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Epidemiology and risk factors of seizures in dogs: Insights into breed, age, gender and management practices

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Abstract
Seizures are a common neurological emergency in dogs, arising from diverse etiologies including idiopathic, structural, metabolic, infectious and toxic causes. This study evaluated 126 dogs with seizures to investigate breed predisposition, age of onset, gender, neutering status, preventive care, source of adoption and dietary factors. Non-descript dogs (20.6%) were most frequently affected, followed by Golden Retrievers (12.7%) and Labrador Retrievers (11.1%). Seizures were most commonly observed between 6 months and 6 years of age (57.9%), predominantly idiopathic/structural in origin, while organ dysfunction and infectious causes were more common in geriatric and juvenile dogs, respectively. A higher proportion of affected dogs were male (60.3%) and intact (64.3%). Preventive care was suboptimal, with irregular or absent vaccination and deworming noted in a majority of dogs. Dogs acquired from breeders/kennels (34.1%) exhibited higher seizure incidence, likely reflecting genetic predispositions and dietary patterns indicated increased risk in dogs fed non-vegetarian diets (46.0%). These findings underscore the multifactorial nature of seizures in dogs, highlighting the influence of breed, age, sex, preventive care, adoption source and diet.

Keywords: Seizures, dogs, breed predisposition, age of onset, preventive care, diet, epidemiology

1. Introduction
Seizures are among the most frequently encountered neurological disorders in dogs and represent a major cause of morbidity in veterinary practice. The term “seizure” originates from the Greek word *epilambanein*, meaning “to grasp suddenly,” highlighting the abrupt onset of these events.

Epidemiological factors such as breed, age, sex, neutering status, preventive care, diet and adoption source can influence seizure incidence. Certain breeds, including Labradors, Golden Retrievers and non-descript dogs, are predisposed due to genetic or hereditary factors (Adler and de la Pena Moctezuma, 2010; Amude *et al.*, 2007) [1, 2]. Seizure etiology also varies with age: puppies are more prone to infectious or metabolic causes, adults typically exhibit idiopathic or structural epilepsy and geriatric dogs often show organ dysfunction-related seizures (Salgado and Cortes, 2013; Kaneko *et al.*, 2008) [3, 4].

Male dogs and intact individuals may have higher seizure incidence due to hormonal influences and behavioral factors, including increased exposure to trauma or environmental stressors (Dewey, 2015; Podell *et al*., 2013) [5, 6]. Inadequate preventive care and nutritional imbalances further exacerbate the risk of seizures triggered by systemic disorders (Gilor *et al*., 2014; Vandevelde *et al*., 2012) [7, 8].

Understanding these breed-specific and demographic associations is crucial for early identification, preventive strategies and effective management of seizures in dogs. The present study investigates the epidemiological and clinico-demographic profile of seizures in 126 dogs, focusing on breed distribution, age, sex, neutering status, preventive care, adoption source and dietary patterns.

2. Materials and Methods

Over a six-month period, 126 dogs presenting with seizures to the Outpatient Department of Veterinary Medicine, Veterinary College, Hebbal, Bengaluru were included. Dogs showing clinical signs of seizures such as restlessness, disorientation, paddling, limb rigidity, pupillary dilation, chewing or jerking movements were selected. While those with chronic debilitating diseases or presented for routine checkups, vaccination or deworming were excluded. Owner provided history included age, breed, sex, age of seizure onset, duration, frequency, diet, preventive care, trauma, poisoning and reproductive status. Clinical evaluation assessed vital signs, lymph nodes, body condition, hydration, pupillary reflex, ataxia, muscle twitching, frothing and other neurological signs. Laboratory tests including hematology, serum biochemistry, urinalysis and imaging when indicated were performed to classify seizures as idiopathic/structural or reactive. Data on breed, age, sex, neutering status, preventive care, source of adoption and diet were analyzed descriptively and associations were assessed using chi-square or fisher's exact tests (p<0.05).

