Hindawi
Advances in Agriculture
Volume 2022, Article ID 4806982, 9 pages
https://doi.org/10.1155/2022/4806982

Research Article

Reproductive Disorders of Cattle in the Tole District of Southwest Ethiopia and Their Prevalence and Associated Risk Factors

Dereje Tulu[1] **and Chaluma Negera**[2]

[1]*Ethiopian Institute of Agricultural Research, Tepi Agricultural Research Center, P.O. Box 34, Tepi, Ethiopia*
[2]*Southwest Shoa Zone Livestock Development and Fishery Office, Woliso, Ethiopia*

Correspondence should be addressed to Dereje Tulu; derejetulu5@gmail.com

Received 21 September 2022; Revised 10 December 2022; Accepted 14 December 2022; Published 29 December 2022

Academic Editor: Xinqing Xiao

Reproduction is a basic requirement for efficient cattle production to continue or cease; whereas, reproductive disorders are the leading cause of economic loss in the cattle industry. To determine the prevalence and associated risk factors of major reproductive disorders in cattle in the Tole district, a cross-sectional study design was conducted from October, 2020, to October, 2021. To identify potential risk factors for cattle reproductive disorders, a multivariable random effect logistic regression analysis was used. A total of 400 randomly selected cows were examined, and 37.8% of them had at least one reproductive disorder. The three main reproductive disorders observed in the study area were abortion (17.8%), stillbirth (4.8%), and dystocia (3.3%). Risk factors for reproductive disorders in the study area included the calving season (OR = 3.7, 95% CL-1.37–7.18) and the accessibility of dogs to cattle (OR = 2.5, 95% CL-1.64–3.85). Accessibility of dogs to cattle in the study areas was also a risk factor for abortion (OR = 7.5, 95% CL-3.59–15.54). The present study also identified parity (OR = 5.2, 95% CL-1.05–26.04) as a risk factor for dystocia in cattle in the study areas. This demonstrated that losses in cattle production in the study areas are significantly attributed to reproductive problems. Hence, it is essential to increase public awareness of how reproductive disorders affect cattle production and to develop and implement appropriate control measures for these disorders. The causes of abortion and dystocia in various areas should be precisely identified and described through further research.

1. Introduction

A fundamental requirement for effective livestock production, whether it is continuous or terminal, is reproduction [1]. However, a number of factors, such as nutrient deficiencies, specific and nonspecific infections, hormonal imbalances, immune system problems, environmental factors, and others, can cause hindrance to the physiological process [2]. Consequently, farm animals frequently experience complicated diseases that prevent them from producing their offspring at their best [3, 4]. One of the significant barriers to the production of cattle in sub-Saharan Africa was the prevalence of reproductive disorders [5–7].

Ethiopia has the largest livestock population in Africa, with 60.4 million cattle, of which the majority (54.7%) are cows [8]. Conversely, there is a growing market for dairy and red meat products from livestock. Ethiopia has given breed improvement, pasture development, and animal health intervention priority to increase the productivity of cattle and meet the rising demand for livestock products (meat and milk). This increases the contribution of cattle to economic growth. Enhancing dairy farming at the farmer level has been prioritized in order to increase the supply of milk from smallholder dairy farms in Ethiopia [9, 10]. To increase milk production, temperate breeds have been brought into a country through the use of crossbreeding programs for cattle [11]. Crossbreeding with improved exotic dairy breeds on a wide scale has been introduced as an option some many years back for upgrading the genetic potential of the indigenous cattle breed and later to enhance the dairy sector in the country [12]. Besides this, the creation and application of

artificial insemination (AI) techniques have altered the breeding of cattle and the genetic advancement of those animals, particularly in the dairy industry [13–15].

However, the main issue impeding the development of the dairy industry in the country now is reproductive problems. The main reasons for smallholder dairy farms' economic losses and poor reproductive results in the country are issues related to reproduction disorders. The most frequent reproductive issues that have an immediate effect on dairy cattle's productivity are abortion, dystocia, stillbirth, retained fetal membrane, anestrus, endometritis, and pyometra [16–21]. Due to slower uterine involution, a decreased reproductive rate, and a prolonged interconception period, abortion, and postpartum reproductive disorders have been greatly contributing to serious economic loss [16, 22]. Other causes contributing to the high economic loss include the long calving interval, expensive medication, a decline in milk production, a smaller calf crop, and the early depreciation of possibly beneficial cattle [21–25]. It can be difficult to identify these problems by a single disease or symptom since the risk variables interact [23, 26].

Only a few reports that estimate the prevalence and risk factors for reproduction issues are currently available. The results of this study contribute to the development of prevention and mitigation strategies to reduce the effects of reproduction problems on cattle production. Moreover, policymakers and animal health extension personnel could be given access to interventions based on scientific research. The aim of the present study was to determine the prevalence of major reproductive disorders and risk factors in cattle in the Tole district of southwest Ethiopia.

2. Materials and Methods

2.1. Study Areas. Tole district is located in the southwest Shoa zone, where this study has been conducted. It is situated 86 kilometers southwest of Addis Ababa. The district is located between latitudes 8028′ and 8047′N and longitudes 38017′ and 38029′E. This district is primarily comprised of plateau land with lower slopes and has an elevation range of 2150 to 3100 meters above sea level. Mid-altitude (80%) and highland (20%) are the two main agroecological types in the district. Tole district experiences mean annual temperatures between 13 and 20°C. The distinct region has two distinct rainy seasons: a short rainy season (from March to May) and a long rainy season (from June to September). The annual rainfall averages more than 1300 mm. Tole district has 87,300 cattle, 43,457 sheep, 30,456 goats, and 132,946 human population. The local cattle breeds (Gurage breed) are the most common, followed by some Holstein-Friesian crosses. The study area has extensive (crop-livestock production) and semi-intensive (urban production) management systems (Figure 1).

