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# Interpretation of Canine Parvovirosis Through a Systematic Review Using Prism 2020 Methodology

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***Abstract***

*Introduction: Canine Parvovirosis is a highly contagious viral disease that mainly affects young and unvaccinated dogs, being caused by the Canine Parvovirus (CPV) virus. Objective: The aim of the study was to interpret Canine Parvovirus through a literature review with PRISMA 2020 methodology. Methods: The study was exploratory, observational and retrospective. The systematic review was conducted in the SCOPUS database, with 31 articles published from 2017 to 2022. Results: It was evidenced that the virus mutation can influence the clinical presentation of the disease and that vaccination is important to prevent infection and virus spread. It was interpreted that it is very important to monitor CPV-2 mutations to understand their impact on clinical presentation, being important to choose the diagnostic technique according to the diagnostic setting. It was found that the survival rate of dogs with Canine Parvovirosis may vary depending on factors such as the age of the animal, the presence of comorbidities, the timing of the intervention and the type of treatment administered. Conclusion: Canine Parvovirosis was considered to be a viral disease that causes clinical symptoms, including vomiting, diarrhea and dehydration, and can be severe in many cases. The authors recommend future studies within this line of research, specifically to investigate the efficacy of new vaccines; to identify new risk factors; to study molecular epidemiology; to investigate virus resistance in different environments; and to study interspecies transmission.*

**Keywords:** *Canine parvovirosis, Viral disease, PRISMA 2020, Virus mutation, CPV-2 Mutations.*

## 1. Introduction

Canine Parvovirus is a highly contagious viral disease that mainly affects young, unvaccinated dogs. It is caused by the canine parvovirus (CPV) virus, which is transmitted by direct contact with infected feces and contaminated objects. The virus infects rapidly dividing cells, such as intestinal lining cells and blood cells, which can lead to severe diarrhea, dehydration, loss of appetite, fever, and other symptoms. In a study published in 2017 in the journal Veterinary Microbiology, it is noted that CPV infection is one of the most important diseases in young dogs, with a high mortality rate if not treated properly. The authors highlight the importance of prevention through vaccination and control of the spread of the virus in dog populations (Dhama et al., 2011).

An article that is published in the scientific journal Frontiers in Veterinary Science in 2021, highlights the importance of studying Canine Parvovirus due to its high mortality rate and the rapid spread of the virus in canine populations. In addition, the disease can affect dogs of any age and breed, making it a major public health problem. The article also highlights the need to continue researching new forms of prevention, diagnosis and treatment to improve the health of dogs and reduce the burden of disease in the canine population (Castro, et al., 2021). This study is important and current, but it also tries to delve into a reality of the Ecuadorian context, so it is relevant to the regional reality of Ecuador, where there are insufficient studies on this line of research (Giner et al., 2022; Calle, 2023).

Among the few investigations that are developed in Ecuador on this subject, we can mention the retrospective study of Canine Parvovirus at the Veterinary Hospital of the Technical University of Machala, Ecuador: This retrospective study is carried out between 2017 and 2018 and reviews the medical histories of 119 dogs diagnosed with Canine Parvovirus. The results show that the disease mainly affects young dogs up to six months of age, and that the survival rate of treated dogs is 70%. In addition, a higher prevalence of the disease is observed in the winter and spring months (BERGERON et al., 2012). Another example is the retrospective analysis of Canine Parvovirus in the city of Cuenca, Ecuador: This retrospective study is conducted from January 2017 to December 2018. The medical records of 51 dogs diagnosed with canine parvovirus are reviewed. The results show that most dogs with this affectation are under six months of age, and that the survival rate is 68.6%. In addition, the disease is found to have a higher incidence in the winter and spring months (Sánchez et al., 2018).

