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# Evaluation of feline infectious peritonitis in a Persian Cat using different diagnostic methods in pet hospital, Dhaka

Saima Akter[1] Sharmin Akter[1] Md. Shohel Al Faruk[2]

[1] *Faculty of Veterinary Medicine, Chattogram Veterinary and Animal Sciences University, Chattogram, Bangladesh.*
[2] *Departments of Physiology Biochemistry and Pharmacology, Faculty of Veterinary Medicine, Chattogram Veterinary and Animal Sciences University, Chattogram, Bangladesh.*

***Correspondence:*** *Md. Shohel Al Faruk (shoheldvm03@gmail.com)*

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## ABSTRACT

Feline infectious peritonitis (FIP) is a viral contagious disease of all domestic and wildcats. A 2.5 years old male Persian breed cat was brought to the Teaching and Training Pet Hospital and Research Center, Purbachal, Dhaka, with a history of the lateral recumbent, swollen abdomen, breathing difficulty, and without urination. A clinical examination revealed a collection of fluid in the abdomen and chest, and the cat was suspected of FIP. The blood sample was collected for the estimation of biochemical parameters of total protein (TP), albumin, bilirubin, SGPT, and SGOT. An X-ray and ultrasonography were performed to check the chest and kidney morphology. Collection of fluid in the abdomen and chest, and decreased levels of total protein, albumin, and albumin-globulin ratio confirmed that the cat was infected by FIP. A Rivalta test was performed to observe the changes in effusion fluid and also performed an FIPV antibody test for the qualitative detection of FIPV antibody in feline serum. As the prevalence of FIP is increasing nowadays, a proper diagnosis of this disease is required.

***Keywords:*** *Feline infectious peritonitis, Diagnosis, Blood test, Rivalta test*

## INTRODUCTION

Feline infectious peritonitis is a viral disease caused by feline coronavirus (FCoV) that mainly affects wild and domestic cats. FCoV is an RNA virus with enclosed positive strands and is frequently seen in cats (Hartmann et al., 2003).Together with canine coronavirus, they are members of the family Coronaviridae and the order Nidovirales (Kipar and Meli, 2014). FCoV has been divided into two forms based on serological and genetic characteristics, with type 1 being the most common worldwide. Feline coronavirus can persist for seven weeks in a dry environment and can spread indirectly, notably during cat exhibits, via litter trays, shoes, hands, and clothing (Addie et al., 2009).

Epidemiological studies of FIP have identified the highest prevalence in young cats (3 months to 3 years of age) with the majority of cases (75%) in multi-cat environments (Pesteanu-Somogyi, et al., 2006). Domestic cats are frequently infected with the feline coronavirus, and wild felids may also be seropositive. This infection is more prevalent in several pets than it is in single ones. A fatal disease called FIP, which is most prevalent in environments with many cats, develops in about one in nine FCoV-infected cats. Breeds like the Bengal and particular lineages within breeds have a higher mortality rate from FIP. Age is a significant risk factor, and 70% of cases are kittens under 1-year-old. FCoV-infected cats who are under stress over time are more likely to develop FIP (Addie et al., 2009). Susceptible cats are most likely to contract

FCoV after coming into touch with it in asymptomatic cats' excrement. Within one week of a natural infection, cats start spreading the virus in their feces, and they continue to do during for weeks, months, and in some cases, their entire lives (Pedersen et al., 2008).

The early symptoms of disease cats with FIP disease may be very asymptomatic. Clinical symptoms that are frequently described include listlessness, lethargy, diminished appetite, weight loss, and a fluctuating fever (Riemer et al., 2016). Other symptoms often start to appear after a few days to a few weeks. Most cats at this stage will develop the "wet" or effusive type of FIP, characterized by the buildup of fluid in body cavities. Fluid may build up in the abdomen, causing an enlarged abdomen, or in the thoracic cavity, causing breathing difficulties. In some felines experience "dry" or non-effusive FIP develops, in which little or no fluid builds up. The eyes, brain, liver, intestine, or other organs of the body are frequently severely affected in dry form, which can result in various clinical symptoms. The only clinical symptom in many cats with non-effusive FIP will be ocular problems. Once its infected, most affected cats decline quickly, however, some cats continue to function normally for a few weeks. Unfortunately, practically every occurrence of the illness will end in death (Riemer et al., 2016).