2.2. Study Population and Design. Cows from the Tole district that were raised under extensive and semi-intensive production methods made up the study population. The cattle used in this study were three-year-old and older cows, both local and crossbred cattle. From October, 2020, to October, 2021, researchers in the Tole district used the cross-sectional study method. An investigation was carried out to determine the prevalence and risk factors for major reproductive problems in cattle in the study areas.

2.3. Sampling Methods and Sample Size Determination Techniques. The study district was purposefully chosen based on reports of previous reproductive issues, whereas kebeles and villages were selected using a simple random sampling technique. Taking the number of cattle in the district into account, a total of six kebeles (small administrative units within a district) were selected for sampling. Using a 95% confidence interval, 5% precision, and 50% expected prevalence, the sample size was calculated following Thrusfield's formula [27]. Consequently, the sample size was 384 cows, but in order to improve the accuracy of the result, 400 cows were used in total. Individual cows from selected kebeles based on the number of cattle in the population were also sampled using a straightforward random sampling technique.

2.4. Data Collection Methods. A total of 400 cows were selected, and their owners were contacted to acquire information on each cow's history of reproductive disorders and potential risk factors. Age, breed, body condition, parity, and other factors specific to individual cattle were noted and considered in the data collection. In addition, environmental and management-related factors like calving season, herd size, herd type, breeding method used, management system, and other variables were noted. Richard [28] classified the management system as either extensive or semi-intensive. On the basis of the criteria adopted by Moran [29], cattle body condition was similarly divided into poor, medium, and good categories. Since the estimated age at first calving for cattle in tropical environments is between 24 and 36 months [30], cattle were divided into three age groups: less than three, three to six, and greater than six years. The herd size was divided into two categories: small (<10 cattle) and large (>10 cattle). Cattle that shared the same barn were grouped together and treated as a single herd [31, 32]. Monoparous (parity 1) and pluriparous (two or more parities) were the two classifications for parity number [19, 33]. Depending on whether or not the cattle are accessible to dogs, they are classified as having "yes" or "no" interaction with them. Since dogs can transmit a variety of diseases, including neosporosis, leptospirosis, brucellosis, and coxiellosis, which are the main causes of reproductive issues in cattle.

2.5. Management and Analysis of Data. The collected data were entered into Microsoft Excel Windows 2010 and stored there before being analyzed with STATA 11.0. To calculate the prevalence of reproduction disorders in cattle, we divide the number of cattle with reproduction disorders by the total number of cattle sampled. The 95% confidence interval (CI) was calculated for the prevalence of reproductive disorders

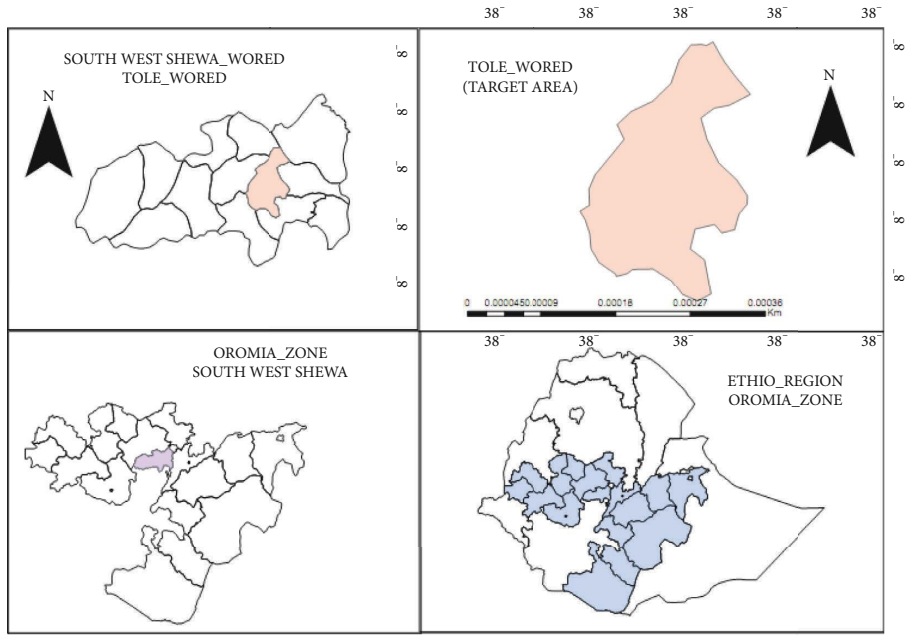

Figure 1: Map showing the study area.

using the Epitools binomial exact method. Using a logistic regression model, the association between reproductive issues, such as abortion and dystocia, and their potential risk factors were investigated. Adjusted odd ratios were used to assess the strength of the association between the variables. A screening of several risk factors associated with reproductive issues, abortion, and dystocia was done using the univariable random effects logistic regression analysis. A multivariable random effects logistic regression model was used to find the risk factors for dystocia, abortion, and reproductive issues. The multivariable random effects logistic model included variables whose P value in the univariate analysis was 0.05 or higher. A cut point of 0.05 for the LR test was used to select the variables based on the backward elimination method. Using cross-product terms and the collinearity matrix index, respectively, variables were examined before the creation of the final model for interaction effects and multiple collinearities. The Hosmer–Lemeshow test was used to assess the validity of the model. In this study, a 95% confidence level and a P value of 0.05 were used in all analyses.

3. Results and Discussion

3.1. Occurrence and Associated Risk Factors of Major Reproductive Disorder in Cattle. A total of 400 animals were examined, and 37.8% (95% CI: 0.33–0.43) of them had at least one reproductive problem (Table 1). Abunna et al. [34] and Tigabneh et al. [35] found a comparable prevalence of 30.1% in central Ethiopia and 39.8% in northeast Ethiopia, respectively, which is consistent with this finding. A similar prevalence has also been reported in northeast India [36]. The prevalence observed in this study is lower than that determined by Tolosa et al. [37], who reported a prevalence of the reproductive problem of 66.2% in Bale Robe. The production system, breed, and environmental factors that could be seen in various locations could be attributed to this variation in prevalence. The prevalence of reproductive disorders was found to be highest in Armufo Taji kebele (50%) and lowest in Qursit and Arada Leeqa kebele (26.8%) in the Tole district of southwest Ethiopia (Table 1).

