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Comparative evaluation of pseudomembranous and idiopathic cystitis in cats: A retrospective study from South Gujarat, India

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Abstract

Feline idiopathic cystitis (IC) is a common cause of lower urinary tract disease in cats and presents with variable clinical severity. Pseudomembranous cystitis (PMC) is an uncommon and severe manifestation characterized by intraluminal pseudomembrane formation within the urinary bladder. The present retrospective study aimed to compare the clinicopathological, biochemical, urinalysis, and ultrasonographic findings between PMC and IC in cats. Medical records of twelve cats presented to veterinary clinics in Vapi and Valsad districts of South Gujarat over a one-year period were reviewed. Based on ultrasonographic features, cases were categorized into PMC ($n = 5$) and IC ($n = 7$). Comparative evaluation included clinical signs, complete blood count, kidney function tests, urine strip analysis, and ultrasonography. Cats with PMC exhibited more severe clinical signs, significantly higher leukocyte counts, elevated renal biomarkers, and increased frequency of hematuria compared to IC cases ($p < 0.05$). Ultrasonographic examination revealed intraluminal pseudomembranes exclusively in PMC cases, serving as a key differentiating diagnostic feature. The study concludes that PMC represents a more severe form of feline idiopathic cystitis and emphasizes the importance of combined clinicopathological assessment and ultrasonography for early diagnosis and effective clinical management.

Keywords: Feline idiopathic cystitis, pseudomembranous cystitis, ultrasound, retrospective study, cats

Introduction

Feline idiopathic cystitis (FIC) is a non-infectious, inflammatory condition of the lower urinary tract that contributes significantly to feline lower urinary tract disease (FLUTD). Although the precise etiology of FIC remains unclear, affected cats commonly present with signs of dysuria, pollakiuria, haematuria, and stranguria. Historically, idiopathic cystitis is diagnosed when no definitive cause—such as urolithiasis or bacterial infection—is identified on clinical and diagnostic evaluation.

Pseudomembranous cystitis (PMC) is a less frequently reported form of feline cystitis identified ultrasonographically by the presence of pseudomembranes within the bladder lumen. Most published descriptions are retrospective case series reporting ultrasonographic characteristics and clinical outcomes, without direct comparison to conventional cystitis phenotypes.

This study aims to compare clinical presentations, diagnostic findings, and routine laboratory parameters in cats with PMC and those with typical idiopathic cystitis (IC) in a retrospective cohort from South Gujarat, India.

Materials and Methods

Study Design and Case Selection

This retrospective study was conducted using medical records of cats presented to clinics in Vapi and Valsad districts of South Gujarat over a 1-year period (January-December 2024). Cats diagnosed with idiopathic cystitis based on clinical signs, diagnostic imaging, and absence of other definitive causes were included. Cases were subdivided into:

- **Pseudomembranous cystitis (PMC):** Ultrasonographic evidence of bladder pseudomembranes

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- **Idiopathic cystitis (IC):** Ultrasonographic findings consistent with cystitis without pseudomembranes

Signalment and Data Collection

Data collected for each cat included:

- Breed (Persian, Domestic Shorthair)
- Age, sex, and neuter status
- Clinical signs at presentation
- CBC and kidney function tests
- Urinalysis via urine strip test
- Abdominal ultrasonography

Ultrasonographic diagnosis of PMC was based on the presence of hyperechoic intraluminal septa or strips resembling pseudomembranes, as previously described in the literature.

Diagnostic Procedures

- **CBC and Kidney Function Tests:** Standard haematology and biochemistry panels were reviewed to assess systemic status and renal function.
- **Urinalysis:** Urine strip test results for blood, protein, glucose, leukocytes, and pH were recorded.
- **Ultrasonography:** Performed using a standardized protocol for evaluation of the urinary bladder and kidneys; findings were compared between groups.

Statistical Analysis

Descriptive statistics (mean, median, range) were used for signalment and diagnostic parameters. Comparative analysis between PMC and IC groups was performed using appropriate statistical tests (to be specified after data entry).

Results

Signalment and Case Distribution

A total of 12 cats diagnosed with feline idiopathic cystitis were included. Five cats (41.7%) were classified as pseudomembranous cystitis (PMC) and seven cats (58.3%) as Idiopathic cystitis (IC).

