IJABBR- 2014- eISSN: 2322-4827

International Journal of Advanced Biological and Biomedical Research

Journal homepage: www.ijabbr.com

Original Article

Risk Factors of Seven Groups of Health Disorders in Iranian Holstein Cows

Nastaran Ahangaran Rajabi*, Seyed Abbas Rafat

Department of Animal Science, Faculty of Agriculture. University of Tabriz, East Azerbaijan, Tabriz, Iran

ARTICLE INFO

Article history:
Received: 06 July, 2014
Revised: 28 July, 2014
Accepted:20, August, 2014
ePublished:30 September, 2014

Key words:
Holstein cows
Locomotion problem
Metritis
Abomasal
Displacement
Cecal dilatation

ABSTRACT

Objective: The cows that don't have access to sufficient energy in their ration can get sickness. Milk production has a high priority in metabolism of dairy cows so lactating cows are more prone to get sick This can ruin all the benefits of higher milk yield because of the higher prevalence of the disorders. **Methods:** Data for this research had gathered from a herd with 1600 Holstein cattle in East Azarbayjan province of Iran. Data were from 5052 lactation period of 1796 Holstein-Frisian cows which had parturition among 2005-2009. Seven groups of disorders have been analyzed. They are as follow: Cecal dilatation and rotation, diarrhea, abomasal distention and displacement to the right or left, locomotion problems and metritis. Each model consists of milk yield, parity, season and the year of calving. To determine the correlation between 305-day milk yield and occurring of disorders data have been analyzed with logistic regression model. **Results:** In this research current lactation was used as the lactation with occurrence of particular disorder. According to performed analysis on all cattle (heifers and the cows) higher milk yield was not a risk factor for the disorders occurrence except for diarrhea. Our outcomes showed a negative correlation between milk production with abomasal distention and left abomasal displacement. Analysis of correlation between prevalence of the disorders and 305- day yield showed a negative correlation with abomasal dilatation and displacement to the left and a positive correlation with diarrhea. Parity had a negative correlation with cecal rotation and dilatation, and a positive correlation with diarrhea. The year of calving had a significant correlation with abomasal dilatation and displacement of that to the right, cecal dilatation and rotation, diarrhea and locomotion problems. Calving season had only a significant relationship with cecal dilation and rotation. This research showed a complete correlation between some diseases and disorders in dairy cows and parameters that refer to milk production.

1.INTRODUCTION

The cows that don't have access to sufficient energy in their ration can get sickness (Butler et al. 2011, O'Neill et al. 2012, Lane et al. 2013). Milk production has a high priority in metabolism of dairy cows so lactating cows are more prone to get sick for example infertility than dry cows. This can ruin all the benefits of higher milk yield because of the higher prevalence of the disorders (Bigras-Poulin et al. 1990, Gröhn et al. 1995, Esposito et al., 2014). There is an extensive controversy among researchers about that and the proof of this hypothesis is so difficult. Although some scientists have shown these correlations (Gröhn et al. 1995, Uribe et al. 1995, Esposito et al. 2014) but the hypothesis of high correlation between higher milk yield and occurrence of the disorders is not completely clear. Researches have

***Corresponding Author:** Nastaran Ahangaran Rajabi, Department of Animal Science, Faculty of Agriculture. University of Tabriz, East Azerbaijan, Tabriz, Iran. (Ahangaran_genetic@yahoo.com)

shown that milk fever was the only disorder that has relation with milk yield among the controlled disorders (Jawors et al. 2012). They couldn't find any relationship between other controlled disorders like dystocia, retain placenta, metritis, ovarian cysts, ketosis, abomasal displacement to the left and mastitis with milk yield. Therefore with providing good management and nutrients sufficiency the high milk yield is not a risk factor for disorders. The Aim of study was to know the effect of higher milk yield as a risk factor of disorders.