The prevalence of cattle abortion (17.5%, 95% CI: 0.14–0.21) observed in this study (Figure 2) is in agreement with the results of Dinka [38] and Kifle and Moges [26], who reported 14.5% and 19.7% prevalence of cattle abortion, respectively. However, compared to Bitew and Prased's [39] 13.9% prevalence in Bedele and Benti and Zewdie's [21] 12.2% prevalence in the Borena zone, the current result is higher. This disparity in abortion prevalence could be attributed to the differences in environmental factors, management systems, and veterinary service levels. In agreement with the results of Filmon et al. [40], who observed a 3.0% prevalence of stillbirth in northeast Ethiopia, the prevalence of stillbirth (4.8%, 95% CI: 0.03–0.07) found in this research (Figure 2). The present result, however, is higher than the findings of Tesfaye and Shamble [25] and Tulu and Gebeyehu [18], who reported a prevalence of 1.0% in the districts of Boloso Sore and Jimma Horro. Hypokalemia, various pathogens, and forced fetal extraction are among the causes of stillbirth. The prevalence of dystocia in the current study (3.3%, 95% CI: 0.02–0.05) (Figure 2) was comparable to the prevalence of 3.3% and 3.4% in the Borena zone and East Shoa zone, respectively, in Ethiopia [12, 21]. Nevertheless, compared to the findings of Kifle and Moges [26], Wagari and Shiferaw [41], and Filmon et al. [40], which found that dystocia was more common, the prevalence of dystocia mentioned in the current study is lower at 9.2%. This variation could be brought about by variations in the size of the bull used, the calves' fetuses and

Table 1: Distribution of the prevalence of reproductive disorders in cattle in the study area.

Kebele	Total animal examined	Total animals positive	Prevalence (%)	P value
Bili malima	60	24	40	
Armufo taji	64	32	50	
Abeebe	60	21	35	
Allanu	64	27	42.2	0.119
Malima and saden botone	81	28	34.6	
Qursit and arada leeqa	71	19	26.8	
Overall	400	151	37.8	

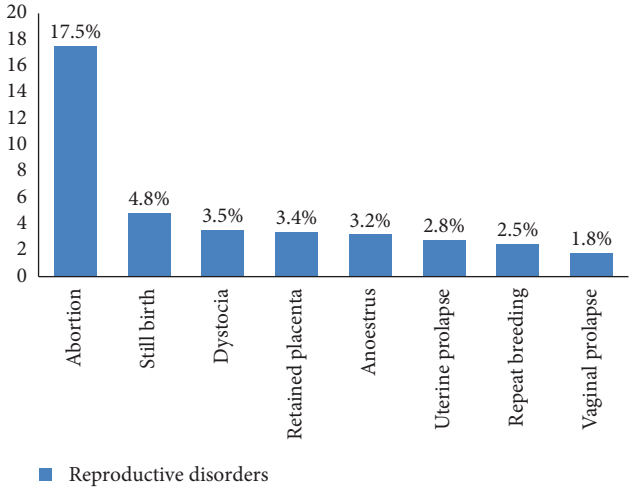

Figure 2: Major reproductive disorders in the study area.

birth canals, feeding practices, breeds of cattle, and environmental factors.

According to the present findings, there was a statistically significant association between the season and the cattle reproductive disorder. In the spring (March, April, and May) compared to the winter (December, January, and February), cattle were nearly four times (OR = 3.7; $P < 0.05$) more likely to have a reproductive disorder (Table 2). This could be brought about by seasonal variations, which could reflect shifting exposure to pathogenic potential pathogens, shifting patterns of reproductive hormones, the existence of a seasonal vector, or different seasonal feeding schedules [42, 43]. This finding is consistent with research by Siyoum et al. [44], Tulu and Gebeyehu [18], and Ayana and Gudeta [45], who mentioned that the season had an impact on reproductive disorders.

This finding revealed that the risk of reproductive disorders and abortion was two times (OR = 2.5; $P < 0.05$) and eight times (OR = 7.5; $P < 0.05$) higher in cattle that had contact with a dog than in those that did not (Tables 2 and 3). This might be a result of the fact that while cattle are one of the intermediate hosts for *Neospora caninum*; dogs are its sole definitive host. Ingestion of feed and drinking water tainted by oocysts shed on dog faces causes cattle to contract the disease [46, 47]. This result is in line with earlier research from Ethiopia [48–50] and other countries [51, 52], which found a significant correlation between neosporosis and the presence of reproductive problems and abortion in cows that had significant exposure to dogs. This finding is also in agreement with the findings of Bahari et al. [53] and Kardjadj [54], who stated that cattle exposed to dogs on a regular basis experienced leptospiral abortion. This could be as a result of *leptospiral* abortion (infection from *Canicola*) occurring in the area where dogs serve as the primary reservoir. Besides that, there is a chance that dogs and cattle could contract the same infectious disease, and cattle could help keep the canicola serovar alive in the wild [55]. Similar to this, Soomro et al. [56] indicated that brucellosis increased the risk of abortion and reproductive disorders in cattle exposed to stray dogs. Due to the fact that these animals were dragging placentas from newborn calves that had died or been aborted they spread brucellosis between herds [50, 57]. However, cattle reproduction disorders were not demonstrated to be significantly associated ($P > 0.05$) with age, herd size, management method, species composition, parity, breed, type of breeding, body condition score, or previous history of the reproductive problem (Table 2).

