Indian Vet. J., June 2024, 101 (6) : 12 - 15 https://doi.org/10.62757/IVA.2024.101.6.12-15

Haemato-Biochemical and Clinical Analysis of Dogs with Urinary Tract Infection Associated with *Escherichia coli*

P. Rana* and D.G. Dighe

Department of Veterinary Epidemiology and Preventive Medicine, Mumbai Veterinary College, Parel (400012).

(Received : November, 2023 226/23 Accepted : May, 2024)

Abstract

The study entitled was carried out on dogs suspected for urinary tract infection at Mumbai Veterinary College, Parel. The Mean ± SE of hemoglobin, PCV, and TEC, of dogs with *E. coli* associated UTI was 2.23±0.62 gm%, 35.96±1.82%, and 5.45±0.28×10^6/cmm respectively. These parameters were found to be within normal range. Mean ± SE of Neutrophils was 77.89±1.42 %, for Eosinophils 1±0.31%, for Lymphocytes 19.53±1.25%, for Monocytes 1.42±0.18% and for Basophils was 0.16±0.12%. Marked leukocytosis with neutrophilia associated with UTIs was observed. Mean ± SE of ALP, AST and ALT was 108.84±9.77 U/L, 47.33±4.44 U/L and 50.24±9.85 U/L respectively. These values were almost normal. Mean ± SE of total protein, albumin and globulin were 6.42±0.2 g/dl, 2.52±0.1 g/dl and 3.86±0.24 g/dl respectively. There was mild hypoalbuminemia with hyperglobulinemia. Mean ± SE of BUN was 30.41±5.85mg/dl and mean ± SE of creatinine was 1.72±0.21. This elevation may be due to decrease renal filtration due to the renal injury caused by inflammation and infection.

Key words: Urinary tract infection, *E. coli*, haemato-biochemical, renal

The Urinary tract infection in dogs usually go unnoticed and their diagnosis is mainly an incidental finding. Although asymptomatic at first, signs can later appear and if left untreated, serious repercussions can be there including prostatitis, urolithiasis, septicemia or even kidney failure. (Dowling, 1996). The clinical signs associated with UTIs are haematuria stranguria, pollakiuria, urinary incontinence, fever, emesis and many more (Bartges, 2004). These signs are useful in identifying a UTI patient. Studies reveal that 5-27% of dogs suffer from UTI once in a lifetime (Smee *et al*., 2013) and the females are generally more affected than males. Once a urinary tract infection is suspected on the basis of signs and symptoms, the haemato-biochemical analysis and urinalysis has to be carried out. The haemato-biochemical analysis is mostly normal in cases of UTIs. There may be increase in the total leukocyte count in case of bacteraemia/septicaemia kidney values may increase in cases where kidney is affected. Haematuria may alter the values of hemoglobin, TEC (10^6/cmm) and PCV (%).

Materials and Methods

The study was conducted at Department of Veterinary Epidemiology and Preventive Medicine and Department of Veterinary Public Health, Mumbai Veterinary College, Parel. The dogs with suspected urinary tract infection, referred from Out Patient Department (OPD), Teaching Veterinary Clinical Complex (TVCC), Parel and Goregaon, Mumbai Veterinary College, affiliated Bai Sakarbai Dinshaw Petit Hospital for Animals (BSDPHA) and cases referred from private practitioner from Mumbai were included in present study. Ailing dogs with clinical or subclinical bacteriuria of any breed, age, or sex were included in the study. Preliminary data including, patient's age, sex, breed, weight, and previous medical history were collected.

**Corresponding author* : Email : ranaparul328@gmail.com

Hemato-Biochemical Analysis

Blood samples were collected on 0th day and 7th day from cases presented and processed for Complete Blood Count, Kidney Function Test and Liver Function test. Complete blood count (CBC) was carried out on automatic hematology analyzer (Orphee Mythic 18) by using Impedance principle for measuring analytes. The serum samples were subjected to liver function tests and kidney function tests by Em 200 Transcasia biochemical analyser by using calorimetric principle.

