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Dystocia in the cat evaluated using an insurance database

Bodil Ström Holst[1,2], Eva Axnér[1,2], Malin Öhlund[1], Lotta Möller[3] and Agneta Egenvall[1]

Abstract

Objectives The aim of this study was to describe the incidence of feline dystocia with respect to breed.

Methods The data used were reimbursed claims for veterinary care insurance and/or life insurance claims in cats registered in a Swedish insurance database from 1999–2006.

Results The incidence rates for dystocia were about 22 cats per 10,000 cat-years at risk, 67 per 10,000 for purebred cats and seven per 10,000 for domestic shorthair cats. The median age was 2.5 years. A significant effect of breed was seen. An incidence rate ratio (IRR) that was significantly higher compared with other purebred cats was seen in the British Shorthair (IRR 2.5), the Oriental group (IRR 2.2), Birman (IRR 1.7), Ragdoll (IRR 1.5) and the Abyssinian group (IRR 1.5). A significantly lower IRR was seen in the Norwegian Forest Cat (IRR 0.38), the Maine Coon (IRR 0.48), the Persian/Exotic group (IRR 0.49) and the Cornish Rex (IRR 0.50). No common factor among the high-risk breeds explained their high risk for dystocia. There was no effect of location; that is, the incidence rate did not differ depending on whether the cat lived in an urban or rural area. Caesarean section was performed in 56% of the cats with dystocia, and the case fatality was 2%.

Conclusions and relevance The incidence rate for dystocia was of a similar magnitude in purebred cats as in dogs. The IRR varied significantly among breeds, and the main cause for dystocia should be identified separately for each breed. A selection for easy parturitions in breeding programmes is suggested.

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Introduction

The incidence of dystocia in cats has been described to vary between 0.4% and 8.0%, and reach even higher numbers in certain breed groups.[1–4] Dystocia may be due to functional causes (uterine inertia) or obstructive causes (maternal, fetal or a combination). Uterine inertia is the most common cause of feline dystocia.[5] Other common causes include fetal malpresentation or malformations.[2,5,6] A significant association has been described between dystocia and both small and large litter sizes.[3,4]

Dystocia is a reproductive emergency, life-threatening to both mother and kittens, and consequently of great distress to the breeder. Many cat breeds are numerically small, but even in numerically larger breeds the number of breeding animals is often low. Causes for this include a large number of neutered animals, a wish to avoid contact with other animals to avoid the spread of infectious diseases and a restrictive selection of breeding animals.[4] A careful selection of breeding animals and breeding strategies is thus needed to avoid negative consequences related to a narrow genetic base.

In dogs, the risk for dystocia differs among breeds.[7] As a consequence, a selection for easy whelpings in breeding programmes has been suggested,[8] and in certain breeds pelvimetry may be a useful tool.[9] A significant difference in incidence between individual cat breeds has not yet been shown.

[1]Department of Clinical Sciences, Swedish University of Agricultural Sciences (SLU), Uppsala, Sweden
[2]Centre for Reproductive Biology in Uppsala (CRU), Uppsala, Sweden
[3]Agria Insurance, Stockholm, Sweden

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Corresponding author:
Bodil Ström Holst DVM, PhD, Associate Professor, Department of Clinical Sciences, Dipl ECAR, Swedish University of Agricultural Sciences (SLU), PO Box 7054, SE-750 07 Uppsala, Sweden
Email: bodil.strom-holst@slu.se

The Swedish insurance database (Agria Pet Insurance; www.agria.se) has been used to describe patterns of mortality in life-insured cats and morbidity in cats with veterinary care insurance,[10,11] and the incidence of pyometra.[12] Choosing a clinically distinct disease complex – caesarean section/dystocia – the aim of the present study was to describe the incidence of dystocia with respect to breed.

Materials and methods

The data used were reimbursed claims for veterinary care insurance and life insurance claims in cats insured at the Agria Pet Insurance company during the period from 1999–2006.

Description of the insurance process: 1999–2006

Most cats with life insurance are purebred. Life insurance is usually acquired at a young age, even although cats can obtain life insurance up to 6 years of age.[10] Cats can enter a veterinary care insurance programme at any age and stay insured for their whole life, but stay life-insured only up to 13 years of age. After a veterinary visit the receipt for veterinary care costs is submitted to the insurance company. When a life-insured cat dies, a claim is processed using forms completed by the attending veterinarian. In general, in the insurance computer database only one diagnostic code is used per claim.

