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Clinical and epidemiological findings of cecal disorders in horses in the state of Paraíba

Achados clínicos e epidemiológicos dos distúrbios cecais em cavalos no estado da Paraíba

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ABSTRACT: This was a retrospective case study of colic syndrome of cecal origin in 159 horses treated at a reference Veterinary Center between June 2015 and July 2021. The data studied were breed, age, sex, clinical examinations of the initial emergency care, treatment protocols (clinical and/or surgical) and resolution (hospital discharge, euthanasia or death). It was observed that 7.55% (n = 12) of the cases corresponded to colic syndrome of cecal origin, where 75% (n = 9) had heart rate within the physiological range for the species, as well as 50% (n = 6) for capillary refill time values, 33.33% (n = 4) for pink mucosa, 41.67% (n = 5) for rectal temperature, and 16.67% (n = 2) on abdominal auscultation. In 58.34% (n = 7) of patients, pain could be controlled with analgesics, with recurrence in 41.67% (n = 5). All treated cases were cecal impaction, where 58.33% (n = 7) ruptured the cecum. In 75% (n = 9) of the cases, surgical treatment was performed. Regarding the general resolution of cases, 41.67% (n = 5) of the animals were discharged. Therefore, it is concluded that despite the increase in the diagnosis of colic of cecal origin, this disease is still rare (7.55%) and has a high potential for death since there are few clinical alterations, making its early diagnosis difficult.

KEYWORDS: acute abdomen, horses, cecal stasis, impaction, rupture.

RESUMO: Este foi um estudo retrospectivo dos casos de síndrome cólica de origem cecal em 159 cavalos atendidos em um Centro Veterinário de referência entre junho de 2015 e julho de 2021. Os dados estudados foram raça, idade, sexo, exames clínicos do atendimento inicial de emergência, protocolos de tratamento (clínico e/ou cirúrgica) e resolução (alta hospitalar, eutanásia ou óbito). Observou-se que 7,55% (n = 12) dos casos correspondiam à síndrome cólica de origem cecal, onde 75% (n = 9) apresentavam frequência cardíaca dentro da faixa fisiológica para a espécie, assim como 50% (n = 6) para valores de tempo de enchimento capilar, 33,33% (n = 4) para mucosa rosada, 41,67% (n = 5) para temperatura retal e 16,67% (n = 2) para ausculta abdominal. Em 58,34% (n = 7) dos pacientes, a dor pôde ser controlada com analgésicos, com recidiva em 41,67% (n = 5). Todos os casos tratados foram de impactação cecal, onde 58,33% (n = 7) romperam o ceco. Em 75% (n = 9) dos casos, o tratamento cirúrgico foi realizado. Em relação à resolução geral dos casos, 41,67% (n = 5) dos animais tiveram alta. Portanto, conclui-se que apesar do aumento do diagnóstico de cólica de origem cecal, esta enfermidade ainda é rara (7,55%) e apresenta um alto potencial de óbito visto que há poucas alterações clínicas dificultando seu diagnóstico precoce.

PALAVRAS-CHAVE: abdomen agudo, cavalos, estase cecal, impactação, ruptura.

INTRODUCTION

According to THOMASSIAN (2005), the term syndrome describes a set of signs that define a disease, while the term colic is a clinical condition mainly characterized by abdominal discomfort of gastrointestinal origin or by other systemic pathological changes that result in the onset of this symptom. Colic syndrome is a major cause of death in horses.

Although the clinical manifestations of colic are similar, the etiology, pathophysiology and prognosis differ drastically, and it is up to the clinician to distinguish cases with easy clinical resolution from those that require greater caution due to critical gastrointestinal lesions and which can progress to death. Thus, identifying the type of colic the patient has is essential for its resolution, whether clinical or surgical (DI FILIPPO et al., 2010).

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Among the types of acute abdomen, cecum colic comprises only 2% referrals (RAKESTRAW; HARDY, 2006). Impactions, torsions, intussusception, tympanism and ruptures are the affections presented by this organ. The cecal pathological condition most commonly observed in clinical routine are cecal impactions, which cover 5% intestinal impactions and 40-55% cecal diseases, where in up to 43% of cases there is death or euthanasia of animals due to perforations or ruptures (DABAREINER; WHITE, 1997; THOMASSIAN, 2005; WORMSTRAND et al. 2014).

