



Characterization of neurological diseases in canines: University of San Carlos of Guatemala, year 2017

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ABSTRACT

Objective. To determine the casuistry of neurological diseases, as well as the age, race and affected neuroanatomical sites. **Materials and methods.** A retrospective study of the clinical records of canine patients attended was carried out at the Veterinary Hospital of the Faculty of Veterinary Medicine and Zootecnics of the University Universidad de San Carlos de Guatemala in 2017. The data were classified according to the VitaminD mnemonic rule. The variables sex, race, age, and neuroanatomical localization of lesions were included. The data were summarized using descriptive statistics through frequency distribution tables. **Results.** From 1127 case records, the prevalence of neurological diseases was 8.43%. The frequency was higher in males than in females (53.68% vs 46.32%). The most affected age group ranges from zero to seven years. Regarding breeds, a higher frequency was observed in canines without defined breed (25.53%) followed by French Poodle dogs (20.21%). The pathologies found were vascular (1.05%), inflammatory/infectious (25.26%), traumatic (13.68%), metabolic (8.42%), idiopathic (6.32%), neoplastic (1.05%) and degenerative (44.21%). The most common neurolocalization was at the CNS level (86.32%). **Conclusions.** According to the findings of this study, it was determined that degenerative diseases represented most of the neurological casuistry. The highest frequency of cases occurred in young canine patients, males of mixed breeds. The most frequent neuroanatomical site of lesions was in the spinal cord at the thoracolumbar level.

Keywords: Classification of diseases; neurology; Guatemala (*Source: DeCS, MeSH*).

RESUMEN

Objetivo. Determinar la casuística de enfermedades neurológicas, así como la edad, raza y los sitios neuroanatómicos afectados. **Materiales y métodos.** Se realizó un estudio retrospectivo de los expedientes clínicos de los pacientes caninos atendidos en el Hospital Veterinario de la Facultad de Medicina Veterinaria y Zootecnia de la Universidad de San Carlos de Guatemala en el año 2017. Los datos fueron clasificados según la regla nemotécnica VITAMIN D. Se incluyeron las variables sexo, raza, edad y localización neuroanatómica de lesiones. Los datos fueron resumidos utilizando

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estadística descriptiva por medio de tablas de distribución de frecuencias. **Resultados.** De los 1127 registros de casos la prevalencia de enfermedades neurológicas fue de 8.43%. La frecuencia fue mayor en machos que en hembras (53.68% vs 46.32%). El grupo etario más afectado oscila entre los cero y los siete años. Respecto a razas, se observó una mayor frecuencia en caninos sin raza definida (25.53%) seguido de los perros French Poodle (20.21%). Las patologías encontradas fueron: vascular (1.05%), inflamatoria/ infecciosa (25.26%), traumática (13.68%), metabólica (8.42%), idiopática (6.32%), neoplásica (1.05%) y degenerativa (44.21%). La neurolocalización más frecuente fue a nivel de SNC (86.32%). **Conclusiones.** Según los hallazgos de este estudio se determinó que las enfermedades de carácter degenerativo representaron la mayor parte de la casuística neurológica. La mayor frecuencia de casos se presentó en pacientes caninos jóvenes, machos de razas mixtas. El sitio neuroanatómico más frecuente de localización de lesiones fue en medula espinal a nivel toracolumbar.

Palabras clave: Clasificación de enfermedades; neurología; Guatemala (*Fuente: DeCS, MeSH*).

INTRODUCTION

Neurological evaluation is a tool that allows us to know the structure and functioning of the nervous system to make a correct interpretation and specific localization of lesions (1). Once the neuroanatomical site of the injury has been established, the disease must be categorized, which is important to list the differential diagnoses. One of the most widely used systems is the VITAMIND mnemonic rule (2), which is based on the pathophysiological mechanisms of diseases, as it tries to establish an order of pathologies taking into account age, race, sex, anamnesis and physical examination (3).

