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Congenital anomaly cases in calves

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Summary

The purpose of this study was to investigate the prevalence of congenital anomalies in calves brought to the Ondokuz Mayıs University, Faculty of Veterinary Medicine animal hospital surgery clinic between 2010 and 2020. The study material consisted of 140 calves with anomalies of different races and genders.

Gender was examined for its effect on the formation of anomaly types and found to be a statistically insignificant factor ($P > 0.05$). Simmental calves had a statistically significant higher number of digestive system anomaly diagnoses than Holstein calves ($P < 0.01$). Simmental calves were found to have a 2.85 times higher risk of digestive system anomalies than Holstein calves. The predisposition of atresia ani according to race or gender was not statistically significant in digestive system anomalies, but males tended to be more disadvantaged in general. Similarly, it was determined that the gender and race predisposition for atresia coli anomaly was statistically significant ($P < 0.05$), and males were significantly more prone to this anomaly than females by 3.33 times ($P < 0.05$). When musculoskeletal anomalies were compared based on race, the distribution of susceptibility was found to be significant ($P < 0.01$). Simmental and Holstein breeds were shown to have a 5.84 times higher risk than other breeds in this anomaly category, with Simmental breeds having a 5.32 times higher risk than Holsteins in the Samsun region of Turkey.

As a result, it was concluded that breed selection is critical in cow breeding to limit the likelihood of congenital abnormalities.

Keywords: calves, abnormality, congenital

Congenital anomalies are structural and functional abnormalities that appear in animals after birth (2). These anomalies can occur in a single organ or system, as well as in multiple organs and systems at once (12). In recent years, it has been observed that the number, pace, and diversity of congenital defects has increased significantly in parallel with the development of livestock breeding (19). Congenital malformations account for 11.5% of surgical disorders in veterinary practice, and these anomalies are significant in terms of causing economic losses and genetically transmitting them to future generations (2). According to reports, about 0.5-1.0% of calves born with spontaneous congenital defects are subjected to abortion, with higher rates of calves (5, 7, 15, 17).

Although there is insufficient information on the causes of congenital malformations, non-hereditary and hereditary variables have been reported to be effective (18). Etiological factors of non-hereditary anomalies in animals include genetic causes, race, blood affinity, parental age, stress factors, nutritional disorders, vitamin deficiencies, incorrect breeder selection, teratogens (6, 14), endocrine disorders, exposure to extreme temperatures, radiation, drugs, chemicals, toxic plants and infectious diseases, adverse environmental conditions (17), the position of the pup in the mother's womb, carcinogenic substances, and the use of rectal palpation before the 42nd day or rectal ultrasound between 28-90 days for pregnancy diagnosis (5, 21). Mutant genes or chromosomal errors have been shown to be effective in the production of hereditary anomalies (5), and chromosomal changes often exhibit themselves as a spectrum of malformations rather than a single deformity (17).

It has been claimed that when the mother and the embryo are incompatible throughout the fetal development stage, improper organ and skeletal development of the offspring is more common (17). At the same time, arthrogryposis and Palatucci's syndrome are recessive genetic defects in Charolais, Angus, and Hereford cattle breeds (21, 23). In another study, it was found that Holstein-Friesian calves are more susceptible to atresia coli than other breeds (8).

Congenital malformations in natural breed offspring are usually the result of environmental, genetic, or combined factors (17). It has been reported that ap-

