

Haematobiochemical examination and urinalysis in dogs with renal disease

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Abstract

Early detection of renal diseases in canines is crucial for improving prognosis and extending quality of life. Urinalysis plays major role in identifying renal dysfunction. This study was aimed to evaluate different haemato-biochemical parameters along with urinalysis in dogs with Stage I and II of renal disease. Study was conducted on 13 dogs with Stage I and II renal disease. Mean values of TEC, PCV, Sodium, Potassium and Calcium were decreased while mean values of TLC, Monocytes, MCH, MCHC, Creatinine and ALT were increased. The urine pH of 10 dogs ranged from 5.0-6.5 whereas 3 dogs had pH 8. Mean value of UP:C was found to be significantly increased. Crystaluria (5), struvites (4) and bilirubin crystals (1) were found.

Keywords: Urinalysis- renal dysfunction – dogs

Introduction

Renal diseases are among the most prevalent and potentially life-threatening conditions affecting canines, often progressing silently until significant kidney function is lost. Early detection is critical for improving prognosis, guiding therapeutic interventions, and enhancing the quality of life in affected dogs. Among various diagnostic modalities, urinalysis remains a cornerstone in veterinary nephrology due to its non-invasive nature, affordability, and diagnostic value. Diagnosing kidney issues in dogs primarily relies on their medical history, clinical assessment, and elevated levels of serum creatinine.

Urinalysis provides essential information about the physical, chemical, and microscopic characteristics of urine, reflecting both renal and systemic health. Parameters such as urine specific gravity, proteinuria, haematuria, and the presence of casts or crystals indicate renal pathology before clinical signs or serum biochemical changes become evident. The present study includes detailed clinical examination, haemato-biochemical examination and urinalysis to assess renal diseases in canines.

Materials and Methods

The present study was carried out on dogs presented during the period of November 2024 to May 2025 in the Department of Veterinary Medicine, Veterinary Clinical Complex, College of Veterinary & Animal Sciences, CSKHPKV Palampur (H.P). Initial screening was done on the basis of patient's history and presenting clinical signs as inappetence, dehydration, fever, occasional vomiting, diarrhoea, urine dribbling, oliguria and halitosis. Haemato-biochemical estimation, electrolytes analysis and urinalysis were performed. Physical, chemical and microscopic examination of urine samples were done. Thirteen dogs in Stage I and II based on IRIS CKD classification were included for the study. Ten apparently healthy dogs presented for general checkup and vaccination were included as control group.

Results and Discussion

Out of 13 dogs, 53% (7/13) were in Stage I while 46.15% (6/13) were in Stage II of renal disease. Different aetiologies in these dogs are presented in Table 1. Most common clinical signs observed were urine dribbling, occasional vomiting, halitosis, inappetence, fever, dehydration and weight loss. Clinical, haematobiochemical parameters of dogs in Stage I and II of renal disease are presented in Table 2

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Table 1: Etiologies in dogs with Stage I and II of renal disease

S.No.	Etiology	No. of cases (n=13)
1.	Haemoprotozoan infection	4/13 (30%)
2.	Cystitis	3/13 (23%)
3.	Urethral Calculi	2/13 (15%)
4.	Haematuria	2/13 (15%)
5.	Megaesophagus	1/13 (7.6%)
6.	Endometrial hyperplasia	1/13 (7.6%)

Table 2: Clinical, Haematobiochemical parameters of dogs in Stage I and II of renal disease

Sl.No.	Parameter	Healthy control (n=10)	Stage I and II renal disease (n=13)
Clinical parameters			
1.	Rectal temperature ($^{\circ}\text{F}$)	101.88 $\pm$ 0.17	101.01 $\pm$ 0.54
2.	Heart rate (per minute)	132.40 $\pm$ 2.78	120 $\pm$ 5.46
3.	Respiratory rate (per minute)	32.40 $\pm$ 1.24	35.27 $\pm$ 2.43
Haematology			
4.	Hb (g/dl)	13.47 $\pm$ 0.34	12.28 $\pm$ 1.021
5.	PCV (%)	38.87 $\pm$ 1.04	33.85 $\pm$ 2.63
6.	TEC ($10^{12}/\text{L}$)	6.49 $\pm$ 0.21	5.21 $\pm$ 0.42*
7.	TLC ($10^9/\text{L}$)	11.13 $\pm$ 0.6	21.14 $\pm$ 5.24
8.	N (%)	79.68 $\pm$ 0.85	79.5 $\pm$ 2.75
9.	L (%)	15.3 $\pm$ 0.62	12.53 $\pm$ 2.60
10.	M (%)	4.04 $\pm$ 0.27	6.16 $\pm$ 0.70*
11.	E (%)	1.35 $\pm$ 0.18	2 $\pm$ 0.73
12.	PLT ($10^9/\text{L}$)	299.2 $\pm$ 23.72	279.23 $\pm$ 48.29
13.	MCV (fl)	61.57 $\pm$ 0.47	64.43 $\pm$ 1.97
14.	MCH (pg)	21.88 $\pm$ 0.4	24.16 $\pm$ 0.45**
15.	MCHC (g/dl)	35.18 $\pm$ 0.58	375.84 $\pm$ 8.27***
Biochemical Parameters			
16.	Creatinine (mg/dL)	1.01 $\pm$ 0.08	1.8 $\pm$ 0.306*
17.	BUN (mg/dL)	25.14 $\pm$ 4.54	82.88 $\pm$ 29.14
18.	Total Protein (g/dL)	6.6 $\pm$ 0.35	6.723 $\pm$ 0.265
19.	Glucose (mg/dL)	102.67 $\pm$ 2.66	102.60 $\pm$ 5.732
20.	Bilirubin (mg/dL)	0.22 $\pm$ 0.04	0.76 $\pm$ 0.366
21.	AST (U/L)	38.05 $\pm$ 3.98	175.56 $\pm$ 112.36
22.	ALT (U/L)	33.92 $\pm$ 2.4	110.78 $\pm$ 23.738*
23.	ALP (U/L)	79.25 $\pm$ 8.72	307.29 $\pm$ 97.23
Serum electrolytes			
24.	Sodium (mmol/L)	151.8 $\pm$ 1.71	146.20 $\pm$ 1.64*
25.	Potassium (mmol/L)	4.7 $\pm$ 0.16	3.97 $\pm$ 0.24*
26.	Chloride (mmol/L)	110.05 $\pm$ 1.85	109.53 $\pm$ 1.121
27.	Calcium (mg/dl)	10.56 $\pm$ 0.27	9.825 $\pm$ 0.218*

