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Status of Hemato-biochemical Parameters in Feline Infectious Peritonitis (FIP) Affected Cats

Zarka Naseer Khan [a], Jasmine Grewal [a], Oveas Raffiq Parray [a], Rather Izhar Ul Haq [a], Shahid Hussain Dar [a], Amatul Muhee [a], Riyaz Ahmad Bhat [a], Raja Aijaz [a], Gh. Rasool Bhat [a] and Mohd. Iqbal Yatoo [a*]

[a] Faculty of Veterinary Sciences and Animal Husbandary Shuhama, Srinagar Kashmir, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Feline infectious peritonitis (FIP) is a serious viral disease of cats that usually results in death. There is derangement of vitals in cats due to FIP including clinical and hemato-biochemical parameters. This study reports same findings in a group of six cats (3 Persian, 2 mixed breed, 1 nondescript) affected with FIP. Cats were diagnosed on clinical signs, FIP rapid test, Rivalta test, USG and X-ray. Ground glass appearance of abdomen on X-ray, hyperechogenicity of liver and loss of renal/cortical texture on ultrasonography (USG) was noted. Among the liver function tests,

**Corresponding author: E-mail: iqbalyatoo@gmail.com;*

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alanine aminotransferase (ALT) and aspartate aminotransferase (AST) were increased to 76.2400±4.35373 and 58.6333±13.75860 IU/L, respectively. Kidney function tests including bilirubin, blood urea nitrogen (BUN) and creatinine were raised 3.533±0.4601, 62.5000±2.45967 and 2.8833±0.48402 mg/dl, respectively. Hematological values including haemoglobin (Hb) (10.4500±0.76714), red blood cell count (RBC) (7.4400±0.78636), packed cell volume (PCV) (26.7667±3.59042), white blood cell count (WBC) (18.2850±2.72594 10^3/µl), granulocytes (15.3167±2.84762%), lymphocytes (1.7000±0.34351%) and platelets (310.8333±75.50074) showed derangement. This study establishes baseline data for FIP cases in this region and can serve as a basis of prognosis of FIP based on clinical and hematobiochemical parameters.

Keywords: Feline infectious peritonitis; viral infectious disease; virus.

1. INTRODUCTION

Feline infectious peritonitis (FIP) is one of the most important viral infectious disease of cats caused by feline infectious peritonitis virus (FIPV) strains of feline coronavirus (FCoV) [1,2]. FIP was reported in 1963 by Holzworth at the Angell Memorial Animal Hospital in Boston, USA [3]. It is present globally and has a variable prevalence ranging from as low to 0.35% to 2% or as high as 22% which depends on numerous risk factors [4,5]. Around 75% cases are in age group of below 3 years with males at higher risk [4,5]. It is a severe immune mediated disease characterised by effusion and pyogranulomatous inflammation [6]. It causes inflammatory cascade and affects multiple organs including liver, kidney, heart, brain and involves structures or body cavities also like peritoneum [7] thus resulting in wet or effusive form and dry or noneffusive form of disease [6]. Complement mediated vasculitis results in effusive form whereas cell mediated granulomatous reaction leads to dry form of disease [8-10]. Clinical signs range from simple fever, anorexia, depression, dullness, weakness, loss of body condition, abdominal distension, to complex ocular deformities and neurological abnormalities [2,11]. Diagnosis is based on clinical signs, effusion analysis, haemato-biochemical, serological, molecular and histological tests [12]. Though there is evidence of FIP in cats in this part of the world however there is lack of study on diagnostic and hemato-biochemical aspects of FIP in cats.

2. MATERIALS AND METHODS

This study was conducted at Veterinary Clinical Complex Faculty of Veterinary Sciences and Animal Husbandry Shuhama. A total of six cats (3 Persian, 2 mix breed, 1 nondescript), in the age group of 1-3 years, were diagnosed based on clinical signs, FIP Rapid test kit, Rivalta test, abdominal USG and X-ray. Blood samples were collected in EDTA vials (0.2 ml) for hematology and clot activator vials (0.8 ml) for biochemical analysis after extracting serum. Hematological analysis was done by automatic veterinary hematology analyser (Nihon Kohden, Celltac alpha MEK-6550) and for biochemical analysis, liver function tests (ALT and AST) and kidney function tests (bilirubin, BUN and creatinine) were done by spectrophotometric assays using kits purchased from Meril India.