Fig. 1. Congenital bouleture in Simmental calf

Fig. 2. Congenital eventration in the Simmental calf

Fig. 3. Congenital hyperthyroidism in Brown Swiss calf

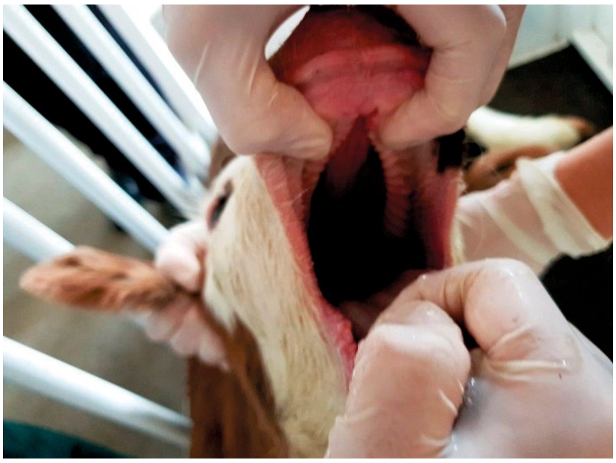

Fig. 4. Congenital cleft palate in the Simmental calf

proximately 0.5-1% of calves born have congenital anomalies and more than this rate is aborted before birth (5, 7, 15, 17).

The most common congenital malformations in calves are musculoskeletal, digestive, and central nervous system disorders, with urogenital, ophthalmic, and skin defects occurring less commonly (6, 18). Arthrogryposis, hydrocephalus, cyst dermoid, arqure, bouleture, hernia umbilicalis, cleft palate (palathochysis, cleft palate), atresia ani et recti (6), and atresia coli (21) are the most frequent congenital defects. It is reported that 26.6% of congenital abnormalities have skeletal and muscular system defects (1). These anomalies are known to be fatal, complicate the animal's life, or remain as an aesthetic flaw with little effect, depending on the critical importance of the organ in which they are shaped (10).

The incidence of congenital anomalies in calves and their susceptibility to race and gender are investigated in this study.

Material and methods

Between 2010 and 2020, 140 calves with congenital defects were presented to the surgical clinic of Ondokuz Mayis University, Faculty of Veterinary Medicine, with a variety of breeds and genders in the Samsun region of Turkey. There were 74 Simmentals, 28 Holsteins, 30 crossbreds, 3 Brown Swisses, 3 Jerseys, 1 Angus, and 1 Charolaise among the calves. There were 91 males, 48 females, and one hermaphrodite among the genders. Clinical examination revealed 75 digestive system, 79 musculoskeletal system, 5 nervous system, 5 urogenital system, two ocular, and one endocrine system anomaly in calves. In 22 of the calves, there were several anomalies.

The cases were divided into categories based on the type of anomaly, body systems, race, and gender, and their distribution percentage was calculated (Tab. 1). Those with a sufficient number of cases of these anomalies were evaluated statistically by calculating their relationship with race and gender, as well as the risks.

Statistical analysis. The data structure in the present study is in the category of discrete variable data. For this reason, robust methods have been preferred since analyzes and interpretations may be biologically meaningful and may contain observation values less than 5 in some cells. Accordingly, both the contrast structure was used in the PROC GENMOD procedure in the SAS (2009) package program, and the ODDS RATIO and 95% confidence intervals were calculated, and the comments were made accordingly. The data structure is summarized as the mean and ODSS RATIO and their 95% confidence limits. SAS (2009) statistical package program was used in all calculations and statistical analyzes in the study.

Results and discussion

Table 1 shows the number of diagnoses and percentage of congenital anomalies diagnosed clinically and radiologically, as well as their distribution by diseases, races, and gender and Figure 5 shows the total number and rates of diagnoses. In 22 (15.7%) of these calves, more than one congenital anomaly was discovered.

A total of 96 congenital anomaly diagnoses were made in Simmental calves (68.57%), with 69 (49.27%) males and 27 females (19.29%). Holstein calves were diagnosed in 29 cases (20.71%), 17 of them were male (12.14%) and 12 of them were females (8.57%). Thirty of the crossbreeds were diagnosed with anoma-

Tab. 1. Types of anomalies in calves and distribution of the systems in which they are seen according to race and gender

