FRONTLINE MEDICAL SCIENCES AND PHARMACEUTICAL JOURNAL
(ISSN – 2752-6712)
VOLUME 02 ISSUE 05 Pages: 5-15
SJIF IMPACT FACTOR (2021: 5.14) (2022: 5.605)
OCLC – 1272874727 METADATA IF – 6.986
Publisher: Frontline Journals

Journal Website: https://frontlinejournals.org/journals/index.php/fmspj

Research Article

PHYSIOLOGICAL EFFECT OF PREGNANCY ON SOME RENAL FUNCTION TESTS

Submission Date: May 02, 2022, **Accepted Date:** May 11, 2022,
Published Date: May 24, 2022
Crossref doi: https://doi.org/10.37547/medical-fmspj-02-05-02

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ABSTRACT

Pregnancy associated with a variety of physiological consequences on several organs and bodily systems, including the renal system. These effects can be investigated us-ing biochemical measures that are useful in determining renal function. In a recent re-search, the blood of 82 healthy pregnant women was tested for three parameters: urea, uric acid, and creatinine. The women were separated into three subgroups based ac-cording to gestational age (first, second, and third trimester). As properly as, 33 curi-ously healthful non pregnant girls as a control group, in order to look at the physiolog-ical results of pregnancy on some renal feature checks as well as, identify the impact of gestational age on these laboratory parameters. It is determined that for the dura-tion of first and second trimesters of pregnancy, the suggest values of serum urea, uric acid, and creatinine was appreciably decrease in the pregnant crew than in controls. During the third trimester, the levels of serum urea, uric acid, and creatinine decreased non-significantly when compare to controls. The differences in values of serum uric acid, urea, and creatinine levels within different trimesters show a significant changes between the third trimester and the first and

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second trimesters, with third trimester being greater than the first and second trimesters, while the first and second tri-mesters appear no significant difference.

KEYWORDS

Creatinine, Urea, Renal, Pregnancy.

INTRODUCTION

Pregnancy is also termed as gravidity or gestation,(1) consider as a dynamic physio-logical state that occurs throughout the life of a woman(2). It is the period during which a woman's one or more offspring develop. From the last menstrual cycle [LMP] through birth, it lasts roughly 40 weeks(1,3). There are three trimesters in a typical pregnancy. The first trimester includes conception and the creation of the fetus and placenta and lasts from week one to week twelve(1). The second trimester is defined as weeks 13 to 28. About the middle of the second trimester, the fetus begins to move. The third trimester of pregnancy lasts from 29 to 40 weeks(1). Several organs and systems are affected by major physiological, anatomical, biochemical, and endo-crine alteration that could be occur during pregnancy. These changes are necessary to promote the woman's adaptation to her pregnancy as well as the fetus growth and sur-vival(4). Part of these changes have an influence on normal biochemical outcomes, Others however, might be mistaken for indications of illness. It's crucial to distinguish between naturally occurring physiological changes and disease pathology(5). The physiology and anatomy of the urinary tract and renal system are complicated by pregnancy(6). The kidneys are responsible for excreting end products and toxins sub-stances such as creatinine, urea, uric acid, in addition to controlling extracellular fluid [ECF] volume, serum osmolality, and electrolyte levels, and formation some hormones such as erythropoietin, active form of vitamin D, and rennin(7,8). Glomerular filtra-tion rate [GFR] and

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Renal plasma flow [RPF] both elevated, in contrast to non-pregnant levels, by using 50–85 and 40–65%, respectively as a consequence of renal vasodilatation(9). This increase in GFR is seen in humans as early as the first weeks after conception and generally lasts until the conclusion of the pregnancy(5). Kidney function may be investigate and assessed using a range of clinical laboratory tests. The concentrations of urea, creatinine, and uric acid in the serum can be usage to deter-mine renal function(10). Creatinine is a breakdown products of muscle creatine phos-phate in the body produce at a steady rate by the body relying on muscle mass(11). It is an endogenous marker for glomerular function rises(12). Creatinine levels can fluc-tuate because they are affected by function of the muscle, composition of the muscle, activity, food, and health, as well as muscle mass(13). The measurement of blood cre-atinine concentration is the usual method of assessing renal function in pregnancy, however no typical gestational values have been defined(14). The nitrogenous end product of amino acid and proteins degradation is urea; it is formed in the liver and distributed throughout the intracellular [ICF] and extracellular fluid [ECF]. The renal glomeruli, filtrate urea from the blood and partially resorbed with water(15). In hu-man, uric acid is the fundamental product of catabolism of the purine, adenosine and guanosine.(16)

