Case Report

Feline Icterus with a False-Positive FIP Rapid Test: A Case Report Highlighting the Supportive Diagnostic Role of the Albumin: Globulin Ratio

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Abstract | Feline icterus (jaundice) is a clinical condition marked by bilirubin accumulation, requires a systematic diagnostic approach to differentiate among various hepatobiliary hemolytic or systemic disorders including Feline Infectious Peritonitis (FIP). Differentiating these conditions is crucial especially in resource-limited settings where advanced diagnostics are unavailable. This case report aimed to document a case of feline icterus associated with a false positive FIP test result and supportive role of the albumin: globulin (A:G) ratio in the diagnostic pathway. A two year old male domestic cat presenting with icterus, anorexia, and lethargy underwent clinical examination, rapid FIP antibody testing, serum biochemistry and imaging. The rapid FIP test was positive but serum biochemistry results showed a normal A:G ratio (0.89) with elevated liver enzymes and bilirubin. These findings, combined with the absence of characteristic FIP features on imaging and a positive response to hepatic support therapy led to a diagnosis of primary hepatic jaundice. This case highlights the importance of using the A:G ratio as a supportive diagnostic parameter to scrutinize rapid FIP test results. While not definitive, a normal A:G ratio serves as a critical checkpoint in the diagnostic algorithm for icteric cats helping to prevent misdiagnosis when confirmatory molecular testing is inaccessible.

Keywords | Feline icterus, Feline infectious peritonitis, False positive, Albumin:globulin ratio

Received | February 10, 2026; **Accepted** | April 28, 2026; **Published** | June 13, 2026
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Citation | Islam MM, Sen P, Faruk MSA (2026). Feline icterus with a false-positive FIP rapid test: A case report highlighting the supportive diagnostic role of the albumin:globulin ratio. Res J. Vet. Pract. 14(2): 41-46.
DOI | https://dx.doi.org/10.17582/journal.rjvp/2026/14.2.41.46
ISSN | 2308-2798

INTRODUCTION

Feline icterus (Jaundice) is a common clinical disorder in feline medicine, resulting from the accumulation of bilirubin and characterized by visible yellow pigmentation of the skin, mucous membranes, digital pads and sclera (Sherding, 2000; Silva *et al.*, 2024). Bilirubin is primarily produced from the breakdown of aged red blood cells by macrophages in the spleen and liver. The resulting unconjugated (indirect) bilirubin is transported to the liver to be conjugated and excreted into the biliary system (Rothuizen, 2009). Disruption at any point in this pathway can lead to bilirubin accumulation and icterus. The underlying dysfunction is classically classified as pre-hepatic (hemolytic), hepatic (hepatocellular) or post-hepatic (obstructive) (Center, 2007).

Clinically, icterus is frequently one of the first obvious clinical signs of serious underlying disease in cats. The yellow pigmentation is easily observed in non-pigmented

areas such as the pinnae, gingivae, ventral abdomen, digital pads and sclera. Lethargy, anorexia, vomiting, and weight loss are examples of accompanying systemic symptoms that are often non-specific and reflect the systemic nature of the primary illness (Gagne *et al*., 1999). Bilirubinuria in cats indicates conjugated hyperbilirubinemia and suggests hepatobiliary disease (Kozat and Sepehrizadeh, 2017). FIP is caused by virulent mutations of feline coronavirus (FCoV), is a frequent differential diagnosis for icteric cats due to it's hepatic involvement. It is a fatal immune-mediated disease often presenting with non-specific signs such as fever, icterus, weight loss and effusions (Quimby and Borjesson, 2018). Given these non-specific clinical signs in a cat, a clinician's initial diagnostic step is often a rapid FIP test to help rule in or rule out FIP as a primary differential.

