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An Investigation of Risk Factors, Clinical Manifestations and Aetiology of Lower Urinary Tract Diseases in Cats in Diyarbakır, Turkiye

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FELINE lower urinary tract disease (FLUTD) is a common feline disease characterized by urinary bladder and urethral dysfunction. The present study aimed to investigate the epidemiological data, clinical symptoms, aetiology and risk factors of lower urinary tract diseases in the feline population in Diyarbakir and compare the data with published research results. The health records of 1658 cats who presented to the Animal Hospital, Faculty of Veterinary Medicine, Dicle University between January 2020 and May 2022 were reviewed, and 38 cats diagnosed with feline lower urinary tract disease (FLUTD) were included in the study. Information about the patients' age, sex, diet and sterilization status was recorded. Following the collection of anamnesis data (diet, accommodation conditions and observed abnormalities), clinical examination, haematological analysis, serum biochemical analyses, radiography and abdominal ultrasonography were performed to make a diagnosis. A total of 21 (55.26%) patients were diagnosed with feline idiopathic cystitis (FIC)/urinary tract infection (UTI), 11 (28.9%) with urolithiasis, 5 (13%) urethral plaque and 1 (2.63%) with neoplasia. The most frequent cause of FLUTD was FIC/UTI. FIC was the most prevalent FLUTD in the Diyarbakir region, with the most frequent clinical symptoms being pain, stranguria, pollakiuria, haematuria, obstruction and periuria. The disease was more prevalent in male cats, and a single-cat household setting, dry and wet food diets and drinking tap water were important risk factors for the occurrence of the disease.

Keywords: Aetiology, Clinical manifestations, Feline, Lower urinary tract.

Introduction

Feline lower urinary tract disease (FLUTD) is a common feline disease characterized by urinary bladder and urethral dysfunction [1, 2]. FLUTD is a broad term for many disorders, including feline idiopathic cystitis (FIC), urethral plaque (UP), urolithiasis, urinary tract neoplasia and urinary tract infection (UTI) [1]. Common clinical manifestations of the disease include dysuria, haematuria, stranguria, pollakiuria and periuria [2-7]. The diagnosis is based on a thorough examination of specific causes. Accordingly, urine analyses (urine strips, urinary sediment and urine culture), radiography and abdominal ultrasonography are used [2]. In cases where a specific cause cannot be determined, the disease is classified as idiopathic cystitis [2, 4, 5].

A review of the relevant literature indicated that FIC was the most frequently diagnosed disease (55%–60%) among lower urinary tract diseases [1-7]. Urethral obstruction is a prevalent complication of the disease, especially in male cats [3, 6]. Relevant literature reported that obstruction was caused by UP (55%) and urolith (15%) in felines, with no mechanical cause in 28% [2]. In Thailand, FIC was reported to be the

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most prevalent FLUTD (57.7%), followed by urolithiasis (18%) [3]. In an Indonesian study, the most frequently diagnosed diseases were FIC (55%), UTI (25%), urolithiasis (13%), UP (4.9%) and neoplasia (0.4%) [1]. Another Indonesian study reported that FLUTD was associated with FIC (21.9%), urolithiasis (57.5%), UTI (16.4%), neoplasia (1.4%), trauma 1.4% and nervous disorders (1.4%) [8]. In a study with European cats, urolithiasis was found in 22% of cats, UPs in 10% and UTI in 8%, with 57% of the cats classified as idiopathic (lack of a specific cause) [5]. It was reported that the most prevalent disease in Norwegian cats was FIC (55%), followed by UPs (21%) [7]. It was reported that the most frequently diagnosed disease in the German cat population was FIC (55%), followed by UTI (18.9%), UP (10.3%) and urolithiasis (7%) [2].

Risk factors for FLUTD differ by country because of geography, seasons, diets, and cat housing practices [2]. Low activity and an indoor care setting were identified as risk factors for FLUTD in New Zealand [9]. In Norway, male cats in indoor care settings were found to be at a higher risk of FLUTD [1, 2]. Similarly, in Belgium, indoor pet care was identified as an incident risk factor for FLUTD [10]. In Thailand, commercial dry food and excess weight were reported to increase the risk of FLUTD [11]. A study with European cats reported that the disease had a higher incidence in male cats [5].

