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Incidence, Occurrence, Predisposing Factors and Etiology of Uterine Torsion in Buffaloes: A Review

M. Selvaraju[1]* and C. Karthick[2]

[1]Veterinary University Training and Research Centre, Tamil Nadu Veterinary and Animal Sciences University, Manmangalam (Post), Karur – 639 006, Tamil Nadu, India
[2]Department of Veterinary Gynaecology and Obstetrics, Veterinary College and Research Institute, TANUVAS, Namakkal – 637 002, Tamilnadu, India

**Corresponding author*

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A B S T R A C T

Uterine torsion is one of the common obstetrical problems encountered in buffaloes, if not treated properly may lead to death of the fetus subsequently the dam causing economic loss to the farmers. The occurrences of uterine torsion in buffaloes in relation to species, breed, parity, season, stage of gestation, side of torsion, site of torsion, degree of uterine torsion, duration of uterine torsion, fetal presentation, position and posture, sex of the fetus, livability of the fetus, survivability of the dam following detorsion, predisposing factors and etiological factors were reviewed.

Introduction

The domestic water buffalo (*Bubalus bubalis*) is an important livestock resource in many countries of Asia, the Mediterranean region and Latin America. The world population of buffalo is estimated to be 172 million (FAO: http://faostat.org/) of which 96 per cent (166 million) are in Asia and the remainder mainly in the Mediterranean and Latin American regions (Perera, 2008). Uterine torsion is recognized as a major obstetrical disorder in buffaloes causing dystocia (Srinivas *et al.*, 2007) and caesarean section is the only choice to solve this disorder in delayed cases (Selvaraju *et al.*, 2012). The occurrence of uterine torsion increases adrenocortical activity and influences blood vascular cellular components as well as the metabolism of liver, kidney and muscular system (Ghuman, 2010). Uterine torsion, first reported in 1766 by Boutrolle, is the rotation of the pregnant

uterus on its longitudinal axis (Purohit and Gaur, 2014). It inflicts heavy economical losses to the farmers due to death of either fetus or dam or both beside impaired lactation (Prakash *et al.,* 2018). A diverse list of contributing causes has been proposed including the anatomy, slipping or sudden fall, the manner by which the animal lies down and gets up and strong movements of the fetus during first stage of labor (Noakes *et al.,* 2009). The etiology and pathogenesis of this condition is inadequately understood and remains open to speculation. Hence, the incidence, occurrence, predisposing factors and etiology of uterine torsion in buffaloes are reviewed in detail.

Incidence of uterine torsion in bovines

Torsion of the gravid uterus in bovines has been reported to be one of the major causes of dystocia in bovines (Siddiquee and Mehta, 1992 and Singh *et al.,* 1992). In bovines, uterine torsion may involve uterine horn alone or uterine horn along with uterine body but former was rarely encountered (Dhaliwal *et al.,* 1993). In buffaloes, incidences of 29.5 to 30.6 (Siddiquee and Mehta, 1992 and Amer *et al.,* 2008), 52 to 70 (Purohit and Gaur, 2014), 67 to 83 (Malhotra, 1990; Singh, 1991 and Prabhakar *et al.,* 1994) and 83.33% (Srinivas *et al.,* 2007) were recorded. In dairy cows, the reported incidences of uterine torsion between 3 and 10.7 per cent of dystocias were attended by general practitioners (Manning *et al.,* 1982 and Laven and Howe, 2005). Out of 852 dystocias analysed from 2010 to 2015, the percentage of incidence of uterine torsion in cows and buffaloes was 13.97 and 27.46 (Karthick *et al*., 2015)

Occurrence of uterine torsion

Species

Occurrence of uterine torsion has been reported in various species viz., buffalo (Selvaraju *et al.,* 2014 and Karthick *et al.,* 2016), cow (Prakash *et al.,* 2014), doe (Manokaran *et al.,* 2012), ewe (Velladurai *et al.,* 2017), llama (Hopkins *et al.,* 1991), camel (Cebra *et al.,* 1997) and mare (Jung *et al.,* 2008). Uterine torsion was also recorded in a bitch (Raut *et al.,* 2008) and queen with pyometra (Stanley and Pacchiana, 2008) and even in laboratory species like rabbit (Hobbs and Parker, 1990) and guinea pig (Kunstyr, 1981).