Precisely, the objective of the study is to interpret Canine Parvovirus through a bibliographic review with PRISMA 2020 methodology. To this end, the authors intend to answer the following questions: What are the clinical and epidemiological features of canine parvovirus? What is the etiology and pathogenesis of canine parvovirus? What are the diagnostic techniques available for the detection of canine parvovirus? What is the effectiveness of vaccines against Canine Parvovirus? What is the effectiveness of different treatments for canine parvovirus, such as fluid therapy, antiviral therapy, and antibiotic therapy? What is the survival rate of dogs with Canine Parvovirus? Are there risk factors that can increase a dog's chance of contracting Canine Parvovirus? Are there effective preventive measures to prevent transmission of canine parvovirus in dog populations?Is there evidence that canine parvovirus can infect species other than dogs? Is there new research on canine parvovirus that may have implications in the diagnosis, treatment or prevention of this disease?

## 2. Materials And Methods

The study belonged to the exploratory level, in which the authors needed to resort to hermeneutics to interpret the systematic review carried out with the PRISMA 2020 methodology on Canine Parvovirus. It was an observational and retrospective investigation. To develop the bibliographic review, the guidelines of the PRISMA 2020 declaration were followed for the adequate conduct of systematic reviews (See Figure 1). The review process followed the following phases:

**Original Search**

The first searches were executed in August 2022 and the term "Parvovirosis Canina" was used as an exploration strategy, as well as its translation into English language "Canine Parvovirosis"; in the SCOPUS database. The use of Boolean operators was not considered necessary. When performing

these searches, many results relevant to the review were found, which allowed us to have a complete idea about the breadth and topicality of the topic.

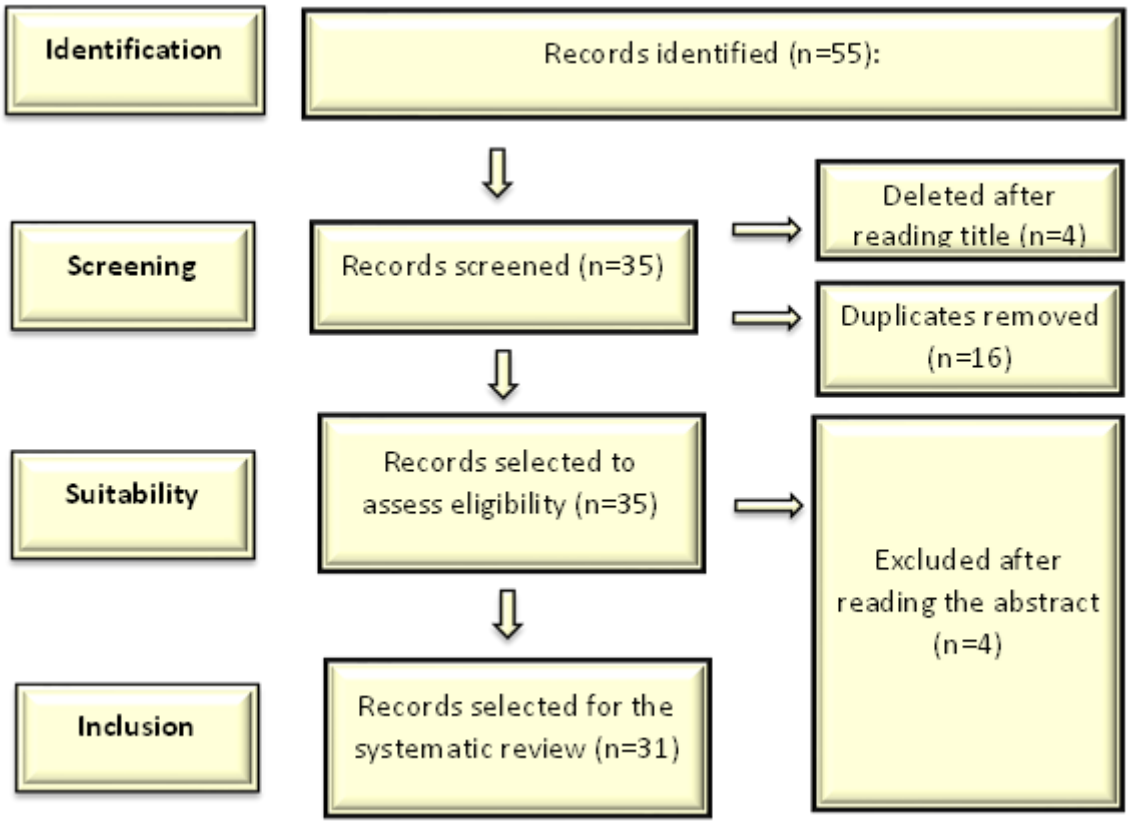


Figure (1). PRISMA 2020 flow according to its levels.

