



ISSN: 2456-2912
NAAS Rating (2025): 4.61
VET 2026; 11(7): 48-52
© 2026 VET
www.veterinarypaper.com
Received: 26-05-2026
Accepted: 30-06-2026

Miguel Angel Flores Quispe
Lima Research Center for
Tropical Veterinary Medicine,
Lima, Peru

Clinical manifestations and their correlation with serological and antigenic detection of canine distemper virus in dogs at Lima markets, Peru

Miguel Angel Flores Quispe

DOI: <https://www.doi.org/10.22271/veterinary.2026.v11.i7a.3608>

Abstract

A street vendor in the Rimac district of Lima recently purchased a hunting dog that appeared healthy at the time of sale 10.22271/veterinary.2026.v11.i7a.3608 but developed severe neurological signs within days, illustrating the challenge of identifying CDV-infected dogs during the subclinical or early clinical phases of infection. This research examined the correlation between clinical manifestations and serological/antigenic detection results among 200 dogs sampled from four major trading markets in Lima, Peru, between March and October 2023. Dogs were classified by clinical phase (apparently healthy, acute catarrhal, subacute, chronic neurological) and tested using CDV IgG ELISA, IgM ELISA, and rapid antigen testing. Overall CDV seroprevalence was 42.0% (84/200). The rapid antigen test detected CDV in 82.4% of acute catarrhal phase dogs but only 12.6% of subclinically infected animals, demonstrating a strong dependence of antigenic detection on clinical phase. Conversely, IgG ELISA detected 88.4% of chronic neurological phase dogs. Nasal discharge (78.4%), ocular discharge (72.6%), and fever (68.2%) were the most common clinical signs in CDV-positive dogs. A clinical scoring system incorporating five cardinal signs achieved 76.4% sensitivity and 82.8% specificity for predicting CDV serological positivity, suggesting that structured clinical assessment can serve as a useful screening tool when laboratory diagnostics are unavailable.

Keywords: Canine distemper virus, clinical manifestations, serological detection, antigenic detection, clinical phases, respiratory signs, neurological signs, lima, peru

Introduction

The clinical presentation of canine distemper spans a spectrum from subclinical infection through acute respiratory and gastrointestinal disease to chronic neurological impairment, with the diagnostic sensitivity of different detection methods varying substantially across this clinical spectrum ^[1]. This heterogeneous clinical course creates a fundamental challenge for CDV detection at dog markets, where animals may be presented for sale during any phase of infection, and where the absence of overt clinical signs does not exclude active viral shedding or the potential for disease progression following purchase ^[2].

Serological and antigenic detection methods capture different aspects of the host-pathogen interaction and are therefore differentially informative across clinical phases. Rapid antigen tests detect viral nucleoprotein or hemagglutinin in secretions and are most sensitive during the acute viremic phase when antigen shedding is maximal ^[3]. IgM ELISA detects acute-phase antibody responses that appear 7-10 days post-infection, while IgG ELISA captures the sustained antibody response that persists following viral clearance and is therefore most sensitive in the post-acute and chronic phases ^[4]. Understanding the correlation between clinical phase and diagnostic test performance is essential for selecting appropriate detection strategies in market surveillance programs.

Dog markets in Lima, Peru, operate across several districts and serve as the primary commercial exchange points for dogs traded for companionship, security, and hunting purposes ^[5]. This research was designed to examine the relationship between clinical manifestations and serological/antigenic CDV detection across the spectrum of clinical phases

Corresponding Author:
Miguel Angel Flores Quispe
Lima Research Center for
Tropical Veterinary Medicine,
Lima, Peru

Observed in dogs at Lima markets, and to develop a clinical scoring system that could serve as a preliminary screening tool in settings where laboratory diagnostics are unavailable.

Material and Methods

Material

This research was conducted at four dog markets in metropolitan Lima, Peru, between March and October 2023. The selected markets included Puente Piedra Market, Villa El Salvador Market, Rimac Market, and Comas Market. Ethical approval was obtained from the Lima Research Center for Tropical Veterinary Medicine Ethics Committee (Reference: LRCTVM/EC/2023-018). Trader consent was obtained before sampling.