Roberts (1986) stated that uterine torsion was occasionally observed as a cause for dystocia in beef cows, bitches, queens, ewes, does, and mares but rarely in sows. In dairy cows, it was observed more frequently than other species (Laven and Howe, 2005). But, Srinivas *et al.,* (2007) reported that uterine torsion was the most important cause of maternal dystocia in buffaloes.

Breed

Brown Swiss cows were at a significantly higher risk, while Hereford, Angus and Jersey cows were at a lower risk for uterine torsion when compared with Holstein-Friesian cows (Frazer *et al.,* 1996). Uterine torsion has been reported mostly in dairy type buffaloes of India (Selvaraju *et al.,* 2014), Pakistan (Ahmed *et al.,* 1981) and Egypt (El-Naggar, 1978) but reports on its occurrence in the swamp buffalo were not seen.

Age/parity of the animal

The influence of age on occurrence of uterine torsion remains controversial, as there was no age predisposition in uterine torsion affected buffaloes and cows of 2 to 18 years of age (Selvaraju *et al.,* 2014 and Karthick, 2015). Pleuriparous buffaloes might be at greater risk of uterine torsion than primiparous (Selvaraju *et al.,* 2014). The occurrences of uterine torsion in cows and buffaloes in relation to parity were 19.83 and 31.53% in primiparous

cows and buffaloes and 80.17 and 68.47% in pleuriparous cows and buffaloes, respectively (Karthick *et al.,* 2015).

Season

Frazer *et al.,* (1996) stated that there was no effect of season on the incidence of uterine torsion in cows. However, they found the highest number of uterine torsion cases during peak calving period. Although a seasonal influence has been described in buffaloes, it appeared to be because of higher calving during that season (Purohit *et al.,* 2011). The incidence was known to be more in cows maintained on mountainous areas (Singh, 1995). Roberts (1986) stated that the uterine torsion observed mostly during spring when cows were let onto pasture after prolonged stabling. As per the authors experience, occurrence of uterine torsion was more during October to February in cows and buffaloes in Namakkal District of Tamil Nadu.

Stage of gestation

The most striking aspect of bovine uterine torsion was that they almost invariably occurred at term and although the exact cause remains controversial. There was general agreement that most of the bovine uterine torsions occurred in association with first stage labor. This was based on the fact that in most cases a variable degree of cervical dilation was noted prior to or immediately after detorsion (Purohit and Gaur, 2014; Karthick *et al.,* 2015).

Occasionally the cervix found to be fully dilated, with the membranes already ruptured. Thus, these cows actually entered the initial phase of second stage labor before the torsion developed (Selvaraju *et al.,* 2014). However, uterine torsion from 5th month of gestation also has been reported (Roberts, 1986). Prakash *et al.,* (2018) reported the occurrence of uterine torsion at 75 days of gestation in graded Murrah buffaloes.

Side of uterine torsion

A preponderance of right side uterine torsion in buffaloes (95-98%) (Srinivas *et al.,* 2007 and Purohit *et al.,* 2011) was postulated to be because of the absence of a muscular fold on right broad ligament in buffaloes (Brar *et al.,* 2008) and the presence of the rumen on the left side (Purohit and Gaur, 2014).

Torsion to the left was generally associated with right horn pregnancy and vice versa because generally the gravid horn rolled toward and over the nonpregnant horn (Sloss and Dufty, 1980). Right sided postcervical uterine torsions at term were common in pleuriparous buffaloes (Srinivas *et al.,* 2007). On the contrary, Frazer *et al.,* (1996) and Aubry *et al.,* (2008) reported higher incidence of counter-clockwise (left) torsion than clockwise direction in exotic cows. Karthick *et al.,* (2015) found 91.61 % and 72.34% right side uterine torsion in buffaloes and cows respectively.

