Avicenna Veterinary Research
Vol. 1, No. 4, Winter 2025: 7-10
Bu-Ali Sina University

ORIGINAL ARTICLE

Clinical and Epidemiological Survey of Urinary Stones in Cats

Farnoosh Kaviani*, **Erfan Jafari Moghadam**
Department of Clinical Sciences, Faculty of Veterinary Medicine, Bu-Ali Sina University, Hamedan, Iran.

Article info

Article history:
Received 2025-08-30
Received in revised form 2025-08-28
Accepted 2025-08-01

Keywords:
Feline urolithiasis
Urinalysis
Risk factors
Qazvin

Abstract

Urinary tract stones in cats can have severe and dangerous complications, so evaluation the statistics of affected animals in different geographical areas can be helpful. The most common stone types are calcium oxalate (CaOx) and struvite that prevalence has changed over time. Breed, age, sex, lifestyle and underlying conditions influence the formation of urinary stones. In this study, 537 cats were evaluated over a six-month period at a veterinary clinic in Qazvin. Approximately 7% of cats have urinary tract stones, that 90% in the bladder and 10% in the kidney. Older male cats are more likely to develop calcium oxalate (CaOx) uroliths, while struvite stones occur in younger female cats. Persian and Domestic Shorthair breeds were most affected and were at greater risk. Urinalysis revealed hematuria (72%), crystalluria (89%), and urine pH >7 (40%). These results highlight value of urinalysis, combined with clinical assessment and imaging, for effective diagnosis and management in feline.

1. Introduction

Urinary tract stones (urolithiasis) are a major disease in cats that can affect both upper and lower urinary tracts and, in severe cases, can lead to serious clinical complications and even death (Kopecny *et al.*, 2021). s This condition is associated with clinical signs such as hematuria, dysuria, pollakiuria, urethral obstruction, and in some cases, acute renal failure. According to the Merck Veterinary Manual, urolithiasis is one of the most common causes of urinary tract diseases in cats and contributes significantly to patient visits to veterinary clinics (Gomes *et al.*, 2018). Complete urethral obstruction can result in uremia and renal failure within 36 to 48 hours, and if untreated, may progress to coma or death within about 72 hours. The term urinary stone refers to the presence of calculi in any part of the urinary tract, although most cases are reported in the bladder and urethra (Gomes *et al.*, 2018). Uroliths are classified based on mineral composition; therefore, qualitative and quantitative analyses are essential for selecting the appropriate therapeutic and preventive approach. Among the mineral compositions, calcium oxalate (CaOx) and struvite have historically been the most common types of urolith types in cats, although their relative frequencies have changed over time (Gomes *et al.*, 2018).

In recent years, a decrease CaOx stone and an increase in struvite stones have been reported, which requires more detailed investigations. Epidemiological knowledge of the prevalence and composition of urinary stones is an essential basis for treatment planning and preventive measures. Previous studies (including the analysis of 4495 canine and feline uroliths in the Benelux region and studies conducted between 1981 and 2008 have have emphasized the importance of collecting epidemiological data to better understand trends in urolith composition and prevalence (Picavet

*Corresponding author: F. Kaviani (Assistant Professor)
E-mail address: f.kaviani@basu.ac.ir
http://dx.doi.org/10.22084/avr.2025.31539.1018

et al., 2007). For instance, an epidemiological study in Mexico that examined data from 81 feline urolithe, it was found that oxalate (54.3%) and struvite (32.1%) to be the most common, followed by urate, cystine, and silica in smaller proportions (Mendoza-López *et al.*, 2019). These results emphasize the dominance of two main compositions (CaOx and struvite) in the formation of feline urinary stones (Kopecny *et al.*, 2021, Hesse et al., 2012). In addition, retrospective studies have shown that less common uroliths, such as urate stones, are often associated with metabolic disorders and liver disease. For example, urate stones in cats usually occur in association with underlying diseases and that careful laboratory and diagnostic workup is necessary to find the underlying cause (Dear et al., 2011). Clinical presentation in patients with urinary calculi can be highly variable. Some cats may remain asymptomatic, while others develop hematuria, dysuria, or even acute urethal obstruction. The type of stone, location, and associated conditions such as chronic kidney disease (CKD) can be critical in determining treatment and prognosis (Taylor *et al.*, 2025).

Urinary tract diseases are one of the main reasons for visiting veterinary clinics and can affect animals of all ages, breeds and sexes. urolithiasis is the second most important cause of clinical signs consistent with urinary tract disease in felids. It should not be viewed as a single disease entity but rather as a multifactorial disorder influenced by nutrition, metabolic abnormalities, genetic predisposition, and infections. Other risk factors include breed, sex, age, obesity, sedentary lifestyle, geographical location, and climate (Gomes *et al.*, 2018). Understanding the risk factors and pathophysiology of urolithiasis is critical for selecting appropriate therapeutic and preventive measures. This knowledge not only facilitates diagnosis and treatment but also helps identify at-risk populations and minimize exposure to risk factors. Epidemiological data on feline urolithiasis are therefore essential as the foundation for both treatment and prevention (Hesse *et al.*, 2012).

