Sudan Journal of Science and Technology (2014) **15**(1): 5-10

Sudan Journal of Science and Technology
Journal homepage: http://jst.sustech.edu/

Metabolic Profile of the Dairy Cattle in Khartoum State

Rania I.Mustafa, SihamE. Suliman and Mohamed A. Abdalla*

College of Veterinary Medicine, Sudan University of Science and Technology,P.O. Box: 204, Khartoum North, Sudan.

* Corresponding author E-mail:salamaa2000@sustech.edualternative E-mail:esiham75@gmail.com

ARTICLEINFO

Article history

Received: 21July2014

Accepted: 17August 2014

Available online: 10t December 2014

Keywords:

Production disease,

pregnancy stages,

Profile test.

ABSTRACT

A total of 40 whole blood and plasma samples were collected from 30 pregnant cows at different trimesters (first, second and third stage) of pregnancy and 10 sample from empty cows were used as control in Khartoum state to evaluate some haematological parameters and to determine some biochemical parameters. In haematological findings PCV showed significant changes (p<o.o5), but there was slight changes in Hb. Whereas total protein, albumin and globulin showed significant changesat different trimesters ($p < 0.05$). The level of calcium in the first and second trimesters of pregnancy were 2.4 ± 0.6 mmol/l , 1.6 ± 0.3 mmol/l respectively, these values was low when compared with control animals, while the third trimesters revealed high value of calcium. Also glucose level was increased in the third trimesters of pregnancy (4.9 ± 0.7 mmol/l). Urea level revealed significant changes especially in the third stage of pregnancy (55.3 ± 9.8 mg/dl); there was slight change in phosphorus, sodium and potassium levels. Production diseases can be predicted earlier and control through using of routine examination for pregnant cows with good management and early treatment.

INTRODUCTION

Production diseases in cattle are characterized by imbalance between the rate of input of dietary nutrients and the output of production. The most important diseases in this species are parturition paresis, downer cow syndrome and ketosis (Radostits *et al.*,2007). Parturition paresis (milk fever) caused by a decrease of calcium at or soon after parturition and manifested by

generalized paresis and circulatory collapse (Barrington, 2011).

Downer cow syndrome is characterized by unable to rise to standing position due to unresponsive to standard hypocalcaemia or milk fever therapy but remain alert and recumbent (Laurent and Alexander, 2007).

Injuries of musculoskeletal system or dystocia due to an oversized calf may result in extensive oedema of the pelvic tissues and vulva and failure of the cow to stand following parturition (Joachim, 2012). Frequently in early lactation may be associated with other problems such as fat cow syndrome, retained placenta, mastitis, metritis and displaced abomasum.

Ketosis positive cows always should be examined for these other complication factors, because the main cause of this disease is multi-factorial disorder of energy metabolism (Smith, 2007). The incidence of production disease occurs generally in high producing adult lactating dairy cattle (Oetzel, 2007; Radostits *et al.*,2007).

The profile tests have given valuable attention in productivity in dairy cows in tropical and subtropical areas for confirmation (Whitake *etal.*, 1999).

Treatment and prevention of dairy cows is by restoring normal serum calcium levels as soon as possible to avoid muscle and nerve damage (Barrington, 2011). Also keeping the animals in balanced ration, particularly energy intake, and maximise dry matter intake before and after calving (Smith, 2007; Barrington, 2011).

The aim of this study was to evaluate some haematological as well as some biochemical parameters in cows at different stages of pregnancy.

MATERIALS and METHODS

Study area

The study was conducted in Khartoum State which is situated in Northern Sudan. The climate of Khartoum is characterized by a wide range in daily and seasonal temperatures. Cold season, between December and February, the weather is cool and dry, with minimum daily temperature of 24°C. The season is characterized by low humidity,a hot dry weather between March and October, where a temperature of 45°C may be recorded in the day. The rainy season during the period from mid-July to September; in this season there is an increase in relative humidity, with a maximum of 68%.

Blood Samples collection

A total number of 40 blood samples were collected from dairy cows in different stages of pregnancy. Another 10 samples were collected from lactating animals (control),10 samples from first trimesters of pregnancy (1-3 months), 10 samples from second trimesters (4-6 months), and 10 samples from third trimesters (7-9 months) of pregnancy. Some haematological parameters and biochemical tests were evaluated in these samples.