Site of torsion

Most cases of uterine torsion were postcervical torsion (80%) and only a few cases were precervical torsion (20%) in buffaloes (Srinivas *et al.,* 2007; Aubry *et al.,* 2008; Amin *et al.,* 2011 and Jeengar *et al.,* 2015). Purohit *et al.,* (2011) reported that the incidence of precervical uterine torsion was 83.60% in buffaloes. Similarly, in graded Murrah buffaloes, 14.19 % precervical and 85.81% per cent postcervical uterine torsion was reported (Karthick *et al.,* 2015).

The probable reason for higher incidence of postcervical uterine torsion could be because the anterior vagina is the weaker point of the bovine genital tract or due to the absence of

the muscles in the cervical area of broad ligaments as opined by Jeengar *et al.,* (2015).

Duration of uterine torsion

Selvaraju *et al.,* (2014) stated that the duration of torsion was calculated based on the history provided by the farmer and the condition of the delivered fetus. Therefore, it was not unusual for uterine torsion to have occurred between 6 and more than 72 hours before the case was presented (Selvaraju *et al.,* 2012). The estimated duration of labor in 63 % torsions was between 8 and 12 hours and more than 12 hours in 21% uterine torsions (Manning *et al.,* 1982). In another study, the percentage of uterine torsions presented in less than 6 hours, 6 to 24 hours, 24 to 48 hours, 72 to 96 hours and 96 to 168 hours after onset of torsion was 5, 55, 16, 17 and 7, respectively (Frazer *et al.,* 1996).

Degree of uterine torsion

High (52.3%), moderate (31.0%) and mild (16.7%) degrees of uterine torsion was reported in buffaloes (Ali *et al.,* 2011). Roberts (1986) stated that minor torsions (45 to 90°) detected during routine pregnancy diagnosis underwent spontaneous correction. The severity of the uterine torsion was predominately 180 to 270^0 (57 per cent) and 271 to 360^0 (22%) (Frazer *et al.,* 1996) in buffaloes. The percentages of uterine torsion with $<90^0$, 90^0-180^0, 180^0-360^0 and $>360^0$ were 12-21, 57-59, 12-28 and 3 in buffaloes, respectively (Singh *et al.,* 1992 and Srinivas *et al.,* 2007). About 49.10 % cows and 51.52% buffaloes were affected with 90° to 180° uterine torsion (Karthick *et al*., 2015).

Sex and weight of the fetus

Uterine torsion noticed frequently in the case of male calves than female and the majority of uterine torsion was associated with the presence of an exceptionally heavy fetus (Frazer *et al.,* 1996). On the contrary, uterine torsion was rare in cases of feto-pelvic disproportion (Aubry *et al.,* 2008). The calves born after detorsion had 30 to 50 kg body weight according to the stage of pregnancy (30 kg at 7 month of pregnancy to 50 kg at full term) with more male than female calves in bovines (Amin *et al.,* 2011). Similarly, 67.57 and 60.55 % male fetus and 32.43 and 39.45 % female fetus in cows and buffaloes affected with uterine torsion (Karthick *et al*., 2015). The majority of the calves delivered were male (63 to 72.72 percent) in buffaloes following detorsion (Kanakapur *et al.,* 1999; and Shiv Prasad *et al*., 2000).

Fetal presentation, position and posture

Sloss and Dufty (1980) reported that abnormal presentation could not be a factor in the development of uterine torsion. In fact, 80 to 100 per cent calves from uterine torsion affected bovines usually delivered in anterior presentation with majority in dorso-ilial (17 per cent) or dorso-pubic (43 per cent) position (Prabhakar *et al.,* 1994; Frazer *et al.,* 1996; Noakes *et al.,* 2009; and Aubry *et al.,* 2008). Roberts (1986) stated that the calf mostly was in the dorso-pubic presentation in cows with at least a rotation of 180^0 and dorso-ilial presentations were commonly found in torsions of 240^0.