2. MATERIALS AND METHODS

Data of this research has gathered from veterinarians weekly visits to a dairy cows herd in east Azarbayjan. The 305-day milk yield corrected for 4% fat recorded by the province animal breeding center inspectors monthly. In this study 5052 lactation periods from 1796 Holstein cattles has been analyzed. Milk yield has been categorized in four levels; each class contains nearly 25% of data. Level 1: 1219 kg ≤ Milk305 ≤ 7480kg, Level 2: 7483 kg ≤ Milk305 ≤ 8779 kg, Level 3: 8780 kg ≤ Milk305 ≤ 9996 kg, and Level 4: 9998kg ≤ Milk305 ≤ 14911kg. The parity records were classified in four levels as follow: First parity: level 1, Second and third parity: Level 2, Fourth and fifth parity: level 3, and Sixth parity and more: level 4. The year of calving had 5 levels of 2005 to 2009. The studied disorders included seven groups of diseases:

1-Cecal dilatation and rotation: Cecal dilatation and rotation: This is a post parturient disorder in cows that occurs in the early days after parturition. Clinical signs are: moderate abdominal pain, decrease in stool volume and a tumor like mass in right flank that is palpable in rectal examination or external palpation (Blood obe and Studdert 1993).

2-Mastitis: It is the inflammation of udders without the importance of causative agent. This disorder can be detected by physical, chemical and microbial changes in milk and changes in mammary glands tissue too. Decrease in milk yield, enhancement of production fees and decrease in milk quality are important problems of mastitis but more than that is microbial contamination of milk and transferring the disorders to the humans (Blood obe and Studdert 1993).

3-Diarrhoea: rapid movement of gastro intestinal tract materials from intestine. It can cause malabsorption of nutrients, water and electrolytes. As a consequence poly defecation with watery stool is occurred. This disorder is one of the most important problems of cows that can cause infertility, low fertility and sometimes death. It forces a high economic loss in dairy farms (Blood obe and Studdert 1993).

4 and 5- Right and left abomasal displacement and dilatation: Right or left abomasal displacement and dilatation: The term is used when abomasum moves from its normal location to the left or right. Normally abomasum is located at the button of the abdominal wall somehow to the right. Abomasum can move under the rumen or to the left of rumen wall. Entrapment of abomasum and pressure on its contents can make the problem worse. Gas production and entrapment can lead to bloat. Most of the abomasal displacements (90%) occur till the end of 6th week after the gestation (Blood obe and Studdert 1993).

6-Locomotion disorders: These disorders are cellulitis, foot rot, digital dermatitis, ulcer of white line, breaks and dislocations in different parts of the limbs and the most important of laminitis. Laminitis is inflammation of vascular tissues and is a degenerative condition in sensitive layer of hooves. Laminitis can reduce the food consumption and thus decrease in milk production. It can interfere with oestrus signs. This can lead to low fertility. Laminitis is a consequence of different factors nutrition, environment, infection, genetic and the animal behavior. These factors have interaction with each other and the relative importance of them is different among herds (Blood obe and Studdert 1993).

7. Metritis: It is inflammation of uterus and occurs till the 10th day after the parturition. Clinical signs are: Fever, inappetence, decrease in milk yield, an ordinary vaginal secretion and kyphosis (Blood obe and Studdert 1993).

2.1. Statistical analysis

The disorders could occur more than one time in each animal so the percentage of affected animals and disorders occurrence has been calculated separately. Logistic regression has been used to investigate the influence of milk yield and other factors on occurrence of a disorder as a binary variable. The fixed effects were parity, season and the year of parturition. Current lactation has been used in all the analysis that means the lactation in which the disorder was diagnosed. Estimation of regression coefficients is defined as follow: for a one unit change in the predictor variable (our risk factors), the difference in log-odds for a positive outcome is expected to change by the respective coefficient, given the other variables in the model are held constant.

$$\text{Log}[p.(1-p)]=b_0+b_1*\text{milk305}+b_2*\text{parity}+b_3*\text{calveyear}+b_4*\text{calve season}$$

The response variable is occurrence disorder in cow; therefore p is the probability that occurrence disorder is 1. The 95% confidence limits for each regression coefficient shows that value of each constant parameter locates between two end points in 95% of the cases. In this model b_0 is estimation of logistic regression

(Intercept) when there is no any predictor factor in model except the response variable. For a particular illness, b_1, b_2, b_3 and b_4 are regression coefficients.

