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Original article

Reproductive disorders of cows in several villages of Kedamean district, Gresik regency, East Java, Indonesia in 2023

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ABSTRACT

Reproductive disorders are the main cause of economic losses in beef herds. This study aimed to determine the type of reproductive disorder in beef cows in Kedamean district, Gresik regency, related to feeding, age, and parity. The method used for this study was a survey. Primary data was obtained from field surveys by interviewing farmers, animal health officials, inseminators, and direct inspection of cows and pens. Secondary data was obtained from the Gresik Animal Husbandry and Animal Health Service. The data obtained was then compiled and performed descriptively. The results showed that the number of productive cows in this study area was 935, of which 340 (36.36%) had reproductive disorders. The highest type of reproductive disorder was ovarian hypofunction (OHF) (14.55%, 136/935) and the smallest was cystic ovaries (0.11%, 1/935). Cows aged two and three years (heifers and first parity) have a percentage of reproductive disorders of more than 60% compared to cows of other ages, most of them (13.82% and 12.65%) were OHF. The cows fed straw have a greater percentage of reproductive disorders than cows fed field grass. Cases of OHF engaged the first position followed by cases of silent estrus and persistent corpus luteum. It could be concluded that reproductive disorders in the form of OHF, persistent corpus luteum, and silent estrus in several villages in Kedamean district, Gresik regency, East Java, Indonesia in 2023 mostly occured at the age of two to three years on heifers or first parity, fed straw.

Keywords: cyclic cows, cystic ovary, ovarian hypofunction, persistent corpus luteum, silent estrus

INTRODUCTION

Meat self-sufficiency had been proclaimed by the government since 1989, but until 2023 it had not been achieved (Lumawir *et al*., 2023). Increasing population growth and increasing people's purchasing power had led to increased demand for meat. Demand for beef is not balanced with the increase in national cattle population and productivity, so the government has to import (Hadi and Chung, 2022). Meat imports since 1989 had fluctuated from year to year, but the trend had increased in the last 40 years. One of the obstacles to increasing the national cattle population was reproductive disorders. Reproductive disorders caused low female fertility, low pregnancy rates and the number of calving (Salman *et al*., 2021a). Most

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of the cattle population in Indonesia (90%) was on smallholder farming, and the rest was on commercial farms and large beef cattle companies (Agus and Widi, 2018). Reproductive disorders at the livestock scale had an impact on reducing livestock populations and meat supplies nationally (Prastiya *et al*., 2022).

Most small farmers preferred to raise livestock to produce calves that can be sold directly, rather than fattening them first. On the island of Java, the typical characteristic of smallholder farmers was keeping 2-4 cows integrated with agriculture as a source of animal feed (Agus and Widi, 2018). The beef cattle production share of East Java was among the highest national production (Sunyigono *et al*., 2021). In the last ten years, the population of beef cattle on smallholder farms in Gresik regency had ranked sixth largest in East Java (BPS, 2022a). Kedamean district would have a cattle population of 7,399 head in 2022 (BPS, 2022b). The veterinarians in the Kedamean Animals Health Center reported the high incidence of reproductive disorders.

Reproductive disorders were the main cause of economic losses in beef herds (Tulu and Negera, 2022). Reproductive disorders affect reproductive performance and reproductive efficiency in cows (Afif *et al*., 2023). Therefore, this study aims to determine the type of reproductive disorder in beef cows in Kedamean district, Gresik regency based on feeding, age, and parity.

MATERIALS AND METHODS

This study was conducted in Kedamean, Gresik district, Gresik regency (Figure 1), district from 15 February 2023 to 15 April 2023. Kedamean, Gresik regency, East Java, at coordinates 7◦ 19′ 25″ South latitude and 112◦ 32 ′ 54″ East longitude, is at an altitude of ± 11 meters above sea level. Temperature 21.3 - 33.4, humidity 43 - 98%, rainfall 207 - 229 mm/year, number of rainy days 170 - 178 days/year.

