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# FACTORS INFLUENCING THE VIABILITY OF CALVES BORN BY DYSTOCIA IN ALGERIA

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## ABSTRACT

The objective of this study was to determine the factors that influence the viability of calves born by dystocia in Algeria. Out of 3060 calving followed, the average rate of dystocia recorded was 6.9 per cent (n=212). Among the 212 calves born by dystocia, 47.6 per cent died (n=101) at the time of parturition or 24 h after and 52.4 per cent survived (n=111). Several factors significantly influenced the viability of calves such as foetal sex (FS) ($p$<0.001), body condition score (BCS) of the cow ($p$<0.05), body weight of calves (BW) at birth ($p$<0.01), timing of intervention (TI) ($p$<$10^{-8}$), type of dystocia (poor presentations PP: $p$<0.05 and no cervical dilatation NCD: $p$=0.05) and type of intervention (manual: $p$<0.001, fetotomy of dead calves: $p$<0.01 and culling of cows: $p$<0.005).This demonstrates the losses that can be caused by dystocia and that often these losses are due to the lack of follow-up and poor management of the farms. Education of farm management and personnel in strategies to reduce dystocia and its effect on calf and dam health should be a priority according to the results of this study.

**Keywords:** Calving difficulty, Stillbirth, Viability

## INTRODUCTION

Calving is a critical time in the cow-calf production cycle and some calving problems are dystocia and stillbirth (Philipsson *et al*., 1979). Stillbirths and dystocia can result in direct losses due to calf and dam mortality and premature culling, as well as indirect loss due to additional veterinary services, labour and treatment (John *et al*., 1992). Several studies have implicated dystocia as contributing factor to stillbirth (Meyer *et al*., 2001 and Lombard *et al*., 2007), reduced milk yield (Dematawewa and Berger, 1997 and Rajala

and Gröhn, 1998), impaired health (Erb *et al*., 1985 and Peeler *et al*., 1994), infertility (Thompson *et al*., 1983 and Dematawewa and Berger 1997) and reduced life span (Erb *et al*., 1985 and Dematawewa and Berger, 1997) of the cow. Nevertheless, few studies dealt with the prevalence and the risk factors of stillbirth in dairy herds of Algeria. Dystocia has been defined as a difficult birth resulting in prolonged calving or severe assisted extraction of the calf at birth (Mee, 2004). It represents on average, three to seven per cent of calving (Noakes *et al*., 2001) and requires the intervention of external assistance. Stillbirth is defined as birth in which a calf born after at least 260 days of gestation is born dead or dies within 24 hours after its birth (Szücs *et al*., 2009). Reports from all over the world including USA (Meyer *et al*., 2001), Denmark (Hansen, 2004) and the Netherland (Harbers, 2000) reveal stillbirth rates of 10 to13 per cent.

The purpose of this study was to describe the distribution of dystocia and stillbirth in Algerian cow-calf herds and to investigate the effects of some factors on viability of new born calves.

This study was carried out nationally on 11 different provinces representing the four corners of Algeria (Souk Ahras, Batna, BordjBouArreridj, Bouira, Boumerdes, Algiers, Médéa, Tiaret, Relizane, SidiBelabbés and Biskra). The study was conducted between January 2010 and December 2011, in 40 veterinary clinics and two dairy farms with highly qualified veterinary doctors. About 3060 calvings of dairy cows (purebred Holstein), were observed among which 212 presented dystocia. All cows subjected to a consultation during calving were taken into consideration during the study. All the informations like date, age, breed, body condition score (BCS) of cows, cause of dystocia, sexes and weight of calves, type of dystocia, method and time of intervention, were recorded in technical sheets to be analysed.

Statistical analysis was carried out using two software packages: the Epi 6 fr and the Epi Info 2000. It included a description of the study population, for all the variables measured. The results were expressed in numbers and percentages.

The study of the relationships between these different variables and the selection of the most representative variables was made using the following statistical tests:

- X2 Test
- Yates Correction (used when calculated strength < 5).
- Fisher exact Test: calculated from the

Epi 6 fr software, and this when the calculated number is less than 3.