3. RESULTS

Total number of the animals with parturition among 2005 to 2009 was 1796 cows. Table 1 shows the type of disorders, number of occurrence, percentage of occurrence, number and percentage of affected animals, and mean of post partum days till the disease occurrence in all lactations. The average of all 305-day milk yields were 8637.6 kg with the maximum of 14911kg and minimum of 1219 kg. Nearly 34.8% of milk yield was from level 1, 42.8% from level 2, 16.65% from level3 and 5.6% was from level 4. Cecal dilatation and torsion with 35.8% and diarrhea with 25.13% were the most common disorder, and metritis with 3.15% was the rarest ones (Table 1). Regression coefficients of b_1 have been used for milk yield risk factor, b_2 for parity, b_3 for the year of parturition and b_4 for the season of calving. The prevalence of the disorders and 305- day yield showed a negative correlation with abomasal dilatation and displacement to the left and a positive correlation with diarrhea (Tables 4 and 6). Parity has significant influence on cecal dilatation, rotation and diarrhea. The year of parturition had significant effect on cecal dilatation and rotation, diarrhea, dilatation and displacement of abomasum to the right and locomotion disorders (Tables 2, 4, 5, and 7). Season of calving had only significant effects on dilatation and rotation of cecum. Except of diarrhea, none of the illnesses in all parities were not dependent to higher milk yield.

Table 1.

Frequency of health disorders in the Holstein herd in 5 year interval

	Disorder complex	Times of incidence	Percentage of incidence	Number of affected animals	Percentage of affected animals	Mean Postpartum day of occurrence
1	Cecal dilatation and rotation	341	35.8	274	15.25	121.7
2	Mastitis	58	6.09	56	3.11	12.5
3	Diarrhea	239	25.13	200	11.13	125.18
4	Right displaced abomasum	88	9.2	84	4.67	127.7
5	Left displaced abomasum	132	13.88	123	6.84	135.5
6	Locomotion disorders	63	6.62	61	3.39	123.6
7	Metritis	30	3.15	30	1.67	167.3

Table 2.

Regression coefficients of risk factors for cecal dilatation and rotation

Parameters	Estimate	Standard error	Probability level	95% Confidence limits
Intercept	-554	204.8	0.006	———
305-d Milk	0.06	0.10	0.53	0.8-1.3
Parity	-0.39	0.14	0.006	1.1-1.9
Calving year	0.39	0.14	0.006	1.1-1.9
Calving season	0.28	0.09	0.003	1-1.6

Table 3.

Regression coefficients of risk factors for mastitis

Parameters	Estimate	Standard error	Probability level	95% Confidence limits
Intercept	-415	385	0.28	———
305-d Milk	-0.19	0.20	0.34	0.5-1.2
Parity	-0.03	0.34	0.91	0.4-1.8
Calving year	0.29	0.27	0.28	0.7-2.3
Calving season	-0.05	0.18	0.75	0.6-1.3

Table 4.

Regression coefficients of risk factors for diarrhea

Parameters	Estimate	Standard error	Probability level	95% Confidence limits
Intercept	320.6	222.4	0.14	———
305-d Milk	0.20	0.11	0.07	0.9-1.5
Parity	0.31	0.21	0.13	0.9-2
Calving year	-0.23	0.16	0.14	0.5-1
Calving season	-0.13	0.10	0.21	0.7-1

Table 5.

Regression coefficients of risk factors for right abomasal displacement and dilatation

Parameters	Estimate	Standard error	Probability level	95% Confidence limits
Intercept	870.8	317.8	0.006	———
305-d Milk	0.12	0.16	0.43	0.8-1.5
Parity	-0.33	0.35	0.34	0.3-1.4
Calving year	-0.62	0.22	0.006	0.3-0.8
Calving season	-0.03	0.14	0.82	0.7-1.2

Table 6.

