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RESEARCH ARTICLE

DETERMINATION OF SERUM URIC ACID, SERUM CREATININE AND SERUM UREAIN NORMAL PREGNANT WOMEN IN THEDIFFERENT TRIMESTERS IN SHENDI LOCALITY, SUDAN

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ABSTRACT

Background: Pregnancy has being found to be associated with changes in serum uric acid, serum creatinine and serum urea and this differs with each trimester.
Material & Methods: This cross-sectional study was conducted at Shendi locality. The patients underwent a clinical assessment, which included history (a questionnaire) and clinical examination. 160 women were divided into four group's non pregnant, 1st, 2nd and 3rd trimester of pregnancy respectively. The age limits was 12 to 40 years.
Results: The mean of serum uric acid, urea andcreatinine showed lower values in pregnant groups ofpregnancy than the non-pregnant (control group). While the mean value of serum uric acid1sttrimester ofpregnancy show a significant decrease compared to thenon-pregnant (control group). There was a significant difference in serum uric acid and creatinine betweenthe 1st and 3rd trimester which were higher in the 3rd trimester than the 1st trimester ofpregnancy, but no significant difference in serum urea between the 1st and 3rd trimester.Comparison between numbers of pregnancy and the serum urea, uric acid and creatinineconcentration are not significant.
Conclusion: The mean of serum uric acid, urea andcreatinine showed lower values in pregnant groups than the non-pregnant (control group).

INTRODUCTION

The changes that pregnancy brings to a woman's body can induce certain disorders, including kidney disease. Many changes in renal function occur in normal pregnancy, without a proper understanding of these changes, routine clinical investigations may be easily misinterpreted (Brown, 1992) such as serum uric acid, urea and creatinine.Renal function is affected by the changes in other systems particularly by those that occur in hemodynamic control (Milne *et al.,* 2002). The systemic hemodynamic profile of pregnancy is characterized by an increase in intravascular volume, cardiac output and heart rate with marked fall in vascular resistance and tendency toward a decrease in a mean blood pressure in association with an increase in renal plasma flow (RPF) and glomerular filtration rate (GFR) (Chapman *et al.,* 1998; Mabie *et al.,* 1994). The increase in GFR has important clinical implications, such as serum level of uric acid, urea and creatinine during pregnancy (Waltzer, 1981). Measurement of serum creatinine is a more reliable guide as it is produced from muscle at a constant rate and almost completely filtered at the glomerulus. As very little creatinine is secreted by tubular cells, the creatinine clearance provides a reasonable approximation of the glomerular filtration rate. If muscle mass remains constant, changes in creatinine concentration reflect changes in GFR (Burits, 1999), (Haslett *et al.,* 2002). Plasma creatinine is mostly derived from endogenous source by tissue creatine breakdown. Urea is the major nitrogencontaining metabolic product of protein catabolism in human, the reference intervals using an enzymatic about 2.5 – 7.5 mmol/l (15 – 45 mg/dl) (6). The measurement of plasma or serum urea concentration is widely regarded as a test of renal function but not a good guide to renal function as it varies with protein intake, liver metabolic capacity and renal perfusion (Haslett *et al.,* 2002). Serum uric acid concentration decreases by at least 25% during early pregnancy and this change reflects alterations in the fractional clearance of uric acid (uric acid clearance - GFR), with a decrease in net tubular reabsorption (Dunlop, 1977). As pregnancy advances, the kidney appears to excrete a smaller proportion of the filtered uric acid load and this increase in net reabsorption is associated with an increase in serum uric acid concentration near term (Davison, 1983). The aim of this study to determine the changes of serum uric acid, serum creatinine

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and serum urea during normal pregnant women in the different trimesters.

