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Research Article

Effect of Lactation on Hemato-Biochemical and Minerals Constituents in Small Ruminant

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ABSTRACT

One of major stressors affecting the animal is lactation phase, ewes and does are no exception. This study aimed to investigate alterations in serum biochemical, mineral status and hematologic value in lactating ewes and does compared with non-lactating animals under same condition (climate, feeding and rearing system). Significant reduction in RBCs, HB, and PCV% along with significant increase in MCV were the most consistent hematologic alterations. Significant reduction in protein and lipid profile along with increase in BUN was the most consistent biochemical alteration. The minerals profile showed decrease in Zinc, Copper and Calcium, though P^H showed no change. In Conclusion, this study showed that the lactation has significant effect on body metabolites, hematologic and mineral storage in small ruminant, for future production scheme, failure to substitute those deficit, will have a bad impact on health and metabolism of animal production lifespan.

Key words: Lactation, Ewe, Doe, Hemato-biochemical, Mineral

INTRODUCTION

In several countries, sheep and goat industry comprise a great portion of animal production sector (Njidda, *et al.*, 2014). They rose for dissimilar reasons, though milk, meat and wool production are the main goals (Smith and Sherman, 2009). Ewes and does represent the major gears, by reproducing lambs and kids, they provide the industry with new blood needed for continuousness.

In farm-reared basis, nursing ewes and does usually group fed, though this plan is simple, but it doesn't take in consideration individual variations and needs (Snowder and Glimp, 1991). In many developing countries, sheep and goat flocks seen grazing on non-nutritional substances, those ewes and does consequently become underfed. Lactation is a major physiological factor that alter animal's metabolism (Iriadam 2007).

Serum biochemical constituents and hematologic values are essential indicators of metabolic state of any nursing animals (Karapehlvian *et al.*, 2007). Blood is a vital index of any pathological or physiological alterations in body (Miturka and Rawshey, 1977). The obtained data from simple biochemical or hematologic analysis can pinpoint any hidden clinical conditions (Feldman *et al.*, 2000).

During lactation period, up to 80% of blood metabolites are directed to production of milk (Piccione *et al.*, 2009). Lack of appropriate feeding plan or simply insufficient feedstuff, or in those ewes and does feeding on maintenance ration with their definite deficiency of nutritious values, can have a significant effect on milk quality and hemato-biochemical parameters.

Therefore, this study designed to scrutinize the hemato-bichemical and minerals alterations associated with lactating (28-35 day) ewes and does compared to non-lactating animals.

MATERIALS AND METHODS

Animals

This study was performed on 11 ewes and 13 does (Egyptian Baladi, native breed) during lactation, inclusion criteria involved ewe or doe delivered single lamb or kid only, nursing in period of 28-35 day post part-partum. The data were compared with non-lactating ewes (7) and does (7) (Egyptian Baladi, native breed). The non- lactating and lactating ewes and does were fed on wheat straw and a mixture of yellow corn, wheat bran, cottonseed meal, molasses, sodium chloride and calcium carbonate powder with *ad-libitum* water.

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Samples

Two blood samples were withdrawn from jugular vein in each animal into EDTA-containing tube for hematologic investigation and plain tube to separate serum samples (Feldman *et al.,* 2000).

Hematologic examination

For hematologic estimation, RBCs and Leukocyte count were estimated using hemocytometeric method, while micro-hematocrit centrifugation was used to determine PCV, HB concentration was determined spectrophotometrically. Differential leukocyte counts were determined from Giemesa-stained blood films (Weiss and Wardrop 2010)

Serum biochemistry estimation

The collected sera were used to estimate levels of TP, albumin, globulin, triglycerides, and cholesterol, BUN, Zn, Cu, Ca and Ph using respective test kits (Spectrum diagnostic-Egypt).

Statistical Analysis

Data of lactating ewe and doe were compared with non-lactating animals using Student T-test, with $P \leq 0.05$ considered significant.

RESULTS AND DISCUSSION

Among a lot of stressors facing animals, lactation constitutes a major stress on animal health. Hematologic alterations associated with lactation in ewes and does are present in table 1.