Figure 1 Villages in Kedamean district, Gresik regency (Source: Google Maps)

This study is a survey with primary data obtained from direct field observations, and the results of interviews with farmers, animal health official, and inseminators, whereas secondary data consisted of beef cattle population data in the villages of Tanjung, Sawen, Belahan Rejo, Slempit, and Mojoroto and data on the results of reproductive checking of cows' reproductive disorders by the Gresik regency Animal Husbandry and Health Service. The diagnosis of

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reproductive disorders in this study was carried out by an experienced and authorized veterinarian using rectal palpation examination techniques. Ovarian hypofunction was a reproductive disorder characterized by the condition of smooth ovaries with no follicles and no corpus luteum on the surface (Salman *et al*., 2021b). Persistent corpus luteum (PCL) was the presence of corpus luteum in the ovaries of non-pregnant cows and based on recordings the cow did not show signs of estrus for more than one estrus cycle (18-22 days) (Magata *et al*., 2012). An ovarian cyst was a condition where there was an accumulation of fluid in a hard-walled structure with a diameter of 2.5 cm on the surface of the ovary that persisted for 10 days or more (BorŞ and BorŞ, 2020; Al-azzawi *et al*., 2022). Silent estrus (SE) was a condition in which a cow could be palpated for the presence of follicles or corpus luteum in its ovaries, but based on recordings the cow did not show signs of estrus for more than one estrus cycle (18-22 days) (Crowe *et al*., 2014). The data obtained is displayed descriptively.

RESULTS

Kedamean of Gresik district consists of 15 villages, namely Banyuurip, Belahan Rejo, Cermenlerek, Glidah, Katimoho, Kedamean, Lampah, Menunggal, Mojowuku, Ngepung, Sidoraharjo, Slempit, Tanjung, Tulung, and Turirejo (Figure 1). This study was conducted in five villages, including Tanjung, Sawen, Belahan Rejo, Slempit, and Mojoroto. Cattle population in this study area was 3,331 heads, with a distribution based on village location as can be seen in Figure 2. Tanjung village had the largest number of cattle, while Slempit village had the smallest cattle population. The number of bull was the highest, followed by the smallest number of cows and calves.

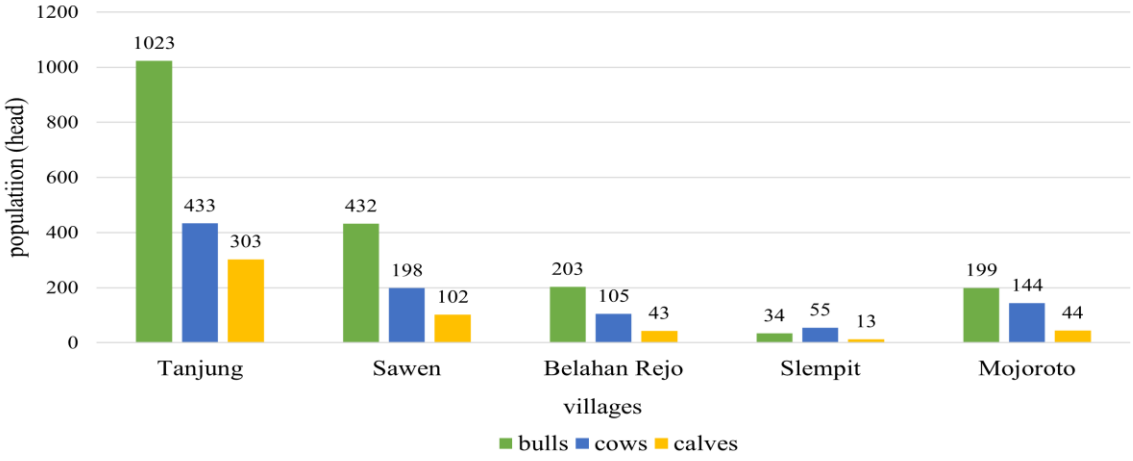

Figure 2. Beef cattle population in several villages in Kedamean district, Gresik regency, East Java, Indonesia in 2023

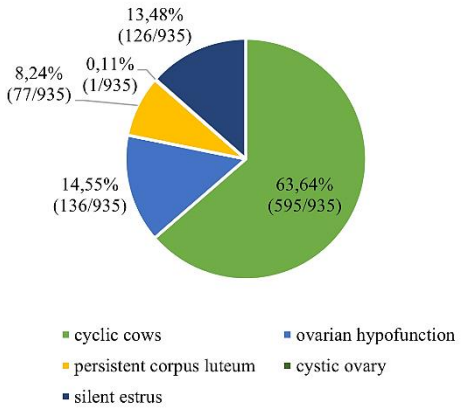

Figure 3 Distribution of reproductive disorders in several villages in Kedamean district, Gresik regency, East Java, Indonesia in 2023