In many clinical settings, particularly in developing regions like Bangladesh, veterinarians rely heavily on rapid immunochromatographic tests for FIP diagnosis. Rapid immunochromatographic tests for FCoV antibodies are widely used due to their convenience but are not conclusive as false positives can occur due to cross-reactivity with enteric coronaviruses or interference from samples with high protein levels potentially leading to misdiagnosis (Felten and Hartmann, 2019; Stranieri *et al*., 2018; Vojtkovská *et al*., 2022). This diagnostic challenge is exacerbated by limited access to confirmatory tools such as PCR or histopathology.

Consequently, clinico pathological parameters specifically the serum Albumin:globulin (A:G) ratio become vital supportive tools. A low A:G ratio (<0.4–0.5) supports a diagnosis of FIP due to concurrent hypoalbuminemia and hyperglobulinemia, while a ratio >0.8 makes FIP less likely (Hartmann et al., 2003; Quimby and Borjesson, 2018; Riemer *et al*., 2016). This report describes a case where a normal A:G ratio provided critical evidence to question a positive FIP rapid test, leading to successful management of hepatic jaundice.

CASE PRESENTATION

Case history and description

A 2-year-old weighing 3.3 kg local breed male cat named Simba was presented to TTPHRC (Teaching and Training Pet Hospital and Research Centre), a institute under Chattogram Veterinary and Animal Sciences University (CVASU), Dhaka, Bangladesh with a 4-days history of complete anorexia, lethargy, and yellow discoloration of the mucous membranes, pinna, sclera and digital pads (Figure 1). The patient was depressed and markedly icteric. Vital signs were within normal limits. Abdominal palpation revealed no pain. The cat had also the history of properly immunized and dewormed. Based on the young age (2 years) presence of icterus and non specific systemic signs (anorexia, lethargy, depression) FIP was included in the differential diagnosis despite the absence of fever or effusions, as FIP can present with hepatic involvement and icterus in the non effusive form.

Clinical examination

The cat's body temperature was measured at 100.3°F. the respiratory rate was 25/min. The heartbeat per minute was 120. The patient was depressed, dehydrated and micturition was normal. The only notable physical examination findings were yellowish mucous membrane (Figure 1). There were no abnormalities detected upon abdominal palpation.

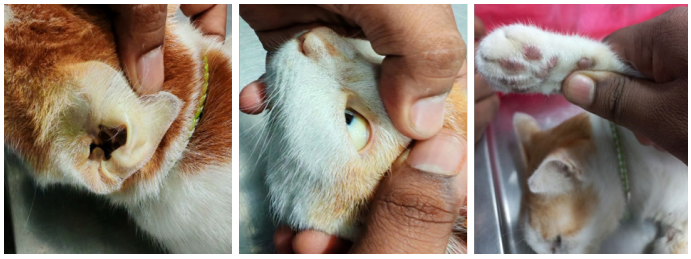

Figure 1: Clinical presentation of feline icterus showing yellow discoloration of the mucous membranes and non-pigmented skin.

Sample collection for laboratory examination

Blood was drawn aseptically from the cephalic vein for biochemical analysis and rapid FIP kit test with a 3 mL sterile disposable syringe and a 22-gauge butterfly needle (Figure 2). A total of 3 ml blood was collected and divided into 2 plain red-top tubes (BD Vacutainer®). The tubes blood sample was left to clot at room temperature, between 20 and 30 minutes and centrifuged at 3000 rpm. to extract the serum. Careful harvesting of the separated serum was done followed by the transfer of the sample to two clean microcentrifuge tube. Biochemical analysis was carried out in semi-automated biochemical analyzer (Humalyzer 3000, GmbH, Germany).

Figure 2: Aseptic blood collection from the cephalic vein for biochemical analysis and rapid FIP antibody testing and laboratory analysis.

Diagnostic test

A stepwise diagnostic approach was adopted to identify the

cause of icterus and to systematically exclude or confirm key differentials particularly FIP. Given the non-specific clinical signs and the young age of the cat, a rapid FIP antibody test was performed as an initial screening tool due to its low cost and immediate availability. Subsequently, serum biochemistry (including A:G ratio) and imaging (radiography and ultrasonography) were pursued to further characterize the hepatobiliary disease and to assess for effusions or structural lesions. This sequential strategy allowed for a comprehensive evaluation while minimizing unnecessary procedures.

