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# Dystocia frequency and causes in horses with pregnancy disorders or a history of dystocia: A prospective study

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## Abstract

Dystocia typically presents a life-threatening condition for both the mare and the foal. This prospective long-term study aimed to ascertain whether mares with prior pregnancy disorders or a history of dystocia were at a higher risk of experiencing subsequent dystocia in comparison to those without such medical antecedents. To achieve this goal, the authors analysed 207 parturitions and 164 mares over a 10-year period. Of these, 57 were associated with pregnancy disorders or prior dystocia (Group 1), while 150 parturitions followed uneventful pregnancies in mares that had not yet experienced dystocia (Group 2). Mares in Group 1 were significantly more likely to develop dystocia than those in Group 2 ($p = .0180$; odds ratio = 2.98). Foetal causes of dystocia were more prevalent than maternal causes ($p < .0389$). Maternal mortality stood at 0.5%, and neonatal mortality reached 1.9%. The results demonstrate that mares are at significantly higher risk of developing dystocia after experiencing pregnancy disorders or parturition complications during previous pregnancies, emphasizing the need for systematic birth monitoring.

KEYWORDS
Dystocia, equine, pregnancy disorders, parturition complications

## 1 | INTRODUCTION

Dystocia is considered one of the most perilous occurrences animals of various species can face during parturition. Recent studies have underscored the significance of investigating instances related to pregnancy disorders and dystocia in diverse animal populations (Amin et al., 2020; Nagel et al., 2020). Equine dystocia, though perceived as infrequent in veterinary obstetrics (Frazer, 1997; Leidl et al., 1993), presents a critical condition during parturition, posing a life-threatening risk for both the mare and the foal (Lu et al., 2006; Vandeplassche, 1993). Therefore, timely recognition of potential complications is necessary to prevent the fatal consequences of dystocia (Frazer et al., 1999; McCue & Ferris, 2012). A recent literature search revealed that the frequency of dystocia, its causes, and consequences in horses was typically determined retrospectively in previous studies (Ellerbrock & Wehrend, 2023a, 2023b). At present, there is a lack of data offering insights into how often horses, having encountered pregnancy disorders or parturition complications in a previous pregnancy, subsequently develop dystocia.

The objective of this prospective study is to examine the hypothesis that mares with pregnancy disorders or a history of parturition complications are more likely to develop dystocia than mares without this history.

## 2 | MATERIALS AND METHODS

The data were gathered during veterinary procedures and are subject to approval by the Giessen Regional Council (kTV8-2017) for use. Written consent from animal owners was obtained upon the mares' admission to the clinic, permitting the use of their data. A comprehensive analysis encompassed 207 parturitions involving 164 mares, with several mares undergoing multiple birth monitoring sessions throughout the observation period. The mares belonged to 22 different horse breeds (Table 1), which, according to the Breeding Association Regulations of the German Equestrian Federation from 2021, were grouped into five different categories.

### 2.1 | Animals

Data were collected and analysed from mares during birth monitoring at the Veterinary Clinic for Reproductive Medicine and Neonatology, Justus-Liebig University, between 1 January 2010 and 31 December 2020.

**TABLE 1** Categorisation and number of horse breeds, along with the corresponding number of parturitions within the birth monitoring of Groups 1 and 2.

| Category | Breeds | Number of parturitions | Total number |
|---|---|---|---|
| German riding horse | Warmblood | 43 | 171 |
| | Hanoverian horse | 39 | |
| | Thoroughbred | 23 | |
| | Holsteiner horse | 20 | |
| | Oldenburger | 19 | |
| | Westphalian | 15 | |
| | Trakehner horse | 7 | |
| | Zweibrücker horse | 2 | |
| | Arabian horse | 1 | |
| | Dutch Warmblood | 1 | |
| | Rhinelander | 1 | |
| Ponies and small horses | Pony | 9 | 18 |
| | Icelandic horse | 7 | |
| | Fjord horse | 1 | |
| | Haflinger | 1 | |
| Other breeds | Quarter horse | 9 | 11 |
| | Andalusian | 1 | |
| | Friesian | 1 | |
| Heavy Warmblood and Coldblood breeds | Coldblood | 3 | 5 |
| | Noriker | 1 | |
| | Shire horse | 1 | |
| Trotting horse | Trotting horse | 2 | 2 |
| Total | 22 | 207 | 207 |

