



**Análisis epidemiológico retrospectivo de Distemper Canino en la ciudad de Pachuca de Soto,
Estado de Hidalgo**

Retrospective epidemiological analysis of Canine Distemper in Pachuca of Soto city, Hidalgo State

**Rebollar-Zamorano Maleny, Morales-Ubaldo Ana L, González-Alamilla Eddy N, Ángeles-Rodríguez Adán,
Valladares-Carranza Benjamín, Velásquez-Ordoñez Valente, Rivero-Pérez Nallely*, Zaragoza-Bastida Adrián***

Data of the Article

¹Institute of Agricultural Sciences.
Veterinary Medicine.
Autonomous University of the State of
Hidalgo.
Av. Universidad km 1 s/n Ex Hacienda.
A.P. 32 CP.43600. 01771717 2000 ext.
2440. Aquetzalpa. Tulancingo de Bravo.
Hidalgo, México.

²Faculty of Veterinary Medicine and
Zootechnics. Autonomous Mexico State
University. The Cerrillo Piedras Blancas.
Toluca, State of Mexico. C.P 50090.
Mexico.

***Contact address:**
Institute of Agricultural Sciences.
Veterinary Medicine.
Autonomous University of the State of
Hidalgo.
Av. Universidad km 1 s/n Ex Hacienda.
A.P. 32 CP.43600. 01771717 2000 ext.
2440. Aquetzalpa. Tulancingo de Bravo.
Hidalgo, México.

**Nallely Rivero-Pérez,
Zaragoza-Bastida Adrián**

E-mail address:
adrian_zaragoza@uaeh.edu.mx
nallely_rivero@uaeh.edu.mx

Palabras clave:

Distemper,
estudio epidemiológico,
caninos.

***J. Selva Andina Anim. Sci.*
2020; 7(1):40-46.**

Record of the Article

Received November, 2019.
Returned December, 2019
Accepted January, 2020.
Available online, April, 2020.

**Edited by:
Selva Andina
Research Society**

Resumen

El virus del distemper canino (VDC) ha sido el causante de la enfermedad vírica multisistémica más difundida, altamente contagiosa y letal de los cánidos, cuya morbilidad varía entre 25-75% y la mortalidad entre 50-90%. El objetivo de la presente investigación fue realizar un estudio epidemiológico de distemper canino de un Hospital Veterinario en la ciudad de Pachuca de Soto, Estado de Hidalgo. Se obtuvo información de 7280 historias clínicas de pacientes caninos atendidos durante el período 2017-2018, de las cuales 65 cumplieron con los criterios de caso positivo al VDC. Se realizó un estudio epidemiológico observacional, de tipo trasversal y con una búsqueda retrospectiva de casos. Se determinó que 8 de cada 1000 pacientes que asisten a la clínica fueron positivos al VDC, observándose que una mayor frecuencia de machos con un 63%, con Riesgo Relativo (RR) de 0.67 y una Odds Ration (OR) de 0.47, los pacientes menores de 6 meses tienen la mayor frecuencia de casos con un 62% (RR de 8.0 y OR de 19.2); Pese a la variabilidad de las razas dentro del análisis efectuado, se encontró la mayor frecuencia en los perros mestizos con un 52% (RR de 1.79 y OR de 2.66), por otra parte, se determinó que la estacionalidad influye en el grado de presentación de esta enfermedad, siendo mayor en invierno con un 45% de los casos (RR 1.81 y OR 2.47). En conclusión en el Hospital Veterinario en estudio el VDC afecta más a los caninos criollos machos menores de siete meses de edad no vacunados y la enfermedad se presenta con mayor frecuencia en invierno.

© 2020. Journal of the Selva Andina Animal Science. Bolivia. Todos los derechos reservados.

Abstract

Canine distemper virus (CDV) is the causative agent of one of the most spread, highly contagious and lethal viral disease in canines, whose morbidity varies between 25-75% and mortality between 50-90%. The present study aimed to carry out an epidemiological study of CDV from a Veterinary Hospital in the city of Pachuca of Soto, State of Hidalgo. The information was obtained from 7280 medical records of canine patients treated during the 2017-2018 period, of which 65 met the positive case criteria for the CDV. An observational, cross-sectional epidemiological study with a retrospective search of cases was carried out. It was determined that 8 out of every 1000 patients attending the clinic were positive for CDV, observing that a higher frequency of males with 63%, with Relative Risk (RR) of 0.67 and an Odds Ratio (OR) of 0.47, patients under 6 months have the highest frequency of cases with 62% (RR of 8.0 and OR of 19.2); Despite the variability of the breeds within the analysis performed, the highest frequency was found in mongrel dogs with 52% (RR of 1.79 and OR of 2.66), on the other hand, it was determined that seasonality influences the degree of presentation of this disease, being greater in winter with 45% of cases (RR 1.81 and OR 2.47). In conclusion, in the Veterinary Hospital

Key words:

Distemper,
epidemiological study,
canines.

understudy, the CDV affects male Creole dogs less than seven months of age unvaccinated more and the disease occurs most frequently in winter.