Significant reduction in RBCs, PCV and HB values were observed in lactating ewes and does, however goats seemed to be more severely affected, these findings agreed with Hassan *et al*., 1982, who reported a low PCV and HB concentration in lactating animals and postulated a negative association between PCV and milk production, Moreover, PCV was found to decrease in first month of lactation in Barki ewes (El-Sherif and Assad, 2001), it has been suggested that the elevated erythrocyte devastation in mammary cells are responsible for low PCV% along with mobilization of water to mammary gland (Anwer *et al*., 2012). A similar findings were recorded in goats, a decrease in HB, RBCs and PCV were observed during lactation (Azab and Abdel-Maksoud, 1999). Results of red cell indices suggests macrocytic anemia.

A decrease in WBCs value was observed in lactating goats and sheep along with significant increase in lymphocytes. The observed decrease in WBCs and the elevated lymphocyte count could be attributed to the fact WBCs migrate to milk from blood to ensure effective phagocytic process and to enhance immune defenses' against invading microbes in the mammary glands (Paape *et al*., 1992; Das and Singh, 2000; Iriadam, 2007), a similar pattern was observed in lactating ewes (Antunovic *et al*., 2011).

Concerning alterations in biochemical values, results are shown in table 2. Significant reduction in protein profile was observed in lactating ewes and does. Lactation considers a stress on protein metabolism (Amer *et al*., 1999), the significant reduction in protein profile is linked with anemia (Alton, 2005; Radostitis, 2007), and moreover, the requirement for milk production may be correlated with the resultant decrease in proteins (Abdelrahman and Aljumaah, 2012). However, this result disagree with Piccione *et al.* (2009) who detect a high protein level during lactation. Globulin is used to synthesis the milk casein and Igs (Singh and Singh, 1990), however some researchers suggest the levels of protein depends on food protein (Sakkinen *et al.,* 1999) and physiologic status (pregnant, dry, lactating) of animal plays a role in regulating protein absorption and metabolism (Gonzalez *et al.,* 1985), furthermore, Quanes *et al.,* (2011) suggested the dam exhaustion during milk production process and poor food composition may be attributed in TPs reductions. Another explanation given by Kaneko *et al.* (2008) attributing the decreased levels to rapid removal of Ig from blood to milk. Changes in proteins may constitute an adaptive tool to the elevated deployment of protein to milk via blood (Anwar *et al.,* 2012).

Significant reduction in triglycerides and serum cholesterol levels were observed in lactating ewes and does. A reduction in serum cholesterol was observed in lactating does (Amer *et al.,* 1999), a similar findings were observed in dairy cow due to increase energy demand (Marcos *et al.,* 1990). Piccione *et al.* (2009) attributed

Table 1: Hematologic alterations in Lactating ewes and does

Parameter	Non-lactating ewe	Lactating ewe	P value	Lactating Doe	Non-lactating Doe	P value
RBCs	10.80±0.834	6.45±0.353	0.001	5.766±0.308	11.400±1.239	0.001
HB	11.8267±0.716	9.45±0.612	0.03	8.398±0.489	11.826±0.719	0.04
PCV	32.85±1.67	25.09±1.56	0.004	21.8±1.85	29.32±2.64	0.04
WBCs	9.5±1.07	6.700±1.03	0.10	6.53±0.73	9.313±0.57	0.007
Neutrophils	28.75±8.26	26.00±4.88	0.761	34.13±2.72	38.40±3.61	0.3526
Lymphocytes	47.20±4.28	64.83±4.53	0.02	62.25±2.40	54.40±2.16	0.04
MCV	30.75±2.86	43.15±0.81	0.001	43.85±4.5	27.4±1.94	0.027
MCHC	33.38±0.84	35.92±1.24	0.11	35.4±1.8	35.8±1.5	0.8

