

RISK FACTORS FOR GASTROINTESTINAL FOREIGN BODIES IN CATS: A RETROSPECTIVE STUDY IN EGYPT

Ahmed Abdelbaset-Ismail^{1*}, Nehal Ibrahim¹, Mohamed Samir^{2,3}, Abd-Elmegeed Elmezyen¹, Mahmoud Abd-Elmaboud¹

¹Department of Surgery, Anesthesiology and Radiology, ²Department of Zoonoses, Faculty of Veterinary Medicine, Zagazig University, 44519 Zagazig, El-Sharkia, Egypt, ³Pirbright Institute, Ash Rd, Pirbright, Woking, UK.

*Corresponding author, E-mail: aaismaeil@vet.zu.edu.eg

Abstract: Gastrointestinal foreign body (FB) obstruction in felines is one of the emergencies and commonly required surgical interventions. The purpose of this study was therefore to investigate the risk factors that could prone cats to ingest FB. This study was retrospectively conducted on sixty-five cats that had been diagnosed with FB obstruction. On the other hand, sixty-five cats that had no clinical findings suggestive of gastrointestinal illnesses were used as controls. Among cats with gastrointestinal illnesses, we found that 9.97% had FB obstructions. The most common presenting breeds of both cat patients with FB obstruction and controls were Persian and Siamese. Similarly, most of the presented normal and diseased cats were males. Cats with FB were younger ($p < 0.05$) than those of control cats. There was no significant difference in the body weight for cats with FB versus control cats. Among the investigated factors, we also observed that living style, anxiety/stress, and frequency of exercise were the only factors that were strongly associated with the occurrence of FB obstruction. In conclusion, observations of this study indicate that a living style, anxiety/stress, and frequency of exercise have a significant impact on cat behavior and should be seen by cat-owned clients as important to prevent pica. Thus, the likelihood of blockage of the gastrointestinal tract by foreign bodies can be reduced.

Key words: foreign bodies; gastrointestinal tract; risk factors; obstruction; pica; cats

Introduction

Feline gastrointestinal foreign bodies (FB) obstruction is one of the emergencies that always needs critical care and commonly surgical intervention (1). Pica is known in cats as the ingestion of non-edible substances such as fabric, plastic, rubber, soil, and threads. In general, the prevalence of feline and canine behavioral problems (e.g., pica) varies according to breed, age, sex, age, lifestyle, and geographic region. These behavioral problems may consequently produce other related disorders; thus, it is valuable for veterinarians in

advising owners about counteracting behavioral problems (2-6).

The possible underlying factors in cats exhibiting pica include boredom, lack of social connectivity, genetic predisposition, early weaning, fasting, or anxiety disorders (7). In cats, it was proved in a case-control study that cats showing pica were less common in cats fed ad libitum. As has often been mentioned, pica and vomiting have been correlated, but the causative relationship is not well elucidated (8). In addition, this study also reported that most of the cats introduced with pica were shorthaired or longhaired domestic cats (8).

The recognition of these factors might help to reduce exposure and increase the protection against FB obstruction. Since in our animal hospital we

receive a considerable number of felines suffering FB obstruction, we became concerned to address the predisposing factors that may be associated with the incidence of FB obstruction in feline patients admitted to our veterinary hospital.

Therefore, the main purpose of this study was to figure out the predisposing factors that are likely associated with gastrointestinal tract FB obstruction in cats.

Materials and Methods

Animals and data collection

The current work was performed following the rules of the ethical committee and animal welfare of the Faculty of Veterinary Medicine, Zagazig University, Egypt. The animal study protocol was approved by the animal Ethics Committee of Zagazig University (ZU-IACUC/2/F/29/2022).

From the medical case records, the feline cases admitted to the Animal Clinic at Surgery, Anesthesiology and Radiology Department, Zagazig University, Zagazig, Sharkia, Egypt, from February 2019 to November 2021 were reviewed. From these records, cat patients diagnosed with GIT illness with radiologically and ultrasonographically confirmed FB obstruction were selected. The inclusion information of each cat included sex, age, breed, and body weight. The diagnosis of cats with FB obstruction was initially based on the case history, clinical investigation, blood analysis data, radiographic and ultrasonographic examination as described previously (17). Feline cases (n = 65) admitted to the clinic during the study period for reasons other than gastrointestinal disorders were employed as controls. The data concerning the proposed predisposing factors that could prone cats to ingest FB were collected from feline owners, and statistically analyzed.

