

An Evaluation of Nutritional Factors on The Prevalence of Urolithiasis in Cats at The Veterinary Teaching Hospital, Universitas Airlangga During 2017–2019

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Abstract

Stones, or uroliths, in the urinary tract cause a disorder called urolithiasis. Patients with urolithiasis may experience blockage and possibly mortality; therefore, prompt treatment is imperative. This study aimed to investigate the prevalence of urolithiasis and its nutritional association in cats treated at the Veterinary Teaching Hospital, Universitas Airlangga during 2017–2019. Data was collected from the secondary resource from the medical report and the factor of feed nutrition involved fiber, protein, fat, and moisture. Data was analyzed using logistic regression to determine the influence of nutrition on the prevalence of urolithiasis in cats in the respective period. The findings indicated that in 2017, urolithiasis prevalence was 0,96%; in 2018, it was 5,55%; and in 2019, it was 0,91%. Meanwhile, it was revealed that the prevalence of urolithiasis was not significantly impacted by feed nutritional variables.

Keywords: cats, feed nutrition, urolithiasis

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INTRODUCTION

Cats are true carnivores who eat small prey with low-calorie density so they require a lot of prey to meet their nutritional needs (Sadek *et al.*, 2018). Feeding twice a day or even ad libitum is not a natural way for cats to eat. Cats usually need 250 kcal (Scherk, 2016). Nutritional problems in the feed can trigger disease in the cats' body, one of which is the urinary system. According to Fauziah (2015), cat urinary disorders can occur on average 6 cases per month. Urolithiasis is calcification in the form of calculi that occurs in the urinary system which is often called kidney stones (Sholihah, 2015). According to Apritya (2017), the incidence of urolithiasis in pet cats in Surabaya is quite high, which shows that there is still a lack of knowledge or awareness of cat owners about the predisposing factors that influence urolithiasis in cats.

Cats reared indoors tend to be given relatively large volumes of food, even ad libitum without considering the cats' needs (Sadek *et al.*, 2018). Obesity in cats can be caused by continuous excessive feeding so many substances are excreted which burdens kidney function. One example of a substance that is wasted is fat. Fat will be catalyzed into cholesterol, triglycerides, and free fatty acids (Setyaningsih, 2008). Excess cholesterol will be carried with the blood to the kidneys and mixed with urine which then binds to dissolved crystals to form uroliths (Lina, 2008).

The process of supersaturation and urolith aggregation is also influenced by the role of protein in urine (Ali and Arianto, 2020). According to Triakoso (2016), giving food containing excessive protein, calcium, sodium, and vitamin D can trigger hypercalciuria. Approximately 80% of hypercalciuria can form calcium oxalate uroliths and a small portion

becomes calcium phosphate (Hartiningsih *et al.*, 2012).

In Western countries, cat owners avoid using dry food that contains little water (< 14%). Cats need food that has high water content and low carbohydrates so dry food is considered unhealthy for cats (Beynen, 2018). Low water content is thought to cause the formation of stones in the urinary tract or in medical terms it is called urolithiasis. Increasing the amount of water intake will cause the volume of urine to increase, thereby reducing the level of urine saturation reducing the risk of disorders of the lower urinary system, and stimulating cats to urinate on time (Kerr, 2013).

According to Lina (2008), low fiber consumption can increase the risk of developing calcium oxalate stones because fiber will bind calcium in the intestine which will reduce calcium levels in the urine. This opinion was also confirmed by Lulich (2010) where feeding a high-fiber diet restored cats affected by hypercalcemia.

Choosing good cat food by considering balanced nutritional content is expected to help owners maintain the health of their beloved cats. This study was conducted to investigate the prevalence of urolithiasis during 2017–2019 and the association with appropriate feeding.

MATERIALS AND METHODS

Samples

This study was a retrospective study that aimed to investigate the prevalence of urolithiasis in cat patients examined at the Veterinary Teaching Hospital, Universitas Airlangga during 2017–2019, followed by an evaluation of feed nutritional factors i.e., protein, fiber, fat, and moisture. The secondary data from medical records were collected from January 2017 to December 2019. This study included 40 cat patients according to the inclusion criteria which were divided into 20 cats with urolithiasis and 20 without urolithiasis were used to examine the relationship of feed nutrition.

Prevalence Calculation

The data collected was then calculated for the prevalence of the disease. Prevalence was the

proportion of a population that has certain characteristics in a certain time period (McNutt, 2013). According to Spronk *et al.* (2019), the prevalence formula is described in the following formula: $\text{Prevalence (\%)} = (\text{Number of positive patients}) \times (\text{Total number of patients})^{-1} \times 100$.

Data Analysis

Logistic regression analysis was used to evaluate the relationship between cats diagnosed with urolithiasis as a dichotomous response variable (Yes/No) and the cats' nutrition.

