Bulgarian Journal of Agricultural Science, 20 (No 3) 2014, 710-714
Agricultural Academy

CLINICAL MASTITIS INCIDENCE AND ANALYSIS OF HEALTH CONTROL APPLICATIONS IN DAIRY FARMING ENTERPRISES

B. SENTURK[1]*, B. TEKE[2], M. UGURLU[2] and F. AKDAG[2]
[1] *Ondokuz Mayis University, Department of Livestock Economics and Management, Faculty of Veterinary Medicine, 55200 Atakum, Samsun, Turkey*
[2] *Ondokuz Mayis University, Department of Animal Breeding and Husbandry, Faculty of Veterinary Medicine, 55200 Atakum, Samsun, Turkey*

Abstract

SENTURK, B., B. TEKE, M. UGURLU and F. AKDAG, 2014. Clinical mastitis incidence and analysis of health control applications in dairy farming enterprises. *Bulg. J. Agric. Sci*., 20: 710-714

The aim of this study was to identify the relationship between clinical mastitis and various factors such as physical conditions and teat-health control measures undertaken at dairy-farm enterprises and the proprietor's education and teat-health awareness levels. The study also aimed to determine the prevalence rate of clinical mastitis. Research material consisted of 1838 head of cattle from 68 dairy cattle enterprises among 1079 enterprises affiliated with the Samsun province Cattle Breeders Association. Enterprises were separated into three groups by size as either small (7-20 head), medium (21-30 head), or large (31-94 head). Data was collected using a questionnaire. Barn type was found to vary significantly among the groups ($P<0.05$). The prevalence of mastitis was found to be 7.293% among enterprises and 1.690% per animal in the same enterprises. This rate did not vary significantly among groups ($P<0.05$).

Key words: dairy cattle, clinical mastitis, incidence, udder health practices

Introduction

Teat disease is the most common endemic disease in dairy cattle enterprises and results in significant economic loss. Mastitis is characterized by various sub-clinical indicators, such as the number of somatic cells, color change and clotting in milk; teat swelling; pain; raised temperature; and rashes.

Since 2000, Turkish law requires dairy-cattle enterprises to perform somatic cell counts, a procedure used to detect sub-clinical mastitis in developed countries; however, this procedure is rarely implemented (Annon., 2000). As a result, the detection of mastitis incidence remains problematic and mastitis-related production losses and disease cannot be evaluated.

The cost and efficiency of the various measures undertaken to control mastitis vary. In order to evaluate economic losses caused by mastitis, adequate information regarding teat-health control measures undertaken in enterprises is required. A previous study examined breeder profiles, production characteristics and mastitis control measures in the provinces of Konya, Burdur and Kırklareli. Both breeder profile and mastitis control measures were reported to differ among provinces (Yalçın et al., 2010).

To effectively evaluate economic loss, information regarding the incidence and prevalence of disease is crucial. In a study conducted in 2004 on the subject of health issues related to dairy-cattle breeding in Kars, data were collected using both retrospective and prospective methods, and mastitis cases were evaluated. No differences were found between the data-collection techniques, and the retrospective method was thus reported to be a viable research option (Erdoğan et al., 2004). Other studies investigating various health issues using prospective methods reported the incidence of mastitis to range between 11%-28% (Fourichon et al., 2001; Yalçın et al., 2008).

This study investigated the parameters considered to play a significant role in the occurrence of clinical mastitis (i.e. education level of enterprise proprietor, physical condition of enterprise, proprieter awareness of teat-health control measures, teat-health control measures). It also aimed to deter-

* Correspondence: berrinsenturk@gmail.com

mine the relationship between these parameters and the scale of the enterprise as well as the relationship between scale of enterprise and clinical mastitis rates and the relation between number of animals and clinical mastitis rates. Data collected for the purposes of this study can be used in the future to determine the costs of clinical mastitis to dairy-farm enterprises in Turkey.