The number of productive cows in this study area was 935, of which 340 (36.36%) had reproductive disorders, and the remaining 935 (63.64%) were cyclic cows. The most common reproductive disorders were OHF (14.55%, 136/935) and the least common was cystic ovaries (0.11%, 1/935) (Figure 3, Table 1). The

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percentage of reproductive disorders in each village showed that Tanjung village had the highest number of cows with reproductive disorders (11.44%, 107/935), and the lowest was in Slempit village (5.56%, 52/935) (Table 2). The description of reproductive disorders based on cow age showed that cows aged two to three years had a percentage of reproductive disorders of more than 60% compared to cows of other ages, most of which were cases of OHF (13.82% and 12.65%) (Table 2).

Table 1 Distribution of reproductive disorder cases per village and percentage of the cow population in Kedamean district, Gresik regency, East Java, Indonesia in 2023

village	cow population (%)	cyclic cows (%)	reproductive disorder				
			number (%)	OHF (%)	PCL (%)	CO (%)	SE (%)
Tanjung	433 (46.31)	326 (34.87)	107 (11.44)	63 (6.74)	30 (3.21)	1 (0.11)	13 (1.39)
Sawen	198 (21.18)	118 (12.62)	80 (8.56)	31 (3.32)	19 (2.03)	0 (0.00)	30 (3.21)
Belahan Rejo	105 (11.23)	30 (3.21)	75 (8.02)	21 (2.25)	13 (1.39)	0 (0.00)	41 (4.39)
Slempit	55 (5.88)	29 (3.10)	26 (2.78)	12 (1.28)	4 (0.43)	0 (0.00)	10 (1.07)
Mojoroto	144 (15.40)	92 (9.84)	52 (5.56)	9 (0.96)	11 (1.18)	0 (0.00)	32 (3.42)
total	935 (100.00)	595 (63.64)	340 (36.36)	136 (14.55)	77 (8.24)	1 (0.11)	126 (13.48)

OHF: ovarian hypofunction; PCL: persistent corpus luteum; CO: cystic ovary; SE: silent estrus

Table 2 Incidence of reproductive disorders according to age groups and percentage of cow population in Kedamean district, Gresik regency, East Java, Indonesia in 2023

age	number of cows (%)	reproductive disorder			
		OHF (%)	PCL (%)	CO (%)	SE (%)
2	99 (29.12)	47 (13.82)	20 (5.88)	0 (0.00)	32 (9.41)
3	106 (31.18)	43 (12.65)	24 (7.06)	0 (0.00)	39 (11.47)
4	40 (11.76)	16 (4.71)	6 (1.76)	1 (0.29)	17 (5.00)
5	55 (16.18)	17 (5.00)	20 (5.88)	0 (0.00)	18 (5.29)
6	24 (7.06)	8 (2.35)	4 (1.18)	0 (0.00)	12 (3.53)
7	12 (3.53)	4 (1.18)	3 (0.88)	0 (0.00)	5 (1.47)
8	2 (0.59)	1 (0.29)	0 (0.00)	0 (0.00)	1 (0.29)
9	2 (0.59)	0 (0.00)	0 (0.00)	0 (0.00)	2 (0.59)
total	340 (100.00)	136 (40.00)	77 (22.65)	1 (0.29)	126 (37.06)

OHF: ovarian hypofunction; PCL: persistent corpus luteum; CO: cystic ovary; SE: silent estrus

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Table 3 Incidence of reproductive disorders based on feed type groups and the percentage of cow population in Kedamean district, Gresik regency, East Java, Indonesia in 2023

forage type	number of cows	reproductive disorder			
		OHF (%)	PCL (%)	CO (%)	SE (%)
straw	320 (94.12)	136 (40.00)	77 (22.65)	1 (0.29)	106 (31.18)
field grass	20 (5.88)	0 (0.00)	0 (0.00)	0 (0.00)	20 (5.88)
total	340 (100.00)	136 (40.00)	77 (22.65)	1 (0.29)	126 (37.06)

OHF: ovarian hypofunction, PCL: persistent corpus luteum, CO: cystic ovary, SE: silent estrus

The description of reproductive disorders based on animal feed showed that cows fed straw had a greater percentage of reproductive disorders than cows fed field grass. Cases of OHF engaged the first position followed by cases of SE and PCL (Table 3). Table 4 shows that the incidence of reproductive disorders in cows mostly occurs in the first and second litters. Cases of OHF engaged the first position followed by cases of SE and PCL (Table 4).

