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Dystocia in Cattle: Prospective Analysis in Daily Veterinary Practice (N = 573 Parturitions)

Chantal Bühler[1], Jürg Hüsler[2], Gaby Hirsbrunner[3]

[1]Tierarztpraxis Unternährer, Langenthal, Switzerland
[2]Institute of Mathematical Statistics and Actuarial Science, University of Bern, Bern, Switzerland
[3]Clinic for Ruminants, Vetsuisse Faculty, University of Bern, Bern, Switzerland
Email: gaby.hirsbrunner@vetsuisse.unibe.ch

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Abstract

Purpose: The aim of this prospective study was to collect cases of dystocia in 4 rural veterinary practices in Switzerland over 12 months, focusing on calf vitality. Methods: During 12 months, data of 573 assisted parturitions were collected. The age of the cows involved ranged from 2 to 17 years (median 5.2 yr) with a median gestation length of 288 days. Results: Overall, 651 calves were born (61.2% male). 481 were single and 85 were twin births. For 7 calves, no data were available. As to calf vitality: 66.1% of the calves were alive, 25.4% dead, 5.1% weak and 3.4% died during the assisted parturition process. The percentage of dead calves was higher in twins (43.5%) than in singletons (18.9%). The vitality was influenced by gestation length, parity and the time elapsed since the rupture of the amniotic sac. In this study, calf vitality was neither influenced by sex of the calf nor breed of the parents. A uterine torsion was found in 31.8% of the cases with the direction of the rotation anti-clockwise in 94%. Twins were twice as often in posterior presentation as single-born calves (31.4% versus 15.6%). Conclusion: Calf vitality was influenced by parity, gestation length and time from amniotic sac rupture to veterinary intervention.

Keywords

Cattle, Dystocia, Veterinary Practice, Obstetrics, Calf Vitality

1. Introduction

Eutocia or normal calving describes a physiological parturition process without human help after a normal gestation length [1]. The common gestation length in cattle varies between 270 and 290 days [1] [2]. Dystocia is defined as calving difficulty resulting from prolonged spontaneous calving or prolonged or severe as-

sisted extraction [3] [4]. The reasons for dystocia can be grouped in fetal and maternal factors [4].

The incidence of dystocia ranges from 3% to 40% of all calving [5] [6] [7] and is influenced by multiple factors: age at first calving, breed, sire, nutritional status, housing, calving management of farmer and assisting veterinarian [3]. Mee *et al.* (2011) described an overall incidence of calving assistance and dystocia of 31.1% and 6.8%, respectively [7]. Though dystocia rates internationally may appear to be low, calving assistance rates are higher, varying between 10% [8] and >50% [9].

The aim of this study was to collect cases of dystocia in the daily veterinary practice in Switzerland over 12 months and to describe the underlying causes. A special focus was set on calf vitality.

2. Materials and Methods

Data collection

Data of 4 rural veterinary practices in the canton of Lucerne, Switzerland, were collected over 12 months (January 2015 - December 2015) and for n = 573 cases. The veterinarians filled out a short questionnaire after each assisted calving.

Cow and pregnancy

Using the individual ear tag number of every cow, the following data were collected via the Swiss animal movement database (http://www.agate.ch/): breed, age, parity, date of last insemination, calving date.

Dystocia

Time elapsed between rupture of the amniotic sac and veterinary intervention was recorded. As herds are small in Switzerland, parturition is generally observed by owners very frequently and the time of the rupture of the amniotic sac is normally recorded. Monitoring systems are used seldom.

The position of the calf, feto-maternal disproportion, uterine inertia, uterine torsion, and applied calving assistance (including number of persons pulling) were registered by the veterinarians, including drugs administered. Additionally, information about the number of fetuses, gender, the estimated birth weight as well as the vitality and malformations of calves were gathered. Calving assistance was done by manual pulling through owners. A calf jack was only used in 3 cases.

The following categories of vitality were used: alive, dead, weak and dying during the assisted parturition process. "Weak" was defined according to Kovacs *et al.* with calves with low tonicity, needing support for sternal recumbency and head requiring support [10]. Drugs used under parturition were also listed. The cow's condition post partum (p.p.) focusing on injuries resulting from parturition was protocolled.