The present retrospective study aimed to investigate the epidemiological data, clinical symptoms, aetiology and risk factors of FLUTD in Diyarbakir based on data provided by the Animal Hospital, Faculty of Veterinary Medicine, Dicle University, and to compare the data with published research results.

Materials and Methods

Ethical approval

Ethical approval for this study was obtained from the Dicle University Local Ethics Committee for Animal Experiments (23.05.2022 dated and numbered E- E-35582840-020-289673)

Animals and Data collection

Within the scope of the study, the health records of 1658 cats presented to Animal Hospital, Faculty of Veterinary Medicine, Dicle University between January 2020 and May 2022 were reviewed, and 38 cats diagnosed with FLUTD were included in the study.

Information about the patients' age, sex, diet and sterilisation status was recorded. Following the collection of anamnesis data (diet, accommodation conditions and observed abnormalities), clinical examination, haematological analyses, serum biochemical analyses, radiography and abdominal ultrasonography were conducted to make a diagnosis. Not all procedures were carried out on all of the cats included in the study.

The number of cats with haematuria, pollakiuria, periuria, obstruction and pain was recorded. Owners reported crying out during urination, an abnormally difficult walk, or startling upon contact with the abdomen as signs of pain in the cats.

Blood samples were collected from the patients. Complete blood count and serum biochemical analyses (blood urea nitrogen, creatinine and phosphorus) were performed to assess the severity of the disease and health status. Patients with elevated blood urea nitrogen, creatinine and phosphorus levels were excluded from the study.

Upon ultrasonographic examination, the cats were diagnosed with cystitis, with urinary bladder fullness and wall thickening. Urolithiasis diagnosis is based on the detection of uroliths upon radiography or ultrasonography of the urinary bladder or urethra. Cats with a plug or a piece of a plug during urethral catheterisation were diagnosed with UP. Obstructive urination was defined as cats with a marked urinary bladder fullness, inability to urinate, or drop-by-drop urination. Cats with urethral stones and resistance during catheterisation were also considered obstructive, despite the absence of urinary bladder fullness. Large masses detected by ultrasonographic examinations were considered neoplasia (without definitive histopathological diagnosis). Cats with elevated body temperature and total leukocyte count were diagnosed with UTI. Cats without a specific diagnosis were diagnosed with idiopathic FIC. Nevertheless, cats diagnosed with UTI and FIC in the present study were assessed in the same group as urine culture could not be performed (Table 1).

Statistical analysis

The collected data were descriptively analysed using Microsoft Excel software.

Results

The records of 1658 cats presented to Animal Hospital, Faculty of Veterinary Medicine, Dicle University with various complaints between January 2020 and May 2022 were reviewed with the aim of investigating FLUTD incidence. A total of 64 (3.86%) patients had urinary tract diseases, with 38 (59.37%) diagnosed with FLUTD. Patients diagnosed with nephritis or pyelonephritis among cats with urinary tract diseases based on ultrasonographic and biochemical analysis results were excluded from the study. A total of 38 patients diagnosed with FLUTD were investigated within the scope of the study.

A total of 21 (55.26%) patients were diagnosed with FIC/UTI, 11 (28.9%) with urolithiasis, 5 with (13%) UP and 1 (2.63%) with neoplasia. The most frequent cause of FLUTD was FIC/UTI. The most prevalent clinical manifestations associated with the disease were pain in 38 (100%), stranguria in 31 (81.57%), pollakiuria in 28 (73.68%), obstruction in 23 (60.52%), haematuria in 19 (50%) and periuria in 11 (28.9%) cats. Along with pain, cats with FIC/UTI also had stranguria in 17 cases (80.95%) and pollakiuria 16 (76.19%). The most common clinical signs in cats with urolithiasis were pain in 11 (100%), stranguria in 7 (81.81%) and obstruction in 7 (63.63%) (Table 2).

In the study, 21 (55.26%) cats were of the Tabby breed. The fact that a significant proportion of the cats fed in the Diyarbakır region are Tabby breed cats may account for the above statistics. Other cat breeds affected by the disease were Persian 8 (21.05%), Scottish 3 (7.89%), Russian Blue 2 (5.26%), Orange Tabby 2 (5.26%) and British 2 (5.26%) (Table 3).