Infection with FCoV is widespread in cats. The FCoV infection rate in domestic cats is approximately 40%, and it reaches 90% in multi-cat households (Tasker, 2018). An increase in FCoV-related disease is most likely a result of changing trends in feline management (Addie, 2012). However, FCoV infection causes feline infectious peritonitis (FIP) in a limited percentage of cases, a deadly condition that is a common cause of mortality in young cats (Pedersen, 2009). FIP outbreaks in multi cat homes or shelters are occasionally documented, possibly more frequently recently (Wang et al., 2013). It might be challenging to accurately diagnose FIP ante mortem in many clinical situations. Therefore, the objective of this case report is to introduce the common and available diagnostic method to identify Feline Infectious Peritonitis in Bangladesh.

## CASE PRESENTATION

A Persian male cat who was 2.5 years old and complaining of not being able to urinate and having an enlarged abdomen was taken to the Teaching and Training Pet Hospital and Research Center, Purbachal, Dhaka, Bangladesh. The cat was not vaccinated and also one of the cats the of the owner died with the same symptoms previously. On clinical examination, the cat was found dehydrated with lateral recumbence. The cat showed 39.4°C body temperatures on clinical examination. The cat was initially suspected of having FIP based on clinical symptoms.

**Sample collection**

Blood samples were taken into vacutainers without anticoagulants for the measurement of total protein (TP), albumin, and globulin to confirm the presence of FIP. Thoracentesis was done through Ultrasonography guidance using a 22 Gauge butterfly needle connected with a 5 mL syringe to collect fluid (Figure 1) and the color of the fluid was yellow (Figure 2).

**Figure 1.** Collection of fluid from the chest

**Laboratory investigation of blood**

For a biochemical test, anticoagulant-free blood was allowed to coagulate for 30 minutes in a slant position before the serum and supernatant were properly separated. Then, the HumaLyzer 3000® carried out the biochemical test following the prescribed procedure and the manufacturer's guidelines.

The biochemical analysis of blood revealed that TP (12.1 gm/dL) is higher than the reference value and albumin (2.3 gm/dL) is less than the reference value as shown in Table 1. The value of globulin was also found through TP and albumin values. The value of

globulin was 9.8 gm/dl. The ratio between albumin and globulin was 0.23. The value of bilirubin, SGPT, and SGOT was 2.1 mg/dL, 185 u/L, and 172 u/L respectively (Table 1).

**Figure 2.** Yellow color thoracic fluid.

**Table 1.** Biochemical parameters of blood serum.

| Blood analysis | Result (gm/dL) | Reference value |
|---|---|---|
| Total protein | 12.1 | 5.2-8.8 (gm/dL) |
| Albumin | 2.3 | 2.5-3.9 (gm/dL) |
| Bilirubin | 2.1 | 0.1-0.4 (mg/dL) |
| AIT/SGPT | 185 | 10-100 (u/l) |
| AST/SGOT | 172 | 10-100 (u/l) |

**Ultrasonography and X-ray**

To determine the morphology of the abdomen and both kidneys, a USG (ultrasonography) of the ventral lower abdomen was performed. The animal was prepared for this by using a disposable razor to shave the ventral lower abdomen. After the animal had been properly restrained, a USG probe was positioned on the ventral lower abdomen to locate the cortex of both kidneys and to assess the internal condition of the abdomen. USG was carried out at a 15A and 4.0MHz frequency.

An X-ray was also performed to know the condition of the abdomen and chest. After the animal had been restrained, the animal was placed under the light in lateral recumbency and also ventral recumbency to take the pictures of abdomen and chest.

