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Review Article

Bovine dystocia - An overview

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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 (cow 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

Breed of dam has been reported to influence dystocia on male births but not on female births (Abera *et al.* 2017). As feto-pelvic disproportion is a common cause of dystocia, methods of reducing calves' birth weight is of particular interest (Hickson *et al.* 2006). It has been reported that birth weights vary greatly among breeds, and there are also large differences among sires within the breed (Purohit *et al.* 2011; Abera *et al.* 2017). Similar to birth weight, the length of gestation was affected by both breed of sire and sire within a breed. Crossbreeding of dairy cows with beef breeds, or some dual-purpose breeds, particularly European continental breeds, has traditionally been associated with increased risks of dystocia (Purohit *et al.* 2012). However, Maltecca *et al.* (2006) reported that introduction of Jersey genes via crossbreeding may lead to a reduction in dystocia and improvement in calf health and survival in Holstein herds.

Breed	Country	Incidence (%)	Author(s) and Year
Cattle			
Dairy breeds	Turkey	31.10	Erdogan *et al.* (2004)
Sahiwal	India	0.90	Mandal *et al.* (2005)
Holstein-Friesian	USA	13.70	Gevrekci *et al.*(2006)
Dairy breeds	Ethiopia	1.30	Lobago *et al.* (2006)
Holstein-Friesian	Spain	2.50	Lopez de Maturana*et al.* (2006)
Dairy breeds	Iran	9.80	Maryam (2007)
Crossbred	Ethiopia	3.10	Haile *et al.* (2010)
Karan Fries	India	3.84	Balasundaram *et al.* (2011)
Beef breeds *viz.* Asconne, Charolaise, Limousine	Czech Republic	4.29	Citek *et al.*(2011)
Friesian	Netherlands	6.90	Gaafar *et al.* (2011)
Crossbreds	India	4.30	Ghuman *et al.* (2011)
Holstein Friesian	Ireland	6.80	Mee *et al.* (2011)
Indigenous and dairy crossbreds	Ethiopia	6.60	Molalegne and Prasad (2011)
Holstein	Iran	10.80	Atashi *et al.* (2012)
Buffalo			
Surti	India	2.09	Murugeppa *et al.* (1998)
Non-descript	India	4.47	Singh *et al.* (2003)
Murrah	India	1.78	Taraphder *et al.* (2003)
Surti, Mehsana, Jafarabadi	India	2.12	Mand*ali et al.* (2004)
Non-descript	Pakistan	3.87	Ishaq *et al.* (2009)

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 iliosacral 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 malposture, breech malpresentation or cranial malposture (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 mostcommon when the fetus is of normalsize for its breed but the maternal pelvis is notbig enough, or the fetus is unusually large andcannot be delivered through a pelvic canal ofnormal 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*, *Perosomus elumbis*, double or conjoined monsters. Hydrocephalus, ascites, anasarca and hydrothorax are some of the other fetal abnormalities that result in dystocia (Noakes 2009).

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