© 2020. *Journal of the Selva Andina Animal Science, Bolivia. All rights reserved.*

Introducción

Canine Distemper Virus (CDV) also known as distemper or Carré as discovered by Henri Carré in 1905, this virus has been the cause of the most widespread, highly contagious and lethal multisystemic viral disease of canids and other members of the *Procyonidae* and *Mustelidae* families¹, it is a disease of high morbidity and variable mortality². The virus belongs to the family *Paramyxoviridae* of the genus *Morbillivirus*, the infection in dogs can lead to severe multisystemic disease, which affects the gastrointestinal, respiratory, and neurological systems³.

Viral replication produces cellular destruction, which clinically results in vomiting, diarrhea, bronchitis, pneumonia, dermatitis, and behavioral disturbances, including neurological manifestations such as myoclonus, spasms, paresis, skin hyperesthesia, and seizures⁴. Consequently it doesn't exist effective antiviral treatment, it is nonspecific and palliative.

Therapeutic actions are symptomatic and supportive, aimed at limiting secondary bacterial infections via using broad-spectrum antibiotics, maintaining fluid balance, and in the case of respiratory disturbances, expectorants, and bronchodilators⁵.

From a public health point of view, it is believed that CDV doesn't infect human cells or causes diseases in humans, nevertheless, some studies have found that said virus has taken place in Piaget bone disease⁶, in the same way, it has been shown that the virus infects and replicates in human osteoclast

precursors, increasing concern about the possibility of zoonotic transmission of CDV⁷.

According to with a study carried out by Costa in 2019⁸, in Mexico until 2018 there is no report of studies carried out in the country, regarding the prevalence of CDV, therefore in Pachuca city and the rest of Hidalgo State, the study of this disease is null, mainly due to the lack of analysis of the information that is collected in veterinary consultations, this limitation is attributed to the lack of an adequate experimental design to address the problem.

Due to the aforementioned, the present investigation is aimed to carry out an epidemiological study of Canine Distemper Virus in a veterinary hospital (VH) in the city of Pachuca de Soto, belonging to Hidalgo State.

Material and methods

Study área. The study was carried out in the veterinary Hospital "Petterra", located in Pachuca de Soto city, capital of Hidalgo State. The city is geographically located between the coordinates 20°, 07 'and 21" north and 98°, 44 '09" west longitude, with a height of 2400 to 2800 masl. The city is bordered to the north by Mineral del Chico and Mineral del Monte, to the south by Zempoala and Zapotlán de Juárez, to the east by Mineral de la Reforma and Epazoyucan, and to the west by San Agustín Tlaxiaca. The climate is temperate semi-cold, with rains in summer, its rainfall from 400 to 800 mm

annually. The prevailing winds occur 9 months a year and generally come from the northeast, having an extreme speed of 60 to 65 km/h. Its annual average temperature is 24 °C.

Sampling unit. A search was carried out in the medical records archives of the canine patients admitted and attended in general consultation at the VH during the period 2017-2018. The clinical diagnosis of CDV was performed considering the clinical signs and manifestations, which the patient evidenced during the general clinical examination, such as appetite loss, depression, hyperthermia or fever, ocular and nasal discharge, conjunctivitis, neurological signs, and pads hyperkeratosis (palmar and plantar) and in the nasal plane. The clinical diagnosis of CDV cases was confirmed by laboratory analysis (biometrics) and rapid tests (Test Kit Materlab⁹).

Inclusion and exclusion criteria. Any canine with clinical sinology and biometrics associated with CDV was considered as a positive case, as well as those confirmed by rapid tests (Test Kit Materlab⁹). Respect to the age, those canines younger than two months, with nervous signs during admission or with presumptive clinical manifestations of another pathology, and were receiving any pharmacological treatment, were excluded.