Statistical analysis

The association of categorical variables and the presence of foreign bodies was determined by the Pearson chi-square test or Fisher's exact test as needed. To estimate the contribution of each risk factor toward foreign body formation, Odds ratios (ORs) with their 95% CIs were first determined in a univariate logistic regression model. Then

a multivariate logistic regression model was constructed after a backward stepwise elimination procedure against foreign body formation in the cat. Factors associated with foreign body formation with a *P-value* of 0.05 were included in the multivariate logistic regression analysis. This analysis was done using the Generalized linear model (GLM) Function in R software (version 4.1.1) (9). Student-t test (unpaired two-tailed) was used to test the differences in blood parameters in the presence and absence of a foreign body.

Results

Figure 1 shows representative images for FBs retrieved from gastrointestinal tract in cats. Of a total of 1921 cats admitted during the studied period, we found that 652 cats (33.94%) had gastrointestinal tract illness. Among these 625 cats, sixty-five (9.97%) with FBs obstruction were identified and analyzed against the normal cats (n=65).

As shown in Table 1, the most common presenting breeds of cat patients with FBs obstruction were Persian (30/65) and Siamese (21/65). Similarly, for controls, the most common presenting cats were Persian (25/65) and Siamese (28/65). Most of the presented cats were males (50/65 for cat patients and 39/65 for controls). The mean \pm SD age for Cats with FB (2.7 ± 0.86 years) was younger ($p < 0.05$) than those of control cats (4.35 ± 1.25 years). There was no significant difference in body weight for cats with FB (3.53 ± 1.03 kg) versus control cats (3.93 ± 0.89 kg) (Figure 2).

Table 1: Distribution of breeds and gender of cats diagnosed with gastrointestinal FB obstruction (n=65) and control cats (n=65)

Breeds	Cats with FB	Control Cats
	No. (%)	No. (%)
Persian	30 (46.15)	25 (38.46)
Siamese	21 (32.31)	28 (43.08)
Domestic shorthair	10 (15.38)	7 (10.77)
Egyptian Mau (native breed)	2 (3.08)	1 (1.54)
Crossbreed	2 (3.08)	4 (6.15)
Male	50 (76.92)	39 (60.00)
Female	15 (23.08)	26 (40.00)

