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ORIGINAL ARTICLE

Retrospective study of congenital anomalies of cattle and goats in selected areas of Mymensingh and Netrokona districts of Bangladesh

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Abstract

Background: Ruminants, especially cattle and goats, are prone to a wide range of congenital anomalies influenced by dietary, genetic, or environmental factors. Understanding these anomalies is essential for improving animal health and productivity. This study aimed to identify congenital defects in calves and kids across three upazilas in Bangladesh and to analyze their occurrence concerning breed, sex, and season.

Methods: Retrospective data on species, sex, breed, and season (summer, rainy, and winter) were collected from the register books of the Veterinary Teaching Hospital (VTH), Bangladesh Agricultural University, Mymensingh; Upazila Veterinary Hospital, Mymensingh Sadar, Mymensingh; and Upazila Veterinary Hospital, Kendua, Netrokona, spanning July 2013 to June 2023. Among 1159 cases, 1050 involved calves, and 109 involved kids. Data were analyzed using the Chi-square test in SPSS version 20.

Results: The most prevalent congenital anomaly identified was umbilical hernia (52.6%), followed by dermoid cyst (21.4%), atresia ani (15%), persistent urachus (5.8%), knuckling (3.4%), and rectovaginal fistula (1.8%). Both cattle (55.8%) and goats (57.8%) showed a higher prevalence of anomalies in males. Specifically, atresia ani, dermoid cyst, and umbilical hernia were more common in male calves, with occurrences of 62.4%, 57.35%, and 52.9%, respectively, while persistent urachus was found predominantly in males (80.3%). Knuckling was slightly more prevalent in females (52.8%), and rectovaginal fistula occurred exclusively in females. Regarding breed, persistent urachus was more frequently observed in indigenous breeds (55.7%), while atresia ani and rectovaginal fistula showed high frequencies in indigenous calves, with 65% and 63.2%, respectively. Conversely, dermoid cyst, umbilical hernia, and knuckling were more common in crossbred animals, occurring at frequencies of 55.6%, 60%, and 55.6%, respectively. Seasonal variations also played a role, with atresia ani most frequent in the rainy season (35%), while all other anomalies showed their lowest occurrences during this season. Persistent urachus was most prevalent in winter (41%), while dermoid cyst, umbilical hernia, and rectovaginal fistula were most common in summer, with frequencies of 38.2%, 39.7%, and 42.1%, respectively. Additionally, cattle exhibited a higher occurrence of congenital anomalies in crossbred calves during summer, whereas Black Bengal kids were more affected during winter.

Conclusion: Calves exhibited a higher occurrence of diverse congenital anomalies, with umbilical hernia being the most common, while kids were predominantly affected by atresia ani. Anomalies were more frequently observed in male animals and during the summer season.

Keywords: Calves, kids, sex, breed, season.

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Introduction

The livestock sector plays an important role in maintaining the sustainability of the rural economy. It contributes 1.85% to the GDP of Bangladesh by providing milk and meat (BBS, 2024) The main obstacle to Bangladesh's livestock development is animal diseases (Ali and Hossain, 2016). One of these is a congenital defect, which is an abnormality of either structure or function and is present from birth (Badaway, 2011). In ruminants, the prevalence of congenital abnormalities varies from 26.8% to 40.48% (Fubini, 2004) and is mostly shown in newborn offspring. As cattle and goats are the main sources of food protein, veterinary practices are mostly focused on these animals (Islam *et al*., 2021).

Although the exact causes of many congenital abnormalities remain unknown, a combination of environmental influences, genetic defects (Shukla *et al*., 2007), or both factors and viral factors, crossbreeding (Samad, 2021) have been identified as etiologic determinants of some cases of abnormal fetal development. Environmental factors may be the dam's consumption of toxic plants and viral infections developed early in pregnancy by the dam and fetus (Bendemkiran *et al*., 2009) and teratogens are factors that cause physical defects to develop in an embryo or fetus (Dart, 2020). As the number of crossbred cattle has increased, congenital diseases in calves have drastically increased (Jaman *et al*., 2018).