MATERIALS AND METHODS

This study was conducted at Shendi locality to determination of serum uric acid, serum creatinine and serum urea in normal pregnant women. The study included (160) normal pregnancy women attending to AL Noor Modern Medical Center. Their ages range from (12-40 years). Blood samples were taken from antecubital vein by plastic disposable syringes. The blood was then transferred into a plane glass tubes. After one hour at room temperature (after clot retraction) centrifugation of the blood was done at a relative centrifugal force of 1000 g for 5 minutes. Afterward, sera were removed by disposable pasture pipettes and transferred into glass containers. Sera were analyzed in patches. Estimation of blood, urea, uric acid and creatinine was done by kitmethod. Blood pressure were done for all participants in this study. Clinical data were collected through a questionnaire the (SPSS) version (11.5) program was used for data analysis. All the data were presented as the mean ± SD.

Inclusion criteria:pregnant women, the age between 12 -40 years.

Exclusion Criteria: pregnant women with gestational diabetes mellitus, hypertension, and women with other chronic diseases.

RESULTS

DISCUSSION

Some previous studies showed that the serum uric acid, urea and creatinine in normalpregnancy aredecrease which may be compared to the levels in non-pregnant women (Das *et al.,* 2016). In our study also this observation holdstrue. In this study, it was observed that the concentration of serumuric acid, urea and creatinine showed lower values in pregnant groups of pregnancy than the non-pregnant women.In first trimester of pregnancy plasma volume and GFRincrease during the course of pregnancy [Davison, 1974; Moran, 2003]. Thesechanges in plasma volume and GFR may give possible explanation for initial increase the clearance ofurea, creatinine and uric acid [Dunlop, 1977; King, 2000] so all threeparameters are therefore slightly decrease in serum. Thepositive protein and purine balance during growth of thefetus, and the increase of GFR, result in loweredmaternal plasma urea and urate levels [Zilva, 2013]. In our study, we observed a significantly decrease serumcreatinine (0.77±0.22mg/dL) in 1st trimester compered to 3rd trimester. This is in accordance withthe studies carried out by Das B et al (0.70±0.10mg/dL) (Das *et al.,* 2016). Creatinine is freely filtered, so the serum creatinine levels dependon the GFR. The GFR increases in normal pregnancy, so the serum concentration of creatinine decreases. It appearsthat changes in fluid distribution might produce an increase in GFR and lower plasma creatinine (OkonkwoOluchukwu Patricia1, 2013), although thesehave been found to increase progressively with gestation period; as it was reported that the plasma volume increasesduring pregnancy, sometimes by as much as 50 % and these changes

Table 1. Average Values of Measured Parameters for non-pregnant and normal pregnant women.

Parameter	Non pregnant (control n=40)	1st Trimester (n=40)	2nd Trimester (n=40)	3rd Trimester (n=40)
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Age in yrs	28.57±8.57	25.82±6.57	25.00±5.97	25.62±5.60
Age at marriage in yrs	20.57±7.84	19.15±4.25	19.35±4.16	20.17±4.98
Duration of marriage in yrs	8.0±7.98	6.67±5.50	5.65±5.86	5.45±4.09
Number of pregnancy	2.0±2.19	3.72±2.72	3.22±2.24	3.05±1.90
Systolic BP in mm of Hg	73.75±8.06	67.0±6.07	67.25±5.54	74.0±9.81
Diastolic BP inmm of Hg	114.75±10.37	107.75±4.79	108.75±5.63	114.25±12.17

Table 2: serum uric acid, urea and creatinine in non-pregnant (control) and pregnant women (first, second and third trimester)

Parameter		1st Trimester (n=40)		2nd trimester (n=40)		3rd trimester (n=40)	
		Mean ± SD	P value	Mean ± SD	P value	Mean ± SD	P value
Pair 1	Creatinine (Control)	0.91± 0.2	.144	0.91 ± 0.2	.951	0.91± 0.2	.828
	Creatinine	0.77 ± 0.22		0.75 ± 0.16		0.89 ± 0.15	
Pair 2	Urea (Control)	20.05±5.2	.606	20.05±5.2	.549	20.05±5.2	.329
	urea	18.54 ± 6.7		17.1±5.4		17±6.3	
Pair 3	Uric acid (Control)	6.0 ± 0.8	.039*	6.0 ± 0.8	.949	6.0 ± 0.8	.653
	Uric acid	5.2±1.1		5.5±1.2		5.79±0.8	