Data management

Data on all cats insured between 1999 and 2006 were downloaded from the database. Variables used in this study included cat identification, sex, date of birth, breed, life insurance coverage, and diagnostic codes for receipts for veterinary care insurance and life insurance claims. Dates of visits to veterinarians and when cats entered or left the insurance programme were included. Cats were assigned to the age category they had on 1 January of each year (0 <1 years, 1 <2, etc).

Sex was recorded as either male or female as reliable information on neutering status was not available in the database. In the insurance data, 41 breed codes were used to classify breeds. Breeds that were considered closely related were combined; Abyssinians and Somalis were combined in the Abyssinian group; Persians and Exotic Shorthairs in a Persian/Exotic group; and Siamese, Balinese, Oriental Shorthair and Seychellois in the Oriental group. 'Domestic cats' included domestic shorthair and longhair cats.

Diagnoses

Veterinarians classify the medical problems using a standardised hierarchical diagnostic registry, including both specific and general codes. The diagnoses for the studied diseases were one for caesarean section and 16 single codes for dystocia.

Data analysis

Two datasets were analysed. One dataset consisted of all cats with veterinary care insurance and the other of cats with both veterinary care and life insurance. In both datasets, cats with at least one reimbursed receipt for claimed insurance, with a relevant diagnosis submitted to the insurance company, contributed to the numerator for morbidity. For the first dataset the cases were only for veterinary care, while in the other dataset, the claims could be of either or both insurance types. The case fatality, that is, the proportion with claimed life insurance, was determined from the dataset of cats with both veterinary care and life insurance.

Female cats were at risk from either the 1 January 1999 or the start date of insurance (if later) until the date of the first relevant veterinary care claim, of death or of withdrawal from insurance. Incidence rate (IR) calculations were performed with the exact time at risk (cat-years at risk [CYAR]) as the denominator. Rates were expressed as cats (cases with at least one event) per 10,000 CYAR. Standard errors multiplied with a factor of 1.96 yielded 95% confidence intervals (CIs). IR ratios (IRRs) were used to compare the IRs between groups, comparing rates for a breed with all other purebred cats. CIs for the IRRs were calculated with the following formula: $\exp(\ln(\widehat{IRR}) \pm 1.96 * \widehat{SD}[\ln(\widehat{IRR}])$.[13] A 95% CI for the IRRs not including the null value of 1 was considered evidence to conclude that the groups were significantly different. Case age (first event) was described using the 5th, 50th and 95th percentiles. As recurrent cases, the number of cats in the 'only veterinary-care' dataset with two claims for dystocia/caesarean section that were more than 90 days apart were determined.

Selection of study population

Information from SVERAK, the Swedish FIFe member (www.sverak.se), showed that all breeds except Persian/Exotics and European Shorthair increased between 1999 and 2006. The number of registrations for the Persian/Exotic group and the European Shorthair decreased. The number of European Shorthair cats in the database was very high compared with the number of registered cats in Sweden. This is likely owing to a misclassification of domestic shorthair cats, and the European Shorthair cats were therefore not included in the study population. Three breeds were not registered in Sweden throughout the study period. The first Bengal cats were registered in 1999, Siberian cats in 2000 and Sphynx in 2003. The proportion of female cats that is used for breeding can therefore be expected to be large in these breeds, leading to a relatively larger proportion of cats at risk for dystocia compared with other breeds. Because this may increase the IR for this disease complex, these three breeds were not included. Altogether, four breeds – European

Table 1 Cat-years at risk (CYAR) for female cats with veterinary care insurance and for cats with both veterinary care and life insurance coverage. Data for breeds with <1000 CYAR are not shown

Breed	Veterinary care		Veterinary care and life insurance	
	n	CYAR	n	CYAR
Domestic/mixed breed	101,044	329,264	1050	3201
Persian/Exotic group	8979	31,054	5355	14,839
Birman	5721	21,585	4126	13,069
Norwegian Forest Cat	5263	17,917	3116	8911
Oriental group	2032	6977	1392	3925
British Shorthair	1587	5349	1090	3166
Maine Coon	1612	4578	1281	3060
Burmese	1112	4404	773	2482
Abyssinian group	1180	4087	869	2520
Ragdoll	1415	3380	1257	2649
Cornish Rex	1011	3230	727	1859
Devon Rex	710	2397	595	1701
Russian Blue	488	1921	304	1096
Ocicat	320	1064	272	749
Total	132,474	437,207	22,207	63,227

Shorthair, Bengal, Siberian cats and Sphynx – were thus not included in the study.

