Incidence of some reproductive problems following a voluntary waiting period in cows on family-type cattle breeding farms in Van Province

Research Article

ABSTRACT

This study aimed to identify some reproductive problems in cows on family-type cattle breeding farms in rural areas of Van province using transrectal ultrasonographic examination. The study included 196 cows (at least 50 days postpartum and non-pregnant) of various breeds and ages. Postpartum days and current body condition scores (BCS) were recorded. Genital organs of each animal were examined twice using rectal palpation and ultrasonography, at intervals of 7-11 days. Cows with a detected corpus luteum in their ovaries were classified as cyclic, while those without were classified as non-cyclic, also categorized according to anovulatory anestrus types. The average number of days postpartum for cows was determined to be 94.42 days. Based on ovarian examination results, 51.03% (n = 99) of the cows were classified as cyclic, while 48.97% (n = 95) were classified as non-cyclic. According to anovulatory anestrus types, 15% (n = 15) of the cows were classified as Type I anovulatory anestrus, 26% (n = 26) as Type II anovulatory anestrus, 54% (n = 54) as Type III anovulatory anestrus, and 5% (n = 5) as Type IV anovulatory anestrus. In addition, pyometra was diagnosed in two of the cows. In the study, it was concluded that the cows in family-type cattle breeding farms in rural areas of Van Province were delayed in starting postpartum cycle activities and high anestrus rates may be primarily due to nutrition. It was concluded that the widespread use of ultrasonography in family-type cattle breeding farms would have significant and positive effects on the reproductive success of cows and sustainable animal breeding.

Keywords: Anovulatory anestrus, dairy cattle, infertility, reproduction, theriogenology

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INTRODUCTION

Livestock plays a crucial role in the social and economic fabric of a country. It has a wide range of functions, not only limited to animal food production but also creating employment, contributing to national income, supplying raw materials to the industry, reducing unemployment in rural areas, and preventing migration to city centers. Especially with the global population increasing, sustaining these roles requires maintaining high-performance animal husbandry practices (Luperto Telli, 2017).

Fertility is a critical factor that affects the success of cattle breeding, which should be kept at an optimal level and is important for the sustainability of the sector (Alcay et al., 2022; Ata, 2013; Koca et al., 2023). In cattle breeding, focusing on calf and heifer productivity is the key to ensuring economical production in cattle farms. In order to ensure economical production, the primary aim is to obtain calves from cows within the optimum period of time. Otherwise, it is not possible to make

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a profit from this sector (Ata, 2013; Cevik, 2023; Koca et al., 2024; Yalcın, 2008). For cattle farms to carry out profitable livestock farming, the life cycle of cows, encompassing parturition, lactation, pregnancy, dry period, and calving to conception, must unfold within a defined timeframe (Noakes, 2009; Ocal, 2007). For pregnancy to occur again after parturition, several crucial processes must occur physiologically, including the completion of uterine involution in the postpartum period, the elimination of bacterial contamination, the regeneration of the endometrium, and the resumption of cyclic activity in the ovaries (Ocal, 2007; Sheldon, 2004).

Negativity and disruptions related to reproduction, by extending the time between calvings, causes a decrease in calf and milk yield throughout a cow's life (Peters and Lamming, 1990). To achieve the goal of having a calf within the optimum period, a cow must become pregnant at the optimal time after the voluntary waiting period. It is understood that a cow should conceive within 80-100 days postpartum, and the postpartum period should not exceed the physiological limit of days (Mwaanga and Janowski, 2000; Rhodes et al., 2003; Roche et al., 2000; Yavas and Walton, 2000). Normally, the interval from calving to first ovulation in dairy cows ranges from 2 to 4 weeks (Crowe 2008; Darwash et al., 1997; McCoy et al., 2006). Dairy cows experiencing postpartum problems are reported to have lower pregnancy rates at the first insemination and require a higher number of inseminations per pregnancy compared to cows with early ovulation (Lamming and Darwash, 1998). Disruptions arising from follicular dynamics and ovulation mechanism in the postpartum period result in follicles on the ovary not entering the follicular wave (inactive ovary), the follicle entering the follicular dynamics atresia without becoming the dominant follicle, the dominant follicle forming but not ovulating and turning into a cystic structure, or the corpus luteum forming after the dominant follicle ovulates showing activity for a long time (Peter et al., 2009; Song et al., 2021).