Various congenital abnormalities such as atresia ani, umbilical hernia, dermoid cyst, knuckling, persistent urachus, and rectovaginal fistula are found among others. These anomalies can affect several organs and systems (İşler *et al*., 2016) but mostly occur frequently in the gastrointestinal system (46.84%) and the musculoskeletal system (30.38%). Some anomalies do not affect vital functions of the systems, but some cause death of the animal (kaya *et al*., 2011)

Congenital abnormalities have detrimental effects on neonates' productivity and market value (Chauhan *et al*., 2011). According to Aslan *et al*. (2009), Congenital malformations contribute to 11.5% of surgical difficulties. These anomalies significantly result in financial losses in two ways. Firstly, the dam is kept for another year as the fetus is not viable and secondly, an abnormal fetus may indicate the beginning of an epidemic of afflicted fetuses if an environmental teratogen has affected the herd (Janmeda *et al*., 2014). The frequency causes and risk factors should be identified to prevent these anomalies and reduce financial losses. While several causes have been identified for some disorders, the etiology remains unclear. Therefore, the study was conducted to know the congenital anomalies that occurred in ruminants in selected hospitals and the occurrence of congenital anomalies about breed, sex, and season in the studied areas.

Materials and methods

Study area

The study was conducted at Veterinary Teaching Hospital, Bangladesh Agricultural University, Mymensingh (VTH) Upazila Veterinary Hospital, Mymensingh Sadar, Mymensingh (Sadar) and Upazila Veterinary Hospital, Kendua, Netrokona.

Study duration and data collection

Retrospective data of different congenital anomalies of ruminants (cattle, goats) were collected from the patient register book of respective Veterinary Hospitals from July 2013 to June 2023. The total number of cases was 1159 and among those 1050 cases were of cattle The information about species, breed, age, sex, and season was recorded during the collection of data.

Data analysis

Data were imputed in the Microsoft Excel spreadsheet and after that, the chi-square test was performed to evaluate the occurrence of anomalies based on sex, breed, and season. All data were analyzed using SPSS version 20.

Results

Overall occurrence of congenital anomalies in cattle and goat

The congenital defects recorded in cattle during the study are shown in Table 1. The common congenital anomalies of cattle were atresia ani, dermoid cyst, umbilical hernia, knuckling, urachus, and rectovaginal fistula.

Table 1. Frequency and overall percentage (%) of congenital anomalies in calves Based on hospital data

Disease	VTH	Sadar	Kendua	Total
Atresia ani	8.7% (57)	26.4% (58)	23.5% (42)	15% (157)
Dermoid cyst	16.3% (107)	29.8% (65)	29.6% (53)	21.4% (225)
Umbilical hernia	58.6% (384)	43.2% (95)	40.8% (73)	52.6% (552)
Knuckling	5.5% (36)	-	-	3.4% (36)
Rectovaginal fistula	2.0% (13)	-	3.4% (6)	1.8% (19)
Persistent urachus	8.5% (56)	-	2.8% (5)	5.8% (61)
Total (N)	62.2% (653)	20.76% (218)	17.04% (179)	100% (1050)

Table 2. Distribution of congenital anomalies in calves by sex

Group-Sex	Atresia Ani	Dermoid cyst	Umbilical Hernia	Knuckling	Recto-vaginal fistula	Persistent urachus
	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)
Male	62.4% (98)	57.3% (129)	52.9% (292)	47.2% (17)	0% (0)	80.3% (49)
Female	37.6% (59)	42.7% (96)	47.1% (260)	52.8% (19)	100% (19)	19.7% (12)

Table 3. Distribution of congenital anomalies among calves of various breeds

Group-Breed	Atresia Ani	Dermoid cyst	Umbilical Hernia	Knuckling	Recto-vaginal fistula	Persistent Urachus
	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)
Cross	35% (55)	55.6% (125)	60.0% (331)	55.6% (20)	36.8% (7)	44.3% (27)
Indigenous	65.0% (102)	44.4% (100)	40.0% (221)	44.4% (16)	63.2% (12)	55.7% (34)

