

Prevalence of retained fetal membranes in a dairy cattle farm located in Mureș county, Romania

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Abstract: A clinical study was conducted in a cattle farm in Sângeorgiu de Mureș, Mureș County, Romania (46°34'35"N - 24°36'15"E, altitude 320 m) with a continental-moderate climate, average annual temperature of 8-9°C, and humidity of 86%. The study spanned January to December 2021, involving 240 cattle, including 105 adult cows. The population comprised three breeds: Baltata Romaneasca (n=89), Pinzgau (n=12), and Red Holstein (n=4), with age groups 2-4 years (n=57), 5-7 years (n=41), and >7 years (n=7). The study analyzed the prevalence of retained fetal membranes, dystocia, and endometritis by breed, age, calf sex, and season. Results showed a 13% prevalence of retained fetal membranes (14/105), 2% dystocia (2/105), and 4% endometritis (4/105). Among Baltata Romaneasca, retained fetal membranes was 15.73% (14/89), and Pinzgau had 1 case (8.33%). Dystocia was observed at 2.25% (2/89) in Baltata Romaneasca, and endometritis at 33.33% (4/12) in Pinzgau. Age influenced disease prevalence, with cows over 7 years showing higher rates: retained fetal membranes (28.57%) compared to younger groups (≤12.28%). Endometritis and dystocia followed similar age-related trends. Seasonally, retained fetal membranes cases were highest in spring (16.67%) and winter (14.29%), and lower in summer (9.25%). Endometritis was seen only in summer (12.5%), and dystocia in autumn. Retained fetal membranes was more prevalent in cows with male calves (18.18%) versus female calves (8%). Differences in endometritis and dystocia by calf sex were not significant.

Keywords: prevalence, retained fetal membranes, risk factors, Bălțată Românească, Romania

1. Introduction

In the most recent USDA National Animal Health Monitoring System survey, producers reported that 4.5% of dairy cows experienced retained fetal membranes [1]. The etiology of retained fetal membranes is influenced by factors such as hygiene, management practices [2], cow age and parity, nutrition, and calving conditions (stillbirth, single, or twin calving) [1].

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Several risk factors contribute to this condition, including abortion (especially due to brucellosis or mycotic infection), dystocia, twin births, stillbirths, hypocalcemia, high environmental temperatures, advancing cow age, premature birth or induced parturition, placentitis, and nutritional imbalances, such as elevated prepartum serum nonesterified fatty acids. Cows with retained fetal membranes face a higher likelihood of developing metritis, displaced abomasum, mastitis, ketosis, and early-lactation culling. Additionally, their fertility in the subsequent lactation can be adversely affected. The economic impact of metritis is significant, with an estimated cost of \$386 per case due to decreased milk production, longer intervals to the next pregnancy, increased risk of related periparturient diseases, and higher culling rates [3].

Risk factors for retained fetal membranes vary among different regions or countries because of differences in general management, environment, and herd health control conditions [4, 5]. In addition, effects of retained fetal membranes on

reproductive performance have varied [6]. Our first objective was to determine the risk factors for retained fetal membranes by evaluating several factors: the breed and age of the cows, season, sex of the calves in Băltața Românească cattle farm located in Mureș County, Romania.

2. Materials and Methods

The clinical study was conducted in a cattle farm located on the territory of Sângeorgiu de Mureș in Mureș County, Romania. Geographically, this area is located at 46°34'35"N - 24°36'15"E, an altitude of 320 m, on the left bank of the Mureș river. The climate is continental - moderate with an average annual temperature of 8-9°C and humidity 86%.

The study was conducted between January 2021 and December 2021, in this period of time the farm having a total of 240 cattle, including both adults and young stock.

Concerning the feeding regimen, at the cattle farm, animal nutrition is primarily sourced from existing stock resources year-round, maintaining the unaltered daily ration composition. Notably, green forage is abstained from in the diets of lactating cows.

At the farm, during the winter months, Romanian Spotted Cows are fed with hay that has an appropriate botanical composition to ensure superior nutritional value. During the summer, their diet is occasionally supplemented with fresh forage from the pasture. Additionally, the hay provided was periodically weighed to estimate the average consumption per fed cow. It was challenging to precisely determine the exact quantity of feed ingested by each individual bovine due to the collective maintenance system with unrestricted access to feed. For better handling, the hay was provided in the form of cylindrical bales with a diameter of 1.20 meters. It was made available to the cattle by placing it in a specialized feeding trough with 12 feeding stations located within the paddock where the taurine cattle are housed.

Experimental Animals

Research manuscripts reporting large datasets that are deposited in a publicly available database should specify where the data have been deposited and provide the relevant accession numbers. If the accession numbers have not yet been obtained at the time of submission, please state that they will be provided during review. They must be provided prior to publication.