Material and Methods

Out of a total of 1079 enterprises affiliated with the Samsun province Breeding Cattle Breeders Association in January 2011, 1838 head of cattle from 68 dairy cattle enterprises were selected for this study.

The following formula was used to determine an effective sample size:

$$n = N\,t2\,p\,q\,/\,d2\,(N\text{-}1) + t2pq^{l},$$

where:

N: Individual number in target population

n: Sample size to be included in the study

p: Estimated survey of population with mastitis (probability of occurrence)

q: Estimated survey of population with lack of mastitis (probability of non-occurrence)

t: Theoretical value in t table at a defined significance level

d: Accepted ± sampling error

The required sample size in non-homogeneous enterprises was calculated as n=64 with a 90% confidence interval and ±10% sampling error. Based on these parameters, 68 enterprises were randomly selected for inclusion in the study.

The number of cattle in the selected enterprises varied between 7-94 head. Enterprises were divided into three groups with respect to animal number. Enterprises were separated into three groups by size as either small-scale enterprises with 7-20 head (Group 1, n=418), medium -scale enterprises with 21-30 head (Group 2, n=530 and large-scale enterprises with 31-94 head (Group 3, n=20), for a total of 890 head of cattle.

A questionnaire was prepared and distributed to enterprise proprietors, and the physical conditions of the barns were evaluated. The questionnaire collected data on education level of enterprise proprietors (8 or less years of education, more than 8 years of education), physical conditions of enterprises, including barn type ['stable' vs 'other' (free-range or penthouse)] and barn floor, breeder awareness of teat-health control measures [California Mastitis Test (CMT); Somatic Cell Number (SCN); biosafety measures; education on mastitis and current teat-health control measures (glove usage, teat dripping, dry cow therapy, milking order)].

This study retrospectively examined clinical mastitis cases occurring over the year prior to the study. Mastitis prevalence was calculated both in relation to number of enterprises and in relation to number of animals. Average herd size per enterprise was fixed as the number of dairy cattle at the start of the year, with the number of cattle joining or leaving the enterprise during the year discounted from calculations.

Statistical Analysis of Data

Data collected in this study were analyzed using the Statistical Package for Social Sciences (SPSS) for Windows 17.0, and descriptive statistics (Number, percentage, mean, standard deviation) were evaluated. A Kolmogorov- Smirnov normal distribution test found that the research variables did not show normal distribution ($P<0.05$). Variables were analyzed using the non-parametric chi-square test, with a 95% confidence interval and a significance level of 5%.

Results

Data were examined under five headings, as follows: education levels of enterprise proprietors, physical conditions of enterprise, breeder awareness about teat-health control measures, teat-health control measures and clinical mastitis rates.

Education levels of enterprise proprietors

Education levels of enterprise proprietors are provided in Table 1.

Differences in cattle number per enterprise did not vary significantly with respect to the education level of the proprietor ($P>0.005$). In general, 86.8% of all enterprise proprietors had eight years of education or less.

Table 1
Education levels of enterprise proprietors

Education	Group 1		Group 2		Group 3		Total	
	n	%	n	%	n	%	n	%
8 years and less	24	92.3	19	86.4	16	80.0	59	86.8
More than 8 years	2	7.70	3	13.60	4	20.0	9	13.20
Total	26	100.0	22	100.0	20	100.0	68	100.0

Physical condition of enterprises (barn type and barn floor type)

Barn type and floor type are provided in Tables 2 and 3. In small scale enterprise group, the ratio of 'closed stable' barns was significantly higher than 'other barn types' ($P<0.05$). Overall, 80.9% of all enterprises comprised closed stables. The prevalence of clinical mastitis was higher in closed stable barns (26 enterprises, 47.3%) than in other types (6 enterprises, 46.2%). However, these differences were insignificant ($P>0.05$).

Barn-floor type did not vary significantly among groups ($P>0.05$). In general, the floors of 75% of enterprises were concrete. Clinical mastitis was observed in 54.5% of enterprises with soil floors, 33.3% of enterprises with stone floors and 47.1% of enterprises with concrete floors ($P>0.05$).