Table 1 shows that the three most recorded defects were umbilical hernia (52.6%), dermoid cyst (21.4%), and atresia ani (15%) in cattle. Veterinary Teaching Hospital, Bangladesh Agricultural University, Mymensingh (VTH) had the highest occurrence of umbilical hernia (58.6%), Knuckling (5.5%) and Persistent urachus (8.5%). Upazila Veterinary Hospital, Sadar, Mymensingh (Sadar) had the highest occurrence of Atresia ani (26.4%) and dermoid cyst (29.8%). A total of 109 cases were recorded in goats and the only congenital anomaly found was atresia ani (Figure 1). The highest occurrence was found in the Veterinary Teaching Hospital, Bangladesh Agricultural University (VTH), (49.0%, n= 53), followed by the occurrences in Upazila Veterinary Hospital, Kendua, Netrokona (Kendua) (24.0%, n=26) and in Upazila Veterinary Hospital, Sadar, Mymensingh (Sadar) (27.0%, n=30).

Occurrence of congenital anomalies based on sex

Figure 2 and Figure 3 show that most cases were found to occur in male calves and kids admitted at the three veterinary hospitals. Table 2 shows that the occurrence of atresia ani (62.4%), dermoid cyst (57.3%), Umbilical hernia (52.9%), and Persistent urachus (80.3%) was higher in male calves. At the same time, the occurrence of Knuckling was found to be higher in female calves (52.8%). Recto-vaginal fistula was a sex-specific disease that occurred only in female calves. No significant association was found between sex and diseases in both cattle (chi-^{2} =0.346; p=0.841) and goats (chi-^{2} =0.405; p=0.817).

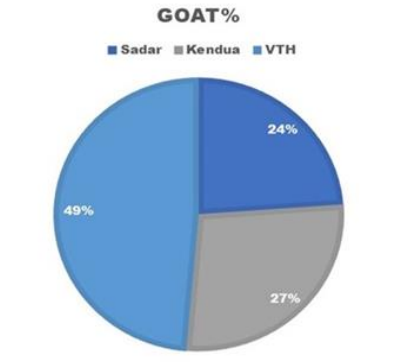

Figure 1. Proportion of congenital anomalies in kids of study areas

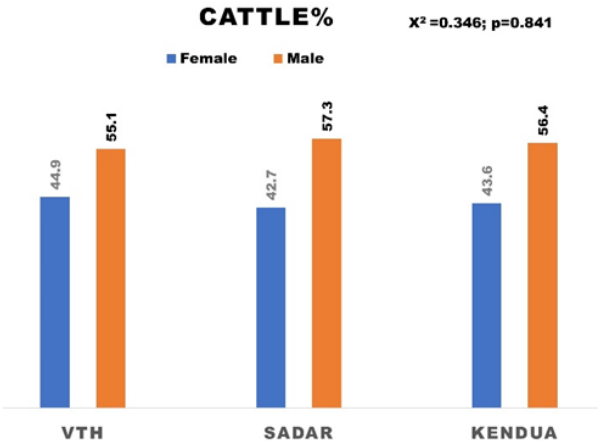

Figure 2. Proportion of congenital anomalies according to sex in the study areas

Figure 3 shows that the highest number of atresia ani was found in male kids at Sadar Upazila. However, there was no significant (Chi^2=0.683; p=0.711) association of occurrence in males and females.

Distribution of congenital anomalies based on breed

The study analyzed the prevalence of congenital anomalies based on the breed of calves and results are shown in Figure 4 and Table 3. Most affected claves were crossbred recorded in Kendua (53.63%), Sadar (52.3%), and VTH (54.5%). Table 3 reveals that calves of crossbred cattle had higher frequencies of dermoid cysts (55.6%), umbilical hernia (60.0%), and knuckling (55.6%). Whereas, a higher occurrence of atresia ani (65.0%), rectovaginal fistula (63.2.0%), and Persistent urachus (55.7%) was observed in indigenous calves. Results showed an insignificant (Chi^2 =0.336; p=0.845) association existed between cattle breeds.

Figure 5 shows more than 60.0% of cases of atresia ani occurred in kids of Black Bengal goats in three veterinary hospitals. However, there was no significant (Chi^2=0.683; p=0.711) association of the occurrence of atresia ani in the two breeds.