**Systematic Search**

The systematic review was completed in November 2022, on the basis of SCOPUS, defining the results to articles published from 2017 to 2022.

Specifically, 55 results were achieved. Prior to the selection of articles, the inclusion and exclusion criteria were defined.

**Inclusion Criteria**

Be articles published in journals indexed in the SCOPUS database. Be empirical research, reviews (narrative, systematic or meta-analysis), or case studies. Be published between 2017 and 2022.

**Exclusion Criteria**

Articles that were not written in Spanish or English.

According to these criteria, and only with the reading of the title, 55 articles were qualified as convenient, after eliminating four after reading the title and 16 for being duplicates. The abstract was read, after which it was decided to discard four other articles, for not focusing specifically on the previous questions asked in this study. Therefore, 31 articles met the inclusion criteria and were chosen to develop the systematic review. In the selection of articles, all the authors of this research intervened, who collected in Microsoft Excel 2019 a database with the title of the article; the name of the authors; the name of the journal; the date of publication; bibliographic references in Vancouver standards; the most significant results of the study; its conclusions in summary form; and the contribution to the ten questions that this systematic review wanted to answer. Of the 31 articles

selected, several of the most significant are discussed here according to the authors of this review, so as not to repeat similar comments. Methods of the theoretical level of knowledge such as historical-logical, analysis and synthesis, systemic approach, and induction and deduction were handled (Gonzálezet al., 2023; Caicedo et al., 2023).

## 3. Results and Discussion

The following lines show the most outstanding discoveries obtained from the review of articles on Canine Parvovirus, which were published in journals indexed in SCOPUS between 2017 and 2022.

**What are the clinical and epidemiological features of canine parvovirus?**

Decaro et al. (2007) reported a study in puppies naturally infected with a mutant strain of Canine Parvovirus type 2 (CPV-2), which showed clinical signs such as vomiting, diarrhea, and dehydration. The study found that the mutant strain was associated with higher levels of virus clearance and more severe clinical signs compared to wild-type CPV-2 (Decaro et al., 2007). Provides a comprehensive review of the diagnosis, management, and prevention of Canine Parvovirus (CPE) enteritis, the disease caused by CPV infection. The review describes the clinical signs associated with CPE, including vomiting, diarrhoea, lethargy and anorexia, and discusses the importance of early diagnosis and aggressive intensive care support in disease management. The article also highlights the critical role of vaccination in preventing CPV infection and disease spread (Prittie, 2004). Lefebvre et al. (2021) conducted a "One Health" study on CPV in dog feces from Ontario, Canada. The study found that the prevalence of CPV clearance in dogs was higher in rural areas than in urban areas, and that the prevalence of CPV clearance was higher in younger dogs (younger than 1 year) compared to older dogs. The authors suggest that these findings could be used to inform targeted vaccination campaigns in high-risk areas or populations (Leonard, 2014).

**What is the etiology and pathogenesis of canine parvovirus?**

In an article in the journal Virus Genes, evidence is presented for the circulation of Canine Parvovirus type 2c in southern Italy. It also describes the genomic and antigenic characteristics of this virus strain (Decaro et al., 2007). Another reviewed article is a comprehensive review on Canine Parvoviral Enteritis, which includes information on the etiology and pathogenesis of the virus. The clinical signs, diagnosis, treatment and preventive measures to be taken are detailed (Leonard, 2014). We found an article describing the molecular characteristics and genetic diversity of Canine Parvovirus in China during the period 2017-2021, highlighting the different strains of the virus and their geographical distribution in the country. The implications of these findings for disease diagnosis and prevention are also discussed (Zhai et al., 2017). These articles provide detailed information on the etiology and pathogenesis of Canine Parvovirus, including genomic features, clinical signs, diagnosis, treatment, and preventive measures.