Table 4 Incidence of reproductive disorders based on parity group and percentage of cow population in Kedamean district, Gresik regency, East Java, Indonesia in 2023

parity	number of cows	reproductive disorder			
		OHF (%)	PCL (%)	CO (%)	SE (%)
0	115 (33.82)	54 (15.88)	22 (6.47)	0 (0.00)	39 (11.47)
1	92 (27.06)	38 (11.18)	22 (6.47)	0 (0.00)	32 (9.41)
2	39 (11.47)	16 (4.71)	7 (2.06)	1 (0.29)	15 (4.41)
3	52 (15.29)	16 (4.71)	18 (5.29)	0 (0.00)	18 (5.29)
4	27 (7.94)	7 (2.06)	5 (1.47)	0 (0.00)	15 (4.41)
5	11 (3.24)	4 (1.18)	3 (0.88)	0 (0.00)	4 (1.18)
6	2 (0.59)	1 (0.29)	0 (0.00)	0 (0.00)	1 (0.29)
7	2 (0.59)	0 (0.00)	0 (0.00)	0 (0.00)	2 (0.59)
total	340 (100.00)	136 (40.00)	77 (22.65)	1 (0.29)	126 (37.06)

OHF: ovarian hypofunction, PCL: persistent corpus luteum, CO: cystic ovary, SE: silent estrus

DISCUSSION

Percentage of reproductive disorders in cows varies in each country or region. On farms in the Republic of Bashkortostan, 20-31% of cows examined had reproductive disorders (Skovorodin *et al*., 2020b). Reproductive disorders in North Labuhanbatu regency, North Sumatra province reached 57.3% (Nasution *et al*., 2021). This study was conducted in five villages out of 15 villages in Kedamean Gresik district with a population of 3,331 cows, the number of productive cows was 935, of which 340 (36.36%) with reproductive disorders. The main cause of reproductive disorders was abnormalities in the performance of the ovary-pituitary-adrenal-thyroid endocrine axis and the utero-ovary (Afif *et al*., 2023). Reproductive disorders in cows found in Kedamean district, Gresik regency, East Java, Indonesia in 2023 were OHF, PCL, cystic ovary, and SE.

Ovarian hypofunction

Ovarian hypofunction in cows was a reproductive disorder related to massive economic loss (Widarini *et al*., 2017). Cows with OHF did not show signs of estrus (anestrus) for some time beyond the normal cycle. Rectal examination of the ovaries showed a flat, small, and smooth appearance without corpus luteum and follicles (Long *et al*., 2021), there were no

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palpable follicles and corpus luteum on the ovaries (Salman *et al*., 2021a). In this study, cases of OHF were 14.55% (136 of a population of 935 cows). Case reports of OHF in cows in several regions showed various variations. In Woha Sub-district, Bima regency, West Nusa Tenggara province OHF was 5.45% (Lukman *et al*., 2023), in the district of Kaliori, Rembang regency, Central Java province was6.25% (Sutiyono *et al*., 2017), in Jepara regency, Central Java, Indonesia was 8.88% (Salman *et al*., 2021a), and in Tutur district, Pasuruan regency was 22% (Qodri *et al*., 2020).

The etiology of this ovarian dysfunction was low-quality feed, problem of minimal health, poor sanitation, and housing problems (Widarini *et al*., 2017). Ovarian hypofunction had the strongest correlation with body condition score, followed by the feed given to cows (Nasution *et al*., 2021). Lack of nutrition (protein, energy, minerals, and vitamins) caused late estrus, SE, or anestrus (Nasution *et al*., 2021). This nutritional deficiency was related to increased fat mobilization and impaired steroidogenesis caused by negative energy balance during breastfeeding and impaired phosphorylation due to mineral deficiency (Skovorodin *et al*., 2020b). Long-term poor health and lack of food caused OHF, which in chronic case could cause ovarian atrophy (Salman *et al*., 2021a). In this study, it was confirmed that all cows with OHF were fed only dry straw.

