

## Evaluation of Serum Biochemical, Minerals and Haematological Parameters in Pregnant and Lactating Ewes in Lafia Metropolis

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**Abstract:** The present study was carried out in Lafia Local Government Area of Nasarawa State, Nigeria to evaluate the serum biochemical, minerals, and haematological parameters in pregnant and lactating Ewes in Lafia Metropolis. Eighteen (18) apparently healthy adult sheep comprising 9 pregnant and 9 lactating Ewes were used for this study. The Ewes' age were between 2.5-3years based on dentition following the standard protocol. 5ml of blood samples were taken by jugular venipuncture from both the pregnant and lactating Ewes, into two sets of collection tubes. The first set were non-heparinized tubes without anticoagulant for serum minerals and serum biochemical analysis while the second set of tubes were the heparinized tubes containing ethylene diamine tetra acetic acid (EDTA) which serves as anticoagulant for haematological analysis. All statistical analyses were done using General Linear Model (GLM) of the Statistical Package for Social Sciences (SPSS version 22). The level of statistical significance was defined as ( $P < 0.05$ ). Fisher's Least Significance difference (LSD) was used to separate the means. The values of serum Creatinine of lactating Ewes was significantly ( $P < 0.05$ ) higher than the pregnant Ewes values while the values of serum albumin of pregnant Ewes was significantly ( $P < 0.05$ ) higher than lactating values respectively. The values of serum urea, globulin and total protein of pregnant and lactating Ewes did not differ significantly ( $P < 0.05$ ). No significant differences ( $P < 0.05$ ) were found between the serum mineral values of pregnant and lactating Ewes. The values of Packed cell volume (PCV), haemoglobin (Hb), red blood cell (RBC) and white blood cell (WBC) of pregnant and lactating Ewes did not differ significantly ( $P < 0.05$ ). The findings from this study would aid in understanding the physiological status of sheep.

**Keywords:** Minerals, biochemical, haematological, pregnant, lactating, Ewes, Lafia.

## INTRODUCTION

Sheep husbandry plays a vital role in meat and wool production and it continues to be a backyard profession, primarily in the hands of poor, landless or small and marginal farmers.

As sheep contribute greatly to the economic earnings of both urban and rural dwellers alike [1], thorough understanding and practical scientific manipulation of reproductive functions need to be employed to achieve higher reproductive efficiency.

There has been much interest regarding pregnancy nutrition and its impact on animal's health, reproductive and lactation performances [2]. Pregnancy and lactation are physiological statuses considered to modify metabolism in animals [3]. Pregnancy causes

physiological and biochemical changes needed to support fetal growth and development.

Minerals have a significant role to play in many aspects of production including successful establishment of pregnancy. Minerals activate enzymes; which are essential co-factors of metabolic reactions function as carriers of proteins, regulate digestion, respiration, water balance, muscle reaction, nerve transmission and skeletal strength [4]. Concentrations of minerals in blood are generally not only related to intake, but also, are influenced by sex, breed, age, and reproductive status.

The most important reason to assess the mineral status of Ewes is usually regarding the lowering of the productivity performance [5]. Few information,

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however, has been provided during the last years about the macro-mineral status in sheep.

Electrolytes are a critical element in cellular metabolism, muscle contraction, nerve transmission, and enzyme reactions [6]. Numerous studies have shown that mineral deficiencies lead to impaired growth and reproduction and to an increase in disease incidence, and it seems that these are strictly related to the diet mineral concentrations [7]. In fact, the most frequent disease is related to some physiological status, during which the body requests a major amount of some electrolytes, such as pregnancy and lactation [8].

There will be changes in body metabolic rate in Ewes during various physiological stages such as non-pregnancy, early pregnancy, mid pregnancy and late pregnancy. Measurement of biochemical parameters provide a practical diagnostic tool for evaluating pathological conditions in live animals or for monitoring the health status of animals [9].

Blood biochemical parameters like total protein and albumin are important indicators of the metabolic activity in ewes [10]. Mineral components play essential role in cellular metabolism, homeostasis, reproduction and growth as per the stages of life. Pregnancy represents the high anabolic period in the life cycle of female animal.

During pregnancy, protein and minerals acts as important nutrient substances for the dam and growing fetus. Mineral imbalance can affect pregnancy outcome through alterations in the metabolism of maternal and conceptus sides and the evaluation of protein and mineral profile during different stages of pregnancy would help in better management practice, nutritional practice and diagnosis of health condition [11]. Therefore this study was aimed to evaluate the serum biochemical, minerals and haematological parameters in pregnant and lactating Ewes in Lafia Metropolis.

## **MATERIALS AND METHODS**

### **Experimental Site**

This study was carried out in Lafia Local Government Area of Nasarawa State, Nigeria. The area falls within the Guinea Savanna agroecological zone and is found between latitudes 7<sup>o</sup>52 N and 8<sup>o</sup>56 N and longitudes 7<sup>o</sup>25 E and 9<sup>o</sup>37 E respectively. It has two distinct seasons. The wet season lasts from about the beginning of May and ends in October. The dry season last between November and April. Annual rainfall figures range from 1100 to 2000 mm. The mean monthly temperatures in the State range between 20 and

34°C, with the hottest months being March/April and the coolest months being December/January [12].