Regression coefficients of risk factors for left abomasal displacement and dilatation

Parameters	Estimate	Standard error	Probability level	95% Confidence limits
Intercept	-119.7	250	0.63	———
305-d Milk	-0.19	0.13	0.13	0.6-1
Parity	-0.02	0.23	0.91	0.6-1.5
Calving year	0.08	0.18	0.63	0.7-1.5
Calving season	-0.02	0.12	0.82	0.7-1.2

Table7.

Regression coefficients of risk factors for locomotion disorders

Parameters	Estimate	Standard error	Probability level	95% Confidence limits
Intercept	740.9	401.2	0.06	———
305-d Milk	0.12	0.20	0.54	0.7-1.6
Parity	0.01	0.42	0.98	0.4-2.3
Calving year	-0.53	0.28	0.06	0.3-1
Calving season	0.04	0.18	0.81	0.7-1.5

Table8.

Regression coefficients of risk factors for metritis

Parameters	Estimate	Standard error	Probability level	95% Confidence limits
Intercept	155.5	490.5	0.75	———
305-d Milk	0.18	0.24	0.44	0.7-1.9
Parity	0.43	0.44	0.32	0.6-3.7
Calving year	-0.11	0.35	0.74	0.4-1.7
Calving season	0.01	0.22	0.95	0.6-1.5

4. DISCUSSION

Lots of bias factors in researches exist about the correlation of milk yield and occurrence of the diseases that makes these relations unclear. For example elimination of low milk producers with mastitis and saving the high producers with the disease could produce a correlation between mastitis and high production but it could be false.With our knowledge, there is not many research about the relation of milk yield and diseases. It should be noted milk yield is not the only risk factor of diseases. Occurrence of a particle illness can have manage mental and conditional reasons but understanding of all factors and their importance is something hard to do even with modern digital and computerized technologies, so, it is not simple to evaluate the interaction between different factors. It has been shown different ration of heifers from dry cows of previous lactations delay in growth of these heifers and improper growth of their mammary glands influences the milk production in first lactation so first lactation is not a proper marker for the animal milk yield and first lactation yield should be assessed separately. There are some biases in evaluating the correlation between milk yield and occurrence of the illnesses. One of these biases is finding the sick animal and treatment or omitting of them by the animal owner himself and so not observing of that by veterinarians (Gröhn et al. 1995). Another problem is that most of the animal owners delete patient animal with low milk production (e.g., animals with mastitis), but animals with the same disease and high milk production are not omitted so after analysis a false correlation between high milk yield and a particular disease could be found. Correlation between milk yield and mastitis has been evaluated by some researcher. In contrast to Rajala (1998), Gröhn (1998), Gröhn et al. (1995) and Bigras- Poulin et al. (1990), we couldn't find any correlation between mastitis and milk yield. Absence of correlation between current lactation milk yield and mastitis in our research could be because of decrease in milk production as a consequence of infection. It should be concerned that most of the mastitis cases are detected in milking hall.

Outcomes of this research showed there is a negative correlation between milk yield and left abomasal displacement. Fleischer et al. (2001) showed the risk of abomasal displacement can enhance with higher milk yield in the previous lactation .There are some different reports in journals about this correlation. These correlations could not be found when other factors are considered concurrently (Rohrbach et al. 1999). Gröhn et al. (1995) showed that there is no risk of abomasal displacement when the milk yield increases. Cows with parity of 3 or higher have 1.5 times more risk of abomasal displacement compared with the cows with parity of 2. They found that cows with parturition between March to May have a higher risk of abomasal displacement to the right or left. But we could not find any correlation between parity and abomasal displacement to the right and left. Season had no effect on both the illnesses but parturition year had a significant relation with right abomosal dilatation and displacement. In spite of results of Fleischer et al. (2001), we could not find any correlation between milk yield and locomotion problems. There are lots of wrong or incomplete data from dairy farms about the disorders and some of them are not from veterinarians (Fleischer et al. 2001). It should be considered that in C–models (models based on current milk yield-like our model) potency of correlation between milk yield and mastitis has been reduced because of the mentioned reason. Correlation between lower milk yield and locomotion problems has been proved by Rajala (1999). They also found that in 4th parity or higher, healthy cows have lower milk yield than the cows with locomotion problems. This is opposite to our findings. We could not find any relation between parity and this disorder. Just the parturition year had relation with this problem. Heuer et al. (1999) reported that higher milk yield in first lactation period can enhance the risk of locomotion disorders but we did not find similar relationship. In this

disorder nutrition can have an important role. Higher milk yield can only be achieved with higher concentrate in ration but it can cause ruminal acidosis and subclinical lameness (Fleischer et al. 2001).

