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Serum urea and creatinine levels in pregnant women attending Antenatal clinic in General Hospital Suleja- Niger state

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Abstract

Levels of renal function parameters (urea and creatinine) were assessed in normal pregnant women attending General Hospital Suleja- Niger State in order to identify the association between these biochemical parameter and gestation period (first, second and third trimester) compared to those of normal non- pregnant women as a control. A total of 200 women were participating in the study, they include 150 pregnant women and 50 non-pregnant women. The result obtained showed a significant ($p<0.05$) lower value in mean serum urea level in the pregnant group during the 3rd trimester of the pregnancy, while the mean value of urea show a non significant ($p<0.05$) decrease through out the 1st and 2nd trimester of the pregnancy when compared with the control group. There was a significant difference in serum creatinine between the 1st and 3rd trimester, which were higher in the 3rd trimester than in the 1st and 2nd tirmester of the pregnancy, but no significant difference in serum creatinine between 1st and 2nd trimester of the pregnancy when compared with the control group. All these changes could be due to physiological adaptations of the mother to the growing fetus.

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Keywords: Serum creatinine, urea, pregnant women, General Hospital, Suleja.

1. Introduction

Pregnancy is the period during which a woman carries a developing fetus, normally in the uterus, from the first day of the last menstrual period of parturition, usually for about 280 days (Elizabeth, 2003). During pregnancy a woman undergoes dramatic physiological and hormonal changes with large amount of oestrogen, progesterone and corticosteroid being produced that affects various metabolic, physiological and endocrinological functions (Ashwood, 2002). Some examples include the breast increase in size; the great increase in appetite, the woman may also experience morning sickness which is characterised by the woman vomiting in the early stage that is the first six weeks. Although in certain women vomiting may persist till the ninth month (Sikkim *et al*., 2001).

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The circulating concentration of oestrogen, progesterone and corticosteroids alters the concentration of many substance in plasma urea, urate plasma levels decrease as a result of foetal growth, and increase in glomerular filtration rate (GFR) have also been reported (Mayne, 2005). Glomerular filtration rate (GFR) usually increases to about 170ml/min/1.73m^3 by 20 weeks against the normal of 125ml/min/1.73m^3, and increase the clearance of urea, creatinine and uric acid (Steven and Frank, 2000).

The blood urea is used much less as a measure of renal function since it varies considerable with the dietary protein intake, it is reabsorbed in the tubules and it is therefore, not a glomerular substance. The reabsorbtion varies with urine flow and its clearance becomes completely independent of the GFR at a low urine flow rate (George, 2007). Urea is the major nitrogen containing metabolic product of protein catabolism in human, the reference intervals using an enzymatic about 2.5 – 7.5 mmol/l (15 – 45 mg/dl) (Burits and Ashwood, 1988).

During pregnancy, the very high circulating concentrations of oestrogen and progesterone plasma volume increase up to 40% during growth of the fetus and the increase in glomerular filtration rate (GFR) occurs which results in lowering maternal plasma urea and urate concentrations (George, 2007). Also the renal blood increases resulting in an increase in urine formation, nausea and vomiting that leads to an increase in urea excretion. A significantly elevated plasma urea concentration above 15mmol/L (blood urea nitrogen 42mg/dl) usually indicates impaired glomerular function (Davey, 2006). Creatinine is produced endogenously and released into the body fluid at a constant rate and its plasma levels are maintained within narrow limits. Its renal clearance is used as an indicator of glomerular filtration rate (GFR) (Haslett *et al*., 2002). Serum creatinine excretion is not influenced much by usual changes in diet or by urine flow. As long as there are no abnormalities in muscle mass, an increase in serum creatinine almost always reflects decrease in GFR (Bolarin and Bolarin, 2005). During pregnancy, glomerular filtration rate increases and this result in increase in creatinine clearance rate, especially during the third trimester (Mathew *et al*., 2007).

Many pregnant women develop varicose veins as the pregnancy progresses, these changes occurs due to hormonal changes, birth control pill or other medications containing estrogens and progesterone (Sahelian, 2004). Sometimes, varicose vein occurs as a result of the weight of the fetus compressing the inferior vena cava, that increases the venous pressure in the leg, which lead to oedema of ankle and leads to an increase in creatinine excretion thus causing an

increase in the plasma creatinine level (Watt *et al*., 2007). The present study was designed to investigate the effect of pregnancy on serum urea and creatinine during the 1st, 2nd and 3rd trimester of gestation.

2. Material and Methods

Research design

200 women were used in this research, 150 of which were normal pregnant women, out of these, 50 were in their first trimester, 50 were in their second trimester and 50 in the third trimester all of which were within the same age bracket (15-45 years); and 50 non- pregnant women were used as control.

Ethical approval

The permission to conduct the research was granted by the Ethics Committee of the General Hospital, Suleja, Niger state, Nigeria. The consent of the participants was also obtained before the collection of blood samples.

Sample collection

5mls of blood sample was collected from each woman with a sterile needle and syringe, 70% alcohol was used to sterilize the site of collection. The blood sample was collected into well labelled plain bottle and were allowed to clot, after which they were centrifuged for 15 minutes. The serum was separated using clean Pasteur pipette into another well labelled, clean plain bottle and determination of urea and creatinine concentration was carried out immediately after separation.

