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**CORRELATION BETWEEN NEFA LEVELS IN SERUM IN PRE AND POSTPARTUM  
PERIODS ON OVARIAN REBOUND IN COWS**

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**ABSTRACT**

Fatty liver syndrome (Hepatic lipidosis) or fat cow syndrome is a major metabolic disorder in many dairy cattle in early period of lactation. The aim of present study was to determine the correlation between NEFA levels in serum in dry and postpartum periods on ovarian rebound in cows. In present study, during frequently visits from dairy cattle farms of Tabriz, according to statistics of dairy cattle in Tabriz area, the inspection of 60 Holstein cows (30 primiparous and 30 multiparous Holstein cows) were done. Blood sampling was done 2 times separately, the first sampling was done 10 days before parturition and second sampling was done 10-20 days after parturition. Since 3 weeks after parturition, ovarian activity was monitored using Ultrasonography. At the time of testing, sera were defrosted and NEFA levels in serum were measured by Randox kit and Auto analyzer. Comparison of data of NEFA value showed that there is significant difference among cows of both groups in pre and post-partum period in which serum value of NEFA in pre-partum period was higher than in post-partum period in primiparous cows. Contrary, in post-partum period, NEFA value in multiparous cows was higher than primiparous cows.

**Keywords: Fatty Liver Syndrome, NEFA, Pre and Post-partum, Cows**

## INTRODUCTION

Fatty liver syndrome (Hepatic lipidosi) or fat cow syndrome is a major metabolic disorder in many dairy cattle in early period of lactation [3, 6] and it's combined with decrease in health and reproduction rate of livestock [9,14]. Fatty liver syndrome was documented in forties (decade 1940) but there were few researches about it until mid-seventies. In early 70 and 80 decades, this syndrome was reported around parturition widely and it was recorded in many countries [3, 6]. When this disorder is severe, milk production and appetite of cow, both are decreased. So effective prevention of fatty liver can save millions of dollars every year and prevent from decrease in milk production [4]. Incidence of Fatty liver in dairy cattle is mainly in first four weeks after parturition [10], when more than 50% of cows show different degrees of triacylglycerol (TAG) accumulation in their livers [13,14]. One of the reasons is that daily nutrition of cow is not sufficient and it can't meet increasing need of energy in cattle that is producing milk. In this condition, none Esterified fatty acid (NEFA) is released from adipose tissue, often more than it's needed, and extra amount is transferred to liver, especially in fat cows [15]. Fatty liver occurs when liver harvesting of lipids is more than their Oxidation and

secretion by the liver and it is with high plasma concentrations of NEFA that is resulted from high adipose tissue [4, 10]. Extra fat is stored in liver as TAG and results in decrease of metabolic function of liver [4]. Liver is classified to three types, according to fat level: normal liver, liver with average fat and liver with very high fat [4, 10]. The latter type is categorized to Non-encephalopathic fatty liver [1] and hepatic encephalopathy [4, 10]. Unbalanced or insufficient nutrition, overweight and high concentration of estrogen are involved in etiology of fatty liver [9]. The disorder can be accompanied with high rate of dystocia, infectious and inflammatory disease, long interval between parturitions and reduction of milk and longevity average [9]. For as much as even slight fatty liver is dual with decrease in health and reproduction status of cow, prevention of its occurrence with supplying enough food and creating an isolated place at preparation period for parturition can reduce decline rate of producing milk and it would be the most efficient therapeutic procedure among the other methods [18]. However this prevention is not enough for fat cows or the ones that are not feed well, the cows that have problem during parturition or had twins, the cows that have metabolic or infectious disease

and the ones that have developed severe energy imbalance because of producing high amount of milk immediately after parturition [18]. Assuming existence of about 9 million dairy cattle all over the America, annual charges of fatty liver in this country is estimated more than 60 million dollars [1]. If there are more studies about molecular changes and relationship between the disease and immunity function, better remedies and more efficient ways to prevent fatty liver can be presented [19]. In our country, because of industrial methods that speed for nurture and maintenance of dairy cattle, and because of producing more milk, more nutrition is considered; occurrence of this syndrome is most likely. According to these conditions, providing exact diagnose of this syndrome and estimate it's incidence rate and finally how to prevent it in our country is a necessity and this case made us do the first study about this disease in Tabriz. It's possible that origin of many diseases happening around parturition could be fatty liver incidence in this region's dairy cattle. The aim of present study was to determine the correlation between NEFA levels in serum in dry and postpartum periods on ovarian rebound in cows.

## **MATERIALS AND METHODS**

In present study, during frequently visits from dairy cattle farms of Tabriz, according to statistics of dairy cattle in Tabriz area, the inspection of 60 Holstein cows (30 primiparous and 30 multiparous Holstein cows) were done. In this inspection, age, body condition score and Pregnancy status of animals was investigated [7]. Simultaneous inspection of animals, attempting to obtain blood samples of 10 ml of jugular vein was done by venoject. Blood sampling was done 2 times separately, the first sampling was done 10 days before parturition and second sampling was done 10-20 days after parturition. Since 3 weeks after parturition, ovarian activity was monitored using Ultrasonography.

Blood samples taken near the ice and sent to the laboratory and after serum preparation were freezing inside the micro tube. At the time of testing, sera were defrosted and NEFA levels in serum were measured by Randox kit and Auto analyzer. In this study to analyzing and comparison of data, Correlation and T-test was used.

