Bovine dystocia - An overview

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Received date: August 20, 2019; Accepted date: August 30, 2019; Published date: September 06, 2019

Citation: Madhumeet Singh, Akshay Sharma and Pravesh Kumar, Department of Veterinary Gynecology and Obstetrics, College of Veterinary and Animal Sciences, Palampur –INDIA. Journal of Veterinary science and zoology. 1(1):Doi: 10.31579/JVSZ/2019

Abstract
A number of physical, physiological and hormonal changes take place to prepare the dam and fetus for parturition. It is one of the most important obstetrical conditions and requires immediate attention of obstetricians as it causes severe economic losses to dairy farmers. Dystocia is often affected by several factors such as breed, parity of dam, sex of calf, birth weight of calf, pelvic size of dam, gestation length, nutrition, year and season of calving. The causes of dystocia are generally classified as being maternal or fetal in origin of which fetal dystocia dominates the maternal one in terms of incidence. It causes trauma to both cow and its offspring, and can lead to increased rates of uterine infections, periparturient disorders such as retained placenta, metritis and longer calving intervals.

Keywords: Bovine; Dystocia; Etiology; Incidence; Risk factors

Introduction
Dystocia has been defined as “a birth that reduces calf viability, causes maternal injury and requires assistance” (Noakes 2009). Immediate or long term consequences due to dystocia can turn the effort into an uneconomical and wasteful endeavour (Arthur et al. 2000). As considerable time, effort and expenses are spent in ensuring that a cow conceives, by artificial insemination (AI) or natural service, dystocia can have a huge economic impact on producers due to calf morbidity and mortality (Abera et al. 2017), increased veterinary costs, decreased production (McGuirk et al. 2007), reduced fertility (Purohit et al. 2012), and in extreme cases, injury to or death of the dam (Bicalho et al. 2008). Recent research suggests that dystocia can also have potential long-term effects on the calves born, reducing survival rate to adulthood and subsequent milk production in them (Atashi et al. 2012).

1. Incidence
The incidence of dystocia in dairy cattle was reported to range from 2 to 22 percent, while the proportion of assisted calving was higher, ranging from 10 to 50 percent (Mee 2008). The incidence recorded by various authors in two bovine species i.e. cattle and buffaloes, are given in Table 1.

2. Risk factors for dystocia in bovines
Dystocia is affected by several factors such as breed, parity of dam, sex of calf, birth weight of calf, pelvic size of dam, gestation length, nutrition, year and season of calving (Mee 2008). Age, parity of dam and sex of the calf are non-genetic factors that affect dystocia (Purohit et al. 2011) whereas, genetic, environmental, and periparturient management are other factors that influence dystocia in varying degrees (Mee 2008; Purohit et al. 2012). Zaborski et al. (2009) reviewed various factors affecting dystocia in cattle and grouped them into four main categories: direct factors (malpresentation and uterine torsion, phenotypic factors related to calf and cow (calf birth weight, pelvimetry, body weight and body condition of cow at calving, gestation length), non-genetic factors (calf age and parity, year and season of calving, place of calving, sex of the calf, nutrition, level of hormones in the periparturient period) and genetic factors (genotype of the dam, inbreeding, muscular hypertrophy, selection and quantitative trait loci).

2.1 Parity of the dam
The most important maternal factor that affects calving performance is parity as the frequency of dystocia is two to four times higher in heifers than in older cows (Purohit et al. 2011, 2012). Hickson et al. (2006) also reported higher incidence of dystocia in heifers than in older cows due to feto-maternal disproportion. The incidence of dystocia in heifers was quantified to be 10-50 per cent of all births (Purohit and Mehta 2006; Abera et al. 2017) whereas, in multiparous cattle incidence of dystocia ranged between 4-30 per cent (Uzmay et al. 2010). Mee et al. (2011) reported that the 40.0 and 28.2 percent incidence in primiparae and pluriparae for calving assistance, and 9.3 and 5.8 per cent for dystocia, respectively. They concluded that the probability of assisted calving, but not dystocia, increased linearly in primiparae as animals calved at a younger age relative to the median age at first calving. On the contrary, Grohn et al. (1990) reported that the risk of dystocia increased with increasing parity. On the contrary, body condition score, age and parity of the cow had no effect on the occurrence of dystocia (Yildiz et al. 2011). Researchers have also reported that the parity as well as season had statistically significant effect on total abnormal calving in buffaloes (Srinivas et al. 2007).

