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Assessment of Reproductive Health Disorders in Dairy Cattle and Its Associated Risk Factors in Melka Belo Woreda of East Hararghe Zone, Oromia, Ethiopia

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ABSTRACT

One of the key elements affecting the profitability of the cow-calf business is reproductive disorders. From March to August of 2022, a cross-sectional study was conducted in Melka Belo Woreda East Hararghe Zone with the aim of identifying reproductive health issues in dairy cattle and the risk factors associated with them. According to the current study, of the 50 respondents, 37 (74%) were men and 13 (26%) were women, with respect to various occupational and educational backgrounds. Of the 50 respondents, 2 (4%) worked in Artificial Insemination, 17 (34%) in animal health, and 31 (62%) as animal owners. All of these respondents were representative of the study population in the study area. Out of the 397 cows that were analyzed, 126 (31.74%) had at least one reproductive issue that was found through both routine follow-up (n = 13) and retrospective analysis (n = 384). The study found that dystocia (8.85%), retained fetal membrane (7.3%), repeat breeder (5.2%), prolapse of the uterus and vagina (4.43%), anestrous (3.13%), and abortion (2.34%) were the main reproductive issues. Breeds and parity had no statistically significant ($p>0.05$) impact on the incidence of reproductive difficulties in dairy cattle, while the prevalence of assessed reproductive disorders showed a significant difference ($p<0.05$) with respect to age and body condition. In general, the current findings showed that reproductive health issues are prevalent in the study region, as indicated by their percentage and categories, which occasionally vary. This study demonstrated the strong correlation between reproductive problems and dairy cows' ability to reproduce. Therefore, consistent control of reproductive health and appropriate husbandry techniques may offer ways to mitigate issues that arise in various production systems. The primary reproductive health conditions in the research region should be the subject of more thorough investigations.

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Keywords: Dairy Cattle, Melka Belo, Reproductive Problems, Risk Factors

Abbreviations

AI Artificial Insemination
PA Peasant Association
RFM Retained Fetal Membrane

Introduction

Ethiopia is believed to have the largest livestock population in Africa. This livestock sector has been con-tributing a considerable portion to the economy of the country. The livestock population of Ethiopia is estimated to be 70 million cattle, 42.9 million sheep, 52.5 million goats, 8.1 million camels, 13.33 million equines, and 57 million chickens. Of the total livestock population of the county, 34.4% are males and 65.5% are females [1]. About 99.2% of the cattle population is made up of indigenous breeds, whereas hybrids and exotic breeds with high productivity were only represented by 0.1% and 0.64%, respectively [2].

To increase livestock productivity and satisfy the increasing demand for livestock products, the Ethiopia has prioritized breed improvement, pasture development and animal health. The country has paid consid-erable attention to cattle productivity (meat and milk) through breeding and health interventions to in-crease the contribution of cattle to economic growth as well as to meet the increasing local demands [3]. Reproductive performance is one key component of dairy production and the goal of reproductive man-agement in dairy cattle is to have cows become pregnant in an efficient manner and at a profitable interval after calving. So, high reproductive efficiency is necessary for a successful dairy operation and requires a calving interval that maximizes milk production within the herd [4].

The amount of milk sold per cow per day of life is a proxy of dairy herd efficiency [5]. Economy of the dairy farming largely depends on pregnancy rate after insemination. The 12-month calving interval is ad-vantageous for high milk yield per cow with the good economic return. High reproductive efficiency of cows is very important for achieving the maximum return from dairy farming [6].

Dairy production has been hampered by multi-faceted, production system-specific constraints related to genotype, Diseases, feed resources, and feeding systems, access to services and inputs, low adoption of improved technologies, marketing and absence of clear policy support to the sector [7]. Any abnormality in reproductive system can interrupt animal production performance. Reproductive problems of dairy cows have multifactorial causes which related to reproductive management and ovarian and uterine health [8].