Results

Population

From 1999–2006 the population of female cats with veterinary care insurance was 133,631 and the total number of CYAR was 438,558. The number of female cats with both veterinary care and life insurance was 22,833, and the number of CYAR was 64,726 (Table 1).

Dystocia and caesarean section

The median case age was 2.5 years. Median age for the different breeds is shown in Table 2.

The overall incidence of dystocia or caesarean section in the population with a veterinary care insurance (IR) was 22 cases per 10,000 CYAR. The IR for purebred cats was 67 per 10,000 CYAR and for domestic cats seven per 10,000 CYAR. The IRR for purebred cats compared with domestic cats was 9.3 (95% CI 8.1–10.8). In the population with a veterinary insurance, 972 cats had an insurance claim for dystocia or caesarean section, and 542 of these were reimbursed for caesarean section. This means that 56% of the cats with a diagnosis of dystocia underwent caesarean section.

In the population of cats with both veterinary and life insurance, 670 cats were reimbursed for caesarean section or dystocia (IR 50); 13 of these (2%) had a life insurance claim and thus the mean case fatality was 2%.

Breed variation in dystocia

The IR and IRR varied by breed (Table 2; Figure 1). The British Shorthair, Oriental group, Ragdoll, Birman and Abyssinian groups all had significantly higher IRRs when compared with all other purebred cats, and the Norwegian Forest Cat, Persian/Exotic group, Maine Coon and the Cornish Rex had significantly lower IRRs (Figure 1). There was no significant effect of location (urban or rural).

For 100 cats (10.3%), there was a second claim for dystocia. The most common breeds were Birman (n = 23), followed by British Shorthair (n = 17), the Oriental group (n = 16), Abyssinian (n = 13) and the Persian/Exotic group (n = 12). Five recurrent cases or less were seen in Burmese, Cornish Rex, Devon Rex, Korat, Norwegian Forest Cat, Ragdoll, Russian Blue and Turkish Van.

Discussion

The overall IR for dystocia was 22 cats per 10,000 CYAR. For purebred cats it was 67 cats per 10,000 CYAR. This latter figure is similar to the 57 dogs per 10,000 dog-years at risk that had a claim reimbursed for dystocia in a previous study from the same database using data on dogs.[7] Not all cats in an insurance database are used for breeding, and only pregnant animals are at risk of dystocia. The much lower IR in the large group of domestic shorthair cats (seven cats per 10,000 CYAR) than in purebred cats is likely, at least in part, owing to the fact that they are generally not used for intentional breeding, leading to a comparatively low population at risk. The population of purebred cats is more representative for breeding animals and more similar to the Swedish dog population than domestic cats. Assuming that the proportion of purebred cats that is used for breeding is similar to the

Table 2 Number of cats, incidence rates (IRs) with 95% confidence intervals (CIs) and median age of cases for cats with dystocia or caesarean section with veterinary care insurance. Breeds with <1000 cat-years at risk are not shown

Variable	Category	Cases			Case age (years), percentiles		
		n	IR	95% CI	Median	5th	95th
Overall	All cats	972	22	21–23	2.4	1.1	7.0
Breed	British Shorthair	81	157	123–191	2.3	1.1	6.5
	Oriental group	92	135	107–163	2.4	1.1	5.7
	Ragdoll	34	102	68–137	2.2	1.2	4.6
	Birman	213	101	87–114	2.6	1.2	6.6
	Abyssinian group	40	100	69–132	2.2	1.1	6.2
	Ocicat	9	86	30–141	3.0	0.8	4.1
	Russian Blue	16	85	43–127	3.9	1.1	9.1
	Devon Rex	16	68	35–101	1.8	1.2	7.6
	Burmese	28	64	41–88	2.6	1.2	6.3
	Persian/Exotic group	118	38	31–45	2.7	1.3	8.3
	Cornish Rex	11	34	14–54	1.8	1.2	4.6
	Maine Coon	15	33	16–50	2.3	0.9	6.4
	Norwegian Forest Cat	51	29	21–36	2.4	1.3	6.4
	Domestic cat	236	7	6–8	2.6	0.9	9.0
Location	Urban	423	22	20–24	2.7	1.1	6.9
	Rural	549	23	21–24	2.4	1.1	7.0

