levels (blood urea etc.).
- (iv) Prevention of infection (provision of good nursing).
- (v) Implementation of renal dialysis (haemodialysis or peritoneal dialysis) when the indication arises.

Chronic Nephritis and Pregnancy

The occurrence of pregnancy in a patient with chronic nephritis is a rare association; but when it does arise, the outlook for both the mother and the foetus are extremely poor.

The management of patients with chronic nephri-

**TABLE I
RENAL DISEASES IN PREGNANCY**

- (1) Pyelonephritis in Obstetrics
 - (a) acute
 - (b) chronic
- (2) Acute Renal Failure in Obstetrics
- (3) Acute Nephritis (Bright's Disease)
- (4) Nephrotic Syndrome
- (5) Chronic Nephritis
- (6) Renal Tuberculosis
- (7) Polycystic Disease of the Kidneys
- (8) Renal Calculi

**TABLE II
RENAL FAILURE IN
CLINICAL AETIOLOGY OF ACUTE
OBSTETRICS AND GYNAECOLOGY**

1. Shock
 - (i) Neurogenic.
 - (ii) Oligaemic.
 - (iii) Bacteraemic.
 - (iv) Anaphylactic.
2. Septicaemia.
3. Fulminating PET/Eclampsia.
4. Concealed Accidental Haemorrhage.
5. Fulminating Renal Infection.
6. Intra-Vascular Haemolysis
 - (i) Blood Groups
 - (ii) Bacteria
 - (iii) Chemicals
7. Acute Urinary Tract Obstruction.
8. Nephrotoxic Agents.

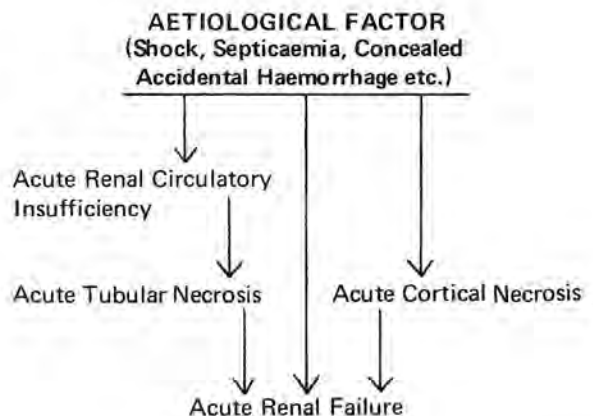


TABLE III
CHRONIC NEPHRITIS
Differential Diagnosis between PET and
Chronic Nephritis with pregnancy

1. Definite history of having had acute nephritis.
2. Albuminuria in early months of pregnancy (before the 20th week)
3. Albuminuric retinitis constantly present.
4. Repeated urine examinations will reveal:
 - (a) Consistently low S.G. below 1010.
 - (b) Persistent albuminuria throughout pregnancy.
 - (c) Presence of Hyaline, and occasionally granular and epithelial casts.

TABLE IV
CHRONIC NEPHRITIS
Pre-pregnancy Renal Investigations

1. Intravenous pyelography *
2. Repeated Blood Urea Investigations
3. Urea-concentration Excretion Test
4. Water Concentration Test
5. Microscopy of the Urine.

TABLE V
CHRONIC NEPHRITIS
Findings in Favour of a
Successful Pregnancy

1. The absence of Albuminuria.
2. A normal or slightly elevated B.P.
3. A Blood Urea not exceeding 30 mgm.%
4. A Urea-Concentration of over 2Gm%.
5. A constantly high S.G. of the urine — over 1010.

tis and pregnancy constitute a problem even in the best hands. In order to attain maximal maternal and foetal salvage in these cases, the medical and obstetrical skill should be of the highest standard. In addition, their care involves excellent team-work between obstetrician, physician, biochemist and nursing personnel.

The salient aspects of the problem of chronic nephritis and pregnancy can be presented in sum-

mary-form in the undermentioned four tables (Tables III, IV, V and VI). These tables are self-explanatory.

TABLE VI
CHRONIC NEPHRITIS
Findings in Favour of an
Unsuccessful Pregnancy

1. Persistent and/or severe albuminuria.
2. Continued and increasing hypertension.
3. Blood Ureas exceeding 40 mgm. %.
4. Urea-concentration of less than 2Gm%.
5. A persistently low S.G. of Urine of 1010 or less.
6. Increased retinal changes.
7. Supervention of severe PET or even mild PET in very early pregnancy (24th week).

Summary

1. A review of renal function in pregnancy, on a physio-anatomical basis is presented.
2. The significance and pitfalls, involved in the routine screening of pregnant patients for renal pathology, are discussed.
3. The pattern of renal diseases encountered in the pregnant patient, is tabulated.
4. The problem of acute renal failure in obstetrics and gynaecology is comprehensively reviewed and appraised.
5. The salient aspects of the relatively rare clinical problem of chronic nephritis and pregnancy are tabulated.

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