Among the major reproductive problems that have direct impact on reproductive performance of dairy cows are abortion, dystocia, retained fetal membrane (RFM), pyometra, metritis, prolapse (uterine and vaginal), anestrous and repeat breeder. They are classified as before gestation (anestrous and repeat breed-ing), during gestation (abortion, vagina prolapse and dystocia) and after gestation (retained fetal membrane and uterine prolapsed [9]. The different types reproductive health problems of dairy cattle can re-duce the reproductive performance of the dairy cattle. This problem makes slower uterine involution, pro-longed inter-conception and calving interval, negative effect on fertility, increased cost of medication, drop in milk production and early depreciation of potentially useful cows [8].

Some studies conducted in different parts of Ethiopia revealed that 66.15% were affected by either one or more reproductive disorders in dairy cattle in and around Bale Robe, Oromia Regional State, Ethiopia and retrospective analysis of clinical data in Eastern Ethiopia showed 24.2% of the cows had major prepartum and postpartum reproductive problems [8,10]. The Studies of Mekbib et al.and Beredu and Biruk, also reported the prevalence of 43.90% and 30.3% of reproductive health problems of cows in Wondo Genet district, Southern Ethiopia and in Asella Town, Central Ethiopia, respectively [11,12]. Accordingly, so many studies on reproductive problems in dairy cattle were done on central, southern, southwestern, northern, northeastern, northwestern and western parts of Ethiopia with variable prevalence. Even though reproductive problems in dairy cattle are a major problem through causing huge economic loss in dairy farms and local area households through breeding, life or animal product loss. The conse-quence of reproductive problems must need awareness creation by veterinarians and para-veterinarians for the community to control and prevent the risk factors, there was no research conducted in the study area. Therefore, the study determined reproductive disorders of dairy cattle and its associated risk factors.

Materials and Methods

Description of Study Area

East hararghe zone is located to the eastern part of Ethiopia. The study was conducted in the Oromia regional state in Jaja district and peasant association around that serviced on jaja veterinary clinic from March 2022 to August 2022. According to Musa stated that Jaja is located 558 Km east of the capital city Addis Ababa and 142 Km south of Dire Dawa in the Ethiopian highland, mid-highland and lowland. The area is located at 9.077865^0 latitude and 41.367545^0 longitude with an altitude of 1626.03 meters above sea level. The climate is warm and temperate in jaja [1]. There is 41% kola, 39% woyna dega and 20% dega agro ecology with temperature range of 14-35°C.

According to Musa, stated that Melka Belo Woreda animal population with an estimated 200,747 cattle, 38,322 sheep, 190,837 goats, 928 horses, 28,665 donkeys, 555 Mules, 5,418 camels, 185,652 poultry, and 2,580 different types of bee hives. As well, the total population of the woreda is 208,753 (106,781 males and 102,172 females) [1]. Moreover, jaja and its surrounding have variable and yet representative agro-ecologies of the country. These agro-climatic zones are inhabited with different plant and animal species.

The map of study areas displayed below are taken from Musa, source by opening administrative bounda-ries of Ethiopian wereda and select my study area map of Melka Belo wereda as shows as follow [1].

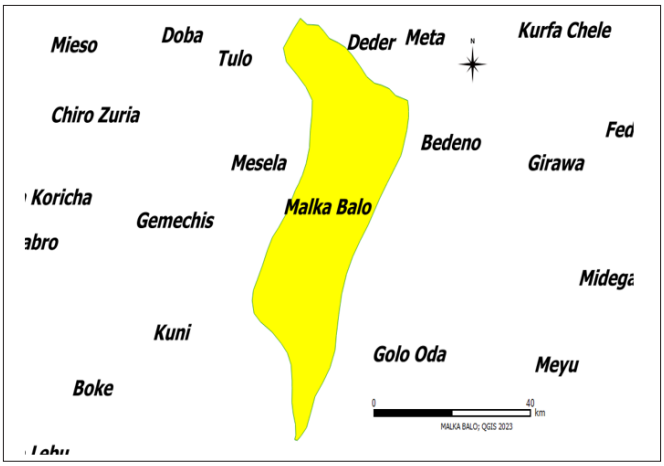

Figure 1: Map of Melka Belo Wereda Where the Studies Were Conducted

Study Population

Dairy cows in the study area are kept under semi-intensive system by residence of the district and traditional extensive system by householders of peasant associations. Most householders contain three dairy cows. The assessed animals in the district and peasant associations were different breeds of cattle that is local and crossbreed. Not only breeds but also includes dairy cows of different parity, age variation and body conditions. The body condition score was determined according to and were grouped as poor, medium and good [13].