3. RESULTS

Cats revealed clinical signs of FIP including abdominal distension (3) (Fig. 1), lethargy, inappetance, intermittent fever, dullness, weakness (6), pale mucous membrane (2), jaundice/icterus (3) and ocular (2) signs. None had neurological signs. Peritoneal fluid from affected cats with abdominal distension (3) showed positive Rivalta test. Five out of six suspected cats tested positive on rapid FIP test. Ground glass appearance of abdomen on X-ray in cats having abdominal distension and hyperechogenicity of liver and loss of renal/cortical texture on USG was noted.

Hematological values including Hb (10.4500±0.76714), RBC (7.4400±0.78636), PCV (26.7667±3.59042), WBC (18.2850±2.72594 10^3/µl), granulocytes (15.3167±2.84762 10^3/µl), lymphocytes (1.7000±0.34351 10^3/µl) and platelets (310.8333±75.50074 10^3/µl) showed derangement. Among the liver function tests, ALT and AST were 76.2400±4.35373 and 58.6333±13.75860 IU/L, respectively. Kidney function tests including bilirubin (3.533±0.4601), BUN and creatinine were 62.5000±2.45967 and 2.8833±0.48402 mg/dl, respectively.

Table 1. Status of biochemical and haematological values (Mean±SE) in FIP affected cats

Parameter	N	Minimum	Maximum	Mean±SE	
	Statistic	Statistic	Statistic	Mean	Std. Error
ALT (U/L)	6	60.99	89.07	76.2400	4.35373
AST (U/L)	6	0.00	88.05	58.6333	13.75860
WBC (10^3/µl)	6	7.01	25.90	18.2850	2.72594
RBC (10^6/µl)	6	5.07	10.20	7.4400	0.78636
Hb (mg/dl)	6	7.30	12.30	10.4500	0.76714
PCV (%)	6	14.50	36.80	26.7667	3.59042
L (10^3/µl)	6	0.70	2.70	1.7000	0.34351
M (10^3/µl)	6	0.10	.40	0.2667	0.04216
E (10^3/µl)	6	0.30	1.50	1.0333	0.20602
G (10^3/µl)	6	3.90	23.50	15.3167	2.84762
PLT (10^6/ µl)	6	0.83	5.4	3.108	0.755
BUN (mg/dl)	6	55.00	70.00	62.5000	2.45967
Creatinine (mg/dl)	6	1.90	5.00	2.8833	0.48402
Bilirubin (mg/dl)	6	2.5	5.6	3.533	0.46019