Cows with OHF had a problem in converting dehydroepiandrosterone sulfate into testosterone and estradiol-17β. There was no estrogen surge before ovulation in these cows (Mikhalev *et al*., 2021). Histological and histochemical studies revealed that high atresia in all types of ovarian follicles was associated with OHF. This was associated with stromal vascular dystrophy and was accompanied by atrophy of endocrine elements resulting in decreased endocrine and generative function of the ovaries (Skovorodin *et al*., 2020b). TNFα levels in cows with OHF were higher than in cyclic cows. TNFα stimulates IL-1β production, while serum IGF levels in cows with OHF were lower, indicating decreased function of gonadal hormone production and decreased insulin production. The serum concentration of anti-Müllerian hormone in hypofunctional cows was lower, indicating that the reproductive cycle was abnormal and there were no mature follicles (Mikhalev *et al*., 2021).

The cases of OHF in this study could be treated generally with gonadotrophin hormone. Ovarian hypofunction was treated with gonadotropins (200 IU PMSG and 100 IU HCG) followed by 100% estrus and a pregnancy rate of 70% of inseminated estrus cows (Berliana *et al*., 2023). Furthermore, treating OHF with a combination of 300 IU PG-600 and 100 IU hCG was sufficient to induce 100% estrus rates and 100% pregnancy rates (Masruro *et al*., 2020). Several pharmacological substances and their application techniques had been reported to be effective in suppressing hypofunctional estrus in cows. The combination of Metrostim (the active substance is carbacholine) had a restoring effect on the myometrium, and Surfagon, a synthetic analog of Gonadotropin-Releasing Hormone, had a gonadotropic effect (Khamitova *et al*., 2020). Treatment of bovine OHF with intraovarian administration of autologous platelet-rich plasma, which was rich in growth factors, chemokines, and cytokines, had been reported to stimulate follicle growth and steroidogenesis. Intraovarian platelet-rich plasma reduced follicular atresia or revitalizes dormant oocytes thereby restoring fertility (Cremonesi *et al*., 2020). Another treatment technique with epidural injection of gonadotropins had also been reported to be effective in reactivating OHF. It was known that sympathetic neurons of the ovarian plexus and hypogastric nerves innervated the ovaries of cow, so epidural injections had an impact on the ovaries. Epidural injection of Gonadotropin-Releasing Hormone analogs induced the estrous response and conception events in cows with inactive ovaries. Concentrations of progesterone, follicle stimulating hormone, and luteinizing hormone increased significantly (Amin *et al*., 2023).

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Persistent corpus luteum

Corpus luteum was a gland that produced progesterone with a lifespan of only 18 days in cyclic cows or during pregnancy. The corpus luteum was formed due to a surge in luteinizing hormone which triggered ovulation in mature follicles. In addition, arachidonic acid, growth factors, and cytokines in the stromal tissue remaining from ovulation in the ovary caused luteinization of granulosa cells to produce corpus luteum. Physiologically, corpus luteum underwent regression by prostaglandin F2α (PGF2α) which was produced by healthy, non-pregnant endometrium at the end of the luteal phase. Corpus luteum structural regression was influenced by endothelin-1, cytokines (tumor necrosis factorα, interferon), and nitric oxide which play a role in inducing apoptosis. Luteolysis followed by functional regression was no longer able to carry out steroidogenesis, or progesterone synthesis, so it was characterized by a decrease in progesterone levels (Skarzynski *et al*., 2013). Basal progesterone levels eliminated negative feedback to the hypothalamus and anterior pituitary, thereby releasing follicle-stimulating hormone for follicle growth. When the follicles mature, estrogen was produced in sufficient quantities to cause signs of estrus (Evans *et al*., 2022). Persistent corpus luteum was characterized by the presence of a corpus luteum (thick-walled luteal tissue) in the ovarian cortex in cows that did not show signs of estrus for more than one estrous cycle (Long *et al*., 2021).

In this study, PCL cases were 8.24% (77 of a population of 935 cows). This was lower than 11.82% PCL cases in Woha Sub-district, Bima regency, West Nusa Tenggara province (Lukman *et al*., 2023), and 10.0% in North Labuhanbatu regency, North Sumatra province (Nasution *et al*., 2021). Cows with PCL in younger cows were confined to lower parity (Long *et al*., 2021). In this study, it was confirmed that some cows with PCL at a young age (two to three years old, heifers or first parity). It was known that endometritis after the first calving has a greater influence on the occurrence of PCL than in subsequent calving. Microbiological studies had proven the presence of a greater number of pathogenic bacteria in the uterine lumen associated with the first corpus luteum postpartum than in subsequent calving (Strüve *et al*., 2013). Cows with PCL generally had poor body condition scores. Poor body condition scores were caused by malnutrition (Long *et al*., 2021). In this study, it was confirmed that all cows with PCL were fed only dry straw.