3. Results and Discussion

3.1 Breed Distribution

A total of 126 dogs with seizures were evaluated representing diverse breeds (Table 1, Figure 1). Non-descript (ND) dogs accounted for the largest proportion (20.6%), followed by Golden Retrievers (12.7%) and Labrador Retrievers (11.1%). Shih Tzus (10.3%) and Siberian Huskies (9.5%) were also relatively frequent, while breeds such as Dalmatian, Spitz, Saint Bernard and Mudhol were rare as shown in Table 1 and Figure 1. These findings are consistent with previous reports indicating higher seizure incidence in Labradors, Golden Retrievers and mixed-breed dogs (Berendt and Gram, 1999; Jaggy and Steffen, 1990; Packer *et al*., 2010) [9-11]. The predominance of these breeds likely reflects their greater representation in the general population rather than a true breed predisposition.

Table 1: Distribution of canine seizures in relation to breed

S. No.	Breed	Number of Dogs (N=126)	Percentage of dogs affected (%)
1.	ND	26	20.63
2.	Golden retriever	16	12.70
3.	Labrador retriever	14	11.11
4.	Shih tzu	13	10.32
5.	Siberian Husky	12	9.52
6.	Pomeranian	9	7.14
7.	Pug	7	5.56
8.	Rottweiler	5	3.97
9.	German Sheperd	3	2.38
10.	Cocker spaniel	3	2.38
11.	Great Dane	3	2.38
12.	Beagle	2	1.59
13.	French Bull dog	2	1.59
14.	Dachshund	2	1.59
15.	Chihuahua	2	1.59
16.	Dalmatian	1	0.79
17.	Spitz	1	0.79
18.	Saint Bernard	1	0.79
19.	Poodle	1	0.79
20.	Belgian Maltese	1	0.79
21.	Mudhol	1	0.79
22.	Lhah Spaso	1	0.79

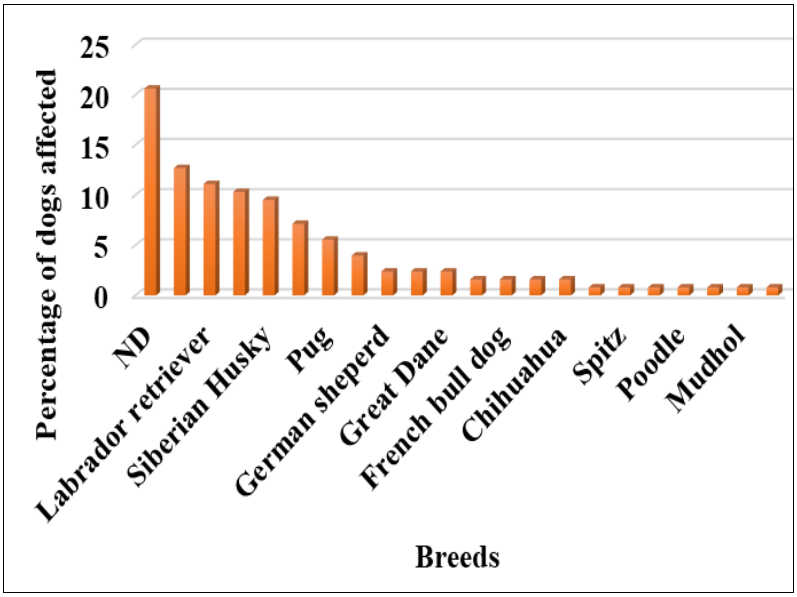

Fig 1: Distribution of canine seizures in relation to breed

3.2 Age of Onset and Seizure Etiology

Seizure onset varied significantly across age groups (p<0.05) (Table 2, Figure 2). Puppies (< 6 months) primarily exhibited seizures due to infectious diseases (30%) and idiopathic/ structural causes (40%), adults (6 months-6 years) were dominated by idiopathic/structural seizures (65.8%) and geriatric dogs (> 6 years) mostly showed idiopathic/structural (51.9%) and organ dysfunction-related seizures (33.3%) as shown in Table 2 and Figure 2.

Overall seizures most frequently began between 6 months and 6 years (57.9%), followed by dogs over 6 years (27.0%) and under 6 months (15.1%). These patterns are consistent with previous studies highlighting idiopathic epilepsy as the predominant cause in young to middle-aged dogs, while infectious causes in puppies reflect immature immunity or incomplete vaccination and organ dysfunction in older dogs is linked to age-related renal, hepatic or cardiac decline (Salgado and Cortes, 2013; Jaggy and Steffen, 1990; Kaneko *et al*., 2008) [3, 10, 4].