Study design. It was carried out a non-experimental, descriptive, cross-sectional epidemiological study (period 2017-2018) with a retrospective case search. The study cases (n=65) and the reference population (7280) were tabulated in electronic spreadsheets from Microsoft Excel® software, considering gender, vaccination history, age, same which was stratified into age groups: less than or equal at 6 months (puppies), from 7 to 12 months (puberty), from 13 to 36 months (adults), from 37 to 72 months (mature) and animals older than 72 months (senile), respect to the breed, only the breeds with more than

three cases were tabulated, breeds with only one case were considered in other breeds and seasonality (date of medical history). CDV cases were compared to canines attended for some different CDV reasons in the same study period.

Statistical analysis. Once data was obtained, a descriptive statistical analysis was performed, the information was represented in tables and figures, the effect of the variables aforementioned was analyzed over the disease presence, through a case-control design, it was calculated relative risk (RR), Odds ratio (OR) and Chi-Square test (X^2), calculations were carried out in the statistical package EPIDAT 3.1¹⁰.

Results

During the period 2017-2018, it was diagnosed 65 positive CDV cases, representing a prevalence rate of 9 cases for every 1000 patients who attend the VH under study. Respect to the association of the studied variables and the relation with the disease presence it was determined, that males are the most affected with 63% (41 of 65) compared to females with 37% (24 of 65), a statistically significant association ($P = 0.034$) was observed for this variable, with a RR of 0.67 and 0.46 (OR) more possibilities to acquire CDV in the case of males (table 1).

Regarding vaccination history, is important to highlight that 65% of the cases under study was not vaccinated (40 of 65), it was determined a statistically significant association ($P=0.003$) respect to the patients which was not vaccinated and the presence of CDV, patients without vaccination history had a RR (2.50) and 3.44 (OR) more times the possibility of contracting the disease (table 1).

The first six months of life (≤ 6 months), is the age at which 62% (40 of 65) of patients contract the

virus, it was determined that the patient's age is statistically associated (P=0.0001) with the presence of the disease, observing a descent of the RR and the OR according to the age of patients increase, nevertheless the age group with patients under six months is the most affected with a RR of 8, significantly higher than that of the other considered age groups, and 19 (OR) more times the possi-

bility to contract the disease at this age (table 2). However it was determined a statistically significant association in the group of adult patients (P=0.014) and senile (P=0.008), noticing that the RR and OR for these groups are less compared with the group above described (table 2).

Table 1 Gender and vaccination association with the presence of Canine Distemper virus in Pachuca of Soto City, Hidalgo State

Factor	Number of cases	%	RR	CI 95%	OR	CI 95%	X ²	P-value			
Gender	Female	24	37	0.67	0.45	0.98	0.47	0.23	0.95	4.46	0.034*
	Male	41	63								
Vaccinated	yes	25	39	2.50	1.31	4.78	3.44	7.95	3.31	8.80	0.003*
	No	40	61								

RR relative risk, CI confidence interval 95%, OR Odds ratio, *Statistically significant value to 95%

Table 2 Age association with with the presence of Canine Distemper virus in Pachuca of Soto City, Hidalgo State

Age (months)	Number of cases	%	RR	CI 95%	OR	CI 95%	X ²	P-value		
≤ 6	40	62	8.00	3.37	18.98	19.2	6.78	54.33	41.63	0.000*
7-12	6	9	0.75	0.28	2.04	0.72	0.24	2.22	0.32	0.577
13-36	12	18	0.52	0.28	0.96	0.41	0.18	0.93	3.27	0.070
37-72	5	8	0.33	0.13	0.86	0.28	0.09	0.82	5.91	0.015*
> 72	2	3	0.18	0.04	0.79	0.16	0.03	0.73	6.92	0.008*

≤ Less or equal than, >Greater than, RR relative risk, CI confidence intervale 95%, OR Odds ratio, * Statistically significant value to 95%

Table 3 Breed association with with the presence of Canine Distemper virus in Pachuca of Soto City, Hidalgo State

Breed	Number of cases	%	RR	CI 95%	OR	CI 95%	X ²	P-value		
Mestizo	34	52	1.79	1.15	2.79	2.66	1.29	5.47	7.52	0.0061*
Chihuahua	5	8	0.63	0.22	1.81	0.59	0.18	1.92	0.77	0.3805
German Shepherd	4	6	0.57	0.18	1.86	0.54	0.15	1.95	0.84	0.3583
Siberian Husky	3	5	0.75	0.17	3.22	0.74	0.16	3.44	0.15	0.6976
Pug	3	5	0.75	0.17	3.22	0.74	0.16	3.44	0.14	0.7131
Others	16	25	2.00	0.92	4.35	2.33	0.92	5.90	3.27	0.0705

RR relative risk, CI confidence interval 95%, OR Odds ratio, * Statistically significant value to 95%

