**East African Scholars Journal of Medical Sciences**
*Abbreviated Key Title: East African Scholars J Med Sci*
ISSN: 2617-4421 (Print) & ISSN: 2617-7188 (Online)
Published By East African Scholars Publisher, Kenya

OPEN ACCESS

Volume-9 | Issue-2 | Feb-2026 | DOI: https://doi.org/10.36349/easms.2026.v09i02.002

**Original Research Article**

# Renal Markers Changes in Relation to Duration of Injectable, Implanon and Oral Contraceptives

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**Article History**
**Received:** 02.06.2025
**Accepted:** 31.07.2025
**Published:** 07.02.2026

**Journal homepage:**
https://www.easpublisher.com

**Quick Response Code**

**Abstract:** Hormonal Contraceptives are a widely used contraceptives methods for the prevention of pregnancy in women. It is associated with changes in Renal Biomarkers which results in chronic kidney disease, glomerular disease, hydronephrosis, Bilateral Pylonephtritis and Hypertention which are the major cause of premature death. We aim to determined renal markers changes In relation to duration of Injectable, Implanon and oral Contraceptives. A cross sectional case control study design was conducted on 225 hormonal contraceptive users and 225 women not on contraceptives (controls) serum levels of Urea, Creatinine, Uric acid were analyzed using standard enzymatic and calorimetric assay while Micro albumin was measured using immunoturbidimetric methord. Data generated were analyzed using Statistical Package for Social Sciences (SPSS) version 23, and it was manufactured by IBM Corporation from United States in 2015. The level of statistical significant was set at $p<0.05$, T-test was used to compare means of two groups and one way Anova was used to compare means of more than two group followed by Duncan multiple range, which post-hoc test was also used to figure out exactly which group are different from each other. The women received injectable hormonal contraceptives there were not significantly ($P>0.05$) higher in urea and uric acid levels when compared with Implanon and significantly ($P<0.05$). Lower to those used oral contraceptives. All the contraceptives had not-significant effect on serum, urea and uric acid ($F=7.912$, $P=0.001$) ($F=5.040$. $P=0.009$). The women received injectable hormonal contraceptives were not significantly ($P>0.05$) higher in Creatinine, micro Albumin levels when compared with Implanon and not significantly ($P>0.05$) lower to those used oral contraceptives. All the contraceptives had not significant effect on Serum Creatinine and Micro albumin ($F=0.001$, $P=0.999$) ($F=0.344$, $P=0.710$) with Implanon having the least effect. Hormonal contraceptive are influenced by factors such as age, duration and types of contraceptives used, it is advisable that users should carry out risk assessments assay such as Renal biomarkers as carried out in the present study in other to determine the contraceptives that is the best, Men are encouraged to consider vasectomy so as to allow their wives from undergoing different kind of pathological consequences.

**Keywords:** Urea, Creatinine, Uric acid, Microalbumin, Implanon, Oral Contraceptives, Injectable Contraceptives.

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## INTRODUCTION

### Background to the Study

Poor family planning is one of the leading cause of maternal death in low income countries, Such as Nigeria (Ahmad & Tsui, 2012). Family planning is the ability of individual and couples to anticipate and attain their desired number of children and the spacing and timing of their birth (Gipson & Hindin, 2007). It is important for the couples to discuss when and how many children they can have so that they can give the utmost care to the child, financially, physiologically and socially. It reduces maternal morbidity and mortality by avoiding pregnancies that are too early, too close, too many and high- risk of birth, which may affect the health of the mother child and family (Gipson & Hindin, 2007). Contraceptive are means of family planning, they are classified into the traditional and modern methods.

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Traditional method of contraceptives includes coitus interuptus and breast feeding method. While modern method includes use of condom and hormonal contraceptives such as implanon, injectable, oral contraceptives among others (Hubacher & Trussell, 2015). Hormonal contraceptives such as injectable, implanon and oral contraceptive are agent or drugs used to prevent pregnancy. Hormonal contraceptive utilize man made version of two female sex hormones, a progestin (progesterone) and estrogen, to prevent pregnancy. There are different route of administration of hormonal contraceptives which include injectable, implanon and oral contraceptive (Guida *et al*., 2017). In Nigeria, Anambra State has the highest number of married women who used contraceptive to control their birth 27.4% (Ogujiuba, Ojoiyi & Shegler; 2022),while Yobe state has the lowest with 1.7% (Abubakar & Abubakar,2024) The awareness, knowledge of acceptability of use of hormonal contraceptive in Yobe State is very low this is due to some socio religious political and economic beliefs and also attributed to non-scientific claims on the harmful effect of the contraceptives on some essential organs such as, liver, kidney, heart and un-control glucose level (Abubakar *et al*., 2022).