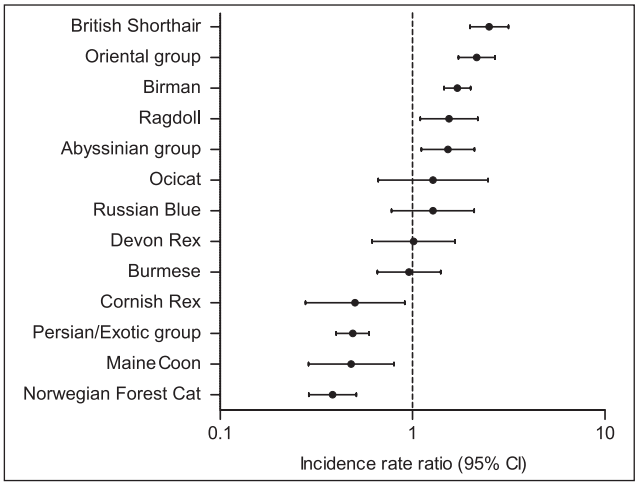

Figure 1 Incidence rate ratios of dystocia risk for different breeds compared with all other purebreds. Breeds with at least 1000 contributed cat-years at risk are shown. Error bars represent the 95% confidence interval (CI)

proportion of dogs, the results of the present study suggest that the IR of dystocia is of a similar magnitude in purebred cats as in dogs. Three high-risk dog breeds – Boston Terrier, English Bulldog and French Bulldog – were not represented in the previous study using the canine database because special rules for reimbursement related to caesarean section apply for them.[7] No specific rules for reimbursement related to caesarean section apply for any special cat breed. The true figure for dogs may therefore be slightly higher, and the IR for dogs and cats may thus be even more similar.

A significant difference in IRR for dystocia between cat breeds was described for the first time, with the highest IRR in British Shorthair and Oriental cats. Previous studies have not detected a significant difference between individual breeds.[2–4] The large population included in the present study, compared with previous questionnaire-based studies,[2–4] may contribute to the detection of a variation among breeds.

There may be several reasons for the difference in IRR for dystocia among purebred cats. Uterine inertia is the most common cause of dystocia.[5] Although information from the mother of a potential breeding cat may be valuable, it is not possible to diagnose functional dystocia before parturition, and this complicates the selection of breeding animals. In one publication, describing a significantly higher risk of dystocia in purebred cats than in colony cats, colony cats that experienced dystocia were not used for further breeding.[2] This selection for easy deliveries likely contributed to the low risk of dystocia. If easy parturitions are not included in the breeding

programmes, a genetic predisposition to dystocia may increase in the population. Three breeds with a high IR for dystocia – British Shorthair, the Oriental group and Birman – also had a high number of recurrent cases. The low heterozygosity within several breeds is a drawback when establishing breeding programmes.[14] The high-risk breeds, such as Birman, Abyssinian and Siamese, are among the breeds with the lowest heterozygosity,[14] and this should be taken into account when designing breeding programmes.

Other factors that may account for a breed variation in dystocia include litter size, body conformation and body condition score (BCS). Litter size has been described to vary between breeds and to be significantly associated with dystocia.[3,4] A litter size significantly lower than average has been identified in the Birman (in the present study identified as a high-risk breed) and the Persian/Exotic group (identified as a low-risk breed).[4] In another study, Birman and Persian/Exotics, as well as Abyssinian, British Shorthair, Korat, Maine Coon, Rex and Oriental shorthair/Siamese, all had significantly smaller litter sizes than the Burmese,[3] but the Oriental breeds, in general, often have relatively large litter sizes.[3,4,15,16] The breeds with highest IRR for dystocia thus had varying litter sizes.