Haematological indices

Packed cell volume (PCV) was measured according to Kelly (1984) and the reading of the sample was recorded by mmol/l. Also haemoglobin concentration (Hb)g/dl was determined using a reagent based on cyanomethaemoglobin method the absorbance of cyanomethaemoglobin was measured at 540 nm (Bio med – MDSS –Gmbh, Schiffrgrben 41-30175, HannoverGermany).

Biochemical tests

Total protein, albumin, globulin, glucose, urea and phosphorus were determined in the plasma according to bio systems (Costa Brard 30, Barcelona – Spain). Plasma calcium, sodium and potassium were also measured by kits (Bio med – MDSS –Gmbh, Schiffrgrben 41-30175, Hannover Germany).

Data analysis

The data were analyzed using the software statistical package for the social sciences version 16.0(SPSS Inc. and Chicago,IL, USA). All blood samples were analyzed by analyses of variance (ANOVA) to evaluate the significant differences between the stages. Statistical significance was set at a p-value of < 0.05.

RESULTS

In haematological findings there was significant changes in PCV which was low in the first and third stages of pregnancy and reached 52.6 ± 6.6 mmol/l, 74.0 ± 6.4 mmol/l respectively compared with control animals 76.4± 4.5 mmol/l, whereas in the second stage was high, 86.5± 1.3 mmol/l . Slightchanges were seen in haemoglobin concentration (Table 1).

Table 1: PCV (mmol/l) and Haemoglobin (g/dl) at different trimesters of pregnancy compared to empty cows

Parameter	Control group	Pregnancy stages		
		First stage	Second stage	Third stage
PCV mmol /l	76.0 ± 4.0*	52.6 ± 6.6*	86.6 ± 1.3*	74.0 ± 6.4*
Haemoglobin g/dl	11.4 ± 0.9	7.3 ± 1.3	12.8 ± 0.7	11.9 ±1.0

In Table (2) the total protein, albumin and globulin concentration showed significant changes within and between different stages of the pregnancy. The values of the calcium in the first and second stages of pregnancy were 2.4± 0.6mmol/l, 1.6± 0.3mmol/l respectively, these values were both low as compared with control 3.2± 1.2mmol/l while the third stage revealed high value of calcium 3.8± 0.9mmol/l (Figure 1). Glucose level decreased in the first and second stages of pregnancy (4.1± 0.3mmol/l, 4.1± 0.2mmol/l) as compared by control animals the level was increased at third stage and reached 4.9± 0.7mmol/l (Figure 2). Also urea level (Table 2) showed significant changes. Slightly changes in phosphorus, sodium and potassium value (Table2) were recorded.

Table 2: Some biochemical parameters in pregnant cows at different stages of pregnancy

Parameters	Control group	Pregnancy stages		
		First stage	Second stage	Third stage
Total protein g/l	67.8±3.6*	169.0±30.3*	57.4±1.9*	88.2±8.8*
Albumin g/l	28.5±3.9*	69.9±12.9*	26.6±1.8*	44.0±8.0*
Globulin g/l	39.3±4.1*	99.8±17.9*	30.7±2.7*	42.4±7.0*
Phosphorus mmol/l	5.0±1.2	3.1±0.8	6.4±2.3	5.0±1.2
Urea mg/dl	47.5±9.4*	32.3±2.8*	33.7±3.2*	55.3±9.8*
Sodium mmol/l	128.9±1.6	125.4±1.5	131.3±1.6	130.2±1.3
Potassium mmol/l	8.8±0.6	8.8±0.5	10.0±0.3	7.8±0.6