TABLE 1. Definitions and diagnostic methods for various types of FLUTD [1, 2].

Type FLUTD	Methods
FIC/ UTI	Eliminate the other specific causes (Urolithiasis, UP, Neoplasia) possibilities
UP	The obstruction of the urethra caused by the plug identified on catheterization
Urolithiasis	Bladder/urethral stone detected on radiography and/or ultrasonography
Neoplasia	The lesion was identified by ultrasound examination

TABLE 2. Clinical signs of all cats with feline lower urinary tract disease and cats diagnosed with six different conditions [n (%) of cats].

	All Cats n(%)	FIC/UTI n(%)	Urolithiasis n(%)	UP n(%)	Neoplasia n(%)
Total	38 (100)	21 (55.26)	11 (28.9)	5 (13)	1 (2.63)
Hematuria	19 (50.0)	10 (47.61)	5 (45.45)	3 (60.0)	1 (100)
Stranguria	31 (81.57)	17 (80.95)	9 (81.81)	4 (80.0)	1 (100)
Pollakiuria	28 (73.68)	16 (76.19)	7 (63.63)	4 (80.0)	1 (100)
Periuria	11 (28.9)	8 (38.09)	3 (27.27)	1 (7.69)	1 (100)
Obstruction	23 (60.52)	11 (52.38)	7 (63.63)	5 (100)	0 (0)
Pain	38 (100)	21 (100)	11 (100)	5(100)	1(100)

TABLE 3. Cats diagnosed with FLUTD by breed [n (%)].

	All Cats (n = 38)	FIC/UTI (n = 21)	Urolithiasis (n = 11)	UP (n = 5)	Neoplasia (n = 1)
Tabby breed	21 (55.26)	11 (52.38)	5 (45.45)	4 (80)	1 (100)
Orange Tabby	2 (5.26)	2 (9.52)	0 (0)	0 (0)	0 (0)
Russian blue	2 (5.26)	1 (4.76)	1 (9.09)	0 (0)	0 (0)
Persian	8 (21.05)	4 (36.36)	3 (27.27)	1 (20)	0 (0)
Scottish	3 (7.89)	2 (9.52)	1(9.09)	0 (0)	0 (0)
British	2 (5.26)	1 (4.76)	1(9.09)	0 (0)	0 (0)

The average age and body weight of cats diagnosed with FLUTD were 3.07 years and 3.26 kg, respectively. The prevalence of the disease in male and female cats was 25 (65.78%) and 13 (34.21%), respectively. The disease was observed in cats of almost all ages (0.5–13 years) and sexes; nevertheless, the prevalence of urolithiasis was markedly high in advanced age (4.75 years), in cats with a higher body weight (4.29 kg), castrated cats 9 (81.81%), and in male cats 8 (72.72%) compared to FIC/UTI and UP (Table 4).

A review of the association between FLUTD and life conditions indicated that a significant proportion of the cats affected by the disease were domestic cats 37 (97.36%). In the study, 23 (60.52%) cats lived in single-cat households, while 15 (39.47%) lived in multiple-cat households (≥ 2 cat households) (Table 5).

A review of the diet regimens of cats with FLUTD showed that the rate of cats fed dry and wet foods and dry food alone was 21 (55.26%) and 17 (44.73%), respectively. The prevalence of urolithiasis was high compared to other diseases in 9 cats (81.81%) fed with dry food and 11 cats (100%) drinking tap water (Table 6).

Discussion

To the best of our knowledge, this study is the first to report epidemiological data, clinical symptoms, aetiology and risk factors of lower urinary tract diseases in the feline population in Diyarbakir. In the present study, 38 cats were diagnosed with FLUTD based on the data provided by the Animal Hospital, Faculty of Veterinary Medicine, Dicle University.