Anomaly	Races														Number of Calves			140	
	Simmental		Holstein		Crossbreed		Angus		Brown Swiss		Charolais		Jersey			Total			
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	H		%	M	F
Digestive system	25	15	9	7	8	7			1		1		1	1		75	53.6	45	30
%	17.9	10.7	6.4	5	5.7	5			0.7		0.7		0.7	0.7				32.1	21.4
Atresia ani	4	5	1	1	4	4			1		1					21	15	11	10
Atresia coli	20	6	8	5	4	1							1	1		46	32.9	33	13
Atresia recti		1														1	0.7		1
Rectovaginal fistula		3		1		2										6	4.3		6
Cleft palate	1															1	0.7	1	
Musculoskeletal system	41	11	8	5	11		1		1					1		79	56.4	62	17
%	29.3	7.9	5.7	3.6	7.9		0.7		0.7					0.7				44.3	12.1
Arqure	16	7	1	3	4		1							1		33	23.6	22	11
Bouleture	17		2	2	6				1							28	20	26	2
Tarsal deformity			1													1	0.7	1	
Tarsal laxity	3		1													4	2.9	4	
Athrogryposis		1														1	0.7		1
Eventration	1	2														3	2.1	1	2
Scoliosis	1		1													2	1.4	2	
Hemivertebra	1															1	0.7	1	
Kyphosis					1											1	0.7	1	
Angular deformity	2		2													4	2.9	4	
Caudal agenesis		1														1	0.7		1
Nervous system	2	1			2											5	3.6	4	1
%	1.4	0.7			1.4													2.9	0.7
Hydrocephalus	2				2											4	8	4	
Cerebellar necrosis		1														1	2		1
Urogenital system	1	1			1											5	3.6	2	1
%	0.7	0.7			0.7													1.4	0.7
Urachus fistula					1											1	0.7	1	
Orifice urethra atresia		1														1	0.7		1
Ureteral stenosis	1															1	0.7	1	
Hermaphrodism															1	1	0.7		
Ocular	1				1											2	1.4	2	
%	0.7				0.7													1.4	
Exophthalmia					1											1	0.7	1	
Amaurosis	1															1	0.7	1	
Endocrine system									1							1	0.7	1	
%									0.7									0.7	
Hyperthyroidism									1							1	0.7	1	

Explanations: M – male; F – female; H – hermaphrodite

lies (21.43%), of which 23 were males (16.43%) and 7 were females (5%).

A total of 75 congenital digestive system anomalies (53.6%) were identified. These anomalies were divided into 45 males (32.1%) and 30 females (21.4%). The disease weighted distribution was 21 atresia ani (15%) and 46 atresia coli (32.9%). The weighted distribution by race and gender was as follows: 40 Simmental (28.6%), 25 male (17.9%), 15 female (10.7%), and 16 Holstein (11.4%) 9 males (6.5%), 7 females (5%) and 15 crossbreeds (10.7%) 8 males (5.7%) and 7 females (5%).

A total of 79 congenital anomalies (56.4%) related to the musculoskeletal system were identified. There were 62 males (44.3%) and 17 females (12.1%). The disease weighted distribution is 33 arqure (23.6%) and 28 bouleture (20%). The distribution of these anomalies by race and gender is 52 Simmental (28.6%) 41 males (29.3%), 11 females (7.9%), 13 Holstein (5.7%) 8 males, 5 females (3.6%), 10 crossbreeds males (7.1%), 1 Angus male (0.7%), 1 Brown Swiss male (0.7%), and 1 jersey female (0.7%).

Five congenital nervous system anomalies were discovered (3.6%). These anomalies were distributed by race and gender as follows: 3 Simmental (2.1%), 2 males (1.4%), 1 female (0.7%), and 2 crossbreed males (1.4%). 5 urogenital system anomalies (3.6%) were identified, including 1 hermaphrodite (0.7), 2 Simmental males (1.4%), and 1 crossbreed female (0.7%). 2 ocular anomalies were identified (1.4%). There is 1 Simmental male (0.7) and 1 crossbreed male (0.7). A congenital anomaly of the endocrine system was discovered in one Brown Swiss male (0.7) calf.

Figure 5 shows that the calves presented to the clinic have anomalies primarily originating in the digestive and musculoskeletal systems. These two groups of anomalies were found to be statistically more significant than the other group of anomalies examined.