## RESULTS AND DISCUSSION

### Frequency of dystocia

Of all recorded calvings (n=3060), 212 were dystocics which contributed to an overall incidence of around 6.90 per cent. The rest of the calvings (2848) were eutocics; with an overall incidence of 93.1 per cent. Dystocia rate varied across countries and farms; in the United States and the incidence ranged from 28.6 to 51.2 per cent and 10.7 to 29.4 per cent in primiparous and multiparous cows, respectively (Meyer *et al*., 2001; Lombard *et al*., 2007), whereas in Europe lower incidence was reported, ranging from 3 to 22 per cent and from 2 to 13 per cent in primiparous and multiparous cows, respectively (Mee, 2008).

**Table 1:** Incidence of dystocia in Algeria between 2010 and 2011 in Holstein cows

| Calving | n | Per cent (%) |
|---|---|---|
| Dystocic | 212 | 6.9 |
| Eutocic | 2848 | 93.1 |
| Total | 3060 | 100 |

Chesneau (1997) observed an average incidence of 7.8 per cent dystocia in dairy herds while Peeler *et al.* (1994) observed an average incidence of 12.9 per cent. The average incidence of dystocia was 1.3 to 2.16 per cent (Curtis *et al*., 1985; Erb *et al*., 1985; Grohn *et al*., 1990 and Correa *et al.,* 1993). These variations could be attributed primarily to genetic factors, as beef cattle breeds were more exposed to dystocia because of their anatomy and to many other factors like the rank of parturition (primiparous were more prone to dystocia than multiparous).

### Influence of dystocia on the viability of calves

In this study, the incidence of stillbirth was 47.6 per cent (n=101) and viability was 52.35 per cent (n=111). These results clearly showed that economic losses were caused by dystocia. Parturition was a crucial event because anomalies in this process such as prolonged or difficult calving negatively affected welfare, survival and performance of calves (Kovács *et al*., 2016).

**Table 2:** Prevalence of stillbirth in dystocic calvings in Algeria

| | Dead calves | Living calves | Total |
|---|---|---|---|
| **n** | 101 | 111 | 212 |
| **(%)** | 47.6 | 52.4 | 100 |

n: number of animals; Per cent (%)

Majeed *et al*., (1989) reported that 52.5 per cent of calves born by dystocia died while Lombard *et al*., (2007) reported a stillbirth rate of 8.2 per cent in calves born by dystocia. Nix *et al*., (1998) reported that dystocia significantly increased the mortality rate in calves (4.5 per cent).

Dematawewa and Berger (1997) reported that dystocia has significant negative impact on the viability of calves. The increased mortality rate seen during dystocia was due to late intervention of the veterinarians and the non-monitoring of the calves after dystocia.

**Origin of dystocia**

Based on the results of the present study, more live calves than dead were reported with fetal dystocia. Nevertheless, the stillbirth rate exceeded the viability rate for maternal dystocia.

However, no statistically significant influence was reported for dystocia on the viability of calves in this study ($p>0.05$). This could be explained by the insufficient number of cases studied in this survey. Hansen *et al*., (2004) reported that a direct maternal effect for stillbirth in the Danish Holstein population was found.

**Type of Dystocia**

Among the five types of dystocia encountered in this study, only two showed a statistically significant relationship with calf viability; namely, poor presentations and non-dilatation of the cervix. The other three types (feto-maternal disproportion, narrow pelvis and uterine torsion) did not affect calf viability. With poor presentations, a higher rate of viability (56 cases) out of the 87 cases of poor presentations, was noticed ($p<0.005$). Nevertheless, an opposite situation was observed with non-dilation of the cervix, (13 cases) among the 33 cases listed in this study for this category of dystocia; suggesting that this parameter showed a slightly statistically significant influence only ($p=0.05$).

John *et al*., (1992) reported a very significant influence of poor presentations on calf viability ($p<0.01$). Improper presentations, which are not serious can be reduced easily in a short time; which might account for the lower mortality rate with this type of dystocia, while with non-dilatation of the cervix it is quite the opposite; the loosening of the cervix takes much longer, even with hormonal treatments, which predisposes the fetuses to asphyxia.