Livability of fetus

Frazer *et al.,* (1996) delivered only 24 per cent of the calves alive following detorsion in bovines. In their study, the condition of the dead fetuses ranged from fresh to autolytic, with 14 per cent being described as emphysematous. Ali *et al.,* (2011) recorded that fetal and maternal mortalities occurred in 78.6 and 23.8 per cent following uterine torsion in buffaloes, respectively. They also stated that the stage of pregnancy and degree

and duration of uterine torsion were major risk factors for fetal mortality, while the stage of pregnancy and fetal viability were important risk factors for maternal mortality. Live fetuses of 45.95 and 46.79 per cent and dead fetuses of 54.05 and 53.21 per cent in respectively were extracted following detorsion in cows and buffaloes. The high rates of live fetal delivery when compared to the previous reports might be due to the availability of expertise, prompt diagnosis and timely intervention in our clinics (Karthick *et al.*, 2015).

Survivability of dam

The survivability rate following detorsion in cows and buffaloes was 86.55 and 88.46 per cent respectively (Karthick, 2015). This finding was in accordance with the reports of Sloss and Dufty (1980) and Frazer *et al.*, (1996) in bovines. However, Amer and Hashem (2008) found the dam survival rate as 69.00 per cent in bovines. Major factor played a role in the survivability of dam might be the time elapsed between the occurrence of torsion and its correction (Prabhakar *et al.*, 1994). The death of the dam in uterine torsion affected buffaloes was attributed to development of uterine edema and ischaemic necrosis which led to endotoxic shock (Sloss and Dufty, 1980 and Manning *et al.*, 1982), severe uterine necrosis, fetal putrification, maternal toxemia, dehydration, shock and peritonitis (Selvaraju *et al.*, 2014).

Predisposing factors

Manning *et al.*, (1982) and Roberts (1986) reported that during pregnancy, there was a relatively small increase in the length of the broad ligaments causing the uterus to curve around the point of attachment, coming to lie between the rumen, intestines and abdominal wall. This anatomical arrangement permitted an increased uterine mobility in late gestation and predisposed to development of a uterine torsion (Sloss and Dufty, 1980 and Roberts, 1986). Amer *et al.*, (2008) stated that even in the last months of pregnancy, when horn asymmetry became maximal, uterine torsion was an exception rather than the rule.

A large number of predisposing causes have been described for uterine torsion which included (i) anatomical factors especially broad ligament attachment (ii) close confinement (iii) hilly tracts (iv) external injury (v) wallowing habits of the buffaloes (vi) the lowering of front legs by the animal first, when lying down (vii) excessive fetal weight (viii) deep capacious and pendulous abdomen of the buffalo (ix) inherently weaker muscles of the broad ligaments (x) the amount of fetal fluids in relation to the size of the fetus resulting strong fetal movements and (xi) parity (Purohit *et al.*, 2011; Amer *et al.*, 2008 and Ghuman, 2010).

Etiology

Several etiological factors have been contemplated to have direct or indirect effects viz., (i) geographical location (Roberts, 1986) (ii) husbandry practices (Ahmed *et al.*, 1981) (iii) fetal weight and sex (Karthick *et al.*, 2015) (iv) travel/accidents in advanced stage of pregnancy (Brar *et al.*, 2008) (v) secondary to rolling because of a gastro-intestinal problem or following some traumatic incident (Taylor *et al.*, 1989) (vi) weaker broad ligaments, smaller quantity of fetal fluids and decrease in uterine tone coupled with inordinate fetal movements (Purohit and Gaur, 2014) (vii) instability of the uterus during a single horn pregnancy and inordinate fetal or dam movements (Purohit *et al.*, 2011) (viii) external injury, lack of exercise and irregular movement of animals (Selvaraju *et al.*, 2014) and (ix) uterus didelphys (Singh *et al.*, 1991).

In conclusion, uterine torsion also occurred in prepartum period even at 75 days of gestation. Buffaloes are commonly affected than cows. Gestation with male calf makes the dam susceptible to uterine torsion. Availability of expertise, prompt diagnosis and timely intervention and treatment increases the survivability of the dam and fetus following detorsion in buffaloes.

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