Sampling Method and Sampling Size

Determination

The sample size required for this study was determined depending on the expected prevalence of assessment reproductive problems and the desired absolute precision by the formula given by Thrusfield [14].

$$n = \frac{(1.96)^2 Pexp\,(1-Pexp)}{d^2}$$

Where
N= required sample size
P exp = expected prevalence
D= desired absolute precision
1.96 = z- value for 95% confidence interval

$$n = \frac{(1.96)^2 0.5\,(1-0.5)}{(0.05)^2}$$

Therefore, using 95% confidence interval, 5% precision and 50% expected prevalence, the number of cows needed to demonstrate the prevalence of assessment reproductive problems in Jaja district and peas-ant associations around the districts serviced on site veterinary clinic were 384 dairy cows. Simple random sampling was used to sample individual animals that needed service from veterinary clinic PA around the district based on composition of livestock population.

Study Design

Cross-sectional type of study was undertaken from March, 2022 to August, 2022 in Jaja district and peasant associations around that serviced on Jaja veterinary clinic based on dairy cattle population to assess the reproductive problems of dairy cattle in the study area.

Study Methodology

Questionnaire Survey

Different questionnaire were distributed for veterinary profession such as animal health profession, artificial insemination profession, animal owners and doctor of veterinary medicine in the study area and complained the following reproductive problems such as mastitis, dystocia, retained fetal membrane, uterine and vaginal prolapse, abortion, anestrus and repeat breeding. Households possessing at least one dairy cow in the districts and peasant associations around the districts that serviced on site veterinary clinic in similar manner cattle owned by these households represent the study population.

Secondary Data

Secondary data of 384 cattle were collected from the recorded casebooks used for treatment, control and prevention of disease program on the district and site veterinary clinic including AI casebook of the clinic in the last four years; from March, 2018 to February, 2022 to identify the major reproductive problems in dairy cattle and assess associated risk factors of the dairy cattle in the study area.

Regular Follow up

Selected 13 dairy cattle in the last trimester that were accessible used for regular follow up to assess the prevalence and incidence of reproductive health disorders.

Data Analysis

The data collected was entered into a Microsoft Excel spreadsheet with risk factors of the study areas up-on column parts by coding the value through many care to minimize the mistake or problem until the end, then save as the file in the form of Excel 93-2003 workbook and analyzed by using STATA version 13 through opening the data that saved in Microsoft Excel workbook to transform into STATA data saver. Descriptive statistics was employed to compute the prevalence of reproductive problems in dairy cows. Pearson's chi square was utilized to assess the presence of association between independent variable (breeds, age, parity and body condition) of animals with over all prevalence of reproductive problems was analyzed. Confidence interval was set at 95% confidence level and with 5% degree of precision. A statistically significant association between variable was considered to be appear if the computed P-value is less than 0.05 ($p<0.05$).

Results

Questionnaire Survey

According to the current study, of the 50 respondents, 37 (74%) were men and 13 (26%) were women, with respect to various occupational and educational backgrounds. Of the 50 respondents, 2 (4%) worked in Artificial insemination, 17 (34%) in animal health, and 31 (62%) as animal owners. All of these respond-ents were representative of the study population in the study area.

Table 1: Demographic Characteristics of The Respondents and Knowledge of Reproductive Disorders

Parameter		Frequency	Percent
Types of respondents	Animal health profession	17	34%
	AI technicians	2	4%
	Animal owners	31	62%
Sex	Male	37	74%
	Female	13	26%
Age	20-30	15	30%
	30-50	31	62%
	>50	4	8%
	Adolescent Education	19	38%
Education status	Primary	10	20%
	Above secondary	21	42%
	Food	8	16%
Importance of animal	Income generation	33	66%
	Privilege	9	18%
	Disease	36	72%
Factors affecting use of animals	Poor genetics	6	12%
	Management	8	16%
Knowledge reproductive disor-der	Yes	43	86%
	No	7	14%
How to manage reproductive disorder	Improve management	12	24%
	Treating case	32	64%
	Control affected animal	6	12%