Cecal impactions can be classified as primary and secondary according to the consistency of the cecal content and its motility (DABAREINER; WHITE, 1997; ALVAREZ et al., 2020). Primary impaction is characterized by ingesta dehydration and occurs gradually, while secondary impaction, also called cecal stasis or emptying defect, results from several factors, mainly external, that interfere with physiological functioning of the cecum (ALVEZ, 2007; SHERLOCK, 2019; ALVAREZ et al., 2020).

Due to its silent character, cecal disorders cause a high mortality rate, in addition to a possible underreporting due to the difficulty of diagnosis, requiring studies that describe their occurrence, clinical signs and treatments performed for this condition, enabling the reversal or decrease in the percentage of fatal cases. Thus, the objective was to carry out a retrospective case study of colic syndrome of cecal origin in horses treated at a reference Veterinary Center.

MATERIAL AND METHODS

In addition to analyzing the records corresponding to the care provided to patients diagnosed with cecal disorders, a survey of total visits for treating colic syndrome was carried out to quantify the cecal colic episodes.

An observational and analytical study was carried out by collecting data from 159 horses with a history of acute abdomen treated between June 2015 and July 2021 at a reference veterinary center in the state of Paraíba, a region that has large stud farms dedicated almost exclusively to the sport of vaquejada. Animal management consisted mainly of offering Tifton hay and water *ad libitum*, concentrate for athletic horses offered three times a day, semi-intensive breeding system most of the time, in addition to training on the track at least three times a week. The animals treated came from stud farms in the metropolitan region of Campina Grande, known as the birthplace of the quarter horse in the region.

The treated cases usually did not exceed the first 12 hours of symptoms until they were taken to specialized veterinary care, as they are animals of high zootechnical value and the veterinary center has 24-hour care. All horses underwent nasogastric lavage, parenteral fluid therapy, paracentesis and analysis of peritoneal fluid and lactate, rectal palpation, laboratory tests, abdominal ultrasound and clinical treatment with the use of prokinetics. Those who did not respond to clinical treatment or who had predisposing factors for surgical intervention underwent exploratory laparotomy.

The attendance records were selected and evaluated in order to quantify the cases of colic syndrome of cecal origin, in addition to data of breed, sex, age, clinical examinations, treatment protocols (clinical and/or surgical) and resolution (discharge, euthanasia or death). After collection, data were distributed in a spreadsheet in the Excel® 2016 program belonging to the Microsoft® Office package and analyzed for absolute and relative frequency.

RESULTS AND DISCUSSIONS

Table 1 lists the data from the quantitative analysis of the colic syndrome case series attended between June 2015 and July 2021, in which 7.55% (n = 12) corresponds to colic syndrome of cecal origin, diverging from the 2% presented in the literature (RAKESTRAW; HARDY, 2006). As in the present study, other authors obtained higher values, as listed in table 1.

Over the years, extensivism has declined, opening up semi- or intensive horse rearing. Thus, horses in stalls are more prone to colic when compared to animals reared on pasture. The supply of concentrates to maintain the animal weight and musculature ends up influencing the appearance of gastrointestinal tract disorders.

SILVA (2015) observed that the number of visits for treating colic, in almost ten years, increased sixfold, which demonstrates that the increase in visits for treating colic and the appearance of colic of cecal origin may have occurred due to the diagnosis of this disorder, since cecum colic is difficult to identify, which often only occurs when the animal undergoes surgical intervention.

Table 2 provides the descriptive analysis of data obtained in the evaluation of clinical care forms, where each number corresponds to the clinical care of a horse.

For a better understanding of the data, table 3 was broken down into the four subsequent tables, bringing the focus to the data referring to the animals, the physical exams, the evolution of pain and the outcome of the cases.

Table 3 describes the breed, age and sex of horses treated with colic syndrome of cecal origin. The results demonstrate

Table 1. Cases of cecal colic syndrome in a reference Veterinary Center between 2015 and 2021 compared to cases of cecal colic syndrome in other Brazilian hospitals.

Veterinary Center			
	Cecal colic	***n*[1]**	**%**
Cases of Colic Syndrome	12	159	7.55
Other Brazilian hospitals			
Pessoa et al. (2012)	2	70	2.86
Correia (2017)	2	36	5.56
Jesus (2018)	6	150	3.99

[1] Total number of animals with colic syndrome.

