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Comparison of hemogram, amylase and lipase values in cats with feline panleukopenia disease and healthy cats

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ABSTRACT

Feline panleukopenia (FPV), commonly known as the feline distemper virus, is a type of DNA virus. Known for its high transmissibility, FPV primarily affects young cats, particularly targeting the bone marrow, intestines, and lymphatic system. Without treatment, it can be fatal. The aim of this study is to compare the hemogram parameters of an infected cat with those of a healthy cat, and to facilitate diagnosis and prognosis by also comparing amylase and lipase levels. In the study, 30 cats were evaluated and divided into two groups: the control group and the patient group. The patient group consisted of 15 cats that tested positive for FPV using a rapid antigen test, while the control group consisted of 15 cats that tested negative for the antigen and showed no clinical symptoms. In the study, white blood cell, lymphocyte, neutrophil, neutrophil, monocyte, eosinophil, red blood cell and platelet counts, haematocrit and haemoglobin values were found lower in sick cats ($p<0.05$). Amylase and lipase values of sick cats were found to be higher than healthy cats ($p<0.05$). According to the study's results, white blood cell count, neutrophil, monocyte, lymphocyte counts, and platelet count were found to be highly reliable parameters for diagnosing FVP infection.

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Introduction

Feline Panleukopenia Virus (FPV) is a disease called Feline Distemper or Feline Parvovirus infections. The causative agent of this disease is a single-stranded non -enveloped DNA virus of the Parvoviridae family. This virus is highly contagious in cats and causes many physiological changes. FPV, also known as feline infectious enteritis, pseudomembranous enteritis, feline agranulocytosis due to its pathogenesis, is a disease agent with symptoms such as high fever, vomiting and diarrhoea. It is seen in cats of all ages, but young cats are more affected. The disease is most characterised by a decrease in white blood cells and an affected bowel structure. Mortality and morbidity rates are high (Bet aler ve et al., 1983, Scott, 1987, Steinel et al., 2001). It affects other members of the felidae family as well as cats. It also infects mink, raccoons and foxes.

Many methods have been developed to diagnose and follow the prognosis in FPV to date. Detection of faecal FPV antigen is one of the most valuable diagnostic methods. The faecal antigen test has excellent specificity. However, due to its limited sensitivity, false positive results are very rare, so false negative results are more likely. Therefore, a negative faecal ELISA does not rule out FPV infection. Additional tests may be valuable in these cases (Tuzio, 2021).

Antibodies against FPV can be detected by haemagglutination inhibition (HI), ELISA or indirect immunofluorescence. As these tests do not distinguish between vaccine-derived and infection-derived

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antibodies, their use for the diagnosis of FPV infection in sick animals is limited. However, they are useful for identifying animals protected against panleukopenia (Tuzio, 2021).

Haematological parameters may show pancytopenia and mild anaemia due to decreased erythrocyte production.

Serum biochemistry panel results are not specific for FPV. Hypoalbuminemia is the most common abnormality, probably due to decreased protein intake and leakage from mucosal lesions into the gastrointestinal tract (Kruse ve et al, 2010).

Since parvovirus causes pathognomonic microscopic changes of intestinal crypt necrosis with villus blunting in the jejunum and ileum, histopathology is the confirmatory test. Cellular depletion of bone marrow and lymphoid tissues may also occur. In any suspicious case, samples from these four tissues should be sent for histopathology (Tuzio, 2021).

One of the common problems in virus detection is the rapid decline of virus particles in faeces when an enteric infection occurs and false negatives caused by a decrease in the number of virus particles with dilution (diarrhoea) (Tuzio, 2021).

Although many laboratory and pathological tests are used in the diagnosis of FPV, it is known that tests can yield false negative results in the early stages of the disease, and existing leukopenia may not be reflected in laboratory results. Therefore, there is a need for additional parameters that can support diagnosis in cats carrying the disease and in co-infection situations, provide early findings of organ damage, and be used to monitor prognosis during treatment.

In our study, the differences in hemogram, serum amylase, and lipase values of FPV-infected cats were compared to healthy cats. It is known that leukopenia, neutropenia, lymphopenia, thrombocytopenia, and anemia are observed in the hemogram. However, since studies have shown that hemogram parameters may not always provide disease-specific and sensitive results, serum amylase and lipase levels were also examined in our study, as they are thought to indicate gastrointestinal system damage and facilitate diagnosis when supported by hemogram parameters. The elevated serum amylase value, which indicates gastrointestinal system involvement, showed an increase compared to normal cats. For the lipase enzyme, it was concluded that it can be elevated in secondary infections as well as in gastrointestinal damage. Since both enzymes are released from the gallbladder, other gallbladder-related pathologies were also examined.