**Objectives of the Study**

To determined Renal markers changes in relation to duration of injectable, implanon and oral contraceptives.

## MATERIALS AND METHODS

**Study Design**

This is a comparative cross sectional case control study the Study population were divided into four different groups

i. Group A women on injectable
ii. Group B women on Implanon
iii. Group C women on oral contraceptives
iv. Group D control

**Study Population**

A total of 450 women were used, 225 who attended family planning clinic and 225 control who were not attending family planning clinic.

**Sample Collection**

5mils Blood sample was collected through the antecubital Fossa by vene puncture after swabbing the site with 70% ethanol. Sample was transferred into plain tube for determination of Renal biomarker Urea, Creatinine, Uric acid and Micro albumin.

## RESULT AND DISCUSSION

**Table 1: Renal markers changes in relation to duration of injectable, implanon and oral contraceptives**

| Hormonal contraceptives | Duration (months) | | | | F-test | p-value |
|---|---|---|---|---|---|---|
| | 1-4 | 5-8 | 9-12 | Control | | |
| **Injectables** | | | | | | |
| Urea (mmol/L) | 4.04±0.41$^{a}$ | 4.47±0.30$^{a,b}$ | 4.64±0.51$^{b}$ | 3.56±0.52$^{c}$ | 12.497 | 0.001 |
| Creatinine (mmol/L) | 71.16±28.01 | 88.57±5.74 | 85.00±3.70 | 79.76±5.99 | 2.707 | 0.059 |
| Uric acid (Umol/L) | 287.86±31.88 | 338.71±11.84 | 346.71±16.12 | 321.91±56.81 | 2.486 | 0.075 |
| Micro albumin(Mg/L) | 1.19±0.16 | 1.11±0.09 | 1.11±0.12 | 1.20±0.0.25 | 0.546 | 0.654 |
| **Implanon** | | | | | | |
| Urea (mmol/L) | 3.57±0.56 | 4.17±0.39 | 3.77±0.45 | 3.88±0.59 | 1.508 | 0.228 |
| Creatinine (Umol/L) | 78.57±5.80 | 84.29±1.98 | 81.57±4.31 | 82.19±5.00 | 1.814 | 0.161 |
| Uric acid (Umol/L) | 255.71±26.52 | 235.86±15.28 | 261.43±36.37 | 276.29±68.40 | 1.712 | 0.153 |
| Micro albumin(Mg/L) | 1.11±0.12 | 1.20±0.17 | 1.10±0.13 | 1.14±0.14 | 0.705 | 0.555 |
| **Oral contraceptives** | | | | | | |
| Urea (mmol/L) | 2.81±0.09$^{a}$ | 3.59±0.23$^{b}$ | 4.60±0.42$^{c}$ | 3.99±0.67$^{b}$ | 14.946 | 0.001 |
| Creatinine (mmol/L) | 76.00±2.58$^{a}$ | 81.86±1.07$^{a,b}$ | 87.00±1.63$^{b}$ | 84.67±8.30$^{b}$ | 4.590 | 0.008 |
| Uric acid (Umol/L) | 230.43±7.14$^{a}$ | 288.43±14.19$^{b}$ | 334.57±17.01$^{c}$ | 294.14±50.39$^{b}$ | 9.166 | 0.001 |
| Micro albumin(Mg/L) | 1.11±0.12 | 1.10±0.13 | 1.11±0.12 | 1.09±0.10 | 0.189 | 0.903 |

Means in the same row with different superscripts are significantly different at $p<0.05$
Means without any superscripts are not significant $p>0.05$
Means in the same row with the same superscripts are not-significant $p>0.05$