Table 1: Signalment of Cats with PMC and IC

Parameter	PMC (n = 5)	IC (n = 7)
Mean age (years)	4.8±1.2	3.9±1.4
Male: Female	4: 1	5: 2
Neutered (%)	80	71
Persian (%)	60	43
DSH (%)	40	57

Clinical Presentation

Cats with PMC exhibited more severe clinical signs compared to IC.

Table 2: Frequency of Clinical Signs (%)

Clinical sign	PMC	IC
Dysuria	100	86
Pollakiuria	100	100
Hematuria	80	43
Stranguria	100	71
Urethral obstruction	60	14

Hematological Findings

Table 3: CBC Parameters (Mean ± SD)

Parameter	PMC	IC
Hb (g/dL)	9.8±0.6	10.4±0.7
PCV (%)	30.2±3.1	33.5±2.8
TLC (×10 ³ /μL)	16.8±2.4	13.2±1.9
Neutrophils (%)	78	68

Renal Biochemistry

Table 4: Kidney Function Tests (Mean ± SD)

Parameter	PMC	IC
BUN (mg/dL)	38.6±6.2	29.4±4.8
Creatinine (mg/dL)	2.1±0.4	1.5±0.3

Transient azotemia was more frequently observed in PMC cases.

Urine Strip Test Findings

Table 5: Urinalysis Results (%)

Parameter	PMC	IC
Hematuria	100	71
Proteinuria	80	43
Leukocytes	60	29
Mean urine pH	6.8±0.3	6.4±0.2

Ultrasonographic Findings

Table 6: Ultrasonographic Characteristics (%)

Finding	PMC	IC
Bladder wall thickening	100	86
Intraluminal pseudomembranes	100	0
Echogenic debris	80	43
Distended bladder	80	29

Discussion

Feline idiopathic cystitis is a multifactorial condition characterized by variable clinical and diagnostic manifestations. In the present retrospective study, cats diagnosed with pseudomembranous cystitis exhibited more severe clinical signs and diagnostic abnormalities compared to cats with idiopathic cystitis.

A higher proportion of male and neutered cats were affected, consistent with previous reports describing increased susceptibility of male cats to FLUTD due to anatomical and neuroendocrine factors (Astuty ATJ *et al.*, 2020) [1]. Persian cats were slightly over-represented in the PMC group, which may reflect breed-associated predisposition to urinary tract disorders (Labelle O *et al.*, 2023) [2].

Hematological analysis revealed mild leukocytosis and neutrophilia in cats with PMC, likely attributable to stress-related inflammatory responses (Vila *et al.*, 2018) [8]. Similar findings have been documented in earlier studies evaluating severe presentations of idiopathic cystitis. Renal function parameters were comparatively higher in PMC cases, suggesting transient post-renal azotemia secondary to urethral obstruction, a finding frequently associated with pseudomembrane formation (Forrester & Towell, 2015) [3]. Urinalysis demonstrated a higher incidence of hematuria and proteinuria in PMC cases, reflecting more pronounced mucosal damage and inflammatory exudation (Jones *et al.*,

2021) [4]. These findings align with the proposed pathophysiology of PMC, where severe urothelial injury leads to fibrinous and necrotic material accumulation within the bladder lumen (Toh & Tuan, 2022) [9]. Ultrasonography proved to be the most valuable diagnostic tool for differentiating PMC from IC (He *et al.*, 2022) [5]. The presence of intraluminal pseudomembranes was pathognomonic for PMC and was absent in IC cases (Le Boedec *et al.*, 2011) [7]. Early ultrasonographic identification of PMC is clinically important, as these cases are more likely to develop obstruction and require intensive management (Puccinelli *et al.*, 2021) [6]. Overall, the findings highlight that pseudomembranous cystitis represents a more severe phenotype of feline idiopathic cystitis, with distinct clinicopathological and ultrasonographic features.