Determination of serum urea

Serum urea was estimated by an enzymatic method (Urease-modified Berthelot reaction) using a kit (biomerieux /France) (Fawcett and Scotte, 1960).

Determination of Creatinine

Serum creatinine was based upon the colorimetric method with deproteinisation using a kit (Syrbio / France) (Henry, 1974).

Statistical analysis

All data presented as mean of five determinations ± standard error of mean (SEM). The significance of difference among groups was determined by the one-way Analysis of Variance (ANOVA), the Duncan's Test was used for the Post Hoc analyses and $p < 0.05$ was accepted as significant (Mahajan, 1997). The graph pad prism 5 was used for the analysis.

3. Results

Figure 1 shows the mean level of serum urea in pregnant women attending ante-natal clinic at General Hospital Suleja at the different trimester of the pregnancy and non- pregnant women serves as control group. The result revealed that there was a progressive decrease in the level of urea as the pregnancy advanced with significant ($p<0.05$) lower value in the 3rd timester of the pregnancy when compared with the control.

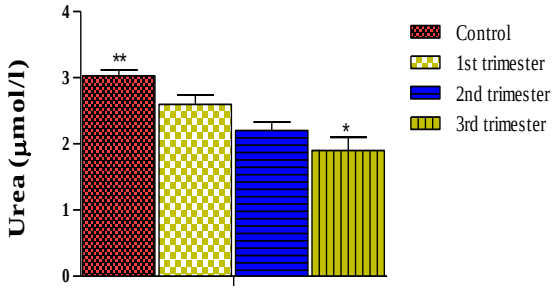

Fig. 1: Serum urea in pregnant and non- pregnant women attending ante-natal clinic at General Hospital Suleja. The bars are mean ± SEM of determinations, the letter superscript shows the statistical different with $P<0.05$.

Figure 2 shows the mean serum creatinine level in three stages of pregnancy. There was a significant (*$p<0.05$*) decrease in creatinine level at 1st trimester when compared with the control group. The creatinine level was significantly ($p<0.05$) higher at 3rd trimester when compared with the 1st and 2nd trimester of the pregnancy.

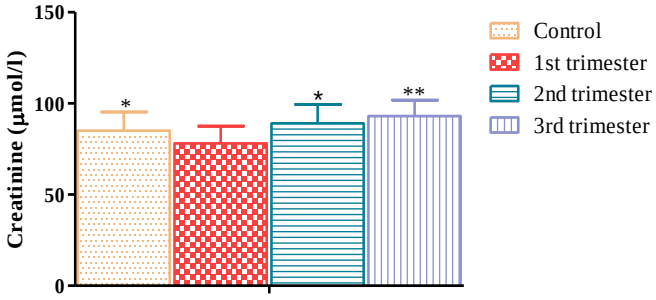

Fig. 2: Serum creatinine in pregnant and non- pregnant women attending ante-natal clinic at General Hospital Suleja. The bars are mean ± SEM of determinations, the letter superscript shows the statistical different with P<0.05

4. Discussion

During pregnancy most women undergo dramatic physiological and hormonal changes. As a result of such changes many of the laboratory reference intervals for non- pregnant patient are not appropriate for pregnant patient (Ashwood, 2001). The laboratory determination of serum creatinine and urea can be a reliable means of assessing of kidney function of pregnant women worldwide and evaluating the risk to the life of pregnant mothers and their fetuses, as a result of changes in renal function during pregnancy (Okonkwo *et al.*, 2013). The present results showed that the serum urea level in the 3rd trimester was lower when compared with control group (figure 1). The decrease in serum urea is in line with the report of Naismith (1980) in which he noted there were a decreased activity of hepatic enzymes which are involved in amino acid deamination and urea synthesis. He also observed that as maternal protein is broken down for the foetus as an alternative energy source which is as a result of placenta intake.

The increase in serum creatinine observed in pregnant women at 3rd trimester was in agreement with the work of Weisberg (1999), who reported that the plasma creatinine concentrations were lower in early pregnancy and increase with advancing gestational age. The increase in serum creatinine observed by Weisberg (1999) shows that serum creatinine increase during the third trimester and return to normal 72 hours after delivery. The significant increase in serum Creatinine ($p>0.05$) observed as the pregnancy progresses may also be associated with an increase in body mass as the pregnancy progress, this is in line with Abrams and Parker (2006) who reported that most women gained about 12.5kg during the 40 weeks of pregnancy; this may be assumed to be responsible for the increase serum

creatinine is derived mainly from baby mass. Weigsbeigh (1999) shows that serum creatinine in 32 women during the last 3 weeks of pregnancy and in further 39 women during and after labour. The serum creatinine increases though not significantly during the third trimester and returned to normal by 72 hours after delivering. Ogunbode *et al*., (1976); observed that in 143 pregnant women, there were increases in creatinine level as pregnancy progressed.

5. Conclusion

The result obtained in this study appears to be changes that have become a physiological adaptation of mother to provide for the growing fetus. Though changes do not mean abnormality, there could be a shift in the equilibrium which might tend toward pathological. As such, the increase in the serum creatinine level could be due to muscle expansion and contraction during pregnancy. The decrease in serum urea level with advancement of pregnancy, possibly resulting from hydration, increased anabolic rate, and an increase in kidney functions which accompany normal pregnancy.

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