Table 2: Serum Biochemical alterations in lactating ewes and does

Parameter	Non-lactating ewe	Lactating ewe	P value	Lactating Doe	Non-lactating Doe	P value
TP	7.07±0.38	5.45±0.157	0.002	6.21±0.217	7.22±0.29	0.01
Albumin	2.8±0.114	2.35±0.1435	0.04	2.53±0.177	3.4±0.252	0.01
globulin	4.44±0.309	3.06±2.35	0.006	3.26±0.151	3.93±0.261	0.042
Cholesterol	68.66±2.45	56.89±3.3	0.017	72.91±5.60	97.600±8.80	0.032
Triglycerides	20.85±1.36	14.16±2.15	0.032	15.67±2.19	45.640±2.83	0.001
BUN	12.12±1.05	16.26±0.99	0.01	18.122±1.62	12.400±1.43	0.04

Table 3: Selected serum Mineral profile

Parameter	Non-lactating ewe	Lactating ewe	P value	Lactating Doe	Non-lactating Doe	P value
Ca	12.100±0.206	11.176±0.156	0.01	9.39±0.429	10.95±0.329	0.01
Ph	6.45±0.5	5.29±0.435	0.128	6.025±0.773	6.517±0.443	0.561
Cu	103±11.7	60.22±8.78	0.016	95.89±0.7.23	123±6.05	0.05
Zn	99.142±10.96	65.54±9.60	0.044	63.7±7.85	84.86±3.49	0.042

these drops to the fact that insulin triggers lipogenesis during lactation became incompetent and this drop in competency manifested by reduction in serum cholesterol and triglycerides. A strong evident suggests that during energy deficit in ruminants, triglycerides drops (Mazur *et al.,* 2009). The blood triglycerides are a major element in milk fat synthesis (Nazifi *et al.,* 2002). During lactation phase, mammary gland uptake 80% of body metabolites to form milk, the increase in adrenalin cause decrease in lipid (Quanes *et al.,* 2012). The negative balance of energy during lactation causes a decrease in triglycerides and cholesterol (Antunovic *et al.,* 2011).

Observed elevation in BUN in lactating ewes and does was recorded, the elevated values come in accordance with other reports (Carcangiu *et al.,* 2007, Karapehlivan *et al.,* 2007), and was attributed to changes in protein metabolism during lactation. El-sherif and Assad (2001), suggest that urea begin to decrease when milk production became less stressful on kidney, furthermore, cortisol trigger protein catabolism in body (Silanikove, 2000). Moreover, Colderia *et al.,* (2007) found that lower body condition score is associated with elevated urea levels in lactating ewe.

Regarding alterations in selected minerals profile, results are shown in table 3. A reduction in zinc, copper and calcium were observed, however phosphorus didn't follow other minerals pattern. Minerals are known to play a role in metabolism and production (Underwood, 1971). The increased demand on zinc during pregnancy as it was observed to decrease during this phase (Kulcu and Yur, 2003), failure to substitute the deficit may be linked to the observed decrease during lactation. Copper (Cu) concentration was similarly decreased, descend of Cu in milk can be associated with the resultant decrease in serum Cu levels (Underwood, 1971). A marginal decrease in Ca level was observed; Azab and Abdel-Maksoud (1999) reported a wavering in serum Ca during period of lactation and attributed that to Ca mobilization. However, Antunovic *et al.,* (2011), reported similar pattern (decrease Ca with no change in Ph) and this observation recorded elsewhere (Abdelrahman *et al.,* 2002, Carcangiu *et al.,* 2007). An elevation in Ph level recorded in lactating goats (Tanritanir *et al.,* 2009). The Ca and Ph mobilization from bone follow similar mechanism, however, Ca are markedly deployed from blood to milk, Ph too but not in the same proportion, there for, Ph can remain stable in blood and even elevated compared to Ca (Antunovic *et al.,* 2011). Generally speaking, lactating animal needs a substantial quantity of Ca which comes from blood, when Ca decreased in food, the mechanism of Ca disposition from bone to blood activated (Carcangiu *et al.,* 2007).

Conclusion

In Conclusion, this study showed that the lactation has significant effect on body metabolites, hematologic and mineral storage in small ruminant, for future production scheme, failure of substitute those deficit, will have a bad impact on health and metabolism of animal production lifespan.

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