The total number of parturitions was categorized into two groups:

1. Parturitions involving mares with a history of pregnancy disorders or prior dystocia (Group 1)
2. Parturitions involving mares without a history of pregnancy disorders or prior dystocia (Group 2).

The inclusion criteria for Group 1 were as follows:

1. Prior dystocia or birth of a dead foal
2. Inadequate breeding maturity
3. Any of the following conditions during the last trimester of pregnancy
   a. Colic requiring treatment
   b. Surgical retorsion of the uterus following antepartum uterine torsion
   c. Abdominal wound
   d. Bladder stones and cystitis
   e. Placentitis or vaginitis
   f. Uterine dorsiflexion
   g. Antepartum vaginal prolapse
   h. Severe lameness or ataxia.

The inclusion criteria of Group 1 were considered exclusion criteria for members of Group 2.

All mares underwent a standardized daily clinical examination and 24-h birth monitoring with hourly observation. The timing and nature of the parturitions (eutocic or dystocic delivery) were recorded. The obstetric examinations adhere to a predetermined standardized procedure. The cause was recorded for each case of dystocia confirmed by obstetric examination. Cases in which the mare was discharged before parturition, parturition was induced, or a caesarean section was performed antepartum were excluded from the analysis.

### 2.2 | Statistics

The Chi-square test and Fisher's exact test were employed to assess the independence of the two characteristics: type of parturition (dystocia or eutocia) and cause of parturition complications (foetal or maternal) across the groups. Fisher's exact test was utilized in cases where the prerequisites for the Chi-square test were not met. Additionally, a binomial test was performed to assess the nature of the distribution between the two characteristics within a group.

## 3 | RESULTS

Group 1 comprised 57 parturitions, while 150 were assigned to Group 2. Overall, obstetric interventions were necessary in 9.7% of parturitions (20 out of 207). In Group 1, dystocia occurred in 17.5%

of cases (10 out of 57), whereas in Group 2, it was observed in 6.7% of cases (10 out of 150) (Table 2).

The mares in Group 1 exhibited a significantly higher propensity for dystocia compared to those in Group 2 ($p = .0180$), demonstrating an almost threefold higher probability of experiencing dystocia (odds ratio = 2.98).

A total of 25 complications requiring intervention were identified in 19 cases of dystocia. Parturitions with maternal and foetal causes of dystocia were excluded from statistical analysis. Hence, 19 cases of dystocia were analysed.

The primary causes of these complications were of foetal origin, reaching 73.7% (14 out of 19), while maternal causes accounted for five dystocia cases (26.3%) (Table 3). Foetal causes were notably more prevalent ($p < .0389$; 95% CI = 53.88–93.48) than maternal causes (95% CI 6.5–46.12). Among the foetal causes, abnormal position was the most frequently diagnosed factor contributing to dystocia.

