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Prevalence of periparturient disorders during transition period in buffaloes

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Abstract
The transition period from 3 weeks prepartum to 3 weeks postpartum, is the most stressful phase for buffaloes. A total of 65 transition buffaloes were included in present study. Out of which 53.85 per cent (35/65) transition buffaloes were found affected with periparturient disorders. Out of these 35 affected buffaloes, 20.00 per cent had multiple periparturient disorders whereas remaining 80.00 per cent had single periparturient disorder. Among the different periparturient disorders, sub-clinical hypocalcaemia (SCH) was found as the most prevalent periparturient disorder accounting for 12.31 per cent cases followed by sub-clinical mastitis (9.23 per cent); dystocia (7.69 per cent); milk fever (6.15 per cent); mastitis, post-parturient metritis and torsion (4.61 per cent each); post-parturient indigestion, lameness and uterine prolapse (3.08 per cent each); and post-parturient haemoglobinuria, retention of placenta and traumatic reticulo-peritonitis (1.54 per cent each).

Keywords: Periparturient disorders, transition period, buffaloes

Introduction
Transition period (from 3 weeks prepartum to 3 weeks postpartum) is one of the most critical periods during life of dairy animals. Transition period is especially critical for health and subsequent performance of dairy animals (Castillo *et al.*, 2005) [5]. Dairy animals are more susceptible to a variety of metabolic and infectious diseases during the transition period (Sordillo *et al.*, 2007; Sharma *et al.*, 2011) [45, 41]. The transition from non-lactating to lactating status imposes enormous stress on dairy animals which may impair the herd health and is associated with the incidence of several diseases which may be metabolic, nutritional and infectious in nature (Srinivas Naidu, 2015; Van Saun, 2016; Weber *et al.*, 2016) [47, 54, 56].
During transition period, dairy animals are under many physiological and biochemical challenges including metabolic and endocrine changes, environmental and managemental stressors (Sepulveda-Varas *et al.*, 2013) [38] as nutritional and physical adaptation to lactation (Ingvartsen and Moyes, 2013; Roche *et al.*, 2013) [11, 35], immunosuppression (Sordillo and Aitken, 2009; Piccione *et al.*, 2012) [44, 28] and increased mucosal exposure to immunogenic compounds, namely endotoxins (Dosogne *et al.*, 2002; Mateus *et al.*, 2003; Emmanuel *et al.*, 2007) [7, 24, 8].
Dairy animals are at higher risk for many diseases and disorders during periparturient period. Dairy animals experience a marked metabolic load due to the prevailing negative energy balance, which makes them susceptible toward infectious and metabolic diseases. The most common diseases associated with transition period include metabolic disorders (fatty liver, ketosis, milk fever, downer cow syndrome etc.), infectious diseases (mastitis, endometritis and metritis), reproductive disorders (retained placenta, uterine prolapse, dystocia), respiratory problems (dyspnoea), digestive disorders (ruminal acidosis, subclinical acidosis, displaced abomasum, sub-acute ruminal acidosis), locomotive abnormalities (lameness, laminitis) and digital dermatitis (LeBlanc, 2010; Suthar *et al.*, 2013; Singh *et al.*, 2020) [18, 50, 42].
Periparturient diseases are interconnected and it is difficult to identify as a single entity. Dairy animals that develop clinical hypocalcaemia are eight, five and nine times more likely to develop mastitis, retained placenta and downer cow syndrome, respectively (Abuom *et al.*, 2012) [1]. Similarly, animals with subclinical ketosis are eight times more likely to develop left displaced abomasum (LeBlanc *et al.*, 2005) [19]. Cows with subclinical ketosis had 1.5, 9.5 and 5.0 times greater odds of developing metritis, clinical ketosis and displaced abomasum, respectively (Suthar *et al.*, 2013) [50].

The occurrence of displaced abomasum, ketosis, retained placenta and metritis was 3.7, 5.5, 3.4 and 4.3 times more likely, respectively, in cows that had subclinical hypocalcaemia (SCHC) than cows with normal level of calcium (Rodriguez *et al.*, 2017) [36].

Materials and Methods

The present investigation was carried out on 65 transition buffaloes in Udaipur district of Rajasthan. Complete history including breed, age, parity, general behaviour, health status, body condition, housing and managemental practices, history of previous illness if any, and any other relevant information were collected. The date of service (natural/artificial insemination), date of pregnancy diagnosis and expected date of calving was recorded for each buffalo. All the transition buffaloes were subjected to detailed clinical examination followed by blood collection for estimation of routine haemato-biochemical parameters and mineral status.

