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Financial losses related to placental retention in dairy herds in Turkey

[*Perdas financeiras relacionadas à retenção placentária em rebanhos leiteiros na Turquia*]

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ABSTRACT

This study aimed to calculate the financial losses related to placental retention (PR) in dairy cattle in Turkey taking into consideration the previous study results in three different geographical regions and 87 herds of Turkey. The mean prevalence of PR in dairy herds was assumed to be 5.6% (4.1-6.7%). Direct (milk losses, treatment, and involuntary culling) and indirect losses (extended calving interval and extra insemination) were calculated. In the financial analysis, direct and indirect losses were calculated according to the current prices of 2022. As a result, the financial losses per infected dairy cattle were estimated at $ 249.7 (624 Lt milk eq.). A total of 67.7% ($173) of these resulted from direct losses, and the remainder 32.3% ($82.5), were indirect losses. PR was responsible for a total of $92 million (ranged from $67-110 million) losses, which equates to 1.2% (0.8-1.14%) of the annual milk production in Turkey. In conclusion, magnitude of PR-related losses will provide evidence-based decision support to the farmers and policymakers when determining the priorities for disease mitigation and control strategies.

Keywords: dairy cows, financial losses, incidence, placental retention, Turkey

RESUMO

Este estudo teve como objetivo calcular as perdas financeiras relacionadas à placental retention (PR) em gado leiteiro na Turquia. Considerando os resultados do estudo anterior em três diferentes regiões geográficas e 87 rebanhos da Turquia. A prevalência média de SR em rebanhos leiteiros foi assumida em 5,6% (4,1-6,7%). Na análise financeira foram calculadas as perdas diretas (perdas de leite, tratamento e descarte involuntário) e indiretas (intervalo de partos prolongado e inseminação extra). Na análise financeira, as perdas diretas e indiretas foram calculadas de acordo com os preços atuais de 2022. Como resultado, as perdas financeiras por gado leiteiro infectado foram estimadas em $249,7 (624 Lt leite eq.). Um total de 67,7% ($173) destes resultou de perdas diretas, e os 32,3% restantes ($82,5), foram perdas indiretas. PR foi responsável por um total de $ 92 milhões (variou de $ 67-110 milhões) de perdas, o que equivale a 1,2% (0,8-1,14%) da produção anual de leite na Turquia. Em conclusão, a magnitude das perdas relacionadas ao PR fornecerá suporte à decisão baseado em evidências para os agricultores e formuladores de políticas ao determinar as prioridades para estratégias de mitigação e controle de doenças.

Palavras-chave: vacas leiteiras, perdas financeiras, incidência, retenção placentária, Turquia

INTRODUCTION

Milk production and reproduction (calving) are the leading economic indicators for the sustainable dairy industry. Higher milk production has led to lower fertility (Mahnani *et al.*, 2021a). Placental retention (PR) is a postpartum reproductive-metabolic disorder on dairy farms and causes considerable financial losses (Mahnani *et al.*, 2021b). PR occurs due to failure to remove the fetal membranes after

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calving and causes a delay in uterus involution, fertility disorders (prolonged service period, days open, low conception rate) due to uterine infections, and decrease in milk yield. PR may also be responsible for the fourth most significant financial losses after mastitis, metritis, and lameness (Ózsvári, 2017).

The fetal membranes are expected to pass from the uterus within 6-8 h after the parturition. However, 12-24 h failure to expel after calving is defined as retained placenta (Lu *et al.,* 2020). Mostly premature and prolonged calving, dystocia, abortions, twinning, infections, season, age, hormonal imbalance, and deficiencies are the reasons for the disease (Han and Kim, 2021).

While there are many studies in different countries on the etiology, incidence, and treatment of PR (Joosten *et al.,* 1987; Stevenson, 2000; Fourichon *et al.,* 2001a), research on calculating financial losses related to PR is rare (Joosten *et al.,* 1988; Esslemont and Spincer, 1993). There are different studies and losses in the field of animal health economics in Turkey such as Neospora caninum ($ 40.5 million loss), Lumpy skin disease ($568,144-$683,695 losses), Brucella abortus ($ 508 million loss) (Demir *et al.,* 2020; Eşki *et al.,* 2021; Mat *et al.,* 2021). To the best of the authors' knowledge, no studies have been conducted on PR-related losses at the national level in Turkey.

The present study aims to provide decision support for farmers to determine priorities in disease prevention and control strategies by calculating the financial losses with current prices (2022) from PR in Turkey.

MATERIAL AND METHODS

Considering the previous study results in three different geographical regions and 87 herds of Turkey (Yalçın *et al.,* 2012), the mean prevalence of PR in dairy herds was assumed to be 5.6% (4.1-6.7%). The calculation methods, technical and financial data used in study are given in Table 1 and 2.