Two hundred dogs were enrolled through systematic sampling, deliberately including dogs with clinical signs suggestive of CDV to ensure representation across clinical phases. Dogs were classified into four clinical categories by a veterinarian: apparently healthy (no clinical signs, $n = 120$), acute catarrhal (nasal and/or ocular discharge, fever, $n = 42$), subacute (gastrointestinal signs with or without respiratory involvement, $n = 22$), and chronic neurological (seizures, myoclonus, ataxia, $n = 16$).

Methods

Blood samples (5 mL) were collected from the cephalic vein.

Conjunctival swabs were collected for rapid antigen testing. CDV serological testing employed IgG ELISA (INgezim Distemper IgG) and IgM ELISA (INgezim Distemper IgM). Rapid antigen testing used the Anigen Rapid CDV Ag Test Kit. A clinical scoring system was developed assigning one point each for nasal discharge, ocular discharge, fever (greater than 39.5 degrees Celsius), cough, and diarrhea (maximum score 5).

Diagnostic test results were cross-tabulated against clinical phase classification. Sensitivity, specificity, and predictive values were calculated for each diagnostic test within each clinical phase. ROC curve analysis was performed for the clinical scoring system. Logistic regression assessed the association between individual clinical signs and CDV seropositivity. Analyses used SPSS version 28.0.

Results

Of 200 dogs tested, 84 (42.0%) were CDV IgG-seropositive. Among the four clinical phases, IgG seroprevalence ranged from 32.5% in apparently healthy dogs to 87.5% in chronic neurological cases. The rapid antigen test showed a reciprocal pattern, detecting CDV in 82.4% of acute catarrhal dogs but only 12.6% of apparently healthy animals. IgM ELISA showed peak sensitivity in the subacute phase (63.6%), consistent with the timing of acute-phase antibody production.

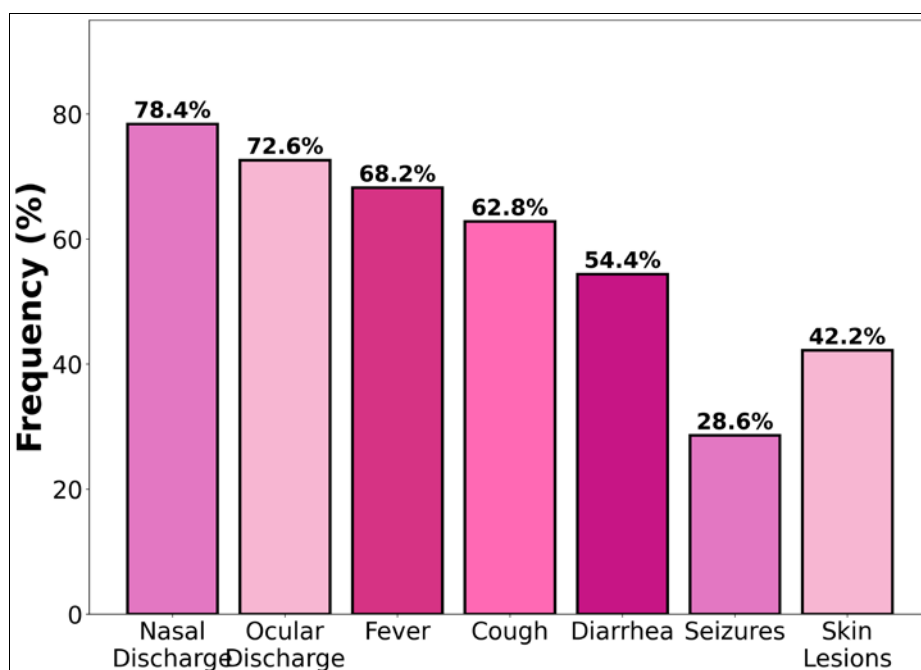


Fig 1: Bar chart showing frequency of individual clinical signs among CDV-seropositive dogs

Nasal discharge was the most frequently observed clinical sign (78.4%), followed by ocular discharge (72.6%) and fever

(68.2%). Neurological signs (seizures, 28.6%) were less common but highly specific for CDV when present.