**TABLE 2** Comparison of dystocia frequency, maternal, and foetal mortality between Groups 1 and 2.

| Dystocia frequency and mortality | Group 1 | Group 2 | Total |
|---|---|---|---|
| Dystocia frequency | 17.5% (10/57) | 6.7% (10/150) | 9.7% (20/207) |
| Maternal mortality | | | |
| In relation to all parturitions | 1.8% (1/57) | 0% (0/150) | 0.5% (1/207) |
| In relation to all dystocias | 10% (1/10) | 0% (0/10) | 5% (1/20) |
| Foetal mortality | | | |
| In relation to all parturitions | 5.3% (3/57) | 0.7% (1/150) | 1.9% (4/207) |
| In relation to all dystocias | 30% (3/10) | 10% (1/10) | 20% (4/20) |

**TABLE 3** Incidence of parturition complications in 19 cases of dystocia. The total count of parturition complications exceeds 19 due to cases of multiple occurrences.

| Kind of dystocia | Kind of abnormality | Number of cases | Total number |
|---|---|---|---|
| Abnormal foetal positioning | Lateral position | 5 | 10 |
| | Ventral position | 5 | |
| Abnormal posturing of the foetal head | Lateral deviation of the head | 2 | 4 |
| | Ventral deviation of the head | 2 | |
| Abnormal posturing of the foetal forelimbs | Unilateral shoulder flexion | 2 | 4 |
| | Bilateral carpal flexion | 1 | |
| | Unilateral fetlock joint flexion | 1 | |
| Relative foetopelvic disproportion | | 3 | 3 |
| Premature placental separation | | 3 | 3 |
| Uterine inertia | | 1 | 1 |
| Total | | 25 | 25 |

Conservative interventions were performed in 19 of 20 dystocic deliveries. In one case, a caesarean section became necessary. Nineteen mares were successfully discharged in good health after obstetric care (95%). The maternal mortality rate stood at 0.5% (1 out of 207) in relation to all parturitions. Unfortunately, one of the mares from Group 1 died a few hours after giving birth. The cause of death was internal bleeding and hypovolaemic shock, which resulted from an attempt to correct a foetal lateral position by means of conservative obstetric care.

The neonatal mortality reached 1.9% (4 out of 207). Two foals, which were already dead, were delivered by conservative obstetric care, and two others died within hours after birth despite conservative interventions. Among the foals from Group 1, the mortality rate stood at 5.3% (3 out of 57), with three out of 10 foals not surviving dystocia. There was no significant difference between the two groups in terms of maternal and foetal mortality ($p > .05$).

## 4 | DISCUSSION

Formerly, the frequency of dystocia in mare populations was determined retrospectively (Ellerbrock & Wehrend, 2023a). In this long-term study, however, the authors adopted a prospective approach to ensure consistent data collection and standardized examination procedures.

The mares in the study population belonged to 22 different horse breeds. According to the authors, the number of parturitions assigned to each horse breed was considered too low to derive breed predispositions. Therefore, the aspect of breed was not further analysed.

A literature review revealed dystocia in mixed mare populations, with rates of 10.1% (McCue & Ferris, 2012) and 11.2% (Ginther & Williams, 1996). Similar to the present study, the authors collected data from a diverse group of mares representing various breeds, including Warmbloods, Thoroughbreds, Quarter Horses, and ponies. Regarding individual breeds, Dicken et al. (2012) reported a dystocia frequency of 6% in Warmblood mares, while Rosales et al. (2017) recorded a rate of 8.4% in Thoroughbred mare parturitions. Haas et al. (1996) observed a 4.5% dystocia rate in draught horse crosses. Surveys conducted at stud farms indicated dystocia rates ranging from 2% to 13% across these breeds (Ellerbrock & Wehrend, 2023a). This study, in turn, reveals closely aligned dystocia frequencies at 9.7% (20/207) across the groups.