Table 4 Season year effect over the presence of Canine Distemper virus in Pachuca of Soto City, Hidalgo State

Season year	Number of cases	%	RR	CI 95%	OR	CI 95%	X ²	P-value		
Winter	29	45	1.81	1.09	3.00	2.47	1.17	5.21	5.74	0.0165*
Spring	15	23	0.94	0.51	1.73	0.92	0.41	2.06	0.04	0.8369
Summer	12	18	0.75	0.93	1.46	0.69	0.30	1.61	0.73	0.3934
Fall	9	14	0.56	0.27	1.18	0.49	0.20	1.21	2.43	0.1193

RR relative risk, CI confidence interval 95%, OR Odds ratio, * Statistically significant value to 95%

It was determined that 52% of CDV cases occurred in mestizo breed (34 of 65) and 48% belong to a specific breed (31 of 65), according to with the statistical analysis it exists a statistically significant association ($P=0.0061$) among Mestizo patients and CDV, Mestizo breed presents a RR OF 1.79 and 2.66 (OR) more times the possibility to contract the disease (table 3).

Regarding the season year effect over the presence of CDV, it was determined that 45% of the cases were presented during the winter, 23% in the spring, 18% in summer and 14% during the fall being the winter the season statistically associated ($P=0.0165$) with the presence of CDV, for winter it was calculated an RR of 1.81 and 2.47 (OR) more times the possibility that during this season patients were infected by CDV (table 4).

Discussion

Once carried out the CDV epidemiologic study, it was determined a prevalence rate of 9 cases for every 1000 patients into the VH under study, which is located in Pachuca de Soto City. Related to the association variables it was determined that the gender, vaccine or not vaccine applications, age, breed and season year, they can make a canine more or less susceptible to contract and develop the disease, regarding the gender it was observed a higher incidence in males (63%) than in females (37%), data that agree with that reported by González-Chávez et al¹¹ who reported an incidence of 67% and 33% in males and females respectively, according to with Soto et al¹², it exists a higher prevalence in males, due to them ambulatory habit, which favors contact between infected individuals, increasing the exposition and therefore the infection risk.

On the other hand, the vaccine application is a practice that can lead to decrease the risk to contract the virus, since it was observed a 61% in disease presentation frequency is not vaccinated dogs, a situation similar to that shown by González-Chávez et al¹¹, who reported a presentation frequency of 95%, according to with Sykes³, an opportune immunization is the key for the prevention of the infection caused by CDV, nevertheless, according to with obtained data in the present study this practice is not carried out.

Age is a determining factor in the presentation of CDV, in the present study it was determined a higher prevalence in those individuals under 6 months, according to with described by Martella et al¹³, puppies become more susceptible due maternal antibodies decrease, while older individuals are protected by immunization via vaccination, nevertheless it is possible cases occurring. In a study carried out by Almuna¹⁴, it was shown that as age increase the number of seropositive dogs increases too, which coincides with that reported by Lechner et al¹⁵, who mention that it exists a higher risk to contract the disease according to individuals age increases, due to the individual has more time to be exposed to the virus and become naturally infected.

Despite the existence of reports, which indicate a high presentation frequency in pure breed canines, in this study it was reported that Mestizo breed individuals had a 52% presentation frequency, similar to that reported by González-Chávez et al¹¹, who reported a 43% presentation frequency in Mestizo breed canines.

Respect to disease seasonality, according to the reported by Ettinger & Feldman¹⁶ and Martella et al¹³, the presentation degree for this disease is higher during fall and winter, similar to that reported in the present study.

CDV is an infectious disease with a high prevalence of the VH understudy, males and individuals under 7 months are the most affected, as well as the Mes-tizo breed dogs, the disease occurs more frequently during the winter. Animals without vaccines are the most affected, although an important percentage of vaccinated animals presented the disease.

Conflicts of interest

Authors declare that they have no potential conflicts of interest regarding the research, authorship, and / or publication of this article.

Acknowledgments

To the veterinary hospital "Petterra" for providing the medical records of the patients admitted during the period 2017-2018.