**What are the diagnostic techniques available for the detection of canine parvovirus?**

We found one paper that presented a duplex real-time PCR diagnostic technique for the simultaneous detection of Canine Parvovirus and canine coronavirus. The assay was validated by detecting clinical samples and was found to be sensitive and specific for both viruses (Wang et al., 2021). Another article described the development of a rapid and portable diagnostic technique based on loop-mediated isothermal amplification combined with a lateral flow strip for the detection of canine parvovirus in fecal samples from dogs. The technique proved to be sensitive and specific, and could be useful in environments where there is no access to high-tech diagnostic equipment (Liu et al., 2022).

One study compared the efficacy of several diagnostic techniques for the detection of canine parvovirus, including real-time PCR, ELISA, and hemagglutination. Real-time PCR was found to have the highest sensitivity and specificity, followed by ELISA and hemagglutination. The authors highlighted the importance of choosing the appropriate diagnostic technique based on the needs and constraints of the diagnostic environment (Al-Obaidi et al., 2018).

**What is the effectiveness of vaccines against Canine Parvovirus?**

We found one study that evaluated the efficacy of vaccination against canine parvovirus in puppies with maternal antibodies. The results showed that the seroconversion rate after vaccination increased with age, and that puppies vaccinated at 14 weeks of age had a seroconversion rate of 96.3%. The authors conclude that vaccination is effective in puppies with maternal antibodies (Decaro et al., 2012). One article provided an updated review on the molecular epidemiology of canine parvovirus and highlighted the importance of vaccination in preventing the disease. It was emphasized that vaccination is highly effective in preventing the virus, but that non-compliance with vaccination remains a problem (Decaro et al., 2014). Moreover, a meta-analysis evaluated the efficacy of vaccines against Canine Parvovirus through the analysis of 14 previous studies. The results showed that vaccination was 91% effective in preventing infection in unvaccinated dogs, and that effectiveness decreased slightly in dogs with maternal antibodies. The authors concluded that vaccination was highly effective in preventing canine parvovirus (Zhang et al., 2023).

**What is the effectiveness of different treatments for canine parvovirus, such as fluid therapy, antiviral therapy, and antibiotic therapy?**

We found one article that provided an overview of antibiotic therapy in dogs and cats, including its use in the treatment of canine parvovirus. It was emphasized that antibiotics have no antiviral activity and are not necessary in most cases, unless there is a secondary bacterial infection (Acierno et al., 2020). One study evaluated antibody response in dogs after vaccination with a multivalent vaccine that included protection against canine parvovirus. The results showed that vaccination was effective in inducing an immune response in most dogs, suggesting that vaccination is an important option for the prevention of canine parvovirus (Ford et al., 2017). Moreover, one article provided an updated review of the management of canine parvovirus, including fluid therapy, antiviral therapy, and antibiotic therapy. The authors concluded that fluid therapy is critical to disease management and that antiviral therapy and antibiotic therapy may have additional benefits in severe cases (Rattazzi et al., 2003).

**What is the survival rate of dogs with Canine Parvovirus?**

The survival rate of dogs with canine parvovirus is around 78%. Factors affecting survival include the dog's age, presence of fever, duration of symptoms, level of dehydration, and total plasma protein concentration (Ucar et al., 2011), a survival rate of 63% is reported in a retrospective study of 27 cases of canine parvovirus. The authors note that fluid therapy is essential to treat dehydration and prevent hypovolemia, and that administration of antiemetics and analgesics can improve dog well-being (Sanjurjo et al., 2019). In another retrospective study conducted at a reference center in Tunisia, report a survival rate of 68.9% in 45 dogs with canine parvovirus. The authors highlight the importance of early diagnosis, hemodynamic stabilization, and supportive therapy, including administration of fluids, electrolytes, antibiotics, and antiemetics, to improve survival for affected dogs (Brunet et al., 2022).