RESULTS AND DISCUSSION

Cat samples who were successfully recorded based on the medical report at the Veterinary Teaching Hospital, Universitas Airlangga during the 2017–2019 period were 5995 samples. In 2017 there were 1771 samples recorded, in 2018 there were 2014 samples and in 2019, there were 2210 samples. There were 48 cases of cats with urolithiasis in the 2017–2019 period, with 17 cases reported in 2017, 11 cases reported in 2018, and 20 cases reported in 2019. The prevalence of urolithiasis based on the collected data was calculated using the proportion formula according to Spronk *et al.* (2019) and found that the prevalence of urolithiasis in 2017 was 0,96%, in 2018 it was 0,69%, and in 2019 it was 0,77%, and the prevalence of urolithiasis during 2017–2019 period was 0,80% (Table 1). A study conducted by Kharisma (2016) during 2012–2013 reported 12 (1,42%) male cats with urolithiasis of 842 total samples which was relatively higher than this study. Suryani (2015) also reported the prevalence of urolithiasis during 2013–2014 period, where found 17 (0,60%) cats with urolithiasis of 2796 total samples.

Based on the logistic regression analysis indicated that fiber, protein, fat, and moisture had no significant influence on the prevalence of urolithiasis in cat samples at the Veterinary Teaching Hospital, Universitas Airlangga from 2017 to 2019 (Table 2). This evidence is thought to be because the feed consumed by cat patients affected by urolithiasis is not much different from the standards provided by AAFCO (2014). There

Table 1. Prevalence of urolithiasis in cats during 2017–2019

Year	Number of samples	Samples with urolithiasis	Prevalence (%)
2017	1771	17	0,96
2018	2014	14	0,69
2019	2210	17	0,77
Total	5995	48	0,08

is a change in cat food formulation that can minimize the risk of urolith-forming crystalluria such as calcium oxalate crystalluria.

Table 2. Evaluation of the influence of nutrition on urolithiasis

Nutrition	p-value
Fiber	0,334
Protein	0,477
Fat	0,863
Moisture	0,315

Based on the Nagelkerke R-Square value was 0,375 and Cox & Snell R-Square value was 0,281, which indicated that there were 62,5% other factors outside of nutritional factors that can explain the prevalence of urolithiasis in cat samples. Another factor that is often associated with cases of urolithiasis is age. The percentage risk of calcium oxalate urolithiasis in cats is only 3% in cats < 1 year old and 97% in cats > 2 years old. This is because urine takes time to carry out the nucleation and saturation process (Sardjana and Triakoso, 2014). However, several retrospective studies reported that cats' age risk associated with urolithiasis such as < 2 years old in Surabaya, Indonesia (Kharisma, 2016; Suryani, 2015), 7 years in Brazil (Pimenta *et al.*, 2013).

Another factor that can be associated with cases of urolithiasis in cats is that male cats have a urethral anatomy shaped like a narrowed tube so that obstruction often occurs from the urinary bladder to the outside of the body, which causes urine to be trapped in the urinary tract (Apritya *et al.*, 2017). This is in line with a study reported by Suryani (2015) where as many as 88% of cats diagnosed with urolithiasis were male in Surabaya, Indonesia. The same study was also reported by Brilhante *et al.* (2022) in Brazil where 75% of cats were male during 2018–2019 period.

The reason why food nutrition did not have an effect on the prevalence of urolithiasis in this

study is also thought to be due to differences in the personality and nature of cats considering that cats are territorial animals. According to Schrek (2016), some cats have not been able to adapt to living close to and socializing with humans, allegedly due to the cats' personalities for example, aggressive, calm, fearful, and friendly. It is possible that the cat feels unsafe to drink or carry out normal activities because its territorial area is narrow, which makes the cat stressed (Tavinia *et al.*, 2023). This condition can also occur due to dominance from other cats (Suroiyah *et al.*, 2018; Purnomo *et al.*, 2022). Cats have a dominant nature that tends to bully other cats in the house and has the potential to cause stress, aggression, or injury to other cats (Litchfield *et al.*, 2017). Clinical signs of stress and anxiety may be obvious e.g., change in appetite, excessive body licking, frequent hiding, aggression, and excessive spraying (Scherk, 2016; Dewi *et al.*, 2023).

CONCLUSION

In conclusion, the prevalence of urolithiasis was 0,80% based on data on the total number of cat samples recorded in medical reports at the Veterinary Teaching Hospital, Universitas Airlangga from 2017 to 2019. Details of the prevalence of urolithiasis each year were 0,96% in 2017, 0,55% in 2018, and 0,91% in 2019. Feed nutritional factors were reported to have no significant influence on the prevalence of urolithiasis.

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