105 adult cows were included in the study and their calving were followed for one year. First of all, the structure of the population was analyzed according to race and age. The cows in the analyzed population belonged to three breeds: Baltata Romaneasca (no. = 89), Pinzgau (no.= 12) and Red Holstein (no. = 4) (Figure 1).

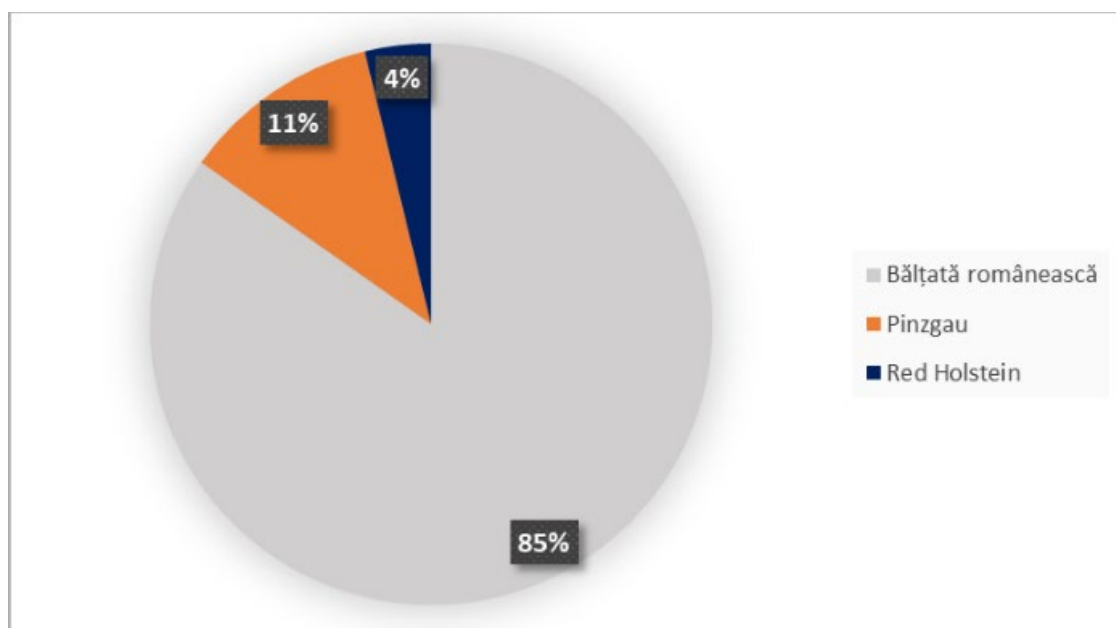


Figure 1. The structure of the studied population: the percentage distribution of the breeds.

In terms of age, the following intervals were established: 2-4 years (no. = 57), 5-7 years (no. = 41) and >7 years (no. = 7) (Figure 2).

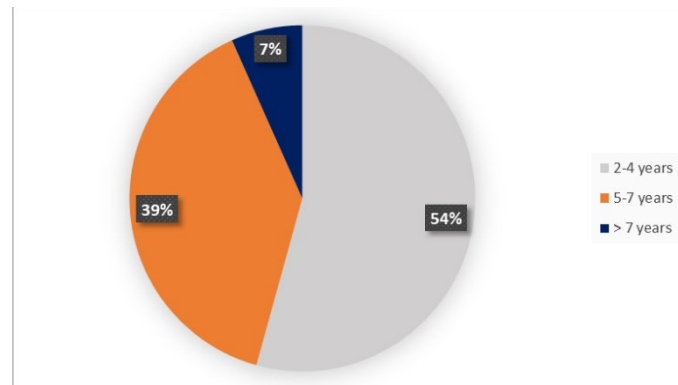


Figure 2. The structure of the studied population: the percentage distribution of age.

Data analysis

The prevalence of retained fetal membranes and other diseases was analyzed descriptively, depending on the breed and age of the cows, season, sex of the calves. For each analyzed variable, data reporting was done for the total number of calving within each category. The results were expressed in absolute and percentage terms (Table 1).

Table 1. Distribution of calvings according to breed and age of cows, season, sex of calves.

BREED	TOTAL CALVING (no. = 105)	
	No.	%
Balațată Românească	89	84.76
Pinzgau	12	11.43
Red Holstein	4	3.81
AGE		
2 – 4 years	57	54.29
5 -7 years	41	39.05
> 7 years	7	6.67
SEASON		
spring	24	22.86
summer	32	30.48
autumn	21	20.00
winter	28	26.67
CALF SEX		
M	55	52.38
F	50	47.62

3. Results and Discussion

This study showed that the prevalence of retained fetal membranes accounted for 13 % of the population (14 out of 105), during the analyzed period, 2 dystocia (2%) and 4 cases of endometriosis (4%) were also diagnosed

(Figure 3). The current study found an overall prevalence of retained fetal membranes at 13%, which is lower than the 17.8% and 18.3% reported by Markusfeld, 1987 [7], Gaafar et al. 2010 [8], and Rahawy, 2021 [9], but higher than the incidences of 6.6%, 7.8%, and 10% reported by Bruun et al. 2002 [10] and Goff, 2006 [11]. The variation in retained fetal membranes incidences reported by different authors may be due to factors such as environment, breed, age, heredity, nutrition, immunity, and hormonal status.