All data were then transferred to Excel sheets (Microsoft® Office Excel 2007).

Statistical analysis

Descriptive statistical methods were used. Metric variables were described

with median, 25% and 75% quartiles, minimum and maximum. Depending on data, a Chi square test or a Kruskal-Wallis test was used. A logistic regression with backward and forward selection was performed to identify the influence of all factors on calf vitality. Level of significance was set at $p < 0.05$.

3. Results

Cow and pregnancy

Data from 573 cases were collected of which 15.2% were primipara. Median age of the cows was 5.2 yr, median parity was 3 and median gestation length was 288 days (Table 1). There were 43% Holstein, 38% Brown Swiss and 19% other breeds represented. As to breed of sires used, there were mainly beef bulls (53%) followed by 20% Brown Swiss, 16% Holsteins and 11% others. Artificial insemination had been performed in most of the cases (78%). Percentage of cows in tiestalls (49%) and in freestalls (51%) was balanced. All cows had access to pasture in the period between April and October depending on weather. Calving was not seasonal.

Dystocia

From all calvings needing veterinary assistance, 79.8% of the calves were presented in anterior presentation. Twins were twice as often in posterior presentation as single-born calves. The percentage of hip flexion was 16.0% in twins compared to 2.5% in singletons. A feto-maternal disproportion was recorded in 21.8% of the cases. Uterine inertia was found in 179 cows, thereof 45% were classified as primary uterine inertia (Table 2). The number of cows suffering from uterine inertia increased with increasing parity (10.3% in heifers compared to 75% in 9th parity). A uterine inertia was diagnosed in 31.6% of singleton dams and 28.2% of twin mothers. A uterine torsion was found in 31.8% of all cases, the direction of the rotation was counter-clockwise in 94% (Table 2). In 52% of the uterine torsions, the degree of the torsion was 270˚.

The extraction of the calf was done with the aid of 1 person (22%), 2 persons (67.9%), and 3 persons (10.1%). A cesarean section was performed in 14 cases, a fetotomy in 17 cases. An intravenous treatment with calcium solution was performed in 34.7% of the cases. The tocolyticum Isoxsuprin (Degraspasmin® Dr.E.Gräub AG, Bern Switzerland) was used to correct a malpresentation or malposition or a uterine torsion in 17.1% of the cases whereas in 12.4% of the cases, Dinoprostone (MyotonE2® Dr.E.Gräub AG, Bern Switzerland) was used to enhance uterine contractions and to ripen the cervix [11].

Table 1. Age, parity and gestation length of cows needing veterinary assistance under parturition.

	Age (yr)	Parity (number)	Gestation length (days)
Median	5.2	3	288
25% quartile	3.5	1	283
75% quartile	7.5	5	293

Calves

Overall, 651 calves were born. 481 were single and 85 were twin births (additionally, n = 7 parturitions without data of calves). 61.2% of the calves were male and 38.8% were female. Most twins belonged to the weight category 30 - 39 kg, singletons to 40 - 49 kg. As to vitality, 66.1% of the calves were alive, 25.4% were dead, 5.1% were weak and 3.4% died during parturition (Table 3). In twins, there were relatively more dead calves found than in singletons (38.6% versus 17.8%; p = 0.0005). The logistic regression with backward and forward selection could identify gestation length (class 2: 270 - 280 d), parity

Table 2. Causes for veterinary assistance under parturition, distribution of presentations of calves and time since amniotic sac rupture.

Causes for assistance, presentation and position	Percentage	Specification
Uterine torsion	31.8%	94% counter clockwise
Feto-maternal disproportion	21.8%	
Uterine inertia	31.2%	45% primary
Anterior presentation	79.8%	11.2% deviation of head 5.5% carpal flexion 3.7% elbow lock
Backward presentation	19.7%	6% hip flexion 1.7% hock flexion
Transverse presentation	0.5%	
Upside down position	16.5%	
Time since amnmiotic sac rupture	57.8% ≤ 1 hr 26.5% > 1 - 3 hr 15.7% > 3 hr	

