

EPIDEMIOLOGICAL ASSESSMENT OF FELINE PANLEUKOPENIA AMONG DOMESTIC CATS IN AND AROUND BENGALURU

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ABSTRACT

Feline panleukopenia (FPL) is an acute, highly contagious viral disease of cats characterized by profound leukopenia, enteritis and high mortality in susceptible populations. This study evaluated the incidence of FPL in domestic cats presented to the Veterinary College Hospital, Hebbal, Bengaluru, using clinical, hematological, biochemical, and molecular diagnostic approaches. A total of seventy-six suspected cases and six healthy controls were screened. The causative agent, Carnivore protoparvovirus 1, was confirmed using polymerase chain reaction (PCR) and rapid immunochromatographic (IC) testing. Results revealed that 82.89% of suspected cats were PCR-positive, with the highest prevalence in unvaccinated, outdoor, non-descript cats aged three to six months. Epidemiological factors such as immunization status, housing type, deworming, diet, and early maternal nutrition significantly influenced disease occurrence. The findings emphasize the importance of vaccination, biosecurity, and early preventive care in controlling FPL outbreaks.

Keywords: Feline panleukopenia, PCR, immunochromatography, epidemiology

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INTRODUCTION

Feline panleukopenia (FPL), also known as feline distemper or cat plague, remains a significant cause of morbidity and mortality in domestic and wild felids worldwide, despite the availability of safe and effective vaccines (Day *et al.*, 2016; Barrs, 2019). The disease is caused by Carnivore protoparvovirus 1, a small, non-enveloped, single-stranded DNA virus of

the family Parvoviridae (Cotmore *et al.*, 2019). The virus demonstrates a strong affinity for rapidly dividing cells, especially those in lymphoid tissues, intestinal crypt epithelium, and bone marrow, leading to severe leukopenia, lymphoid depletion, and necrotizing enteritis (Greene, 2012). Clinically, affected cats present with fever, anorexia, lethargy, vomiting, and hemorrhagic diarrhea, and in severe cases, the disease is rapidly fatal particularly in kittens during the immunity gap period (Zenad and Radhy, 2020).

Transmission is primarily feco-oral, with massive viral shedding occurring in feces, urine, saliva, and vomitus. The remarkable environmental resilience of the virus allows it to persist for months to years and resist many commonly used disinfectants, making indirect transmission via contaminated fomites a major epidemiological concern (Hossen *et al.*, 2024). Outbreaks have been documented globally in shelters, multi-cat households, and feral populations, where poor sanitation, high population density, and low vaccination coverage facilitate rapid spread (Rehme *et al.*, 2022).

Risk factors for FPL include age, immune status, housing type, nutrition, and preventive healthcare practices such as vaccination and deworming (Sawale *et al.*, 2024). Kittens are particularly vulnerable during the period when maternally derived antibodies decline below protective levels yet before vaccination-induced immunity develops (Zenad and Radhy, 2020). This

study aimed to determine the prevalence and epidemiological distribution of FPL in domestic cats in Bengaluru by employing clinical assessment, hematology, biochemistry, and both rapid antigen detection and PCR confirmation.

MATERIALS AND METHODS

Seventy-six cats showing clinical signs suggestive of FPL were presented to the Veterinary College Hospital, Hebbal, Bengaluru, between January and June 2025. Six apparently healthy cats served as controls for the study. Detailed history of animals such as age, breed, gender, types of housing, source of adoption, deworming status and vaccination status was obtained from all the clinical cases, and clinical examinations were conducted, recording appetite, activity, rectal temperature, and gastrointestinal signs.

A total of 76 cats were subjected for obtaining blood samples (2 mL in EDTA and 2 mL in clot-activated tubes) utilized for hematology and serum biochemistry, respectively. Fecal swabs were obtained for Immunochromatography (IC) testing and PCR; PCR samples were stored in phosphate-buffered saline. The IC test was performed using FPV rapid antigen kits (BioNote Inc., Korea). DNA was extracted using QIAGEN DNA isolation kit for PCR targeting FPV-specific genes using primers which were synthesized by BioGenics and are as mentioned in Table 1. PCR conditions required for amplification of FPV are also given in Table 2. After obtaining the PCR

product it was run over 1.5% agarose gel using Electrophoresis at the rate of 5V/cm of the gel for about 50-60 minutes was carried out and the amplicon size of 698 was appreciated under Gelstan gel doc system (Medicare) as shown in Fig. 1. Hematological analysis and biochemical assays were done using automatic cell counter and a semi-automatic analyzer respectively.

RESULTS AND DISCUSSION

Of the seventy-six suspected cases, sixty-three (82.89%) were PCR-positive for FPL, confirming the high prevalence of the disease in Bengaluru cats. Rapid IC testing detected thirty-nine positives (51.31%), all of which were confirmed by PCR. This underscores the superior sensitivity of PCR, consistent with earlier recommendations for molecular confirmation due to possible false negatives in antigen detection by other diagnostic methods (Raheena *et al.*, 2017). All of the healthy controls tested negative, further validating the strong association between tentative clinical diagnosis and PCR confirmation. Among the 76 animals tested PCR confirmed 63 as positive giving incidence percentage of 82.89% (Table 3).