*t- test P<0.05 is significant

Table 3. correlation between serum uric acid, urea and creatinine in pregnant women (first, second and third trimester)

Groups		Serum Creatinine		Serum urea		Serum Uric acid	
		Mean ± SD	P value	Mean ± SD	P value	Mean ± SD	P value
Pair 1	1st Trimester(n=40)	.77±.22	.984	18.54±6.78	.902	5.27±1.15	.518
	2nd trimester(n=40)	.75±.16		17.1±5.45		5.51±1.29	
Pair 2	1st Trimester(n=40)	.77±.22	.008*	18.54±6.78	.300	5.27±1.15	.853
	3rd trimester(n=40)	.89±.15		17.0±6.33		5.79±0.80	
Pair 3	2nd trimester(n=40)	.75±.16	.913	17.1±5.45	.010*	5.51±1.29	.906
	3rd trimester(n=40)	.89±.15		17.0±6.33		5.79±0.80	

*t- test P<0.05 is significant

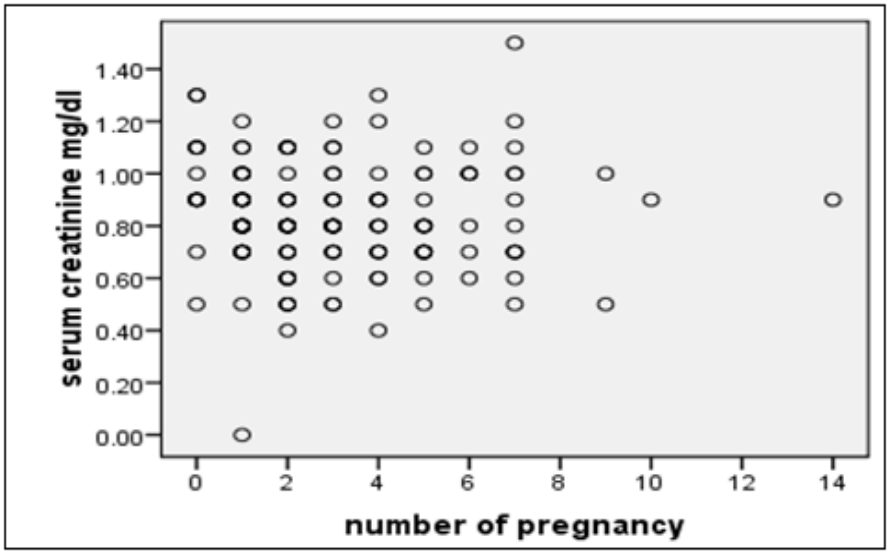

Figure 1. Comparison between number of pregnancy and serum creatinine

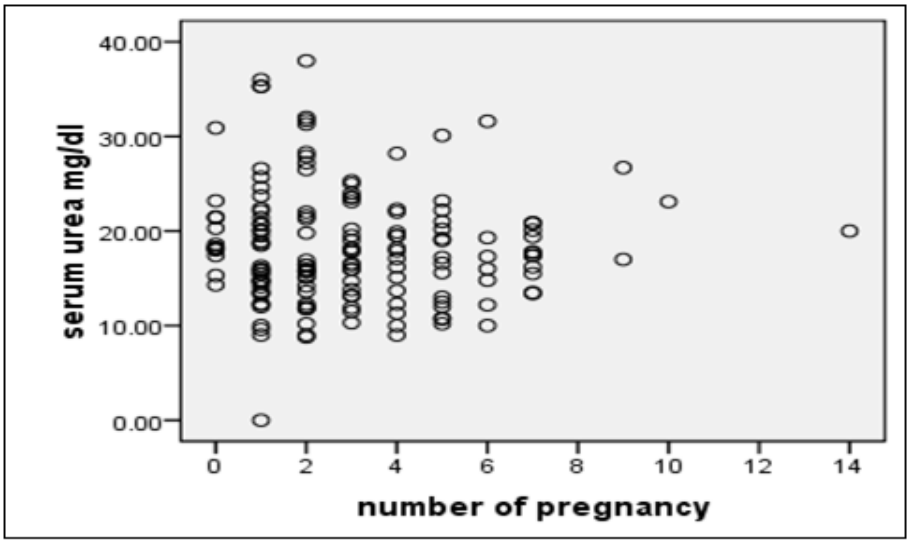

Figure 2. Comparison between number of pregnancy and serum urea

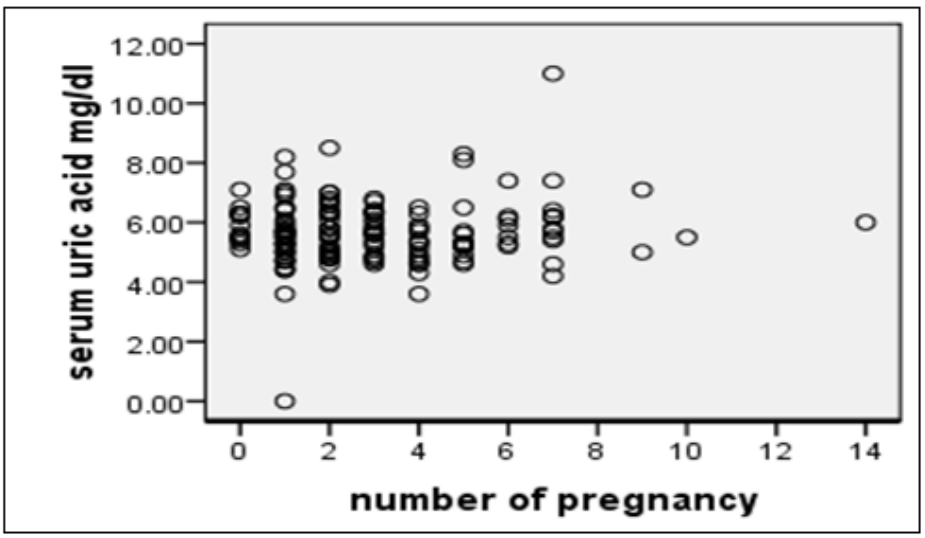

Figure 3. comparison between number of pregnancy and serum uric acid

are accompanied by alteration in theconcentration of many plasma constituents including creatinine (Davidson, 1938). There was a significant difference in serum uric acid between the 1st and 3rd trimester which were higher in the 3rd trimester than the 1st trimester of pregnancy this is may be due to decrease in renal tubular threshold, with increase in cardiac output, renal blood flow andglomerular filtration rate. This is in agreement with (Huy, 2005), who reported that the renal tubular threshold is lowered inpregnancy, which results in an increased excretion of uric acid while cardiac output and renal blood flow areincreased. These lead to an increased GFR, with resultant decrease in concentrations of serum urea, creatinine anduric acid. Pregnancy increases the glomerular filtration rate by 20 weeks of gestation and increases the clearance ofuric acid, urea and creatinine (Lockitech, 1993). The significant ($p<0.05$) increase in serum uric acid level seen in the thirdtrimester of pregnancy may be due to increased tubular re-absorption of uric acid and decreased urate clearance bythe proximal convoluted tubules. It was reported by (Dunlop, 1977) that in late pregnancy, tubular renal function decreases, leading to a decrease in glomerular filtration rate while (Gallery, 1979) reported that pre-eclamptichyperuricaemia is a result ofdecreased urate clearance by the proximal convoluted tubules of the kidney. Hyperuricaemia is an increase inconcentration of plasma uric acid and has been associated with increasing symptoms of pre-eclampsia (Williams, 1981).

Conclusion

The three measurements (serum urea, creatinine and uric acid) that we have used in this study are neither very sensitive nor very specific markers of renal function. The mean of serum uric acid, urea and creatinine showed lower values in pregnant groups of pregnancy than the non-pregnant women.

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