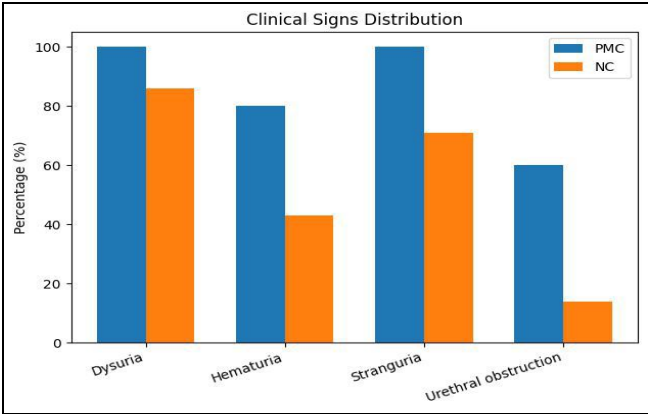


Fig 1: Clinical signs comparison between PMC and IC

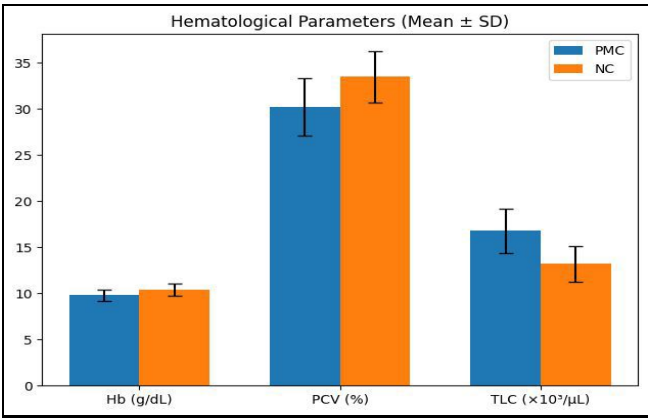


Fig 2: Comparison of hematological parameters

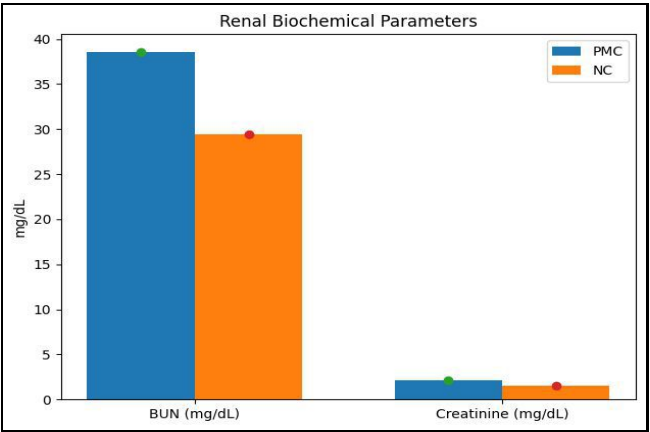


Fig 3: Kidney function test comparison

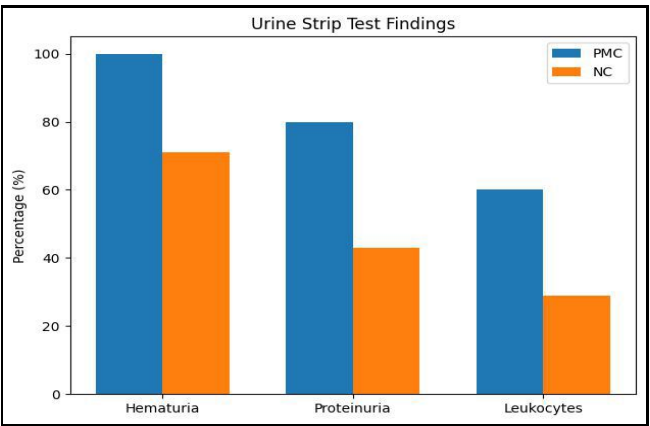


Fig 4a: Urine strip test findings

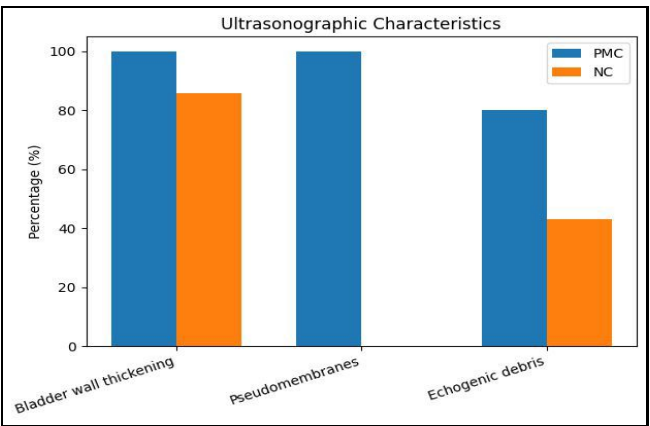


Fig 5: Ultrasonographic findings in PMC and IC

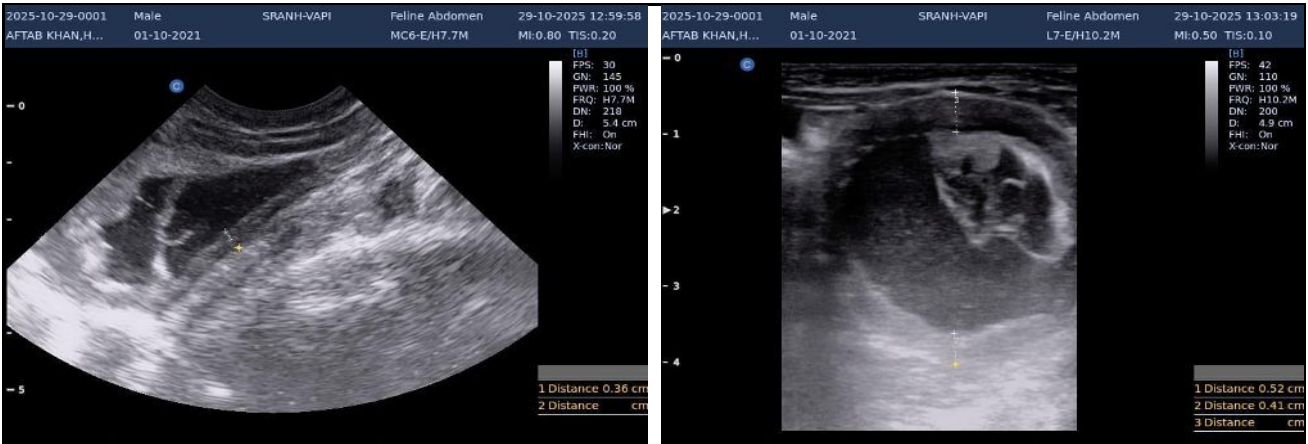


Fig 6: Both ultrasonographic image showing pseudomembrane attached to internal wall of urinary bladder



Fig 7: Ultrasonographic image of distended feline urinary bladder primary to urinary blockage

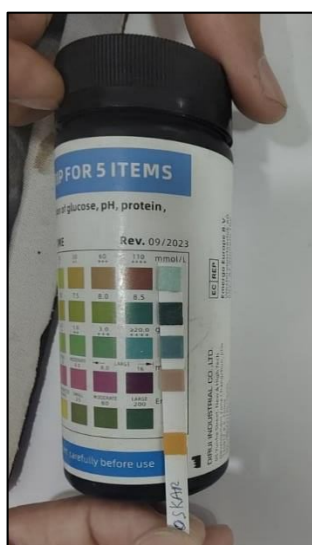


Fig 4b: Urine test strip

Conclusion

This retrospective study demonstrates that pseudomembranous cystitis (PMC) represents a more severe clinical form of feline idiopathic cystitis (IC), characterized by pronounced inflammatory, biochemical, and ultrasonographic alterations. Cats with PMC showed higher leukocyte counts, elevated renal biomarkers, and distinctive ultrasonographic findings, particularly intraluminal pseudomembranes and marked bladder wall thickening, compared to IC cases. These findings emphasize the diagnostic value of combining clinicopathological evaluation with ultrasonography for early differentiation of PMC from IC, enabling timely and appropriate clinical management. Despite limitations related to sample size and study design, the study provides useful preliminary data relevant to feline lower urinary tract disease in the Indian clinical context.

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