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Retrospective Review of Congenital Anomaly Cases in Ruminants

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ABSTRACT This study was designed to provide data on the incidence rates of congenital anomalies and their distribution by organs and systems in calves, lambs and kids brought to Van Yuzuncu Yil University, Faculty of Vetrinary Medicine, Surgery Clinic between 2017-2023. The animal material of the study consisted of 1104 ruminants, including 886 calves, 183 lambs and 35 kids, aged 0-6 months. In addition to clinical examination, anomalies were diagnosed by using direct and indirect radiographic examinations when necessary. In some cases, a definitive diagnosis was made by performing experimental laparotomy based on clinical and radiological examinations. 341 out of 1104 ruminants, including 234 calves, 96 lambs and 11 kids, suffered from congenital anomalies. Of the ruminants with congenital anomalies, 208 (61.00%) were male, 132 (38.70%) female and 1 (0.30%) hermaphrodite. Abdominal wall anomalies were determined with the highest number of 112 (32.9%) cases. These were followed by musculoskeletal system anomalies in 83 (24.4%) cases and gastrointestinal system anomalies in 56 (16.5%) cases. Head region anomalies occurred in 41 cases (12.1%), urinary system anomalies in 23 cases (6.8%) and CNS anomalies in 9 cases (2.6%). Multiple anomalies were recorded in 16 (4.7%) cases. In conclusion, congenital anomalies are frequently seen as pathologies in ruminants in our country, especially in our region. Avoiding inbreeding, making artificial insemination widespread, improving the care and nutrition of the dam during pregnancy, correcting adverse environmental conditions and eliminating stress factors, avoiding over-the-counter medication misuse during pregnancy and most importantly informing field veterinarians and animal owners about the subject will contribute to the prevention of congenital malformations and losses in livestock.

Keywords: *Calf, Congenital anomaly, Kid, Lamb, Ruminant.*

ÖZ

Ruminantlarda Konjenital Anomali Olgularının Retrospektif Değerlendirilmesi

Bu çalışma, 2017-2023 yılları arasında Van Yüzüncü Yıl Üniversitesi, Veteriner Fakültesi, Cerrahi Kliniğine getirilen buzağı, kuzu ve oğlaklarda konjenital anomalilerin insidans oranları hakkında veri sağlamak ve bu hayvanlardaki anomalilerin organ ve sistemlere göre dağılımları hakkında bilgi vermek amacıyla tasarlandı. Çalışmanın hayvan materyalini 0-6 aylık 886 buzağı, 183 kuzu ve 35 oğlak olmak üzere 1104 ruminant oluşturdu. Klinik muayene yöntemlerine ek olarak, gerektiğinde direkt ve indirekt radyografik muayeneler kullanılarak anomaliler teşhis edildi. Bazı vakalarda klinik ve radyolojik muayenelere dayanarak deneysel laparotomi yapılarak kesin tanı konuldu. 234 buzağı, 96 kuzu ve 11 oğlak olmak üzere 1104 ruminanttan 341'i konjenital anomalilere sahipti. Konjenital anomalili ruminantların 208'i (%61.00) erkek, 132'si (% 38.70) dişi ve 1'i (%0.30) hermafroditti. Karın duvarı anomalileri 112 (%32.9) vaka ile en fazla gözlenen anomali çeşidi olarak tespit edildi. Bunu 83 (%24.4) olgu ile kas-iskelet sistemi anomalileri ve 56 (%16.5) olgu ile gastrointestinal sistem anomalileri takip etmiştir. Daha sonra 41 vakada (%12.1) baş bölgesi anomalileri, 23 vakada (%6.8) üriner sistem anomalileri ve 9 vakada (%2.6) MSS anomalileri görüldü. Multiple anomali 16 (%4.7) vakada kaydedildi. Sonuç olarak, konjenital anomaliler bölgemizde ruminantlarda sıklıkla görülen patolojilerdir. Akrabalı yetiştirmeden kaçınılması, suni tohumlamanın yaygınlaştırılması, gebelik süresince annenin bakım ve beslenmesinin iyileştirilmesi, olumsuz çevre koşullarının düzeltilmesi ve stres faktörlerinin ortadan kaldırılması, gebelik süresince bilinçsiz ilaç kullanımından kaçınılması ve en önemlisi saha veteriner hekimlerinin ve hayvan sahiplerinin konu hakkında bilgilendirilmesi çiftlik hayvanlarında konjenital malformasyonların ve kayıpların önlenmesine katkı sağlayacaktır.

