

Association between age, breed and sex in relation to urinary disorders in insured cats in Japan during fiscal year 2012

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ABSTRACT. Data from 48,187 cats insured between April 2012 and March 2013 were analyzed using logistic regression analysis to determine the association of age, breed and sex with the occurrence of urinary disorders. The overall annual prevalence of urinary disorders was 12.2%. Using crossbreeds as the reference breed, Abyssinian cats had the highest odds of having urinary disorders with a ratio of 1.40 (95% confidence interval: 1.20–1.63), followed by Norwegian Forest Cats and Somalis. Male cats had higher odds of having urinary disorders with a ratio of 1.27 (1.20–1.35) over female cats. Older cats had higher odds of having urinary disorders than young cats.

KEY WORDS: cat, insurance, Japan, logistic regression analysis, risk factor, urinary disorder

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In order to prevent disease and maintain good health in companion animals, awareness of the risk factors associated with their age, breed and sex is important. Owners, breeders, veterinary practitioners and researchers all can benefit from knowledge of the disease risks associated with these parameters. However, in most countries, there is no database of disease in companion animals, and little information is available from other accessible sources about the risk factors involved.

Urinary disorders in the cat are of major importance in terms of animal health and welfare. The most commonly seen clinical problems involving the urinary system include cystitis, cystic calculi, urinary obstruction, acute and chronic renal failure and incontinence [8]. Much literature supports the predisposition of cats to these problems by age, breed and sex [3, 8]. Several epidemiological studies have been conducted in this respect [2, 4, 5, 7, 9]. In this study, we assessed the effect of age, breed and sex on the prevalence of urinary disorders in cats insured by Anicom, a major insurance company for companion animals in Japan, using logistic regression analysis.

In order to qualify for pet insurance at Anicom, a cat must be healthy and younger than 11 years old. The insurance policy term is one year from the date of enrolment, but the owner can choose to renew the policy annually until the cat dies. The Anicom pet insurance program covers veterinary care costs. If a cat receives veterinary care, the owner gets between 50% and 70% of the cost reimbursed, depending

on the type of insurance contract. A maximum amount of reimbursement is set, but there is no fixed deductible cost. The insurance claims are settled by the attending veterinarians, who submit the claims to the insurance company either electronically or on paper. Basic data about the cat, such as the date of birth, breed and sex, are submitted at the time of enrolment into the insurance program. The date of visit to the veterinarian, amount paid for the treatment and reason for the claim are submitted with the claim.

The data source for this study derived from insured cats from birth to 19 years of age that either, were entered into an insurance program or, had their policy renewed during fiscal year 2012 (1 April 2012–31 March 2013). These cats were observed for one year from the starting date, or renewal of, the insurance policy. The major variables included age, breed and sex. The reason for submission of a claim and the associated data were entered into the database. If an owner cancelled the insurance program during the observation period, data were excluded from the study. As a result, of a total of 50,385 cats that entered or renewed the insurance policy in fiscal year 2012, 48,187 cats were observed for one year and subjected to the analysis in this study. The distributions of these cats by age and breed are shown in Table 1. Of these cats, 26,003 (54.0%) were male, and 22,184 (46.0%) were female. There were no data available about the neutering status of the cats. The reasons for claims stated on the claim form were used as diagnostic information and were divided into one of the 18 diagnostic categories by body system or type of disease according to the standardized list of diseases developed by this insurance company. The urinary disorder category includes any diseases, disorders or conditions that affect kidneys, ureters, bladder or urethra, or that affect their function. This category included cystitis (21.3%), urinary calculi (6.2%), other lower urinary tract diseases (LUTD) (3.5%), renal failure (53.1%), cystic calculi (3.3%), renal calculus (1.9%) and other urinary diseases (10.7%), according to the number of insurance claims made in 2014 [1]. Of

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Table 1. Number of cats by age of the 15 major breeds in the insured cat population subjected to the analysis in the study

