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Investigation on the Occurrence and Associated Risk Factors of Dystocia in Cattle of Jimma Horro District, Ethiopia

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Abstract: Dystocia is one of reproduction problem that causes a serious economic loss in the cattle production. A cross-sectional study was conducted from January 2017 to January 2018 to determine the occurrence and associated risk factors for dystocia in the Jimma Horro district of Kellem Wollega zone. A questionnaire survey involving a total of 384 randomly selected cattle revealed that 5.7% of them had a dystocia problem. Season of calving (OR=5.5) and method of breeding (OR=4.1) were identified as risk factors of dystocia in the study area. However, age group, origin, breed, parity, sex of calf and body conditions of cattle at calving were not statistically associated (P<0.05) with dystocia. The present study documented the occurrence of dystocia in cattle of study area. Thus, the appropriate size of the bull should be selected during breeding, avoided breeding of heifers at a young age, feeding management and exercise accustomed were recommended. Moreover, further investigation should be conducted on dystocia and the associated loss in the study area.

Key words: Cattle · Dystocia · Prevalence · Risk Factors · Jimma Horro

INTRODUCTION

Ethiopia has a huge number of cattle populations. However, their contribution to the national economy is low [1]. This low economic earning from cattle resources is associated with various factors such as reproduction disorders, diseases, poor nutrition and lack of policies for reproduction problems prevention and control techniques [2]. Reproduction problems in cattle are common in Ethiopia. Cattle are maintained in a different production system and environmental condition which could greatly affect the occurrence of the problems [3]. Among the foremost problems that have a direct impact on the reproduction performance of cattle, dystocia has been indicated to be the foremost common reproductive problem [4].

Dystocia is one of the reproductive problems which have been defined as the failure of cattle to deliver its calf through its own force [5]. It is the foremost reason for calf death, stillbirth and mastitis and ends up in internal reproductive organ infections and additional retained fetal membrane [6, 7]. There are several risk factors of dystocia including breed, parity, condition of cattle at calving, birth weight of calf and season of calving [8]. Foeto-pelvic inconsistency is the main cause of calving difficult. In addition, dystocia might ensuing from different causes that interfere with the expulsive forces required to expel the calf like lack of uterine contractions, incomplete dilation of cervix, because of stenosis and uterine [9]. Dystocia is more common in primiparous than in multiparous cattle and results from smaller stature and the slow maturation of pelvic dimension of young heifers [2, 10].

The primary type of dystocia in heifer is oversize calf, abnormal foetal position and failure of the vulva to dilate. In older cattle, the primary types of dystocia are abnormal fetal position, oversized calves, multiple fetuses, uterine inertia, torsion and failure of cervix to dilate [11]. Higher rates of dystocia were observed in heifer than older cows. The prevalence of dystocia seems to be higher in the crossbreed cattle than others [12].

Dystocia causes a serious economic loss in the dairy industry [13]. It causes huge economic impact on producers because of calf death, veterinary labor prices,

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decreased rebreeding efficiency and injury or death to the cow [7]. Several studies indicated that dystocia affected the survival, health and production of calves and dams [14]. Dystocia also results in calf mortality at birth, reduced fertility, reduced milk production and influence on cattle performance [15-18]. A prevalence of dystocia as high as ranging from 2.9-11.6% has been reported in Ethiopia. However, those studies did not give sufficient on the occurrence and associated risk factors of dystocia in the country. Specifically, there was limited information on cattle dystocia. The management of dystocia is easier when specific physical, environmental and management situations that influence its occurrence are identified [19].

There is widespread dystocia in cattle of Jimma Horro district that compromise cattle production. These unusually high dystocia represent a great economic loss to the nation and it is a significant blow to the livelihood of the people in the affected area. Despite the continued and widespread occurrence of cattle dystocia in the district, there were no reports are available that estimate prevalence and associated risk factors of dystocia in the study area. This study is therefore required to provide evidence on the importance of risk factors and the occurrence of dystocia in cattle. The evidence can inform interventions aimed at reducing the impacts of the dystocia. Hence, the present study was designed to investigate the occurrence and associated risk factors of dystocia in cattle of Jimma Horro district among dairy production areas in western Ethiopia.