Anahtar Kelimeler: *Buzağı, Kongenital anomali, Kuzu, Oğlak, Ruminant.*

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INTRODUCTION

Congenital abnormalities are a range of structural, functional, or metabolic disorders that occur during embryonic or fetal development (Su et al. 2023). They may affect a single anatomical structure or function, an entire system, or parts of several systems, or may involve several body systems, or combine functional and structural defects to form syndromes (Leipold et al. 1982; Leipold et al. 1991). Although the causes of congenital anomalies in ruminants have not been fully explained, it has been suggested that they may develop at various stages of embryogenesis or fetal development under the influence of genetic, environmental or both factors. Environmental factors have been reported as nutritional deficiencies, viruses, teratogens, infectious agents, fertilization technique, hormones and antibodies (Newman et al. 1999). It is also stated that stress factors, faulty breeding selection and rectal palpation for early diagnosis of pregnancy may also be effective (Meylan 2008).

Leipold (1982) stated that congenital defects may be lethal, semi-lethal, viable, and minor defects may also have an aesthetic effect. Although economic losses due to congenital defects are less than those due to infectious, chemical and nutritional agents, they may be economically important to livestock producers. Congenital defects cause economic losses by increasing perinatal calf mortality and reducing the value of viable defective calves (Leipold 1978; Leipold 1982). Congenital anomalies account for 11.5% of surgical diseases and are of great importance in veterinary medicine. As patients with congenital anomalies are not usually referred for treatment, it is difficult to determine the number and type of patients. Depending on the species, the breed, sex, age of parent and the environment in which the animals live, the incidence of anomalies varies. All animal species are affected by congenital anomalies. However, they are more likely to occur in calves, lambs and kids (Doğan and Şındak 2013). Congenital defects are most commonly found in the musculoskeletal system and gastrointestinal system, and less frequently in the genitourinary, eye and other organ systems (Aksoy et al. 2006).

The aim of animal breeders is to obtain economically healthy animals and animal products. Birth defects are among the main causes of newborn animal losses. Also, the care and feeding of surviving animals is difficult, and there is a loss of productivity and reduction in animal welfare. It can also cause economic loss for animal breeders (Uzar et al. 2020; İder and Ertürk 2023). Van province is an important region of our country in terms of animal husbandry potential. According to the records in 2023, there are 132.641 cattle, 2.993.722 sheep and 286.423 goat population in Van province (DrDataStats 2023). The majority of the people of the region make their living from animal husbandry. Birth defects are important in our region. The present study was designed to provide data on the incidence rates of congenital anomalies in calves, lambs and kids brought to our clinic between 2017 and 2023, their distribution according to organs and systems, treatment and precautions to be taken.

MATERIAL AND METHODS

The study was carried out with the permission of Van Yuzuncu Yil University Animal Experiments Local Ethics Committee, numbered 2024/01-03.

The animal material of the study consisted of a total of 341 animals, including 234 calves, 96 lambs and 11 kids with congenital anomalies of different breeds, ages and genders, brought to surgery department of veterinary faculty in Van Yuzuncu Yil University between 2017 and 2023 (Table 1).

Routine physical clinical examinations such as general condition, heart rate and respiratory rate were performed. Then, anomalies were diagnosed by using clinical examination methods such as inspection, auscultation, palpation and percussion, as well as direct and/or indirect radiographic examinations when necessary. In some cases, a definitive diagnosis was made by experimental laparotomy following clinical and radiological examination. Surgical intervention was performed in cases such as hernia umbilicalis, hernia scrotalis, urachus fistula, atresia ani, atresia ani et recto-vaginal fistula, atresia coli, meningocele, cyst dermoid. Supported bandage was applied in cases such as flexural contracture and joint laxity in the extremities. Euthanasia was recommended in animals with a negative prognosis such as arthrogryposis and spina bifida. No intervention was performed in cases such as anophthalmia and microphthalmia.

Statistical Analysis

The data of breed, sex, frequency and localization of anomalies were evaluated using descriptive statistical analysis.

RESULTS

Between 2017 and 2023, 1104 ruminants, including 886 calves, 183 lambs and 35 kids aged 0-6 months, were brought to our clinic and 341 of them were with the complaint of congenital defects. The distribution of these cases by species was 234 (68.62%) calves, 96 (28.15%) lambs and 11 (3.23%) kids. Of the calves with congenital malformations, 158 (67.52%) were Simmental, 46 (19.66%) native cross, 28 (11.97%) Brown Swiss and 2 (0.85%) Holstein Friesian breeds. Of the lambs with congenital abnormalities, 70 (71.88%) were Akkaraman, 16 (16.67%) Norduz and 10 (10.41%) Morkaraman breeds. Of the kids with congenital disorder, 7 (63.64%) were Coloured Mohair and 4 (36.36%) hair goat. Of the ruminants with congenital anomalies, 208 (61.00%) were male, 132 (38.70%) female and 1 (0.30%) hermaphrodite. Of the anomaly cases in calves, 138 (58.97%) were male and 96 (41.03%) females. In lambs, 60 (62.50%) were male, 35 (36.36%) female, 1 (1.04%) hermaphrodite, and in kids, 10 (90.90%) were male and 1 (9.10%) female. The species, breed and sex distribution of the anomaly cases are given in Table 1.