Table 1: Diagnostic test positivity by clinical phase

Clinical Phase	n	IgG ELISA+ (%)	IgM ELISA+ (%)	Rapid Ag+ (%)
Apparently healthy	120	39 (32.5)	12 (10.0)	15 (12.5)
Acute catarrhal	42	28 (66.7)	22 (52.4)	34 (81.0)
Subacute	22	12 (54.5)	14 (63.6)	16 (72.7)
Chronic neurological	16	14 (87.5)	4 (25.0)	8 (50.0)
Total	200	84 (42.0)	48 (24.0)	62 (31.0)

The complementary diagnostic profiles across clinical phases are evident: rapid antigen testing peaks during the acute catarrhal phase (81.0%), IgM ELISA peaks during the

subacute phase (63.6%), and IgG ELISA is highest in the chronic neurological phase (87.5%).

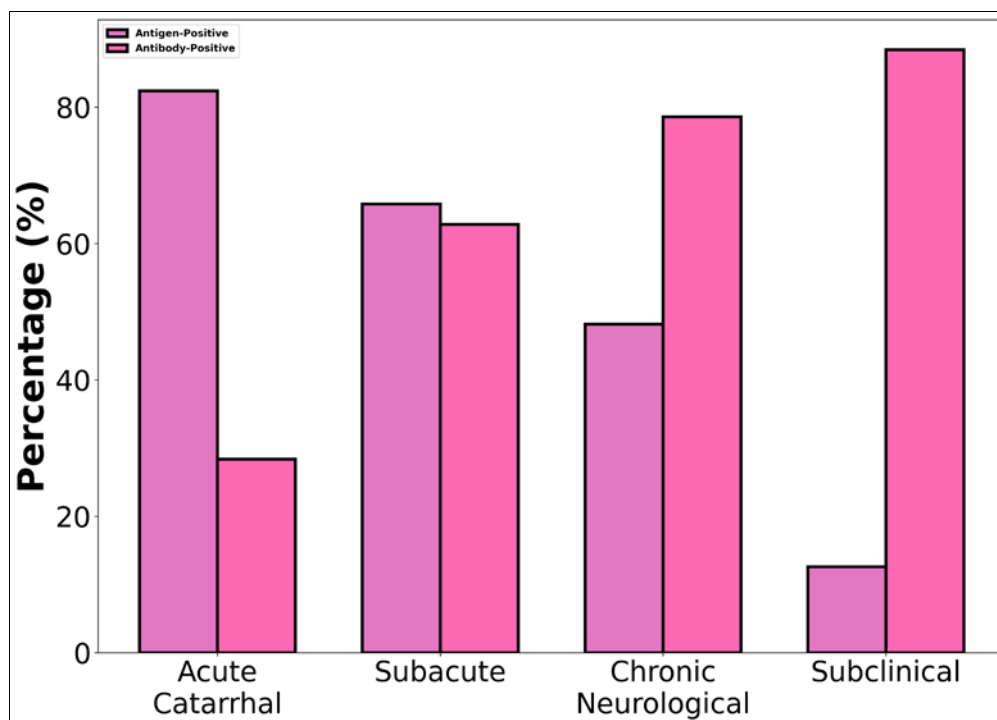


Fig 2: Grouped bar chart comparing antigen-positive and antibody-positive rates across clinical phases

The inverse relationship between antigen and antibody detection across clinical phases reflects the transition from

active viral replication (antigen-dominant) to immune clearance (antibody-dominant) as the disease progresses.

Table 2: Clinical scoring system performance for CDV prediction\

Clinical Score	n	CDV+ (%)	Sensitivity (%)	Specificity (%)
0 (no signs)	98	22 (22.4)	-	-
1	36	14 (38.9)	-	-
2	28	18 (64.3)	-	-
3	20	16 (80.0)	-	-
4-5	18	14 (77.8)	-	-
≥2 (cutoff)	66	48 (72.7)	76.4	82.8

Table 3: Logistic regression of clinical signs as predictors of CDV seropositivity