Breeder awareness of teat-health control measures

Responses of proprieters regarding awareness of teat-health control measures are presented in Table 4. Differences in proprietor awareness among groups were found to be insignificant ($P>0.05$).

Teat-health control measures

Parameters examined related to teat-health control measures included glove usage, teat-dipping, milking order and dry cow therapy were investigated. Findings are presented in Table 5. Differences between groups were found to be insignificant ($P>0.05$).

Clinical mastitis rates

The prevalence of clinical mastitis by group and by number of animals is presented in Table 6 and clinical mastitis incidences with respect to enterprise groups were given in Table 7. The present study found overall clinical mastitis prevalence rates to be 7.293% among enterprises and 1.690% per animal in the same enterprises. When examined by group, the mastitis rate was higher in Group 2 (medium-scale enterprise) (54.5%) than in Group 1 (38.5%) and Group 3 (50.0%). The mastitis rate per animal was also higher in Group 2 (3.8%) than in Group 1 (3.3%) and Group 3 (1.9%). However, differences between groups were insignificant ($P>0.05$).

Table 2
Barn types in regard to enterprise groups

Barn type	Enterprise groups							
	Group 1		Group 2		Group 3		Total	
	n	%	n	%	n	%	n	%
Stable	25	96.2	17	77.3	13	65.0	55	80.9
Other	1	3.8	5	22.7	7	35	13	19.1
Total	26	100.0	22	100.0	20	100.0	68	100.0

Table 3
Barn floor with respect to enterprise groups

Barn Floor	Enterprise Groups								X^2
	Group 1		Group 2		Group 3		Total		
	n	%	n	%	n	%	n	%	
Stone	3	11.5	3	13.6	0	0	6	8.8	6,364
Concrete	21	80.8	16	72.7	14	70.0	51	75.0	
Soil	2	7.7	3	13.6	6	30	11	16.2	
Total	26	100.0	22	100.0	20	100.0	68	100.0	

Table 4
Awareness on some teat health applications with respect to enterprise groups

Properties	Enterprise Groups							
	Group 1		Group 2		Group 3		Total	
	n	%	n	%	n	%	n	%
Job education	9	34.6	9	40.9	4	20.0	22	32.4
Biosafety	6	23.10	7	31.80	6	30.0	19	27.90
Knowledge on CMT	0	0.0	1	4.50	1	5.0	2	2.90
Knowledge on SCN	0	0.0	1	4.5	1	5.0	2	2.90

Discussion

Parameters such as education level of breeder, physical conditions of enterprise, teat-health control measures and awareness of these measures may affect the prevalence of clinical mastitis in dairy-cattle breeding enterprises.

In this study, only 13% of all enterprise proprietors had more than 8 years of education. No significant difference in education level was found among proprietors by group; however, the rate of proprietors with eight years of education or more was higher in Group 3 (large-scale enterprises) than in the other groups. A previous study conducted in Konya, Burdur and Kırklareli provinces reported that 21.2% of enterprise proprietors had 8 years or more of education (Yalçın et al., 2010), and another study carried out in Kars province reported this rate to be 22.2% (Erdoğan et al., 2001)6). The education level of the breeders in this study was found to be lower than that reported for other provinces; however the education level increased in proportion with the size of the enterprise.

Overall, this study found 80.9% of all enterprises to have stable-type barns, with the lowest rate found in Group 3. Various studies conducted in Turkey have reported rates of stable-type barns to vary between 76% and 97% (Şeker et al., 2012; Tilki et al., 2013). The present study found the majority of barns (75%) had concrete floors. A previous study of dairy-cattle enterprises in Giresun province found concrete floors in 47.5%, wood floors in 42.4%, earthen floors in 9.7% and stone floors in 0.5% (Tugay and Bakır, 2006). In Burdur, rates were reported to be 73.1% for concrete, 2.4% for stone and 24.5% for earthen floors (Elmaz et al., 2012).