Results and Discussion

In present study, out of 65 transition buffaloes, 53.85 per cent (35/65) were found affected with periparturient disorders. Out of these 35 affected buffaloes, 20.00 per cent (7/35) had multiple disorders whereas remaining 80.00 per cent (28/35) had single disorder. In multiple disorders, combinations of three types of disorders were found. The disorders diagnosed as single disorder in transition buffaloes included post-parturient indigestion (PPI), mastitis, post-parturient haemoglobinuria (PPH), traumatic reticulo-peritonitis (TRP), torsion, uterine prolapse and retention of placenta (ROP) whereas, periparturient disorders which were seen in multiple forms included milk fever and sub-clinical mastitis (SCM); post-parturient metritis (PPM) and lameness; and sub-clinical hypocalcaemia and dystocia.

Table 1: Animal wise prevalence of various periparturient disorders in buffaloes

S. No.	Periparturient disorder	No. of affected buffaloes	Per cent
1.	Sub-clinical mastitis (SCM)	4	6.15
2.	Post-parturient Indigestion (PPI)	2	3.08
3.	Sub-clinical hypocalcaemia (SCH)	5	7.69
4.	Lameness	1	1.54
5	Mastitis	3	4.61
6.	Post-parturient metritis (PPM)	2	3.08
7.	Milk fever (MF)	2	3.08
8.	Post-parturient Haemoglobinuria (PPH)	1	1.54
9.	Torsion	3	4.61
10.	Dystocia	2	3.08
11.	Uterine Prolapse	2	3.08
12.	Retention of placenta (ROP)	1	1.54
13.	Traumatic Reticulo-peritonitis (TRP)	1	1.54
14.	Milk fever + Sub-clinical mastitis (SCM)	2	3.08
15.	Post-parturient metritis (PPM) + Lameness	1	1.54
16.	Sub-clinical hypocalcaemia (SCH) + Dystocia	3	4.61
		Total N = 35	

LeBlanc (2010) [18] reported that one-third of dairy cows were affected by some form of metabolic or infectious disease in early lactation. Serrenho *et al.* (2021) [40] reported that up to 50 per cent of dairy cows suffer from atleast one disease event in the transition period. Macmillan *et al.* (2021) [21] reported that overall 61 per cent of Holstein dairy cows were diagnosed with atleast one postpartum health disorder, with 25 per cent of cows having multiple disorders during early postpartum (2 wks).

Ribeiro *et al.* (2013) [32] reported that overall, 37.5 per cent of the periparturient multiparous dairy cows presented atleast one clinical disease and 59.0 per cent had atleast one subclinical health problem. Sepulveda-Varas *et al.* (2015) [39] reported that overall, 56 per cent of the Holstein dairy cows studied developed atleast one clinical or subclinical disease after calving. Caixeta and Omontese (2021) [4] reported that approximately one third of dairy cows having atleast one clinical disease (metabolic and/or infectious) and more than half of the cows having atleast one subclinical case of disease during early lactation.

Table 2: Total various individual periparturient disorders in buffaloes

S. No.	Name of Periparturient disorder	No. of buffaloes affected	Per cent
1.	Sub-clinical mastitis (SCM)	6	9.23
2.	Post-parturient Indigestion (PPI)	2	3.08
3.	Sub-clinical hypocalcaemia (SCH)	8	12.31
4.	Lameness	2	3.08
5	Mastitis	3	4.61
6.	Post-parturient metritis (PPM)	3	4.61
7.	Milk fever (MF)	4	6.15
8.	Post- parturient haemoglobinuria (PPH)	1	1.54
9.	Torsion	3	4.61
10.	Dystocia	5	7.69
11.	Uterine prolapse	2	3.08
12.	Retention of placenta (ROP)	1	1.54
13.	Traumatic Reticulo-peritonitis (TRP)	1	1.54

In present investigation, subclinical hypocalcaemia was the most prevalent (12.31 per cent) periparturient disorder. Ribeiro *et al.* (2013) [32]; Krishna *et al.* (2014) [15]; Sepulveda-Varas *et al.* (2015) [39] and Tsiamadis *et al.* (2021) [51] have also reported higher prevalence of subclinical hypocalcaemia in dairy animals while Sundrum (2015) [49] reported lower prevalence of sub-clinical hypocalcaemia (2.2 per cent). Ruprechter *et al.* (2018) [37] found that incidence of subclinical hypocalcaemia was greater in multiparous than primiparous dairy cows (43 v/s 9.5 per cent) respectively from -3 to +4 weeks relative to calving. Macmillan *et al.* (2021) [21] reported the prevalence of subclinical hypocalcaemia in primiparous and multiparous dairy animals 17.1 and 23.3 per cent, respectively.