The clinician must consider in turn that each category of disease involves an age range and a racial predilection, among other factors to consider. For example, Mondino et al (4) indicates that the neurological pathologies that occur most frequently in dogs are myelopathies, encephalopathies, encephalomyelopathies, vestibular and cerebellar syndromes. On the other hand, Fluehmann et al (5) and Pellegrino et al (2) report idiopathic epilepsy, hydrocephalus, brain neoplasms and diseases of the intervertebral disc. Given the diversity of the casuistry of each place, it is necessary to know the presentation of the diseases in each clinical context.

The purpose of this study was to generate information about the main pathologies that affect the nervous system in patients treated at the Veterinary Hospital of the Faculty of Veterinary Medicine and Zootechnics of the University Universidad de San Carlos de Guatemala. This in order to make known to veterinary clinicians the most common presentations of the disease in the study area.

MATERIALS AND METHODS

Type of study. A retrospective study was carried out from records of 1127 clinical cases of canine patients.

Localization. The patients were treated at the Veterinary Hospital of the Faculty of Veterinary Medicine and Zootechnics [FMVZ for its acronym in Spanish] of the University Universidad de San Carlos de Guatemala [USAC for its acronym in Spanish] whose coordinates are 14°34'58.44"N and 90°33'10.44 W during 2017.

Data collection. Records were taken of the variables: sex, race, age and neuroanatomical localization of lesions of canine patients with neurological disorders attended in neurological consultation. The classification of etiologies was carried out according to the VITAMIND mnemonic rule by means of its acronym: V, vascular; I, inflammatory, infectious; T, traumatic, toxic; A, abnormal; M, metabolic; I, idiopathic; N, neoplastic; and D, Degenerative (3). The patients were grouped according to their age into four age ranges: 0 to 3 years, 4 to 7 years, 8 to 11 years, and 12 to 15 years old.

The diagnoses were made using simple radiological images, ultrasound, laboratory tests such as complete blood count, blood chemistry, urinalysis, and chromatographic immunoassay tests. In cases in which it was not possible to perform diagnostic aids, the presumptive diagnosis was used, established through findings of lesions and signs in the physical and neurological examination, as well as clinical reasoning through the onset and progression of the disease.

Data analysis. Descriptive statistics were used for data analysis, using frequency distribution tables through the statistical program past® version 3.

RESULTS

1127 case records were examined. The prevalence of neurological diseases in the studied sample was 8.43%. Regarding sex, 53.68% (n = 51) corresponded to males and 46.32% (n = 44) to females. The average age of the patients with neurological disease was 5.60 ± 0.42 years. However, considering the distribution of frequencies, the age variable was categorized into four groups (Table 1), being puppies and young adults the groups with the highest frequencies.

Table 1. Distribution of patients with neurological disease according to age group.

Years	n	%
0 to 3	34	35.79
4 to 7	30	31.58
8 to 11	21	22.11
12 to 15	10	10.53

Regarding breed, the casuistry of neurological disease was observed more frequently in patients without a defined breed (25.53%) followed by patients of the French Poodle breed (20.21%) (Table 2), other breeds constituted 31.91%.

Table 2 Frequency of cases of canines that showed neurological disease, according to their breed.

Breed	n	%
Without defined breed	25	25.53
French poodle	19	20.21
Schnauzer	7	7.45
Siberian Husky	7	7.45
Cocker Spaniel	7	
Others	30	31.91

Categorization of diseases according to the VITAMIND system. In table 3, it was determined that degenerative diseases represented most of the neurological casuistry (44.21%), followed by inflammatory / infectious (25.26%) and traumatic / toxic (13.68%) nature.

Table 3. Frequency of cases in canines with neurological disease treated at the USAC FMVZ veterinary hospital, according to the VITAMIND system category, during 2017.

VITAMIND	n	%
Vascular	1	1.05
Inflammatory / Infectious	24	25.26
Traumatic / toxic	13	13.68
Allergic / autoimmune / developmental abnormality	0	0
Metabolic	8	8.42
Idiopathic	6	6.31
Neoplastic / nutritional	1	1.05
Degenerative	42	44.21

Table 4 shows the frequencies of the cases of neurological diseases in each category of the VITAMIND system.

Table 4. Frequencies of the cases of neurological diseases by each category of the VITAMIND system.