Cows with PCL had impaired release of prostaglandin (PG) F(2α) from the endometrium. Corpus luteum tissue biopsies showed that the expression of mRNAs related to lymphangiogenesis, inflammation, and apoptosis were the same in PCL and gestation corpus luteum, but not in cyclic corpus luteum (Magata *et al*., 2012). Persistent corpus luteum could be removed by manual enucleation, but this technique carried the risk of adhesions between the ovaries and surrounding tissue which could cause new problems for reproduction (Hamouda *et al*., 2020). Persistent corpus luteum treatment could be carried out by administering prostaglandin F2a or its analogs intramuscularly, intrauterinely (Behzadi-Shahrbabak *et al*., 2021), or intravulvosubmucosally (Rovani *et al*., 2012). Prostaglandin F2a or its analogs caused luteolysis through the mechanism of disrupting blood microcirculation, parenchymal macrobiotics, and corpus luteum mesenchymal stromal vascular dystrophy (Skovorodin *et al*., 2020a). Persistent corpus luteum regression would be followed by folliculogenesis and induced estrus (Evans *et al*., 2022).

Cystic ovary

Ovarian cysts were classified into three, namely follicular cysts, luteinized follicular cysts, and corpora luteal cysts. In cows that were lactating, there was a decrease in follicle stimulating hormone and luteinizing hormone levels and a significant increase in the value of prolactin hormone which caused ovarian cysts. Timely weaning and balanced feeding could reduce risk factors associated with cystic ovary syndrome (Al-azzawi *et al*., 2022). Follicular

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cysts were characterized by repeated estrus faster than the normal estrus cycle phase (18-24 days), while PCL and luteal cysts were characterized by an anestrous condition of more than one estrus cycle (Turner *et al*., 2023). Follicular cysts in cows were identified based on the presence of structures such as anovulatory follicles measuring 2.5 cm and persisting for more than 10 days (Jeengar *et al*., 2014), with signs of continuous estrus (Long *et al*., 2021). Follicular cysts occurred due to impaired hormone secretion and receptor mRNA expression in bovine cystic follicles, which affected steroidogenesis in the ovaries (Xu *et al*., 2023). In granulosa and theca cells, the expression levels of IL-1RI, IL-1RII, IL-1RA, and IL-4 were higher in cystic follicles than in normal dominant follicles (Stassi *et al*., 2019). Corpus luteum cysts were characterized by anestrus in cows. Luteal cysts were diagnosed based on symptoms of anestrus, by trans-rectal palpation techniques, or combined with ultrasonography. Corpus luteum cysts form due to impaired luteinizing release, due to low estrogen feedback mechanisms from the developing follicle. This disorder caused cellular and molecular changes in the growing follicles to fail to ovulate and form corpus luteum cysts (BorŞ and BorŞ, 2020).

Examination of ovarian cysts could be done by rectal palpation or using ultrasound. Based on examination with B-mode ultrasound, it was carried out by measuring the width of the edge of the luteal tissue. A follicular cyst greater than 20 mm in diameter without a corpus luteum persisted for at least 10 days. A luteal rim width of more than 3 mm is a luteal cyst. The accuracy of the diagnosis of follicular and luteal cysts could be validated by measuring serum progesterone levels. A progesterone concentration of more than 1 ng/mL confirmed luteal cysts, while a progesterone level of less than 1 ng/mL confirmed follicular cysts. Color Doppler ultrasound technology allowed assessing the measurement of blood flow areas in the ovaries. Luteal cysts on Color Doppler showed no vascularization within the cyst or show low blood flow resistance around the cyst. The opposite was true for follicular cysts (Turner *et al*., 2023). In this study, based on rectal palpation examination reports, it was showed that cases of cystic ovaries were very small, namely only 0.11% (1 in 935 cow population) in the study area. The percentage of ovarian cysts in several regions was varied. In Woha Sub-district, Bima regency, West Nusa Tenggara province follicular cysts were reported at 12.73% (Lukman *et al*., 2023), 1.25% in the district of Kaliori, Rembang regency, Central Java province (Sutiyono *et al*., 2017) and 9% in Tutur district, Pasuruan regency (Qodri *et al*., 2020).