Some factors limiting this study include the disease presenting with nonspecific symptoms in the early stages and progressing in the late stages, delaying diagnosis and treatment; difficulties in performing diagnostic tests due to the patient's clinical findings and general condition deterioration; challenges in controlling patients while collecting blood samples; and the inability of pet owners to cooperate with relevant veterinarians during the diagnosis and treatment process.

The aim of the study is to compare the hemogram parameters, amylase, and lipase values of an FPV-infected cat with those of a healthy cat.

Materıals and Methods

Ethical statement

The study was conducted within the scope of the Ethics Committee Report obtained from Sivas Cumhuriyet University Animal Experiments Local Ethics Committee (decision dated 08.03.2023 and numbered 65202830-050.04.04-711).

Animal material

As part of the study, the animal material consisted of 15 cats diagnosed with Feline Panleukopenia and 15 healthy cats without any signs of illness, all of which were owned and brought to the Mascote Veterinary Clinic in the Bornova district of Izmir province.. The animal owners were provided with necessary information about the blood and stool sample collection process and the interventions to be applied to the animals during these procedures within the scope of the study and a consent form was signed. No anesthetic or analgesic drugs were administered to the animals during the collection of samples.

Rapid antigen test method

After positioning the cat appropriately for the rapid antigen test, a swab was gently inserted about 1 cm into the rectum and moved around the rectal pouch lumen to collect a fecal sample. The fecal sample on the swab was mixed in the sample diluent fluid for about 10 seconds. The sample was left to stand for about 20 seconds to allow large particles to settle. The test kit (Vet Expert FPV Ag, South Korea) was placed on a flat surface. Using the dropper provided with the test kit, 4 drops of the sample were added vertically to the sample well. The test was left for 10 minutes before reading. Cats whose tests were read and determined to be positive were included in the patient group.

Collection of blood samples and processing in the laboratory

Blood samples were collected by veterinarians from the cephalic veins of cats, with 0.5 ml drawn into a 2 ml

tube containing Ethylenediamine Tetraacetic Acid (K2EDTA) and 1 ml into a 5 ml tube with Clot Activator. After collecting blood in the EDTA tube for complete blood count, it was gently mixed by inverting to prevent coagulation and sent to the laboratory. The blood collected in the Clot Activator tube for biochemistry results, was left to rest for 10 minutes in the laboratory before centrifugation. A Mindray BC-30 Vet Hemogram device was used to determine the hemogram data. After entering the device settings, the EDTA tube containing the blood sample was placed in the device's sample intake apparatus to deliver the sample. Results were digitally transferred by the device and a physical copy was obtained.

After the biochemistry tube arrived at the laboratory, it was centrifuged in a Medwelt 800d centrifuge at 3000 rpm for 10 minutes. The centrifuged samples were then placed in a Fujifilm Dri-Chem NX600 biochemistry analyzer. Results were digitally transferred by the device and a physical copy was obtained.

Statistical analyses

It was determined that the data (haemogram parameters, amylase and lipase) did not show normal distribution by performing normality test. The comparison of health status (patient and healthy), gender (male and female) parameters were compared by Mann-Whitney U test and age group (3-5 months, 6-11 months, 12-17 months and 18 months and over) were compared by Kruskall-Wallis test and 5% significance level was accepted.

Results

The study evaluated 30 cats. The age range of the patient group was between 2 months and 22 months, while the control group's age range was between 5 months and 11 years. In both groups, eight male and seven female cats were assessed.

Examining the hemogram parameters, leukopenia and neutropenia were observed in all 15 cats in the patient group. Lymphopenia was detected in 9 patients, anemia in 2 patients, and thrombocytopenia in 9 patients. The hemogram parameters in the control group were within normal ranges (Yarsan, 2023).

The values of white blood cell (WBC) count, lymphocyte count, lymphocyte percentage, neutrophil count, neutrophil percentage, eosinophil count, eosinophil percentage, erythrocyte count, and monocyte count in the patient cats were found to be lower and statistically significantly different compared to healthy cats ($p<0.05$).

Hemoglobin, hematocrit, and platelet values were lower in patient cats compared to healthy cats, with statistically significant differences ($p<0.05$). The patient cats were anemic and thrombocytopenic.

When examining amylase and lipase values, although these values were within the reference range for both groups, they were found to be higher in patient cats compared to healthy cats, with statistically significant differences ($p<0.05$) (Yarsan, 2023). The blood parameter values, amylase, and lipase values for patient and healthy cats are given in Table 1.

When comparing the blood test parameters of male and female patient cats, no statistically significant differences were found between male and female patient cats for hemogram and biochemistry parameters ($p>0.05$).

In the comparison of blood test parameters according to the age groups of cats, no statistically significant differences were found between the groups ($p>0.05$).