Neurological Diseases	n	%
Vascular		
Stroke	1	100
Infectious inflammatory diseases		
Canine Distemper	15	62.5
Ehrlichiosis	2	8.3
Neosporosis	1	4.17
Toxocariasis	1	4.17
Noninfectious inflammatory diseases		
Encephalitis due to unknown causes	4	16.7
Polymyositis	1	4.16
Traumatic or toxic		
Spinal cord trauma	9	69.23
Traumatic brain injury	2	15.38
Atlantoaxial instability	1	7.69
Lumbosacral instability	1	7.69
Anomalías		
Metabólicas		
Hypertensive encephalopathy due to chronic kidney disease	6	75
Hypocalcaemia	1	12.5
Hypothyroidism	1	12.5
Idiopathic		
Genetic epilepsy	3	50
Facial paralysis	1	16.66
Peripheral vestibular syndrome	2	33.34
Neoplásicas		
Neoplastic brain disease	1	100
Degenerativas		
Intervertebral disc disease	22	52.38
Spondylosis Deformans	16	38.10
Intervertebral disc calcification	1	2.38
Degenerative myelopathy	1	2.38
Fusion of sacral vertebrae	1	2.38
Cerebellar abiotrophy	1	2.38

In the degenerative category, the main disease diagnosed was intervertebral disc disease.

Neuroanatomical localization. Regarding the neuroanatomical localization, 86.31% of the cases occurred in the central nervous system, while 2.11% in the peripheral nervous system. 11.58% corresponds to disorders without a specific neuroanatomical localization.

At the central nervous system level, 42.68% of the cases studied were in the intracranial region, while 57.32% were in the extracranial region. Table 5 shows the frequencies of the neuroanatomical sites of intra- and extracranial lesion.

Table 5. Frequency of cases in canine patients with neurological disease at the central nervous system level according to neuroanatomical site.

	n	%
Neurolocalization		
	Intracranial	
Brain	25	30.4
Cerebellum	8	9.75
Brain stem	0	0
Central vestibular	0	0
Peripheral vestibular	2	2.44
	Extracranial (spinal cord)	
Cervical	9	10.98
Cervicothoracic	0	0
Thoracolumbar	28	34.15
Lumbosacral	10	12.19
Cauda equina	0	0

Only 2.11% of casuistry had peripheral nervous system-level lesion being one case reported by facial paralysis and another by polymyositis. Table 6 describes the frequencies according to the neuroanatomical site of the lesion.

Table 6. Frequency of cases in canine patients with neurological disease at the peripheral nervous system level according to neuroanatomical site.

	n	%
Neurolocalization		
Nerve roots	0	0
Peripheral nerves	1	50
Neuromuscular junction	0	0
Muscular	1	50

DISCUSSION

The prevalence of neurological diseases found provides the clinician with epidemiological information for diagnosis according to their environment as there are few studies that share this data, or these are focused on a specific disease. On the other hand, neurological diseases with the greatest casuistry were those of a degenerative nature because of intervertebral disc disease. Pellegrino et al (2), Mondino et al (4), Fluehmann et al (5) and Chaves et al (6) report similar frequencies. This disease was mainly reported in canines of medium-sized and chondrodystrophic breeds of medium and advanced ages which is consistent with what is described by Fluehmann et al (5), Chaves et al (6) and Murakami et al (7). Affecting the thoracolumbar and cervicothoracic region of the spinal cord, similar to what was reported by Shimose and Salinas (8).

The second most prevalent disease was spondylosis deformans. The most affected canines were of advanced ages, which coincides with what was observed by Perez et al (9) and Kranenburg et al (10). The breeds most predisposing to this disease are German shepherds and boxers (10) as well as breeds of work or sport (11). This makes a difference to the results of this study, since the most frequently affected breeds were canines without defined breed, French Poodle and Schnauzer. This difference may be due to the mixed or small-medium-sized breeds being more common in Guatemala, but they are also subject to constant exercise or may suffer some form of microtrauma that lead to the development of the disease. The most commonly affected neuroanatomical sites were the medullary, thoracolumbar and lumbosacral spinal segments, similar to what is reported by Perez et al (9) that shows that the most common sites for the localization of spondylosis lesions were lumbosacral, lumbar and thoracic. This disease affects both male and female canines.