2.2 Sex of the fetus
There was a higher percentage of calving difficulty in male as compared to female births for all ages of cows (Purohit et al. 2011).
Similarly, Mee et al. (2011) concluded that there were consistently greater odds of dystocia for male calves compared to female calves, although the difference between sexes decreased with increasing parity. This theory was supported by Purohit et al. (2012) who concluded that male calves experienced more severe dystocia than females because they were heavier at birth with larger body dimensions. Contrarily, Monserrat and Sanchez (1993), reported that sex of calf, did not have a significant influence on occurrence of dystocia.

In buffaloes, Singla and Sharma (1992) reported higher rate of dystocia when the sex of calf was male (60%). They concluded that sex of the calf (male calves), twins, and milk fever increased the risk of dystocia. In a study on Iraqi buffaloes (Majeed 2001), incidence of dystocia was more in buffaloes delivering male calves (55.2 per cent) than female calves (44.8 per cent).

### 2.3 Breed of dam

<table>
<thead>
<tr>
<th>Breed</th>
<th>Country</th>
<th>Incidence (%)</th>
<th>Author(s) and Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy breeds</td>
<td>Turkey</td>
<td>31.10</td>
<td>Erdogan et al. (2004)</td>
</tr>
<tr>
<td>Sahiwal</td>
<td>India</td>
<td>0.90</td>
<td>Mandal et al. (2005)</td>
</tr>
<tr>
<td>Holstein-Friesian</td>
<td>USA</td>
<td>13.70</td>
<td>Gevrekei et al. (2006)</td>
</tr>
<tr>
<td>Dairy breeds</td>
<td>Ethiopia</td>
<td>1.30</td>
<td>Lobago et al. (2006)</td>
</tr>
<tr>
<td>Holstein-Friesian</td>
<td>Spain</td>
<td>2.50</td>
<td>Lopez de Maturanaet al. (2006)</td>
</tr>
<tr>
<td>Dairy breeds</td>
<td>Iran</td>
<td>9.80</td>
<td>Maryam (2007)</td>
</tr>
<tr>
<td>Crossbreed</td>
<td>Ethiopia</td>
<td>3.10</td>
<td>Haile et al. (2010)</td>
</tr>
<tr>
<td>Karan Fries</td>
<td>India</td>
<td>3.84</td>
<td>Balasundaram et al. (2011)</td>
</tr>
<tr>
<td>Beef breeds viz. Asconne, Charolaise, Limousine</td>
<td>Czech Republic</td>
<td>4.29</td>
<td>Citek et al. (2011)</td>
</tr>
<tr>
<td>Friesian</td>
<td>Netherlands</td>
<td>6.90</td>
<td>Gaafar et al. (2011)</td>
</tr>
<tr>
<td>Crossbreeds</td>
<td>India</td>
<td>4.30</td>
<td>Ghuman et al. (2011)</td>
</tr>
<tr>
<td>Holstein Friesian</td>
<td>Ireland</td>
<td>6.80</td>
<td>Mee et al. (2011)</td>
</tr>
<tr>
<td>Indigenous and dairy crossbreeds</td>
<td>Ethiopia</td>
<td>6.60</td>
<td>Molalegne and Prasad (2011)</td>
</tr>
<tr>
<td>Holstein</td>
<td>Iran</td>
<td>10.80</td>
<td>Atashi et al. (2012)</td>
</tr>
</tbody>
</table>