This study aimed to evaluate reproductive findings detected through ultrasonographic examinations of non-pregnant animals that had completed the voluntary waiting period on family-type cattle breeding farms in Van province, Türkiye. In this way, the objective is to raise awareness about reproductive health in family-type cattle breeding farms in our country. These farms, although small-scale, have a positive impact on local economies by efficiently utilizing natural resources and offer sociological advantages such as reducing rural-to-urban migration. The goal is to support productivity in the livestock sector and contribute to the sustainability of rural livestock farming.

MATERIALS AND METHODS

Animals

The study utilized 196 cows of various breeds and ages, all of which had calved at least once, in rural areas of Van province. The study received ethics committee approval from the Van Yuzuncu Yil University Animal Experiments Local Ethics Committee (Approval no: 2023/11-02).

Examinations of the genital organs

Family-type cattle breeding farms in rural areas of Van province were visited and cows that had completed at least a 50-day voluntary waiting period after birth and were not pregnant were included in the study. The last calving dates of the cows were recorded and the number of days after birth was determined. After each animal underwent a clinical examination and scoring of body condition score (BCS) between 1-5 (Atalay et al., 2019; Yolcu, 2024), their genital organs were examined in detail through rectal palpation and ultrasonography (Honda HS-1500), conducted twice at intervals of 7-11 days.

Cows (n=194) with a detected corpus luteum in their ovaries were categorized as cyclic, whereas those without were classified as non-

cyclic. Also, anovulatory anestrus cows (n=100) were classified according to ovarian findings as specified by Senünver and Nak (2015). Accordingly, cows in which no corpus luteum or dominant follicle was detected in both examinations and no follicular activity (having follicles <5 mm in both examinations) were classified as Type I anovulatory anestrus. Cows in which a dominant follicle is detected on examination (having a follicle up to 8 mm in at least one of the two examinations) but no corpus luteum is detected are classified as Type II anovulatory anestrus. Cows in which ovulatory-sized and larger follicle/follicles are detected during examination, but no corpus luteum is detected in both examinations, are classified as Type III anovulatory anestrus. Cows with persistent corpus luteum detected in both examinations, prolonged luteal phase, and no estrus detected in the anamnesis were classified as Type IV anovulatory anestrus. Cows (n=2) with uterus filled with purulent contents and corpus luteum were accepted as pyometra.

Statistical analysis

The descriptive statistics for continuous variables in the study were expressed as number (n), percentage (%), mean, standard deviation, minimum, and maximum. The SPSS statistical package program (IBM SPSS for Windows, ver.26) was used for calculations.

RESULTS

The study determined that the average number of days after birth for the cows included was 94.42 day (Table 1).

Table 1. The number of days after parturition for the animals included in the study.

Days after parturition	Mean ± Standard deviation	Minimum	Maximum
	94.42±39.01	51.00	280.00

Based on the results of ovarian examination, 51.03% (n=99) of the cows were found to be cyclic, while 48.97% (n=95) were found to be non-cyclic (Fig. 1).

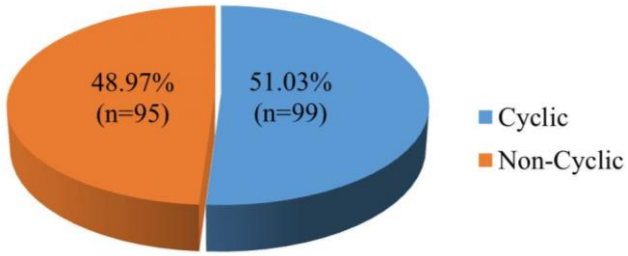

Figure 1. Results of the ovarian examination.

According to the anovulatory anestrus types, 15% (n = 15) of the cows were classified as Type I anovulatory anestrus, 26% (n = 26) as Type II anovulatory anestrus, 54% (n = 54) as Type III anovulatory anestrus, and 5% (n = 5) were identified as Type IV anovulatory anestrus (Table 2). Also, pyometra was diagnosed in two of the cows.

Table 2. Anovulatory anestrus classifications.