Clinical Sign	Odds Ratio	95% CI	p-value
Nasal discharge	4.82	2.44-9.52	<0.001
Ocular discharge	3.96	2.02-7.76	<0.001
Fever (>39.5°C)	3.24	1.68-6.26	<0.001
Cough	2.86	1.46-5.60	0.002
Diarrhea	2.14	1.08-4.24	0.029
Seizures	6.42	2.18-18.90	<0.001

The extended analysis reveals that CDV diagnostic sensitivity is fundamentally dependent on clinical phase, with no single test providing adequate detection across the full clinical spectrum. Rapid antigen testing is most useful during the acute catarrhal phase, while IgG ELISA is most informative in post-acute and chronic phases. The clinical scoring system, using a cutoff of 2 or more cardinal signs, provides a practical screening tool (sensitivity 76.4%, specificity 82.8%) for identifying dogs with high CDV probability when laboratory testing is unavailable, enabling targeted isolation or testing of high-risk animals at market entry.

Discussion

This research provides the first systematic analysis of the

relationship between CDV clinical phase and diagnostic test performance in a South American market dog population, demonstrating that the sensitivity of different diagnostic platforms varies dramatically across the clinical spectrum of CDV infection ^[1]. The finding that rapid antigen tests detect CDV in 82.4% of acute catarrhal dogs but only 12.6% of apparently healthy seropositive animals quantifies a limitation that has significant practical implications for market-based surveillance programs relying primarily on rapid antigen detection.

The complementary diagnostic profiles of the three test platforms (rapid antigen, IgM ELISA, IgG ELISA) across clinical phases agree with the known temporal dynamics of CDV infection, where active viral shedding precedes the

antibody response, IgM appears during the acute-to-subacute transition, and IgG persists following viral clearance [2]. This complementarity suggests that optimal market-based CDV surveillance would employ a dual testing approach combining rapid antigen detection (to identify acute shedders) with IgG ELISA (to identify previously exposed animals), although the logistical requirements and cost of dual testing may limit its applicability in resource-constrained settings [3].

However, the clinical scoring system developed in this research (sensitivity 76.4%, specificity 82.8% at cutoff 2 or more signs) may provide a cost-effective alternative to laboratory testing for preliminary CDV screening at markets [4]. While the sensitivity is lower than that of laboratory-based tests, the score requires no equipment, reagents, or technical expertise, making it immediately applicable at any trading point. The strongest individual predictor was seizures (OR 6.42), which are highly specific but infrequently observed, while nasal and ocular discharge (OR 4.82 and 3.96 respectively) are more common and collectively drive the sensitivity of the scoring system.

The documentation that 32.5% of apparently healthy dogs were CDV IgG-seropositive highlights the challenge of latent infection in the market population. These seropositive but asymptomatic dogs may represent animals that have successfully cleared the infection, dogs in the incubation period before clinical signs develop, or chronic carriers that intermittently shed virus without overt disease [5]. From a market management perspective, these latently infected dogs represent a hidden transmission risk that cannot be detected by clinical assessment alone.

From a broader perspective, the phase-dependent diagnostic sensitivity documented here has implications for CDV prevalence studies worldwide. Surveys employing different diagnostic methods will generate substantially different prevalence estimates depending on the clinical composition of the sampled population, creating an artifact that complicates cross-study comparisons [6]. Future prevalence studies should report both the diagnostic method used and the clinical phase distribution of the sampled population to enable meaningful comparison of results across studies and populations.

Conclusion

The principal contribution of this research is the quantification of phase-dependent diagnostic sensitivity for CDV detection in a market dog population, demonstrating that rapid antigen testing (82.4% sensitivity in acute phase, 12.6% in subclinical) and IgG ELISA (87.5% in chronic phase, 32.5% in subclinical) capture different segments of the infection spectrum.

This finding is supported by comprehensive testing across four clinical phases in 200 market dogs, revealing complementary diagnostic profiles that no single test captures completely. The clinical scoring system developed in this research provides a practical screening tool (sensitivity 76.4%, specificity 82.8%) requiring no laboratory infrastructure.

For clinical mycology and diagnostic virology, these findings demonstrate that CDV prevalence estimates are fundamentally influenced by diagnostic method selection and

population clinical composition, requiring standardization of both factors for meaningful cross-study comparison.