Discussion

FPV is the causative agent of a highly contagious disease characterized by high fever that can result in death (Tuzio, 2021). The study examined the effects of FPV disease on hemogram parameters, amylase, and lipase enzymes in cats.

In a study conducted by Gülersoy et al. (2023), hemogram analysis revealed that the panleukopenia group had lower levels of WBC, lymphocytes, monocytes, granulocytes, erythrocytes, hematocrit, erythrocyte distribution volume, and hemoglobin compared to the control group.

Kadam et al. (2022) observed anemia, neutropenia, and lymphopenia in cats affected by FPL in their study. Modi et al. (2024) detected leukopenia, anemia, thrombocytopenia, neutropenia, and lymphopenia in the hematological analysis of cats affected by FPV.

In the present study, similar to previous studies, WBC, lymphocyte count, lymphocyte percentage, neutrophil count, neutrophil percentage, eosinophil count, eosinophil percentage, erythrocyte count, and monocyte count values were found to be lower in infected cats compared to healthy cats.

The study also found lower hemoglobin, hematocrit, and platelet values in infected cats compared to healthy cats, consistent with previous studies.

After entering the body, the virus multiplies in the oropharyngeal lymphoid tissue. It then spreads to all tissues via the bloodstream. Lymphoid tissue infection causes lymphoid tissue necrosis. Bone marrow infection and suppression lead to a decrease in blood parameters. Clinical signs related to leukopenia and thrombocytopenia appear approximately 2 weeks after bone marrow necrosis.

Table 1. Blood values of healthy and patient cats

Parameters	Group	N	Mean Rank	P (sig.)
WBC	Patient	15	8.00	0.000*
	Healthy	15	23.00	
NEU	Patient	15	8.00	0.000*
	Healthy	15	22.50	
LYM	Patient	15	8.60	0.000*
	Healthy	15	22.40	
MON	Patient	15	8.00	0.000*
	Healthy	15	23.00	
EOS	Patient	15	11.23	0.008*
	Healthy	15	19.77	
NEU%	Patient	15	8.67	0.000*
	Healthy	15	22.33	
LYM%	Patient	15	22.20	0.000*
	Healthy	15	8.80	
MON%	Patient	15	15,13	0.819
	Healthy	15	15.87	
EOS%	Patient	15	19.50	0.013*
	Healthy	15	11.50	
RBC	Patient	15	11.67	0.017*
	Healthy	15	19.33	
HGB	Patient	15	12.50	0.062
	Healthy	15	18.50	
HCT	Patient	15	11.87	0.024*
	Healthy	15	19.13	
MCV	Patient	15	13.63	0.245
	Healthy	15	17,37	
MCH	Patient	15	17.23	0.280
	Healthy	15	13.77	
MCHC	Patient	15	20.60	0.001*
	Healthy	15	10.40	
RDW_CV	Patient	15	17.50	0.213
	Healthy	15	13.50	
RDW_SD	Patient	15	15.97	0.771
	Healthy	15	15.03	
PLT	Patient	15	9.80	0.000*
	Healthy	15	21.20	
MPV	Patient	15	14.70	0.618
	Healthy	15	16.30	
PDW	Patient	15	19,50	0.013*
	Healthy	15	11.50	
PCT	Patient	15	9.53	0.000*
	Healthy	15	21.47	
Lipase	Patient	15	22.70	0.000*
	Healthy	15	8.30	
Amylase	Patient	15	18.77	0.042*
	Healthy	15	12.23	

Irgashev et al. (2023) detected alpha-amylase hyperenzymemia associated with pancreatic damage, a significant increase in bilirubin levels, a 20% increase in serum protein levels, and elevated creatinine and urea levels in their study. This study concluded that cats with panleukopenia have a complex pathogenesis with characteristic changes in hematological and biochemical parameters, along with the development of immunosuppression and multiple organ failure.

Parent et al. (1995) and Armstrong et al. (2012) observed increases in serum amylase and lipase activities in their feline pancreatitis studies.

In the present study, similar to other studies, when examining the biochemical parameters of the infected group and the control group, amylase and lipase values were found to be significantly higher in the infected group compared to the control group. Pancreatic enzyme levels in infected cats are higher than in healthy cats. This increase is thought to be associated with pancreatitis.

Conclusion

In conclusion, FPV is a highly contagious disease agent with high mortality that affects cats of all ages and manifests itself with numerous symptoms. Hemogram parameters will guide clinicians in the diagnosis and prognosis of the disease. The elevated amylase and lipase values in patients compared to the control group are important for diagnosis. However, the fact that amylase and lipase values are within normal reference ranges in all samples makes it difficult to use these enzymes in the diagnosis of FPV.

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