Direct (milk losses, treatment, and involuntary culling) and indirect losses (extended calving interval and extra insemination) were calculated in the financial analysis. Additionally, a decrease in feed consumption due to PR was also considered. Total losses were the subtraction of the reduction in feed consumption from the total losses (direct losses + indirect losses).

Daily milk yield = Total milk yield / Lactation period (305 days)

Table 1. Calculation methods used in the study

Losses/Costs	Explanation
1. Direct losses (a+b+c)	
a. Total milk losses	(No. of total milked cow (head) × PR prevalence)×(reduction in the milk production, kg) × (milk price)]
b. Treatment costs	[(No. of total milked cow (head) × PR prevalence)× (Cost of drug, vitamin etc ($/case) + Vet. fee ($/case) + Cost of labor ($/case)]
c. Culling cost	[(No. of total milked cow (head) × PR prevalence)× (Refresh heifer price ($/head)- Culled cow price ($/head) x (Culling rate due to PR (%)]
2. Indirect losses (d+e)	
Extended calving interval	(No. of total milked cow (head)× PR prevalence) × (Extended calving interval due to PR x Cost of extended calving interval ($/day))
Extra insemination	[(No. of total milked cow (head)× PR prevalence) × Cost of sperm ($/dose) x Extra insemination due to PR (%)]
3. Total losses (a+b+c+d+e)	

Table 2**.** Technical and financial data used in the calculating the losses due to PR

Technical data	Value	Reference/Explanation
No. of total milked cow (head)	6,580,753	Tuik (2022)
Mean prevalence of PR (%)	5.6 (4.1-6.7)	Yalçın *et al*. (2012)
No. of total infected cow (head)	368,522 (269,810-440,910)	Calculation
Total milk yield (lt/lactation)	3,170	Faostat (2022)
Daily milk yield (lt)	10.4	Calculation
Decrease in total milk yield (%)	6	Esslemont and Spincer (1993)
Discarded milk (lt)	40	Guard 1999
Daily feed consumption (kg/head)	12	Yalçın *et al*. (2012)
Consumed feed for 1 lt of milk (kg)	1.2	Calculation
Decrease in feed consumption (%)	30	McInerney *et al.* (1992)
Treatment period (d/case)	4	Guard (1999)
Culling rate due to PR (%)	6	Yalçın *et al*. (2012)
Extended calving interval due to PR (day)	15	Guard (1999)
Extra insemination due to PR (%)	50	Günay *et al.* (2011); Kashoma and Ngou (2021)
Financial data		
Farm-gate milk price ($/lt)	0.4	Tndc (2022)
Concentrated feed price ($/kg)	0.4	Tndc (2022)
Refresh heifer price ($/head)	2,000	Tndc (2022)
Culled cow price ($/head)	1,200	Tndc (2022)
Cost of culling ($/head)	800	Calculation
Cost of labor ($/case)	3	Calculation
Cost of drug, vitamin etc ($/case)	10	Calculation
Vet. fee ($/case)	20	Calculation
Cost of sperm ($/dose)	15	Calculation
Cost of extended calving interval ($/day)	5	Yalçın *et al*. (2012)

Consumed feed for 1 lt of milk = Daily feed consumption / Daily milk yield

Financial losses due to PR were calculated according to the current prices of 2022. Total losses in Turkey were calculated based on average milk yield due to lack of official data for milk yield of different cattle breeds.

RESULTS

Direct, indirect, and total losses due to PR are given in Table 3.

Table 3. Losses due to PR in Turkey

Loss item	Losses ($/case)	Total Losses ($)	%
A. Direct Losses (1+2+3)	173	63,754,306 (46,677,130-76,277,430)	67.7
1. Total milk losses	92	33,904,024 (24,822,520-40,563,720)	36.0
a. Decreased yield	76	28,007,672 (20,505,560-33,509,160)	29.7
b. Discarded milk	16	5,896,352 (4,316,960-7,054,560)	6.3
2- Treatment costs	33	12,161,226 (8,903,730-14,550,030)	12.9
a. Drug, vitamin etc.	10	3,685,220 (2,698,100-4,409,100)	3.9
b. Vet. med.	20	7,370,440 (5,396,200-8,818,200)	7.8
c. Extra labor	3	1,105,566 (809,430-1,322,730)	1.2
3- Culling cost	48	17,689,056 (12,950,880-21,163,680)	18.8
B. Indirect Losses (4+5)	82.5	30,403,065 (22,259,325-36,375,075)	32.3
4-Extended calving interval	75	27,639,150 (20,235,750-33,068,250)	29.4
5-Extra insemination	7.5	2,763,915 (2,023,575-3,306,825)	2.9
C. Decreased feed consumption	-5.8	-2,137,428 (-1,564,898 - 2,557,278)	-2.3
Total Losses [(A+B)-C]	249.7	92,019,943 (67,371,557-110,095,227)	100.0

Total financial losses per infected dairy cattle were calculated as $249.7 (624 Lt. milk eq.); the contribution of direct losses was 67.7% (($173), and the remaining 32.3% ($82.5) was indirect losses. The highest share was calculated for milk losses (36%), and extended calving interval

(%29.4) was later. Costs of involuntary culling (18.8%) and treatment (12.9%) were less than others. PR was responsible for $92 million (ranged from $67-110 million) losses in Turkey.