Among the studies reviewed, only the research conducted by Lanci et al. (2022) provided a somewhat comparable investigation into the association between pregnancy disorders and an increased risk of dystocia in horses, akin to the mares of Group 1 of this study. Lanci et al.'s (2022) study retrospectively examined data

from 222 Warmblood mares, identifying 32 cases as risk pregnancies. However, it is worth noting that the inclusion criteria for their risk group differed from those determined for the purposes of this study. For instance, they did not consider prior dystocia as a risk factor. Furthermore, although their mare population consisted mainly of those included for birth monitoring, it also encompassed mares treated for existing dystocia. Even though a comparison between the dystocia frequency of pregnancies with and without increased risk could not be drawn using a control group, the authors' results also lead to the conclusion that mares with pregnancy disorders suffer from dystocia more frequently. However, dystocia frequency in mares, whose pregnancies were categorized as high-risk by the authors, was significantly higher at 47% (15 out of 32) than in the present study (17.5%, 10 out of 57). In contrast, the incidence of dystocia following pregnancies without an increased risk (9 out of 185) exhibits a similar rate at 4.9%. Mares without pregnancy disorders or a history of parturition complications developed dystocia in 6.7% (10 out of 150) of cases.

In Group 1, various disorders were combined to ensure an adequate number of cases for statistical analysis. Further studies should investigate dystocia probabilities associated with well-defined disorders to facilitate a more comprehensive analysis of risk factors.

The current study confirmed the prevailing notion that foetal causes of dystocia are significantly more frequent than maternal causes. This aligns with earlier findings in the literature (Arthur & Bee, 1996; Ellerbrock & Wehrend, 2023a; Karadjole et al., 2008; Lanci et al., 2022; Threlfall, 2007; Youngquist, 1986). Among the identified causes of dystocia, abnormal positioning or posturing of the foetus was diagnosed most frequently, a pattern consistent with existing literature (Blanchard et al., 2011; Hawkins, 1982; Leidl et al., 1993; McGladdery, 2001; Pynn, 2015; Roberts, 1986).

Across the groups, 20% (4 out of 20) of the foals delivered under dystocic conditions did not survive. Lanci et al. (2022) reported a nearly identical figure of 21% (12 out of 57). In their study, neonatal mortality associated with dystocia within the high-risk group stood at 20% (3 out of 15), which was 10% lower than the rate observed by the authors of this study (30% or 3 out of 10). Freeman et al. (1999) report a foal mortality rate of 89% post-parturition and 95% (97/102) at discharge following obstetrical intervention, whether surgical or conservative. The high mortality is attributed to the prolonged transportation time from the stable to the clinical facility. This does not apply to the cases of the present study as obstetric assistance was provided on-site by a specialized veterinarian. Regardless of the type of treatment, prolonged dystocias are also associated with an unfavourable prognosis for the mare's survival (Ellerbrock & Wehrend, 2023b). In Freeman et al.'s (1999) study, 18.4% (18/98) of mares died following conservative or surgical obstetrical assistance during dystocia. However, the present study and Lanci et al.'s (2022) investigation demonstrate a lower maternal mortality rate.

There was only a slight difference in maternal mortality rates between the two studies (3.8%). It is worth noting that, in Lanci et al.'s (2022) research, 8.8% (5 out of 57) of the mares did not survive dystocia. In the current study, the rate was slightly lower at 5% (1 out of 20). However, it is important to interpret these findings with caution, as the calculated frequencies are based on relatively small sample sizes and would benefit from verification in larger populations.

The association between specific pregnancy disorders and the likelihood of dystocia remains uncertain. Owing to the diversity of pregnancy disorders observed in the mares under study, we refrained from conducting a comprehensive analysis on this aspect. For a more thorough examination, larger groups of mares exhibiting well-defined pregnancy disorders would be essential. In conclusion, the higher incidence of dystocia in mares with pregnancy disorders or a history of dystocia underscores the importance of implementing systematic birth monitoring for these animals.

## AUTHOR CONTRIBUTIONS

AW and JK conceived and designed the experiment. KB supported the statistical data analysis. ME gathered and analysed the data, while AW and ME jointly drafted and edited the manuscript. Translation and editing services were provided by LinguVet.

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## CONFLICT OF INTEREST STATEMENT

None of the authors have any conflict of interest to declare.

## DATA AVAILABILITY STATEMENT

The data supporting this study's findings can be made available from the corresponding author upon reasonable request.

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