Table 2. Identification and parameters of horses treated and diagnosed with colic syndrome of cecal origin between 2015 and 2021.

	Animals											
	1	2	3	4	5	6	7	8	9	10	11	12
Sex	M	M	M	M	M	M	M	F	F	M	F	M
Age[1]	9	8	6	3,8	6	Uni	12	12	7	Uni	1.5	8
Breed	QH	QH	QH	QH	QH	QH	QH	QH	QH	QH	QH	QH
Weight[2]	455	440	450	440	Unm	Unm	461	470	461	436	240	260
Physical exam												
Hr[3]	50	40	40	40	40	64	35	58	31	40	40	39
Crt[4]	2	2	2	4	2	Unm	3	Unm	2	3	Unm	2
Mucosas	P	Co	Pi	Co	Pi	Unm	Co	Unm	Pi	Co	Unm	Pi
Abdm ausc[5]	Hy	Hy	NC	Hy	Unm	Unm	Hy	At	At	At	Hy	Nc
Rt[6]	38.4	37.5	37.6	38.6	37.9	Unm	37.6	Unm	36.9	37.1	Unm	37.2
Typhlocent[7]	Un	N	N	Un	Un	Un	N	Un	Un	Un	Un	Un
Evolution of pain												
Pain	Uni	Ct	Unc	Ct	Ct	Uni	Ct	Ct	Ct	Uni	Uni	Ct
Frequency	Uni	I	Cn	G	G	Uni	Uni	I	I	I	Uni	I
Intensity	Uni	We	Md	We	Md	Uni	Md	We	We	Uni	Uni	We
Analg Rel[8]	Uni	Y	Uni	Y	Y	Uni	Y	Uni	Y	Uni	Uni	Uni
Outcome												
Diagnosis	Ru	Cp	Cp	Cp	Cp	Ru	Ru	Cp	Ru	Ru	Ru	Ru
Treatment	S	S	Cl	S	Cl	S	S	S	S	-	S	S
Internment[9]	-	15	14	26	-	-	-	17	41	-	-	-
Resolution	D	DC	DC	DC	DC	E	E	DC	E	E	E	E

[1]in years, [2]in kg, [3]heart rate, [4]Capillary refill time, [5]Abdominal Auscultation, [6]Rectal temperature in degrees Celsius, [7]Typhlocentesis, [8]Analgesic Relapse, [9]in days. M = male, F = female, Uni = unidentified, QH = quarter horse, Unm = unmeasured, P = pale, Co = congested, Pi = pink, Hy = hypomotility, NC = no change, At = atony, Un = unnecessary, N = necessary, Ct = controllable with analgesic drugs, Unc = uncontrollable with analgesic drugs, I = intermittent, Cn = continuous, G = gradual, We = weak, Md = moderate, Y = yes, Ru = rupture, Cp = compaction, S = surgical, Cl = clinical, D = death, DC = discharge, E = euthanasia.

Table 3. Breed, age and sex of horses diagnosed with cecal colic between 2015 and 2021.

Breed	*n*[2]	%	Age[1]	*n*	%	Sex	*n*	%
			>4	2	16.67			
Quarter horse	12	100	5-8	5	41.67	Female	3	25
			9-12	3	25.00	Male	9	75
			Ni	2	16.67			

[1] In years, [2] Number of animals.

that 100% of the animals were quarter horse breed (n = 12). This is probably because the state of Paraíba is the Cradle of the Horse in the region, with numerous horse breeding farms, in addition to Vaquejada competitions, the main sport and activity of the Northeastern culture.

A higher prevalence of cecal colic was observed in horses from five to eight years of age (41.67%; n = 5) (tab. 3). Taking into account the values in table 2, 66.67% (n = 8) of the horses affected with cecal colic were younger than ten years old, which is probably because this period includes major changes in the life of the animal, such as entry into adulthood, taming, onset of reproductive and sporting life, adjustment in diet and consequently the stress arising from these factors, causing horses to be aged between two and ten years, according to TINKER et al. (1997), are 2.8 times more likely to develop colic. Similar values were described by COHEN (1997), MEHDI; MOHAMMAD (2006) and DI FILIPPO et al. (2010).