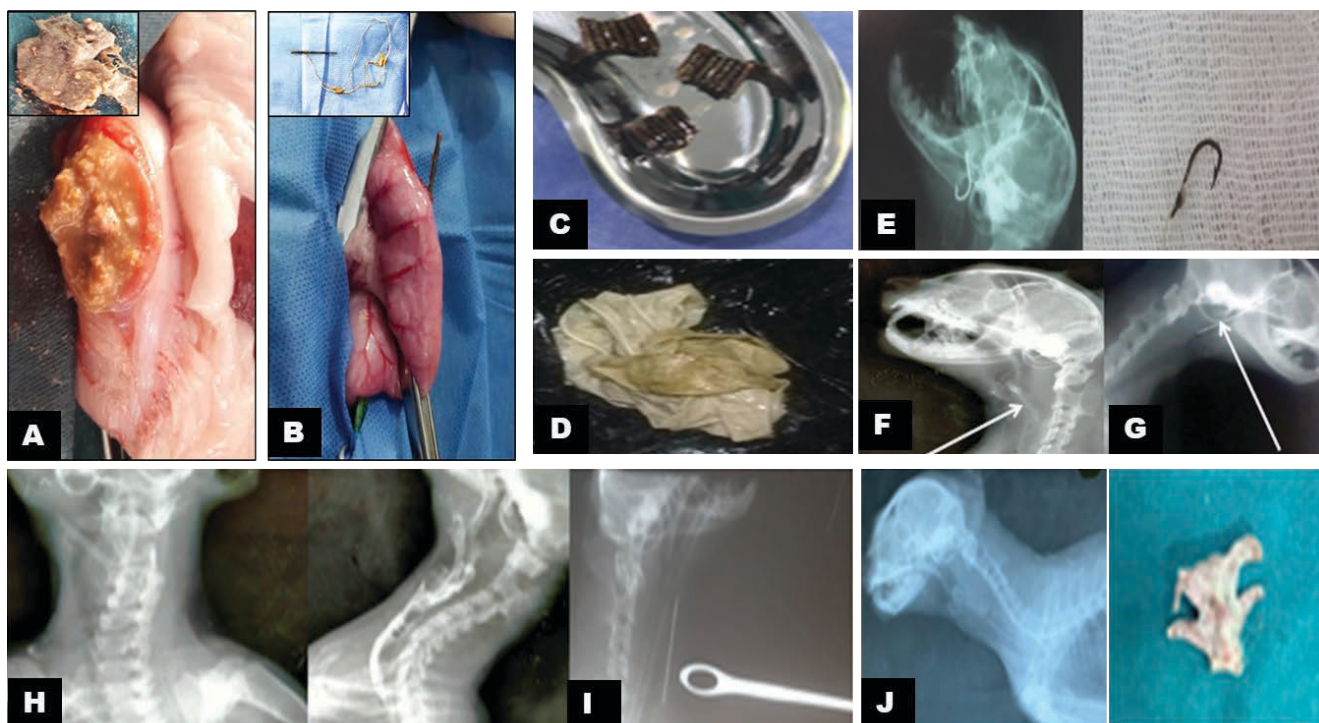


Figure 1: Representative images showing gastrointestinal foreign bodies in cats. and gastric hairball (A), an intestinal needle with string (B), leather parts retrieved from the stomach (C), rubber gloves removed from the intestine (D), a fishing hook in the mouth of a cat impeded in the tongue (E), chicken clavicle bone in the esophagus and application of opaque contrast material for testing perforation of the esophagus (H), needle migrating out of the esophagus into surrounding muscles (I), and chicken cervical bones lodged in the esophagus and one of the retrieved bones (J)

Table 2 shows the proposed risk factors that were investigated in this study for cats diagnosed with FB obstruction and control cats. The results extracted from univariate binary logistic regression analysis and Chi-2 analyses indicated that the Egyptian Mau breed was less likely to have FB obstruction compared to crossbred cats (P-value = 0.04). However, other breeds did not differ significantly from crossbreeds in this regard (Persian vs. crossbreed: P-value = 0.4; Shorthair vs. crossbreed: P-value = 0.3; Siamese vs. crossbreed: P-value = 1).

There was no significant difference between male and female cats for experiencing FB obstruction (P-value = 0.1). Cats that live only outdoors, or only indoors had a significantly higher risk (P-value < 0.0001, each) of FB obstruction than those with mixed living styles. While parent's/siblings' detachment did not significantly differ from weaning on time + relatives (P-value = 0.1), early weaning significantly differed from weaning on time + relatives in cases associated with FB obstruction (P-value < 0.0001). The data also indicated that exposing cats to once or twice exercise a week

differed significantly from performing 5-times exercise per week (P-value = 0.006 and 0.009, respectively), but doing exercise 3- and 4-times did not show any significant difference from exercising 5-times a week (P-value > 0.05). Neither

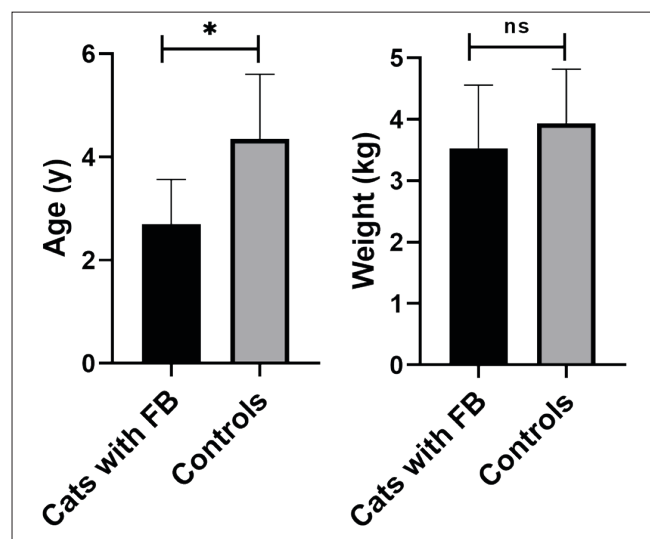


Figure 2: Distribution of age and body weight of the cats with gastrointestinal FB obstruction (n=65) and the control cats (n=65). *p<0.05; ns: non-significant

the studied cat diets nor household felines number had a significant impact on the occurrence of FB obstruction (P -value > 0.05). The univariate binary logistic regression models suggested that some of the factors (namely living, anxiety/stress, and frequency of exercise per week) were strongly associated with a diagnosis of FB obstruction in studied felines, whereas other factors (Breed, sex, kind of food and number of felines in the house) were not associated with the occurrence of FB obstruction in cats.