FIP KIT TEST

Diagnostic testing for Feline Infectious Peritonitis (FIP) was performed using a Rapid Test Kit (TESTSEALAB). The test (FIP Ab Test) returned a positive result (Figure 3) interpreted based on the visible band appearance in both the Control (C) and the Test (T) zones. The rapid FIP test was performed as an immediate screening tool in a resource-limited setting where molecular confirmatory tests are not routinely available. A positive result, although not definitive, raised sufficient suspicion of FIP to warrant a full diagnostic workup. A negative result would have lowered the pretest probability, allowing earlier consideration of alternative hepatobiliary diagnoses.

Figure 3: Positive result of a rapid FIP antibody test, demonstrating visible bands in both the control (C) and test (T) zones.

SERUM BIOCHEMICAL PARAMETERS

Serum biochemical report demonstrated the normal level of glucose (92.3 mg/dl) and total protein (7.6 g/dl) in blood serum (Table 1). Albumin (3.58 g/dl) and globulin (4.02 g/dl) values were also within reference limits maintaining a normal albumin-globulin ratio of 0.89. In contrast, elevations were observed in liver biochemical parameters bilirubin (5.4 mg/dl), ALT (125 u/l) and AST (106 u/l) while ALP (12 u/l) remained within the normal range. Elevations were also noted in renal markers including blood urea nitrogen (88 mg/dl) and serum creatinine (5.7 mg/dl). These findings supported hepatic (hepatocellular) origin of icterus. However, imaging was necessary to exclude structural lesions and assess for FIP.

X- RAY FINDINGS

To assess internal structures and spot possible systemic abnormalities, radiographic imaging was used as a non-invasive diagnostic technique. Bilateral lateral recumbency was used to obtain thoracic and abdominal radiographs (Figure 4). The patient was maintained in a conscious state with minimal restraint to reduce stress with sedation reserved for necessity. A thorough analysis of the pictures showed no notable anomalies. There was no sign of pleural effusion or pulmonary edema. The size, position and opacity of the cardiac outline and pulmonary parenchyma appeared normal. The liver was found to be in a normal anatomic position and size within the abdomen. Effusions, abdominal masses or peritoneal abnormalities were absent. Overall, there were no obvious anatomical flaws or noticeable fluid buildup and the radiographic results were deemed unremarkable. The absence of pleural or abdominal effusions further reduced the likelihood of effusive FIP.

Table 1: Serum biochemical results highlighting elevated hepatobiliary enzymes and azotemia relative to reference intervals.

Parameters	Test value	Reference value*
Glucose (mg/dl)	92.3	50-170
Total Protein (g/dl)	7.6	5.2-8.8
Albumin (g/dl)	3.58	2.5-3.9
Globulin (g/dl)	4.02	2.3-5.3
A/G Ration	0.89	0.6-2.0
Bilirubin (mg/dl)	5.4	0.1-0.4
ALT/SGPT (u/l)	125	10-100
AST/SGOT (u/l)	106	10-100
ALP (u/l)	12	10-50
Blood Urea Nitrogen (mg/dl)	88	14-36
Serum Creatinine (mg/dl)	5.7	0.6-1.6

*(Reference values, from The Merk Veterinary Manual 9th edition).

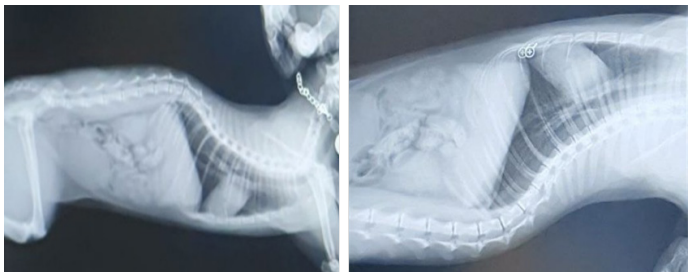

Figure 4: Lateral thoracic and abdominal radiographs showed no significant abnormalities.