Although some studies, such as those mentioned above, do not confirm the relationship of sex with colic, 75% (n =

9) of the horses diagnosed with cecal colic were male. Even though there is no scientific evidence to justify the greater involvement of cecal colic, it is known that males are more used for work and sports than females and, consequently, are subjected to predisposing factors for colic to a greater degree.

Table 4 lists the values for the physical examination of the animals during emergency care. For HR values, 75% (n = 9) horses had physiological values which, according to DUKES; REECE (2006), are between 28 and 40 bpm (tab. 2). As an indicator of pain perception in animals, the higher the HR, the higher the pain threshold and, consequently, the greater the severity of the condition and the lower the survival rate (KELLER, 2015). Although they were within the normal range, 50% (n = 6) of the horses had HR at the upper limit of physiological values (tab. 2). According to RAKESTRAW; HARDY (2006), HR is usually within the normal range of the species or slightly elevated, as observed in the present study.

It was observed that 50% of the treated animals had a 2-second CRT (n = 6), although 8.33% (n = 1) of the horses showed paleness and 33.33% (n = 4) mucosal congestion indicating endotoxemic shock and dehydration (tab. 4). According to THOMASSIAN (2005), the animal may have a 2-second CRT, indicating that the condition is not very serious and the cardiovascular status is under control. With worsening, there is an increase in CRT. Also according to the same author, there is no pattern of coloration of the mucosa to be defined, since in the initial phase of any process, the mucosa is pale and then, depending on the severity of the condition, it evolves to congestion, demonstrating an intense red color.

Regarding abdominal auscultation, table 4 shows that 66.67% (n = 8) of the horses showed alterations, where 25% (n = 3) had atony and 41.67% (n = 4) hypomotility. According to DESROCHERS; WHITE II (2017), in most cases of colic, bowel sounds are reduced and, depending on the severity, are absent, due to the sympathetic response to pain and the inflammatory response affecting the entire intestine of the horse. In these cases, intestinal motility is an extremely important parameter as its decrease or absence increases the probability of an exploratory laparotomy (KELLER, 2015).

For rectal temperature values (tab. 4), 41.67% (n = 5) of the horses were within the reference range, which according to FEITOSA (2014) is between 37.5 and 38.5°C. Generally, an increase in rectal temperature in horses with colic is not observed, except when there are inflammatory and/or infectious conditions. Thus, the only type of colic commonly associated with hyperthermia is proximal duodenum-jejunitis (DJP) (FERNANDES et al., 2003). However, the increase in temperature may be indicative of circulatory shock, which has two phases: hyperdynamic (hyperthermia) and hypodynamic (hypothermia). The hyperdynamic form is the first to develop and is characterized by mucosal congestion and hyperthermia, while the hypodynamic form manifests pale mucosa, tachycardia and hypothermia. In both cases, there is an increase in CRT (MELO et al., 2010). In table 2, animal 1 can be cited as an example of circulatory shock in the initial hypodynamic phase, where the temperature is still within the normal physiological range, as well as the CRT. In contrast, animal 4 is in the hyperdynamic phase.

Table 5 shows pain evolution values in horses in the present study. In 58.34% (n = 7), pain could be controlled with analgesics, such as dipyrone (25 mg/kg/IV). For RAKESTRAW; HARDY (2006), horses with cecal impaction usually show

Table 4. Physical examination of horses diagnosed with cecal colic between 2015 and 2021.

HR	*n*	%	CRT	*n*	%	Mucosa	*n*	%	Abdm	*n*	%	RT	*n*	%
28-40*	9	75.00	2*	6	50.00	P	1	8.33	A	3	25.00	<37.4	3	25.00
41-59	2	16.67	3	2	1.67	Pi*	4	33.33	Hy	5	41.67	37.5-38.5*	5	41.67
>60	1	8,33	4	1	8.33	C	4	33.33	He	0	0.00	38.6-39.0	1	8.33
			Unm	3	25.00	Unm	3	25.00	NC	2	16.67	Unm	3	25.00
									Unm	2	16.67			

HR = heart rate in beats per minute (bpm), CRT = Capillary refill time in seconds, Abdm = Abdominal Auscultation, RT = Rectal temperature in degrees Celsius (°C), *n* = Number of animals, Unm = unmeasured, P = pale, Pi = pink, C = congested, A = atony, Hy = hypomotility, He = hypermotility, NC= no change. *Physiological values for the physical exams of horses.