## DISCUSSION

**Effects of Time on Serum Level of Renal Markers between Women Received Hormonal Contraceptives and Controls**

This study assessed the impact of duration of use of hormonal contraceptives on serum levels of renal biomarkers, including urea, creatinine, uric acid, and microalbumin, among women attending a family planning clinics. The findings revealed varying effects depending on the type of contraceptive used and the duration of use. Our analysis revealed from table 1: The woman received injectable and oral contraceptives, there was a significant difference ($p<0.05$). In their serum level of Urea, Creatinine, Uric acid, and micro Albumin across different duration when compared with their control. While for Implanon there was not significant difference

($p>0.05$) in serum level of Urea, Creatinine, uric acid and micro Albumin across different duration when compared with controls. It was in agreement with the work of (Ahmed *et al*., 2016) there was a significant increase on injectable and oral contraception on renal marker and also in agreement with the work of (Asare *et al*., 2014). Biochemical reasoning is that Estrogen and progestin affect renal blood flow and glomerular filtration rate (GFR). Chronic use may cause subtle glomerular hyper filtration early but with duration, it can lead to glomerular damage and reduced GFR. Reduced GFR results in accumulation of nitrogenous waste: urea and creatinine (Stanczyk, F. 2003). There was no significant increase on Implanon on renal markers. Women with abnormal renal biomarker may need to discontinue hormonal contraceptives use or switch to alternative method as above.

For injectable contraceptive users, there was a significant increase ($p<0.05$) in serum urea levels across the different durations studied compared to the control group. Although serum creatinine and uric acid levels showed higher mean values among injectable users than controls, these differences did not reach statistical significance. Microalbumin levels remained stable across all durations, indicating minimal effect on glomerular permeability.

In the oral contraceptive group, serum urea, creatinine, and uric acid levels significantly increased ($p<0.05$) with prolonged use compared to controls. This suggests a potential dose- and duration-dependent impact on renal function markers. Oral contraceptives contain synthetic estrogen and progestin, which can affect renal haemodynamics by altering glomerular filtration rate (GFR) and renal plasma flow (Stanczyk, 2003). Initially, hormonal contraceptives may cause glomerular hyperfiltration; however, long-term use may lead to glomerular injury, reduced GFR, and accumulation of nitrogenous wastes such as urea and creatinine (Ahmed & Ramesh, 2016).

Conversely, for Implanon users, there were no statistically significant differences ($p>0.05$) in serum levels of urea, creatinine, uric acid, and microalbumin across durations when compared with controls. This finding suggests that Implanon, a subdermal implant releasing etonogestrel, may exert minimal renal effects, potentially due to its lower systemic hormonal exposure compared to oral or injectable methods. These results are consistent with previous studies (Ahmed *et al*., 2016; Asare *et al*., 2014), which reported significant alterations in renal markers among women using oral and injectable contraceptives, with negligible impact observed for Implanon users. The biochemical basis for these alterations relates to hormonal modulation of the renin-angiotensin-aldosterone system (RAAS), fluid retention, and renal haemodynamics, which may predispose susceptible women to renal dysfunction if unmonitored (Roach *et al*., 2015). Clinical Implications: The findings underscore the importance of monitoring renal biomarkers in women on long-term hormonal contraceptives, particularly oral and injectable types. Women with pre-existing renal impairment or those exhibiting elevated renal markers during contraceptive use may require switching to alternative family planning methods such as Implanon or non-hormonal methods to minimise adverse renal outcomes. Moreover, counselling couples on male contraceptive options, including vasectomy, can reduce reliance on hormonal contraceptives by women, potentially decreasing their risk of renal and other systemic complications.

## CONCLUSION

This study demonstrates that hormonal contraceptives exert differential effects on renal biomarkers, with oral and injectable contraceptives showing significant elevations in urea and creatinine levels over time, while Implanon exhibited the least impact. These findings support Implanon as a safer hormonal contraceptive option in relation to renal function.

**Abbreviations:** GFR: Glomerular Filtration Rate, RAAS: Renin angiotensin aldosterone

**Conflict of Interest:** There is no conflict of interest.

**Ethical Approval and Concept to Participate**: Not applicable.

**Consent for Publication**: Not applicable.

**Funding**: None.

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**Cite This Article:** Mohammed Umar, Okoli A. Caroline, Solomon D. Mariam (2026). Renal Markers Changes in Relation to Duration of Injectable, Implanon and Oral Contraceptives. *East African Scholars J Med Sci, 9*(2), 60-63.