Urinalysis and Urine Culture

Urine was collected from dog by catheterization in a sterile container on day 0 and day 7. Physical, biochemical (dipstick method) and microbiological examinations were carried out. The urine collected from the suspected dogs was centrifuged at 2000 rpm for 5 minutes and cultured on EMB agar using an inoculation loop and was incubated at 37°C for 24 hours.

Results and Discussion

Patient details

Nineteen dogs with urinary tract infection (UTI) associated with *Escherichia coli* were selected after screening 25 suspected dogs by urine culture. The other organisms isolated were *Psuedomonas*, *Klebsiella* and *Proteus*. Selected dogs consisted of 52.63% (n=10/19) males and 47.37% (n= 9/19) females (Fig 4.1). Percent of male dogs suffering from UTI associated with *E. coli* were slightly more than females. The finding is in agreement with Mendoza-Lopez *et al.*2017) and Kogika *et al.* (1995) who reported percentage of male and female 74.22% and 25.78%, 49.09% and 42.42%, and 64.7% and 35.3% respectively. In the present study, a greater number of males were enrolled in comparison to females which could have contributed to their higher prevalence.

In contrast, more frequency of females was prone to UTI in the studies of Ling *et al.*(2001), Marques *et al.* (2016), McMeekin *et al.*(2017), Mustapha and Goel (2020) with 58.3%, 61.41%, 68.8% and 13.59% respectively. In the present study, sex of the animal was not associated significantly with occurrence of UTI, which was in agreement with Cetin *et al.*(2003).

In present study, UTI associated with *E. coli* was most frequently observed in Labrador Retrievers 21.05% (n=4/19) followed by German Shepherd 15.79% (n=3/19), non-descript 15.79% (n=3/19), Golden Retriever 10.53% (n=2/19), Doberman 10.53% (n= 2/19), Spitz 10.53% (n= 2/19), Shih Tzu 5.26% (n=1/19), Lhasa Apso 5.26% (n=1/19) and Cocker Spaniel 5.26% (n=1/19) (Fig. 4.2). Similar to this finding, McMeekin *et al.* (2017) in his study found Labrador Retrievers (9.27%) and German Shepherd (8.24%) to be most frequently affected. Similarly, Mendoza-Lopez *et al.* (2017) found high prevalence of UTI in Labrador Retriever (9.27%). Mustapha and Goel (2020) found that German Shepherd (9.71%) was most affected breed in their study. In the present study, the higher frequency of Labrador Retrievers and German Shepherd could be due to their higher enrollment in this study.

Out of the 19 dogs affected, 21.05% (n= 4/19) were in the age group between 0-3 years, 42.11% (n= 8/19) were in the age group 4-9 years and 36.84% (n= 7/19) were in age group of above 10 years and above (Fig. 4.3) The mean ± SE values of age of the animals being 7.63 ± 0.83 years. The mean ± SE values age of males was 8.90 ± 0.91 and females was 6.2 ± 1.32. The mean age in the study of Ling *et al.* (2001) was 8.0 ± 1.0 in case of males and 7.7 ± 0.1 in case of females which is similar to the present study. In the present study higher frequency was seen in middle aged and older dogs which is similar to the study of Kogika *et al.* (1995), Ling *et al.* (2001), Hall *et al.*(2013) and McMeekin *et al.*(2017). As the age increases, the chances of UTI increase and this could be due to decrease in immune response and also due to the predisposing medical conditions which can make the animal more prone to UTIs (Mendoza-Lopez *et al.*2017).

Clinical signs

The clinical signs were in appetence 52.63%, (n=10/19), haematuria 52.63% (n=10/19), urine incontinence 42.11%, fever 42.11%, stranguria 42.11%, oliguria 26.32% and emesis 10.53%.

Mean±SE of rectal temperature was 102.52±0.27°F.

Mean ± SE of heart rate was 135.26±1.56 beats per minute. Mean ± SE of respiration rate of the animals was 23.95±0.5 /minute. The mean of body weight was 22.95±2.34 kg.

