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Study on the Prevalence of Dairy Cattle Lameness and its Effects of Production Indices in Iran. A Locomotion Scoring Base Study

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Abstract: In this current study, prevalence of lameness was detected and its changes during different parities, Days in Milk (DIM) and milk production were studies. In addition, effects of lameness on Open Days (OD) and Service per Conception (S/C) were studied. Three dairy farms on three scales (1: Large, approximately 900 milking cows, 2: Medium, approximately 100 milking cows and 3: Small, approximately 20 milking cows) were watched for lameness in 2005-2006. Locomotion Scoring (LS) by Sprecher method (1-5 point scale) has been done by videoing of the animals at the exit of the milking parlor. Videos were reviewed by two expert and mean of the each score used as score of the animal, cows with scores 1 and 2 recorded as non-lame and 3, 4 and 5 as lame cows. The average score of the lameness in autumn and spring recorded as 2.47 and 2.73, respectively that was higher significantly in spring. LS has been increased significantly by increasing parity and DIM, as highest scores were recorded in parity 4 and DIM 240-300. No significant differences between lame and non-lame cows were recorded in according to their milk production. The highest (percent in lame cows) scores were recorded in high producing cows. No significant difference in milk production has been recorded in different LS. However the average production of milk in lame cows were 1.08 L day^{-1} less that non-lame cows. The average OD of the lame cows was significantly longer (52 days) than non-lame cows. Lame cows needed significantly higher service/conception (one) than non-lame cows. Median of OD and S/C has been increased by LS.

Key words: Lameness, locomotion scoring, servic/conception, open days, cow

INTRODUCTION

Lameness is one of the most important problems in dairy farms that make financial loss for farmer and pain for animal (Clarkson, 1996). Lameness has the third place in economic losses of dairy farming after infertility and mastitis; however, in developing countries possibly infectious diseases and malnutrition precede lameness (Weaver *et al.*, 2005). Economical losses of the lameness can be divided to direct losses like veterinary costs, time, lower milk production, milk discarding, weight or body condition score loss and indirect losses like increase culling rate, decrease reproductive performance, increase open days and increase risk of mastitis (Weaver *et al.*, 2005; Mohamadnia, 2005; Hernandez *et al.*, 2001; Lucey *et al.*, 1986; Sprecher, 1997).

In a study, prevalence of the lameness had a reverse correlation with the knowledge, training and awareness of the farmers (Mill and Ward, 1994; Radostits, 2001). British farmers estimate prevalence of the disease as 5% but its real prevalence was 22% (Whey, 2002). Incidence of the lameness in last 40 years has been increased that maybe is a result of increase milk production, herd size, modified management indices and breed (Whitaker, 1983).

Individual risk factors for lameness are age, lactation state, body weight, Body Condition Score (BCS), breed and wound in the limbs and herd risk factors are management systems, ratio, size housing places, exposure to feces and wet condition of the floor (Wells, 1995; Whitaker, 1983). Incidence of the lameness increase by age (Mohamadnia, 2005; Rowlands, 1985) with the highest in 5-8 years of age. The highest incidence has been reported on the first month after parturition, more than half of the lameness in high producing cows occurred 4 month after calving (Weaver *et al.*, 2005; Rowlands, 1985). Massive changes in ratio around calving time, use of silage, decreasing the ration of fiber or roughages and high energy ratios increase the risk of lameness (Mohamadnia, 2005; Wells, 1995; Whitaker, 1983). Humidity soften the horny covering of the hooves resulted in higher prevalence of the lameness (underrun heel, white line disease) in more humid months (Wells, 1995; Rowlands, 1985).

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By early detection, as with many physical problems, lameness can best be corrected (Clarkson, 1996; Logue *et al*., 1998; Scott, 1996). Methods of successful early detection have yet to be developed and implemented on the scale of modern commercial dairy farms. Single observation, the most obvious method of lameness detection, is time-consuming and requires great skill on the part of the herdsman, who may have to observe several hundred animals per day. Recognizing that many producers do not detect mild cases of lameness (Wells *et al*., 1993), gait assessment or Locomotion Scoring (LS) methods were developed. Manson and Leaver that used 9-point scale for lameness detection had improved the first scoring system that was improved by other investigators (Wells *et al*., 1993).