### **Experimental animals and management**

Eighteen (18) apparently healthy adult sheep comprising 9 pregnant and 9 lactating Ewes were used for this study. The Ewes were selected in their breeding tracts in a certain herds in Lafia. The Ewes' age were between 2.5-3years based on dentition following the procedure of Matika *et al.*, [13]. They Ewes were fed on forages, prepared concentrates and offal respectively.

### **Blood collection**

5ml of blood samples were taken by jugular venipuncture of both the pregnant and lactating Ewes, into two sets of collection tubes. The first set were non-heparinized tubes without anticoagulant for serum minerals and biochemical analysis while the second set of tubes were the heparinized tubes containing ethylene diamine tetra acetic acid (EDTA) which serves as anticoagulant for haematological analysis.

### **Serum minerals and biochemical analysis**

Calcium, sodium, magnesium and potassium levels were determined by flame photometry method (Corning 400R; S/400/3888 Essex UK) [14]. The determination of serum urea was by diacetylmonoxime method of Natelson and March using thiomicarbazide [14]. Urea by enzymatic-colorimetric method and creatinine by Jaffe's reaction determination (*Ureia* CE and *Creatinina enzimática*, Labtest *Diagnóstica* S.A, Brazil). Total protein (TP) and albumin were conducted by biuret and bromocresol green methods (*Proteína total and Albumina*, Labtest *Diagnóstica* S.A, Brazil). Globulin content was also calculated to determine the difference between total protein (TP) and albumin.

### **Haematological analysis**

The haematological parameters analyzed includes: packed cell volume (PCV), red blood cell (RBC) count, white blood cell (WBC) count and haemoglobin concentration (Hb), using Witrobs' micro-haematocrit, improved Neubaur haemocytometer and cyanomethaemoglobin methods.

### **Data analysis**

All statistical analyses were done using standard spreadsheet software of excel and the General Linear Model (GLM) of the Statistical Package for Social Sciences (SPSS version 22). The level of statistical significance was defined as (P<0.05). Fisher's Least Significance difference (LSD) was used to separate the means.

## RESULTS AND DISCUSSION

### RESULTS

**Table-1: Serum biochemical parameters in pregnant and lactating Ewes in Lafia Metropolis**

Parameters	Mean±SE Pregnant (n=9)	Mean±SE Lactating (n=9)	P-value
Urea (mmol/L)	6.689±0.389	7.511±0.389	0.154 <sup>ns</sup>
Creatinine(mmol/L)	76.222±2.844 <sup>b</sup>	85.044±2.844 <sup>a</sup>	0.043 <sup>**</sup>
Albumin (g/L)	29.778±1.419 <sup>a</sup>	25.444±1.419 <sup>b</sup>	0.046 <sup>**</sup>
Globulin (g/L)	19.444±1.150	20.556±1.150	0.504 <sup>ns</sup>
Total Protein (g/L)	49.222±1.549	46.000±1.549	0.161 <sup>ns</sup>

<sup>ab</sup> means on the same rows bearing different superscripts are significantly different (P<0.05),  
\*\* Significant at 95%, ns- Not significant, SE- Standard error

The results of Serum biochemical parameters in pregnant and lactating Ewes in Lafia Metropolis is as shown in (Table-2), the values of serum creatinine of lactating Ewes was significantly (P<0.05) higher than the pregnant Ewes values while the values of serum

albumin of pregnant Ewes was significantly ((P<0.05) higher than lactating values respectively. The values of serum urea, globulin and total protein of pregnant and lactating Ewes in Lafia Metropolis did not differ significantly (P<0.05).

**Table-2: Serum mineral parameters in pregnant and lactating Ewes in Lafia Metropolis**

Parameters	Mean±SE Pregnant (n=9)	Mean±SE Lactating (n=9)	P-value
Na <sup>+</sup> (mmol/L)	154.778±1.705	158.111±1.705	0.186 <sup>ns</sup>
K <sup>+</sup> (mmol/L)	6.333±0.117	6.100±0.117	0.179 <sup>ns</sup>
Ca <sup>2+</sup> (mmol/L)	2.300±0.098	2.322±0.098	0.875 <sup>ns</sup>
Mg <sup>2+</sup> (mmol/L)	1.016±0.036	0.949±0.036	0.214 <sup>ns</sup>

Means on the same rows bearing different superscripts are significantly different (P<0.05),  
ns- Not significant, SE- Standard error

The mean Serum mineral parameters in pregnant and lactating Ewes in Lafia Metropolis values (sodium, potassium, calcium and magnesium) are

shown in Table-2. No significant differences (P<0.05) were found between the serum mineral values of pregnant and lactating Ewes.