The multivariate model applied herein was better than the null model (P -value = 2.2) with no predictors and confirmed the results from the univariate model. It showed that cats that appeared within parents/siblings' detachment or early weaning category were more likely to have FB obstruction diagnosis than cats that appeared within weaning on time + relatives' category (odds ratio = 1.3 and 0.02, P -value = 0.00 and 0.6, respectively). Compared to 5-times exercise a week, fewer time exercises had a higher probability for cats to ingest FB and concurrently led to gastrointestinal obstruction

(odds ratio ranges from 0.01-0.1). The living patterns showed that cats dwelling fully indoors or fully outdoors were more likely for having FB obstruction than cats with a mixed system of living (odds ratio = 0.00 and 0.16, P -values = 0.00 and 0.01, respectively).

Discussion

It is well known that FB obstruction in felines is a progressive life-threatening condition. For this reason, the awareness of feline owners of the factors that lead to the ingestion of foreign objects is significantly associated with early diagnosis and a shorter duration of the signs, accordingly, a higher survival rate of the animal can be obtained. It has been demonstrated that the treatment success rate declined with a longer duration of experiencing clinical signs in pets diagnosed with FB obstruction (10).

Persian and Siamese cats were the most likely breeds to be affected with FB obstruction, whereas it has been reported that Domestic shorthair cats were the most affected than other

Table 2: Distribution of the proposed risk factors investigated in this study to cats with gastrointestinal FB obstruction (n=65) and control cats (n=65)

Factors	Criteria	Number (%)	
		Cats with FB (n = 65)	Controls (n = 65)
Anxiety/stress	Weaning on time + relatives	25 (38.46)	50 (76.92)
	Parents'/siblings' detachment	12 (18.46)	12 (18.46)
	Early weaning	28 (43.08)	3 (4.62)
Frequency of exercise (by times) per week	5	7 (10.77)	16 (24.62)
	4	9 (13.85)	21 (32.31)
	3	7 (10.77)	9 (13.85)
	2	12 (18.46)	12 (18.46)
	1	13 (20)	4 (6.15)
	0	17 (26.15)	3 (4.62)
Living style	Mixed	8 (12.3)	48 (73.8)
	Full outdoor	26 (40)	14 (21.5)
	Full indoor	1 (47.69)	3 (4.6)
Kind of food	Mixed food	9 (13.85)	12 (18.46)
	Canned food	10 (15.38)	13 (20)
	Dry food	42 (64.62)	31 (47.69)
	Homemade food	4 (6.15)	9 (13.85)
Number of household felines	1 feline	23 (35.38)	22 (33.85)
	2 felines	10 (15.38)	14 (21.54)
	3 felines	9 (13.85)	8 (12.31)
	4 felines	23 (35.38)	21 (32.31)

inspected breeds (Siamese) (10), and this could be attributed to country-to-country variation. As well, some longhair cat breeds such as Persian and Siamese are often predisposed to grooming themselves daily and may reach to the point of over-grooming, chewing and swallowing it forming trichobezoars (hairballs) (11), and endure a pica “ingestion of non-edible items”. Also, we found that the Egyptian Mau breed (native breed) was less likely for having been diagnosed with FB obstruction. As reported, the Egyptian Mau as our native breed is known as an intelligent and observant breed, thus are known to have less tendency to chew or eat a foreign object.

It has been demonstrated that the young ages (3.5–3.7 years in dogs and 1.6–4 years in cats) have a higher chance of swallowing a large FB (10, 12–14). Inconsistent with our study, the ages of the cat patients with FB (2.7 ± 0.86 years) were younger than those of control cats (4.35 ± 1.25 years). Regarding the sex of the cats, in this report, we found that the occurrence of FB was commonly found in male cats, and this observation coincided with other investigations that reported male dogs swallowed FB more than females (12, 13).

The univariate binary logistic regression models suggested that some of the factors (namely living, anxiety/stress, and frequency of exercise per week) were strongly associated with a diagnosis of FB obstruction in studied felines, whereas other factors (Breed, sex, kind of food and number of felines in the house) were not associated with the occurrence of FB obstruction in cats.