Age-wise analysis revealed a significant difference in infection rates (χ^2 , $p < 0.0001$). The highest positivity was observed in the 3–6-month group (44.44%), followed by cats >12 months (19.05%) and 6–9 months (14.29%). Notably, only 25% positivity was detected in the 9–12 month group, while kittens below 3 months showed

15.87% incidence (Table 4). This distribution supports earlier findings that kittens in the immunity gap are most susceptible (Zenad and Radhy, 2020).

Vaccination status was a decisive factor (χ^2 , $p < 0.0001$). All unvaccinated cats tested positive (82.54%), compared to 12.70% in irregularly vaccinated cats and just 4.76% in regularly vaccinated cats (Table 5). These results reinforce the importance of proper vaccination schedules in mitigating FPL risk (Day *et al.*, 2016; Kabir *et al.*, 2023).

Gender-wise distribution exhibited a strong statistical association (χ^2 , $p < 0.0001$). Males were disproportionately affected (88.88%) compared to females (11.11%) these results are mentioned in Table 6. This aligns with earlier findings suggesting that roaming and territorial aggression predispose male cats to greater exposure (Hossen *et al.*, 2024).

Table 7 shows the breed-wise distribution showed no statistically significant difference (χ^2 , $p = 0.4025$). Non-descript/Domestic Shorthair cats had the highest incidence (65.08%), followed by Persians (33.33%) and Bengal cats (1.59%). The predominance in non-descript cats mirrors earlier reports highlighting higher exposure risks among stray and mixed-breed populations (Sawale *et al.*, 2024).

Housing patterns were significantly associated with FPL incidence. Cats from multiple-pet households had markedly

higher positivity (85.71%) than single-pet households (14.29%) (χ^2 , $p < 0.0001$). Similarly, outdoor housing carried the greatest risk (84.13%), compared with semi-outdoor (6.35%) and strictly indoor cats (9.52%) (χ^2 , $p = 0.0013$). Table 8 and 9 shows the findings and are supported by earlier observations that environmental contamination and close contact drive FPV transmission (Rehme *et al.*, 2022).

Deworming practices also significantly influenced infection risk (χ^2 , $p = 0.0075$). Cats that were never dewormed had the highest positivity (49.20%), followed by irregularly dewormed (31.75%) and regularly dewormed cats (19.05%). This suggests that parasite-induced immune stress may exacerbate susceptibility to FPL (Table 10).

Source of adoption was another determinant (χ^2 , $p = 0.0091$). The highest infection rates were observed in abandoned/stray cats (42.86%), followed by cats adopted from friends/family (22.22%) and NGO/shelter cats (12.70%). In contrast, breeder/cattery cats showed the lowest positivity (6.35%). These findings reflect differential exposure risks, with stray and shelter populations being most vulnerable due to poor vaccination coverage and high environmental viral load (Table 11).

Overall, the results confirm that FPL remains endemic in Bengaluru's cat population, with significant risk factors

including young age, male gender, lack of vaccination, outdoor housing, poor deworming, and stray adoption. The prevalence patterns parallel global epidemiological trends (Barrs, 2019). Addressing these modifiable risk factors through vaccination, deworming, controlled housing, and early maternal care could substantially reduce the disease burden.

CONCLUSION

Feline panleukopenia remains a major health threat to domestic cats in Bengaluru, especially those that are young, unvaccinated and free-roaming. PCR proved more sensitive than rapid antigen testing, making it the preferred diagnostic method for clinical and epidemiological investigations. Preventive strategies must include complete vaccination programs, regular deworming, provision of adequate maternal colostrum, and minimization of outdoor exposure. Shelter and community cat management programs should prioritize these measures to curb outbreaks.

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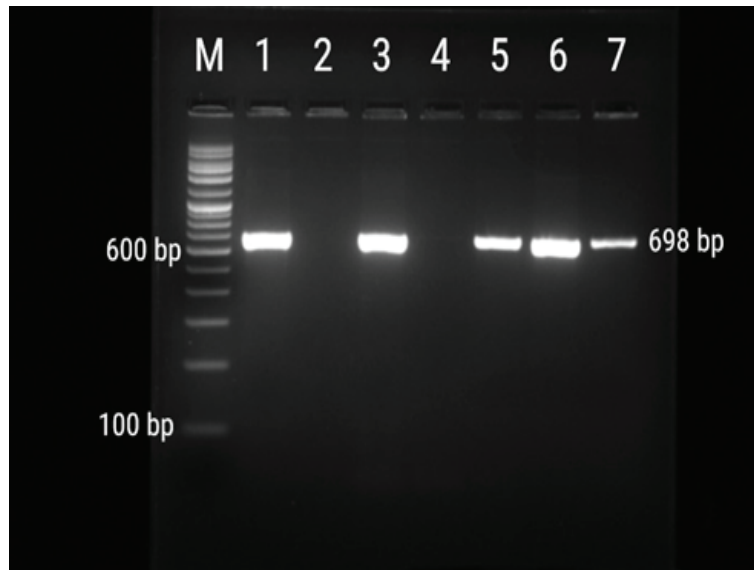
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Table 1: Primers employed for the PCR amplification and their specifications