Prevalence of Retrospective Study and Regular Follow up

Follow up

In the retrospective study, 31.25% (n=120) of the 384 dairy calves that were analyzed using case book da-ta over the course of four consecutive years, from March 2018 to February 2022, had significant repro-ductive issues in a chosen location. Six (46.2%) of the thirteen dairy cattle included in the study were determined to have reproductive issues during the routine follow-up from June 2022

to August 2022. The retrospective analysis and ongoing monitoring in the research region are essential to the current assessment of reproductive issues in dairy cattle, which is provided in. Table 2.

Table 2: The Reproductive Problems in Dairy Cattle Through Retrospective Study and Regular Follow Up Approach

Study Method	No. of cows examined	Cows with reproductive Problems (%).
Retrospective study	384	120(31.25%)
Regular follow up	13	6(46.2%)
Total	397	126(31.74%)

Prevalence of Reproductive Problems in

Dairy Cattle

A retrospective analysis and regular follow-up were carried out on 397 cattle throughout the course of the last four years, from March 2018 to February 2022. The cattle were assessed and recorded from all case-books of the district's veterinary clinic at the location. Additionally, pregnant dairy cattle were routinely followed up with. The findings showed that 126 dairy cattle (31.74%) had the primary reproductive problems. The results of the study, which are presented in Table 3, indicate that the most common reproductive health problems in dairy cattle are dystocia, retained fetal membrane, repeat breeder, uterine and vag-inal prolapse, anestrous, and abortion, with prevalence rates of 8.85%, 7.3%, 5.2%, 4.43%, 3.13%, and 2.34%, respectively.

Table 3: Prevalence of Reproductive Problems of Dairy Cattle in the Study Area Through Retro Spective and Clinical follow up Assessment

Reproductive problems	Retrospectively result n=384	Follow up problems ob-served n=13	Overall prevalence (n=397)
Dystocia	34 (8.85%)	3 (23.1%)	38 (9.32%)
RFMs	28 (7.3%)	1 (7.7%)	29 (7.30%)
Repeat breeder	20 (5.2%)	0 (0.00%)	20 (5.04%)
Prolapse	17 (4.43%)	0 (0.00%)	17 (4.28%)
Anestrous	12 (3.13%)	2 (15.4%)	14 (3.53%)
Abortion	9 (2.34%)	0 (0.00%)	9 (2.27%)
Total	120 (31.25%)	6 (46.2%)	126 (31.74%)

RFMs=Retained fetal membrane, N= number of animal include.