Abdominal wall anomalies were observed in ruminants with the highest number of 112 (32.9%) anomaly cases. These were followed by musculoskeletal system anomalies in 83 (24.4%) cases and gastrointestinal system anomalies in 56 (16.5%) cases. Then, head region anomalies occurred in 41 cases (12.1%), urinary system anomalies in 23 cases (6.8%) and CNS anomalies in 9 cases (2.6%). Multiple anomalies were recorded in 16 (4.7%) cases. In calves, we mostly encountered hernia umbilicalis, flexural deformity, amaurosis omphalocele and cyst dermoid cases, respectively. The most common congenital disorders identified in lambs were atresia ani, followed by omphalocele, flexural deformity, and meningocele. In kids, the most common cases of urethral diverticulum, atresia ani, flexural deformity and scoliosis were observed, respectively. The distribution of anomaly cases detected in ruminants by systems and organs are presented in Tables 2, 3, 4 and 5. Images of various anomalies seen in calves and lambs are presented in Figures 1, 2, 3, 4, 5 and 6.

Table 1: The distribution of anomaly cases by species, breed and sex.

Species	Breed	Animals			Total (%)
		Sex			
		Male	Female	Hermaphrodite	
Calf	Simmental	93	65	-	158 (67.52%)
	Native Cross	28	18	-	46 (19.66%)
	Brown Swiss	15	13	-	28 (11.97%)
	Holstein Friesian	2	-	-	2 (0.85%)
	Total (n) (%)	138 (58.97%)	96 (41.03%)	-	234 (100%)
Lamb	Akkaraman	42	27	1	70 (71.88%)
	Norduz	11	5	-	16 (16.67%)
	Morkaraman	7	3	-	10 (10.41%)
	Total (n) (%)	60 (62.50%)	35 (36.46%)	1(1.04%)	96 (100%)
Kid	Colored Mohair	6	1	-	7 (63.64%)
	Mohair Goat	4	-	-	4 (36.36%)
	Total (n) (%)	10 (90.90%)	1 (9.10%)	-	11 (100%)

Table 2: Abdominal wall, gastrointestinal and urogenital system anomalies.

Anomaly	Calf			Lamb			Kids			Total
	Male	Female	Total	Male	Female	Total	Male	Female	Total	
Hernia umbilicalis	46	32	78	-	-	-	-	-	-	78
Omphalocele	9	8	17	8	6	14	-	-	-	31
Atresia ani	6	4	10	22	11	33	1	1	2	45
Atresia ani et recti	1	-	1	1	1	2	-	-	-	3
Atresia coli	5	3	8				-	-	-	8
Scrotal hernia	-	-		4	-	4	-	-	-	4
Artesia urethra distalis	-	4	4	-	-	-	-	-	-	4
Urethral dilatation	2	-	2							2
Penile urethral diverticulum	-	-	-	-	-	-	6	-	6	6
Urachal fistula	3	5	8	2	-	2	-	-	-	10

Table 3: Anomalies of the musculoskeletal system.

Anomaly	Calf			Lamb			Kids			Total
	Male	Female	Total	Male	Female	Total	Male	Female	Total	
Flexural deformity	32	17	49	5	4	9	2	-	2	60
Joint laxity	3	1	4	-	3	3	-	-	-	7
Arthrogryposis	-	-	-	2	1	3	-	-	-	3
Shoulder dislocation		1	1	-	1	1	-	-	-	2
Patella luxation	1	-	1	-	-	-	-		-	1
Polydactyly	-	1	1	-	-	-	-	-	-	1
Adactyly	1	-	1	-	-	-	-	-	-	1
Coxofemoral luxation	2	-	2	1	-	1	-	-	-	3
Femoral fracture	-	1	1	-	-	-	-	-	-	1
Scoliosis	-	1	1	2	-	2	1	-	1	4

Table 4: Anomalies of the head region and nervous system.