## **RESULTS**

Comparison of data of NEFA value showed that there is significant difference among cows of both groups in pre and post-partum period in which serum value of NEFA in pre-partum period was higher than in post-partum

period in primiparous cows. Contrary, in post-partum period, NEFA value in multiparous was higher than primiparous cows.

Based on data obtained, the mean value of NEFA in primiparous cows before parturition (dry period) was 0.471 meq/l and average of ovarian rebound was 6.85. Based on **Table 1** and Pearson's Correlation index revealed that there is a significant and direct correlation between NEFA and ovarian rebound time so that correlation index was  $r=+0.873$ ,  $p$ -value=0.01 and 95% confidential level.

Based on data obtained, the mean value of NEFA in primiparous cows after parturition was 0.580 meq/l and average of ovarian rebound was 6.85. Based on **Table 2** and Pearson's Correlation index revealed that there is a significant and direct correlation between NEFA and ovarian rebound time so that correlation index was  $r=+0.887$ ,  $p$ -value=0.01 and 95% confidential level.

Based on data obtained, the mean value of NEFA in multipara cows before parturition (dry period) was 0.269 meq/l and average of ovarian rebound was 6.45. Based on **Table 3** and Pearson's Correlation index revealed that there is a significant and direct correlation between NEFA and ovarian rebound time so that correlation index was  $r=+0.858$ ,  $p$ -value=0.01 and 95% confidential level.

Based on data obtained, the mean value of NEFA in multipara cows after parturition was 0.639 meq/l and average of ovarian rebound was 6.45. Based on table 4 and Pearson's Correlation index revealed that there is a significant and direct correlation between NEFA and ovarian rebound time so that correlation index was  $r=+0.927$ ,  $p$ -value=0.01 and 95% confidential level.

**Table 1: Correlation Between NEFA Mean Value and Ovarian Rebound Time Pre-Parturition in Primiparous Cows**

primiparous cows	Mean	Std. Deviation
NEFA (mEq/L)	0.4710	0.08045
ovarian rebound time (week)	6.85	1.268

**Table 2: Correlation Between NEFA Mean Value and Ovarian Rebound Time Post-Parturition in Primiparous Cows**

primiparous cows	Mean	Std. Deviation
NEFA (mEq/L)	0.5800	0.09177
ovarian rebound time (week)	6.85	1.268

**Table 3: Correlation Between NEFA Mean Value and Ovarian Rebound Time Pre-Parturition in Multiparous Cows**

multiparous cows	Mean	Std. Deviation
NEFA (mEq/L)	0.2690	0.06688
ovarian rebound time (week)	6.45	1.504

**Table 4: Correlation Between NEFA Mean Value and Ovarian Rebound Time Post-Parturition in Multiparous Cows**

multiparous cows	Mean	Std. Deviation
NEFA (mEq/L)	0.6395	0.09423
ovarian rebound time (week)	6.45	1.504

## DISCUSSION AND CONCLUSION

For awareness of fatty liver syndrome, blood biochemical parameters can be used or we can measure TAG and total fat of hepatic cell. Some researchers inspect fatty liver based on TAB or hepatic fat percent [18]. Raid (1980) divided livers in 4 levels depending on severity of fat accumulation in it: Normal, slight, average and severe [16]. Nowadays general opinion is that a high percent of mature cows show signs of slight or severe fatty liver around parturition [4, 11]. Almost near parturition NEFA increases in blood and moves to liver, and can cause ketosis, abomasums displacement, metritis and fatty liver after parturition [4, 5, 8]. In a normal situation and positive energy balance, NEFA value is about 200 meq/lit in blood. This value increases since 3 weeks is parturition and reaches to 300 meq/lit in the last week. In the last days before parturition, it reaches to 800 -1200mcq/lit. After parturition these

acids should wane immediately and if it remains more than 700meq/lit after 7 days, represents negative energy balance and probability of fatty liver incidence. 3 weeks after parturition the amount of these acids should return to normal level (200meq/lit) [5]. Also the results of this study have conformity with Grummer results that showed three is most lipid aggregation in liver in first 4 weeks after parturition [10]. There was a research in Netherlands about 71 dairy cattle before parturition that showed 5 percent of liver is occupied with TAG [12]. Also in a slaughterhouse research in Tehran, aggregation of TAG more than 10% in liver in last month of pregnancy was reported. These researchers had not measured NEFA values. In this study, TAG aggregation in liver in last month of pregnancy had occupied more than 5% of liver cells and amount of NEFA was more than 900meq/lit being nonspecific and some other reasons. Slight

and Mild forms of fatty liver can destroy hepatocytes and disturb liver function without making any changes in activity of hepatic specific enzymes found in serum. Measurement of liver enzymes in serum is useful for evaluating fatty liver disease but with certain restrictions such as is being nonspecific. Mild and moderate forms of fatty liver with damaged hepatocytes can cause liver and no specific changes in liver enzymes in serum, liver dysfunction to establish [2,17]. Significant result obtained from our research is higher levels of NEFA in primiparous cows in pre-partum period than post-partum period. This matter shows that we have to take care to animals feed in transitional period because researchers believe that it is one of the most important factor in amount of milking after parturition. In post-partum period, NEFA value in multiparous was higher than primiparous cows which show that decrease in serum value of NEFA in old animals occurs more slowly.

At the end, it can be stated that serum value of NEFA is one of the most important and valuable factor which is used in improvement of herd fertility. Also, ovarian rebound time beside of negative energy balance is related to other factors such as disease, post-partum uterine infection, systemic disorders of animal, season, milk fever, vitamins and

minerals deficiency. So, in addition to considering the energy balance, other factors must be noted.

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