Prevalence of sub-clinical mastitis (SCM) in periparturient buffaloes was 9.23 per cent. There was variation in the prevalence of sub-clinical mastitis in periparturient buffaloes. Higher prevalence of sub-clinical mastitis had been reported by Sundrum (2015) [49] and Gundling *et al.* (2015) [9]. While, lower prevalence of sub-clinical mastitis was observed by Mandali *et al.* (2004) [22]. Macmillan *et al.* (2021) [21] reported the prevalence of sub-clinical mastitis in primiparous and multiparous dairy animals as 20.7 and 27.1 per cent, respectively.

The prevalence of dystocia in periparturient buffaloes was 7.69 per cent. Similar finding has been reported by Stevenson *et al.* (2020) [48]. Prasad and Prasad (1998) [29] and Ribeiro *et al.* (2013) [32] have reported somewhat lower prevalence of dystocia in dairy cows whereas Abuom *et al.* (2012) [1] reported higher prevalence of dystocia in periparturient animals.

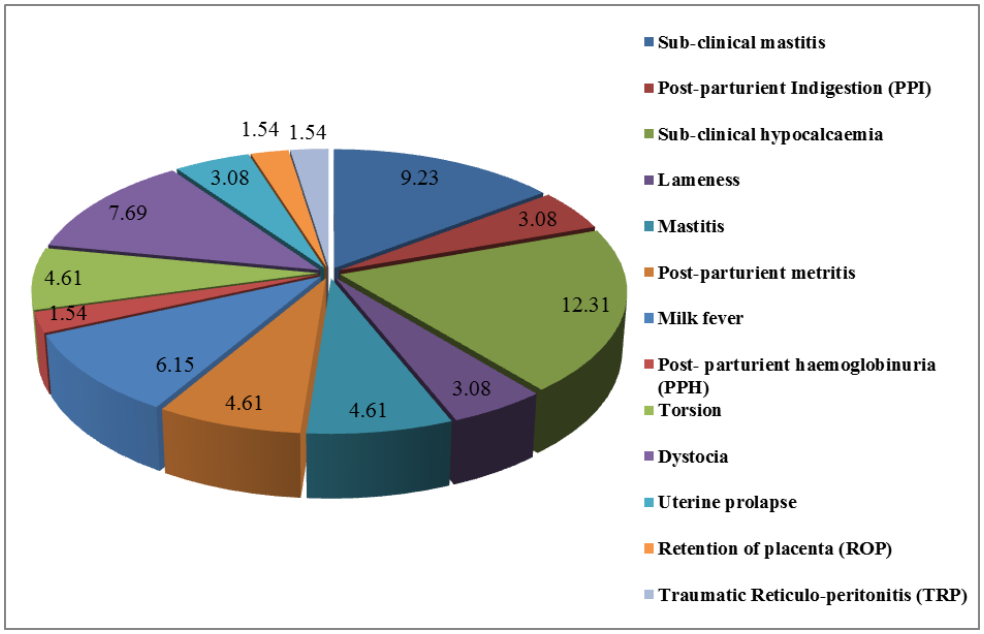

Fig 1: Various individual periparturient disorders in transition buffaloes

The prevalence of milk fever (MF) in periparturient buffaloes was 6.15 per cent. Almost similar findings were reported by Roche (2003) [34] and Sundrum (2015) [49]. Higher prevalence of milk fever has also been reported by Abuom *et al.* (2012) [1]; Braun *et al.* (2017) [3] and Stevenson *et al.* (2020) [48]. Lower prevalence of milk fever was reported by Gundling *et al.* (2015) [9] and Sepulveda-Varas *et al.* (2015) [39]. Venjakob *et al.* (2018) [55] reported 6.4 and 63.2 per cent prevalence of milk fever for primiparous and multiparous cows, respectively. Macmillan *et al.* (2021) [21] reported the prevalence of milk fever in primiparous and multiparous dairy animals as 0.9 and 3.9 per cent, respectively.

Prevalence of mastitis in periparturient buffaloes was 4.61 per cent. Almost similar findings have been reported by Stevenson *et al.* (2020) [48]. Higher prevalence of mastitis was reported by Abuom *et al.* (2012) [1]; Ribeiro *et al.* (2013) [32]; Gundling *et al.* (2015) [9]; Sepulveda-Varas *et al.* (2015) [39]; Sundrum (2015) [49] and Ruprechter *et al.* (2018) [37]. Macmillan *et al.* (2021) [21] reported the prevalence of mastitis in primiparous and multiparous dairy animals as 7.6 and 14.5 per cent, respectively.

