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Research Article

EVALUATION OF PHYSICO-CHEMICAL AND MICROSCOPICAL CHANGES OF URINE IN DOGS WITH URINARY TRACT INFECTION

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ABSTRACT
Dogs suggestive of urinary tract infection (UTI) were physically examined and urine was collected aseptically from selected animals for routine urine analysis in addition to detailed clinical examination. Based on urinalysis, UTI was confirmed in dogs and formed the material for the present study. UTI was detected in 28 cases out of 66 dogs suggestive of urinary tract infection accounting to 42.42%. The incidence was more in sporting group dogs followed by working and herding group breeds. There is no significant change in the Colour, Specific gravity and urine pH. Proteinuria and occult blood was positive in 67.85% and 28.57% dogs respectively. Clinically significant haematuria, pyuria and bacteria were detected in the urine without concurrent increase in WBCs. Bacteriuria was observed in 78.55 % of UTIs and Granular casts observed in two dogs. Urine sediment examination and culture of infective organisms could be used as most important diagnostic tools for urinary tract infections. So the present study was conducted to assess the physical, chemical and microscopic changes of urine in dogs with urinary tract infection.

Keywords: *UTI, Specific Gravity, Occult Blood, Pyuria*

INTRODUCTION
The urinary tract has a great capacity to avoid infection despite its proximity to the anus and potential for fecal contamination. Normal host defenses were hypothesized to be important in preventing urinary tract infections (UTIs). It included normal micturition, mucosal defence barriers, anti-bacterial properties of urine, specific anatomic structures and systemic immunocompetence. UTI refers to microbial colonization of the urine or of any urinary tract organ, except the distal urethra, which has a normal bacterial flora. Infection of the urinary tract may affect more than one organ or may be localized to the upper tract or to the lower tract. UTI is thought to be the most common infectious disease in dogs. It has been estimated that 10% of all canine patients attended by veterinarians for any reason have UTI in addition to the problems for which they are presented. A presumptive diagnosis of UTI is often based on clinical and urinalysis findings, but urine culture is required to confirm UTIs. Studies regarding the canine urinary tract infections are very scanty in India when compared to other countries. This might be due to the misinterpretation of diseases due to overlapping nature of clinical signs of this disease as well as inappropriate diagnostic tools and methods. Urinary tract infections are one of the major etiologies for prostatic diseases in male dogs and this disease can further lead to renal failure, if untreated. Hence, the present study was undertaken to rule out the dogs with urinary tract infection and physiological, chemical and microscopical changes of urine in UTIs.

MATERIALS AND METHODS
Dogs presented to the University Veterinary Hospitals at Kokkalai and Mannuthy with clinical signs suggestive of urinary tract infections were subjected to detailed clinical examination and confirmation were made after urinalysis. A total of 2545 dog cases, 66 cases with clinical signs suggestive of urinary tract infections were selected. Out of these 66 cases, 28 cases were confirmed as UTI based on urinalysis. Urine was collected by ante pubic cystocentesis on the day of admission and 10th day before

discontinuing the treatment, into 50 ml sterile urical vials and kept under refrigeration until further analysis. Physical examination of urine such as colour, transparency, pH and specific gravity were determined as per the standard methods (Benjamin, 1985). Chemical examinations like the protein in urine was detected by nitric acid ring test, presence of occult blood was detected by Benzidine test, bile pigment was detected by Fouchet's test, presence of bile salts was detected by Hay's Sulphur test and glucose was detected by Benedict's test (Boddie, 1962). Whereas for microscopic examination the urine sample was mixed well, poured into conical tipped tube and centrifuged at 1000rpm for 5 min. The supernatant was discarded and the sediment resuspended. Sediment was transferred to a slide and examined. The numbers of erythrocytes, leucocytes, epithelial cells, cast, crystal and bacteria per 5-10 different high power fields were counted and average were recorded (Archer, 2005).

RESULTS AND DISCUSSION

Results

Physical Examination

Colour of the urine samples varied from pale to dark yellow with cloudy to turbid in appearance. Specific gravity of the urine samples ranged from 1.010 to 1.030 with a mean of 1.019 ± 0.005. The mean value of normal urine SPG was 1.022 ± 0.014. The values were not statistically significant. Among 28 dogs, acidic and alkaline urine were observed in 57.14 % and 42.85 % of the cases respectively [Figure 1].

