Nutritional Disorders in Dairy Cattle during mid Lactation Period in Khartoum State

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Abstract:
The purpose of this study was to evaluate some biochemical parameters in dairy cows during mid lactation period and to identify the types of nutrients and the factors that leading to nutritional disorders in the period from November to December 2017. The study was done in Jabal Awlia and Omdurman localities – Khartoum State. A total of 50 cows in mid lactation period were selected randomly from the two localities [25 cows from each locality]. Blood samples [50 samples] were taken from jugular vein for separation of serum to evaluate of total protein, albumin, glucose, calcium, inorganic phosphorus, sodium and potassium. A questionnaire was conducted to obtain information about dairy men [50 men], diseases associated with dairy farms and the feeding system. The results revealed that there was no significant changes in biochemical parameters in these animals [p>0.05]. But the level of total protein was statistically significant [p< 0.05]. Dairy men interviewed their age was between 21 to over 40 years old. Most of them were uneducated [40%] and only 8% of them were working in dairy farm for over 19 years. The occurrence of nutritional disorders was common in two localities [48%] and most of these disorders occurred in dry season [48%]. Most of the diseases occurred in cross breed over 4 years old [26%] with morbidity rate 32.7% and mortality rate 40%. Some risk factors in the farms leading to disturbance of nutrition that the animals were not grazing]36%] or with limited movement [56%] and using of semi-intensive system [48%]. In conclusion, supplementation of diet with constitutes energy feed, minerals, vitamins, concentrate mixture improve the animal health and prevent occurring of the diseases in lactation period.
Keywords: Nutritional disorders, Lactated cows, Jabal Awlia and Omdurman localities.

Introduction:
Deficiency will occur in producing animals as results of dietary deficiency, abnormal absorption and utilization of feeding and presence of diseases [Rodasitits *et al*., 2007]. A common nutritional deficiency occurred due to insufficiency of quantity and quality of feeding [Oetzel and Berger, 1986]. Also protein and energy deficiency are occurred concurrently in livestock with incomplete starvation. Decreasing of protein in the diet leading to hypoproteinemia of both young and mature animals. But Ruminants sometimes not need dietary essential amino acids because ruminal flora synthesizes the necessary amino acids [Oetzel and Berger, 1985]. The prevention of protein-energy malnutrition requirements in animals is depends on the age, stage of pregnancy and production, the environmental temperature and the cost of the feeding [Rodastits *et al*., 2007]. Losses of sodium during lactation period result from milk, rapid growing young animal fed on low-sodium, cereal based diet, hot environment with heavy intense physical work and low-sodium grazing pasture [Akitken, 1976]. At first weeks of lactation dairy cows are suffered from negative