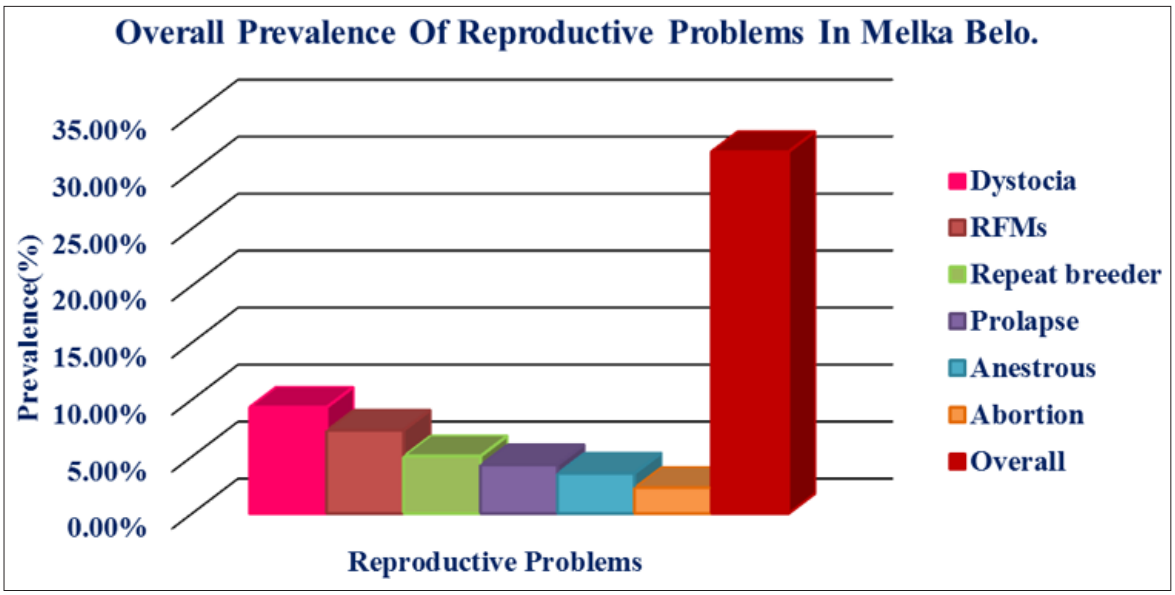

Figure 2: Overall Prevalence of Reproductive Health Problems Assessed Retrospective and Follow Up Methods in Melka Belo Woreda

Factors Associated with Reproductive Problems of Cattle

According to the study, the most common reproductive problems affecting cross-breed configurations and pluriparas cows were 34.4% and 32.81%, respectively. Between breeds and parity, there was no discerni-ble variation in the occurrence of reproductive health issues. The findings indicated a substantial disparity in age groups and body conditions. Significant issues with reproductive health were also influenced by age and body condition type. Dairy cows older than nine years were more susceptible to reproductive disorders, and those with poorer physical conditions were more affected. The processed value is shown below on Table 4.

Table 4: Prevalence and Association of Reproductive Problems in Dairy Cattle by Breeds, Age, Parity and Body Condition

Risk factor		No. examined	No. positive	Prevalence (%)	χ2 (P-value)
Breeds	Local	221	64	28.96%	
	Cross	163	56	34.4%	1.2716 (0.259)
Total		384	120	31.25%	
Age	3-4years	64	15	23.44%	
	5-9years	268	80	29.9%	8.9156 (0.012)
	>9 years	52	25	48.08%	
Total		384	120	31.25%	
Parity	Primiparas	64	15	23.44%	
	Pluriparas	320	105	32.81%	2.1818 (0.140)
Total		384	120	31.25%	
Body Con-dition	Poor	72	50	69.44%	61.9398 (0.000)
	Medium	243	50	20.58%	
	Good	69	20	28.99%	
Total		384	120	31.25%	

x^2=chi-square.

Discussions

The current study, which used a questionnaire survey as its method, found that dystocia, retained fetal membranes, repeat breeding, uterine and vaginal prolapse, anestrous, and abortion were the most frequent reproductive problems in dairy cow. Both the routine follow-up (N=13) and the retrospective investigation (N=384) involved a total of 397 animals. Out of all dairy cattle in the research areas, 126 (31.74%) had at least one reproductive abnormality that was verified by the district. In this investigation (regular follow-up), dystocia, anestrous, and RFM were shown to be the primary reproductive health problems; they accounted for 23.1%, 15.4%, and 7.7% of the cases, respectively.

The current study found that 31.2% of dairy cattle in the chosen study area had reproductive issues overall. The findings of this study were largely consistent with those of, who reported 31.76% of reproductive health issues in smallholder dairy production in and around Nazareth town, Central Ethiopia, and somewhat consistent with those, who reported 33.59% of reproductive health issues in small holder dairy production system in Jimma town, South Western Ethiopia, and abroad [15,16]. According to, 33.85% of reproductive problems in dairy cattle raised in North-Eastern India under semi-intensive systems were reported [6]. In contrast to the findings of Dawit and Ahmed, Haile et al., Mekibib et al., and Fedhiko et al., who reported the prevalence as 40.25%, 43.07%, 43.90%, and 66.15%, respectively, in different locations of Ethiopia, the present study found a lower prevalence [10,11,17,18]. This variation in prevalence could be caused by a variety of factors, including sample size, environmental factors like stress and topography, natural factors like drought, animal breeds, a lack of adequate case book records with sufficient information, and differ-ences in management practices between the various study areas.