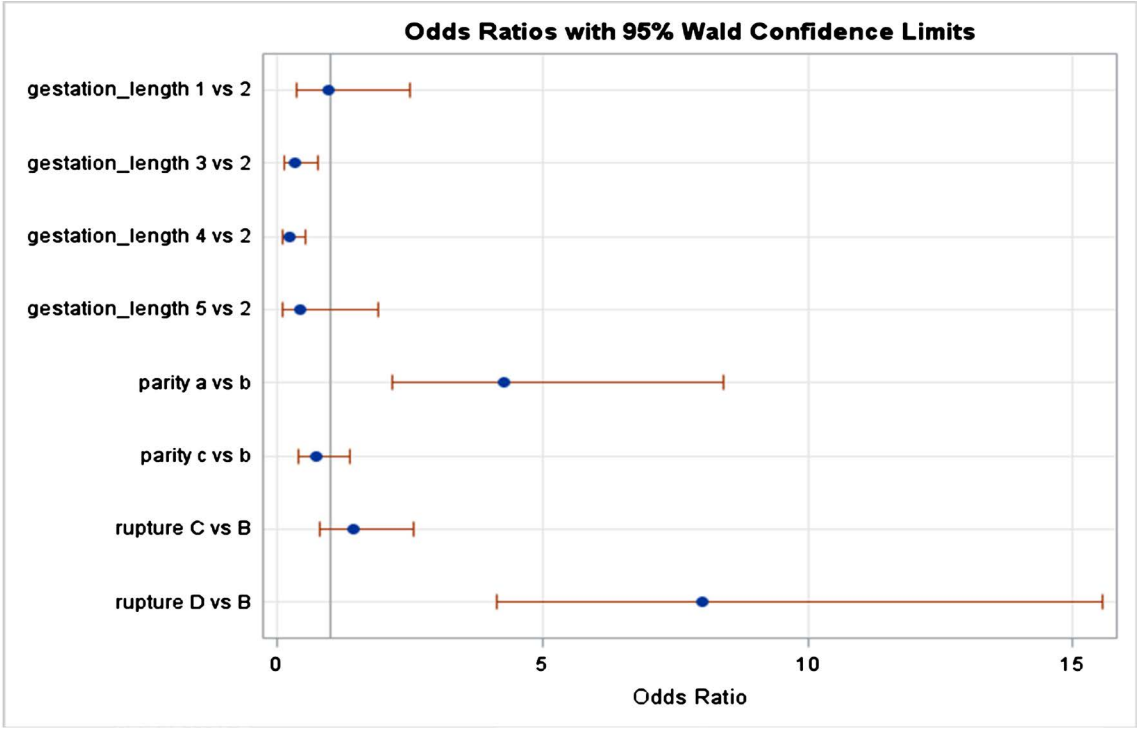
Table 3. Gender distribution, weight and vitality of the calves needing veterinary assistance.

	Number/Percentage	Specification
Single born	N = 481	Male: 54%
Twins	N = 170	n = 2 × 27 male, n = 34 mixed, n = 2 × 22 females, n = 2 × 2 missing
Weight	22.2% (≤39 kg) 40.5% (40 - 49 kg) 27.6% (50 - 59 kg) 9.7% (≥60 kg)	
Vitality	66.1% living 25.4% dead 5.1% weak 3.4% dying under parturition	

(class b: 2nd and 3rd parity) and the time elapsed since the rupture of the amniotic sac (class B: ≤ 1 hr) as positively influencing factors on the calf's vitality (Figure 1, Figure 2). Probability for a calf to survive was better if dam was pregnant 281 - 290 d or 291 - 300 d than 270 - 280 d. Probability to survive was also higher for calves from cows coming to their second or third lactation than from cows coming to their first lactation. Finally, probability to survive was higher if the rupture of the amniotic sac was ≤1 hr before veterinary assistance started than if the rupture of the amniotic sac was >3 hr. In this study, calf vitality was neither influenced by sex of the calf nor breed of the parents. In the weight-category < 40 kg significantly more calves were born dead (p = 0.0002). The highest percentage of living calves was found in the category of 40 - 49 kg. Malformations were found in 18 calves.