MATERIALS AND METHODS

The participants in this study were eighty-two seemingly healthy pregnant girls from Mosul's Alkhansaa Teaching Hospital, ranging in age from 18 to 41 years with an av-erage age of 29. The control team used to be thirty-three healthful non-pregnant wom-en their ages between 17 to 40 years with a average age of 26. A whole history was taken from every pregnant female consisting of name, high, weight, age, job, parity, prior pregnancies, history of family, and any medication usage. There were no kidney or other problems in any of the participants. According to gestational period, the preg-nant women were divided into three categories. The first subgroup consists of 22 healthy pregnant ladies in their first trimester. The second grouping consisted of 24 healthy pregnant ladies in their second trimester of pregnancy, while the third sub-group consisted of 36 healthy pregnant ladies. Anticubital venipuncture was used to take 5 ml of venous blood, which was then put in a plain tube and incubated at 37°C should enable the blood to clot

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for ten minutes, centrifugation at 3000 rpm for fifteen minutes was used to collect serum samples. The serum was gather inside disposable plain tube for creatinine, uric acid and urea determinations. The enzymatic approach utilized to detect serum urea was the Urease-modified Berthelot reaction utilizing kit (biomerieux/France)(17). Uricase an enzymatic technique utilizing kit (bi-omerieux/France) was used to estimate serum uric acid(18). The serum creatinine con-tent was determined using a colorimetric technique combined with a deproteinization kit (Syrbio/France)(19).

All of the data findings was analyzed by the t-test. The standard deviation of all bio-chemical parameters was presented as [mean ± Stander deviation S.D]. The criterion for significance was $p \leq 0.05$(20).

RESULTS

In the recent research, the comparison of a mean values of some renal function tests between the control group and pregnant women within first trimester as seen in table (1), a significant reduction in serum urea, uric acid, and creatinine mean values was noticed in pregnant women within first trimester (4.433±0.559),(251.4±24.2), and (63.13±5.34) respectively compared with control group (5.089±0.520),(271.8±16.7), and (71.84±6.14) respectively.

The comparison of the mean values of some renal function tests between pregnant ladies in the second trimester of pregnancy and controls; as shown in table (2), a sig-nificant decline was noticed in the mean values of serum urea, uric acid, and creati-nine in pregnant ladies group in second stage of gestation (4.625±0.518), (254.1±26.0), and (65.05±5.47) respectively in comparison with controls (5.089±0.520), (271.8±16.7), and (71.84±6.14) respectively.

The differences in the mean values of these renal function tests between controls non pregnant women and pregnant within third trimester; as seen in table (3), a non-significant decline in the mean values of serum urea, uric acid, and creatinine was not-ed in pregnant within third trimester of gestation (4.889±0.431), (269.1±18.0), and (68.92±6.63) respectively as compared with controls (5.089±0.520), (271.8±16.7), and (71.84±6.14) respectively.

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The gestational age effects on some renal function tests (urea, uric acid, and creati-nine) was shown in table (4,5,6).

A comparison between the results of some renal function tests in pregnant women within first and second trimester show that the serum urea, uric acid as well as, creati-nine in pregnant ladies within the second stage of gestation is slightly higher than the first stage but its statistically not significant; as seen in table (4).

The variation of serum urea, uric acid, and creatinine between pregnant groups within (second and third) and (first and third) trimester of gestation as shown in table (5,6); there was a significant elevation in the mean values of serum urea, uric acid, and creatinine in pregnant ladies within third stage of gestation as compared with first and second stage.

Table 1. Comparison of some renal function tests between control and pregnant groups within first trimester.

Parameters	Mean ± S.D		P-value
	Control group (n=33)	first Trimester (n=22)	
Serum Urea (mmol/L)	5.089±0.520	4.433±0.559	0.0001
Serum Uric Acid (µmol/L)	271.8 ±16.7	251.4±24.2	0.0005
Serum Creatinine (µmol/L)	71.84±6.14	63.13±5.34	0.0001

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Table 2. Comparison of some renal function tests between control and pregnant groups in second trimester.