According to the study findings, FIC/UTI had the highest prevalence 21 (55.26%) in cats with FLUTD. Similarly, relevant studies from different countries reported FIC as the most prevalent FLUTD. Lew-Kojrys et al. [4] in Polish cats, Nururrozi et al. [1] in the Indonesian Yogyakarta cat population, Astuty et al. [8] in cats of the Sleman region of Indonesia, Piyarungsri et al. [3] in Thai cats, Gerber et al. [5] in European cats, Dorsh et al. [2] in the German cat population, Kaul et al. [12] in Munich cats, Seavik et al. [7] in Norwegian cats and Hribova et al. [6] in Czech reported that FIC was the most prevalent FLUTD, with rates of 60.7%, 56%, 21.9%, 57.7%, 51.5%, 57%, 55%, 55.5% and 57%, respectively. Furthermore, relevant studies reported UTI as one of the major causes of FLUTD with an incidence rate of 8%–25% [1-7]. Notwithstanding above, FIC and UTI were investigated in the same group in the present study. This study and other published research [1-7] suggest that FIC is the most common cause of FLUTD.

In the current study, urolithiasis was detected in 11 (28.9%) out of 38 cats with FLUTD based on ultrasonographic and radiographic examinations. The prevalence of urolithiasis in different countries was reported by Lew-Kojrys et al. [4] as 13%, Nururrozi et al. [1] as 13%, Astuty et al. [8] as 57.5%, Piyarungsri et al. [3] as 18%, Gerber et al. [5] as 22%, Dorsh et al. [2] as 7%, Kaul et al. [12] as 12.9%, Seavik et al. [7] as 11.8% and Hribova et al. [6] as 5%. The dietary regimens of the patients included in the study, especially drinking tap water, may account for the high incidence of urolithiasis in the present study compared to other reports by relevant studies.

TABLE 4. Age, sex, weight and analyses of cats with FLUTD.

	All Cats (n = 38)	FIC/UTI (n = 21)	Urolithiasis (n = 11)	UP (n = 5)	Neoplasia (n = 1)
Age (year)	3.07 (0.5-13)	1.43 (0.5-4)	4.75 (2.5-8)	2.8 (1.5-4)	13
Weight (kg)	3.26 (1-6.5)	2.23 (1-4)	4.29 (3-6)	2.9 (2-4.5)	6.5
Males (%)	25 (65.78)	12 (57.14)	8 (72.72)	4 (80.0)	1 (100)
Females (%)	13 (34.21)	9 (42.85)	3 (27.27)	1 (20.0)	0 (0)
Spayed/castrated (%)	17 (44.73)	6 (28.57)	9 (81.81)	2 (40.0)	0 (0)
Sexually intact (%)	21 (55.26)	15 (71.42)	2 (18.18)	3 (60.0)	1 (100)

TABLE 5. Living conditions of cats with FLUTD [n (%) of cats].

	All Cats (n = 38)	FIC/UTI (n = 21)	Urolithiasis (n = 11)	UP (n = 5)	Neoplasia (n = 1)
Indoor (%)	37 (97.36)	20 (95.23)	11 (100)	5 (100)	1 (100)
Outdoor (%)	1 (2.63)	1 (4.76)	0 (0)	0(0)	0 (0)
Single cat household(%)	23 (60.52)	13 (61.9)	7 (63.63)	2 (40)	1 (100)
≥ 2 cat household (%)	15 (39.47)	8 (38.1)	4 (36.36)	3 (60)	0 (0)

TABLE 6. Diet regimens of cats with FLUTD [n (%) of cats].

	All Cats (n = 38)	FIC/UTI (n = 21)	Urolithiasis (n = 11)	UP (n = 5)	Neoplasia (n = 1)
Dry food only (%)	17 (44.73)	5 (23.80)	9 (81.81)	3 (60)	0 (0)
Wet food only (%)	1 (2.63)	1 (4.76)	0 (0)	0 (0)	0 (0)
Dry and wet food(%)	21 (55.26)	15 (71.42)	2 (18.18)	2 (40)	1 (100)
Special diet (%)	2 (5.26)	2 (9.52)	0 (0)	0 (0)	0 (0)
Tap water (%)	38 (100)	21 (100)	11 (100)	5 (100)	1 (100)

Up was identified as the cause of FLUTD in 13% of the cats included in the present study. The rate of UP as a cause of FLUTD was reported by Lew-Kojrys et al. [4] as 17.4%, Nururrozi et al. [1] as 4.9%, Gerber et al. [5] as 10%, Dorsh et al. [2] as 10.3%, Seavik et al. [7] as 21% and Hribova et al. [6] as 23%. The UP incidence found in the present study was consistent with the results of other studies [1, 2, 4-7].