Distribution of congenital anomalies based on season

Figure 6 shows that most of the congenital cases were recorded during summer in VTH (38.9%), Sadar (35.9%), and Kendua (38.1%) in comparison to those that occurred in winter and rainy seasons.

Congenital anomalies of cattle and goats

Table 4 presents that the highest occurrences of Dermoid cyst (38.25%), umbilical hernia (39.7%), and rectovaginal fistula (42.1%) were recorded in the summer season. The occurrence of Persistent urachus (41.0%) and atresia ani (35.0%) was found to be the highest in the winter and the rainy season**.**

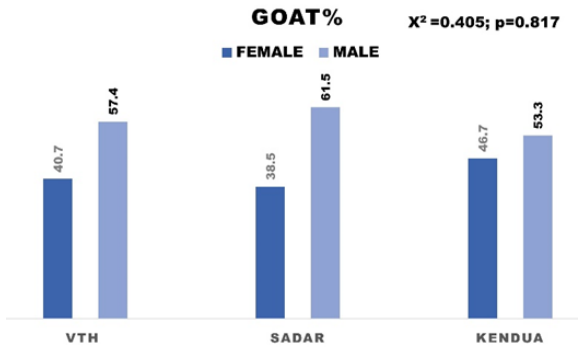

Figure 3. Percentage (%) of congenital anomalies in goats by sex across different study areas

Figure 7 shows that most cases of atresia ani (31.7%, 42.3%, and 40.0%) were found during winter seasons in VTH, Sadar, and Kendua, respectively. The association between congenital anomalies and season was not significant in both cattle (Chi^2 =2.852; p=0.583) and goat (Chi^2 =1.784; p=0.775).

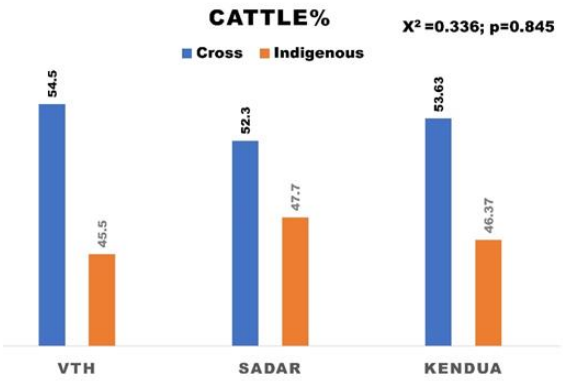

Figure 4. Distribution of congenital anomalies in calves by breed in study areas (%)

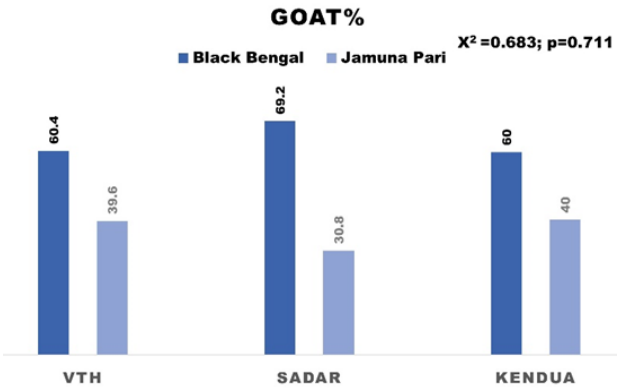

Figure 5. Distribution of congenital anomalies in kids by breed in study areas (%)

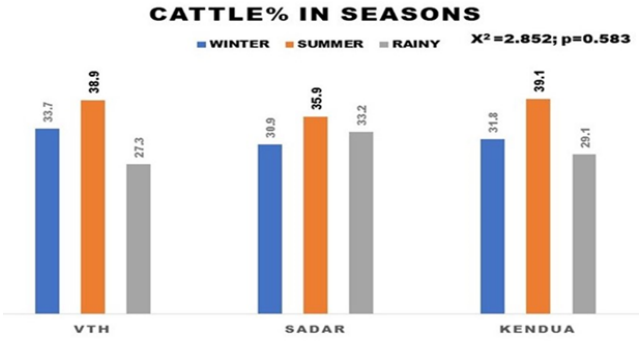

Figure 6. Seasonal distribution of congenital anomalies in calves by breed in study areas (%)