**Table-3: Blood haematological parameters in pregnant and lactating Ewes in Lafia Metropolis**

Parameters	Mean±SE Pregnant (n=9)	Mean±SE Lactating (n=9)	P-value
PCV (%)	32.889±0.922	30.778±0.922	0.125 <sup>ns</sup>
Hb (g/dl)	10.844±0.303	10.122±0.303	0.111 <sup>ns</sup>
RBC ((x 10 <sup>3</sup> /μ)	3.170±0.120	3.056±0.120	0.508 <sup>ns</sup>
WBC ((x 10 <sup>3</sup> /μ)	8.578±0.685	6.611±0.685	0.059 <sup>ns</sup>

Means on the same rows bearing different superscripts are significantly different (P<0.05),  
ns- Not significant, SE- Standard error

Packed cell volume (PCV), haemoglobin (Hb), red blood cell (RBC) and white blood cell (WBC)

The results of blood haematological parameters in pregnant and lactating Ewes in Lafia Metropolis is as shown (Table-3). The values of Packed cell volume (PCV), haemoglobin (Hb), red blood cell (RBC) and white blood cell (WBC) of pregnant and lactating Ewes in Lafia Metropolis did not differ significantly (P<0.05).

could be facilitated [15]. They also contributed to the viscosity and maintenance of the normal blood pressure and PH. The significant serum biochemical values are suggestive of the existence of genetic variation.

## DISCUSSION

Serum parameters are important in the proper maintenance of the osmotic pressure between the circulating fluid and the fluid in the tissue space so that the exchange of materials between the blood and cells

From this present study the values of serum Creatinine of lactating Ewes was significantly (P<0.05) higher than the pregnant Ewes values while the values of serum albumin of pregnant Ewes was significantly ((P<0.05) higher than lactating values respectively. The values of serum urea, globulin and total protein of pregnant and lactating Ewes in Lafia Metropolis did not differ significantly (P<0.05). The non-significance

difference of the other values of serum biochemical levels are in line with the report of Faith *et al.*, [15] who reported that there was no significant difference ( $P<0.05$ ) in the urea and globulin levels in pregnant and lactating Ewes.

The report of this study on albumin corroborates with the work of Whitney *et al.*, [16] who reported statistically higher concentration of albumin in the blood of pregnant Ewes compared to the lactating Ewes.

Decreased in albumin over the lactation could be explain by a rapid extraction of immunoglobulin from the plasma during the last few months of pregnancy when colostrum's is being formed in the mammary gland [17].

The non-significant total protein level of this study for pregnant and lactating Ewes disagree with the report of higher concentrations of total protein in the blood of Ewes in the later stages of lactation by Karapehliyan *et al.*, [10].

The mean Serum mineral levels in pregnant and lactating Ewes in Lafia Metropolis values (sodium, potassium, calcium and magnesium) were not significantly different ( $P<0.05$ ). Although the mean values of sodium in the present study were observed to be higher at lactating Ewes and is not consistence, with the work of Elnageeb and Abdelatif [18] who reported a decrease in serum sodium levels during lactation.

The lack of significant changes in the mean levels of  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  obtained in the present study are similar to previous reports in other species [19, 20]. Faith *et al.*, [15] in their work also reported non-significant ( $P<0.05$ ) difference in the  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  of pregnant and lactating Ewes studied in Lafia Metropolis. This present results is not in agreement with the work of Azab and Abdel-Maksoud [21] who reported increase in serum  $\text{Na}^+$  concentrations and decrease in serum  $\text{K}^+$  concentration during late pregnancy in *Baladi* goats. Despite high demands for minerals, particularly  $\text{Ca}^{2+}$  for milk synthesis in preparation for lactation, the Ewes were able to maintain normal levels of these electrolytes. This is one of the several physiological adaptations during pregnancy that make Ewes capable of preventing hypocalcaemic disorders or other pregnancy related disease [17].

The results of blood haematological levels in pregnant and lactating Ewes in Lafia Metropolis values of Packed cell volume (PCV), haemoglobin (Hb), red blood cell (RBC) and white blood cell (WBC) did not differ significantly ( $P<0.05$ ).

The non-significant ( $P<0.05$ ) differences observed in this study for haematological levels for

pregnant and lactating Ewes is in congruous with the findings of Brito *et al.*, [22] who reported non variation detected in haematological parameters of Lacaune sheep among the physiological status of non-pregnant, pregnant and lactating animals. In other ruminants, Ate *et al.*, [23] revealed no significant differences in haematological parameters during third trimester of pregnancy and early lactation in cattle.

The PCV, haemoglobin WBC and RBC values obtained in this study indicated that the Ewes were healthy and normal. The WBC play prominent role in disease resistance, especially with respect to the generation of antibodies and the process of phagocytosis.

## CONCLUSION

The values of serum Creatinine of lactating Ewes was significantly ( $P<0.05$ ) higher than the pregnant Ewes values while the values of serum albumin of pregnant Ewes was significantly ( $P<0.05$ ) higher than lactating values respectively. The values of serum urea, globulin and total protein of pregnant and lactating Ewes did not differ significantly ( $P<0.05$ ).

No significant differences ( $P<0.05$ ) were found between the serum mineral values of pregnant and lactating Ewes. The values of Packed cell volume (PCV), haemoglobin (Hb), red blood cell (RBC) and white blood cell (WBC) of pregnant and lactating Ewes did not differ significantly ( $P<0.05$ ).

The findings from this study would aid in understanding the physiological status of sheep.

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