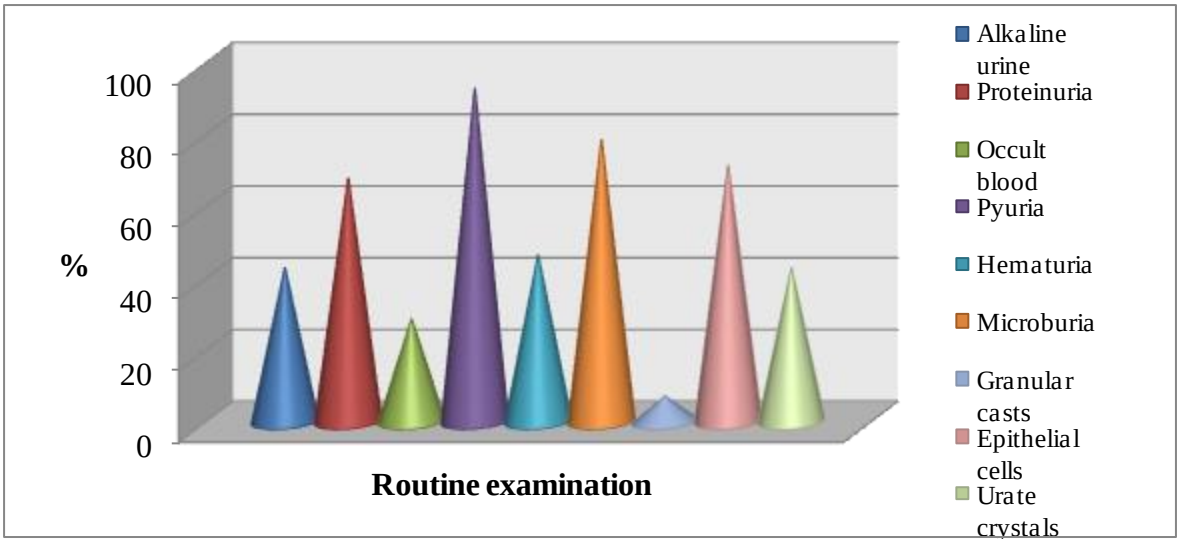

Figure 1: Percentage of positive cases in routine examination of urine

Chemical Examination

Proteinuria was estimated in 19 out of 28 cases. Trace, 1 +, 2 + and 3 + proteinuria were observed in 21.42, 35.71, 7.14 and 3.57 % cases respectively. Occult blood examinations were positive in 8 cases (28.57 %). None of the dogs were positive for glucosuria and bilirubinuria (Figure.1).

Microscopic Examination

Examination of Urine Sediment

The degree of haematuria and pyuria were classified as 0-5, 5-50 and >50 cells /HPF. Out of 28 dogs with UTIs, 15 (53.57 %) were positive for 0-5 RBCs/HPF, 9(32.14 %) were ranged 5-50 cells/HPF and 4 (14.28 %) were positive for >50 cells/HPF. Out of 28 dogs, 50 % were positive for >50 WBCs/HPF, 42.85 % were in the range of 5-50 cells/HPF and 7.14 % were positive for 0-5 WBCs/HPF. Bacteriuria was observed in 22 (78.55 %) cases of UTIs. It was graded as 1 +, 2 +, 3 + and 4 + bacteria/HPF. Out of 22 dogs, 1 +, 2 +, 3 +, 4 + bacteriuria were observed in 46.42, 14.28, 10.71 and 7.14 % respectively

(Figure.2). Granular casts and epithelial cells were observed in 2 (7.14 %) and 20 (71.42 %) cases respectively. Urate crystals were found positive in 42.85 % of the cases in UTIs (Figure.1).