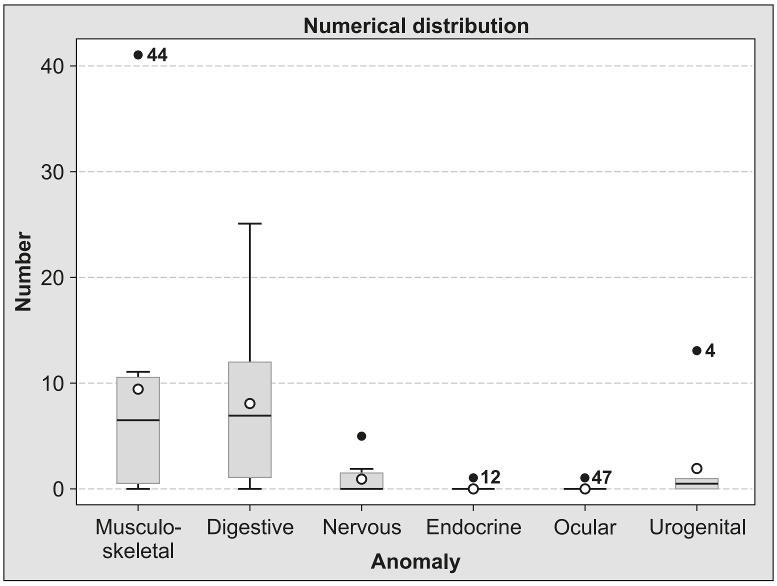

Fig. 5. Numerical distribution of anomalies by diseases

Comparisons were done for the disease group diagnosed with a significant number of abnormalities in Table 2. Because there were enough cases with digestive system and musculoskeletal system anomalies to compare, within-group evaluations for these two anomaly groups were performed. When the distribution of calves with digestive system anomalies was compared between Simmental and Holstein breeds, it is clear that Simmental breed calves are more susceptible to digestive system anomalies as there were more anomalies identified in this category ($P < 0.01$). When the odds ratios were analyzed, Simmental calves were found to have a 2.85 times higher risk of digestive system anomalies than Holstein calves. When musculoskeletal anomalies were compared according to races with a similar approach, the distribution of susceptibility according to races was found to be significant ($P < 0.01$). It has been determined that Simmental calves have a higher risk of musculoskeletal anomalies than other breeds. Accordingly, the breeds with the least risk were the cattle breeds examined under the other

Tab. 2. Analysis results and odds values regarding the orientation of some anomalies diagnosed in patients at tending the clinic according to body systems and races*

Anomaly	Races	Total	Odds Ratio*	95% Wald' Confidence Intervance	X^2 [P value]	X^2 [P value]
Digestive System	Simmental	40	2.85	1.5-5.4	40.73 [P = 0.0001]	3.24 [0.197]
	Holstein	16				
	Other	1	–	–		
Musculoskeletal System	Simmental	52	5.32	2.73-10.37	50.84 [0.0019]	
	Holstein	13				
	Other*	5	5.84	19.85-34.99		

Explanations:*Simmental or Holstein groups were combined under the same group, and the risks were calculated based on the group with other races. Because some diagnostic values in the X^2 analysis contained fewer than 5 diagnoses, the GENMOD procedure was used in the analyses to ensure that the executable tests produced robust results. As connection functions, Link = Log Land Dist = Poisson are used.

Tab. 3. Digestive system anomalies observed in the clinic, their dependence on gender and race

Digestive system anomaly	Races						Total	
	Simmental		Holstein		Other			
	M	F	M	F	M	F	M	F
Atresia ani	4	5	1	1	7	4	12	10
X^2 value	0.06		–	–	0.55		0.02	
P value	0.80		–	–	0.45		0.92	
Odds Ratio	1.17 (0.38-3.55)		–	–	1.45 (0.52-4.04)		1.0645 (0.5319-2.13)	
Atresia coli	20	6	8	5	5	0	33	11
X^2 value	5.43		0.49		–	–	6.55	
P value	0.019		0.48		–	–	0.010	
Odds Ratio	3.33 (0.96-11.48)		1.60 (0.42-5.95)		–		2.14 (1.19-3.85)	

group. It has been determined that Simmental and Holstein breeds have 5.84 times higher risk in terms of this anomaly group compared to the breeds in the other group, and the higher risk in Simmental breeds is 5.32 times higher than Holstein.