The present study found similar rates of clinical mastitis by barn type and barn floor type; however, enterprises with earthen floors had higher rates of clinical mastitis incidence, which may be attributed to difficulties in disinfecting an earth floor.

Whereas various countries have developed systems for collecting data on endemic animal diseases (Gardner at al., 1990; Kaneene and Hurd, 1990; Emanuelson, 1998), a recording system for endemic diseases in field conditions has yet to be established in Turkey. This has limited research undertaken to determine economic losses caused by endemic diseases. Understanding case-unit costs and breeder behavior is particularly important for the regulation of endemic diseases. This study collected data regarding the awareness of clinical mastitis that could provide a basis for future studies. Breeder's teat-health control measures were also studied in this context. Job education, biosafety, CMT and SCN application values did not differ remarkably among the groups. Overall, breeder aware-

Table 5
Some teat health applications with respect to enterprise groups

Features	Enterprise Groups							
	Group 1		Group 2		Group 3		Total	
	n	%	n	%	n	%	n	%
Glove Usage	5	19.20	0	0.0	1	5.0	6	8.80
Teat–Dipping Application	3	11.50	3	13.60	4	20.0	10	14.70
Milking Order Application	21	80.8	18	81.8	16	80.0	55	80.9
Dry off Period Therapy	6	23.10	9	40.9	6	30.0	21	30.90

Table 6
Clinical mastitis incidence in all enterprises

Features	N	Mean	SD	Min.	Max.
Clinical mastitis incidence per enterprise, %	32	7.293	4.939	2.700	25.000
Clinical mastitis incidence per animal in enterprises, %	32	1.690	0.965	1.000	5.000

Table 7
Clinical mastitis incidences with respect to enterprise groups

Features	Enterprise Groups					
	Group 1		Group 2		Group 3	
	n	%	n	%	n	%
Clinical mastitis incidence in enterprise groups	26	38.5	22	54.5	20	50.0
Clinical mastitis incidence per animal in enterprises	418	3.3	530	3.8	890	1.9

ness of CMT and SCN was found to be 2.9%. Differences in breeder awareness of CMT and SCN did not vary significantly among groups, although proprietors of small-scale enterprises were least aware, with awareness tending to increase with an increase in enterprise scale. A study covering Konya, Burdur and Kirklareli provinces reported SCN awareness to be 3.3% and CMT usage to be 4.4% (Yalçın et al., 2010).

According to the present study, 30.9% of breeders apply dry cow therapy, 14.7% apply teat dipping and 8.8% regularly use gloves while milking In the study carried out in Konya, Burdur and Kirklareli provinces, the same parameters were reported as 61.5%, 18.4% and 18.3%, respectively (Tugay and Bakır, 2006)), whereas another field study conducted in Samsun province reported these rates to be 50%, 3.7% and 9.5%, respectively. The significant differences between studies with regard to dry cow therapy rates indicates that breeders who took part in the present study were less well informed about dry cow therapy and other teat-health control measures when compared to breeders in other regions.

The present study found clinical mastitis prevalence rates to be 7.293% among enterprises and 1.690% per animal in the same enterprises. When looked at by group, clinical mastitis rates varied from 38.5% to 54.5%, whereas rates by animal varied from 1.9% to 3.8%. Rates reported by previous studies range widely, from 3.8% to 28% (Yalçın et al., 2010; Fourichon et al., 2001; Yalçın et al., 2008, Seegers et al., 2003). In general, the clinical mastitis rates were higher in the present study than in previous studies. Although the differences in clinical mastitis rates among groups in the present study were statistically insignificant, the fact that fewer mastitis cases were found in Group 3 (large-scale enterprises) could be due to the higher ratio of enterprise proprietors with more than 8 years of education in this group as well as the higher ratio of teat-health control measures such as the use of CMT and SCN to identify mastitis and teat dipping after milking in this group when compared to the other groups.