Table 5. Evolution of pain in horses diagnosed with cecal colic.

Pain	*n*[4]	%	Frequency[1]	*n*	%	Intensity[2]	*n*	%	Relapse[3]	*n*	%
Controllable[5]	7	58.34	Intermittent	5	41.67	Weak	5	41.67	Yes	5	41.67
Uncontrollable[6]	1	8.33	Gradual	2	16.67	Moderate	3	25.00	Unidentified	7	58.33
Unidentified	4	33.33	Continuous	1	8.33	Severe	0	0.00			
			Unidentified	4	33.33	Unidentified	4	33.33			

[1,2] of pain, [3] After the use of analgesic drugs, [4] Numbers of animals, [5,6] With the use of analgesic drugs.

mild signs of pain, with intermittent periods, as demonstrated by the values of frequency and intensity of pain, where both present 41.67% horses. There was analgesic recurrence in 41.67% (n = 5) patients, but the reported recurrence only occurred after the period of action of the applied drug.

All horses (n = 12) were treated for cecal impaction, where 58.33% (n = 7) presented rupture (Table 6). DABAREINER; WHITE (1997) stated that the mortality rate (43%) of horses with cecal impaction is predominantly caused by rupture. The authors also reported a study where 57% horses with cecal impaction ruptured the cecum and, thus, advocate surgical treatment as an initial intervention.

As the clinical signs of cecal conditions are usually subtle, in these cases, the animal usually looks to the flank, digs and has a loss of appetite, causing the owner to seek assistance. Therefore, there is the possibility of recognizing symptoms of colic when cecal rupture is imminent, as observed in the care of animals 1 and 10 (Table 2) that arrived at the reference veterinary center with the cecum already broken, being identified during emergency care.

In 75% (n = 9) cases, surgical treatment was performed (tab. 6). The choice of treatment was determined by the pain manifested by the patients and the negative response to clinical treatment. The surgical technique used was exploratory laparotomy, where the anesthetic protocol consisted of xylazine (1mg/kg/IV) or detomidine (20 – 40 µg/kg/IV) as pre-anesthetic medication, esketamine (2.2 mg/kg/ IV) and diazepam (0.05 – 0.1 mg/kg/IV) as anesthetic induction and maintenance with isoflurane (1 – 3%/animal). The same protocol was indicated by NETO; GAROFALO; CARREGARO (2019) as a protocol for pre-anesthetic medication, anesthetic induction and maintenance in horses with colic syndrome and was used by SALOMÃO; ABREU (2021) as an anesthetic protocol for acute abdomen.

In the trans-surgical period, ozonized saline solution was used in the abdominal cavity. In the trans-surgical period, ozonated saline solution was used in the abdominal cavity. According to LEANDRO et al. (2017), antibiotic therapy associated with ozonated saline solution is an effective alternative in the prevention of peritonitis.

In the postoperative period, liver protector (Antitoxic®, UCBVET – 1 mL/20kg/IV), nutritional supplement (Roboforte®, Ceva – 20 mL/animal/IV) and ascorbic acid (Marcovit C®, Marcolab – 20 mL/animal/IV) were administered, diluted each in 1 liter of ringer's lactate solution; prophylactic antibiotic therapy with sodium ceftiofur (4.4 mg/kg/IV) associated with amikacin (15 mg/kg/IV) or associated with gentamicin (6.6 mg/kg/IV) and penicillin (30,000 IU/kg/IM); non-steroidal anti-inflammatory drugs, such as dimethylsulfoxide (DMSO) (10%/IV), flunixin meglumine (1.1 mg/kg/IV), also comprising the antiendotoxemic dose, and dipyrone (25 mg/kg/IV) in case of fever, as well as parenteral fluid therapy and a single dose of anti-tetanus serum.

The association of penicillin with an aminoglycoside, such as gentamicin and amikacin, is a good choice as a broad-spectrum antibiotic therapy, especially in the prophylaxis of peritonitis (BOHANON, 2005; GREET, 2008; PEREIRA, 2016). GONÇALVES (2022) used a similar protocol, associating gentamicin with ceftiofur as antibiotic therapy in an exploratory laparotomy.