Breed	Age							Total
	0–1	2–3	4–5	6–7	8–9	10–11	12+	
Scottish Fold	3,532	1,707	811	680	432	136	63	7,361
American SH	2,343	1,331	708	672	500	260	178	5,992
Japanese Cat	686	827	629	529	463	504	262	3,900
Russian Blue	910	632	400	372	279	143	44	2,780
Persian	590	359	249	300	233	114	94	1,939
Munchkin	1,260	368	73	35	12	4	0	1,752
Norwegian FC	890	412	174	119	103	28	21	1,747
Maine Coon	695	406	215	214	111	45	32	1,718
Abyssinian	417	346	241	212	191	96	39	1,542
Ragdoll	705	347	181	120	54	20	9	1,436
Somali	506	311	140	96	34	15	7	1,109
American Curl	329	222	104	66	61	27	9	818
British SH	431	114	40	22	8	4	0	619
Bengal	288	131	78	60	24	14	4	599
Crossbreds ^{a)}	2,336	2,051	1,728	1,834	1,877	1,548	1,348	12,722
Others ^{b)}	1,039	408	207	182	144	94	79	2,153
Total	16,957	9,972	5,978	5,513	4,526	3,052	2,189	48,187

a) Crossbreds (mongrels) are cats of mixed breed where either, one or both parents are not purebred, or the parents are purebred but of different breeds. b) Others include pure breeds whose sample size (n) ≤ 500 . British SH=British Shorthair; Norwegian FC=Norwegian Forest Cat; American SH=American Shorthair

the 48,187 cats, 23,803 (49.4%) had at least one insurance claim for veterinary care, and 5,879 (12.2%), 5,590 (11.6%) and 4,192 (8.7%) cats had at least one claim for urinary, digestive and dermatological disorders, respectively.

Those cats that had at least one claim for urinary disorder were considered to have that disorder. We first conducted univariate analysis and identified that age, breed and sex are all significant risk factors. Then, we estimated the odds ratios for urinary disorders using logistic regression analysis, using these three factors as independent variables. We selected the top 15 represented breeds whose sample size (n) was more than 500, including Abyssinian, American Curl, American Short Hair, Bengal, British Short Hair, Japanese Cat, Main Coon, Munchkin, Norwegian Forest Cat, Persian, Ragdoll, Russian Blue, Scottish Fold, Somali and crossbreed. We placed all other pure breeds as 'other breeds'. To represent the 15 breeds and 'other breeds', we used 15 dummy variables. We used crossbreed (the breed with the highest frequency) as the reference cat breed. We used six two-year age groups (0–1, 2–3, 4–5, 6–7, 8–9 and 10–11) and an age group of 12 and older (12+) as categorical variables after comparing between a model with the age as linear variable and a model with the age group as categorical variable using the Akaike information criterion (AIC). We did not include interaction terms in the model after testing the effects of interactions between the three independent variables (age, breed and sex), because the models with interaction terms had a lower predictability in terms of AIC values. We performed the statistical analysis using EpiInfo7 (Centers for Disease Control and Prevention, Atlanta, GA, U.S.A.).

Table 2 shows the effect of age, breed and sex on the

annual prevalence of urinary disorders. Using crossbreed as the reference breed, Abyssinian had the highest odds of having urinary disorder with a ratio of 1.39 (95% confidence interval: 1.19–1.61), followed by Norwegian Forest Cat with a ratio of 1.33 (95% confidence interval: 1.14–1.56) and Somali with a ratio of 1.19 (95% confidence interval: 1.00–1.47). Male cats had higher odds of having urinary disorders with a ratio of 1.27 (95% confidence interval: 1.20–1.35) over female cats. As shown in Fig. 1, the cats had higher odds of having urinary disorders in a non-linear manner as their age increased.

The data of insured cats used in this study represent only 0.7% of the total cat population in Japan [1, 6]. Therefore, extrapolation of the results of this study requires caution and careful consideration. The potential biases that we should keep in mind are: age distribution (biased toward younger ages, because the insurance process is relatively new) [1, 6]; breed distribution (pure breeds are over-represented compared to the general population) [1, 6]; accessibility to veterinary care (insured cats are more likely to receive expensive veterinary care); and habitat (cats living in urban areas are over-represented compared to those living in rural areas) [1]. The first two potential biases were corrected in the present study by using logistic regression analysis. To account for other potential sources of bias, further studies are needed. Keeping these potential biases in mind, we compared our results with the results of previous studies as follows.