Anomaly	Calf			Lamb			Kids			Total
	Male	Female	Total	Male	Female	Total	Male	Female	Total	
Amaurosis	10	9	19	1	1	2	-	-	-	21
Dermoid cyst	8	6	14	-	-	-	-	-	-	14
Anophthalmia	1	-	1	2	-	2	-	-	-	3
Microphthalmia	-	-	-	-	1	1	-	-	-	1
Ankyloblepharon	-	-	-	1	1	2	-	-	-	2
Bilateral anterior nasal atresia	1	-	1	-	-	-	-	-	-	1
Meningocele	-	-	-	5	1	6	-	-	-	6
Spina bifida	2	-	2	1	-	1	-	-	-	3

Table 5: Multiple anomalies of various system.

Anomaly	Calf			Lamb				Kids			Total
	Male	Female	Total	Male	Female	HM	Total	Male	Female	Total	
Atresia ani and polymelia (notomelia)				2	-		2	-	-	-	2
Atresia ani and rectovaginal fistula	-	3	3	-	3		3	-	-	-	6
Atresia ani and hermaphroditism	-	-	-	-	-	1	1	-	-	-	1
Polymelia (thoracomelia) and scoliosis				-	1		1	-	-	-	1
Spina bifida and flexural deformity	1	-	1	-	-		-	-	-	-	1
Amaurosis and exophthalmos	1	-	1	-	-		-	-	-	-	1
Atresia ani and hernia umbilicalis	1	-	1	-	-		-	-	-	-	1
Atresia ani and coccygeal agenesis	2	-	2	-	-		-	-	-	-	2
Schistosoma reflexum	-	-	-	1	-		1	-	-	-	1

Figure 1: Radiographic view of a calf with atresia ani and coccygeal agenesis.

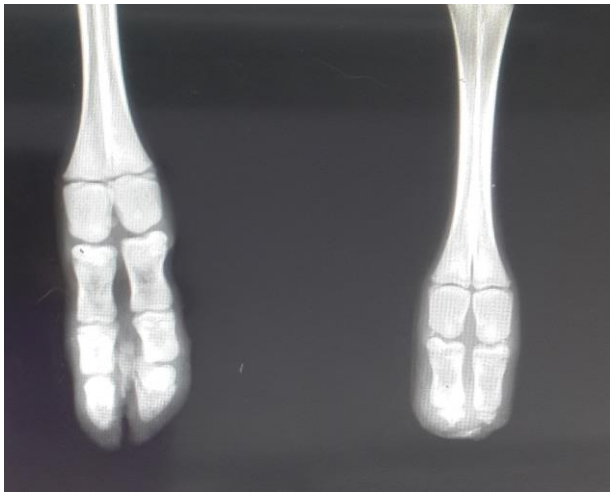

Figure 2: Radiographic view of a calf with adactyly.

Figure 3: Flexural deformity of the forelimbs in a Simmental calf.

Figure 4: Dermoid cyst in the right eye of a Simmental calf.

Figure 5: Scoliosis in Brown Swiss calf.

Figure 6: Meningocele in lamb.

DISCUSSION AND CONCLUSION

Congenital anomalies, defined as morphogenesis defects present at birth, are an important problem in livestock farming. These defects can lead to the death of animals, reduce their productivity and affect animal welfare. It can also cause economic loss for animal breeders (Uzar et al. 2020). It is stated that factors such as genetic causes, stress factors, nutritional disorders, vitamin deficiencies, incorrect stud selection, environmental factors and not preferring artificial insemination play a role in the etiologies of anomalies (Newman et al. 1999; Meylan 2008). In studies conducted in our region, it is estimated that the factors causing anomalies may be mineral and vitamin deficiencies, inbreeding, and unconscious drug use by patient owners (Belge et al. 2000; Aksoy et al. 2006). Since no investigation was conducted related to the cause in this study, it was not possible to identify the factors causing the anomaly. However, we estimate that these congenital anomalies seen in our region may be due to genetic factors as well as non-genetic factors such as inadequate nutrition, inbreeding, uncontrolled drug use and the use of animals without pedigree in the enterprise.

In congenital defects, as a result of the defect affecting the embryo in the first 3 weeks of gestation, the embryo either dies or the regulatory mechanism in the embryo prevents damage and the embryo survives. The period when the embryo is vulnerable to abnormal growth is between 3 and 8 weeks (embryogenesis period). Structural abnormalities in the affected embryo are inevitable during this period. After eight weeks of gestation, major structural abnormalities are unlikely to occur. This is because by this time many of the embryo's organs have completed their formation (Sinowatz 2010). We assume that the malformations that occurred in the cases in our investigation were probably caused by malformation-causing effects during the embryogenesis of the embryos in the womb.