2. Materials and Methods

This study was conducted on cats referred to a veterinary clinic in Qazvin, Iran, between september 22, 2024, and March 20, 2025. Out of 537 referred cases, all cats presenting with urinary complaints (such as hematuria, burning urination, obstruction, or frequent urination), were screened via ultrasonography for urolithiasis. They were divided according to breed, age, and sex. the urine of these animals was obtained by cystocentesis and evaluated with urine dipstick. The samples were stored in sterile containers and examined within a maximum of 60 minutes. Uroliths detected by ultrasonography were categorized as bladder stones or renal stones (including pelvic and parenchymal locations). For each affected cat, data on sex, age, breed, stone location, and urinalysis results were recorded. Data were analyzed using SPSS software, and statistical significance was set at $P<0.05$ (t-test).

3. Result

During the six-month study period, 37 out of 537 cats (6.9%) were diagnosed with urolithiasis. Among these, 33 (89%) had bladder stones and 4 (11%) had renal stones (including pelvis or parenchyma). Gender analysis showed that the prevalence of the disease was higher in male cats than in females; 22 (59%) were males and 15 (41%) were females. In terms of age, the highest frequency was observed in the 4–6-year age group (15 cases; 41%), followed by the 7–10-year age group (10 cases; 27%), the 1–3-year age group (8 cases; 22%), and finally, over 10 years old (4 cases; 11%). Domestic shorthair (DSH) cats were most affected (20 cases; 54%), followed by Persian cats (10 cases; 27%), and other breeds (7 cases; 19%). In the urinalysis, Hematuria was the most frequent abnormality (25 cases; 68%), followed by proteinuria (10 cases; 27%). Crystalluria revealed struvite (12 cases; 32%), calcium oxalate (8 cases; 22%), and mixed/other types (17 cases; 46%).

These results suggest that bladder stones were the most common form of urolithiasis in the studied population, with middle age, male sex, and DSH breed representing major risk factors.

4. Discussion

In this study, the prevalence of urinary stones among cats visiting the clinic during the second half of 1403 was evaluated. Out of 543 referred cats, approximately 7% were diagnosed with urinary tract stones, of which about 90% were located in the bladder and 10% in the kidneys. Regarding sex distribution, three out of every five affected cats were male and two were female. The highest prevalence was observed in Persian and Domestic Shorthair cats.

Calcium oxalate formation was associated with increasing age, and struvite stones were more common in younger cats. Therefore, the chance of successful stone removal was higher in younger cats than other. For example, a retrospective study in the Republic of Ireland and Northern Ireland found that 54.3% of urinary stones were calcium oxalate, 32.1% were struvite, 7.4% were purine (urate and xanthine), and 6.2% were other types and Nearly 90% of the reported stones were from domestic short-haired cats Also males mainly affected by calcium oxalate stones and females more frequently presenting with struvite stones (Ortega et al., 2023). Similar studies in Mexico (Mendoza-López *et*

al., 2019), Thailand (Hunprasit *et al.*, 2019), Poland (Lew-Kojrys *et al.*, 2017), the United Kingdom (Geddes et al., 2023), and Kenya (Kimani *et al.*, 2021) Females are more likely to be affected by struvite stones (Dvorska *et al.*, 2015). Genetic predisposition and lifestyle, such as dry diets or indoor housing, were also identified as factors (Hsu *et al.*, 2022).

Urinalysis findings indicated crystalluria in 89% of cases and hematuria was also observed in 72%. Urine pH was above 7 in 40% of cases and urine specific gravity was lower than the physiological state of the animal (Lund *et al.*, 2013). These findings demonstrate the importance of thorough urinalysis for early detection and prediction of stone type, Researchs have also shown that acidity affects the type of stone (alkaline urine causes struvite stones and acidic urine causes calcium oxalate stones), so urinalysis is also helpful in treatment (Okafor *et al.*, 2019).

According to *The Merck Veterinary Manual* (12th ed., 2023), Epidemiological data suggest that the prevalence of urinary stones in cats is relatively low, but their clinical significance is high, including urinary obstruction and acute renal failure. Studies have indicated that complete urethral obstruction in cats can lead to uremia within 36–48 hours and may result in coma or death within 72 hours.

Finally, comprehensive clinical assessment urine and use imaging (ultrasonography and radiography), is essential not only for the diagnosis and treatment of urinary stones but also for preventing and guiding dietary (Ayoub et al., 2024). Recognizing risk factors such as age, sex, breed, diet, and environmental conditions is crucial for identifying susceptible populations and minimizing exposure to stone-promoting factors (Mendoza-López *et al.*, 2019).