The body conformation may affect the IR. Turkish native cats, similar to the European Shorthair, with dystocia were shown to have smaller pelvic dimensions than control cats, linking the pelvic size to dystocia.[17] Most of the cats with dystocia were about 1 year old, and may still have been growing. In another study using direct pelvimetry, brachycephalic cats had smaller pelvic measurements (pelvic inlet and outlet areas, and a smaller pelvic canal) than mesocephalic cats.[18] Selecting against obstructive dystocia is problematic because body biometric measurements do not correspond well with internal pelvic measurements.[18] The high braincase of the fetus in brachycephalic breeds has also been suggested to contribute to dystocia in these breeds.[19] In a previous study, cats that were categorised as brachycephalic (Persian, British Shorthair and Devon Rex) and dolicocephalic (Siamese-type and Cornish Rex) had a significantly higher prevalence of dystocia than mesocephalic breeds.[2]

In the present study, a brachycephalic breed, the British Shorthair, had a high IRR. This breed has previously been shown to have a significantly elevated proportion of stillbirths and of kitten mortality,[4] which often is associated with dystocia. The Oriental group (dolicocephalic) had the second highest IRR. Kitten stillbirth and mortality has previously been shown to be high in the Oriental and the Persian/Exotic group.[4] The Cornish Rex and Devon Rex, previously described as having a high IR for dystocia,[2] did not belong to the high-risk breeds in the present study. The Persian/Exotic group, brachycephalic breeds that have been shown to have small pelvic sizes,[18] had a significantly lower IRR for dystocia than all other purebred cats in the present study. As the number of registrations per year for Persian/Exotics decreased during the study period, compared with the registrations for other breeds that increased, this low IRR must be interpreted with caution because a relatively low population at risk may decrease the IRR. However, a clear connection between brachycephaly and dystocia was not seen in the present study.

A varying BCS between breeds may contribute to breed variations in dystocia because obesity may increase the risk of dystocia.[20,21] A significant difference in BCS between cat breeds has been described.[22] The British Shorthair is a breed with a higher BCS than average, but the Siamese is not, and the Oriental Shorthair even had a lower BCS than average.[22] A high BCS is more prevalent in castrated animals than intact animals,[22] which may decrease the influence of this factor in breeding animals.

The breeds with the highest IRRs for dystocia (the British Shorthair, Oriental group, Birman, Ragdoll and the Abyssinian group) differ regarding litter size, body conformation and risk of having a high BCS, suggesting that none of these factors alone strongly influences the overall incidence of feline dystocia. However, one breed with a high IRR for dystocia, the British Shorthair, is a high-risk breed regarding all these three factors, possibly contributing to the high IRR for dystocia in this breed.

Caesarean section was performed in 56% of the cats with dystocia, similar to the number reported for dogs and for cats in a questionnaire-based study,[3,7,23] but lower than the 74–79% previously reported for cats.[2,5] The varying proportions of caesarean section between studies may have several explanations, including the ease of correcting a malpresentation, time aspects and the owners' wishes.[5] The overall case fatality was 2%, stressing the fact that dystocia is a reproductive emergency that needs proper and timely treatment.

Diagnostic information from the insurance database for cats has been validated and been found to be correctly coded in 84% of scrutinised records, and data on breed, age and sex (only male/female) were correctly coded to an even greater extent.[24] The diagnoses in the present study are clinically distinct, and the correctness of diagnoses is therefore expected to be high. There is no reason to believe that the insurance coverage differs among cat breeds, although it cannot be excluded that the most popular insurance companies may differ among breeders of different breeds.

A drawback in studying dystocia and caesarean section using insurance data is that the proportion of animals used for breeding, and thus the real population at risk, is not known. The low IR for domestic cats in the

present study is affected by the fact that they are generally not used for intentional breeding. Increasing or decreasing popularity of a breed also affects the population at risk. During the study period, Persian/Exotics had a decreased number of registered cats per year, and this breed also had a significantly lower IRR for dystocia compared with the other purebreds that had increasing number of registrations.

In a previous study using the same database the rate of at least one veterinary care event was generally higher in urban compared with rural areas.[11] In the present study, IR did not differ between urban and rural areas.

Conclusions

The IR for dystocia was of a similar magnitude in purebred cats as in dogs. The IRR varied significantly among breeds, and the main cause for dystocia should be identified separately for each breed. A selection for easy parturitions in breeding programmes is suggested.

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