MATERIALS AND METHODS

Description of the Study Area: The study was carried out from January 2017 and January 2018 in choose peasant associations of Jimma Horro district, Kellem Wollega zone in western Ethiopia. This district is delimited by Begi district in North, Gawo Kebe district in East, Yamalogi Wolel district in South and Gidami district in West. The area is located at an elevation of 1400-1830 meters above sea level. The topography of this district is characterized by a forest of Wolel Mountain and Dati Wolel Park. The environmental condition alternates with long summer rain (June to September), short season (March to May) and winter time of year (December to February). The minimum and maximum annual rain fall and daily temperature range from 800 to 1200mm and 15 to 25°C, respectively. The agro-ecology of Jimma Horro district is characterized by 19.7% highland, 48.5% midland and 31.8% lowland. Cattle population within the area is calculable to be concerning 68,500 heads of cattle. The farmers in the district practice mixed (crop-livestock) farming system (Figure 1).

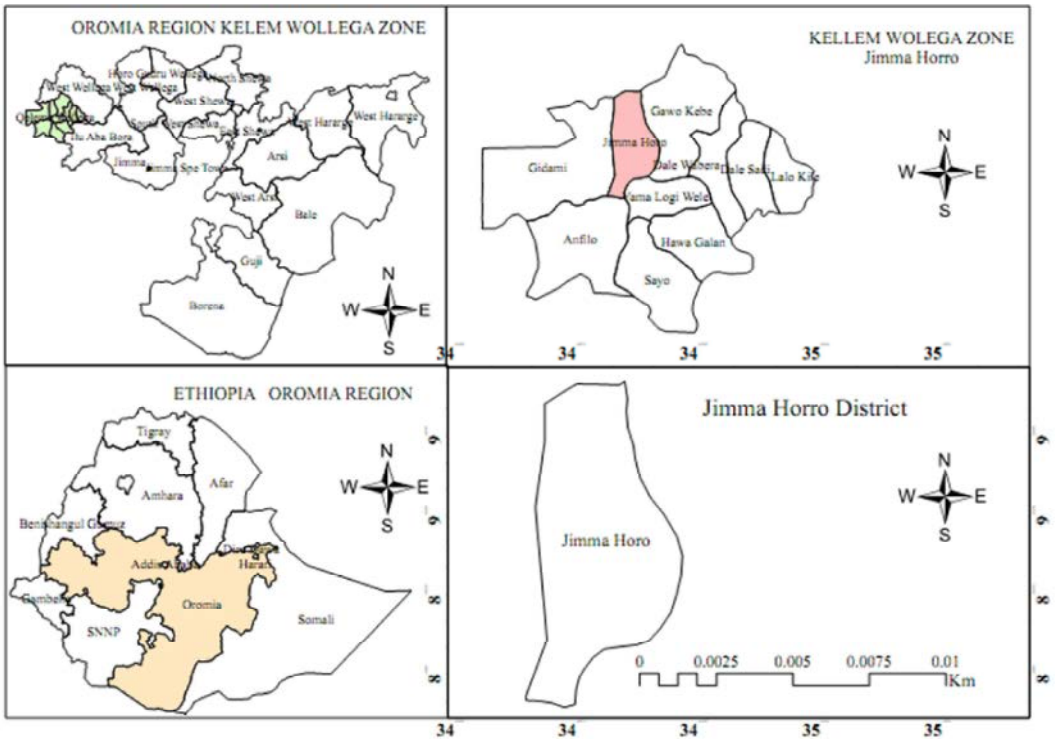

Fig. 1: Map of the study area

Study Population and Design: All-female cattle in Jimma Horro district were target population whereas the study population was breeding cattle in selected peasant associations of the study district. Heifer and cow with two years and above were included in this study. The cross-sectional study design was conducted from January 2017 to January 2018 to investigate the occurrence and associated risk factors of dystocia in Jimma Horro district. For the purpose of this study, dystocia is defined as a failure of cattle to deliver its calf through its own force [5].

Sampling Method and Sample Size Determination: A simple sampling technique was used to choose six peasant associations from the study district. The sample size was calculated based on the formula recommended by Thrusfield [20], using a 95% confidence interval, 5% precision and 50% expected prevalence of dystocia. Hence the sample size needed to determine the prevalence and associated risk factors were 384 cattle. Individual cows were designated by a simple sampling technique from peasant associations based on the amount of cattle population.