The most common casuistry of infectious/inflammatory diseases was encephalitis by infectious agents such as canine distemper, erlichiosis, neosporosis and toxocariasis. The affected canines were those without defined breed and French Poodle with age ranges between 0 and 3 years and 4 to 7 years old. On this aspect Pellegrino et al (2) indicate that the prevalence of these disorders increases with age since he observed 22% of cases in dogs under 1 year, 33% in animals aged 1 to 6 years and 45% in ages over 6 years. The high casuistry of infectious diseases especially canine

distemper in Latin America, when compared to Europe or North America is due to a greater number of abandoned dogs that do not receive immunization on a systematic basis (2).

Within the category of VITAMIND traumatic diseases, spinal cord trauma was the most prevalent diagnosed disease. This is consistent with Mendes and Arias (11) who observed in their study that the spinal segments most affected were the thoracolumbar level and the lumbosacral with a greater predominance in young male canines, probably due to the reckless behavior of these animals. The main causes of trauma are collision, attack by another animal and falls. This may be related to the high number of wandering animals, the high flow of vehicles and the irresponsibility of owners who do not use safety measures during rides, such as the use of straps (6).

The most common neuroanatomical site of lesion localization was in the extracranial structures at the thoracolumbar level of the spinal cord coinciding with what is described by Arias et al (12) who mention that about 85% of the dogs with diseases at the intervertebral disc level have conditions in the thoracolumbar region and 15% in the cervical region. One factor for the presentation of thoracolumbar lesions may be the anatomical narrowness of their spinal canal when compared to the cervical region (8).

The most affected age group was 0 to 3 years. Neurological diseases diagnosed in patients between this age range belonged to the infectious/inflammatory category. This age group may be at increased risk of infection with viral agents and protozoan likely related to the immaturity of their immune system, especially those who do not receive some form of immunization. On the other hand, the age group corresponding to adult canines between 4 and 7 years old, corresponds mainly to diseases of degenerative category similar to what is reported by Shimose and Salinas (8).

As for the sex of patients, there was a higher frequency of cases in male canines compared to females diagnosed mainly by diseases of a degenerative nature by intervertebral disc disease, similar to those evaluated by Itoh et al (13) and Mondino et al (4). There is a significant risk factor in males for degenerative neurological diseases, probably linked to their higher weight or an alleged protective effect of estrogen against intervertebral disc degeneration (8). Itoh et al (13) suggest that sex hormones could influence the cause of herniated intervertebral disc at the thoracolumbar level.

Patients without a defined breed had a higher frequency of neurological diseases. Pellegrino et al (2) describe that this situation is noticeable in Latin American countries, where many owners adopt stray animals or from shelters instead of buying pedigree dogs, for free choice or economic reasons. The main reason for the susceptibility of this group of animals may be due to health and nutrition deficiencies, in addition to being exposed to all kinds of dangers outside. Moreover, the possession of breeds such as French Poodle, Chihuahua, and Schnauzer, can be attributed to the physical space, care, and food that these breeds require because they are small-medium size versus large sizes (14).

It should be mentioned that in Guatemala there is a tendency to attribute to all patients with neurological signs, erroneous diagnoses of toxic category. However, no disease of this category was observed in this study but only traumatic nature. Therefore, it is important to perform a good clinical and neurological examination of the patient, since diagnostic aids are not commonly performed in Guatemala due to economic limitations of customers or lack of equipment in small veterinary clinics.

With the results evidenced in this study, the analysis of medical history, signs, neurolocalization, evolution and progression of the disease is sufficient to obtain a good diagnosis as long as an informed and reasoned clinical practice is performed. Identifying the disease category is sufficient to initiate appropriate treatment and solve the neurological problem, even if the etiological diagnosis (1.6) cannot be achieved. However, it is recommended that whenever the use of imaging equipment can be accessed to obtain an accurate diagnosis and thereby choose the best treatment for the patient's recovery.

This study opens the door to future longer-term research and other geographical locations that expand the epidemiological presentation of neurological diseases. It is also important to constantly train and educate physicians in this area to avoid diagnostic errors and provide quality service to patients using the means in the work environment.

Conflict of Interest

The authors declare that there is no conflict of interest.

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