The incidence of neoplasia was 2.63% in the present study, making it the least prevalent cause of FLUTD. Similarly, several studies [1-7] reported the incidence of neoplasia between 0.4% and 3.6%, which indicates that neoplasia is the least reported cause of FLUTD.

Cats diagnosed with FLUTD may present with clinical manifestations of stranguria, haematuria, pollakiuria, periuria, pain and obstruction [2, 3]. In the present research, the most frequent

clinical symptoms were pain (100%), stranguria (81.57%), pollakiuria (73.68%), obstruction (60.52%), haematuria (50.0%) and periuria (28.9%). Lew-Kojrys et al. [4] reported that the most common clinical manifestations in cats with FLUTD were stranguria (81.3%), pollakiuria (71.7%), obstruction (59.5%), haematuria (49.9%) and periuria (25.9%). Nururrozi et al. [1] reported that the clinical signs associated with the disease were stranguria, haematuria, pollakiuria, dysuria and periuria, and their incidence rates were 45.3%, 40.4%, 11.9%, 6.0% and 3.2%, respectively. Gerber et al. [5] reported that the most common clinical manifestations in cats with FLUTD were stranguria (48%), pain (43%), haematuria (43%), pollakiuria (40%) and periuria (32%). Dorsch et al. et al. [2] reported that the most common clinical signs were stranguria (54.0%), obstruction (52.6%) and haematuria (42.4%). The clinical manifestations in the present study were consisted with the findings of relevant studies [1, 2, 4, 5]. Nevertheless, all the owners in the present study reported complaints of pain. Furthermore, there were clinical signs of obstruction (100%) and stranguria (80%) in the cats diagnosed with UP in the present study, which may be associated with inflamed urethra [2].

A review of the risk factors associated with the disease suggested that male sex, dry and wet food and drinking tap water were important risk factors in the current study. Furthermore, the incidence of the disease was markedly higher in single-cat households. Castration, dry food and drinking tap water, in addition to advanced age, were important risk factors for urolithiasis in male cats. When cats with FLUTD were evaluated, Piyagrungsri et al. [3] found that the highest rate (46%) was observed in castrated male cats and the incidence of FLUTD was higher in single-cat households (62.8%), cats on a dry food diet (50%) and cats who drank tap water (44.9%). Dorsch et al. [2] reported that FLUTD was prevalent in male cats (81.8%), with higher prevalence rates in cat households and cats on dry and wet food diets at 83.8% and 53.0%, respectively. In their study on the risk factors for FLUTD, Pusoonthornthum et al. [11] reported that male sex, cats on a dry food diet, and cats who drank tap water were more likely to contract the disease. Gomes et al. [13] reported that sex, living conditions, food, and water source were risk factors for urolithiasis, with castration being an important factor associated with predisposition. Lekcharoensuk et al. [14] reported a high incidence of urolithiasis in castrated male cats. According to Jones et al. [9], urolithiasis is common in cat households, castrated cats, and cats on a dry food diet. A review of the findings from relevant studies [2, 3, 11, 13, 14] suggested that male sex, castration, single-cat households, and a diet based on dry and/or dry–wet formula were important risk factors for FLUTD, which supported the findings of the present study. In addition, Lund and Eggertsdottir [15] reported that stress played a role as a predisposing factor in the occurrence of FIC and urolithiasis by affecting the feeding habits and water intake of cats and contributing to the occurrence of uroliths by inducing changes in urine pH. This is thought to be explained by the risk factors reported in the present study, especially in single-cat households and castrated cats, in the occurrence of FLUTD.

In conclusion, FIC was the most common cause of FLUTD in the Diyarbakir region, with the most prevalent clinical manifestations being pain, stranguria, pollakiuria, haematuria, obstruction and periuria. The disease was more prevalent in male cats, and a single-cat household setting, dry and wet food diets and drinking tap water were important risk factors for the occurrence of the disease.

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Conflict of interest

The authors declare that they have no conflict of interest

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