Data Collection: A tested questionnaire was administered to the cattle owners that randomly selected from peasant associations. Household participating in the study were informed about the purpose of the study and their verbal agreement was obtained. The questionnaire contained information about the dystocia history and dystocia frequency in the herd during the last one year. Associated risk factors were investigated containing age groups (<3, 3-6 and > 6 years), sex of calf (male and female), cattle breed (local and Holstein-Friesian), body condition (poor, medium and good), parity (monoparous and pluriparous), the use of artificial insemination (yes and no) and calving season (autumn, summer, spring and winter).

Data Management and Analysis: Data acquired during this study was recorded in excel for windows 2010 and transferred to STATA version 11.0 for analysis. The association between dystocia and independents variables was inspected using the logistic regression model. The potential risk factors related to dystocia were identified using a multivariable logistic regression model (Adjusted odds ratios). The variables with P≤ 0.25 in univariable analysis were included in the multivariable logistic regression model for further selection based on backward elimination technical using an LR-test at 0.05 point. Interaction effect and multiple-collinearity of variables were tested using cross-product terms and collinearity matrix index, respectively before building the final model. The validity of the model to detected data was evaluated by calculating the Hosmer-Lemeshow test. The confidence level (CL) was set to be at 95% and P-value less than or equal to 0.05 were fixed for significance for all analysis in this study.

RESULTS

The present study indicated that from a total of 384 pregnant cattle examined, 22 of them had dystocia problem with overall prevalence of 5.7% (22/384). The highest prevalence (10.4%) of dystocia was recorded in Abono peasant association. However, there was no statistically significant difference (P>0.05) in prevalence of dystocia among peasant association. The prevalence of dystocia (10.7%) was higher in cattle with more than six years age than other age groups; the variation was statistically insignificant among them (P>0.05). The highest prevalence of dystocia (7.3%) was recorded in cattle having good body condition at calving, nerveless, the difference was not statistically significant (P>0.05). Regarding the season of calving of cattle, the highest (7.4%) prevalence of dystocia was recorded in spring season than others. The variation in prevalence of dystocia among the seasons was statistically significant (P<0.05). Similarly, the higher prevalence of dystocia (6.8%) was recorded in cattle bred by natural service than that use artificial insemination (3.3%). The cattle bred naturally were almost seven times more likely to be faces dystocia than that use artificial insemination. However, in univariable analysis the association between prevalence of dystocia and related risk factors like parity, breed and sex of calving were not statistically significant (Table 1).

The variable with a p-value less than or equal to 0.05 in univariable with no multi-collinearity was entered in the multivariable logistic regression model. The multivariable logistic regression detected that cattle calving in the autumn season were more likely (OR=5.5, P<0.05) to have dystocia than those calving in the winter season. Likewise, the cattle that no bred by artificial insemination were more likely (OR=4.2, P<0.05) to had dystocia than those bred with artificial insemination. No significant interaction between variables was identified (Table 2). The Hosmer-Lemeshow goodness-of-fit test indicated that the model was good (P=1.0).

Table 1: Univariable logistic regression analysis of dystocia related risk factors in study area

Variables	Category	Total cattle examined	Total cattle positive (%)	OR (CL; 95%)	P-value
Origin	Abono	96	10 (10.4)	0.28 (0.05-1.04)	0.06
	Makanisa	96	4 (4.2)	0.74 (0.16-3.41)	0.70
	Nunu Inaro	96	5 (5.2)	0.59 (0.14-2.53)	0.48
	Une	96	3 (3.1)	-	-
Age	>6 years	75	8 (10.7)	0.40 (0.15-1.08)	0.07
	<3 years	111	5 (4.5)	1.01 (0.33-3.09)	0.99
	3-6 years	198	9 (4.5)	-	-
Body condition at calving	Medium	145	9 (6.2)	1.2 (0.46-3.12)	0.72
	Poor	116	4 (3.4)	2.2 (0.66-7.39)	0.20
	Good	123	9 (7.3)	-	-
Season	Autumn	121	6 (5.0)	6.8 (1.87-4.85)	0.004
	Summer	103	5 (4.9)	5.8 (1.58-11.08)	0.008
	Spring	121	9 (7.4)	3.9 (1.26-11.87)	0.018
	Winter	39	2 (5.1)	-	-
Parity	Monoparous	263	17 (6.5)	1.6 (0.59-4.45)	0.37
	Pluriparous	121	5 (4.1)	-	-
Using of artificial insemination	No	263	18 (6.8)	6.5 (1.90-12.10)	0.003
	Yes	121	4 (3.3)	-	-
Breed	Local	364	19 (5.2)	3.2 (0.86-11.89)	0.082
	Holstein-Friesian	20	3 (15.0)	-	-
Calf sex	Female	321	3 (0.9)	1.14 (0.32-4.01)	0.84
	Male	63	19 (30.2)	-	-