3.2. Distribution of Cattle Abortion among the Gestation Stage and Its Potential Risk Factors. The third trimester had the highest prevalence of abortion (61.4%), followed by the second (31.4%), and the first trimester had the lowest prevalence (7.1%) in the current study. This difference was found to be statistically significant ($P < 0.05$) as stated in Table 4. The third gestational stage was where abortion rates

Table 2: The effect of potential risk factors on the reproductive problems of cattle in the study area.

Variables	Categories	Total cattle tested	Total cattle positive (%)	*Univariate analysis*		*Multivariate analysis*	
				OR (CI; 95%)	*P* value	OR (CI; 95%)	*P* value
Herd size	Small (<10)	298	114 (38.3)	—	—		
	Large (>10)	102	37 (36.3)	1.1 (0.68–1.74)	0.722		
Species composition	Only cattle	261	96 (36.8)	1.1 (0.74–1.72)	0.584		
	Mixed	139	55 (39.6)	—	—		
Breed	Local	290	110 (37.9)	1.0 (0.65–1.62)	0.903		
	Cross	110	41 (37.3)	—	—		
Parity	Monoparous	15	5 (33.3)	1.2 (0.41–3.65)	0.719		
	Pluriparous	385	146 (37.9)	—	—		
Age	<3 years	52	20 (38.5)	1.0 (0.54–1.87)	0.979		
	3–6 years	110	39 (35.5)	1.2 (0.72–1.84)	0.567		
	>6 years	238	92 (38.7)	—	—		
Body condition	Good	57	17 (29.8)	1.6 (0.85–3.14)	0.143		
	Medium	194	73 (37.6)	1.2 (0.74–1.78)	0.533		
	Poor	149	61 (40.9)	—	—		
Type of breeding	Natural	325	120 (36.9)	1.2 (0.72–2.0)	0.478		
	AI	75	31 (41.3)	—	—		
Management	Extensive	348	132 (37.9)	—	—		
	Sem-intensive	52	19 (36.5)	1.1 (0.58–1.94)	0.847		
Season of calving							0.026
	Autumn	95	34 (35.8)	1.1 (0.58–1.95)	0.843	1.1 (0.57–2.00)	0.838
	Summer	101	30 (29.7)	1.4 (0.76–2.58)	0.278	1.4 (0.73–2.60)	0.329
	Spring	118	55 (46.6)	3.7 (1.39–6.10)	0.001	3.7 (1.37–7.18)	0.003
	Winter	86	32 (37.2)	—	—	—	—
Previous history of the problem	Yes	67	22 (32.8)	1.3 (0.74–2.25)	0.364		
	No	333	129 (38.7)				
Contact of cattle with a dog	Yes	218	103 (47.2)	—	—	—	—
	No	182	48 (26.4)	2.5 (1.64–3.82)	0.0001	2.5 (1.64–3.85)	0.0001

OR: odds ratio; CI: confidence interval; "—" Ref: reference.

Table 3: The effect of potential risk factors for cattle abortion in the study area.

Variables	Categories	Total cattle tested	Total cattle positive (%)	*Univariate analysis*		*Multivariate analysis*	
				OR (CI; 95%)	*P* value	OR (CI; 95%)	*P* value
Herd size	Small (<10)	298	54 (18.1)	1.2 (0.65–2.19)	0.577		
	Large (>10)	102	16 (15.7)	—	—		
Herd type	Only cattle	261	49 (18.8)	—	—		
	Mixed	139	21 (15.1)	1.3 (0.74–2.27)	0.359		
Breed	Local	290	52 (17.9)	—	—		
	Cross	110	18 (16.4)	1.1 (0.62–2.01)	0.713		
Parity	Monoparous	15	3 (20.0)	—	—		
	Pluriparous	385	67 (17.4)	1.2 (0.33–4.32)	0.795		
Age	<3 years	52	10 (19.2)	—	—		
	3–6 years	110	15 (13.6)	1.5 (0.63–3.63)	0.360		
	>6 years	238	46 (19.3)	1.0 (0.48–2.19)	0.957		
Body condition	Good	57	8 (14.0)	1.4 (0.60–3.33)	0.423		
	Medium	194	34 (17.5)	1.1 (0.63–1.89)	0.763		
	Poor	149	28 (18.8)	—	—		
Type of breeding	Natural	325	55 (16.9)	1.2 (0.65–2.32)	0.528		
	AI	75	15 (20.0)	—	—		
Management	Extensive	348	60 (17.2)	1.1 (0.54–2.40)	0.725		
	Sem-intensive	52	10 (19.2)				

Table 3: Continued.

Variables	Categories	Total cattle tested	Total cattle positive (%)	*Univariate analysis*		*Multivariate analysis*	
				OR (CI; 95%)	*P* value	OR (CI; 95%)	*P* value
Season of calving	Autumn	95	19 (20.0)	—	—		
	Summer	101	12 (11.9)	1.9 (0.85–4.07)	0.123		
	Spring	118	22 (18.6)	1.1 (0.55–2.16)	0.803		
	Winter	86	17 (19.8)	1.1 (0.49–2.11)	0.969		
Previous history of abortion	Yes	67	12 (17.9)				
	No	333	58 (17.4)	1.1 (0.52–2.08)	0.923		
Contact of cattle with a dog	Yes	218	61 (27.9)	—	—		
	No	182	9 (4.9)	7.5 (3.59–15.54)	0.0001	7.5 (3.59–15.54)	0.0001

OR: odds ratio; CI: confidence interval; "—" Ref: reference.

Table 4: Prevalence of abortion based on the stage of pregnancy.

Stage of gestation	Numbers of aborted cattle	Prevalence (%) (95% CI)	Crude OR (CI; 95%)	*P* value
First trimester	5	7.1 (0.01–0.13)	—	—
Second trimester	22	31.4 (0.21–0.42)	1.7 (0.98–2.91)	0.058
Third trimester	43	61.4 (0.50–0.73)	2.9 (1.83–4.82)	0.0001
Overall	70	100		0.0001

CI: confidence interval; OR: odds ratio; "—" Ref: reference.