**Fetal sex, body condition score and birth weight**

The influence of fetal sex on calf viability was highly significant in our study ($p<0.001$), with higher mortality among males. These results are explained by the higher number of births of male calves recorded in our study compared to female calves, as well as the greater difficulty encountered with male calves in case of dystocia due to their size, which is often larger and which requires more handling and time, which decreases their chances of

**Table 3:** Influence of the origin of dystocia in cows on calf viability between 2010 and 2011

| | Dead | | Alive | | Total | | | |
|---|---|---|---|---|---|---|---|---|
| **Origin of dystocia** | **n** | **(%)** | **n** | **(%)** | **n** | **(%)** | **X2** | ***p*** |
| Fetal | 57 | 26.9 | 69 | 32.5 | 126 | 59.4 | 0.719 | 0.2004 |
| Maternal | 44 | 20.7 | 42 | 19.8 | 86 | 40.6 | | |
| Total | 101 | 47.6 | 111 | 52.3 | 212 | 100 | | |

**Table 4:** Influence of types of dystocia on calf viability

| | | Total | | Alive | | Dead | | |
|---|---|---|---|---|---|---|---|---|
| ***P*** | **X2** | **(%)** | **n** | **(%)** | **n** | **(%)** | **n** | **parameters** |
| 0.00183 | 8.53 | 41 | 87 | 26.4 | 56 | 14.6 | 31 | PP |
| 0.32 | 0.22 | 12.7 | 27 | 6.13 | 13 | 6.6 | 14 | FMD |
| 0.26 | 0.468 | 6.13 | 13 | 3.77 | 8 | 3.35 | 5 | PA |
| 0.30 | 0.296 | 13.2 | 28 | 7.54 | 16 | 5.66 | 12 | UT |
| 0.05 | 2.63 | 15.6 | 33 | 6.13 | 13 | 9.43 | 20 | NCD |

PP Poor presentations; FMD Feto-maternal disproportion; PA Pelvic angustia; UT Uterine torsion; NCD No cervical dilatation; n: number of animals; Per cent (%)

**Table 5:** Influence of fetal sex, body condition score of cows and birth weight of calves on calf viability

| | Dead | | Alive | | Total | | | |
|---|---|---|---|---|---|---|---|---|
| **Parameters** | **n** | **(%)** | **n** | **(%)** | **n** | **(%)** | **X2** | ***p*** |
| FS (Female) | 17 | 8.01 | 40 | 18.9 | 57 | 26.9 | 9.92 | 0.0008 |
| FS (Male) | 84 | 39.6 | 71 | 33.5 | 155 | 73.1 | | |
| BW (kg)<25 | 11 | 5.18 | 4 | 1.88 | 15 | 7.07 | 9.77 | 0.0075 |
| BW (kg)25-30 | 57 | 26.9 | 84 | 39.6 | 141 | 66.5 | | |
| BW (kg)>30 | 33 | 15.6 | 23 | 10.8 | 56 | 26.4 | | |
| BCS<2.5 | 25 | 11.8 | 13 | 6.13 | 38 | 17.9 | 6.33 | 0.0422 |
| BCS2.5-3.5 | 67 | 31.6 | 84 | 39.6 | 151 | 71.2 | | |
| BCS>3.5 | 9 | 4.24 | 14 | 6.6 | 23 | 10.8 | | |

FS Fetal sex; BW Birth weight; BCS Body condition score, n: number of animals; Per cent (%)

**Table 6:** Influence of the method of intervention on calf viability.

| | Dead | | Alive | | Total | | | |
|---|---|---|---|---|---|---|---|---|
| **Intervention method** | **n** | **(%)** | **n** | **(%)** | **n** | **(%)** | **X2** | ***p*** |
| Manual | 55 | 25.9 | 92 | 43.4 | 147 | 69.3 | 20.10 | <0.0001 |
| Caesarean | 18 | 8.49 | 12 | 5.66 | 30 | 14.2 | 2.13 | 0.0755 |
| Hormonal | 10 | 4.71 | 7 | 3.30 | 17 | 8.01 | 0.92 | 0.1755 |
| Culling | 7 | 3.30 | 0 | 0 | 7 | 3.30 | 5.93 | 0.0049 |
| Fetotomy | 11 | 5.18 | 0 | 0 | 11 | 5.18 | 10.6 | 0.0002 |

n: number of animals; Per cent (%)