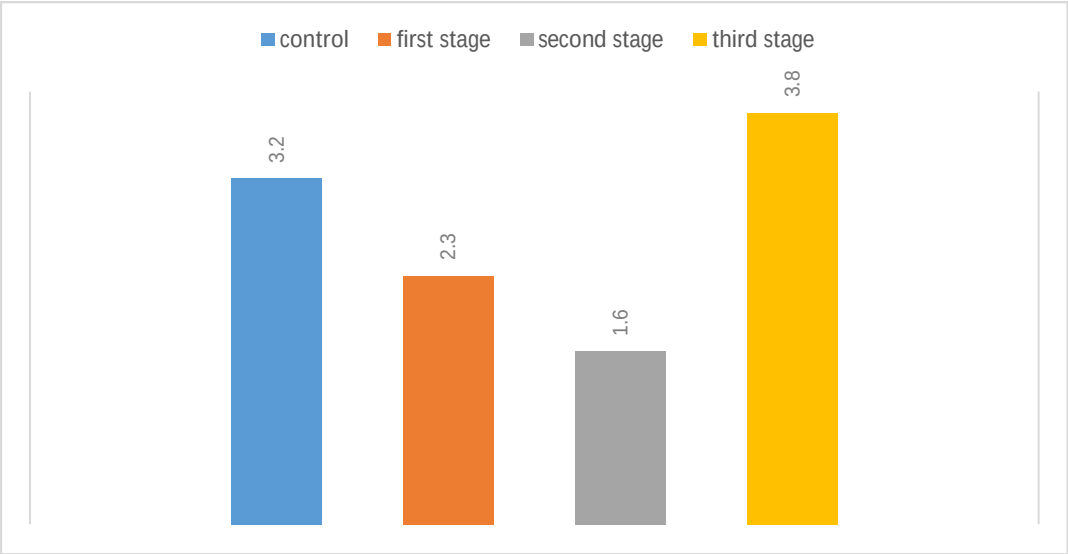

Figure 1: The level of calcium in pregnant cows at different stages

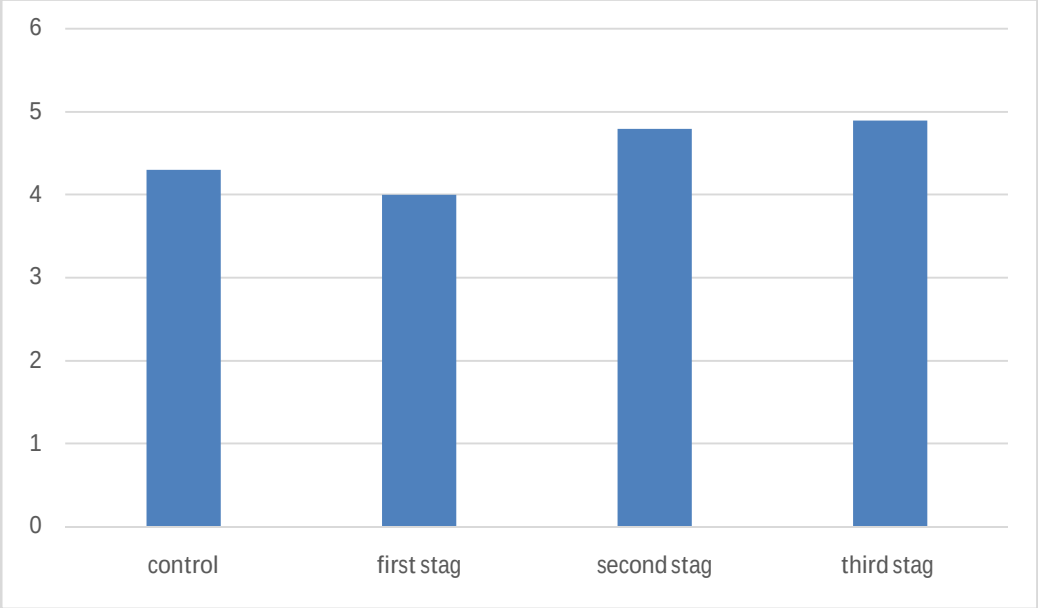

Figure 2: The level of glucose in pregnant cows at different stages

DISCUSSION

In the present study there was increase in PCV duringthe second stage and decrease in the first and third stages, but slight changes in Hb. These results there wereindicated that there is mild anaemia (Radostits *et al.,* 2007). The changes in total protein which identified according to its constituents as albumin and globulinis usually affected by nutritional status of animals (Coles, 1986).Plasma protein serves as source of nutrition for tissues and play a dynamic equilibrium

exists between the proteins of plasma and those of tissue.