In studies conducted in our country, the prevalence of congenital anomalies in calves was reported as 26.8% by Özaydın et al. (1995), 6.58% by Belge et al. (2000), 16.5% by Aksoy et.al. (2006), 1.9% by Elma (1992), 22.37% by Han and Durmuş (2005), 18.20% by Kaya et al. (2011), 7.55% by İşler et al. (2016), 13.99% by Karabulut et. al. (2001) and 2.96% by Oğurtan et al. (1997). It is stated that in calf screening studies conducted on a regional basis, congenital anomalies were detected at a rate of 0.80% (Hasan et al. 2015) and 6.26% (Herschler et al. 1962; Nigam et al. 1984). In a study that reviewed case reports on congenital anomalies in farm animals published in Bangladesh from 1975 to 2021; It is reported that 1746 cases of congenital anomalies were detected in calves and 55 cases in kids (Samad 2021). In many studies, the prevalence of congenital anomalies in lamb was reported as 16.6% by Elma (1992), 36% by Aksoy et.al. (2006), 2.89% by İşler et al. (2016) and 0.2-2% by Dennis (1993). The frequency of birth defects in kids was found as by 22.7% Elma (1992), 5.12% Basrur et al. (1993), 18.67% Al-Ani et al. (1998) and 83% by Aksoy et al. (2006). During the 6-year period, 341 (30.88%) of 1104 ruminants aged between 0-6 months brought to our clinic were diagnosed with congenital anomalies. We recorded that 234 out of 886 calves (26.41%), 96 out of 183 lambs (52.45%) and 11 out of 35 kids (31.42%) aged between 0-6 months were born with anomalies. We estimate that these different rates of incidence of anomalies in ruminants vary according to criteria such as geographical region, nutritional level, parental age and environmental factors (Sonfada et al. 2010). When the studies on the incidence of congenital anomalies are analyzed, most of them were conducted either in the form of regional surveys or on animals admitted to veterinary faculty clinics. Therefore, we consider that these data do not reflect the actual and general prevalence of congenital anomalies.

When congenital defects in calves are evaluated in terms of breed, different results are reported. While some researchers reported that there was no significant difference between congenital anomalies in calves and their breeds (Özaydın et al. 1995), many studies reported that congenital anomalies in calves were mostly seen in Holstein (Han and Durmuş 2005; İşler et al. 2016), Simmental (Aksoy et al. 2006; Yurdakul 2019; Polat 2022; Sağlam et al 2023), Brown Swiss (Kaya et al) breeds. In a survey study conducted in Swiss sheep, it was reported that congenital defects were detected most frequently in Swiss White Alpine sheep breed (Greber et al. 2013). In different studies conducted in our country, it was reported that birth defects were found most frequently in Morkaraman breed (Aksoy et al. 2006) and Akkaraman breed (Polat 2022) in sheep and in Mohair goat breed in goats (Aksoy et al. 2006; Polat 2022). In this report, when the relationship between birth defects and breed was evaluated, the highest number of congenital malformations were observed in Simmental breed calves, Akkaraman breed lambs and Colored Mohair breed kids. The high incidence of congenital anomalies in these breeds in our study suggests that it may be related to the common breeds bred in the region. In some studies, it is stated that anomalies are related to the breed factor, but some environmental and pathological factors may also be effective in the region (Göksel and Sarıtaş 2016), and when a new breed is started to be raised in a region, an increase in congenital anomalies may occur due to environmental factors (Aksoy et al. 2006).

In many studies in which the sex distribution of congenital anomalies in ruminants was analyzed, it was reported that congenital anomalies were mostly observed in the male sex (Özaydın et al. 1995; Oğurtan et al. 1997; Aksoy et al. 2006; Göksel and Sarıtaş 2016; İşler et al. 2016, Polat 2022; Sağlam et al. 2023). In our research, congenital defects were seen in 58.97% of male calves, 62.50% of male lambs and 90.90% of male kids. Except for atresia ani and rectovaginal fistula which were specific to females, atresia urethra distalis, shoulder dislocation, polydactyly, femoral fracture and scoliosis were observed only in calves females and shoulder dislocation, microphthalmia, polymelia (thoracomelia) and scoliosis were observed only in lambs females. In the present study, it was determined that congenital anomalies observed in calves, lambs and kids were mostly observed in the male sex in highly consistent with previous studies. No evidence was put forward by these researchers on the relationship between congenital anomalies and sex (Özaydın et al. 1995; Constable et al. 1997; Oğurtan et al. 1997; Aksoy et al. 2006; Azizi et al. 2010; Göksel and Sarıtaş 2016; İşler et al. 2016). In humans, as in animals, birth defects are reported to be more common in male infants than in female infants. Different theories about sex-related anomalies have been proposed. The interaction of sex hormones and system development is suggested as a possible cause of sex differences in some anomalies such as cleft palate and cleft lip. In addition, urinary and reproductive defects in males are explained by the development of male reproductive organs during early pregnancy and their sensitivity to excessive hormone levels (Sokal et al. 2014).