energy balance due to energy expansion associated with milk production and limited feed intake and the result high mobilization of limit from body fat reserves and hypoglycemia (Veenhuizen *et al.*, 1991; Drackley, 1999; Oetzel, 2004). For decreasing of metabolic damage during production cause by negative balance, feeding glycogenic and lipogenic diet containing fat – enrich supplement (Gabor *et al.*, 2016).   Most important metabolic diseases associated with nutrition in lactation period in dairy cattle are parturient paresis, downer cow syndrome, acute hypokalemia in cattle, ketosis, fatty liver in cattle and post parturient hemoglobinuriain cattle [Rodastits *et al.*, 2007].   Parturient paresis occurs at or near calving because of large calcium demand when the onset of milk produces. Cows are unable to meet the demand of calcium due to ration imbalance, vitamin D influence or parathyroid gland activity.   All these factors influence regulation of the metabolism during the dry period [Smith *et al.,*2007].   Failure of regulation of these metabolites may lead to downer cow syndrome after 48 hours of calving. But there are other causes of this disease including toxic mastitis, metritis, exhaustion from calving, calving paralysis, hip joint luxation and pelvic fracture. Also the presence of hypocalcemia concurrently with hypomagnesaemia, hypophosphatemia and hypokalemia in individual downer cow is expected (Clark *et al.,*1984). This disease can be treated medically with physiotherapy to correct the etiological factors (Kumari and Kaswan, 2015).For prevention of milk fever that by addition of sodium and potassium to reduce metabolic alkalosis and induced mild metabolic acidosis (Goff *et al.*, 1997). Calcium concentration stimulates parathyroid hormones before calving and this hormones its function to activate bone osteoclasts for reabsorption of calcium and renal tubules to reabsorb urinary calcium and production of vitamin D prior to calving. Oral calcium at calving reduces the incidence of milk fever (Bacic *et al.*, 2007).   While ketosis or acetonemia occurs most frequently nearly lactation and may be associated with other problems, such as retained placenta, mastitis, metritis, fat cow syndrome and displacement of abomasum. This disease is associated with lack of energy during which liver converts fatty acids into ketone bodies [Burim, 1988].   But fat cow syndrome is due to excess energy [concentrates, corn silage, some hays] fed during the dry period may cause obese to the animals near calving time. These animals may become diseased by milk fever, ketosis, displaced abomasum, retained placenta or metritis [Smith *et al.*, 2007].   Deficiency of potassium associated with dietary potassium intake and this can lead to hypokalemia, especially in conjunction with other etiological agents of decreasing this element (Brobst, 1986; Carlson, 1989). Also the treatment of ketosis by glycocorticoids decrease plasma concentration of potassium and this effect may promote hypokalemia. The treatment of this condition by oral dosing of potassium chloride with addition of magnesium for inappetent lactating dairy cattle (Constable *et al.,* 2013). But post parturient hemoglobibnurea result from dietary phosphorus deficiency feeding cerciferous plants and also may be related to hypophosphatemia. This disease can be treated by phosphorus supplementation for a week with supportive therapy giving significant improvement in clinical and laboratory parameters (Wakayo *et al.,* 2013). Fatty liver is known as accumulation of fat, mainly triacylgcerol in the liver. Decreasing of feeding during the period of parturition resulting of more severe negative energy balance during early lactation and this leading to increase lipolysis of adipose tissues (Kirwvski and Sladojevic, 2017).   Also fatty acids may enhance the metabolic process in transition cows and adaptation of calcium metabolism to lactation help by using nutritional programmes to decrease the cation-anion difference in the diet [Overton and Waldron, 2004].   Dairy cattle need a dietary source of minerals [calcium, phosphorus, magnesium, manganese, copper, cobalt, zinc and selenium]. In addition, vitamins such as vitamin A, D and in dairy animals concentrates are widely used, and also B-vitamins are added to milk replacers [Fraser and Mays, 1986]. The objective of the paper to evaluate

some biochemical parameters in dairy cows in lactation period and to identify the type of feeding and risk factors associated with dairy farms.

Materials and Methods:

Study area:

The study was carried out from November to December 2917 in Jabal Awlia and Omdurman localities in Khartoum State.

Collection of Samples:

A total of 50 blood samples were collected randomly from 2-4 years old dairy cows [25 samples from each locality]. Whole blood (20ml) was taken from each animal for separation of serum [5ml] for biochemical analysis.

Biochemical Tests:

Biochemical parameters associated with dairy cattle in lactation period were measured spectrophotometrically. Total protein, albumin, glucose, inorganic phosphorus, calcium, sodium and potassium were analysed by test kits (Bio system, S.A. Spain).

Questionnaire Design and Data Collection:

Questionnaire was designed to obtain information on demographic characteristics of the dairy men, nutritional disorders in dairy cows in lactation period, history of diseases associated with nutrition and production, risk factors associated with dairy farms and the feeding system. The questionnaire included 50 dairy people in the JabalAwlia [25 person], and Omdurman [25 person] localities using face to face questions.

Statistical Analysis:

The data of biochemical analysis was analyzed using Statistical Package for Social Science (SPSS), especially T-test for proportion of the some different groups. Analysis of the questionnaire data by using Chi-square Test for examination difference between group and to test the association the independent variable and infection status [p<0.05].