Table 1: Incidence of dystocia in bovines

### 3. Etiology of dystocia

Dystocia will be a consequence, when the expulsive forces are insufficient, when the birth canal is of inadequate shape and size, or when the fetus is too large or its disposition faulty, preventing the fetus to pass through the maternal birth canal. Maternal dystocia can be caused either by constriction of the birth canal or by a deficiency of the expulsive forces. Among fetal factors, dystocia can be caused by fetal oversize, faulty fetal disposition, fetal monsters and diseases (Noakes 2009). In cattle, Singla et al. (1990) reported that fetal dystocia (57.3%) was more common than maternal dystocia (42.7%). Fazili and Syed (1999) reported this ratio to be 76.92 and 23.08 percent, respectively. In a retrospective study, Purohit and Mehta (2006) reported that 35.92 percent dystocia were of maternal origin and 64.08 percent of fetal origin for cattle whereas, for buffaloes this ratio was almost reversed with 64.2 percent maternal dystocia and 35.8 percent fetal dystocia.

#### 3.1 Maternal causes of dystocia

##### 3.1.1 Incomplete dilatation of cervix

Dilatation of cervix at the time of delivery is essential for the easy
passage of fetus. A cascade of hormonal events leads to loosening of the ground substance of its structure due to changes in the composition of collagen components (Noakes 2009). Singla et al. (1990) and Ximenes et al. (2010) reported an incidence of 19.1 and 12.97 percent cervical dystocia in cattle. In buffaloes, incomplete cervical dilatation is rare and only sporadic cases have been reported (Das et al. 2008). In buffaloes, Singh and Nanda (1995) and Srinivas et al. (2007) observed similar incidence of cervical stenosis i.e. 12.2 and 13.10 percent, respectively. Failure of the cervix to dilate due to fibrous induration or sclerosis of cervix is seen in multiparous older cows (Purohit et al. 2011).

### 3.1.2 Narrow pelvis

Maternal pelvic area accounts for 5-10 percent variation in incidence of dystocia (Purohit et al. 2011). However, effective pelvic area in primiparae can increase by up to 15 per cent at calving due to increased mobility of the iliolsal joints, relaxation of the pelvic ligaments, abdominal straining and changes in posture (Abera et al. 2017). A narrow pelvis and an oversized fetus were the causes of more than 50 percent cases of dystocia in cattle (Citek et al. 2011). Fazili and Syed (1999) reported an incidence of 10 percent whereas Singla et al. (1990) reported 6.74 percent cases of dystocia due to narrow pelvis in cattle. In buffaloes, Singh and Nanda (1995) observed 1.56 percent cases of narrow pelvis among maternal dystocia whereas the same was reported to be 1.19 percent by Srinivas et al. (2007).

### 3.1.3 Uterine torsion

Uterine torsion is defined as a revolution or twisting of the uterus along its longitudinal axis (Purohit et al. 2012) and a complication of advanced pregnancy in cattle and buffaloes (Srinivas et al. 2007). Though incidence uterine torsion has been found lower in cows in comparison to buffaloes but locational variations from 7-30% have been observed (Purohit and Mehta 2006; Aubry et al. 2008). However, the incidence of uterine torsion represented about 29.5-30.6 percent of the buffaloes with dystocia (Siddiquee and Mehta 1992). Primary risk factors for the occurrence of uterine torsion are excessive fetal movement during first stage of calving as the fetus adopts the birth posture and increased uterine instability at term (Noakes 2009). Uterine torsion is considered to be the single largest condition contributing to dystocia in buffaloes with incidence as high as 56-80 per cent (Srinivas et al. 2007). Purohit and Mehta (2006) also reported it to be the most common maternal cause of dystocia both in buffaloes (50.95%) as compared to cows (17.5%). In cattle and buffaloes, multiparity has been considered to be at a greater risk of uterine torsion than primiparity (Aubry et al. 2008; Ali et al. 2011).