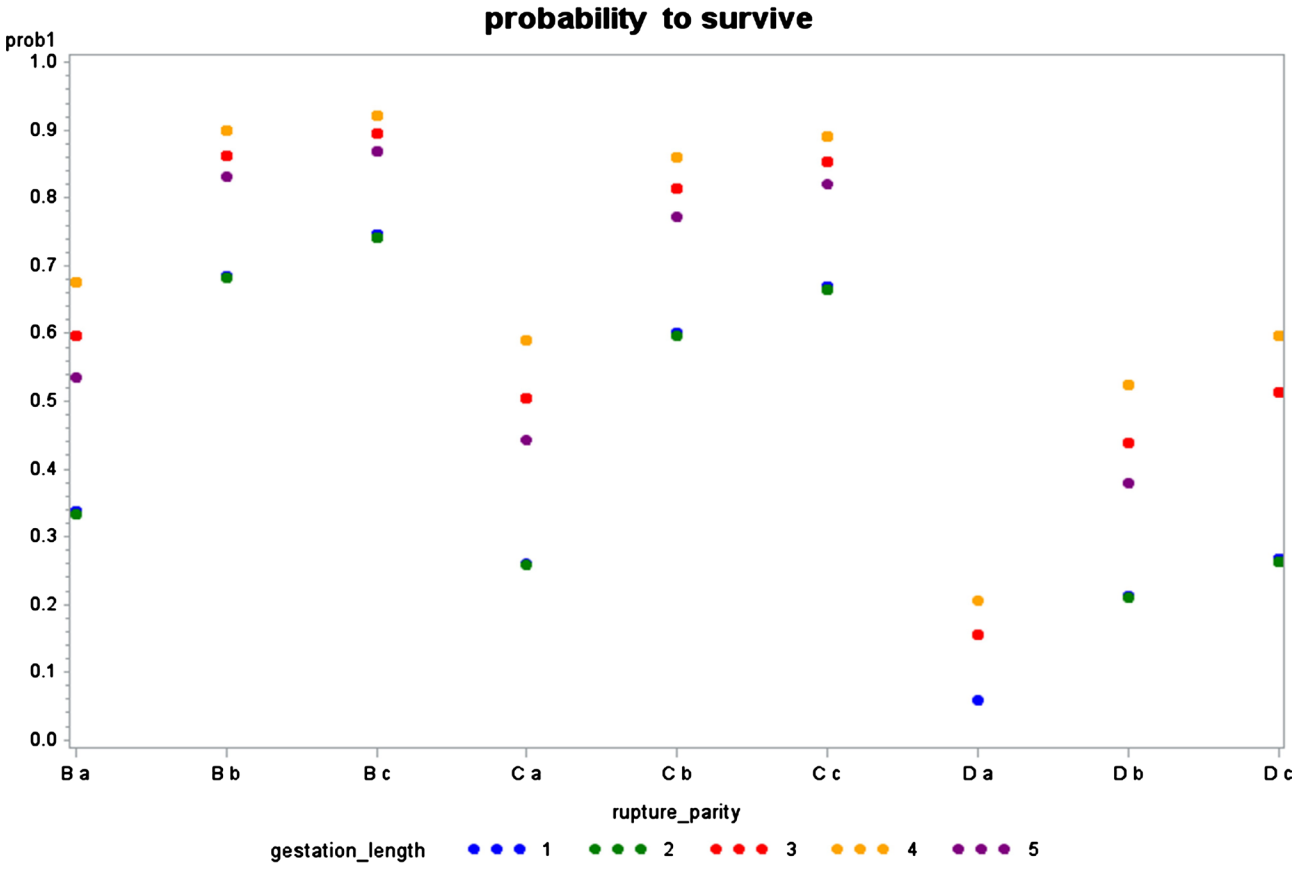
Cows post partum

Injuries were detected in 127 cows during the gynecological examination following parturition. In 57.4% of these cases, superficial injuries of the soft birth canal were found. The incidence of injuries increased with the increasing number of persons pulling: from the cases with 1 person pulling 13% of the cows had injuries compared to 53.7% of the cases with 3 persons pulling. N = 12 cows were slaughtered in an emergency during or immediately after parturition, there from in six cases the calf had been extracted, in one case even alive.