The most common Ultrasonic and X-ray findings of FIP are the presence of free fluid in the abdomen and chest (Lewis and O'Brien, 2010). In this case, the presence of free fluid is observed in the abdomen which appeared as black in USG (Figure 3) and was also observed in the abdomen and chest through X-ray (Figure 4).

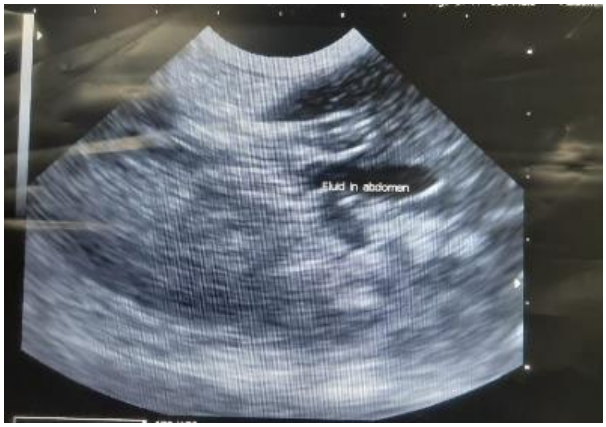


**Figure 3.** Fluid in abdomen.

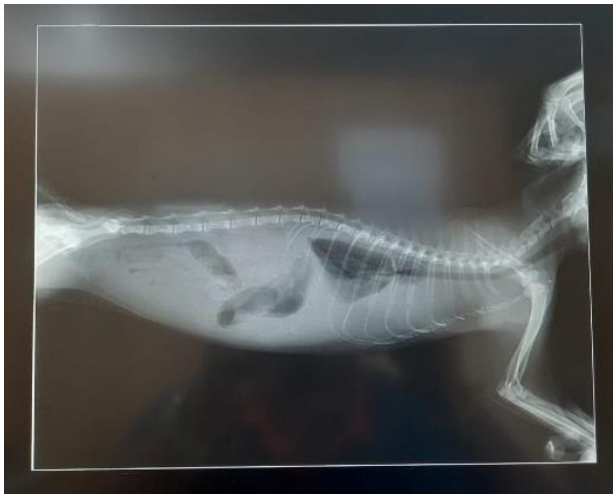

**Figure 4.** Fluid in chest and abdomen.

**Rivalta test**

Rivalta's test can distinguish between transudates and exudates (Fischer et al., 2012). Rivalta test is performed on cat effusions suspected of having FIP. The test is based on the idea that when an effusion fluid sample is put into an acetic acid solution, a precipitate will form.

A reagent tube was filled with 5 mL of distilled water, and 1 drop of acetic acid (98 percent), and the tube's contents were vigorously mixed (Figure 5). One drop of the effusion fluid was carefully put on top of this solution (Fischer et al., 2012).

The Rivalta test was considered effective if a precipitate formed and remained stuck to the surface, maintained its shape, or gradually drifted to the bottom of the fluid. The Rivalta test was considered negative if the effusion fluid drop

disappeared and the solution remained clear. The Rivalta test was regarded as doubtful when slightly opaque swirls occurred that neither formed a clear precipitate nor entirely disappeared (Fischer et al., 2012). In this case, a precipitate was formed and remained stuck to the surface (Figure 5).