Table 5: The effect of potential risk factors for cattle dystocia in the study area.

Variables	Categories	Total cattle tested	Total cattle positive (%)	*Univariate analysis*		*Multivariate analysis*	
				OR (CI; 95%)	*P* value	OR (CI; 95%)	*P* value
Herd size	Small (<10)	298	10 (3.4)	1.2 (0.31–4.25)	0.839		
	Large (>10)	102	3 (2.9)	—	—		
Herd type	Only cattle	261	11 (4.2)	3.0 (0.66–13.79)	0.155		
	Mixed	139	2 (0.1)	—	—		
Breed	Local	290	9 (3.1)	—	—		
	Cross	110	4 (3.6)	1.2 (0.36–3.91)	0.789		
Parity	Monoparous	15	2 (13.3)	5.2 (1.05–26.04)	0.043	5.2 (1.05–26.04)	0.043
	Pluriparous	385	12 (3.1)	—	—	—	—
Age	<3 years	52	3 (5.8)	2.0 (0.51–8.01)	0.320		
	3–6 years	110	3 (2.7)	0.9 (0.24–3.65)	0.912		
	>6 years	238	7 (2.9)	—	—		
Body condition	Good	57	2 (3.5)	1.3 (0.24–7.40)	0.754		
	Medium	194	7 (3.6)	1.4 (0.39–4.72)	0.632		
	Poor	149	4 (2.7)	—	—		
Type of breeding	Natural	325	11 (3.4)	1.3 (0.28–5.98)	0.753		
	AI	75	2 (2.7)	—	—		
Management	Extensive	348	11 (3.2)	—	—		
	Sem-intensive	52	2 (3.8)	1.2 (0.26–5.69)	0.785		
Season of calving					0.772		
	Autumn	95	2 (2.1)	—	—		
	Summer	101	2 (2.0)	0.9 (0.13–6.81)	0.951		
	Spring	118	5 (4.2)	2.1 (0.39–10.85)	0.395		
	Winter	86	4 (4.7)	2.3 (0.41–12.71)	0.352		
Previous history of dystocia	Yes	67	1 (1.5)				
	No	333	12 (3.6)	2.5 (0.32–19.30)	0.390		
Contact of cattle with a dog	Yes	218	5 (2.3)	—	—		
	No	182	8 (4.4)	2.0 (0.63–6.10)	0.246		

OR: odds ratio; CI: confidence interval, "—" Ref: reference.

were found to be most prevalent, and rates rose as gestational stages did as well. This could be as a result of the difficulty in diagnosing abortion in the first stage and the fact that some causes of abortion in cattle are stage-specific during the gestation [50, 58]. Moreover, abortions brought about by brucellosis, leptospirosis, neosporosis, and Q-fever typically take place in the final trimester of pregnancy [3, 59, 60]. This result is in agreement with previous research conducted in Ethiopia [12, 19, 21, 38, 39, 50] and elsewhere [61], which found that the majority of abortion cases took place in the third trimester. However, this finding differs from that of Albuja et al. [62] and Wolf-Jackel et al. [63], who found that the second trimester was the time during which the risk of abortion was at its highest. It is possible that this difference results from the various environmental variables, breeds, and management systems found in the various areas of study.

Cattle that had been exposed to dogs had a higher prevalence of abortion (27.9%) and a lower prevalence (4.9%) than cattle that had not been exposed to it. In both a univariate and a multivariate logistic regression analysis, a statistically significant difference was found between the prevalence of abortion and cattle contact with dogs. However, there was no significant association ($P > 0.05$) between the distribution of abortion in cattle and herd size, herd type, breed, parity, age group, body condition, management system, type of breeding, calving season, or previous history of abortion (Table 4).

3.3. Potential Risk Factors for Dystocia in Cattle. The findings of this research also demonstrated a significant association between cattle parity and the prevalence of dystocia, with monoparous cattle being five times (OR = 5.2; $P < 0.05$) more likely to have dystocia than pluriparous cattle (Table 5). This could be attributed to the smaller size and slower growth of the young heifers' pelvic dimensions [64]. This result is in agreement with the results of Hiew [65] and Benti and Zewdie [21], who stated that dystocia is more prevalent in monoparous cattle than pluriparous cattle. Momoparous cattle had a higher risk of developing dystocia than pluriparous cattle, according to previous findings [66–68]. However, herd size, herd type, breed, age group, body condition, type of breeding, management system, calving season, previous history of dystocia, and cattle interaction with a dog did not significantly affect the prevalence of dystocia in cows (Table 5).

4. Conclusion

This study found a high prevalence of reproductive disorders in Tole district, southwest Ethiopia. Abortion, stillbirth, and dystocia are the three most prevalent reproductive problems identified in the study. Risk factors for reproductive disorders in the study included the calving season and the accessibility of dogs to cattle. The accessibility of dogs to cattle in the study areas was also a risk factor for abortion. The present study also identified parity as risk factors for dystocia in cattle. This demonstrated that the main cause of the cattle production loss in the study is reproductive disorders. Therefore, it is important to increase awareness of the impact of reproductive disorders on cattle production, and applicable control techniques for these disorders should be designed and implemented. Also, further research needs to be carried out to identify and characterize the causes of reproductive issues, particularly abortion and dystocia, in various areas.

Data Availability

The data used in the current study are available upon reasonable request from the corresponding author.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

The researchers would like to express their gratitude to all of the farmers who participated in this study. For its financial and logistical support, the Ethiopian Institute of Agricultural Research is also acknowledged by the authors. The authors also acknowledge the help they received from the Southwest Shoa Zone Office while the authors were out in the field.