The odds ratios that we obtained for different breeds were consistent with our previous study using insurance data from 2008–2013, in which higher annual prevalence was observed for urinary disorders in Abyssinian, Norwegian Forest Cat,

Table 2. Effect of age, breed and sex on the prevalence of urinary disorders

Variable	Coefficient	Odds ratio	(95% CI)	P-value
Constant	-2.645	-		<0.0001
<i>Age</i>				
0-1 (reference)	0.00	1.00		
2-3	0.31	1.36	(1.24-1.49)	<0.0001
4-5	0.49	1.63	(1.47-1.80)	<0.0001
6-7	0.66	1.94	(1.76-2.15)	<0.0001
8-9	0.76	2.13	(1.92-2.37)	<0.0001
10-11	0.87	2.40	(2.13-2.70)	<0.0001
12+	1.58	4.87	(4.33-5.47)	<0.0001
<i>Breed</i>				
Cross Breed (reference)	0.00	1.00		
Abyssinian	0.33	1.39	(1.19-1.61)	<0.0001
American Curl	-0.07	0.93	(0.73-1.19)	0.5791
American Shorthair	-0.15	0.86	(0.77-0.95)	0.0034
Bengal	-0.55	0.58	(0.41-0.82)	0.0019
British Shorthair	0.11	1.11	(0.84-1.46)	0.4537
Japanese Cat	0.06	1.06	(0.95-1.18)	0.2683
Maine Coon	-0.50	0.60	(0.50-0.74)	<0.0001
Munchkin	0.04	1.04	(0.87-1.25)	0.6590
Norwegian Forest Cat	0.29	1.33	(1.14-1.56)	0.0003
Persian	-0.07	0.93	(0.80-1.08)	0.3504
Ragdoll	-0.19	0.83	(0.68-1.01)	0.059
Russian Blue	-0.03	0.97	(0.85-1.11)	0.6679
Scottish Fold	-0.06	0.94	(0.85-1.04)	0.2219
Somali	0.19	1.21	(1.00-1.47)	0.0529
Others	0.01	0.99	(0.85-1.15)	0.9110
<i>Sex</i>				
Female (reference)	0.00	1.00		
Male	0.24	1.27	(1.20-1.35)	<0.0001

British Shorthair, Munchkin and Somali [5]. Some types of kidney disease can be passed genetically among Abyssinian breed [8]. Harada *et al.* [4] conducted a case control study using data of cats treated at veterinary hospitals in Japan and concluded that cats at ages 2-6 had higher risk of lower urinary tract diseases (LUTD) than cats of other ages, while in this study, the odds of having urological disorders was higher at old ages than at young ages. The results of these two studies might not be totally comparable, because cystitis, cystic calculi and other LUTD represent 28.1% of the urinary disorders in Japan in terms of the number of insurance claims made for veterinary care [1]. In terms of sexual predisposition, our study revealed that males had higher risk of urinary diseases as shown in previous studies [2, 9]. This is probably because the male urethra is smaller in size than that of the female and can become plugged with crystals or other solids/semisolids more easily [7]. Also, like many other diseases, the most common cause of chronic renal failure is the normal aging process [8].

In the present study, we used the age, breed and sex as independent variables for the analysis, because they were the only possible risk factors on which information was available in the present dataset. However, there are other potential risk factors that might affect the occurrence of urinary disorders, such as obesity, diet, exercise, stress and habitat. Also,

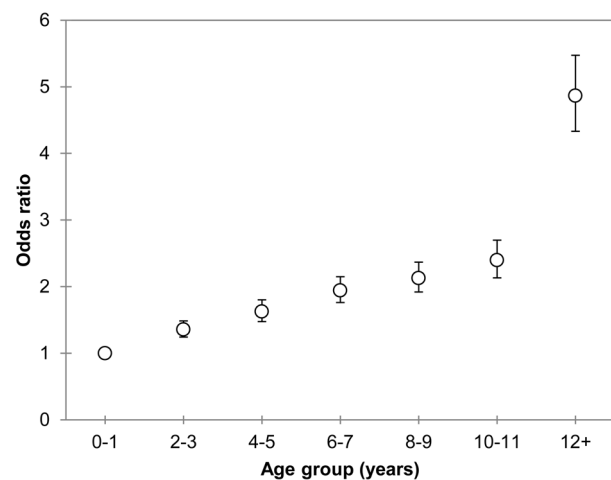


Fig. 1. Odds ratio of having at least one veterinary care for urinary disorder at different ages with age 0 as the reference. Open circles indicate mean odds ratios and error bars 95% confidence intervals.

we did not include neutering status as a potential risk factor in the model, because there were no data available about the neutering status of the cats. To account for these potential

risk factors, further studies are needed with additional information on these factors.

Among urinary disorders, cystitis, cystic calculi, urinary obstruction, acute and chronic renal failure and incontinence are relatively common to companion cats [7]. In the present study, no distinction was made between these diseases, because no data were available in our dataset on the occurrence of these diseases for each cat. However, the effect of age, breed and sex might be different between these diseases. Further studies are needed to identify and quantify the effects of risk factors on these diseases.

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