



Effects of some diseases observed at postpartum period of cows in dairy farms: Economic perspective

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ABSTRACT

In this study, financial losses due to several endemic diseases at the postpartum period of dairy cows were calculated, using the incidence rates and the financial losses from each clinical case of the endemic diseases reported in the literature. The median values of the incidence rates reported in the literature for retained placenta, clinical hypocalcemia, subclinical hypocalcemia, clinical metritis, clinical mastitis, clinical ketosis, subclinical ketosis, lameness and displaced abomasum were 8.6, 3.9, 33, 13.3, 7, 2.5, 19.8, 4.3 and 1.8% respectively. The average losses per case arising from retained placenta, clinical hypocalcemia, clinical metritis, clinical mastitis, clinical ketosis, lameness and displaced abomasum were calculated to be \$257, \$279, \$278, \$212, \$109, \$223 and \$340 respectively. Using the above stated findings, the financial losses for each average cow arising from retained placenta, clinical hypocalcemia, clinical metritis, clinical mastitis, clinical ketosis, lameness, displaced abomasum and the total of 7 diseases were estimated to be \$22, \$11, \$37, \$15, \$3, \$9, \$6 and \$103 respectively.

Key words: Cows, Economic analysis, Endemic diseases, Financial losses, Postpartum period

In dairy cows, genetic selection and improved management conditions led to increased milk production in all countries as well as in Turkey. However, in spite of this increase in milk production, health and fertility problems have also increased significantly (Hailemariam *et al.* 2014, Ingvarsten 2006). This is importantly affected by general profiles of the dairy farms and farmer's ignorance for the rules of business administration. To maintain profitability, farmers often try to maximize milk production while using the ration as cheap and appropriate as possible, yet few of them consider about the financial losses due to health and fertility problems (Hagness-Nielsen and Ostergaard 2009, Ingvarsten 2006).

In dairy farms, fertility problems and endemic diseases specifically at the postpartum stage of the periparturient period (Drackley 1999, Grummer 1995) (the last 4 weeks of pregnancy and the first 4 weeks of lactation) cause an important decline in production and result in associated financial loss (Bar and Ezra 2005, Martins *et al.* 2013).

Dry matter intake decreases while the fetus is growing in the prepartum stage of the periparturient period and milk production increases sharply while dry matter intake increases slowly in the postpartum stage of the periparturient period. Therefore, poorly managed cows use maternal reserves under these conditions leading to suppression of the immune system. As a result, metabolic, reproductive

and mammary diseases are triggered. The postpartum stage takes about 10% of the whole lactation period (300 days) and 30 to 50% of the cows are affected by at least one of these management diseases (Leblanc 2010). Approximately 23.4–65% (Hagness *et al.* 2007, Svensson *et al.* 2006, Waller *et al.* 2009, Zwald *et al.* 2004) cases of clinical mastitis, 90.3% of ketosis, 78.5% of displaced abomasum, 60.4% of metritis and 12.2–36% of lameness are observed at this stage (Zwald *et al.* 2004).

Control of economics and therefore management of endemic diseases in dairy farms became an important issue in the mid-1980s due to decline in subsidies in livestock farming. In Turkey, management of endemic diseases in dairy farms is not considered seriously, yet. As raw milk/feed parity is still at ratio of 1, profitable and sustainable dairy business is almost impossible under current conditions of management. Farmers should either sell the milk at much higher prices or decrease the cost of production. While the farmers are at “passive” position in determining milk prices, they are mostly at “active” position in controlling the production costs (Bar *et al.* 2008, Hogeveen *et al.* 2011, Yıldıız 2008). In this study, endemic diseases related financial losses were evaluated during the postpartum period in dairy cows.

MATERIALS AND METHODS

There is no previous study that calculates financial loss per case during the postpartum stage in the literature. Studies in this field generally focused on losses per case due to a

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single disease or a group of diseases of endemic nature at any time during the lactation period. Therefore, this study, by using the published research, aims to estimate the financial loss per case and per dairy farm due to endemic diseases at the postpartum stage. Endemic diseases included in this study were determined based on their incidence and financial losses that cause; mastitis, metritis, retained placenta, hypocalcemia, laminitis, ketosis and displaced abomasum.