**Figure 5.** Rivalta test positive.

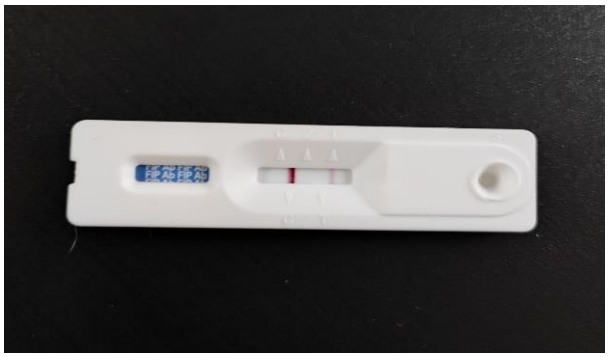

**Figure 6.** FIP antibody rapid test positive.

**Feline Infectious Peritonitis Antibody Rapid test**

The Feline infectious peritonitis antibody rapid test device uses lateral flow immuno-chromatographic assay to identify FIPV antibodies in feline serum or ascites in a qualitative manner and the origin of it is Hangzhou Zhejiang, China. The test device is for in vitro diagnostic use only for felines (www.teastsealabs.com). All kit components (Testsealabs®) and samples (fresh serum) were initially allowed to adapt to room temperature before testing. After waiting for 30 to 60 seconds, 1 drop of serum was added to the sample well. Within 8 to 10 minutes, the result was read after adding 3 drops of buffer to the sample well. In this case, the test kit result was positive (Figure 6).

## DISCUSSION

Ante mortem diagnosis of FIP is challenging that's why the combination of clinical signs and symptoms with diagnostic aid is needed to do the diagnosis of FIP.

Biochemical parameters of blood play an important role in the diagnosis of FIP. In this case, an increased value of TP, bilirubin, SGPT, and SGOT and a decreased value of albumin was found in the biochemical test of blood (Table1). An increase in the concentration of total serum proteins, primarily due to an increase in gamma globulins, is a common laboratory finding of FIP (Paltrinieri et al., 2001). Depending on the extent and location of organ damage, liver enzymes and bilirubin can also be increased, although they are typically not helpful in making a diagnosis. The presence of elevated liver enzyme activity and high bilirubin levels without hemolysis should raise the possibility of FIP (Hartmann et al., 2003). Another important finding of this case was the albumin-globulin ratio which was 0.23. Compared to total serum protein or gamma globulin concentrations, the albumin / globulin ratio has a higher diagnostic value since, if the liver is affected, both albumin and globulin levels will fall (Jeffery et al., 2012). It is hypothesized that Low albumin is frequently accompanied by protein loss carried on by immune complex-induced glomerulopathy or by the extravasation of protein-rich fluid during vasculitis (Fujii et al., 2015). If the serum albumin to globulin ratio is less than 0.8, there is a high probability that the cat has FIP (Julie and Staci, 2016).

The Rivalta test is a common and easy test to suspect FIP. It is used to determine the differentiation of FIP effusions. According to a study of cats who presented with effusion, the test has a strong negative predictive value for FIP of 96% and a positive predictive value of 86% (prevalence of FIP, 51%) (Hartmann et al., 2003). The findings of the Rivalta test, in this case, were a precipitin formed which remains attached to a surface (Figure 5). Compared to blood tests, effusion tests have a better diagnostic value(Giori et al., 2011). Clear yellow effusions with a sticky substance are sometimes referred to as typical findings in the case of FIP but their lone presence in body cavities does not confirm a diagnosis. Pure chylous effusion cases have also been documented in the case of FIP (Addie et al., 2009).

An important diagnostic tool for FIP is FCoV antibody detection. Most likely, healthy cats with negative antibody results are neither FCoV execratory nor carriers. Rapid FIP is the screening test for the accurate detection of FCoV antibodies in whole blood, plasma, serum, and effusion of the cat since it is based on highly specific and recombinant FCoV antigens (Vetlab®). According to the manufacturer's declaration there are two lines on the test cassette. One is C (control) line, and another is T (test) line. The presence of both lines within 10 minutes indicates the presence of FIP, no matter T line is clear or vague. If only a C line has appeared, then the test result is negative (Testsealabs®).

There is a limitation of this case being unable to do CBC (complete blood count). Normocytic, normochromic, non-regenerative anemia, neutrophilic leukocytosis with lymphopenia, eosinopenia, and monocytosis are CBC abnormalities found in FIP-infected cats (Diaz and Poma, 2009).

## CONCLUSION

The clinician must incorporate diagnostic tests to help guide a more definitive diagnosis as the index of FIP suspicion rises. The sensitivity and specificity of the chosen diagnostic test, as well as the limitations of each diagnostic test, must be evaluated.

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