There is significant change in calcium within and between all stages of pregnancy; calcium was high in third stage of pregnancy. this result is in disagreement with the results of Radostits *et al.,* (2000) who reported that calcium level is reduced below normal in all cows at calving whether they have milk fever or not . In this study glucose level was decreased in the two first stages this but in the third stage this was increased. This finding is in agreement with Roche (2003), but in contrary to the findings of Radostits *et al.,* (2000) who indicated that glucose level decreased in late stage due to moving to mammary glands to make lactose whereas, Ahmed and Abdalla (2012) reported that there was no significant decrease in plasma glucose during pregnancy. The high level of urea in the third stage of pregnancy related to enhancement of metabolic activities and use of amino acid as source of energy this results are similar to the result of Bell (1995);Harris (1995) and Westwood *et al.,* (2000). Phosphorus was decreased in early stage of pregnancy, sodium was high in the third stage and potassium was low in third stage in this be may attributed to electrolyte imbalance during parturition. The profile tests are important in screening for production diseases (Jones *et al.,* 1982).

From this study it could be concluded that the disturbance of nutrition during pregnancy may lead to metabolic imbalance and hence to results common production disease are appeared. This can avoid by routine examination for pregnant cows with good management and early treatment.

References

Ahmed,O.A., and Abdalla,M.A. (2012).Metabolic and Endocrine Responses of Crossbred Dairy Cows in Relation to Pregnancy and Season under Tropical Conditions.*American-Eurasian Journal of Agricultural and Environment Science*,**12** (8): 1065-1074

Barrington, G.M. (2011).Parturition paresis in cows.In: *Merck Veterinary Manual*, USA.

Bell, A.W. (1995).Regulation of organic nutrient metabolism during transition from late pregnancy to early lactation.*Journal of AnimalScience*,**73**: 2804-2819.

Coles, E.H. (1986). *Veterinary Clinical Pathology*.4th edition, W. B.SaundersCompany,Philadelphia. pp 136 – 138.

Harris, B. (1995). MUN and BUN values can be valuable management tools. *Feedstuffs,***76**: 14

Joachim, B.(2012). Overview of Bovine Secondary Recumbancy. Veterinary Medicine, DECBHM.*The Merck Veterinary Manual*

Jones, G.M., Wildman, E.E., Troutt, H.F.Jr., Lesch, T.N., Wagner, P.E., Boman, R.L., Lanning, N.M. (1982). Metabolic profiles in Virginia dairy herds of different milk yields**.***Journal of DairyScience*, **65**(4):683-8.

Kelly, W.R. (1984).*Veterinary Clinical Diagnosis*.3rd edition.BailliereTindall London.pp 333 – 334

Laurent, M., and Alexander,T. (2007).Downer Cow Syndrome.*Canadian Veterinary Journal*, 48(5): 487–491.

Oetzel, G. (2007). Herd Level Ketosis, Diagnosis and Risk Factors. Preconference Seminar7C: Dairy Herd Problem Investigation Strategies Transition Cow Troubleshooting. *American Association of Bovine Practitioners.*40th Annual Conference, Vancouver, BC, Canada.

Radostits,O.M., Gay, C.C.; Blood, D.C. and Hinchilliff, K.W. (2000).*Veterinary Medicine,*9th edition.W. B. Saunders Company Ltd,London, 1420-1434

Radostits, O.M., Gay, C.C. and Hinchcilliff, K.W., Constable, P.D. (2007).*Veterinary Medicine,*10th Ed., Elsevier Saunders, London. pp. 1626-1667.

Roche, J. R. (2003). Hypocalcaemia and DCAD for the pasture-based transition cow –areview. *Acta Veterinaria Scandinavia,* 65-74.

Smith, D.R (2007).Dairy Cow Health and Metabolic Disease Relative to Nutritional Factors.University of Nebraska–Lincoln cooperating with the Counties and the United States Department of Agriculture. Neb Guide, G1

Westwood, C.T.,Lean, I.J.,Garvin, J.K. andWynn, P.C. (2000).Effects of genetic merit and varying dietary protein degradability on lactating dairy cows.*Journal DairyScience,***83**: 2926-2940.

Whitaker, D.A., Goodger, W.J., Garcia, M., Perera, B.M., Wittwer, F.(1999).Use of metabolic profile in dairy cattle in tropical and subtropical countries on smallholder dairy farms.*Preventive Veterinary Medicine.* **38**(2-3):119-31.