References

[1] Ayoub SM, Mostafa MB, Abdelgalil AI. Studies on feline lower urinary tract disease in Egypt Cat population. Journal of Applied Veterinary Sciences. 2024 Jan 1;9(1):61-72.

[2] Dear JD, Shiraki R, Ruby AL, Westropp JL. Feline urate urolithiasis: a retrospective study of 159 cases. Journal of feline medicine and surgery. 2011 Oct;13(10):725-32.

[3] Dvorska J, Saganuwan SA. A review on urolithiasis in dogs and cats. Bulgarian Journal of Veterinary Medicine. 2015 Mar 1;18(1):1-8.

[4] Geddes RF, Davison LJ, Elliott J, Syme HM, O'Neill DG. Risk factors for upper urinary tract uroliths and ureteral obstruction in cats under referral veterinary care in the United Kingdom. Journal of Veterinary Internal Medicine. 2023 Mar;37(2):567-77.

[5] Gomes VD, Ariza PC, Borges NC, Schulz Jr FJ, Fioravanti MC. Risk factors associated with feline urolithiasis. Veterinary research communications. 2018 Mar;42(1):87-94.

[6] Hesse A, Orzekowsky H, Frenk M, Neiger R. Epidemiological data of urinary stones in cats between 1981 and 2008. Tierarztliche Praxis. Ausgabe K, Kleintiere/Heimtiere. 2012 Apr 1;40(2):95-101.

[7] Hsu HH, Ueno S, Miyakawa H, Ogawa M, Miyagawa Y, Takemura N. Upper urolithiasis in cats with chronic kidney disease: prevalence and investigation of serum and urinary calcium concentrations. Journal of Feline Medicine and Surgery. 2022 Jun;24(6):70-5.

[8] Hunprasit V, Pusoonthornthum P, Koehler L, Lulich JP. Epidemiologic evaluation of feline urolithiasis in Thailand from 2010 to 2017. The Thai Journal of Veterinary Medicine. 2019;49(1):101-5.

[9] Kimani, Wilson K., J. Nguhiu-Mwangi, John D. Mande, and Susan W. Mbugua. "Prevalence of urinary tract conditions and factors associated with urolithiasis in domestic cats in Nairobi, Kenya." (2021): 196-201.

[10] Kopecny L, Palm CA, Segev G, Larsen JA, Westropp JL. Urolithiasis in cats: Evaluation of trends in urolith composition and risk factors (2005-2018). J Vet Intern Med. 2021 May;35(3):1397-1405.

[11] Lew-Kojrys S, Mikulska-Skupien E, Snarska A, Krystkiewicz W. Evaluation of clinical signs and causes of lower urinary tract disease in Polish cats. Veterinární medicína. 2017 Jul 1;62(7).

[12] Lund HS, Krontveit RI, Halvorsen I, Eggertsdóttir AV. Evaluation of urinalyses from untreated adult cats with lower urinary tract disease and healthy control cats: predictive abilities and clinical relevance. Journal of feline medicine and surgery. 2013 Dec;15(12):1086-97.

[13] Mendoza-López CI, Del-Angel-Caraza J, Aké-Chiñas MA, Quijano-Hernández IA, Barbosa-Mireles MA. Epidemiology of feline urolithiasis in Mexico (2006–2017). Journal of Feline Medicine and Surgery Open Reports. 2019 Nov;5(2):2055116919885699.

[14] Merck Veterinary Manual. 12th ed. Kenilworth (NJ): Merck & Co., Inc.; 2023.

[15] Okafor CC, Pearl DL, Blois SL, Lefebvre SL, Yang M, Lund EM, Dewey CE. Factors associated with

hematuric struvite crystalluria in cats. Journal of feline medicine and surgery. 2019 Oct;21(10):922-30.

[16] Ortega CJ, Stavroulaki EM, Lawlor A, Lulich J, Cuq B. Retrospective analysis of 131 feline uroliths from the Republic of Ireland and Northern Ireland (2010-2020). Irish Veterinary Journal. 2023 Feb 6;76(1):2.

[17] Picavet P, Detilleux J, Verschuren S, Sparkes A, Lulich J, Osborne C, Istasse L, Diez M. Analysis of 4495 canine and feline uroliths in the Benelux. A retrospective study: 1994–2004. Journal of animal physiology and animal nutrition. 2007 Jun;91(5-6):247-51.

[18] Taylor S, Boysen S, Buffington T, Chalhoub S, Defauw P, Delgado MM, Gunn-Moore D, Korman R. 2025 iCatCare consensus guidelines on the diagnosis and management of lower urinary tract diseases in cats. Journal of feline medicine and surgery. 2025 Feb;27(20):1098612X241309176.