*Significant at 5% ($P<0.05$); ** Significant at 1% ($P<0.01$); ***Significant at 0.1% ($P<0.001$)

The mean rectal temperature (101.01 ± 0.54), heart rate (120 ± 5.46) and respiratory rate (35.27 ± 2.43) of the dogs with renal dysfunction were non-significant compared to respective values of apparently healthy animals. Mean values of TEC (5.21 ± 0.42) were found to be significantly lower in dogs with renal dysfunction and are similar to the findings of Senthil *et al.* (2024) and Devipriya *et al.* (2018). Low values of TEC, PCV and Hb suggested dogs suffered from mild anaemia due to decreased erythropoietin production by diseased kidneys. These findings are in accordance with Silverberg *et al.* (2002). Mean values of ALT (110.78 ± 23.738) and creatinine (1.8 ± 0.306) were found to be significantly higher in the dogs with renal dysfunction and was similar to the observations of Devipriya *et al.* (2018). Sonu *et al.* (2019) reported that the increase in creatinine could be due to diminished renal excretion and enhanced tubular absorption of urea. The mean values of sodium (146.20 ± 1.64), potassium (3.97 ± 0.24) and calcium (9.825 ± 0.218) showed significant decrease as compared to healthy group.

Urine pH of 76.9% (10/13) dogs had acidic pH with (pH 5-6.5) whereas 23% (3/13) dogs had alkaline (pH=8). The mean values of urinary pH and specific

gravity were 6.42 ± 0.29 and 1.017 ± 0.002 respectively. These values are in accordance with Oburai *et al.* (2015). The decrease in urine specific gravity is a result of decreased concentrating ability of kidneys. The color of urine was colorless (30.76%), yellow (38.46%), red (15.38%) and brown (15.38%). Increased levels of urinary proteins in (23.07%) +++, (15.38%) ++, (7.6%) +, (23.07%) trace were observed which are similar to the findings of Sonu *et al.* (2024). UP:C ratio (1.38 ± 0.36) was found to be significantly increased which could be due to glomerular damage as observed by Oburai *et al.* (2015). Sonu *et al.* (2024) in his study reported that the most common cause for renal tubular injury in protein losing disease could be increased tubular uptake of filtered proteins or protein bound substances. Microscopic examination of urine of dogs with renal disease (Table 5) revealed presence of pus cells in 53.84% (7/13), increased number of RBCs in 38.46% (5/13) dogs (Plate 1). Crystaluria was found in 38.5% (5/13) dogs with struvite (triple phosphate) crystals in 4 dogs and bilirubin crystals in 1 dog (Plates 2 and 3). Epithelial cells were found in 69.23% (9/13) dogs (Plate 4). These findings are in accordance with Punia *et al.* (2018).

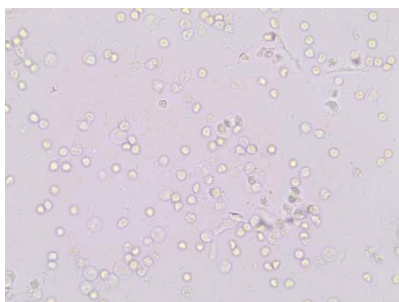


Plate 1. Abundant RBCs, WBCs along with few bacteria, 20X



Plate 2. Struvite crystal with typical coffin-lid appearance, 20X

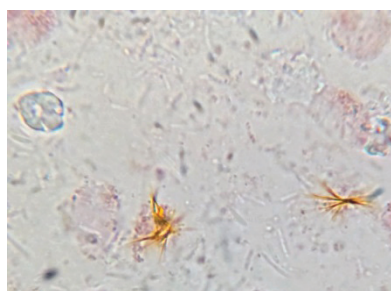


Plate 3. Bilirubin crystals characterised by yellow-brown granular appearance, 20X



Plate 4. Cellular cast, containing variety of cells (Epithelial cells, WBCs), 20X

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