Table 3 shows whether the anomaly types are gender-related or not. As a result, despite the fact that female animals applied for treatment in greater numbers, gender was found to be an insignificant factor in their distribution based on anomalies ($P > 0.05$).

When Table 3 is analyzed, it can be stated that digestive system anomalies are generally related to gender, and in this regard, the predisposition according to race or gender in atresia ani digestive system anomalies is not significant, but it can be stated that males tend to be more disadvantaged in general. The Atresia coli anomaly was identified as an anomaly that developed significantly against males in the same evaluation. Gender and race predisposition were found to be statistically significant ($P < 0.05$). Simmental calves were determined to be the most disadvantaged breed in terms of this anomaly. The intragroup evaluation revealed that male Simmental calves had a 3.33 times more disadvantageous predisposition to this anomaly than female calves, and this predisposition was significant ($P < 0.05$). Although a similar comparison for other breeds was not possible due to a lack of data, it was determined that the predisposition did not differ by gender in Holstein calves ($P > 0.05$), but there was a slight predisposition against males.

It is known that the vast majority of fatalities of calves with congenital defects that die before or shortly after birth, or whose survival is poor, or whose feeding is deemed uneconomical, are not documented in statistical records. The majority of congenital defects recorded are cases brought to the clinic by breeders in the expectation of being treated.

The most common congenital malformations in calves are atresia coli (21), arqure, bouleture, hernia umblicalis, cleft palate (palathochysis, cleft palate), atresia ani et recti, arthrogryposis, hydrocephalus and cyst dermoid, with urogenital, ophthalmic, and cutaneous problems occurring less commonly (18).

Researchers observed that the occurrence of digestive systems abnormalities in calves with anomalies who come to the clinic in their location varies greatly. These rates were found by the following authors as follows: Özaydın et al. (20) 21.4%, Oğurtan et al. (19) 26.20%, Belge et al. (6) 60.92%, Aksoy et al. (1) 47.2%, Isler et al. (13) 16.52%, Atalan et al. (3) 5.3%, Doğan and Şindak (20) 31%, and Kaya et al. (6) 28%. It has also been stated that males are more prone to these anomalies than females (20). Similarly, Isler et al. (13) discovered a higher incidence of malformations in males 64.34%.

In our study, 53.6% of the congenital anomalies brought to the clinic were digestive system related. The gender distribution of these anomalies is 32.1% male and 21.4% female. The digestive system anomalies were most common in Simmental 28.6%, males 17.9%, and females 10.7%. Holstein 11.4% males 6.4% and females 5% and crossbred 10.7 males 5.7% and females 5% were encountered less frequently. Despite the fact that male calves applied for treatment in greater numbers than female calves, it was determined that gender was an insignificant factor in terms of their statistical distribution according to anomalies ($P > 0.05$). Simmental calves had more anomalies than Holstein calves in the digestive system in terms of breed ($P > 0.05$). Simmental calves were thought to be more susceptible to digestive system anomalies because their distribution was statistically significant ($P < 0.01$). When the odds ratios were examined, it was discovered that Simmental calves were 2.85 times more likely than Holstein calves to have digestive system anomalies. The study is consistent with data of Belge (6) and Aksoy (1), but not with Özaydın (20), Oğurtan (19) and İşler's (13) data.

According to studies, atresia ani is the most prevalent digestive system anomaly. Aksoy (1) found this rate to be 29.35% and Atalan (3) found it to be 33.3%, and they stated that the anomaly was genetic. Some researchers claim that this anomaly is more common in males than females (1, 6, 13), while others claim that it is equally prevalent (19). In men, Atalan et al. (3) reported a rate of 66.7%, and İşler et al. (20) reported a rate of 65.21%. The disparities in Atresia ani incidence were assumed to be attributed to regional growing density, care and feeding circumstances, inappropriate sperm use in the region, and an increase in breeders' treatment expectations. According to this study, the incidence of atresia ani was close to each other in Simmentals and crossbreeds, but higher than the races in the other group. The incidence of atresia ani was determined to be 15% in the study, and the predisposition according to race or gender was not statistically significant. Despite the fact that this is not statistically significant, it has been determined that males are more disadvantaged in general, which is consistent with the findings of other researchers (1, 6, 13).