Table 2: Distribution of Canine Seizures in Relation to age of onset of symptoms

S. No.	Age of onset of seizures	G1 (Organ dysfunction)	G2 (Infectious diseases)	G3 (Metabolic disturbance)	G4 (Toxicity)	Dogs with seizures due to idiopathic and structural seizures	P-Value
1.	Below 6 months (N=20)	1 (5.00 %) [a]	6 (30.00 %) [b]	3 (15.00 %) [ab]	2 (50.00 %) [ab]	8 (40.00 %) [c]	0.007
2.	Between 6 months-6 years (N=79)	8 (10.12 %) [a]	12 (15.18 %) [a]	5 (6.32 %) [ac]	2 (2.53 %) [c]	52 (65.8 %) [d]	< 0.001
3.	Above 6 years (N=27)	9 (33.33 %) [a]	3 (11.11 %) [b]	1 (3.70 %) [bc]	0 (00.00 %) [c]	14 (51.85 %) [d]	< 0.001

Note: Values within a row with different superscript letters (a, b, c, d) differ significantly (Fisher's Exact Test, $p<0.05$). Superscripts indicate pairwise comparisons among seizure etiologies within each age group.

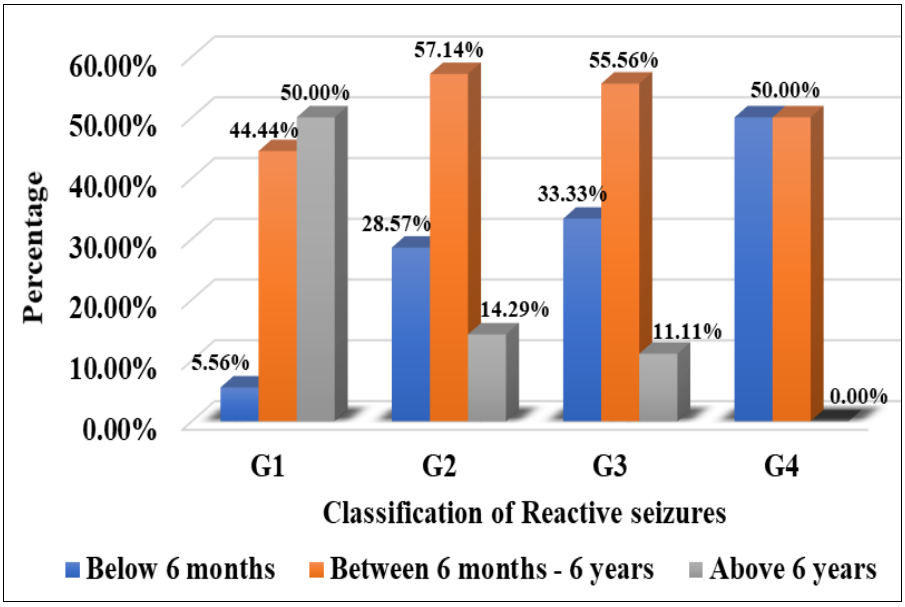

Fig 2: Distribution of reactive seizures in relation to age of onset of symptoms

3.3 Gender and Neutering Status

Of the 126 dogs with seizures, 60.3% were males and 39.7% were females, reflecting a male predominance which was also reported in several studies (Dewey, 2015; Packer *et al*., 2010; Berendt and Gram, 1999; Berendt *et al*., 2007; Smith *et al*., 2002) [5, 11-15]. This higher incidence in males may reflect a larger male population, owner preference, increased outdoor exposure, hormonal influences and neutering practices as shown in Table 3, 4.

Regarding neutering status, 64.3% of dogs with seizures were intact and 35.7% were neutered. Hormonal effects on neuronal excitability and behavioral factors such as roaming or aggression likely contribute to increased seizure risk in intact dogs (Shihab *et al*., 2008; Patterson *et al*., 2006; Farias *et al*., 2011) [16-18].