Types	Rate
Type I anovulatory anestrus, % (n)	15 (n=15)
Type II anovulatory anestrus, % (n)	26 (n=26)
Type III anovulatory anestrus, % (n)	54 (n=54)
Type IV anovulatory anestrus, % (n)	5 (n=5)

BCS was 2.25-2.75 in Type I and Type II anovulatory anestrus cows, 2.75-3.25 in Type III anovulatory anestrus cows and 2.75-3.50 in Type IV anovulatory anestrus cows.

DISCUSSION

In the study, the average number of days after calving determined in our material, which consisted of cows without a current pregnancy,

was 94.42 day. This rate is notably high for cows that are not currently pregnant, indicating that approximately 50% of the cows exceed the limit reported in fertility parameters (Alacam, 2007). Ensuring that animals become pregnant again within ideal and acceptable periods is essential for the sustainability of family-type cattle breeding farms.

While it is normal or physiological for animals to not have a sexual cycle for a few weeks after parturition, a prolonged absence of a sexual cycle can have a negative effect on their ability to become pregnant again (Gautam et al., 2010; Klm et al. 2012). Reproductive efficiency in dairy cattle is put at risk due to the long anestrus period after parturition (Lucy, 2007). In our study, among animals that completed at least a 50-day voluntary waiting period after birth, the cyclic cow rate was determined to be 51.03% and the non-cyclic cow rate was 48.97%. Large variations in the incidence rates of postpartum anestrus in dairy cattle have been reported, with prevalence at the end of the voluntary waiting period varying between 10- 38% (Darwash et al., 1997; Francos and Mayer, 1988; Rhodes et al., 2003; Walsh et al., 2007). This wide range in prevalence is attributed to the genetics of the cows, their management, climatic conditions, and some other factors (age, stress, uterine infections, etc.)(Mwaanga and Janowski, 2000; Rhodes et al., 2003). Gautam et al., (2010) state that the first postpartum ovulation occurring after the 35th day negatively affects the calving-reconception interval and pregnancy rate. Therefore, they emphasize that the threshold period for the first ovulation after birth is 35 days. Gautam et al., (2010) reported an anestrus rate of 18.6% after 49 days postpartum. In another study (Gautam, 2023) conducted on a dairy cow farm, where 60 days after birth was used as a threshold, the anestrus rate was found to be 61%. In the same study, when 90 days after birth was considered as the threshold, the rate was determined as 31.4%, indicating that approximately 30% of the cows experienced their first estrus between 60 and 90 days after parturition. In our study, we found the rate of non-cyclic cows to be significantly higher than the wide range of 10-38%. However, it is a lower rate than reported in the study by Gautam, (2023). Data from a farm with poor management practices may have contributed to this situation.

The classification of cows with anestrus problems according to ovarian ultrasonographic findings is important for the rational diagnosis and treatment of the underlying physiological condition. According to this classification, in type I anovulatory anestrus, follicles, grow until they emerge from the follicular pool, but there is no deviation. The pathophysiology of this condition is not fully understood, but it is attributed to extreme malnutrition (Wiltbank et al., 2002). We found the incidence of Type I anovulatory anestrus to be 15% (n = 15) in our study. Less than 10% of the dairy population in a normal herd may experience this situation during the postpartum period (Peter et al., 2009). Type I anovulatory anestrus may occur in postpartum animals due to malnutrition and a severe energy deficit, resulting in a lack of LH support necessary to maintain follicular growth and dominance (Jolly et al., 1995). The Type II anovulatory anestrus rate in the study was determined as 26% (n = 26). In this type of anestrus, follicular deviation and growth occur, followed by atresia or regression. In some cases, regression or atresia occurs only after the follicle reaches a dominant state (McDougal et al., 1995). Under normal conditions, when the frequency of LH oscillation waves reaches 1 per hour, the dominant follicle usually completes the final maturation process leading to ovulation (Crowe, 2008). These animals are reported to have low LH pulse frequencies, typically once every 3 to 4 hours (Peter et al., 2009). In type III anovulatory anestrus, there are waiting follicles of ovulatory size or follicles that have exceeded the ovulatory size, the animals detected in this type are 54% (n=54) with ovulatory follicle size exceeded. In this type of anestrus, it may be due