**Table 7:** Influence of timing of intervention on calf viability

| | Dead | | Alive | | Total | | | |
|---|---|---|---|---|---|---|---|---|
| **TI (h)** | **n** | **(%)** | **n** | **(%)** | **n** | **(%)** | **X2** | ***p*** |
| <6 | 23 | 10.8 | 104 | 49.1 | 127 | 59.9 | 119 | <0.0001 |
| >6 | 78 | 36.8 | 7 | 3.3 | 85 | 40.1 | | |

TI: Timing of intervention, n: number of animals; Per cent (%)

viability. These results align with those of John *et al*. (1992) and Lombard *et al*. (2007) who reported a highly significant influence of fetal sex on the viability of newborns ($p<0.001$). Another study mentioned that bull calves had significantly more calving difficulty and higher stillbirth rates than heifer calves in all cases (Heins *et al*., 2006).

Fetal weight at birth significantly influenced the viability of calves too ($p<0.01$) with a higher frequency of stillbirth in low-weight calves and also in newborns with excessive birth weight. John *et al.* (1992) found a very significant relationship between birth weight and calf viability ($p=0.005$). These results could be explained by the fact that small calves were often weak and immuno-suppressed since their mothers were often malnourished and sick, so they could hardly bear the stress of a dystocia. As for overweight calves, their size made dystocia very difficult and their extraction took much longer than normal, which decreased their chance of survival.

The body condition score of the cows significantly influenced the viability of the calves as well ($p<0.05$) and as a result, a higher frequency of mortality was noticed in lean cows with BCS<2.5. This could be because lean cows were usually malnourished and therefore weakened and carriers of several diseases and hence their fetuses would almost always be small, weak and immuno-suppressed and could not bear the sufferings of dystocia. These calves even if endured parturition, would often die within a few hours of calving. However, Berry *et al*., (2007) reported that the body condition score of cows at calving did not significantly affect the odds of a difficult calving or stillbirth.

**The method of intervention**

In the present study, three intervention methods had a significant effect on the viability of calves. With the manual technique of treating dystocia the highest level of viability was recorded ($p<0.0001$). The other methods however (caesarean and hormonal treatment), did not show any significant relationship ($p>0.05$) with calves viability. With fetotomy and culling, the mortality of calves was absolute ($p<0.001$ and $p<0.005$ respectively)

With the manual technique, more live calves were recovered than with the other methods because it represented the method of the first recourse and changed only in case of failure. Fetotomy was only advisable when the fetus was dead; which perfectly explained the results. Culling was the last resort in case of dystocia after trying all other methods and when the cow has an unfavorable vital prognosis, this also explained the high rate of dead calves extracted by this method. Regarding this parameter, bibliographic references were lacking.

**The timing of intervention**

In this study, the timing of intervention showed a highly significant relationship ($p<0.0001$) with the viability of calves born by dystocia. A low rate of stillbirth was recorded with an early intervention (<6h) while a very high rate of mortality was recorded with a late intervention (>6h)

Dystocia was a medical emergency for both calves and cows and the slightest delay was fatal and caused the death of the fetus by asphyxia, as well as very serious complications in the cow (uterine tear, even its death). At the time of difficult birth, determining the appropriate time for intervention is paramount for positive outcomes (for survival of both calf and dam) (Schuenemann *et al*., 2011). According to the National Animal Health Monitoring System, 95 per cent of dairy operators surveyed reported that they examined or assisted cows within 3 h of the beginning of calving (USDA, 2010). Assistance should be early and the delivery process should proceed in a steady and methodical manner to avoid injury to the dam and the neonate (Bethany *et al*., 2016). Late intervention around the time of parturition might lead to prolonged labour, thereby increasing the risk of stillbirth (Gundelach *et al*., 2009).

## CONCLUSION

In the present research a high incidence of calf mortality was associated with dystocia. Several factors significantly influenced the viability of calves such as fetal sex, cow body condition score, calf body weight at birth, time of intervention, type of dystocia (poor presentations and no cervical dilation) and the type of intervention (manual, fetotomy and slaughter). These results might help to improve breeding techniques making them more productive and more profitable from an economic point of view.

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