Various studies had been carried out for the early detection of reproductive disorders. Higher plasma non-esterified fatty acid levels and lower calcium levels could be used to predict an increased risk of inactive ovaries and ovarian (follicular or luteal) cysts (Song *et al*., 2021). Treatment of follicular cysts could be done by manually rupturing the follicular cyst. However, manual rupturing was not recommended because of the possibility of bleeding and adhesions (BorŞ and BorŞ, 2020). Treatment with injection of a single dose of hCG or a combination with Gonadotropin-Releasing Hormone, progesterone, and prostaglandins had been frequently used in clinical practice. Other therapies could include injection of an estrogen receptor blocker (clomiphene citrate) or trans-vaginal ultrasound-guided aspiration of cystic follicles (Jeengar *et al*., 2014).

Silent estrus

Silent estrus or sub-estrus occurred when the hormone estrogen was insufficient to manifest visual signs of estrus, even though the genital organs are undergoing normal cyclical changes (Crowe *et al*., 2014). The incidence of SE varies from 10% to 40% among different livestock groups (Utami *et al*., 2022). In this study cases of SE were 13.48% (126/935 cow population in the study area). Several publications reported different results on the incidence of SE cases in cows. Cases in Woha sub-district, Bima regency, West Nusa Tenggara province was 4.55% (Lukman *et al*., 2023), 10-40% in dairy farms (Lee *et al*., 2021), 19% in Tutur district,

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Pasuruan regency (Qodri *et al*., 2020). First ovulation in cows generally occurred silently (i.e., no estrus behavior) and was generally (>70%) followed by a short cycle (Utami *et al*., 2022). In this study, it was confirmed that some cows with SE at a young age (two to three years old, heifers or first parities). Silent estrus could be caused by disruption of ovarian activity due to low consumption of nutrients in feed. Lack of nutrition caused endocrine disorders in the hypothalamus-pituitary-ovary axis, which was followed by low estrogen levels so that cows could not show signs of estrus (Utami *et al*., 2022). In this study, the highest number of SE cases occurred mostly in cows fed dry straw.

Accurate estrus detection was necessary to optimize insemination and improve reproductive performance in cows (Lee *et al*., 2021). Correct estrus detection was very necessary to reduce silent events. The manifestation of estrus was caused by the effects of estrogen on the central nervous system. Standing estrus was the most reliable sign of estrus and an estimate of the time of ovulation. Estrus detection was efficient in reducing the possibility of unnoticed estrus with visual observations carried out three times a day for a minimum of 30 minutes. Visual observation of signs of estrus could be done by monitoring using ultrasound of the ovaries and reproductive tract to estimate the time of ovulation. The timing of ovulation was very important in cow reproductive management because the optimal time for artificial insemination was based on when ovulation occurs. The accurate estrus detection was important to achieve the right time of insemination and high conception rates (Rao *et al*., 2013). The protein bovine lactoferrin (bLF) was known to be overexpressed in bovine cervical mucus during estrus. Anti-bLF monoclonal antibodies (Mab) was known to have high affinity with bLF which could be used as an accurate estrus detection kit (Lee *et al*., 2021). Accuracy in detecting estrus by farmers could be used as an early warning of possible reproductive disorders which could then be verified by a reproductive medical veterinarian. Furthermore, improving the quantity and quality of feed as a source of energy, protein, minerals, and vitamins in sufficient quantity was needed to minimize the occurrence of reproductive disorders.

CONCLUSION

Reproductive disorders in several villages in Kedamean district, Gresik regency, East Java, Indonesia in 2023 were ovarian hypofunction, persistent corpus luteum, and silent estrus which mostly occurred at the age of two to three years on heifers or first parities fed dry straw.

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AUTHOR'S CONTRIBUTIONS

Budi Utomo (BU), Rimayanti Rimayanti (RR), Tjuk Imam Restiadi (TIR), Muhammad Fajar Amrullah (MFA). BU: conceived the idea, and designed the mainframe of this manuscript, acquisition. RR and TIR: analysis and interpretation of data. MFA: manuscript drafting. All authors read and approved the final manuscript.

CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

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