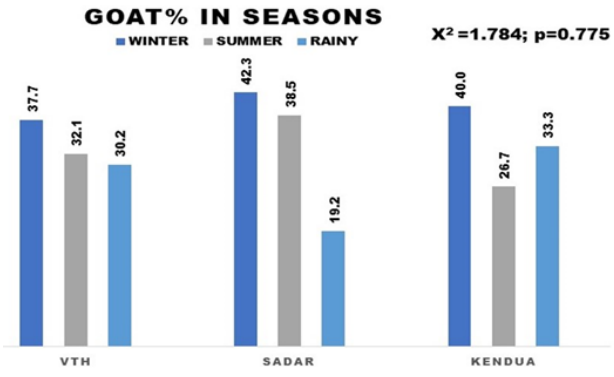

Figure 7. Seasonal distribution of congenital anomalies in kids by breed in study areas (%)

Table 4. Congenital anomalies of calves observed in different seasons

Group-season	Atresia Ani	Dermoid cyst	Umbilical Hernia	Knuckling	Recto-vaginal fistula	Persistent urachus
	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)
Summer (March to June)	34.4% (54)	38.2% (86)	39.7% (219)	36.1% (13)	42.1% (8)	37.7% (23)
Winter (November to February)	30.6% (48)	32% (72)	32.6% (180)	36.1% (13)	31.6% (6)	41.0% (25)
Rainy (July to October)	35.0% (55)	29.8% (67)	27.7% (153)	27.8% (10)	26.3% (5)	21.3% (13)

Discussion

Congenital defects are malformations brought on by genetic or environmental reasons. Seasonal trends connected to harmful plant growth or arthropod viral vectors are the frequent causes. Age, sex, type, and season have all been shown to have an impact on the prevalence of congenital or infectious disorders (Hoda *et al*., 2018; Jaman *et al*., 2018). This study was conducted to know the occurrence of congenital anomalies in calves and kids, with respect to sex, breed, and seasons. The most common defects found in this study were umbilical hernia (52.6%), dermoid cyst (21.4%), and atresia ani (15.0%) in calves and atresia ani in kids. The highest occurrences were found in the Veterinary Teaching Hospital, Bangladesh Agricultural University (VTH). Polat (2022) has reported umbilical hernia (21.51%), atresia ani (15.18%), and constricted tendon (12.65%) as the most frequent congenital abnormalities. Islam *et al*. (2021) investigated the occurrence of congenital anomalies from 2010 to 2019 and found atresia ani, umbilical hernia, dermoid cyst, and knuckling of the leg as the most common congenital diseases in calves at Fulbaria, Muktagacha, and Trishal Veterinary Hospitals. Salam *et al*. (2022) also found only atresia ani as a congenital anomaly in goats among other surgical cases.

In this study, most cases of atresia ani, dermoid cyst, umbilical hernia, and persistent urachus were found in male calves and kids admitted to three veterinary hospitals, with Knuckling being higher in female calves. No significant association was found between sex and congenital diseases. Polat (2022) has also found a higher occurrence of congenital anomalies in male animals (68.49%).

The study found that crossbred calves had higher frequencies of dermoid cysts, umbilical hernia, and knuckling, while indigenous calves had higher rates of atresia ani, rectovaginal fistula, and persistent urachus. In contrast, 60% of cases of atresia ani occurred in Black Bengal goats. There was an insignificant association between breed and disease frequency in both species. According to the findings of Hasan *et al*. (2015) and Samad (2021) cross-bred calves and native kids have been reported to have the most congenital abnormalities reported, in Bangladesh.

The study found that most congenital cases were recorded in calves during summer in VTH, Sadar, and Kendua with the highest prevalence, which is in contrast with the report of Islam *et al*. (2021). Salam *et al*. (2022) found most of the congenital diseases in kids during summer whereas our study found highest during winter.