Prokinetics such as neostigmine (0.022 – 0.044 mg/kg/IV) and calcium (50 – 500 ml/animal/IV) with glucose (10%) and potassium (10%) diluted in ringer's lactate solution (1 liter) were also used to stimulate intestinal motility where necessary. Neostigmine is an indirect-acting cholinesterase prokinetic used to inhibit cecal compaction. According to WONG; DAVIS; BRANCO (2011), neostigmine is not a prokinetic generally used in cases of colic because it delays gastric emptying and reduces the motility of the final portion of the small intestine, but in cecal disorders, it can cause a progressive increase in its motility. Calcium, on the other hand, is usually the first approach to peristaltic stimulation that can be performed, being administered concomitantly with volume restoration and decompression of the stomach and/or cecum (THOMASSIAN, 2000).

All animals undergoing surgical intervention received compressive bandaging, the surgical wound was cleaned once a day with 4% chlorhexidine and rifamycin spray, and the stitches were alternately removed within 15 days after surgery.

Clinical treatment was performed in 16.67% of the animals (tab. 6; n = 2), using mainly parenteral fluid therapy, prokinetics and walking. All animals undergoing only clinical treatment were discharged, while 22.22% patients who required surgical intervention were discharged (tab. 3).

Regarding the values related to the resolution of cases, 41.67% (n = 5) animals were discharged (tab. 6). In cases of

Table 6. Outcome of cecal colic cases.

Diagnosis			Treatment			Resolution		
	n[1]	%		*n*	%		*n*	%
Compaction	5	41.67	Clinical	2	16.67	Discharge	5	40.00
Rupture	7	58.33	Surgical	9	75.00	Death	1	10.00
			Euthanasia[2]	1	8.33	Euthanasia	6	50.00

[1]Number of animals; [2]Rupture identified in the assessment of the peritoneal fluid.

rupture (n = 7), one was euthanized at the end of the emergency examination when the rupture was found (tab. 2 – animal 10), four were euthanized on the operating table after accessing the abdominal cavity and identifying the cecal rupture (tab. 2 – animals 6, 7, 11 and 12) and one was euthanized after 41 days of hospitalization with peritonitis and surgical intervention due to cecal recompaction and subsequent rupture (tab. 2 – animal 9), totaling six of the animals were euthanized (50%). The only case of death (n = 1) (tab. 2 – animal 1) occurred in the operating room during anesthetic induction, and the rupture was identified at necropsy.

It was observed that 71.43% (n = 5) of the ruptured animals (Table 2) had cecal stasis (secondary cecal impaction) due to previous surgical interventions (unilateral orchiectomy, tooth extraction, exploratory laparotomy due to a cecal colic, one herniorrhaphy and one accessory metacarpal osteotomy – animals 6, 7, 9, 11 and 12, respectively). This is due to changes in cecal motility promoted by anti-inflammatory drugs, exercise restriction and reduced food and water intake as a result of the postoperative period. In these cases, according to ROSS (1989), ruptures are commonly masked by the administration of these drugs.

According to BLIKSLAGER (2005), cecal stasis occurs in painful postoperative periods, especially after orthopedic surgeries. However, after gastrointestinal system surgeries, horses may present with postoperative considerable pain and require analgesia and constant monitoring of motility, as any change may indicate the onset of cecal dysfunction (COLLATOS; ROMANO, 1993; ALVES, 2007). According to ALVES (2007), stasis can occur, remain or recur even after surgical treatment, as observed in animal 9 (tab. 2), especially if the cecum is atonic, edematous, with thickening of the wall, color alterations and hemorrhagic regions.

With this, SHERLOCK (2019) states that the high risk of spontaneous cecal rupture emphasizes the importance of frequent clinical monitoring of newly operated horses and those in which impaction in the cecum is observed and that undergo clinical treatment, in addition to rapid surgical intervention, if necessary. Furthermore, their difficulty in identifying and, consequently, underreporting, delay medical conduct, reducing the chances of resolution.

CONCLUSIONS

Therefore, it is concluded that despite the increase in the diagnosis of colic of cecal origin, this disease is still rare (7.55%) and has a high potential for death since there are few clinical alterations, making its early diagnosis difficult.

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