### 3.1.4 Uterine inertia

Uterine inertia, the condition where the cervix is fully dilated but myometrial contractions are too weak to expel the fetus, was associated with approximately 10 percent of total dystocia encountered in dairy cattle, primarily in pluriparae (Purohit and Mehta 2006). Fazili and Syed (1999) reported an incidence of 20 percent in cattle whereas in buffaloes, the incidence was reported to be 2.13-2.38 percent (Singla and Sharma 1992; Srinivas et al. 2007). Uterine inertia can be primary or secondary in origin. Primary uterine inertia might be a consequence in conditions such as hypocalcaemia, hypomagnesaemia, old age, lack of exercise and preterm calving and possibly hyposelenemia (Mee 2004). In primary uterine inertia, although the cervical dilation occurs and the fetus is in normal presentation, position and posture but it is not delivered due to lack of uterine contractions (Noakes 2009). Phogat et al. (1992) reported the incidence of primary uterine inertia to be 5.9 percent. Secondary uterine inertia results when the uterine musculature becomes exhausted subsequent to failure of delivery of a malpositioned or oversized fetus or due to obstruction in the birth canal. Over distension of the uterus because of fetal anasarca, general debility, environmental disturbances and nervousness are some other conditions causing secondary uterine inertia (Noakes 2009).

### 3.2 Fetal causes of dystocia

#### 3.2.1 Fetal maldisposition

Several authors reported that posture and presentation of the fetus were dynamic whereas presentation can change until parturition began and posture sometimes changes as late as the initial phases of the second stage of labour (Srinivas et al. 2007). The normal parturient presentation and position assumed by the fetus at the time of delivery is anterior longitudinal presentation, dorso-sacral position with the head resting on metacarpal bones (knees) of the extended forelimbs (Purohit et al. 2011). Any presentation or position other than this is likely to cause dystocia. Abnormal fetal position most commonly presented as posterior malpresentation, foreleg malposition, breech malpresentation or cranial malposition (Noakes 2009).

In dairy cattle, incorrect fetal orientation was observed as the most frequent cause of dystocia by various authors (39.8%, Fazili and Syed 1999; 66.6%, Purohit and Mehta 2006; 46.77%, Ximenes et al. 2010). The total incidence of dystocia due to fetal maldispositions described for the buffalo varies from 45.40-69.80 percent (Phogat et al. 1992; Srinivas et al. 2007). Purohit and Mehta (2006) reported head deviation and limb flexions as the commonest fetal cause of dystocia both in cattle (20.4% and 19.4%) and buffalo (7.5% and 16.9%). Other conditions include incomplete extension of elbows and complete retention of one or both forelimbs (shoulder flexion). In previous studies, the incidence of head deviation recorded varied from 2.5-20.4 percent in cows (Purohit and Mehta 2006) and 7.5-13.4 percent in buffaloes (Srinivas et al. 2007).

#### 3.2.2 Fetal oversize

The most common cause of dystocia in cattle, especially in heifers, is fetopelvic disproportion which may be the result of the calf being too large relative to the size of the maternal pelvis (Noakes 2009). This is most common when the fetus is of normal size for its breed but the maternal pelvis is not big enough, or the fetus is unusually large and cannot be delivered through a pelvic canal of normal size (Abera et al. 2017). There are various reasons for fetal oversize, such as calf birth weight, calf sex, twins, fetal death and emphysema. Relative or absolute sized calves cause dystocia in 25.2 percent cows (Wehrend et al. 2002). In buffaloes, relative fetal oversize is a less frequent cause of dystocia (Purohit and Mehta 2006) as they are older at first calving, ranging from 36-52 months in different breeds.

#### 3.2.3 Fetal monstrosities

Monstrosities are common in buffaloes. The incidence of monstrosities reported for cows varies from 0.9-3.22 percent (Purohit and Mehta 2006; Ximenes et al. 2010) whereas, an incidence of 7.9-12.8 percent has been reported for buffaloes.
(Singla and Sharma 1992; Phogat et al. 1992). It may be difficult for monsters to pass through the birth canal, either because of their altered shape or relative size. The common monsters causing dystocia are *Schistosoma reflexus*, *Pristisomus eluminis*, double or conjoined monsters. Hydrocephalus, ascites, anasarca and hydrothorax are some of the other fetal abnormalities that result in dystocia (Noakes 2009).

**References**

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