Dystocia, retained fetal membrane, repeat breeder, prolapse of the uterus and vagina, anestrous, and abortion were identified to be the main reproductive health issues in this study (retrospective study and regular follow-up), accounting for 9.5%, 7.233%, 4.99%, 4.22%, 3.5%, and 2.244% of the cases, respectively. With a prevalence rate of 9.5%, dystocia was one of the higher status reproductive issues in dairy cattle that the current study found. The study's 9.5% dystocia prevalence is somewhat consistent with Kassahun [19] study, which found that smallholder dairy cows in and around Awassa had 9.65% significant clinical reproductive problems. In contrast to the findings of Haile et al. [18], who reported a prevalence of 5.9% in the urban and per-urban area of Hosanna, and Seid et al. [8], who reported a prevalence of 3.39% in the West Hararghe Zone, the current study finds that reproductive difficulties in dairy cattle are more common [8,18-19]. The reason for this difference in dystocia cases could be that it depends on various parameters, includ-ing the sire's breed, age, and parity number [20, 21]. Dystocia is also largely caused by genetic factors, nu-tritional factors (such as metabolic diseases and overeating), hormonal imbalances that prevent the cervix from dilation, inadequate pelvic bone ligaments that initiate bone relaxation, and inseminating dairy cattle with semen taken from large or imbalanced bulls without taking the size and age of the dairy cattle into con-sideration.

The results of Haile et al., who reported a prevalence of 7.18% in Urban and Peri Urban Area of Hosanna, and Ambaw et al., who reported a prevalence of 7.6% in Dessie and Kombolcha towns, South Wollo, are fairly consistent with the prevalence of retained fetal membrane (7.233%) found in the current study. In con-trast to the findings of Alemselam et al., Haile et al., Degefa et al., and Gashaw et al., who reported 11.5%, 17%, 18.3%, and 19.2%, respectively, from different parts of Ethiopia, prevalence in our research region was lower. The disparity in nutritional status and management factors may be the cause of the variation in RFM prevalence [16,18,22-25]. RFM has been linked to uterine prolapses, abortion, stress, late or prema-ture birth, dystocia, twinning, infections, hormonal and seasonal abnormalities, immunological suppression, and shortages in vitamins and minerals [26-29]. Other important elements that contribute to the retention of the fetal membrane are low levels of exercise, temperature pressure in the surrounding environment, and low tone in the uterine muscles.

The current study's 4.99% repeat breeding prevalence aligns with Ayisheshim et al., findings, which indi-cated a 4.5% prevalence of the issues [30]. A greater prevalence rate of repeat breeding was found in the current study when the issues with the findings

of Dereje and Surra, Bitew and Shiv, Gashaw et al., and Dawit and Ahmed, who reported prevalences of 0.5%, 3%, 1.3%, and 3.87%, respectively, were evaluated [3,16,17,31]. In contrast, the prevalence reported by Dinka, Alemselam et al., Melese et al. and Natnael and Haben is lower, at 26.8%, 21%, 17%, and 15.1%, respectively. Numerous factors, such as sub-fertile bulls, endocrine imbalances, malnourishment, infections of the reproductive tract, and poor management practices, such as improper timing of insemination or inaccurate heat detection, improper handling of semen, and in-semination techniques, can lead to repeated breeding [7,23,32-35]. The usage of one bulls of the village for breeding purposes by all members of the community is thought to be a significant factor as well as the accumulation of abscesses in the uterine body.

The current study's 4.22% prevalence rate of prolapses (uterine or vaginal) is consistent with studies con-ducted by Melese et al. Ambaw et al., Natnael and Haben which found that the prevalence was 3.3%, 3.5%, and 5.2%, respectively, from various regions of Ethiopia [7,22,33]. A higher prevalence rate of prolapses was found in the current study when the issues with the findings of Gashaw et al., Bitew Shiv, Seid et al., Dereje and Surra, Benti and Zewdie. were evaluated [3,8,16,31,35]. These studies reported preva-lences of 0.5%, 1.7%, 1.94%, 2.3%, and 2.7%, respectively. However, it is still less than the findings of Mekibib et al., and Fedhiko et al., who reported the prevalence in various regions of Ethiopia to be 7.32% and 5.47%, respectively. External pressure that served as predisposing factors, such as excessive traction of the fetus to relief dystocia or retained fetal membranes, dragging the fetus horizontally rather than downward to the udder during parturition by assistant persons, and excessive straining of the cows and pressure on the uterine muscles, may have contributed to the elevated prevalence rate of prolapses in the study area [10,11].