To estimate the financial losses per case and per farm due to endemic diseases at the postpartum stage, a table was prepared to show the results of the previous studies that make calculations for the diseases selected based on their incidence and the economic loss per case.

Since the literature results are not normally distributed and have extreme values, median values were used. The ratio of the median value of financial loss per case to the incidence of certain disease at the postpartum stage was used to calculate economic losses. Also, as the economic losses per case due to diseases are calculated with different currencies in different countries, here we report all the losses as American dollar using the currency exchange of the Turkish Central Bank.

RESULTS AND DISCUSSION

Incidence of endemic diseases at postpartum stage: In the literature, the postpartum stage was not specifically considered and endemic diseases were taken into account as lactation incidence or annual incidence (Yalcin *et al.* 2008, Yildiz 2008). Although reported incidence ratios have a great amount of variation, there is still enough data to calculate disease related financial losses at the postpartum stage and those studies are shown in Table 1.

In Table 1, some studies report data from the official sources of the country while some studies include data from a single farm or multiple farms.

Although it is expected that incidence of a certain disease could differ greatly between countries depending on the time of data collection and different management styles, the mostly observed 7 endemic diseases at postpartum stage have up to 70 fold difference in the incidence of minimum and maximum values reported in Table 1. This difference could be due to differences in methodology of calculations and source of data as previously described by Yildiz (2008).

Based on median values, the most important problem among the clinical diseases appears to be metritis with 13.3% incidence and its main risk factor, retained placenta (8.8% incidence). Mastitis and laminitis (Yildiz 2008) were ranked as 1st and 3rd in annual incidence while they were ranked 3rd and 6th respectively in their incidences at the postpartum stage.

One interesting point as seen in Table 1 is that prevalence of subclinical forms of the diseases are much higher than clinical forms. For example, according to median values, subclinical forms of ketosis and hypocalcemia at the postpartum stage were almost 5 and 8 folds greater than their clinical forms. Although it is reported that subclinical

forms of mastitis, metritis, and laminitis are more serious problems than clinical forms (Yalcin *et al.* 2000), in Table 1 there are no calculations given about the incidence of subclinical forms of these diseases for the postpartum stage.

Financial losses due to endemic diseases at postpartum stage in dairy cows: A number of previous studies that reported financial loss per case in dairy cows due to some endemic diseases are shown in Table 2.

According to Table 2, depending on the time of the study and the country, average financial loss per case was \$278 (162-317) for clinical metritis, \$202 (153-492) for clinical mastitis, \$340 for abomasum displacement, \$245 (68-285) for laminitis, \$279 (146-334) for hypocalcemia, \$109 (73-145) for ketosis and \$257 (244-433) for retained placenta. When the lowest values were considered, financial loss per case for metritis, mastitis, abomasum displacement, laminitis, hypocalcemia, ketosis, and retained placenta were \$162, \$153, \$340, \$68, \$146, \$73, \$244, respectively and totally \$1186. Total financial loss per case from 7 diseases was \$1698.

In Table 3, projected estimation is presented based on data from Table 1 and Table 2 for 7 diseases of the postpartum stage. Median incidence and financial loss per case values were used to calculate the total and individual loss in a 100-head lactating dairy herd.

In Table 3, the total and individual loss in a 100-head lactating dairy herd were calculated to be \$10.279 and \$103 respectively due to endemic diseases at the postpartum stage. The highest financial loss appears to be due to metritis and retained placenta. However, in this evaluation, subclinical forms of the diseases were not taken into account. Since the prevalence of the subclinical forms of hypocalcemia and ketosis were 5 and 8 folds greater than their clinical forms, one can expect that their economic losses must be much greater than the values given in Table 3.

Eradication of endemic diseases completely from dairy farms is not possible, however, one should be aware that increase in production is closely associated with higher incidence of endemic diseases. One main responsibility of the farmer or farm manager must be to minimize the cost of diseases by reducing financial loss and money spent on control strategies.

Firstly, preventable financial losses caused by these diseases should be eliminated. Yalcin *et al.* (2006) reported that 75% of the financial loss due to endemic diseases were preventable in an investigation performed in 87 dairy farms nationwide in Turkey.