Table 2: Multivariable logistic regression model of potential risk factors of dystocia in study area

Factors	Total of animals examined	Total animals positive (%)	Adjusted OR (95%CL)	P-value
Season				0.043
Autumn	121	6 (5.0)	5.5 (1.37-10.08)	0.016
Summer	103	5 (4.9)	3.3 (1.9-10.08)	0.043
Spring	121	9 (7.4)	5.3 (1.09-12.14)	0.037
Winter	39	2 (5.1)	-	-
Using of artificial insemination				
No	263	18 (6.8)	4.2 (1.10-11.14)	0.037
Yes	121	4 (3.3)	-	-

DISCUSSION

This study indicated that the overall prevalence of dystocia in study area was 5.7%. The dystocia prevalence within the current study was comparable to the prevalence of 5.9% and 6.6% in southern and southwest Ethiopia respectively, found by other authors [21, 22]. Similar to this result, Ayana and Gudeta [23] and Ayisheshim *et al.* [24] also reported 6.7% and 6.0% prevalence in the west and northwest Ethiopia, correspondingly. However, the prevalence of dystocia reported in the present study is lower than findings of Kifle and Moges [25] 15.5%, Wagari and Shiferaw [26] 9.2% and Misebo *et al.* [27] 16.5%. This result was higher than the reports of Tulu and Gebeyehu [28], Hadush *et al.* [29] and Eshete and Moges [30], who reported 2.3%, 2.9% and 3.3% prevalence of dystocia respectively in a different part of the country. This variation may be due to the difference in the size of bull used, fetus and birth canal of cattle, feeding, cattle breed and environmental factors.

The current study indicated that the season of calving was significantly associated with dystocia in cattle. Cattle were almost six times more probability (OR=5.5) to have dystocia in autumn than summer and spring seasons compared to the winter season. This difference may be easy access to pasture in summer and spring seasons, more physical exercise and longer days [31]. During the cold season at third gestation, the stage has been related to increased dry matter intake, thyroid concentration, blood flow to the uterus, gestation length and reduced plasma estradiol concentrations were the foremost necessary to increased birth weight and dystocia [32]. This finding is in agreement with [6, 7, 17, 33] that reported season of calving was significantly associated with dystocia. However, this result is not consistent with that of Olson *et al.* [35] and Johanso *et al.* [36] who reported that the season of calving is not affected by calving difficulty. This variation may be due to the difference in management, feeding, environmental factors and breed of cattle in different study areas.

The present finding also indicated that the type of breeding used was significantly associated with the prevalence of dystocia ($P<0.05$) and cattle bred by natural service was four times (OR=4.2) more likely to have dystocia compared to those bred with artificial insemination. This may be due to natural service bull not selected for breeding. Sire is the most important in determining calf birth weight, hence the selection of bull for birth weight and calving ease, it would be possible to alleviate many existing calving problems [37].

The higher prevalence of dystocia was recorded in monoparous (6.5%) than pluriparous (4.1%). This finding is in line with Benti and Zewdie and Hiew [2, 10], who reported that dystocia is more common in monoparous than pluriparous cattle. This may due to smaller size and slow development of pelvic dimension of young heifers. Similarly, the highest prevalence of dystocia was recorded in good body condition than others which is similar with previous reports [2, 10]. Over condition cattle have a better risk of dystocia whereas too thin heifers don't gains the suitable body size at parturition at the age of twenty four months. Three to four point body condition score was optimal level of body condition. The lower score (body condition score <3) showed that the cattle has been deficiency of energy [38]. This result is also in line with the finding of Zemenu, Bekele and Ahmed and Assefa and Adugna [39, 40].

CONCLUSION

This result showed that occurrence of dystocia in cattle. This indicated that dystocia is the major cause of reproduction loss in cattle. This study also identified that season of calving and types of breeding were risk factors for dystocia in cattle. Thus, appropriate size of bull should be selected during breeding, avoided breeding of heifers at young age, feeding management and exercise accustomed were recommended. Moreover, further investigation should be carried out on dystocia and the associated loss.

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