According to Fleischer et al. (2001) there is not a relation between metritis and milk yield. Opposite to Gröhn et al. (1990) we could not find any relation. Bigras – poulin et al. (1990) and Gröhn et al. (1995) could not find any correlation between milk yield and metritis.

REFERENCES

Butler, M. Patton,J. Murphy,J.J and, Mulligan F.J.(2011). Evaluation of a high-fibre total mixed ration as a dry cow feeding strategy for spring-calving Holstein Friesian dairy cows. *Livest Sci*, 136: 85-92.

Bigras-Poulin, M., Meek, A. H and Martin, S. W. (1990). Interrelationships among health problems and milk production from consecutive lactations in selected Ontario Holstein cows. *J. Prev. Vet. Med,* 8:15-24.

Blood obe, D. C and Studdert, V. P. (1993). Baillieres comprehensive veterinary dictionary. London: Bailliere Tindall.

Esposito, G. Irons P.C. Webb, E.C and Chapwanya, A. (2014)Interactions between negative energy balance,metabolic diseases, uterine health and immune response in transition dairy cows. *Anim Reprod Sci,* 144:60-71.

Fleischer, F., Metzner, M., Beyerbach, M., Hoedemaker, M and Klee, T. (2001).The Relationship between milk yield and the incidence of some diseases in dairy cows. *J. Dairy Sci,* 84: 2025-2035.

Gröhn, Y. T., Eicker, S. W and Hertl, J. A. (1995). The association between previous 305-day milk yield and disease in New York state dairy cows. *J. Dairy Sci,* 78:1693-1702.

Gröhn, Y. T., Erb, H. N., McCulloch, C. E and Saloniemi, H. S. (1990). Epidemiology of reproductive disorders in dairy cattle: association among host characteristics, disease and production. *J. Prev. Vet. Met*, 8:25-31.

Heuer, C., Schukken, Y. H and Dobbelaar, P. (1999). Postpartum body condition score and results from the first test day milk as predictors of disease, fertility, yield and culling in commercial dairy herds. *J. Dairy Sci*, 82:295-304.

Jawor,P.E.Huzzey,J.M. LeBlanc,S.J. von Keyserlingk, M. A. G.(2012). Associations of subclinical hypocalcemia at calving with yield, and feeding, drinking, and standing behaviors around parturition in Holstein cows, *J. Dairy sci*, 95:1240-1248.

Lane, E.A. Crowe,M.A. Beltman, M.E and More, S.J.(2013). The influence of cow and management factors on reproductive performance of Irish seasonal calving dairy cows. *Anim Reprod Sci*, 141:34-41.

O'Neill, B.F. Deight, M.H. O'Loughlin,B.M. Galvin, N. O'Donovan,M and Lewis E.(2012).The effects of supplementing grazing dairy cows with partial mixed ration on enteric methane emissions and milk production during mid to late lactation. *J. Dairy sci*, 95: 6582-6590.

Rajala, P. J and Gröhn, Y. T. (1998). Disease occurrence and risk factor analysis in Finnish Ayrshire cows. *J. Acta. Vet. Scand*, 39:1-13.

Rajala, P. J., Gröhn, Y. T and McCulloch, C. E. (1999). Effects of milk fever, ketosis, and lameness on milk yield in dairy cows. *J. Dairy Sci*, 82:288-294.

Rohrbach, B. W., Cannedy, A. L., Freeman, K and Slenning, B. D. (1999). Risk factor for abomasal displacement in dairy cows. *J Am Vet Med Assoc*, 214:1660-1663.

Uribe, H. A., Kennedy, B. W., Martin, S. W and Kelton, D. F. (1995). Genetic parameters for common health disorders of Holstein cows. *J. Dairy Sci,* 78:421-430.