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Determinant and conditioning factors of feline asthma: a questionnaire-base study

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ABSTRACT: Feline asthma is a chronic inflammatory disease of the lower respiratory airways that has shown an increased incidence in the past decades, aside with human asthma. It is also important to acknowledge that human and feline asthma are very similar in their pathophysiology,being the housing conditions (pollutants, stress and obesity) major risk factors to its development. The present study aimed to investigate if these housing conditions could be determining and conditioning factors associated with the occurrence of feline asthma previously reported in literature.

A cross-sectional (self-completed) questionnaire-based study targeting Portuguese-speaking owners of cats was carried out, validated and applied (in both paper and digital form) between September 2018 and March 2019.

A total of 189 questionnaires were analysed, of which 18 corresponded to cats with respiratory disease. Most of studied cats were of mixed breed and neutered, living indoor exclusively, mainly in urbanareas and from the north mainland region. According to the owner's perception, the cats were mostly active and with the ideal weight. The clinical signs more often associated with asthma crisis were respiratory wheezes and cough, whereas the worsening of such clinical signs occurred mostly in spring. Stress symptoms were not common, but the correlation between stress-related diseases and asthma was close to significance *(P*=0.065). A mixed lifestyle was associated with less symptoms of stress *(P*=0.032). Although close to significance *(P*=0.07), the presence of pollutant industries was not associated to asthma in the enrolled cats. Finally, in most of the houses in which an asthmatic cat lived in, no owner or other co-inhabitant had asthma.

The paucity of similar epidemiological studies in cats demonstrates the importance of the current work and the need to conduct further studies on housing conditions associated with the disease. Eventually, further studies will clarify if cats could be used as sentinels for human asthma.

Keywords Allergens, conditioning factors, housing conditons, environment, feline asthma

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INTRODUCTION

Feline asthma is a chronic and recurrent inflammatory disease of the lower respiratory airways and it is becoming one of the most frequent disease affecting the respiratory tract of cats, causing significant morbidity and even mortality (Reinero, 2011; Taylor, 2017; Rosenberg and Druey, 2018).

Asthma is characterized by a reversible airflow limitation caused by an airway hyperactivity, increased mucus production and smooth muscle hypertrophy due to lower airway inflammation - type I hypersensitivity reaction (Taylor, 2017; Venema and Patterson, 2010).

According to recent literature, asthma affects approximately 1-5% of cats across all ages, breeds and genders. Nevertheless some studies described an increased incidence in the Siamese breed and age of occurrencebetween four and five years, although it can occur at any age (Venema and Patterson, 2010; Kettner, 2018; Rosenberg and Druey, 2018).

Feline asthma is the most frequently diagnosed lower airway disease.However,there are other non-infectious, inflammatory diseases affecting cats featuring the sampathophysiology and are often not properly diagnosed or misdiagnosed as asthma (Taylor, 2017).

Aswith feline asthma, an increase in human asthma was noticed during the latter part of the 20thcentury, in developed countries. In fact, the disease itself is very similar. The coexistence of cats and humans in the same environment raises the hypothesis that it can be triggered by common risk factors and that cats can be considered as sentinels for human asthma (Heller et al., 2014; Toskala and Kennedy, 2015; Mueller et al., 2016; Neo and Tan, 2017).

Bermuda grass, house dust mites and other grasses and weeds, cat litter, strong chemical smells, building dust, perfumes, hairspray, tobacco smoke, and other environmental pollutants, are associated with the development of the disease in cats, being most of them also common to human asthma (Reinero, 2009; Reinero, 2011; Fehrenbach et al., 2017; Taylor, 2017).

On the other hand, some of the common risk factors associated with human asthma, like obesity and stresshave not been studied in cats (Reinero, 2011; Toskala and Kennedy, 2015).These were positively correlated to an increase in childhood asthma in humans, and even though their prevalence is increasing in both species, such correlation has not yet been confirmed in cats (Toskala and Kennedy, 2015).

Indoor pollution, along with outdoor pollution, has also been recognized and became an important risk factor in human asthma and probably also in feline asthma, as reported in recent studies (Lin et al., 2018).

Furthermore, in human asthma according with the hygiene hypothesis an exposure to infection and allergens in infancy is correlated with a decrease of allergic diseases in adulthood (Toskala and Kennedy, 2015). Similarly previous studies showed a negative correlation between neonatal exposure to allergens and the development of feline asthma (Heller et al., 2014; Toskala and Kennedy, 2015).

Given the above, the present study aimed to investigate if some of the housing conditions previous reported could be determining and conditioning factors associated with the occurrence of feline asthma.

MATERIALS AND METHODS

Data collection

This was a cross-sectional (self-completed) questionnaire-based study targeting portuguese ownersof cats with or without asthma diagnosed by the refereeing veterinarian. The inclusion criteria included being a cat owner with at least 18 years old, living in Portugal or Portuguese speaker, and living with and taking care of the cat.Exclusion criteria were based on the extent of reply of the questionnaire, being excluded if one or more sections were not completely answered.

The study design complied with the recent General Data Protection Regulation (EU, 2016)as well as other relevant legislation. The University's Scientific Council approved the study (Minuten#44_CC_2018 of October 10th 2018).