The incidence of atresia coli in patients of intestinal atresia was reported by Atalan (3) as 3.7%, by Azizi (4) as 5.7%, and by Göksel and Sarıtaş (10) as 25.58%. Martens (16) reported a 76% rate of intestinal attrition in males while Göksel and Sarıtaş (10) reported a 63.63%, Atalan et al. (3) 66.7%, and Aslan et al. (2) 87%. In the race evaluation, Göksel and Sarıtas (10) reported 27.90% and Yurdakul (22) reported this rate as 15% in Simmentals. According to Constable (8), Holstein-Friesian cattle are more susceptible to atresia coli than other breeds.

The prevalence of atresia coli among calf anomalies was determined in this study as 32.9%. According to the study, the majority of Simmental 18.57% males 14.28% and females 4.28% were diagnosed with atresia coli, followed by Holstein (9.28%) males (6.42%)

and females (3.57%). Race and gender predisposition were found to be statistically significant ($P < 0.05$). Simmental calves were found to be the most vulnerable breed in terms of Atresia coli. The intragroup analysis revealed that Simmental males were 3.33 times more prone to this anomaly than females, and this predisposition was statistically significant ($P < 0.05$). Although a similar comparison could not be made for the other breeds due to a lack of data, it was determined that the predisposition did not differ by gender in Holstein calves ($P > 0.05$), but there was a slight predisposition against males. This study's rate of atresia coli detection is higher than that reported by Göksel and Sarıtaş (10), and other similar researchers. At the same time, the risk of atresia coli in simmental cattle was found to be higher than the risk of Holstein-Friesian cattle reported by Constable.

The prevalence of musculoskeletal anomalies in calves was reported by Özaydın et al. (20) as 64.7%, Oğurtan et al. (19) 43.7%, Belge et al. (6) 19.86%, Aksoy et al. 26%, and Isler et al. (6) 36.2%. This rate was determined in the study as 56.4%. The gender distribution of these anomalies is male 12.1% and female 44.3%. Han and Durmuş (11) calculated the arqure rate as 13.82% and bouleture rate 35.53% based on anomaly type and gender. These rates were discovered in the study as arqure 23.6% and bouleture 20% among the total anomalies. The male arqure rate was 15.71% and the female arqure rate was 7.86%; the male bouleture ratio was 18.57% and the female bouleture ratio was 1.4%. Based on the race and gender, the rate of arqure in Simmentals was 16.42%, in males 11.42%, females 5%, and in Holsteins 5.71% in males 2.86% and in females 2.86%. The rate of bouleture in males was determined to be 12.14% in Simmentals 12.14%.

When musculoskeletal anomalies were compared by race, it was discovered that the distribution of susceptibility by race was significant ($P < 0.01$). In terms of these anomalies, Simmental calves were found to be at a higher risk than other breeds. As a result, the cattle breeds examined under the other groups posed the least risk. It has been determined that Simmental and Holstein breeds have 5.84 times higher risk in terms of this anomaly group than the other breeds, with Simmental having 5.32 times more risk than Holstein.

The rates of encountering skeletal system anomalies differ significantly between studies. As emphasized by the researchers (1, 19, 20), the incidence rate of this group of anomalies in males at 44.3% is significantly higher than in females, 12.1%. The rates of arqure 23.6% and bouleture 20% stand out among these anomalies, particularly in Simmental males. Arqure is quite high in males and females while bouleture is high in males. This is consistent with the findings of other researchers (1, 11, 19, 20). It is believed that the density of breeds grown in the region, breeder expectations, the number and approach of private clinics in the region, and treatment options play a role in the emergence of different results depending on the region.

As a result, it is understood that the cultural breeds Simmental and Holstein have a higher risk of congenital anomalies than native breeds and crossbreeds in the Samsun region of Turkey. Breed selection has been found to be important in reducing the risk of congenital anomalies in cattle breeding.

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