This all could be associated with feline stresses-triggering odd behaviors involving eating foreign objects and consequently, may lead to gastrointestinal obstruction (3, 4, 6, 15). Additionally, environmental enrichment such as offering a bed with vinyl covering led to gastric FB obstruction in a 7-years-old Beagle crossbred dog (16).

Conclusion

The univariate binary logistic regression models suggested that some of the factors (namely living, anxiety/stress, and frequency of exercise per week) were strongly associated with a diagnosis of FB obstruction in the studied felines, whereas other factors (breed, sex, kind of food and number of felines in the house) were not associated with the occurrence of FB obstruction in cats. The addressed predisposing factors

should be carefully considered by feline-owned clients to reduce the possibility of foreign bodies-mediated bowel obstruction.

Acknowledgment

The authors would like to thank the Surgery Departments, Faculty of Veterinary Medicine, Zagazig University where facilities for the present study were provided.

We have no conflicts of interest to disclose.

References

1. Tyrrell D, Beck C. Survey of the use of radiography vs. ultrasonography in the investigation of gastrointestinal foreign bodies in small animals. *Vet Radiol Ultrasound* 2006; 47: 404–8.
2. Mikkola S, Salonen M, Hakanen E, Sulkama S, Lohi H. Reliability and Validity of Seven Feline Behavior and Personality Traits. *Animals (Basel)* 2021; 11.
3. Ramos D, Reche-Junior A, Hirai Y, Mills DS. Feline behavior problems in Brazil: a review of 155 referral cases. *Vet Rec* 2020; 186: e9.
4. Tamimi N, Malmasi A, Talebi A, Tamimi F, Amini A. A survey of feline behavioral problems in Tehran. *Vet Res Forum* 2015; 6: 143–7.
5. Yamada R, Kuze-Arata S, Kiyokawa Y, Takeuchi Y. Prevalence of 25 canine behavioral problems and relevant factors of each behavior in Japan. *J Vet Med Sci* 2019; 81: 1090–6.
6. Yamada R, Kuze-Arata S, Kiyokawa Y, Takeuchi Y. Prevalence of 17 feline behavioral problems and relevant factors of each behavior in Japan. *J Vet Med Sci* 2020; 82: 272–8.
7. Demontigny-Bedard I, Belanger MC, Helie P, Frank D. Medical and behavioral evaluation of 8 cats presenting with fabric ingestion: An exploratory pilot study. *Can Vet J* 2019; 60: 1081–8.
8. Demontigny-Bedard I, Beauchamp G, Belanger MC, Frank D. Characterization of pica and chewing behaviors in privately owned cats: a case-control study. *J Feline Med Surg* 2016; 18: 652–7.
9. Ip EH. General linear models. *Methods Mol Biol* 2007; 404: 189–211.
10. Hayes G. Gastrointestinal foreign bodies in dogs and cats: a retrospective study of 208 cases. *J Small Anim Pract* 2009; 50: 576–83.

11. Cannon M. Hairballs in cats: a normal nuisance or a sign that something is wrong? *J Feline Med Surg* 2013; 15: 21–9.
12. Caixeta AC, Alves EG, Coelho NG, Souza AC, Torres RC, Nepomuceno AC. Foreign body in the gastrointestinal tract of dogs: a retrospective study. *Ars Veterinaria* 2018; 34: 20–4.
13. Hobday MM, Pachtinger GE, Drobatz KJ, Syring RS. Linear versus non-linear gastrointestinal foreign bodies in 499 dogs: clinical presentation, management, and short-term outcome. *J Small Anim Pract* 2014; 55: 560–5.
14. Kassem M, El-Kammar M, El-Menshawey MF. Surgical management of foreign bodies in the stomach and intestine of some foreign breed dogs. *Alex J Vet Sc* 2014; 42: 11–5.
15. Amat M, Camps T, Manteca X. Stress in owned cats: behavioral changes and welfare implications. *J Feline Med Surg* 2016; 18: 577–86.
16. Veeder CL, Taylor DK. Injury related to environmental enrichment in a dog (*Canis familiaris*): gastric foreign body. *J Am Assoc Lab Anim Sci* 2009; 48: 76–8.
17. Gomaa M, Martin K, Samy MT, Omar M, Mekkawy N. Ultrasonographic Findings of Most Common Surgical Disorders of Gastrointestinal Tract in Dogs and Cats. *Iranian J Vet Surg* 2012; 7: 23–37.