Results were similar to the study of Mendoza-Lopez *et al. (*2017) in whose study haematuria and urinary retention were 19.58% each, stranguria 5.15%, pollakiuria 6.17% and urinary incontinence and depression were 2.06% each. Yogeshpriya *et al.* (2018) observed clinical signs such as stranguria (35.71 %), pyuria (42.85 %), anorexia (28.57 %), hematuria (28.57 %), foul smelling urine (17.85 %), pollakiuria (25 %), emesis (3.87 %) and dark yellow urine (14.28 %) which are in accordance to the present study. Kogika *et al.* (1995) also suspected UTI patients on the basis of symptoms such as dysuria, urinary incontinence, pollakiuria, haematuria, fever, polyuria and polydipsia.

According to Bartges (2004) clinical signs associated with UTIs may or may not be present and if present they are variable in every case and they depend on number of factors such as predisposing causes, host immune response, site of the infection, duration of infection and virulence of the pathogen. The signs therefore vary and may include haematuria, stranguria, pollakiuria, inappropriate urination, dysuria, kidney failure and even septicemia.

Haemato-biochemical Tests

The nineteen dogs with signs of UTI were subjected to complete blood count, kidney function tests and liver function test before treatment. The reference range of the haemato-biochemical parameters were from Plumb (2018) and Latimer *et al.*(2003).

Mean ± SE of hemoglobin, PCV, and TEC were 12.23±0.62 gm%, 35.96±1.82%, and 5.45±0.28 10^6/cmm respectively. These parameters were found to be in normal range. Similar observations were made by Yogeshpriya *et al.* (2018) in their study. Mean ± SE of TLC was 19.85±1.97 x10^3/cmm.

Mean ± SE of Neutrophils was 77.89±1.42%, Eosinophils 1±0.31%, Lymphocytes 19.53±1.25%, for Monocytes 1.42±0.18% and for Basophils was 0.16±0.12%. Marked leukocytosis with neutrophilia associated with UTIs was similarly seen in the studies of Cetin *et al.* (2003), Roopali *et al.* (2018) and Yogeshpriya *et al.*(2018),

Mean ± SE of ALP, AST and ALT is 108.84±9.77 U/L, 47.33±4.44 U/L and 50.24±9.85 U/L respectively. These values are almost normal.

Mean ± SE of total protein, albumin and globulin was 6.42±0.2 g/dl, 2.52±0.1 g/dl and 3.86±0.24 g/dl respectively.

There was mild hypoalbuminemia and hyperglobulinemia which may be due to inflammation, as inflammation can cause mild to moderate hypoalbuminemia which might accompany hyperglobulinemia. This can be explained by Throop *et al.* (2004) and Georgieva *et al.* (2008). The observations in the present study were similar to the findings of Yogeshpriya *et al.*(2018).

Mean ± SE of BUN was 30.41±5.85mg/dl and Mean ± SE of creatinine was 1.72±0.21. This elevation may be due to decreased renal filtration due to the renal injury caused by inflammation and infection (Focak *et al.,* 2017). The increase in the BUN and creatinine levels were similar to the result of Yogeshpriya *et al.*(2018), Roopali *et al.* (2018) and Focak *et al.*(2017).

Conclusion

Clinical signs associated with UTIs tend to appear later and may be absent in some cases.

The common clinical signs are haematuria, stranguria and urinary incontinence. There may be changes in Haemato-biochemical values in cases of UTIs such as leukocytosis, neutrophilia, hypoalbuminemia and hyperglobulinemia. There may be increase in BUN and creatinine due to renal injuries. But haemato-biochemical changes are not very reliable in diagnosing UTIs. Urine culture must be done in order to diagnose a urinary tract infection.

References

Bartges, J.W. (2004). Diagnosis of urinary tract infections. Veterinary Clinics: *Small Animal Practice*, **34**(4) : 923-933.

Cetin, C., Senturk S., Kocabiyik,A.L., Temizel,M. and Ozel,E. (2003). Bacteriological examination of urine samples from dogs with symptoms of urinary tract infection. *Turkish Journal of Veterinary and Animal Sciences*, **27**(5) : 225-1229.