Prevalence of post-parturient metritis (PPM) was also 4.61 per cent in periparturient buffaloes in present study. Similar findings were reported by Abuom *et al.* (2012) [1]; Ribeiro *et al.* (2013) [32] and Gundling *et al.* (2015) [9]. While Sepulveda-Varas *et al.* (2015) [39]; Sundrum (2015) [49]; Braun *et al.* (2017) [3]; Ruprechter *et al.* (2018) [37] and Stevenson *et al.* (2020) [48] reported higher prevalence of post-parturient metritis (PPM). Macmillan *et al.* (2021) [21] reported the prevalence of metritis in primiparous and multiparous dairy animals as 17.1 and 13.8 per cent, respectively. Vallejo-Timaran *et al.* (2021) [53] reported the incidences of puerperal metritis, clinical metritis, clinical endometritis and cytological endometritis as 2.8, 25, 29 and 26 per cent, respectively.

The prevalence of torsion in periparturient buffaloes was 4.61 per cent. Abuom *et al.* (2012) [1] reported uterine torsion as only 0.5 per cent in dairy animals.

Prevalence of post-parturient indigestion (PPI) in buffaloes was 3.08 per cent. Findings of present investigation are in agreement with that of Ribeiro *et al.* (2013) [32]. Padmaja and Rao (2012) [27]; Stevenson *et al.* (2020) [48] and Vallejo-Timaran *et al.* (2020) [52] have reported higher prevalence of digestive problems in dairy cows.

Prevalence of lameness in periparturient buffaloes was 3.08 per cent. Similar findings were reported by Ribeiro *et al.* (2013) [32] and Stevenson *et al.* (2020) [48]. Higher prevalence of lameness was reported by Gundling *et al.* (2015) [9]; Sundrum (2015) [49] and Braun *et al.* (2017) [3].

The prevalence of uterine prolapse in periparturient buffaloes was 3.08 per cent. Similar findings were reported by Prasad and Prasad (1998) [29] and Abuom *et al.* (2012) [1] in dairy animals. Higher incidence of uterine prolapse was reported by Singh *et al.* (2005) [43] and Rabbani *et al.* (2010) [30]. Whereas, lower incidence of pre- and post-partum utero-vaginal prolapse was reported by Mandali *et al.* (2002) [23]. Kumar and Singh (2009) [17] also reported prepartum and postpartum prolapse 2.66 and 0.07 per cent, respectively. Modi *et al.* (2016) [25] reported 2.53 % prepartum prolapse in dairy animals.

The prevalence of post-parturient haemoglobinuria (PPH) in periparturient buffaloes was 1.54 per cent. Muhammad *et al.* (2000) [26]; Soren *et al.* (2014) [46] and Deeba and Bashir (2019) [6] reported higher occurrence of the post parturient haemoglobinuria. Muhammad *et al.* (2000) [26] also reported that the majority of PPH cases occurred within the first two months of calving.

The prevalence of retention of placenta (ROP) in post-parturient buffaloes was 1.54 per cent. Similar findings were reported by Ribeiro *et al.* (2013) [32]. While Abuom *et al.* (2012) [1]; Sundrum (2015) [49]; Sepulveda-Varas *et al.* (2015) [39]; Khan *et al.* (2016) [14] and Ruprechter *et al.* (2018) [37] reported higher prevalence of retention of placenta (ROP) during postpartum period. Macmillan *et al.* (2021) [21] reported the prevalence of ROP in primiparous and multiparous dairy animals as 6.4 and 7.2 per cent, respectively.

The prevalence of traumatic reticulo-peritonitis (TRP) in periparturient buffaloes was also 1.54 per cent (1/65). Rajput *et al.* (2018) [31] reported the occurrence in recently calved and pregnant animals as 45 and 30 per cent, respectively. They also reported higher occurrence of foreign body syndrome in buffaloes (60 per cent) than cattle (40 per cent).

During the transitional period, the physiological, endocrine, metabolic and nutritional changes might be attributed to the various subclinical and clinical metabolic and infectious diseases. At the beginning of lactation, there is sudden increase in demand for calcium and phosphorus as these minerals are mobilized from the body and secreted in the colostrum and then in the milk (Lohrenz *et al.*, 2010) [20]. Any deviation or decline in the normal values of these minerals in early lactation, as well as their deficiency in the diet of milch animals can lead to subclinical or clinical manifestations which have a negative impact on production, health and fertility (Roche and Berry, 2006; Holtenius *et al.*, 2008; Kalaitzakis *et al.*, 2010; Kamiya *et al.*, 2010; Kronqvist *et al.*, 2011) [10, 34, 12, 16]. TRP or foreign body syndrome (FBS) mostly occurred in periparturient period because of increase in intra-abdominal pressure due to pregnancy and parturition attributed to penetration of foreign body and occurrence of clinical signs **(**Aref and Abdel-Hakiem, 2013; Rajput *et al.*, 2018) [31, 2].

Prevalence of various diseases during periparturient period may vary according to geographical locations, production of animals and management conditions.

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