Odds-ratios with 95% Wald confidence limits for the parameter "living calf" versus dead, weak or dying calf for pregnancy duration (1 ≤ 270 d, 2 = 270 - 280 d, 3 = 281 - 290 d, 4 = 291 - 300 d, 5 = >300 d), parity (a = 1; b = 2 and 3; c > 3) and time since rupture of the amniotic sac (B ≤ 1 hr, C > 1 - 3 hr, D > 3 hr). Odds ratios not including the value "1" vary significantly between groups (indicated by asterisks).

Figure 1. Living calves in relation to pregnancy duration, parity and time since rupture of the amniotic sac.



Scatterplot of probability to survive for pregnancy duration (1 = <270 d, 2 = 270 - 280 d, 3 = 281 - 290 d, 4 = 291 - 300 d, 5 ≥ 300 d), plotted against parity (a = 1; b = 2 and 3; c > 3) and time since rupture of the amniotic sac (B ≤ 1 hr, C > 1 - 3 hr, D > 3 hr).

Figure 2. Probability to survive.

4. Discussion

According to the practicing veterinarians, the distribution of the dam's breeds in this study reflected the distribution of the breeds in the region. In Brown Swiss cows of this study, uterine torsion was diagnosed in 45% of the cases compared to 31.8% including all breeds. Already Mock (2015) described a higher incidence of uterine torsions in Brown Swiss cows [12]. The rotation of the uterine torsions was anti-clockwise in 94% of the cases which is in agreement with Mock (2015) with 96.2% [12].

In Switzerland, mean pregnancy duration through all breeds was 287 d with longer durations in Brown Swiss (290 d) and shorter duration in Holsteins (282 d) [2]. Different studies describe an increased risk of dystocia with increasing gestation length [3] [4]. It is known that male calves are prolonging the duration of gestation [13]. The higher percentage of male calves (61.2%) in our study might explain a slightly increased median gestation length of 288 d.

The rupture of the amniotic sac is followed by delivery of the calf within 70 min [14]. The timing of intervention during stage 2 of calving clearly influences the risk of stillbirth, with later interventions resulting in a higher risk [15]. This could be demonstrated in this study as in the category > 3 hr between rupture

and intervention by veterinarian, we found less calves alive than in the category ≤ 1 hr.

Bleul (2008) has shown that 7.6% of all calves in Switzerland born from 2002-2006 were twins [2]. In our study, 15% of the cases needing veterinary assistance were due to twinning. Different studies describe a higher rate of birth assistance for twins, often due to malpresentations [5] [16] [17].

Throughout all parturitions in cattle, 5% of the calves are born in posterior presentation [4] [18]. Although physiologic, such calves more often need assistance and are less vital [4]. This was confirmed, as posterior presentation was represented with 19.7% of the cases in our study. Additionally, twins were twice as often in posterior presentation as singletons.

Forced extraction with 1 - 3 persons are more common in Switzerland than using "calf jacks" (in this study only used in 3 farms). However, it is not recommended that more than 2 persons are pulling, as the risk of injuries is increasing with increased force applied [18]. This could clearly be shown in our study with more than 50% of the cases with 3 persons pulling resulted in injuries compared to 13% with 1 person pulling.

The incidence of caesarean sections (2.4%) was lower than described by Wittwer (1999, 5.2%) [19]. An increasing rate of artificial insemination with sires selected for calving ease might have contributed to a better parturition process and less caesarean sections.

Primipara are suffering more frequently from dystocia than pluripara [2] [3], [16]. However, in our study only 15.2% were primipara, which is less than described by Wittwer (30.8%; 2000) in a former Swiss study on veterinary assistance during parturitions [19]. An explanation might be that in our study, 53% of the sires were beef bulls through AI, most of them selected for calving ease. Additionally, the median age of the cows in our study as well as the median age of the cow population might be higher than in other regions of the world. Nevertheless, median age of the cows with dead calves or dying calves was lower than median age of cows with living calves (**Figure 2**).

5. Conclusion

66% of all calves were born alive with the aid of a veterinarian. Calf vitality was negatively influenced by lower parity, gestation length < 270 d, and an increased period from the rupture of the amniotic sac until the assistance of parturition. For the farmers, the last point is the only modifiable one: if the parturition process does not advance after the rupture of the amniotic sac, veterinary assistance is needed without delay.

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Additional Note

A part of the manuscript was presented as a poster and in the proceedings of the ESDAR conference in Cordoba, Spain, 2018.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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