References

[1] J. Wangdi, P. Mindu, K. Bhujel, and S. Wangchuk, "Productive and reproductive performance of dairy cattle and their crossbreds in Bhutan," *Livestock Research for Rural Development*, vol. 26,181 pages, 2014.

[2] N. Ibrahim, "A review on reproductive health problem in dairy cows in ethiopia," *Canadian Journal of Scientific Research*, vol. 6, no. 1, pp. 01–12, 2017.

[3] T. Dereje, D. Benti, B. Feyisa, and G. Abiy, "Review of common causes of abortion in dairy cattle in Ethiopia," *Journal of Veterinary Medicine and Animal Health*, vol. 10, no. 1, pp. 1–13, 2018.

[4] O. A. Lawal-Adebowale, "Farm animals' health behaviours: an essential communicative signal for farmers' veterinary care and sustainable production," in *Livestock Health and Farming*, IntechOpen, London, UK, 2020.

[5] O. Mwai, O. Hanotte, Y. J. Kwon, and S. Cho, "Invited review - african indigenous cattle: unique genetic resources in a rapidly changing world," *Asian-Australasian Journal of Animal Sciences*, vol. 28, no. 7, pp. 911–921, 2015.

[6] P. K. Thornton, "Livestock production: recent trends, future prospects," *Philosophical Transactions of the Royal Society B: Biological Sciences*, vol. 365, no. 1554, pp. 2853–2867, 2010.

[7] R. Mrode, J. M. K. Ojango, A. M. Okeyo, and J. M. Mwacharo, "Genomic selection and use of molecular tools in breeding programs for indigenous and crossbred cattle in developing countries: current status and future prospects," *Frontiers in Genetics*, vol. 9, p. 694, 2018.

[8] Csa, "Livestock and livestock characteristics, agricultural sample survey," *Addis Ababa*, vol. 2, pp. 13–140, 2021.

[9] G. Gebreyohanes, Z. Yilma, S. Moyo, and O. A. Mwai, *Dairy Industry Development in Ethiopia: Current Status, Major Challenges and Potential Interventions for Improvement*, pp. 1–29, ILRI. Position Paper, Nairobi, Kenya, 2021.

[10] MoA, "Review of past policies and strategies for livestock in Ethiopia," Ministry of Agriculture and International Livestock Research Institute, Addis Ababa, Ethiopia, 2013.

[11] A. Hailu, "Crossbreeding effect on milk productivity of Ethiopian local cattle: challenges and opportunities," *Scholarly Journal of Agricultural Science*, vol. 3, no. 11, pp. 515–520, 2013.

[12] A. Hadush, A. Abdella, and F. agassa, "Major prepartu and postpartum reproductive problems of dairy cattle in central ethiopia," *Journal of Veterinary Medicine and Animal Health*, vol. 5, pp. 118–123, 2013.

[13] Y. H. Gebre, G. W. Gebru, and K. T. Gebre, "Adoption of artificial insemination technology and its intensity of use in eastern tigray national regional state of ethiopia," *Agriculture & Food Security*, vol. 11, p. 44, 2022.

[14] C. Chebo and K. Alemayehu, "Trends of cattle genetic improvement programs in Ethiopia: Challenges and opportunities," *Livestock Research for Rural Development*, vol. 24,109 pages, 2012.

[15] D. Zuidema, K. Kerns, and P. Sutovsky, "An exploration of current and perspective semen analysis and sperm selection for livestock artificial insemination," *Animals*, vol. 11, no. 12, p. 3563, 2021.

[16] B. Duguma, "Farmers' perceptions of major challenges to smallholder dairy farming in selected towns of Jimma Zone, Oromia Regional State, Ethiopia: possible influences, impacts, coping strategies and support required," *Heliyon*, vol. 8, no. 6, Article ID e09581, 2022.

[17] B. Fekadu, "Challenges and opportunities of indigenous dairy production and management: the case of selected rural villages in Bambasi District, Benishangul Gumuz Regional State, Western Ethiopia," *International journal of agricultural science and food technology*, vol. 8, no. 2, pp. 105–124, 2022.

[18] D. Tulu and S. Gebeyehu, "Prevalence of major reproductive problem and associated risk factor in dairy cattle of Jimma Horro district in kelem wollega zone, western Ethiopia," *International Journal of Research in Agricultural Sciences*, vol. 5, no. 5, pp. 2348–3997, 2018.

[19] N. Ibrahim, K. Belihu, F. Lobago, and M. Bekana, "Seroprevalence of bovine brucellosis and its risk factors in Jimma zone of Oromia Region, South-western Ethiopia," *Tropical Animal Health and Production*, vol. 42, no. 1, pp. 35–40, 2010.

[20] A. Haile, T. Yisehak, and T. Niguse, "Assessment of major reproductive disorders of dairy cattle in urban and per urban area of Hosanna, Southern Ethiopia," *Animal and Veterinary Sciences*, vol. 2, no. 5, pp. 135–141, 2014.

[21] A. D. Benti and W. Zewdie, "Major reproductive health problems of indigenous Borena cows in Ethiopia," *Journal of Advanced Veterinary and animal research*, vol. 1, no. 4, pp. 182–188, 2014.

[22] G. Ashebir and G. Ashebir, "Major factors influencing the reproductive performance of dairy farms in mekelle city, tigray, Ethiopia," *Journal of Dairy, Veterinary & Animal Research*, vol. 3, no. 4, p. 88, 2016.

[23] M. Y. Temesgen, A. A. Assen, T. T. Gizaw, B. A. Minalu, and A. Y. Mersha, "Factors affecting calving to conception interval (days open) in dairy cows located at Dessie and Kombolcha towns, Ethiopia," *PLoS One*, vol. 17, no. 2, Article ID e0264029, 2022.

[24] F. Abdelhadi, S. Abdelhadi, A. Niar et al., "Abortions in cattle on the level of tiaret area Algeria," *Global Veteterinary*, vol. 14, pp. 638–645, 2015.