Conclusion

This study found that mastitis control practices of dairy-farming enterprises affiliated with the Samsun BCBA did not vary significantly with the scale of the enterprise. Moreover, mastitis prevalence did not differ significantly with the scale of the enterprise. In general, practices such as drying off therapy and teat-dipping were low when compared to the literature, and the overall prevalence of mastitis, 7.29%, was higher than what has been reported by previous studies. The data collected in this study not only makes a contribution to the literature on clinical mastitis, it may be used in the future to study the economic costs of clinical mastitis.

References

Annon., 2000. The ammending of treated drinking raw milk and milk thermal voiding communiqué, Official J., 14.02.2000-23964, Number of Notification**:** 2000/6

Bakır, G., 2002. The structural situation of the private dairy cattle farms in Van Province. Yuzuncu Yıl Universitesi, Ziraat Fakultesi, *Journal of Agricultural Science,* **12:** 1-10 (Tr).

Erdogan, H. M., M. Citil and V. Gunes, 2004. Dairy cattle farming in Kars district, Turkey: I. characteristics and production. *Turkish Journal of Veterinary Animal Science,* **28:** 735-743.

Erdogan, H. M., V. Gunes and M. Citil, 2004. Dairy cattle farming in Kars District, Turkey: II. Health status. *Turkish Journal of Veterinary Medicine*, **28:** 745-752.

Elmaz, O., C. Sipahi, M. Saatcı, M. Ozcelik and M. Metin, 2012. Current trends in dairy cattle farming in the Mediterranean region of Turkey. *Outlook on Agriculture,* **41:** 133-138

Emanuelson, U., 1998. The National Swedish Animal Disease Recording System. *Acta Veterinary Scandinavia*, **84:** 262–264.

Fourichon, C., Beaudeau, F., N. Bareille and H. Seegers, 2001. Incidence of heath disorders in dairy farming systems in western France. *Livestock Production Science,* **68:** 157-170.

Gardner, I. A., D. W. Hird, W. W. Utterback, E. C. Danaye, B. R. Heron, K. H. Christiansen and W. M. Sischo, 1990. Mortality, morbidity, case-fatality, and culling rates for California dairy cattle as evaluated by the National Animal Health Monitoring System, 1986–87. *Preventive Veterinary Medicine*, **8**: 157–170.

Seegers, H., C. Fourichon and F. Beaudeau, 2003. Production effects related to mastitis and mastitis economics in dairy cattle herds. *Veterinary Research*, **34:** 475-491.

Seker, I., H. Tasali and H. Guler, 2012. The structural features of cattle farms in Muş Province. *F.Ü.Sağ.Bil.Vet.Derg.*, **26:** 009-016 (Tr).

Tilki, M., M. Sari, E. Aydin, S. Isik and A. R. Aksoy, 2013. Current status of cattle shelters in livestock enterprises and breeder demands in Kars: I. Current Status. *Kafkas Universitesi Veteriner Fakültesi Dergisi*, **19:** 109-116 (Tr).

Tugay, A. and G. Bakir, 2006. Farmers' of preference of private dairy cattle farms in Giresun Province and the structural situation of barns. *J. of Agricultural Faculty of Ataturk University*, **37:** 39-47(Tr).

Kaneene, J. B. and H. S. Hurd, 1990. The National Animal Health Monitoring System in Michigan. I. Design, data and frequencies of selected dairy cattle diseases. *Preventive Veterinary Medicine*, **8:** 103–113.

Yalcin, C., S. Sariozkan, A. Ş.Yildiz and A. Gunlu, 2008. Incidence of endemic diseases in Dairy herds in Burdur, Konya and Kırklareli Provinces in Turkey. *Turkish Journal of Veterinary Animal Science*, **32:** 423-428.

Yalcin, C., A. S. Yildiz, S. Sarıozkan and A. Gunlu, 2010. Producer profiles, production characteristics and mastitis control applications at dairy herds in Konya, Burdur and Kırklareli provinces, Turkey. *Ankara Universitesi Veteriner Fakultesi Dergisi*, **57:** 43-48.

Received July, 7, 2013; accepted for printing December, 2, 2013.