Table 3: Distribution of canine seizures in relation to gender

S. No.	Gender	Number of Dogs (N=126)	Percentage of dogs affected (%)
1.	Male	76	60.32
2.	Female	50	39.68

Table 4: Distribution of canine seizures in relation to neutering status

	Neutering Status	Number of Dogs (N=126)	Percentage of dogs affected (%)
1.	Intact	81	64.29
2.	Neutered	45	35.71

3.4 Preventive care and seizure occurrence

Preventive care was suboptimal among seizure-affected dogs. Only 19.8% were regularly dewormed, while 52.4% had irregular deworming and 27.8% had never been dewormed. Vaccination was regular in 38.2%, irregular in 35.0% and never administered in 26.8% as shown in Table 5, 6. Poor preventive care may predispose dogs to parasitic infestations and neurotropic infections such as Canine Distemper and Leptospirosis (Thompson *et al*., 2014; Murillo *et al*., 2020) [7, 19]. Limited owner awareness, financial constraints and regional differences in veterinary care likely contribute to these trends.

Table 5: Deworming status in dogs diagnosed with seizures

S. No.	Deworming status	Number of animals	Percentage of dogs affected (%)
1.	Regular	25	19.84
2.	Irregular	66	52.38
3.	Never Done	35	27.78

Table 6: Vaccination status in dogs diagnosed with seizures

S. No.	Vaccination status	Number of animals	Percentage of dogs affected (%)
1.	Regular	48	38.21
2.	Irregular	44	34.96
3.	Never Done	34	26.83

3.5 Seizure incidence and source of adoption

Seizures were most common in dogs acquired from breeders/kennels (34.1%), reflecting genetic predispositions and inbreeding in purebred lines (Amude *et al*., 2007) [2]. Dogs adopted from friends/family (19.8%) and household-born dogs (17.5%) showed moderate representation. Shelter

(13.5%) and stray dogs (15.1%) may have developed seizures due to malnutrition, infections or prior neglect (Smith *et al*., 2018) [20]. The related data is depicted in Table 7.

Table 7: Incidence of seizures in dogs based on source of adoption

S. No.	Source of Adoption	Number of animals (N=126)	Percentage of dogs affected (%)
1	Breeder/Kennel	43	34.13
2	Born in the house	22	17.46
3	Family/Friends	25	19.84
4	NGO/Shelter	17	13.49
5	Abandoned/Stray	19	15.08

3.6 Seizure incidence and type of diet

Seizure incidence was highest among dogs fed non-vegetarian diets (46.0%), followed by commercial diets (30.2%) and home-cooked vegetarian diets (23.8%). Adequate nutrition is critical for neuronal function and deficiencies can predispose dogs to seizures. Home-cooked vegetarian diets may lack essential micronutrients such as B-complex vitamins, taurine and fatty acids, while non-vegetarian diets provide higher protein and taurine, supporting neurotransmission and reducing oxidative stress (Jones *et al*., 2012; Patel *et al*., 2016; Kumar *et al*., 2018) [8, 21, 22].

The related data is depicted in Table 8. Improper storage or low-quality commercial diets may still result in nutritional imbalances. Variations in household feeding practices, socio-economic status and limited veterinary guidance likely contribute to these disparities, emphasizing the need for proper nutritional counseling in seizure-prone dogs.

Table 8: Incidence of seizures based on type of food

S. No.	Type of food	Number of animals (N=126)	Percentage of dogs affected (%)
1	Commercial	38	30.16
2	Veg	30	23.81
3	Non veg	58	46.03

4. Conclusion

Seizures in dogs are multifactorial, influenced by breed, age, sex, neutering status, preventive care, adoption source and diet. Non-descript, Golden Retriever and Labrador dogs were most commonly affected. Idiopathic/structural seizures predominated in adults, infectious causes in puppies and organ dysfunction in older dogs. Higher incidence in males and intact dogs suggests hormonal and behavioral influences, while suboptimal vaccination, deworming and dietary factors further contributed to seizure risk. These findings emphasize the importance of breed- and age-specific preventive strategies, proper nutrition and early intervention to manage and reduce seizure occurrence in dogs.

Conflict of Interest

Not available

Financial Support

Not available

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