Anoestrus was discovered in the current investigation with a 3.5% prevalence rate. These findings were in general agreement with those of Wujira and Nibret, who re-reported prevalence (4.8%) in dairy cows in Wolaita Sodo Town in Selected Farms, and Abunna et al., who reported prevalence (3.7%) in dairy cows in Bishoftu town. A greater prevalence rate of anoestrus was found in the current investigation when the issues with the findings of Fedhiko et al., Bitew and Shiv, Seid et al., Dereje and Surra who reported prevalence of 1.82%, 1.66%, 1.69%, and 0.7%, respectively, were evaluated. However, it is still less than the difficul-ties found by Haile et al., Ayisheshim et al., and Alemselam et al., who indicated the prevalence in various regions of Ethiopia to be 10.26%, 6%, and 37.8%, respectively [4,8-10,18,23,30,31]. Age, defective heat detection, breed, management technique, and dietary difference with environmental location could all be contributing factors to this variation.

The study's prevalence rate of 2.244% for abortion was found to be in fairly good agreement with findings from Gizaw et al., [15], who reported 2.23% in and around Naza-reth town, Natnael and Haben [7], who reported 2.6% in and around Hawassa Town, and Haile et al., [18], who reported 2.56% in Hosanna's ur-ban and per-urban areas. However, when compared to the findings of Gashaw et al., [16], who reported a prevalence rate of 1%, the current finding is higher. On the other hand, Bitew and Shiv [31], Mesele et al., [33], Belay [36], Mekbib et al., [11], and Benti and Zewdie [35] reported 13.9%, 14.5%, 10.6%, 11.7%, and 12.2%, respectively, which are higher than the current finding in various parts of Ethiopia [7,11,15,16,18,31,33,35]. Variations in AI practice, genetics, nutritional status, illness, level of toxicity, and husbandry management systems across different regions may account for variations in the prevalence of abortion. Abortion should be diagnosed as soon as possible to determine its etiology and should be taken seriously when the incidence is 2% or above [37].

The prevalence of reproductive problems in dairy cattle was analyzed, and the results showed that age had a statistically significant association ($p<0.05$). The prevalence of major reproductive problems was highest (39.62%) in cows older than 9 years, compared to 30.4% in those younger than 9 years and 27.7% in those older than 4 years. This is because as animals get older, their body's ability to fight against illnesses declines and their ability to function as cells in their bodies weakens.

The incidence of reproductive health issues in dairy cattle in the current study was influenced by the body condition score of the study animals; incidence is higher in cows with poor body condition (53.42%) than in medium (25.3%) and good (28.6%) body conditions, likely due to the animals' exposure to a variety of re-productive issues caused by overfeeding and underfeeding. The physical condition score varied greatly when it came to the reproductive health issues. According to Ayana and Gudeta's findings, 35.4% of people have good physical condition and 44.7% have bad body condition [38]. The occurrence of reproductive issues in different body situations could be caused by environmental factors, breed, thinning, overfeeding, sample size, production system, farmers' literacy, and production system. Nevertheless, the current study found no significant correlation ($P > 0.05$) between the parity of cows and their breed.

Ultimately, there are more cases of abortion in the current study, albeit the reasons are yet unknown. Even though the woreda type "C" veterinary facility lacks a microbiological laboratory and screening test rea-gents, the case is nonetheless taken seriously. The vacuum in this literature needs to be filled in the future to prevent and control reproductive health issues in order to prevent economic loss in our nation.

Conclusion

The study found that reproductive problems in dairy cattle, such as dystocia, retained fetal membrane, repeat breeder, prolapse of uterine and vagina, anestrous, and abortion, significantly affect reproductive health. Nutritional constraints are crucial for profitable dairy cattle production in the study area. However, the lack of microbiological laboratories and screening test reagents highlights the need for future prevention and con-trol.

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Conflicts of Interest

The author declares no conflicts of interest.

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