Similarly, Yildiz (2008) showed that preventable loss due to endemic diseases might reach up to 69% of the total financial loss. These results are important as they indicate that the farmer or farm manager could avoid a huge portion of the financial loss associated with endemic diseases.

In this study, it was demonstrated that the financial loss by endemic diseases could sum up to 3750 TL in the 4-week postpartum stage even in a traditional small dairy farm of 10 head in Turkey. Moreover, 2700 TL of it (about 2.5

Table 1. Reported incidence/prevalence of endemic diseases at the postpartum stage in dairy farms in different countries.

Study	Country	Farm	Endemic disease*														
			Retained placenta	Clinical hypocalcemia	Subclinical hypocalcemia	Clinical metritis	Clinical mastitis	Clinical ketosis	Subclinical ketosis	Laminitis	Displaced abomasum						
Erdogan <i>et al.</i> (2004)	Turkey	45/	0.4			22.2	3.8										
Mulligan and Doherty (2008)	USA	2/957	3.5	33.0		20.3	15.3					35.4		3.2			
Ribeiro <i>et al.</i> (2013)	Italy	66/470	3.2	3.6	43.3	24.9	8.7					36.6		5.7			8.9
Suthar <i>et al.</i> (2013)	Croatia	7/283	15.3			3.2	8.1					14.8		4.2			0.4
Suthar <i>et al.</i> (2013)	Hungary	24/270	15.2			13.3	7.4					15.6		2.2			1.5
Suthar <i>et al.</i> (2013)	Poland	11/294	12.2	4.1		11.6	7.0					19.4		4.8			2.4
Suthar <i>et al.</i> (2013)	Serbia	42/384	9.5	4.8		18.5	29.9					19.5		10.4			2.1
Suthar <i>et al.</i> (2013)	Slovenia	24/271	28.1	3.4		4.0	4.1					24.0		5.2			1.1
Suthar <i>et al.</i> (2013)	Portugal	113/1000	15.2	4.1		7.2	4.6					29.5		1.2			4.6
Suthar <i>et al.</i> (2013)	Spain	100/1093	8.3	9.5		13.2	2.4					22.5		1.5			2.7
Suthar <i>et al.</i> (2013)	Germany	117/947	8.1	2.3		4.0	1.8					20.0		4.3			1.0
Suthar <i>et al.</i> (2013)	Turkey	24/872	6.4	4.2		3.7	4.6					11.2		1.4			1.1
Sepulveda-Varas <i>et al.</i> (2015)	Chile	6/>200	5.7	0.9	19.5	41.1	11.7					16.6					
Vergara <i>et al.</i> (2014)	USA	251014	8.8	4.2		17.1								5.2			
Armengol and Fraile (2015)	Spain	1/1222	1.1	1.1		27.5											
Median**			8.6	3.9	33.0	13.3	7.0					19.8		4.3			1.8
Minimum			0.4	0.9	19.5	3.2	1.8					11.2		1.2			0.4
Maximum			28.1	9.5	43.3	41.1	29.9					36.6		10.4			8.9
Difference (fold)			70.3	10.6	2.2	12.8	16.6					3.3		8.7			22.3

*Incidence was given for clinical diseases. Prevalence was given for subclinical diseases. **Since the literature results are not normally distributed and have extreme values, median values were used.

tonne of milk) is a preventable loss. This loss could even grow in dairy farms where the incidence of these diseases is higher than average.

However, when evaluating the calculations given in this study for the postpartum stage, calculations were based on information taken from the published research. The incidence of the diseases at the postpartum stage were average values from these published data. However, discrepancies among methodology and data evaluations in

these literatures present serious problems. These discrepancies have been evaluated previously by Yalcin *et al.* (2008). Between 2012–2015, the project of “Networking to enhance the use of economics in animal health education, policy making and research in Europe and beyond” evaluated 850 research papers in terms of discrepancies in used methodology, data evaluation and their use in comparison of the papers. The reasons for these discrepancies are; non-unified calculation methods, use of

Table 2. Financial loss per case in dairy cows due to some endemic diseases reported by previous studies