In many previous studies, musculoskeletal system, ocular system and digestive system (Özaydın et al. 1995; Carraro et al. 1996; Oğurtan et al. 1997; İşler et al. 2016), flexural deformities, meningocele and cleft palate in calves (Abdelhakiem and Elrashidy 2017) digestive system (Özaydın et al. 1995; Oğurtan et al. 1997; Aksoy et al. 2006; İşler et al. 2016), CNS and musculoskeletal system in lambs (Perez et al. 2017) and urinary system anomalies in kids are reported to be the most common system anomalies (Özaydın et al. 1995; Oğurtan et al. 1997; Aksoy et al. 2006; Doğan and Şındak 2013; İşler et al. 2016). Gangwar et al. (2014) reported the most common congenital malformations in calves as hernia umbilicalis, flexural deformity, atresia ani and omphalocele, respectively. In another study, atresia ani was the most common congenital malformation, followed by flexural deformity, amorosis and cyst dermoid. In the same study, it was reported that only atresia ani was detected in kids (Hasan et al. 2005). In recent years, it has been reported that birth defects are most common in the abdominal wall/gastrointestinal system, musculoskeletal system and head region in ruminants in the Elazığ region. It was also reported that hernia umbilicalis, flexural deformity and coccygeal agenesis in calves, and atresia ani in lambs and kids were the most commonly observed congenital anomalies (Polat 2022). The results of the research carried out in Samsun region in recent years show that the distribution of congenital anomalies in calves by organs and systems shows the musculoskeletal system as the most frequent, followed by the digestive system, nervous system, and then the urogenital system. (Sağlam et al. 2023). According to the results of a survey conducted with farmers in Switzerland, the most common defects in sheep were entropion, brachygnathia inferior, umbilical hernia and cryptorchidism (Greber et al. 2013). In a retrospective review of articles, it was found that the most common systemic congenital anomalies in calves and kids were in the digestive system (67.18%), followed by the eye system (17.07%), musculoskeletal system (8.42%), urogenital system (2.58%) and integumentary system (2.52%). In the same paper, it was reported that 56.25% of 1746 anomaly cases in calves and 67.27% of 55 anomaly cases in kids were found to be atresia ani (Samad 2021). In a recent study conducted by Radjendran et al. (2023) in calves, they reported systemic congenital defects at a rate of 46.0% in the gastrointestinal system, 40.0% in the musculoskeletal system, and 8.0% in the urogenital system. Among the gastrointestinal disorders, atresia ani came first, followed by atresia coli. Arthrogryposis was the most common musculoskeletal condition, followed by contracted tendon, polymelia and prognathism. Nervous system disorders included hydrocephalus. In the urogenital system, it contained a permanent urachus with an ectopic bladder. The results of a survey conducted among veterinarians in Ireland show that systemically, musculoskeletal system anomalies are the most frequently observed in calves, followed by digestive system cases. In the same study, it was reported that intestinal atresia was the most common anomaly (Mee et al. 2024). In our research, which we followed for six years, the distribution of congenital anomalies in ruminants by systems, abdominal wall, musculoskeletal and ocular anomalies were the most common in calves, respectively. In lambs, gastrointestinal, musculoskeletal and abdominal wall defects were the most common. All congenital malformations belonged to the urinary system and gastrointestinal systems in kids. Multiple anomalies were recorded equally in calves and lambs. In addition, hernia umbilicalis, flexural deformity and amaurosis were the top three in calves, atresia ani, omphalocele and flexural deformity in lambs, and urethral diverticulum, atresia ani and flexural deformity in kids. The findings obtained in our study are consistent with the many studies on this subject.

In conclusion, congenital anomalies are frequently seen pathologies in ruminants in our country, especially in our region. Although congenital defects in farm animals are not very high compared to other diseases, they can cause significant economic and animal welfare concerns. These birth defects develop under the influence of many environmental factors as well as genetic predispositions. In particular, avoiding inbreeding, making artificial insemination widespread, improving the care and nutrition of the dam during pregnancy, correcting adverse environmental conditions and eliminating stress factors, avoiding over-the-counter medication misuse during pregnancy and most importantly informing field veterinarians and animal owners about the subject will contribute to the prevention of congenital malformations and losses in livestock.