Literature cited

1. Céspedes PF, Cruz P, Navarro CO. Modulation of immune response during canine distemper virus infection: therapeutic and vaccine development implications. *Arch Med Vet* 2010;42(2):14-28. DOI: <https://doi.org/10.4067/S0301-732X2010000200003>
2. Pinotti MA. Distemper Canino: evaluación de dos alternativas terapéuticas y caracterización de aspectos clínico-epidemiológicos en la ciudad de Santa Fe, durante los años 1998-2009 [tesis maestría]. [Santa Fe]. Universidad Nacional del Litoral; 2009 [citado 20 de mayo de 2019]. Recuperado a partir de: <https://bibliotecavirtual.unl.edu.ar:8443/handle/11185/323>
3. Sykes JE. Canine Distemper Virus Infection. In: *Canine and Feline Infectious Diseases*: Elsevier; 2014. p. 152-65. DOI: <https://doi.org/10.1016/C2009-0-41370-9>
4. Bravo Webber LC, Escalante Chavez D. Estudio retrospectivo del Distemper canino en animales llegados al hospital universitario de veterinaria (ciudad de Santa Cruz de la Sierra, quinquenio 2002-2006) [tesis licenciatura]. [Santa Cruz]. Universidad Autónoma Gabriel René Moreno; 2007 [citado 20 de octubre de 2019]. Recuperado a partir de http://190.186.110.75/sistemabibliotecario/doc_tesis/TESIS%20LUIS%20CARLOS%20BRAVO-20101104-100837.pdf
5. Ettinger SJ, Feldman EC, editores. *Tratado de medicina interna veterinaria: 6ta edición*. Madrid: Elsevier; 2007.
6. Ralston SH, Afzal MA, Helfrich MH, Fraser WD, Gallagher JA, Mee A, et al. Multicenter blinded analysis of RT-PCR detection methods for paramyxoviruses in relation to Paget's disease of bone. *J Bone Miner Res* 2007;22(4):569-77. <https://doi.org/10.1359/jbmr.070103>
7. Selby PL, Davies M, Mee AP. Canine distemper virus induces human osteoclastogenesis through NF-kappaB and sequestosome 1/P62 activation. *J Bone Miner Res* 2006;21(11):1750-6. <https://doi.org/10.1359/jbmr.070103>
8. Costa VGD, Saivish MV, Rodrigues RL, Lima Silva RF, Moreli ML, Kruger RH. Molecular and serological surveys of canine distemper virus: A meta-analysis of cross-sectional studies. *PloS one* 2019;14(5):1-19 <https://doi.org/10.1371/journal.pone.0217594>
9. Martelab [Internet]. Madrid. *Test de Distemper canino (virus del moquillo)*; 2019 [citado 23 de mayo de 2019]. Recuperado a partir de:

- https://materlab.com/index.php?id_product=790&controller=product&id_lang=1
10. Xunta de Galicia [Internet]. OPS. EPIDAT 3.1. Coruña A. Washington DC. Xunta de Galicia; 2006 [citado 20 diciembre de 2019]. Recuperado a partir de: <http://dxsp.sergas.es/ApliEdatos/Epidat/Ayuda/12-Ayuda%20Jerarquizacion.pdf>
 11. González Chávez MT, Peraza González B, Díaz Rodríguez S, Camacho Socarrás C, Vega Rodríguez N, Vega Cañizares E. Caracterización clínica del moquillo canino en dos municipios de La Habana. *Rev Salud Anim* 2017;39(1): 43-50.
 12. Soto A, Luna LR, Rosadio R, Maturrano L, Detección molecular del virus del distemper canino en casos clínicos de caninos domésticos no vacunados y determinación de los factores de riesgo. *Rev Investig Vet Peru* 2018; 29(3):964-71. DOI: <https://doi.org/10.15381/rivep.v29i3.14744>
 13. Martella V, Elia G, Buonavoglia C. Canine distemper virus. *Vet Clin Small Anim* 2008;38(4):787-97. DOI: <https://doi.org/10.1016/j.cvsm.2008.02.007>
 14. Almuna R. Factores de riesgo asociados a tasas de infección de distemper canino en perro doméstico (*Canis familiaris*) y carnívoros silvestres de la reserva de la biósfera de Janos, Chihuahua, México 2016. <https://doi.org/10.13140/RG.2.2.17882.54722>
 15. Lechner ES, Crawford PC, Levy JK, Edinboro CH, Dubovi EJ, Caligiuri R. Prevalence of protective antibody titers for canine distemper virus and canine parvovirus in dogs entering a Florida animal shelter. *J Am Vet Med Assoc* 2010;236(12):1317-21. <https://doi.org/10.2460/javma.236.12.1317>
 16. Ettinger SJ, Feldman EC, editores. Tratado de medicina interna veterinaria Vol II. Enfermedades del perro y del gato. 4ta edición. Buenos Aires: Intermedica; 1997. p. 470-84.

Nota del Editor:

Journal of the Selva Andina Animal Science (JSAAS) se mantiene neutral con respecto a los reclamos jurisdiccionales publicados mapas y afiliaciones institucionales.