Discussion

Physical Examination

The cloudiness of urine is not necessarily a pathological condition and many samples may become cloudy upon standing due to the presence of sediments (Benjamin, 1985). In the present study 17.85 % of urine samples had an abnormal odour and 14.28 % had dark yellow coloured urine. These findings were similar to that of Blango and Bartges (2001) who observed cloudy urine in urinary tract infections. Cloudy urine with abnormal odour suggested lower UTIs (Raila *et al.,* 2001). Cloudiness might be due to presence of large concentrations of bacteria, fat, crystals or mucus in urine and found commonly in dogs with UTIs (Meyer *et al.,* 1992; Cetin *et al.,* 2003).

Specific gravity of the urine samples ranged from 1.010 to 1.030. Forrester (2004) observed similar findings in urinary tract infections. Normal USG in dogs was 1.020 to 1.050 (Archer, 2005; Forrester, 2004; Ristic and Skeldon, 2011). High urinary protein concentrations led to increased urine specific gravity (Meyer *et al.,* 1992). Low specific gravity detected in urine samples that yielded growth of bacteria on culture might indicate an increased risk for UTI as opined by Swenson *et al.,* (2004). Whereas Bailiff *et al.,* (2008) found that there was no correlation between decreasing USG and positive urine culture.

Acidic and alkaline urine were observed in 57.14 % and 42.85 % of the cases respectively. Alkaline urine might be associated with urease-producing bacteria such as *Proteus* and *Staphylococcus* infection because these organisms might break down urea to ammonia, resulting in alkaline urine (Meyer *et al.,* 1992). Dogs with UTIs associated with *E.coli* (rods) and *Enterococcus* or *Streptococcus* (cocci) had acidic urine. Urine pH is also influenced by diets and many pathogens which do not produce urease might result in acidic or neutral urine pH (Blanco and Bartges, 2001; Meyer *et al.,* 1992).

Chemical Examination

Proteinuria was observed in 19 out of 28 cases. This was in agreement with Cetin *et al.,* (2003). Proteinuria might result from inflammation or infection within the urinary tract (Archer, 2005). Proteinuria was not only an indicator of renal diseases but also associated with rate of progression of diseases and inflammation of urinary tract as suggested by Raila *et al.,* (2011).

Occult blood examinations were positive 28.57 % cases in the present study and were in agreement with Raila *et al.,* (2011). None of the cases were positive for glucosuria in the present study and was in accordance with the findings of Forrester *et al.,* (1999).

Microscopic Examination

Microscopic examination of urinary sediments revealed red blood cells, white blood cells, bacteria, cast, crystals and epithelial cells. Clinically relevant haematuria (> 5 cells per high-power field) was present in 46.42 % of cases during urinalysis. Increased numbers of RBCs might be seen in samples collected by cystocentesis. This finding was in agreement with that of Seguin *et al.,* (2003).

Clinically relevant pyuria was observed in 92.85% of dogs with UTIs in the present study while Forrester *et al.,* (1999) reported pyuria in 60% of dogs with UTIs and this might be due to variations in the severity of infection. Absence of WBCs did not rule out UTIs. In the present study bacteria were detected in the urine without concurrent increase in WBCs. These observations were similar to the report of Blanco and Bartges (2001) and Seguin *et al.,* (2003).

Bacteriuria was observed in 78.55 % of UTIs and rests of dogs were negative. This was in close conformity with the studies of Forrester *et al.,* (1999) who reported that bacteriuria was present in 69% of dogs with UTIs. Failure to detect bacteria on examination of urine sediment did not exclude their presence or rule out UTIs, it should be verified by urine culture.

Increased numbers of epithelial cells in the present study, probably resulted from urinary tract infection or inflammation as reported by Seguin *et al.,* (2003). Granular casts observed in two dogs might be due to the tubular damage or renal ischemia and this indicated the duration and chronicity of the disease as opined by Archer (2005). The findings of urate crystals observed in this present study agreed with the

observations made by Archer (2005). Urate crystalluria is common in Dalmatian and it was associated with alkaline urine in dogs. There is an inherited reduced ability to oxidize uric acid to allantoin, causing accumulation of uric acid in plasma and urine, which can lead to formation of urate crystals.

Conclusion

To conclude the discussion, the present study was undertaken to examine the urine sediments in urinary tract infections which could be used as most important to diagnose UTIs along with culturing of urine sample. Significant correlation was observed in sediment and culture of urine.

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