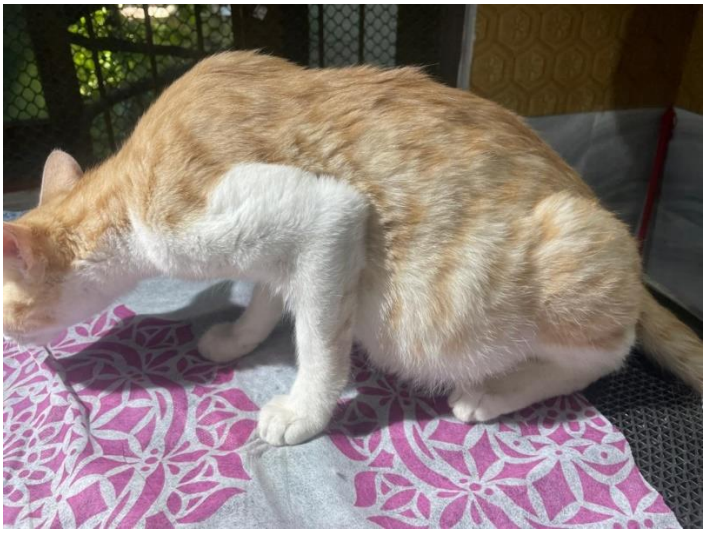

Fig. 1. Abdominal distension in a FIP affected cat

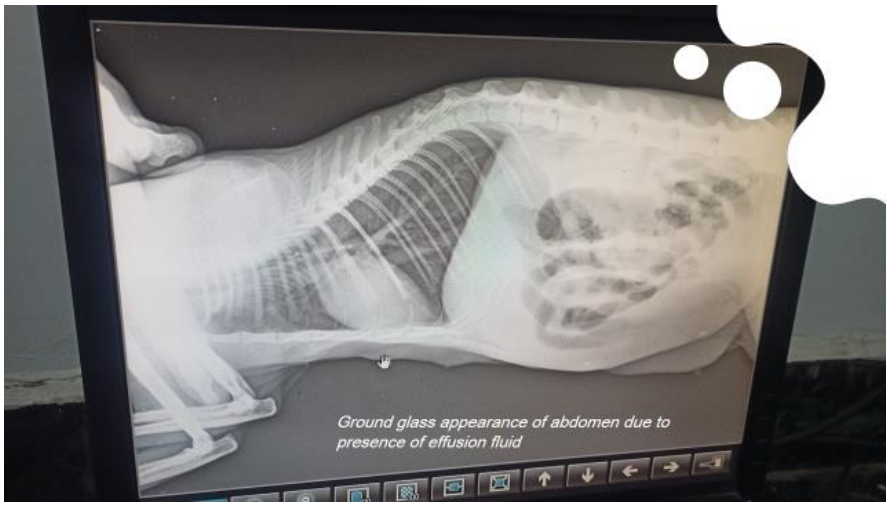

Fig. 2. Ground glass appearance in FIP affected cat

4. DISCUSSION

FIP is a multisystemic disease caused by feline infectious peritonitis virus (FIPV) strains of feline coronavirus (FCoV) [1,2]. It affects various organs or structures thus producing a conglomerate of clinical signs [10,2]. The clinical signs of fever, fluid exudation and distension, loss of body condition, dullness and weakness noted in our findings may be due to inflammatory reactions or perivascular phlebitis induced by FIPV that can affect any organ. These signs are in corroboration with Malbon et al. [7] and Tasker et al. [11].

Diagnosis by Rivalta test and rapid FIP test is routine in clinical practice. High sensitivity has been detected with Rivalta's test which is usually performed for the effusive fluid during the clinical diagnosis of wet FIP cases [12]. It has a sensitivity of 91.3% and specificity of 65.5% [13]. We also noted 100% positive test rate in affected cats with abdominal distension. FIP Rapid tests are frequently used in diagnosing affected cats [12,14]. They detect antigen or antibody in samples and help in rapid diagnosis besides being easy and cheap. They have good sensitivity and specificity. We have noted a positivity of 83.33% (5/6). Vojtkovská et al. [14] have also evaluated various rapid tests for FIP and found a sensitivity of 90 to 95% and specificity of 95% versus PCR test.

In FIP affected cats haematological and biochemical disturbances occur due to effects of virus and inflammatory reactions on various organs and systems. Haematological values RBC, Hb and PCV were lower and WBC, TLC and N were higher in affected cats indicating anaemia and inflammatory response to infection. Yin et al. [15] have also conducted haematological tests in their study which showed similar values in FIP affected cats. Our findings of lower RBC, higher WBC, N and lower L in FIP cats are in corroboration with Paltrinieri et al. [16]. Anaemia, leucocytosis, neutophilia and lymphopenia are routine findings in FIP affected cats which is also reported by Anwer et al. [17] and Tsai et al. [18]. Anaemia may be due to adverse effect on hematopoietic system, nutritional deficiency due to inappetance or anorexia, or damage to RBCs. Leucocytosis may be due to inflammatory response to viral or secondary bacterial infection.

Elevated LFT and KFT parameters may be due to liver and kidney damage. This is in agreement with findings of Anwer et al. [17] and Tsai et al. [18] who have also reported elevated AST, ALT, bilirubin, creatinine and BUN in FIP cats. Sase [19] has reported elevated AST in FIP cats. FIPV damages hepatic and renal parenchymal texture as is also evidenced on USG. Inflammatory exudation or perivascular phlebitis leads to fluid accumulation in abdominal cavity giving ground glass appearance on X-ray. This has also been found by Anwer et al. [17] and Zoia et al. [20].

5. CONCLUSION

This study revealed derangement of clinical, hematological and biochemical parameters in FIP affected cats. Clinical signs can be correlated to effects of inflammatory cascade resulting in fever, dullness, inappetance, lethargy, abdominal distension or recumbency and further progressing to multiorgan damage. Clinical signs, Rivalta test and rapid antigen tests can be helpful in diagnosing FIP. These are easy and cheap but not confirmatory however for confirmation histopathology, RT-PCR or more relevant tests are needed. Their cost and involvement of sophisticated infrastructure make them inconvenient. Diagnostic imaging can be a supportive diagnostic option wherever available.

FIPV affects various organs and organ systems. Decreased values of hemtalogical values may be due to anaemia resulting from liver damage and nutrient deficiency due to less feed intake. Elevated WBC may indicate response to inflammatory reaction or secondary bacterial infection. Increased values of LFT and KFT indicate liver and kidney damage.

Thus this can be concluded from this study that the clinical, biochemical and haematological values can reflect a state of derangement of vital parameters or organ functions and can have diagnostic and prognostic role in FIP cases.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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