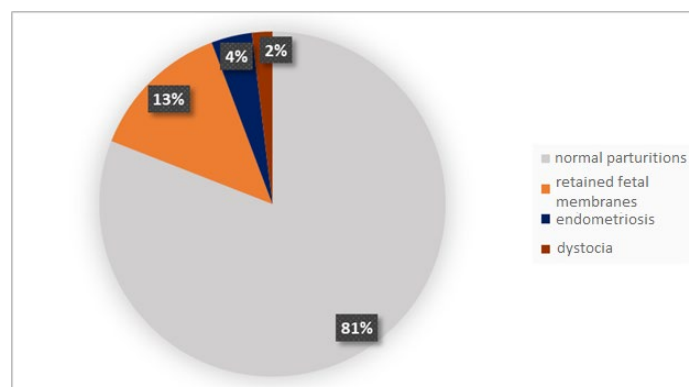


Figure 3. The prevalence of retained fetal membranes, endometriosis and dystocia.

The frequency distribution of retained fetal membranes was presented based on the characteristics of the cows (Figure 4; 5), season (Figure 6), sex of the calves (Figure 7).

From the point of view of the prevalence of retained fetal membranes, depending on the breed, in the case of Balta Romanească (no. = 89) 13 cases (15.73%) were recorded, and for the Pinzgau breed (no. = 12) 1 single case. The other diseases were represented by dystocia with a level of 2.25% (no. = 2) in Baltata Romaneasca and 4 cases of endometriosis (33.33%) in the Pinzgau breed (Figure 4).

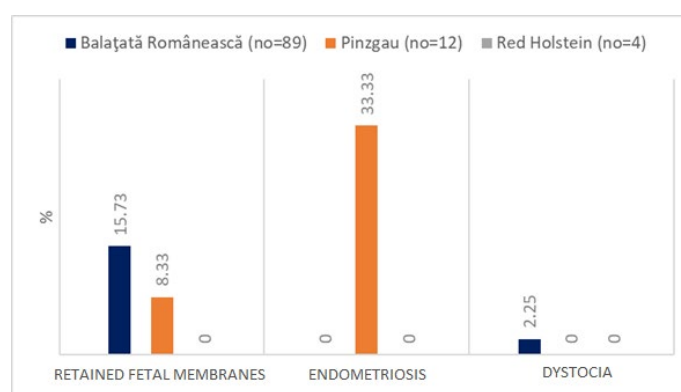


Figure 4. The prevalence of retained fetal membranes, endometriosis and dystocia based on breed of the cows.

The age of the cows was an important factor for all the diseases investigated, the higher percentages being observed in cows over 7 years old. In this category, the level of retained fetal membranes was 28.57%, while for the other categories it did not exceed 12.28%. The same dynamics were observed in the case of endometriosis and dystocia (Figure 5).

Older cows are more frequently associated with retained fetal membranes, older cows tend to have lower uterine muscle tone, contributing to dystocia [12], a known factor in retained fetal membranes [13]. Dairy cows older than five years a decline in their reproductive endocrine system [14], making them more susceptible to retained fetal membranes [15].

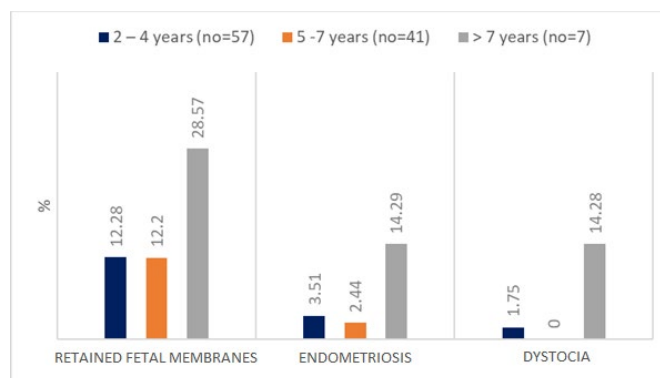


Figure 5. The prevalence of retained fetal membranes, endometritis and dystocia based on age of the cows.