DISCUSSION AND CONCLUSION

First, reliable data should be obtained to make the accurate decisions at both farm and national levels to manage animal diseases. For this purpose, data on animal diseases are collected using data banks and surveys in various countries (Kaneene and Hurd, 1990; Kossaibati and Esslemont, 1997; Jong *et al.,* 2001; Leonard *et al.,* 2001). Target incidence levels for animal diseases are determined using these data. The performance of individual farms can be compared according to these target levels, and timely preventive measures can be taken (Esslemont and Kossibati 1996; Fourichon *et al.*, 2001b). However, disease records are not kept regularly in most dairy cattle farms in Turkey, and even if they are, these records are not used as a decision support tool in disease control strategies. Therefore, individual field studies are carried out to have reliable data on animal diseases. In a comprehensive field study (Yalçın *et al.,* 2012), the incidence rate of PR in Turkey was determined as 5.6% (4.1-6.7%).

The incidence rate of PR was reported as 12.3% in Iran (Mahnani *et al.,* 2021b), 10.4% in Tanzania (Komba and Kashoma, 2020), 8.8% in France (Fourichon *et al.,* 2001b), 7.8% in USA (Goff, 2006), 6.6% in Netherlands (Joosten *et al.,* 1987), 6.5% in Denmark (Bruun *et al.,* 2002), 6.1% in India (Deka *et al.,* 2021), 3-6% in England (Esslemont and Kossibati, 1996), 3.1% in Australia (Stevenson, 2000). So, the incidence rate of PR in Turkey is nearly at an average level.

On the other hand, the estimated loss of $249.7 per cow for PR in this study was reported as $157 in Tanzania (Kashoma and Ngou, 2021), £298 in England (Kossaibati and Esslemont, 1997), $313-386 in USA (Liang *et al.,* 2017; Gohary and LeBlanc, 2018), $350-481 in Iran (Mahnani *et al.,* 2021a) and £471 in Netherlands (Joosten *et al.,* 1988). Direct losses in Egypt per cow were reported as $47 (Kamel *et al.,* 2022), and treatment costs were calculated as $11.3 in India (Deka *et al.,* 2021). Similarly, milk losses reach Turkey's highest proportion of total losses (Kashoma and Ngou, 2021; Mahnani *et al.,* 2021a; Kamel *et al.,* 2022).

In line with the current study, total milk losses and treatment costs per infected cow in the UK were estimated at £88.5 and £26, respectively (Cooper, 2014). Bellows *et al.* (2002) reported the annual milk losses as $54 million in the USA, higher than in Turkey ($24-40 million). Some differences are to be expected according to different management and treatment methods applied in the country, region, and even in the same region in terms of losses caused by animal diseases. Nevertheless, it may be said that the main reason for the difference between the research results and some literature findings is the differences in the loss items considered and the calculation method (methodology) applied. For example, in the USA, Liang *et al.* (2017) and in Egypt, Kamel *et al.* (2022) did not consider the culling cost in the loss calculation. On the other hand, studies based on monetary losses, the fact that the similar currencies ($, €, £), standardized products like milk equivalent, and economic magnitude of losses (ratio to industry or GDP, %) will facilitate understanding and comparisons.

As mentioned in previous studies diseases have a severe impact on the productivity of animals and farmers' profitability of farmers (Kaneene and Hurd 1990; Miller and Dorn 1990; Dijkhuizen *et al.,* 1995). Namely, the quantum of losses caused by the PR is equivalent to 624 Lt of milk and corresponds to approximately 20% of the lactation milk production per cow in Turkey. Also, total PR-related losses at the national level equate to 230 million Lt milk equivalent (ranged from 168-275 million Lt) and 1.2% (0.8-1.4%) of the annual milk production. In conclusion, since PR can reduce milk production, firstly predisposing factors such as insufficient feeding, short dry period, dystocia, and big calf should be considered and prevent to occur metritis. In addition, vitamin-mineral supplements and vaccination against infectious diseases should be provided. The calculated PR-related losses will provide evidence-based decision support to the farmers and policymakers when determining the priorities for disease mitigation and control strategies.

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