Since no national recording system for lameness detection and recording established in Iran, knowing the extent of lameness and its possible effects on production indices can make a basal point for establishing such a national recording system. In other hand different management system and production level in different dairy scales could potentially affect the prevalence of the disease.

MATERIALS AND METHODS

Herds: Three dairy farms on three scales (1: Large, 900 milking cows, with average milk production of 26 L day^{-1}, 2: medium, 100 milking cows, with average milk production of 24 L day^{-1} and 3: small, 20 milking cows, with average milk production of 25 L day^{-1}) in Shahrekord area were watched for lameness and digital lesions during November 2005-April 2006.

In farm one all cows were housed in 10 different partitions in according to milk production and days in milk. The number of the animals in each partition was not the same but their proportions to the surface area were approximately the same and milked three times a day. In farm two and three, cows divided in two different partitions in according to their milk production and milked three times a day.

Locomotion Scoring (LS): Locomotion scoring by 1-5 point scale (Sprecher, 1997) was done in exit of the milking parlor in a given time. At least 10 m of walk was videoed to get the best results. Videos were watched by two observers who taught for LS and average of two scores were used as LS of each cow. Two times of LS from 822 and 908 cows were done in autumn and spring.

Data gathering and analysis: Cows with LS of one and two recorded as non-lame animals and scores 3-5 recorded as lame animals. Information of parity, milk production, Days in Milk (DIM), Service per Conception (S/C) and Open Days (OD) for each cow were used and compared in different LS. For OD and S/C calculation, data of the cows that were positively tested for pregnancy until 2 month after scoring were selected and other information omitted from the study.

One way analysis of variance, t-test, Chi-square and Spearman Rank Order Correlation test used in Sigmastat software for statistical analysis (Jandel Scientific, 2.0). p-values under 0.05 revealed as significant level.

RESULTS

Records of 814 cows recorded in autumn. Four hundred and twenty five (52.2%) cows recorded as non-lame and 389 (47.8%) recorded as lame with the average score of 2.47. In spring 349 cows out of 907 recorded as non-lame (38.47%) and 558 (61.52%) recorded as lame with the average of 2.73 that was significantly higher than autumn (Mann-Whitney Rank Sum Test, $p<0.05$).

LS has been increased significantly by increasing parity, as highest scores were recorded in parity 4 (Table 1) (Kruskal-Wallis One Way ANOVA on Ranks, $p<0.05$).

LS has been increased by DIM (Table 1) (Kruskal-Wallis One Way ANOVA on Ranks, $p<0.05$). A correlation between lameness score and DIM were recorded (Spearman Rank Order Correlation, $p<0.05$).

Milk production of the cows divided into 10 L intervals. No significant difference between lame and non-lame cows were recorded (Table 2) (Chi-Square, $p>0.05$). The highest (percent in lame cows) scores were recorded in high producing cows.

No significant difference in milk production has been recorded in different LS (One Way ANOVA, $p>0.05$) (Table 3). However the average production of milk in lame cows were 1.08 L day^{-1} less that non-lame cows.

Table 1: Distribution of lameness score in different parities and DIM intervals

Parities	1	2	3	4	5
LS (Mean)	2.4	2.57	2.74	2.96	2.93
DIM	1-60	61-120	121-180	181-240	241-300
LS (Mean)	2.38	2.45	2.51	2.35	

Table 2: Distribution of lame cows in different S/C, OD and milk yield

Milk yield (L day^{-1})	0-10	11-20	21-30	31-40	41-50
Lame cows (%)	52.7	53.5	52.6	51.6	57
S/C*	1	2	3	4	
Lame cows (%)	43.75	52.77	62	78.88	
OD*	0-60	61-120	121-180	181-240	>240
Lame cows (%)	41.37	52.32	56.52	81.08	82.5

*Significantly increased in lame cows

Table 3: Distribution of milk yield, S/C and OD between different lameness score

LS	1	2	3	4	5
Milk yield (L day^{-1})	26.26	26.1	25.48	24.39	22.76
S/C*	2.57	2.12	2.86	3.64	4
OD*	124	117	156	193	216

* Significantly increased by LS

The average OD of the lame cows was 52 days longer than non-lame cows (Mann-Whitney Rank Sum Test, $p<0.05$). Lame cows needed one more service than non-lame cows for conception that was significantly higher in this group (Mann-Whitney Rank Sum Test, $p<0.05$). In other word, median of OD and S/C has been increased by LS (Table 3) (Kruskal-Wallis One Way ANOVA on Ranks, $p<0.05$).