Results:

There were no significant changes in biochemical parameters as shown in table 1. While serum protein level showed statistical significant difference [p<0.05] in Jabal Awlia and Omdurman localities. In table 2 the ages of the respondents were between 21 to over 40 years, while 40% of them were uneducated, but only 12% dairy people graduated. Most of them their experience of working in the farms was low (36%), but only 8% having a knowledge about the work (Working over 19 years).

Questionnaires results showed that [48%] of Nutritional disorders in dairy cows in mid lactation period commonly occurred [Table 3]. All nutritional diseases were higher in Omdurman locality than JabalAwlia locality [Table 3]. The management system in the two localities represented to the source of nutritional disorder to the dairy animals [Table 4]. The animals in common grazing [32%] with lower nutritional disorders than animals were not grazed [36%]. Also the animals moving in and out the farm showed lower affection by the nutritional diseases [34%], whereas, the animals with limited movement were susceptible by these diseases [56%]. Pastoral farming system recorded low diseased animals [14%] than semi-intensive system [48%] in the two localities [Table 4].feeding system in the two areas composed of concentrates and roughages. The constitutes of the concentrates were corn, wheat, oats. The roughages used in two areas were pasture, hay, silage green chap and sawdust. Other supplements were calcium, potassium, sodium chloride, antibiotics, antioxidant, copper and molasses.

Table (1) The mean ± standard error of nutritional elements in lactating cows (n=50) in Khartoum State

Elements	Area		Sig
	JabalAwlia	Omdurman	
Total protein	7.74±0.08	7.94±0.04	0.039*

Phosphorus	3.57±0.05	3.60±0.05		0.674	
Calcium	8.31±0.06	8.36±0.07		0.565	
Sodium	131.38±1.20	134.28±0.82		0.053	
Potassium	3.60±0.06	3.62±0.06		0.872	
Glucose	78.22±3.69	74.47±2.38		0.398	
Albumin	3.76±0.09	3.55±0.08		0.109	

*= Significant difference (p< 0.05)

Table (2) Demographic characteristics of dairymen [n=50] in Khartoum State

Respondents	Area		Total	Chi-square	Sig
	JabalAwlia	Omdurman			
Age (years)					
21-25	4(16%)	3(12%)	7(14%)		
26-30	4(16%)	5(20%)	9(18%)		
31-35	4(16%)	5(20%)	9(18%)	0.442	0.979
36-40	6(24%)	6(24%)	12(24%)		
Over 40	7(28%)	6(24%)	13(26%)		
Total	25(50%)	25(50%)	50(100%)		
Level of education					
Uneducated	12(48%)	8(32%)	20(48%)		
Primary	7(28%)	7(28%)	14(28%)		
High school	2(8%)	4(16%)	6(12%)		
Secondary	4(16%)	3(12%)	7(14%)	4.61	0.330
Graduate	0(0%)	3(12%)	3(12%)		
Total	25(50%)	25(50%)	50(100%)		
Number of years of experience in animal business					
1-4	9(36%)	9(36%)	18(36%)		
5-9	5(20%)	6(24%)	11(22%)		
10-14	7(28%)	6(24%)	13(26%)		
15-19	2(8%)	2(8%)	4(8%)	0.168	0.997
Over 19	2(8%)	2(8%)	7(8%)		
Total	25(50%)	25(50%)	50(100%)		

*= Significant difference (p< 0.05)

Table (3): Nutritional disorders in dairy cows (n=50) in lactation period in Khartoum State

Occurrence of diseases in farm	Area		Total	Chi-square	Sig
	JabalAwlia	Omdurman			
First time	5(16%)	3(12%)	8(16%)		
Second time	5(20%)	4(16%)	9(18%)		
Third time	5(20%)	4(16%)	9(18%)	1.389	0.708
Common	10(40%)	14(56%)	24(48%)		
Total	25(50%)	25(50%)	50(100%)		
Season of the occurrence					
Dry	11(44%)	13(52%)	24(48%)		
Rainy	5(20%)	5(20%)	10(20%)		
Any season	9(36%)	7(28%)	16(32%)	0.417	0.812
Total	25(50%)	25(50%)	50(100%)		