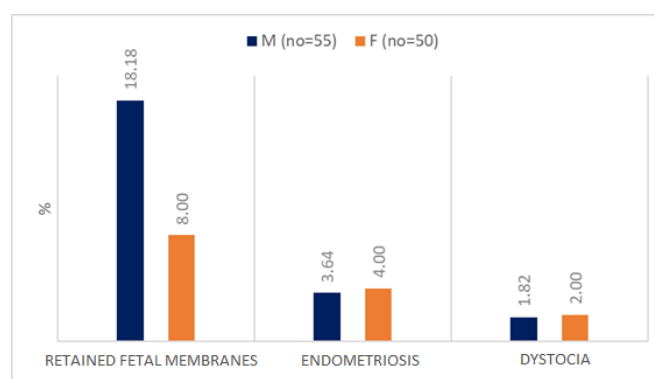


Figure 6. The prevalence of retained fetal membranes, endometritis and dystocia based on sex of the calves.

The analysis of the influence of the sex of the calves on the prevalence of retained fetal membranes revealed the evolution of 10 cases (18.18%) in cows that had male calves and 4 cases (8%) in those with female calves. We consider that the differences recorded from the point of view of the evolution of endometritis and dystocia are not significant (Figure 7).

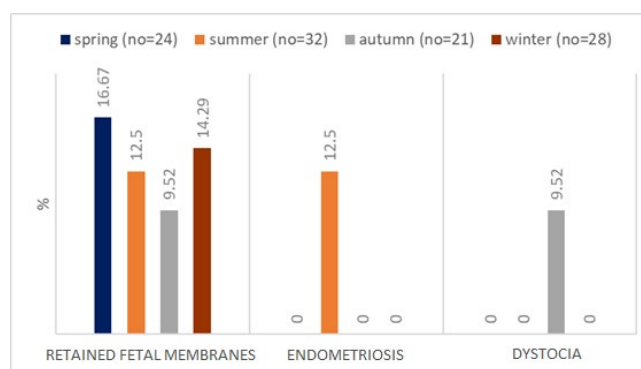


Figure 7. The prevalence of retained fetal membranes, endometritis and dystocia based on season.

This study demonstrated that male calves are more likely to cause retained fetal membranes compared to female calves. Specifically, the incidence of retained fetal membranes was higher in cows with male calves (23.12%) than those with female calves (17.85%) [16]. However, the role of calf sex in retained fetal membranes incidence is debated [17], possibly due to different maternal factors associated with male and female calves, which remain unclear. Gestation length may be a more significant factor in retention of placental membranes, as shorter gestation periods often lead to lighter offspring and a higher likelihood of retained fetal membranes [18]. Female calves typically weigh less (27.57 ± 0.54 kg) than male calves (30.71 ± 0.19 kg) [19], possibly due to fetal androgenic hormones from male fetuses influencing retained fetal membranes incidence [18]. These hormones can negatively

impact the hypothalamic-pituitary axis, reducing Follicle Stimulating Hormone (FSH) and Luteinizing Hormone (LH) production [20], which in turn lowers estrogen levels and increases postpartum progesterone, leading to retained fetal membranes [15].

Regarding the season, we state that most cases of retained fetal membranes were diagnosed in spring (16.67%), followed by the winter season (14.29%), while in spring and summer the percentage was 12.5 and respective 9.25. The evolution of endometriosis was observed only in summer (12.5%), and dystocia in autumn (Figure 6).

Different studies reported that the season of calving significantly influences the incidence of retained fetal membranes [21 - 23]. The summer calving season, in particular, is a major risk factor, with cows calving in summer being 2.84 times more likely to experience retained fetal membranes compared to those calving in spring. The high rate of retained fetal membranes in summer is likely due to heat stress, which hinders placenta expulsion [24]. This finding aligns with Fernandes et al. 2012 [25] but contrasts with Berglund et al. 2003 [26], who observed a higher retained fetal membranes rate in winter, attributing it to stillbirths, dystocia, and twinning. Additionally, Nobre et al. 2012 [22] noted that the rainy season increases environmental challenges for animals, making them more prone to retained fetal membranes.

However, calving's that occur in the summer [27] or during periods of heat stress [1] are linked to a higher incidence of retained fetal membranes. Conversely, Chassagne et al. 1996 [28] found a lower incidence of retained fetal membranes in the autumn. These differing results may be attributed to the varying temperature ranges or management environments across different countries or regions.

5. Conclusions

The study concluded that the prevalence of retained fetal membranes in the cattle population was significantly influenced by breed, age, season, and the sex of the calves. Retained fetal membranes was more common in the Balțata Românească breed (15.73%) compared to the Pinzgau breed (8.33%). Older cows (over 7 years) exhibited a higher incidence of all investigated diseases, with retained fetal membranes reaching 28.57% in this age group. Seasonal variation showed the highest occurrence of retained fetal membranes in spring (16.67%) and winter (14.29%). Additionally, cows that gave birth to male calves had a higher prevalence of retained fetal membranes (18.18%) compared to those with female calves (8%). These findings highlight the importance of considering multiple factors in managing and preventing reproductive health issues in cattle.

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