USG FINDINGS

Ultrasonography was used as a non-invasive imaging technique to assess the hepatic and biliary systems much like the radiographic study. To create the best scanning window, the patient was placed in dorsal recumbency (Figure 5). No biliary dilation or obstruction was observed. The liver parenchyma showed a coarse, moderately echogenic texture, a nonspecific finding compatible with diffuse hepatocellular disease (e.g., cholangiohepatitis or

hepatic lipidosis). These findings, together with the absence of effusions or granulomatous lesions, made FIP less likely and supported primary hepatic disease as the cause of the cat's icterus. As the initial therapeutic approach for these conditions is supportive and an invasive liver biopsy carries risks in an unstable patient, a definitive etiological diagnosis was not pursued. The decision was made to initiate treatment based on the functional diagnosis of primary hepatic disease.

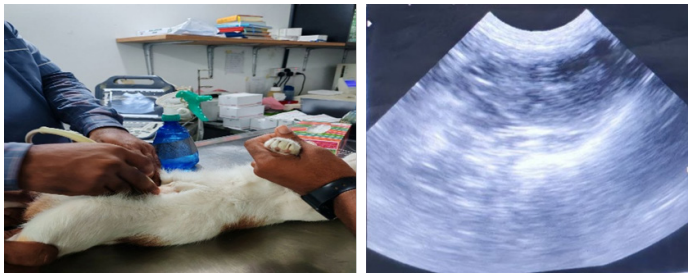

Figure 5: Ultrasonographic image of the liver parenchyma showing coarse echotexture without biliary obstruction.

Treatment and follow up

Based on the diagnosis of primary hepatic disease (elevated liver enzymes, normal A:G ratio, no obstruction) a hepatic support protocol was initiated. The cat was treated with amoxicillin @10 mg/kg (Inj. Moxin 500, Opsonin Pharma Ltd) silymarin @30 mg/kg (Cap. Silybin 140 mg, Square Pharmaceuticals PLC) vitamin B12 (cyanocobalamin) @1ml/10kg (Inj. Cynomin, Jayson Pharmaceuticals Ltd),Vitamin E and C @10mg/kg and 30mg/kg (Tab. EC plus, Orion pharma Ltd) Furliv @1ml/ 10 kg (Syp. Liv 52, Himalaya Wellness Company) and NS fluid therapy @ 20 ml/kg. Treatment was administered over a seven-day period, with a subsequent reevaluation on day 15. The patient was fully recovered with no evidence of any clinical signs (Figure 6).

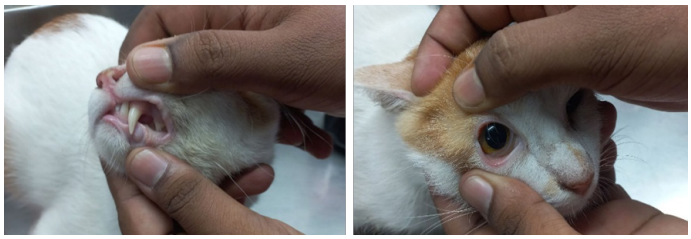

Figure 6: Clinical status at 15 days post-treatment showing complete resolution of icterus with healthy pink MM and normal gingiva.

DISCUSSION

The diagnostic approach to feline icterus requires a meticulous integration of clinical signs, imaging, and laboratory data. In this case, the primary diagnostic challenge arose from the positive result of the rapid FIP antibody test in a young cat presenting with icterus.

The use of immunochromatographic rapid kits for Feline Infectious Peritonitis (FIP) is common in clinical practice due to their accessibility; however, these tests are prone to significant interpretation errors. These kits typically detect antibodies against Feline Coronavirus (FCoV), rather than the specific mutated virulent biotype that causes FIP. Because FCoV is ubiquitous in many cat populations, a positive antibody result often reflects prior exposure to the enteric virus rather than the presence of active FIP. The positive predictive value (PPV) of these tests is notably low, particularly in populations where FCoV is endemic (Felten and Hartmann, 2019; Stranieri *et al*., 2018). In this patient, the positive band was likely a result of cross-reactivity or a high titer of non-pathogenic FCoV antibodies illustrating that a positive rapid test should not be used as a standalone diagnostic for FIP.