[25] D. Tesfaye and A. Shamble, "Reproductive health problems of cows under different management systems in kombolcha northeast ethiopia," *Advances in Biological Research*, vol. 7, no. 3, pp. 104–108, 2013.

[26] M. Kifle and N. Moges, "Major reproductive health disorders of cow in and around gondar, north west Ethiopia," *Journal of Reproduction and Infertility*, vol. 7, no. 3, pp. 88–93, 2016.

[27] M. Thrusfield, *Veterinary Epidemiology*, pp. 345–543, Blackwell Publishing, England, UK, 3rd edition, 2005.

[28] W. Richard, *Dairying. Tropical Agriculturalist*, pp. 43–48, Macmillan Press, London, UK, 1st edition, 1993.

[29] J. Moran, "Tropical dairy farming: feeding management for small holder dairy farmers in the humid tropics," *Landlinks Press*, vol. 18, pp. 209–218, 2005.

[30] D. Wathes, J. Brickell, N. Bourne, A. Swali, and Z. Cheng, "Factors influencing heifer survival and fertility on commercial dairy farms," *Animal*, vol. 2, no. 8, pp. 1135–1143, 2008.

[31] T. Tolosa, F. Regassa, and K. Belihu, "Seroprevalence study of bovine brucellosis in extensive management system in selected sites of Jimma zone, western Ethiopia," *Bulletin of Animal Health and Production in Africa*, vol. 56, no. 1, pp. 25–37, 2008.

[32] H. Asgedom, D. Damena, and R. Duguma, "Seroprevalence of bovine brucellosis and associated risk factors in and around Alage district, Ethiopia," *SpringerPlus*, vol. 5, no. 1, pp. 851–858, 2016.

[33] D. Tulu, B. Deresa, and F. Begna, "Case-control study on risk factors associated with brucellosis in aborted cattle of Jimma zone, Ethiopia," *Iranian Journal of Veterinary Science and Technology*, vol. 11, no. 2, pp. 27–36, 2020.

[34] F. Abunna, B. Merid, G. Goshu, H. Waktole, and G. Mammo, "Assessment of major reproductive health problems, their effect on reproductive performances and association with brucellosis in dairy cows in bishoftu town, Ethiopia," *Journal of Dairy, Veterinary & Animal Research*, vol. 7, no. 1, pp. 2–7, 2018.

[35] A. Tigabneh, S. Fantahun, T. Bihonegn, and W. Tesfay, "Assessment of major reproductive disorders of dairy cattle in dessie and kombolcha towns, south wollo, north eastern Ethiopia," *International Journal of Advanced Research in Biological Sciences*, vol. 4, no. 7, pp. 89–96, 2017.

[36] M. H. Khan, K. Manoj, and S. Pramod, "Reproductive disorders in dairy cattle under semi-intensive system of rearing in North-Eastern India," *Veterinary World*, vol. 9, no. 5, pp. 512–518, 2016.

[37] F. Tolosa, M. Netsere, and Y. Habtamu, "Assessment of major reproductive disorders in dairy cattle in and around Bale robe, oromia regional state, Ethiopia," *Veterinary Medicine International*, vol. 2021, Article ID 8855718, 8 pages, 2021.

[38] H. Dinka, "Reproductive performance of crossbred dairy cows under smallholder condition in Ethiopia," *Journal of Veterinary Medicine and Animal Health*, vol. 1, no. 5, pp. 101–103, 2013.

[39] M. Bitew and S. Prasad, "Study on major reproductive health problems in indigenous and cross breed cows in and around bedelle, south west Ethiopia," *Journal of Animal and Veterinary Advances*, vol. 10, no. 6, pp. 723–727, 2011.

[40] M. Filmon, G. Tadele, and Y. Melese, "Assessment on major reproductive health problems of dairy cattle in Boloso Sore, Southern Ethiopia," *Journal of Veterinary Medicine and Animal Health*, vol. 10, no. 9, pp. 224–230, 2018.

[41] A. Wagari and J. Shiferaw, "Major reproductive health problems of dairy cows at Horro guduru animal breeding and research center, Horro guduru wollega zone, Ethiopia," *International Journal of Biochemistry, Biophysics and Molecular Biology*, vol. 1, no. 1, pp. 18–24, 2016.

[42] A. Fares, "Factors influencing the seasonal patterns of infectious diseases," *International Journal of Preventive Medicine*, vol. 4, no. 2, pp. 128–132, 2013.

[43] V. Sejian, T. Meenambiga, M. Chandirase, and S. M. K. Naqvi, "Reproductive technology in farm animals: new facets and findings: a review," *Journal of Biological Sciences*, vol. 10, no. 7, pp. 686–700, 2010.

[44] T. Siyoum, A. Yohannes, Y. Shiferaw, Z. Asefa, and M. Eshete, "Major reproductive disorders on Jersey breed dairy cattle at adea berga dairy farm, west shewa zone, oromia region, Ethiopia," *Ethiopian Veterinary Journal*, vol. 20, no. 1, pp. 91–103, 2016.

[45] T. Ayana and T. Gudeta, "Incidence of major clinical reproductive health problems of dairy cows at bako livestock research farm over a two-year period (september 2008-december 2010)," *Animal and Veterinary Sciences*, vol. 3, no. 6, pp. 158–165, 2015.

[46] R. Manca, G. Ciccarese, D. Scaltrito, and D. Chirizzi, "Detection of anti-neospora caninum antibodies on dairy cattle farms in southern Italy," *Veterinary Sciences*, vol. 9, no. 2, p. 87, 2022.

[47] S. E. Al-Qassab, M. P. Reichel, and J. T. Ellis, "On the biological and genetic diversity in Neospora caninum," *Diversity*, vol. 2, no. 3, pp. 411–438, 2010.