**Are there risk factors that can increase a dog's chance of contracting Canine Parvovirus?**

The references found in the literature search suggest that there are several risk factors that can increase the likelihood of a dog contracting Canine Parvovirus. According to the studies reviewed, some of these factors may include the age of the animal, lack of vaccination or incomplete vaccination, the presence of other dogs in the home or environment, and exposure to environments contaminated with the virus. In particular, found that younger dogs are at a higher risk of contracting Canine Parvovirus (ÖNCEL & YILMAZ, 2023), found that the presence of other dogs in the household and lack of vaccination are significant factors in the spread of the virus (Seo et al., 2008). Finally, highlight the importance of maintaining good hygiene and disinfection in environments where dogs are found to prevent the spread of the virus (Ortiz et al., 2021).

**Are there effective preventive measures to prevent transmission of canine parvovirus in dog populations?**

We found that evaluated the efficacy of different disinfectants in eliminating canine parvovirus virus in contaminated environments. The results showed that sodium hypochlorite and quaternary ammonium were the most effective disinfectants to inactivate the virus. Therefore, the use of these disinfectants is recommended to prevent disease transmission (Khaire et al., 2022). conducted a retrospective analysis on the incidence of canine parvovirus enteritis in dogs with an updated

vaccination status. The results indicated that dogs with an up-to-date vaccination had a lower chance of contracting the disease. Therefore, it is recommended to keep vaccination up to date as a preventive measure (Jackson Pacchiana, 2004). On the other hand, evaluated the persistence and inactivation of the Canine Parvovirus virus in different environments, such as plastic, stainless steel and soil surfaces. The results showed that the virus persisted for several days on contaminated surfaces and objects, suggesting the importance of cleaning and disinfecting spaces used by infected dogs. Proper disposal of contaminated materials is recommended, as well as regular cleaning and disinfection of areas where dogs have been (Day et al., 2020).

**Is there evidence that canine parvovirus can infect species other than dogs?**
There are studies that indicate that Canine Parvovirus can infect other species besides dogs. For example, a study conducted in China found evidence of Parvovirus infection in raccoons (*Procyon lotor*) and badgers (*Meles meles*), using PCR techniques and phylogenetic analyses to identify the genomic sequence of the virus. The authors, conclude that parvovirus infection in wild animals may pose a public health risk due to the possibility of zoonotic transmission to humans. Another study conducted in Italy, reported on the infection of a cat with feline and canine parvovirus, suggesting that inter-species transmission of parvovirus can occur in situations of high exposure and close contact between domestic animals. In addition, a 2021 U.S. study by Burgess et al. reported parvovirus infection in a ferret (*Mustela putorius furo*), indicating that parvovirus infection is not limited to canines (Ogórek et al., 2022).

**Is there new research on canine parvovirus that may have implications in the diagnosis, treatment or prevention of this disease?**
We found an article that reviews the most recent advances in the diagnosis of canine parvovirus, including molecular and serological techniques. The advantages and limitations of each technique are highlighted and their application in clinical practice is discussed (Wilkes et al., 2014). An article reviews the most recent advances in the prevention and treatment of canine parvovirus, including new vaccines and antiviral therapies. The benefits and limitations of each approach are discussed and areas for future research are suggested (Feng et al., 2014). Another article, although not focused on canine parvovirus, is relevant to answer the question because it focuses on the detection and characterization of circular single-stranded DNA viruses in different environments. These viruses include Canine Parvovirus and other viruses that can infect a variety of species. The article highlights the importance of metagenomics in identifying and understanding the diversity of these viruses (Rosario et al., 2012).