Parameters	Mean ± S.D		P-value
	Control group (n=33)	second trimester (n=24)	
Serum Urea (mmol/L)	5.089±0.520	4.625±0.518	0.0015
Serum Uric Acid (µmol/L)	271.8 ±16.7	254.1±26.0	0.0027
Serum Creatinine (µmol/L)	71.84±6.14	65.05±5.47	0.0001

Table 3. Comparison of some renal function tests between controland pregnant groups in third trimester.

Parameters	Mean ± S.D		P-value
	Control group (n=33)	third Trimester (n=36)	
Serum Urea (mmol/L)	5.089±0.520	4.889±0.431	0.086
Serum Uric Acid (µmol/L)	271.8 ±16.7	269.1 ±18.0	0.52
Serum Creatinine (µmol/L)	71.84±6.14	68.92±6.63	0.062

Table 4. Comparison of some renal function tests between pregnant groups within trimesters firstand second.

Parameters	Mean ± S.D		P-value
	first Trimester (n=22)	second trimester (n=24)	
Serum Urea (mmol/L)	4.433±0.559	4.625±0.518	0.23
Serum Uric Acid (µmol/L)	251.4±24.2	254.1±26.0	0.72
Serum Creatinine (µmol/L)	63.13±5.34	65.05±5.47	0.23

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Table 5. Comparison of some renal function tests between pregnant groups within trimesters secondand third.

Parameters	Mean ± S.D		P-value
	second trimester (n=24)	third Trimester (n=36)	
Serum Urea (mmol/L)	4.625±0.518	4.889±0.431	0.036
Serum Uric Acid (µmol/L)	254.1±26.0	269.1 ±18.0	0.01
Serum Creatinine (µmol/L)	65.05±5.47	68.92±6.63	0.021

Table 6. Comparison of some renal function tests between pregnant groups within trimesters first and third.

Parameters	Mean ± S.D		P-value
	first Trimester (n=22)	third Trimester (n=36)	
Serum Urea (mmol/L)	4.433±0.559	4.889±0.431	0.001
Serum Uric Acid (µmol/L)	251.4±24.2	269.1 ±18.0	0.0023
Serum Creatinine (µmol/L)	63.13±5.34	68.92±6.63	0.001

DISCUSSION

The recent findings revealed that in the first and second trimester of gestation; serum urea, uric acid, and creatinine concentrations were markedly decrease in the pregnant group than in the controls. According to the results; serum creatinine, uric acid as well as, urea concentration throughout the third trimester are higher than first and second trimester but still lower than non pregnant ladies group, in spite of the reduction being statistically insignificant in contrast to the control group. The findings were consistent with Macdonald and Good(1971),(21) Dunlop and Davison's findings(1977),(22) Korda and Horvath,(1979)(23) AL-Hamdani. I. H.

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(2006)(24). This findings can be explained that the plasma volume increases during pregnancy, as does GFR in the ear-ly stages(25,26). These alterations in GFR and plasma volume may explain why the clearance of urea, uric acid, and creatinine initially increased(21,27), therefore, all these biochemical parameters are thus somewhat decreased in serum for most of the pregnancy. Lower maternal plasma uric acid and urea levels come from a positive pu-rine and protein balance during fetal growth, as well as, an increase in GFR and he-modilution effect(28,2). The GFR begins to decline in third trimester, approaching to non-pregnant levels(29), resulting in a small increase in blood urea and creatinine con-centrations in the latter weeks of pregnancy. Tubular uric acid reabsorption increases dramatically(29) during this time, leading to elevated serum uric acid levels. Addi-tionally, As plasma volume decreases, RPF to the secretary site decreases, resulting in a decrease in uric acid release from the tubule's proximal and distal sections(21,30,31). This is due to elevate of serum uric acid levels during last pregnancy duration. These results were in agreement with Obodo etal.(2016)(32). In human serum, uric acid is responsible for around 60% of free radical scavenging action(33). Uric acid, as a re-sult, might be used as a marker for oxidative stress [OS] tissue damage dysfunction. Serum uric acid levels are low during uncomplicated pregnancies. concentrations fall by around 25% to 35% in the first trimester, but subsequently rise throughout the pregnancy until they reach non-pregnant levels near the end(34).

According to the findings, pregnancy affects serum urea, uric acid, and creatinine val-ues with first stage of pregnancy being more affected than the second and third phas-es.

ACKNOWLEDGMENTS

The author would like to thank the College of Pharmacy/ University of Mosul in Mo-sul city for their wonderful assistance in performing this research.

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