[48] K. Asmare, F. Regassa, L. J. Robertson, A. D. Martin, and E. Skjerve, "Reproductive disorders in relation to neospora caninum, brucella spp. and bovine viral diarrhoea virus sero status in breeding and dairy farms of central and southern ethiopia," *Epidemiology and Infection*, vol. 141, pp. 1–9, 2013.

[49] K. Asmare, "Neospora caninum versus Brucella spp. exposure among dairy cattle in Ethiopia: a case control study," *Tropical Animal Health and Production*, vol. 46, no. 6, pp. 961–966, 2014.

[50] B. Deresa, D. Tulu, and F. B. Deressa, "Epidemiological investigation of cattle abortion and its association with brucellosis in Jimma zone, Ethiopia&lt," *Veterinary Medicine: Research and Reports*, vol. 11, pp. 87–98, 2020.

[51] M. Lefkaditis, R. Mpairamoglou, A. Sossidou, K. Spanoudis, and M. Tsakiroglou, "Neospora caninum, A potential cause of reproductive failure in dairy cows from Northern Greece," *Veterinary Parasitology: Regional Studies and Reports*, vol. 19, Article ID 100365, 2020.

[52] M. P. Reichel, M. Alejandra Ayanegui-Alcérreca, L. F. Gondim, and J. T. Ellis, "What is the global economic impact of Neospora caninum in cattle – the billion dollar question," *International Journal for Parasitology*, vol. 43, no. 2, pp. 133–142, 2013.

[53] A. Bahari, G. Abdollahpour, A. Sadeghi-Nasab, S. Sattari Tabrizi, M. Yavari, and B. Dadmehr, "A serological survey on leptospirosis in aborted dairy cattle in industrial farms of Hamedan suburb, Iran," *Iranian Journal of Veterinary Research*, vol. 12, no. 4, pp. 1–3, 2011.

[54] M. Kardjadj, "The epidemiology of cattle abortion in Algeria," *Tropical Animal Health and Production*, vol. 50, no. 2, pp. 445–448, 2018.

[55] F. C. Ayral, D. J. Bicout, H. Pereira, M. Artois, and A. Kodjo, "Distribution of Leptospira serogroups in cattle herds and dogs in France," *The American Journal of Tropical Medicine and Hygiene*, vol. 91, no. 4, pp. 756–759, 2014.

[56] A. H. Soomro, A. A. Kamboh, R. Rind et al., "A study on prevalence and risk factors of brucellosis in cattle and buffaloes in district Hyderabad, Pakistan," *Journal of Animal Health and Production*, vol. 2, no. 3, pp. 33–37, 2014.

[57] E. J. Richey and C. D. Harrell, *Brucella abortus disease (Brucellosis) in beef cattle*, University of Florida. Cooperative Extension Services, Institute of Food and Agricultural Sciences, Gainesville, FL, USA, 1997.

[58] O. M. Radostits, C. C. Gay, K. W. Hinchcliff, and P. D. Constable, *Veterinary Medicine. A Text Book of Diseases of Cattle, Sheep, Pigs, Goats and Horses*, W.B., Saunders, Philadelphia, PA, USA, 10th edition, 2007.

[59] S. Parthiban, S. Malmarugan, M. S. Murugan, J. Rajeswar, and P. Pothiappan, "Review on emerging and reemerging microbial causes in bovine abortion," *International Journal of Nutrition and Food Sciences*, vol. 4, no. 4, pp. 1–6, 2015.

[60] W. Yadeta, G. M. Bashahun, and N. Abdela, "Leptospirosis in animal and its public health implications: a review," *World Applied Sciences Journal*, vol. 34, no. 6, pp. 845–853, 2016.

[61] H. D. Norman, R. H. Miller, J. R. Wright, J. L. Hutchison, and K. M. Olson, "Factors associated with frequency of abortions recorded through Dairy Herd Improvement test plans," *Journal of Dairy Science*, vol. 95, no. 7, pp. 4074–4084, 2012.

[62] C. Albuja, O. Ortiz, C. Lopez, and J. Hernandez Ceron, "Economic impact of pregnancy loss in an intensive dairy farming system," *Veterinaria Mexico OA*, vol. 6, no. 1, 2019.

[63] G. A. Wolf-Jackel, M. S. Hansen, G. Larsen, E. Holm, J. S. Agerholm, and T. K. Jensen, "Diagnostic studies of abortion in Danish cattle 2015–2017," *Acta Veterinaria Scandinavica*, vol. 62, pp. 1–12, 2020.

[64] I. López Helguera, A. Behrouzi, J. P. Kastelic, and M. G. Colazo, "Risk factors associated with dystocia in a tie stall dairy herd," *Canadian Journal of Animal Science*, vol. 96, no. 2, pp. 135–142, 2016.

[65] W. Hiew, *Prediction of parturition and dystocia in holstein-friesian cattle and cesarean section in dystocic beef cattle*, PhD Thesis, p. 240, Purdue University, West Lafayette, IN, USA, 2014.

[66] H. Atashi, A. R. Abdolmohammadi, M. Dadpasand, and A. Asaadi, "Prevalence, risk factors and consequent effect of dystocia in Holstein dairy cows in Iran," *Asian-Australasian Journal of Animal Sciences*, vol. 25, no. 4, pp. 447–451, 2012.

[67] M. Bahrami-Yekdangi, G. R. Ghorbani, A. Sadeghi-Sefidmazgi, A. Mahnani, J. K. Drackley, and M. H. Ghaffari, "Identification of cow-level risk factors and associations of selected blood macro-minerals at parturition with dystocia and stillbirth in Holstein dairy cows," *Scientific Reports*, vol. 12, no. 1, p. 5929, 2022.

[68] T. Hohnholz, N. Volkmann, K. Gillandt, R. Waßmuth, and N. Kemper, "Risk factors for dystocia and perinatal mortality in extensively kept angus suckler cows in Germany," *Agriculture*, vol. 9, no. 4, p. 85, 2019.