Author	Literature			Economic loss per case due to infected animal (\$/case)*						
	Country	Year	Material	Retained placenta	Hypocalcemia	Metritis	Mastitis	Ketosis	Laminitis	Displaced abomasum
Mahnani <i>et al.</i> (2015)	Iran	2015	43488 calving data			\$162				
Sharifi <i>et al.</i> (2014)	Iran	2015	135 farms				\$492			
Nielsen <i>et al.</i> (2010)	Sweden	2010	1 farm (150 cows)				\$304			
Bruijn <i>et al.</i> (2010)	Holland	2010	1 farm (65 cows)						\$95	
Duffield (2003)	Canada	2003	1 farm					\$73		
Halasa <i>et al.</i> (2009)	Holland	2009	1 farm (100 cows)				\$202			
Huijps <i>et al.</i> (2008)	Holland	2008					\$153			
Hagnestam <i>et al.</i> (2007)	Denmark	2009	1 farm (150 cows)				\$621			
Ostergaard <i>et al.</i> (2005)	Denmark	2005	1 farm (65 cows)				\$160			
Kossaibati and Esslemont (1997)	England	1997	90 farms (average 152 cows)	\$433	\$319		\$317		\$274	
Cha <i>et al.</i> (2010)		2010	Literature based						\$178	
Bar <i>et al.</i> (2008)	USA	2008	5 farms (4300 cows)				\$179			
Guard (1996)	USA	1996	Literature based		\$334	\$300		\$145	\$285	\$340
Ozsvari <i>et al.</i> (2007)	Bulgaria	2007	4 farms (1476 cows)					\$68		
Yalçin <i>et al.</i> (2006)	Turkey	2006	87 farms	\$257	\$239	\$317	\$222		\$267	
Yildiz (2008)	Turkey	2008	45 farms (560 cows)	\$244	\$146	\$255	\$155		\$223	
Minimum				\$244	\$146	\$162	\$153	\$73	\$68	\$340
Maximum				\$433	\$334	\$317	\$621	\$145	\$285	\$340
Median**				\$257	\$279	\$278	\$212	\$109	\$223	\$340

*All other currencies were converted to US \$ based on currency exchange of Turkish Central Bank on 09.01.2016. **Median values were used since data are not normally distributed.

Table 3. Total and individual loss in a 100-head lactating dairy herd due to endemic diseases at the postpartum stage.

Source	Retained placenta	Hypocalcemia	Metritis	Mastitis	Ketosis	Laminitis	Displaced abomasum	Total
Average incidence (%)	8.6	3.9	13.3	7.0	2.5	4.3	1.8	
Loss per case (\$/case)	257	279	278	212	109	223	340	1698
Total loss in a 100 head herd (average \$)	2197	1074	3691	1484	273	948	612	10279
Average loss per cow (\$)	22	11	37	15	3	9	6	103

terms for different meanings, and use of different expenditure items in calculations of financial loss (Waret-Szkuta *et al.* 2015, Yalçın and Yildiz 2014).

Disease related financial loss per case was calculated only for the form of the disease that apparently cost money. However, subclinical forms of the disease which is much greater than clinical forms must also be considered in calculations of the financial loss.

In this study, financial loss per case was calculated not only from the losses at the postpartum stage but also from the cases that occurred anytime during the lactation period. One must keep in mind that milk production is higher during the postpartum stage and the cow is more sensitive to health problems, therefore, financial loss at this time is expected to be greater than any other time of the lactation period.

None of the studies evaluated in this study calculated the total financial loss due to endemic diseases. When total financial loss is calculated, it should also include the cost of preventive expenditures that dairy farms spend for control and protection strategies.

It is not appropriate to give priority to any disease just because it costs higher financially. For proper ranking, it is important to know how much of the loss can be preventable. Thus, the disease related financial loss is a crucial clue in combatting the disease. However, it is not enough by itself for farmers to reach final conclusions. The decision should be supported by defining the total and preventable losses.

With these criteria under consideration, there is a need for complete and through studies in different areas of Turkey and on different breeds to determine financial outcomes of endemic diseases. The dairy industry of Turkey would greatly benefit from those studies.

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