Chi-square revealed a significant increase in OD and S/C in lame cows (Table 2).

DISCUSSION

Prevalence of the lameness in Shahrekord area recorded as 55.14% that is somehow higher than some other previous reports. Clarkson (1996) reported 18.6 and 25% prevalence in summer and winter. Sprecher (1997) reported a 65.2% prevalence. Use of different scoring systems maybe the main reason for this difference. An average herd LS ≤2 in Sprecher scoring system and prevalence of 15% is acceptable in dairy farms. In most studies environmental indices like closed pens (Radostits, 2001), hard concrete floors (Radostits, 2001; Nordlund, 2004; Sogstad *et al*., 2005), sliding surfaces (Fault, 1996), overcrowding in walking paths toward milking parlor (Radostits, 2001), extreme humidity (Wells, 1995; Radostits, 2001; Whitaker, 1983) and nutritional indices like use of silage (Wells, 1995) known as risk factors for the lameness. Almost all of these risk factors can be responsible for high prevalence of lameness in this area.

Prevalence of lameness is highest in wet months of the year (Rowlands, 1985). No significant correlation between season and prevalence of the lameness has been found in Wells *et al.* (1993). However, in current study prevalence of the lameness is higher in spring after passing from a wet winter that is the case in some other studies (Rowlands, 1985). In more recent studies changes in seasonality of the hoof lesions like white line disease, digital dermatitis and sole ulcer has been proven (Laven and Lawrence, 2006).

Lameness is more prevalent in higher parities (Radostits, 2001; Well *et al*., 1993; Sogstad *et al*., 2005) that could be a result of stress, hoof condition and higher rate of culling in younger animals (Rowlands, 1985; Wells *et al*., 1993). However strong correlation between type of lesion and parity has been reported, as sole ulcer and white line disease are more prevalent in higher parities (Offer, 2000).

Most studies prove the effect of DIM on lameness, as most cases occur 1-3 month after calving (Weaver *et al*., 2005; Rowlands, 1985). In according to Vaarst *et al*. (1998), most solar disorders happened in 61-120 days after calving. In current study by increasing DIM, lameness has been increased that maybe a result of high environmental insults like long walking tracks, very cold winters, hard and sliding beddings. Also low rate of culling in lame animals maybe a reason for increasing lameness.

One of the most important economical losses of the lameness is less milk production (Weaver *et al*., 2005; Hernandez *et al*., 2001; Radostits, 2001; Hassall, 1993; Hernandez, 2005a). However, some studies could not find any correlation between lameness and milk production (Wells, 1995). In current study daily milk loss estimated as 1.08 L day^{-1} (330 lit per 305 days) that support previously reports, indicating 1.15 L loss per day (Mohamadnia, 2005; Radostits, 2001).

Reduction of reproductive performance is one of economical losses due to lameness (Weaver *et al*., 2005; Hernandez *et al*., 2001; Lucey *et al*., 1986; Radostits, 2001; Hassall, 1993). Disability of the cow in heat expression is the main reason for increasing open days (Weaver *et al*., 2005; Hernandez *et al*., 2001; Sprecher, 1997; Hassall, 1993; Hernandez, 2005b). However, lower conception rate (Hernandez *et al*., 2001; Lucey *et al*., 1986; Hassall, 1993), anestrous (Weaver *et al*., 2005), increase S/C, low BCS, mild metritis concurrent to lameness (Weaver *et al*., 2005) and increased ovarian cysts (Pedro and Julian, 2002) are the most important factors in decreased reproductive performance. Longer OD (32-52 days) and S/C (one) of the lame cows in current study supported by previous reports (14-70 days) (Hernandez *et al*., 2001; Hernandez, 2005b; Collick *et al*., 1989) that showed lower reproductive capability of the lame cows.

CONCLUSION

In conclusion prevalence of the lameness recorded as 55.14% that is higher in spring. By increasing DIM lameness were increased and resulted to lower milk production. Also longer open days and higher service per conception was recorded in this study that needs a new look to controlling and managing of the condition in this country.

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