to the insensitivity of the hypothalamus to the positive feedback effect of estradiol produced by the follicles or to the changing follicular response to the gonadotropic support regulated through metabolic hormones (e.g. insulin-like growth factor and insulin) (Peter et al., 2009). The rate of Type IV anovulatory anestrus, which occurs due to the onset of cyclic activity after birth and the prolongation of the luteal phase, was determined as 5% (n = 5). The occurrence of this anestrus may be caused by the absence of an estrogenic dominant follicle at the expected time of luteal regression (Wiltbank et al., 2002), and many factors increase the risk of a prolonged luteal phase, including parity, dystocia, health problems in the first month of lactation, heat stress, and perhaps ovulation immediately after calving (Opsomer et al., 2000). Additionally, uterine infection (Mateus et al., 2002) or pyometra can prolong the lifespan of the corpus luteum (Sheldon et al., 2006).

BCS monitoring in enterprises is important in terms of minimizing reproductive problems, controlling defects in care and feeding, and determining negative energy balance. BCS during calving in cows is one of the most important factors affecting postpartum re-conception. BCS losses occur in animals that are malnourished after calving (Yolcu, 2024). In our study, BCS was 2.25-2.75 in Type I and Type II anovulatory anestrus cows, 2.75-3.25 in Type III anovulatory anestrus cows, and 2.75-3.50 in Type IV anovulatory anestrus cows. Anestrus problems were encountered due to inappropriate care, feeding, and management facilities in the visited farms and that care, feeding, and management should be carried out in accordance with the physiological conditions of the cows for optimum reproductive efficiency.

Implementation of appropriate nutritional strategies is crucial to optimize reproductive performance in dairy cattle, particularly in addressing the anestrus problems mentioned above (Aksoy and Deniz 2024). One of the main reasons for anestrus in animals is the negative energy balance (NED) caused by malnutrition (Okur and Polat 2019). As a result of NED, it causes the formation of endogenous opioids due to the use of the body reserves of the animals, and as a result, the concentration of non-esterified fatty acids (NEFA) increases in the circulation (Erdogan and Ural, 2020; Okur and Polat 2019). High circulating NEFA concentration reduces the frequency of LH release, leading to disruptions in the ovulation mechanism (Okur and Polat 2019). Lack of energy, especially after birth, is considered the most important reason for the late-onset or disruption of ovarian functions (Butler and Smith 1989). For this reason, it is of great importance that the animals are fed with appropriate rations after birth and that estrus monitoring is carried out properly in order to ensure optimum fertility and achieve the specified goals.

It is normal for cows to have a contaminated uterus after parturition (Sheldon et al., 2002). Although the majority of cows can eliminate this bacterial contamination within 5 weeks postpartum, bacterial infection can lead to uterine disease in 10-17% of animals (LeBlanc et al., 2002). In our study conducted on animals that completed at least 50 days postpartum, pyometra was detected in two of cows. The occurrence of uterine infections is related to the individual immune status of the animals, the type and density of microorganisms they are exposed to, other problems experienced during the involution process, and the defense mechanism of the uterus. In order to maintain optimal fertility in farms, it is important to manage the postpartum period effectively (Avcilar et al., 2023; Sheldon et al., 2006). Uterine infections cause significant economic losses on farms. Therefore, preventive measures against uterine infections should be taken and effective

protection strategies for farms are economically important (Ganaie et al., 2018).

CONCLUSION

As a result, the resumption of postpartum cyclic activity was delayed in cows on family-type cattle breeding farms in rural areas of Van province, and the rates of anestrus, which were mainly due to nutrition and management, were high. The most important factor for animals to resume their cyclic activities after birth and become pregnant at the ideal time is the postnatal energy balance. Thus, farms must take care to feed animals with an appropriate ration. Also, it was concluded that the widespread use of ultrasonography in family-type cattle breeding farms would have significant and positive effects on the reproductive success of cows and sustainable animal husbandry.

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Author Contributions: NC carried out the examinations and created the records, NC and DK conceived the idea and prepared the original draft of the article. NC did the writing and DK helped to finalize the manuscript. All authors made corrections and approved the final version of the manuscript.

Availability of data and materials: The data for this study are available on reasonable request from the corresponding author.

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