An umbilical hernia is the displacement of an organ through an unbroken skin gap in the abdominal wall, involving the contents, sac, and hernial ring. In this study, the occurrence of Umbilical hernia was greater in crossbred (60.0%) and males (52.9%), during

summer (39.7%). Islam *et al*. (2021) stated that males had a higher incidence of umbilical hernias, while crossbreeds had a higher incidence. Nath *et al*. (2016) also reported that the occurrence persisted all year long and male calves are more likely than female calves to experience this disorder. The summer season has a higher incidence of umbilical hernias compared to the winter and rainy seasons (Samad *et al*., 2002; Salim *et al*., 2015) and this finding is similar to our result.

Congenital anorectal deformity known as atresia ani results from either the failure of the fetal anal membrane to perforate, splitting the rectus and anus during fetal development, or the incapacity of the urorectal fold to fully divide the cloaca. This study reports the occurrence of Atresia ani in male (62.4%) and Indigenous (65.0%) calves during the rainy season (35.0%). It is the most prevalent congenital malformation of the lower gastrointestinal system in mammals, especially in kids and calves from Bangladesh (Binanti *et al*., 2013). These results corroborate the results reported in the literature. Atresia ani is a surgical condition distributed by gender, with males having a higher prevalence, native breeds and winter season having a higher frequency (Samad *et al*., 2002, Merei *et al*., 2001; Azizi *et al*., 2010; Islam et al., 2021)

An ocular dermoid is an appendage on the cornea, conjunctivae, or limbus that resembles skin and is caused by an autosomal recessive trait that is polygenic and heritable (Simon *et al*., 2010). It may be bilateral or unilateral, and connected to other ocular symptoms that result from irritation induced by hair (Hashim *et al*., 2016). The study found that the occurrence of Dermoid Cysts was found to be higher in male (57.3%) and crossbred (55.6%) calves, during summer (38.2%). Alam and Rahman (2012) also found a higher incidence of dermoid cysts in crossbred and male calves.

Congenital flexor tendon contracture in the forelimbs is a common musculoskeletal anomaly in newborn calves, affecting the fetlock and pastern joints' flexor and extensor tendons (Fernández-Salas *et al*., 2021), leading to failure of normal limb extension (Anderson *et al*., 2008). In this study, Knuckling occurred frequently in crossbred (55.6%) and female (52.8%) calves, during summer and winter (36.1%). Chakraborty *et al*. (2023) found that 12% of congenitally deformed calves experience knuckling, with male calves experiencing higher frequency in summer and winter, primarily involving the carpal joint. Fazili *et al*. (2014) also reported that there were mostly crossbred calves of both genders affected by contracted tendons which is similar to this study. In contrast, Simon *et al*. (2010) found no breed predilection for such defects. Knuckling is highest in female calves (Islam *et al*., 2021) due to site preference as well as variations in the types of diseases (Noman *et al*., 2013)

The occurrence of female sex-specific anomaly recto-vaginal fistula was higher in indigenous (63.2%) calves, during summer (42.1%). Although uncommon in the general population, certain crossbreds sometimes exhibit it (Wang *et al*., 2015). The incapacity of the anorectal septum to split the cloaca into the rectal and urethra-vesicle segments is thought to be the cause of recto-vaginal fistulas. Atresia ani or atresia ani et recti may be inherited due to a single autosomal recessive gene (Chaudhary *et al*., 2010).

The study reveals a higher occurrence of Persistent urachus in male (80.3%) and indigenous (55.7%) calves, during winter (41.0%). Urine dribbling is caused by persistent urachus, which happens when the urachus, which connects the fetus's bladder to the allantoic sac, fails to close after delivery (Hoda *et al*., 2018). This illness frequently coexists with omphalitis, omphalophlebitis, and urachitis, with infection and inflammation extending to the tissues of the abdomen.

In the case of goats, this study found that 57.8% of atresia ani cases occurred in males, 62.4% cases were in Black Bengal kids, and 39.4% cases during the winter season. Al Noman *et al* (2018) also found a greater ratio of male kids and black Bengal kids in the case of atresia ani of goat. Similar results were reported by Salam *et al* (2022) who found that more male kids (66.67%) and more black Bengal kids (66.67%) had atresia ani at Chuadanga sadar upazila.

Conclusions

Calves exhibited a higher occurrence of diverse congenital anomalies, with umbilical hernia being the most common, while kids were predominantly affected by atresia ani. Anomalies were more frequently observed in male animals and during

the summer season.

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