Dowling, P.M. (1996). Antimicrobial therapy of urinary tract infections. *The Canadian Veterinary Journal*, **37**(7) : 438.

Focak, M., Haskovic,E., Suljevic,D. and Zahirovic,A. (2017). Comparative evaluation of biochemical parameters during urinary infection in Maltese and Belgian shepherd dogs. *Cercetari Agronomice in Moldova*, **50**(3) : 107-114.

Georgieva, T.M., Georgiev, I.P., Iliev,Y., Petrov,V.S., Vachkov,A., Kanelov,I.N. and Eckersall,D. (2008). Blood serum concentrations of total proteins and main protein fractions in weaning rabbits experimentally infected with E. coli. *Revue de Medicine Veterinary*, **159**(8-9) : 431-436.

Hall, J.L., Holmes, M.A. and Baines, S.J. (2013). Prevalence and antimicrobial resistance of canine urinary tract pathogens. *Veterinary Record*, **173**(22) : 549-549.

Kogika, M.M., Fortunato,V.A.B., Mamizuka,E.M., Hagiwara M.K., Pavan M.D.F.B., and Grosso S.N.A. (1995). Etiologic study of urinary tract infection in dogs. *Brazilian Journal of Veterinary Research and Animal Science*, **32**(1) : 31-36.

Latimer, K.S., Mahaffey, E.A. and Prasse,K.W. (2003). Duncan and Prasse's Veterinary Laboratory Medicine: *Clinical Pathology*, 4th ed. 331-338.

Ling, G.V., Norris, C.R., Franti, C.E., Eisele, P.H., Johnson, D.L., Ruby,A.L. and Jang, S.S.(2001). Interrelations of organism prevalence, specimen collection method, and host age, sex, and breed among 8,354 canine urinary tract infections (1969–1995). *Journal of Veterinary Internal Medicine*, **15**(4) : 341-347.

Marques, C., Gama,L.T., Belas,A., Bergstrom, K., Beurlet, S., Briend-Marchal,A., and Pomba, C. (2016). European multicenter study on antimicrobial resistance in bacteria isolated from companion animal urinary tract infections. *BMC veterinary research*, **12**(1) : 1-17.

McMeekin, C.H., Hill, K.E., Gibson, I.R., Bridges, J.P. and Benschop, J. (2017). Antimicrobial resistance patterns of bacteria isolated from canine urinary samples submitted to a New Zealand veterinary diagnostic laboratory between 2005–2012. *New Zealand veterinary journal*, **65**(2) : 99-104.

Mendoza-Lopez, C.I., Del-Angel-Caraza,J., Quijano-Hernández,I.A. and Quijano-Hernández,M.A. (2017). Analysis of lower urinary tract disease of dogs. *Pesquisa Veterinária Brasileira*, **37**(11) : 1275-1280.

Mustapha, M and Goel,P. (2020). Isolation and prevalence of uropathogenic E. coli in different breed, sex and age of dogs. *Revue Vétérinaire Clinique*, **55**(2) : 49-54.

Plumb, D.C. (2018). Plumb's Veterinary Drug Handbook. Desk. John Wiley & Sons, 5th edition, pp. 1241-49.

Roopali, B., Roy,M. and Roy,S. (2018). Haemato-biochemical changes and therapeutic management of urinary tract infection in canines. *The Pharma Innovation Journal*, **7**(6) : 89-92.

Smee, N., Loyd,K. and Grauer,G. (2013). UTIs in small animal patients: part 1: etiology and pathogenesis. *Journal of the American Animal Hospital Association*, **49***(*1) : 1-7.

Throop, J.L., Kerl,M.E. and Cohn,L.A. (2004). Albumin in health and disease: causes and treatment of hypoalbuminemia. *Compendium*, **26 :** 940-948.

Yogeshpriya, S., Pillai,U.N., Ajithkumar,S. and Madhavan, U. (2018). Clinico-Haemato-Biochemical Profile of Dogs with Urinary Tract Infection: A Retrospective Study of 32 Cases (2010-2012). *International Journal of Current Microbiology and Applied Science*,**7**(09) : 2797-2802.