CONFLICTS OF INTEREST

The authors report no conflicts of interest.

AUTHOR CONTRIBUTIONS

Idea / Concept: AK
Supervision / Consultancy: AK, CK, YK
Data Collecting and / or Processing: YK
Analysis and / or Interpretation: CK
Writing the Article: AK
Critical Review: AK, CK, YK

REFERENCES

Abdelhakiem AHM, Elrashidy HM (2017). A retrospective study of the congenital anomalies of the axial and appendicular skeleton in cow calves. *Assiut Vet Med J,* 63 (153), 88-99.

Aksoy Ö, Kılıç E, Öztürk S et al. (2006). Congenital anomalies encountered in calves, lambs and kids 1996-2005 (262 cases). *Kafkas Univ Vet Fak Derg,* 12 (2), 147-154.

Al-Ani FK, Khamas WA, Al-Qudah KM, Al-Rawashdeh O (1998). Occurrence of congenital anomalies in Shami breed goats: 211 cases investigated in 19 herds. *Small Rumin Res,* 28 (3), 225–232.

Azizi S, Mohammadi R, Mohammadpour I (2010). Surgical repair and management of congenital intestinal atresia in 68 calves. *Vet Surg,* 39 (1), 115-120.

Basrur PK (1993). Congenital abnormalities of the goat. *Vet Clin North Am Food Anim Pract.,* 9 (1), 183-202.

Belge A, Gönenci R, Biricik HS, Ormancı S (2000). Buzağılarda doğmasal anomali olguları. *YYÜ Vet Fak Derg,* 11 (2), 23-26.

Constable PD, Shanks RD, Huhn J, Morin DE (1997). Evaluation of breed as a risk factor for atresia coli in cattle. *Theriogenology*, 48 (5), 775-790.

Dennis SM (1993). Congenital defects of sheep. *Vet Clin North Am Food Anim Pract*, 9 (1), 203-217.

Doğan H, Şındak N (2013). The incidence of anomalies in calves, lambs and goat kids in the district of Nizip and its villages and determination of some biochemical parameters in these cases. *Harran Üniv Vet Fak Derg*, 2 (2), 61-66.

DrDataStats (2023). İllere göre Türkiye'de hayvancılık: Canlı hayvan sayıları. Erişim tarihi: 12 Nisan 2024. Erişim Adresi: https://www.drdatastats.com/illere-gore-turkiyede-hayvancilik-canli-hayvan-sayilari/.

Elma E (1992). S. Ü. Veteriner fakültesi cerrahi kliniğine 1985-1990 yılları arasında getirilen hastalara toplu bir bakış. *SÜ Vet Fak Derg,* 8 (1), 58-60.

Gangwar AK, Devi KS, Singh AK et. al. (2014). Congenital anomalies and their surgical correction in ruminants. *Adv Anim Vet Sci,* 2 (7), 369 – 376.

Göksel BA, Sarıtaş ZK (2016). Clinical and operative approach of intestinal atresia in calves. *Kocatepe Vet J,* 9 (3), 200-210.

Greber D, Doherr M, Drögemüller C, Steiner A (2013). Occurrence of congenital disorders in Swiss sheep. *Acta Vet Scand*, 55 (1), 27.

Han MC, Durmuş AS (2005). Buzağılarda bazı konjenital anomali olguları. *Doğu Anadolu Bölgesi Araştırmaları Dergisi,* 3 (2), 175-177.

Hasan MS, Rahaman MM, Sen AB et al. (2015). Prevalence of congenital defects of cattle and goat in Bangladesh. *Int J Nat Soc Sci*, 2 (5), 13-17.

Herschler MS, Fechheimer NS, Gilmore LO (1962). Congenital abnormalities in cattle: their association with hereditary and environmental factors. *J Dairy Sci*, 45 (12), 1493-1499.

İder M, Ertürk A (2023). Koyun ve keçilerde neonatal kayıpların önlenmesi. Alkan F (Ed). Sağlıklı ve Sürdürülebilir Koyun ve Keçi Yetiştiriciliği (S. 28-35). Türkiye Klinikleri, Ankara.

İşler C, Altuğ M, Gönenci R, Aytekin İ (2016). 2005-2009 yılları arasında Bolu bölgesinde buzağılarda tespit edilen anomali olgularının değerlendirilmesi. *Harran Üniv Vet Fak Derg*, 5 (2), 100-104.