This diagnostic conflict was further scrutinized through the serum biochemical profile. Marked hyperbilirubinemia (5.4 mg/dl) and moderate elevations in ALT (125 u/l) and AST (106 u/l) were indicative of hepatocellular injury. Notably, the patient also presented with significant azotemia with BUN at 88 mg/dl and serum creatinine at 5.7 mg/dl. While these values could initially suggest concurrent renal failure, the rapid clinical improvement and normalization of values following intravenous fluid therapy indicate that the azotemia was likely prerenal, secondary to dehydration and decreased perfusion rather than primary renal disease.

The Albumin:globulin (A:G) ratio served as a critical analytical checkpoint in this context. While no single parameter is pathognomonic for FIP, the A:G ratio remains a valuable supportive marker. FIP is typically characterized by hyperglobulinemia and hypoalbuminemia often resulting in an A:G ratio below 0.4. In this case, the patient maintained a normal ratio of 0.89. An A:G ratio <0.4 is highly supportive of FIP, whereas a ratio >0.8 makes FIP unlikely (Thayer *et al*., 2022). In one large retrospective study only 15% of confirmed FIP cases had a ratio >0.8 (Riemer *et al*., 2016). However, the A:G ratio is not absolute; approximately 15% of FIP cats can have a normal ratio, so it must be interpreted alongside other findings.

This finding combined with the lack of effusion or granulomatous lesions on radiographs and ultrasound provided strong evidence to move the diagnosis away from FIP. Importantly no molecular test (RT-PCR) or histopathology was available to definitively exclude FIP which is a limitation of this report.

The patient's response to treatment specifically the resolution of icterus and return of appetite within seven days of receiving hepatic support (silymarin, vitamins) and broad-spectrum antibiotics (amoxicillin) confirmed the

diagnosis of primary hepatic disease.

CONCLUSION

This case demonstrates that a positive FIP rapid test in an icteric cat must be interpreted with caution and correlated with other clinico-pathological findings. Over-reliance on rapid tests alone can lead to misdiagnosis and potentially unnecessary euthanasia. The A:G ratio is a valuable, cost-effective tool that provides a strong contraindication for FIP when values are within the normal range. Veterinarians should adopt a comprehensive diagnostic algorithm that prioritizes biochemical profiling and imaging evidence to ensure accurate diagnosis and appropriate therapeutic intervention.

Limitations

This case report has certain limitations that should be acknowledged. No molecular test (RT-PCR) or histopathology was performed to definitively exclude FIP due to limited facility availability in this resource limited setting. The rapid test used detects antibodies against feline coronavirus rather than the pathogenic biotype and false positives are well recognized. Additionally, while the A:G ratio is a valuable supportive marker it is not absolute; approximately 15% of confirmed FIP cases can have a normal ratio. Furthermore, as this is a single case report, the findings cannot be generalized to the wider feline population. Despite these limitations the clinical, biochemical, imaging, and therapeutic findings provide valuable insight into the diagnosis and management of feline icterus.

ACKNOWLEDGEMENT

The authors thank the Director and technician of the Teaching and Training Pet Hospital and Research Centre (TTPHRC), Chattogram Veterinary and Animal Sciences University, for their support and guidance in patient management and sample collection.

NOVELTY STATEMENT

This case report highlights the diagnostic value of the albumin:globulin (A:G) ratio as a supportive tool to question false-positive FIP rapid test results in icteric cats, particularly in resource-limited settings where confirmatory molecular testing is unavailable.

AUTHOR'S CONTRIBUTION

All the authors contributed to research and manuscript writing.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial or not-for-profit sectors.

Generative AI and AI assisted technology statement

The authors declare that no generative AI and AI assisted technology was used in the creation of this manuscript.

Conflict of interest

The authors have declared no conflict of interest.

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