Forward and reverse primer	Primer's sequence (5'-3' direction)	Target Gene	Product size	Reference
FPL FP	GCTTTAGATGATACTCATGT	VP2 capsid protein	698bp	Mochizuki et al. (1996)
FPL RP	GTAGCTTCAGTAATATAGTC			

Table 2: Composition of reaction mixture employed to amplify VP2 gene of FPLV

Sl. No.	Reaction mix	Quantity
1	Master mix 2X	12.5 µL
2	Forward primer (10 picomoles/µL)	1 µL
3	Reverse primer (10 picomoles/µL)	1 µL
4	Nuclease free water (NFW)	5.5 µL
5	Template DNA	5 µL
	Total	25 µL

**Fig 1: Screening of fecal samples using PCR**

Lane M: 100bp ladder; Lane 1: Positive control – Tricat trio vaccine (698 bp);

Lane 2: No template control ; Lane 3,5,6,7: Positive samples (698 bp)

Lane 4: Negative samples

Table 3: Incidence of feline panleukopenia in domestic cats based on PCR

Total no. of samples	Positive samples	Percent positivity (%)
76	63	82.89

Table 4: Age-wise incidence of feline panleukopenia in domestic cats based on PCR

Age groups	No. of cases suspected	No. of cases positive	Incidence rate (%)	P value (χ^2 test)
0-3 months	11	10 (90.9 %)	15.87	<0.0001
3-6 months	33	28 (84.84 %)	44.44	
6-9 months	10	9 (90 %)	14.29	
9-12months	16	4 (25 %)	6.35	
>12 months	16	12 (75 %)	19.05	
TOTAL	76	63		

Table 5: Incidence of FPL based on vaccination status (combined-Tricat-trio / Biofel PCH)

Vaccination (combined)	No. of cases suspected	No. of cases positive	Incidence rate (%)	P value (χ^2 test)
Vaccinated	12	3 (25 %)	4.76	<0.0001
Improper Vaccination	12	8 (66.66 %)	12.70	
Unvaccinated	52	52 (100 %)	82.54	
TOTAL	76	63		

Table 6: Gender-wise incidence of FPL in domestic cats

Gender	No. of cases suspected	No. of cases positive	Incidence rate (%)	P value (χ^2 test)
Male	57	56 (98.2 %)	88.88	<0.0001
Female	19	7 (36.84 %)	11.11	
TOTAL	76	63		

Table 7: Breed wise incidence of feline panleukopenia in domestic cats by PCR

Breed	No. of cases suspected	No. of cases positive	Incidence rate (%)	P value (χ^2 test)
ND/DSH	48	41 (85.42 %)	65.08	0.4025
Persian	26	21 (80.77 %)	33.33	
Bengal cat	2	1 (50 %)	1.59	
TOTAL	76	63		

ND: Non-descript; DSH: Domestic short hair

Table 8: Influence of type of housing on the incidence of FPL

Housing pattern	No. of cases suspected	No. of cases positive	Incidence rate (%)	P value (χ^2 test)
Single pet	20	9 (45 %)	14.29	<0.0001
Multiple pets	56	54 (96.42 %)	85.71	
TOTAL	76	63		

Table 9: Influence of type of housing on the incidence of FPL

Type of housing	No. of cases suspected	No. of cases positive	Incidence rate (%)	P value (χ^2 test)
Indoor	12	6 (50 %)	9.52	0.0013
Semi-outdoor	6	4 (66.66 %)	6.35	
Outdoor	58	53 (91.37 %)	84.13	
TOTAL	76	63		

Table 10: Incidence of FPL based on deworming status

Deworming status	No. of cases suspected	No. of cases positive	Incidence rate (%)	P value (χ^2 test)
Regular	19	12 (63.15 %)	19.05	0.0075
Irregular	25	20 (80 %)	31.75	
Never done	32	31 (96.87 %)	49.20	
TOTAL	76	63		

Table 11: Incidence of FPL based on source of adoption

Source of adoption	No. of cases suspected	No. of cases positive	Incidence rate (%)	P value (χ^2 test)
Breeder/ cattery	9	4 (44.44 %)	6.35	0.00911
Born in the house	13	10 (76.92 %)	15.87	
NGO/ Shelter	8	8 (100 %)	12.70	
Family/ Friends	17	14 (82.35 %)	22.22	
Abandoned/ Stray	29	27 (93.10 %)	42.86	
TOTAL	76	63		

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