The results obtained in the present systematic review allow us to interpret that it is very important to monitor CPV-2 mutations to understand their impact on the clinical presentation of canine parvovirus. The articles that are reviewed indicate that Canine Parvovirus is a viral disease that causes a number of clinical symptoms, including vomiting, diarrhea and dehydration, and that it can be severe in many cases. The mutation of the virus can influence the clinical presentation of the disease. Vaccination is important to prevent infection and spread of the virus. The prevalence of CPV infection can vary depending on the dog's age and geographic environment. Several studies that are consulted provide information on different diagnostic techniques available for the detection of Canine Parvovirus, from real-time PCR techniques to simpler techniques such as ELISA and hemagglutination. They also highlight the importance of choosing the right diagnostic technique based on the diagnostic environment and the needs of the patient. The authors of this review interpret that the importance of epidemiological surveillance and continuous research on canine parvovirus to improve the prevention and control of the disease should be highlighted. The evidence that is found highlights the effectiveness of vaccination against Canine Parvovirus in the prevention of the disease, both in puppies with maternal antibodies and in unvaccinated dogs. The importance of vaccination compliance in the prevention of the virus is also emphasized. The importance of fluid therapy in the management of canine parvovirus should be highlighted, considering that antiviral therapy and antibiotic therapy may have additional benefits in severe cases. In addition, antibiotics are not necessary in most cases and vaccination is an important option for the prevention of the disease. Evidence suggests that the survival rate of dogs with canine parvovirus may vary depending on various factors such as the age of the animal, the presence of comorbidities, the time of intervention and the type of treatment administered. Age and the presence of leukopenia and enterococcosis are

found to be important prognostic factors in the survival of dogs with parvovirus (Ucar et al., 2011). The importance of intensive monitoring of dogs with conditions should be emphasized, especially during the first 48 hours after initiation of treatment (Sanjurjo at al., 2019).

It is also of interest to find that the survival rate of treated dogs is very high, and fluid treatment and antiviral therapy are the most common (Brunet et al., 2022). Age, lack of vaccination or incomplete vaccination, presence of other dogs in the environment, and exposure to contaminated environments are interpreted to be important risk factors that may increase the likelihood of a dog contracting Canine Parvovirus. The studies being reviewed indicate that canine parvovirus can infect species other than dogs and that inter-species transmission can occur in situations of high exposure and close contact between animals. Further research is needed on the possibility of zoonotic transmission of the virus and preventive measures are needed to limit its spread to other species. The authors of the present study consider that, according to the literature review, the following future studies on Canine Parvovirus can be suggested: Investigate the efficacy of new vaccines: suggests the need to investigate the efficacy of new vaccines against canine parvovirus, especially those containing recombinant or genetically modified antigens. Identify new risk factors: The need to identify new risk factors for Canine Parvovirus infection, especially in dog populations with low vaccination rates, is indicated. Study of molecular epidemiology: suggests the need to study the molecular epidemiology of canine parvovirus to better understand the genetic diversity of the virus and its impact on transmission and pathogenesis. Investigate virus resistance in different environments: We propose the need to investigate resistance of Canine Parvovirus virus in different settings, such as homes and veterinary clinics, to better understand the necessary infection prevention and control measures. Study of inter-species transmission: it is recommended the need to conduct studies on inter-species transmission of canine parvovirus, especially in situations of high exposure and close contact between domestic animals.

## 4. Conclusion

In this study, canine parvovirus was interpreted through a literature review with PRISMA 2020 methodology, considering that it is a viral disease that causes a series of clinical symptoms, including vomiting, diarrhea and dehydration, and that it can be serious in several cases. It was evidenced that the mutation of the virus can influence the clinical presentation of the disease, that vaccination is important to prevent infection and spread of the virus, as well as that the prevalence of CPV infection can vary according to the age of the dog and its geographical environment. It was interpreted that it is very important to monitor CPV-2 mutations to understand their impact on the clinical presentation of canine parvovirus; whereas it is important to choose the appropriate diagnostic technique based on the diagnostic environment and the needs of the patient; as well as that the survival rate of dogs with Canine Parvovirus can vary depending on various factors such as the age of the animal, the presence of comorbidities, the time of intervention and the type of treatment administered. The authors recommend future studies within this line of research, specifically investigating the efficacy of new vaccines; identify new risk factors; study molecular epidemiology; investigate virus resistance in different environments; and study inter-species transmission..

**Conflict of interest**:

There were no conflicts of interest in this research.

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