Karabulut, E, Ünsaldı S, Durgun, T (2001). 1991-2000 Yılları arasında Fırat Üniversitesi veteriner fakültesi cerrahi kliniğine getirilen buzağılardaki doğmasal anomali olguları. *FÜ Sağ Bil Vet Derg,* 15 (2), 367-374.

Kaya M, Okumuş Z, Doğan E, Çetin EM, Yanmaz LE (2011). Erzurum yöresindeki buzağılarda doğmasal anomalilerin görülme sıklığı ve sağaltım oranları. *FÜ Sağ Bil Vet Derg,* 25 (2), 83-93.

Leipold HW (1978). Genetics and disease in cattle. In: Proceedings of The Eleventh Annual Convention American Association of Bovine Practitioners, Baltimore, Maryland.

Leipold HW (1982). Congenital defects of current concern and interest in cattle: A review. *AABP*, 17, 101–114.

Leipold HW, Steffen DJ, Woollen N, Hiraga T, Dennis SM (1991). Congenital Defects of Current Concern in Beef Cattle. In: Proceedings of the Twenty-Fourth Annual Conference. American Association of Bovine Practitioners, Orlando, Florida.

Mee JF, Murphy D, Curran M (2024). Bovine congenital defects recorded by veterinary practitioners. *Reprod Domest Anim,* 59 (1), e14501.

Meylan M (2008). Surgery of the bovine large intestine*. Vet Clin North Am Food Anim Pract,* 24 (3), 479-496.

Newman SJ, Bailey TL, Jones JC, DiGrassie WA, Whittier WD (1999). Multiple congenital anomalies in a calf. *JVDI,* 11 (4), 368-371.

Nigam JM, Misk NA, Rifat JF (1984). Surgical management or congenital anomalies of ruminants. *Agri-practice*, 5 (7), 38-47.

Oğurtan Z, Alkan F, Koç Y (1997). Ruminantlarda kongenital anomaliler. *Türk Vet Hekim Derg*, 9 (4), 24-28.

Özaydın İ, Kılıç E, Okumuş Z, Cihan M (1995). 1992-1995 yılları arasında Kafkas Üniversitesi veteriner fakültesi kliniklerine getirilen buzağılarda doğmasal anomali olguları. *Vet Cerrahi Derg*, 1 (2), 22-25.

Perez V, Fernández M, Benavıdes J et al. (2017). Anomalías congénitas en pequeños rumiantes: revisión de casos de diagnóstico. XVIII Congreso Internacional y XLII Congreso Nacional SEOC, Salamanca, Spain.

Polat E (2022). Descriptive study of congenital anomalies encountered in ruminants in Elazig region of Turkey. *FAVE Sección Ciencias Veterinarias*, 21 (1), 1-13.

Radjendran A, Roshini ST, Gurunathan N et al. (2023). Incidence of Congenital Abnormalities in Newborn Crossbred Calves. *Ind J Vet Sci and Biotech*, 19 (6), 69-74.

Sağlam K, Göl M, Önyay T et al. (2023). Congenital anomaly cases in calves. *Med Weter,* 79 (2), 77-82.

Samad MA (2021). Systematic review of congenital anomalies in calves and kids reported during the period from 1975 to 2021 in Bangladesh. *JVMOHR*, 3 (2), 129-153.

Sinowatz F (2010). Teratology. Hyttel P, Sinowatz F, Vejlsted M, Betteridge K (Eds). Essentials of Domestic Animal Embryology (pp. 339-382). Saunders Elsevier, America.

Sokal R, Tata LJ, Fleming KM (2014). Sex prevalence of major congenital anomalies in the United Kingdom: a national population-based study and international comparison meta-analysis. *Birth Defects Res A Clin Mol Teratol*, 100 (2), 79-91.

Sonfada ML, Sivachelvan MN, Haruna Y, Wiam I, Yahaya A (2010). Incidence of congenital malformations in ruminants in Northeastern Region of Nigeria. *Int J Anim Veter Adv,* 2 (1), 1-4.

Su J, Gao S, Yan R et al. (2023). Is the tradeoff between folic acid or/and multivitamin supplementation against birth defects in early pregnancy reconsidered? evidence based on a Chinese birth cohort study. *Nutrients*, 15 (2), 279.

Uzar T, Szczerbal I, Serwanska-Leja K et al. (2020). Congenital Malformations in a Holstein-Fresian Calf with a Unique Mosaic Karyotype: A Case Report. *Animals (Basel),* 10 (9), 1615.

Yurdakul İ (2019). Buzağılarda kongenital intestinal atresia olgularının klinik ve sağaltım yönünden değerlendirilmesi. *Van Vet J,* 30 (1), 31-36.