*= Significant difference (p< 0.05)

Table (4): Risk factors associated with dairy farms in Khartoum State

Effect of disease on sheep and goat	Area		Total	Chi-square	Sig
	JabalAwlia	Omdurman			
Percent	25(28%)	25(100%)	50(100%)	-	-
Total	25(50%)	25(50%)	50(100%)		
Source of livestock feed on the farm					
Common grazing	8(32%)	8(32%)	16(32%)		
Enclosed	8(32%)	8(32%)	16(32%)	0.000	1.000

Zero grazing	9(36%)	9(36%)	18(36%)		
Total	25(50%)	25(50%)	50(100%)		
Source of water for animals					
Communal water	10(40%)	11(44%)	21(42%)		
Individual water	15(60%)	14(56%)	29(58%)	5.368	0.368
Total	25(50%)	25(50%)	50(100%)		
Movement of animals into and out to of farm					
Any direction	12(48%)	5(20%)	17(34%)		
Limited	10(40%)	18(72%)	28(56%)		
Pre-testing	3(12%)	2(8%)	5(10%)	5.368	0.068
Total	25(50%)	25(50%)	50(100%)		
Farming system					
Pastoral	1(4%)	6(24%)	7(14%)		
Mixed	12(48%)	7(28%)	19(38%)		
Semi-intensive	12(48%)	12(48%)	24(48%)	4.887	0.087
Total	25(50%)	25(50%)	50(100%)		
Source of diseases					
Infected animals	1(4%)	1(4%)	2(4%)		
Contacts	3(12%)	3(12%)	6(12%)		
Wild animals	0(0%)	1(4%)	1(2%)	1.967	0.854
Movement	5(20%)	3(12%)	8(16%)		
No	14(56%)	16(64%)	30(60%)		
Total	25(50%)	25(50%)	25(50%)		

*= Significant difference ($p < 0.05$)

Discussion:

A variety of biochemical parameters can be measured in dairy cows in lactation period associated with nutrition to evaluate the abnormalities at this stage. In this study all biochemical parameters evaluated [Table 1] provide no changing in their values [p>0.05], but total protein was significantly decreased and this is in accordance with the results of Rania (2014) who reported that the measured parameters are normal in lactated cows and these increase in late lactation and decreased in early lactation. Also adequate amounts of protein are required not only for the animal its silf, but also the rumen microflora in low quantity [Faster and Mays, 1986]. The major factor leading to decrease of protein with shortage of energy is poor pasture [Non legume, forages, specialy roughages]. Generally, the seasonal effect can influenced glucose, calcium, phosphorus, sodium and potassium levels (Cerutti *et al*., 2018). Blood glucose level was normal in lactation stage in these results. These findings are in agreement with Rodastits *etal*. (2000); Flore *et al*. (2015); Dioavic *et al.* (2016) who recoded that detection of hypoglycemia in early lactation period in the cows is indicative values. From the results the disorder in nutrition occurred in dry season [Table 3] and in old cows with high morbidity and mortality rates [Table 4]. This may be attributed to dairy men who have no knowledge of practicing in dairy farms [Table 2]. However, special clinical and laboratory examinations of animals are of valuable to diagnosis of diseases and measurement of blood or tissue concentration of minerals and vitamins or biochemical markers in apparently healthy animals that to avoid the occurrence of nutritional deficiencies specially in lactation stage [Rodastits *et al*., 2007]. In conclusion, the results of this study revealed that all biochemical parameters measured were normal in the lactation period in these cows. But morbidity and mortality rates were high in the two areas with low knowledge of practicing in animal farms. Also supplementation of diet constitutes energy feed, minerals, vitamins, concentrate mixture improve the animal health and prevent occurring of the diseases in lactation period.

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