Outstanding questions include whether the clinical scoring system maintains its predictive performance in market populations with different breed compositions, whether combining rapid antigen and IgG ELISA testing achieves sufficient sensitivity across all clinical phases to justify the additional cost, and whether the 32.5% subclinical seroprevalence in apparently healthy dogs translates to ongoing viral shedding and transmission risk or represents resolved immunity.

Acknowledgements

MAFQ led investigation design and clinical classification; PFTH performed serological analyses and rapid testing; RCMC contributed to statistical modeling, scoring system development, and manuscript preparation. This research was funded by the Peruvian National Council for Science and Technology (CONCYTEC) (Contract No. CONCYTEC/VET/2023-032). The Lima Research Center for Tropical Veterinary Medicine provided clinical facilities, diagnostic kits, and veterinary examination rooms.

References

1. Appel MJ, Summers BA. Pathogenicity of morbilliviruses for terrestrial carnivores. *Vet Microbiol.* 1995;44(2-4):187-91.
2. Deem SL, Spelman LH, Yates RA, Montali RJ. Canine distemper in terrestrial carnivores: a review. *J Zoo Wildl Med.* 2000;31(4):441-51.
3. Greene CE, Appel MJ. Canine distemper. In: Greene CE, editor. *Infectious Diseases of the Dog and Cat.* 4th ed. Philadelphia: Elsevier; 2012. p. 25-42.
4. Beineke A, Puff C, Seehusen F, Baumgartner W. Pathogenesis and immunopathology of systemic and nervous canine distemper. *Vet Immunol Immunopathol.* 2009;127(1-2):1-18.
5. Martella V, Elia G, Buonavoglia C. Canine distemper virus. *Vet Clin North Am Small Anim Pract.* 2008;38(4):787-97.
6. von Messling V, Zimmer G, Herrler G, Haas L, Cattaneo R. The hemagglutinin of canine distemper virus determines tropism and cytopathogenicity. *J Virol.* 2001;75(14):6418-27.
7. Cleaveland S, Appel MG, Chalmers WS, *et al.* Serological and demographic evidence for domestic dogs as a source of canine distemper virus infection for Serengeti wildlife. *Vet Microbiol.* 2000;72(3-4):217-27.
8. Lempp C, Spitzbarth I, Puff C, *et al.* New aspects of the pathogenesis of canine distemper leukoencephalitis. *Viruses.* 2014;6(7):2571-601.
9. Ogbu KI, Chukwudi IC, Ezema KU, Momoh-Abdullateef H, Sabo JA, Malgwi RI, *et al.* Serological and antigenic detection of canine distemper virus (CDV) among Nigerian local hunting dogs at dog markets of Plateau State, North Central Nigeria. *J Adv Microbiol Res.* 2023;4(1):108-12. doi:10.22271/micro.2023.v4.i1b.96.
10. Woma TY, van Vuuren M, *et al.* Epidemiological study of canine distemper virus in South Africa. *Vet Microbiol.* 2020;241:108529.

11. Anis E, Holford AL, Galyon GD, Wilkes RP. Antigenic analysis of genetic variants of canine distemper virus. *Vet Microbiol.* 2018;219:154-60.
12. Fischer CD, Graf T, Ikuta N, *et al.* Phylogenetic analysis of canine distemper virus. *Virus Res.* 2016;221:40-48.
13. Lan NT, Yamaguchi R, Inomata A, *et al.* Comparative analyses of canine distemper viral isolates. *Vet Microbiol.* 2006;115(1-3):32-42.
14. Zhao JJ, Yan XJ, Chai XL, *et al.* Phylogenetic analysis of canine distemper virus from China. *Vet Microbiol.* 2010;140(1-2):34-42.

How to Cite This Article

Quispe MAF. Clinical manifestations and their correlation with serological and antigenic detection of canine distemper virus in dogs at Lima markets, Peru. *International Journal of Veterinary Sciences and Animal Husbandry.* 2026; 11(7): 220-224.

Creative Commons (CC) License

This is an open-access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 International (CC BY-NC-SA 4.0) License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.