The initial drafting version of the questionnaire was constructed after a literature review regarding feline and human asthma. To enable internal validation, a panel (comprisingone veterinary epidemiologist, one statistical professional and five small animal clinicians) was asked to answer the questionnaire and give their direct feedback to the authors, regarding the extension and structure of the questionnaire, and if responseswere clear and correctly evaluated the issue, allowing data analysis.In addition, in the validation phase, 10 cat owners were also asked to answer the questionnaire to assess the extension of the questionnaire and if responses were unambiguous and of sim-

ple understanding. The questionnaire was adjusted accordingly and the final version included 55 questions structured in five main sections, regarding information on [A] animal identification and characterization, with 9 questions, [B] respiratory disease, with 10 questions, [C] animal stress, with 18 questions, [D] animal physical condition, with 4 questions and [E] animal environmental pollutants, with 14 questions.

The first section [A], included questions regarding the breed, age, sex and reproductive stage, weight, district of residence, lifestyle and acquisition site.

In the second section [B],the questions addressed the presence or absence of respiratory disease. If present, the frequency and characteristics of the episodes and in which type of scenarios it worsened. In this same section, questions were included relating to the exposure and development of diseases in the paediatric period.

In the third section [C], to perceive the animal's stress level,a grading scheme (Mariti et al., 2017; Atkinson, 2018) with several circumstances related to stress was presented. Besides playing, hiding, appetite, vocalizing and sleep and hygiene habits, the existence of other animals and their behaviour with the cat was also questioned as well as the occurrence of urinary tract disease symptoms.

The fourth section [D] considered the cat´sphysical condition through the adaptation of a body condition score scheme system based in a five-point scale adapted from the WSAVA (World Small Animal Veterinary Association) scale (Laflamme, 2013), it was also assessed the cat´s activity and the amount of treats given.

The fifth and last section [E],was directed at the environment in which the animal lives. Absence or existence (with corresponding distance)of outdoor main pollution producers, as industries and highways, was questioned. As for indoor pollutants, questions regarded the use of chemicals, gas ovens, fireplaces and smoke. Lastly, it was asked if the owner or other co-inhabitant relatives were diagnosed with asthma.

Both paper form (hard copies) and digital form questionnaires were distributed. Paper questionnaires were distributed via personal contacts and via veterinary clinics. The digital questionnaire was developed in Google platform Google forms™ following the same structure as the paper questionnaire. Digital questionnaires were disseminated through email to different veterinary care centres, as well as in social media platforms, namely Facebook™ and Instagram™. Questionnaires were received between September 2018 and March 2019.

Data analysis

Before analysis, coding was applied to all the questions. A descriptive analysis of the responses to each question was performed. After this, a series of independence tests with Chi-Square, trough SAS (Statistical Analysis System) program PROC FREQ (SAS Institute Inc., 2019), was performed to evaluate associations between the different variables included in the questionnaire.

The probability of an animal having respiratory disease was analysed by logistic regression with the same SAS program, with a model that included the several risk factors individually. Subsequently, probability ratios were estimated between the different risk factors levels that significantly influenced the probability of respiratory disease development in inquired animals.

Other variables, as weight, were submittedto several variance analyses developed with SAS program PROC GLM, to understand which significantly influenced it individually.

RESULTS

From the210 questionnaires received, only 189 (90.0%) met the defined inclusion and exclusion criteria. Of the 189 included, 27 were responded in paper form, with only two cats with diagnosed asthma, whereas the remaining ones (n=162) were replied in digital form, of which 16 cats were diagnosed with asthma.

Individual identification and characterization

Among the study population (characterization summarized in table 1),the breed with the higher prevalence was the European or mixed breed (82.0%). The male/female ratio was practically equal (95:93), being most of the cats neutered (78.3%). The mean age was 5±3 years old, ranging from 1to 15 years old and the mean weight was 4±1kg, ranging from 0.5 to 8kg.

Geographical origin of participating owners was broad, with questionnaires been completed also by Portuguese speakers living in foreign countries. Considering only the Portuguese mainland residents (96.6%), the higher number of respondents lived in the north region (48.6%; Figure 1).

Table 1- Characterization of studied cat population by signalment, lifestyle and acquisition

Variable	Categories	Absolute frequency (Relative, %)
Breed	European or mixed breed	n = 155 (82.0%)
	Siamese	n = 16 (8.5%)
	Other	n = 18 (9.5%)
Gender	Male	n = 95 (50.2%)
	Female	n = 93 (49.2%)
	No response	n = 1 (0.5%)
Reproductive status	Neutered	n = 148 (78.3%)
	Non-neutered	n = 40 (21.2%)
	No response	n = 1 (0.5%)
Age		
	< 3 years	n = 91 (48.2%)
	4 - 7 years	n = 48 (25.4%)
	8 - 11 years	n = 31 (16.4%)
	12 - 15 years	n = 14 (7.4%)
	> 15 years	n = 2 (1.0%)
	No response	n = 3 (1.6%)
Weight		
	< 2kg	n = 18 (9.5%)
	3 - 5kg	n = 126 (66.7%)
	6 - 8kg	n = 30 (15.9%)
	No response	n = 15 (7.9%)
Residence area	North mainland region	n = 89 (47.1%)
	Centre mainland region	n = 70 (37.0%)
	South mainland region	n = 18 (9.5%)
	Extra-continental	n = 6 (3.2%)
	No response	n = 6 (3.2%)
Lifestyle	Outdoor only	n = 10 (5.3%)
	Outdoor & indoor	n = 62 (32.8%)
	Indoor only	n = 117 (61.9%)
Acquisition	Street	n = 108 (57.1%)
	Pet shop	n = 10 (5.3%)
	Breeder	n = 8 (4.2%)
	Acquaintance	n = 61 (32.3%)
	No response	n = 2 (1.1%)

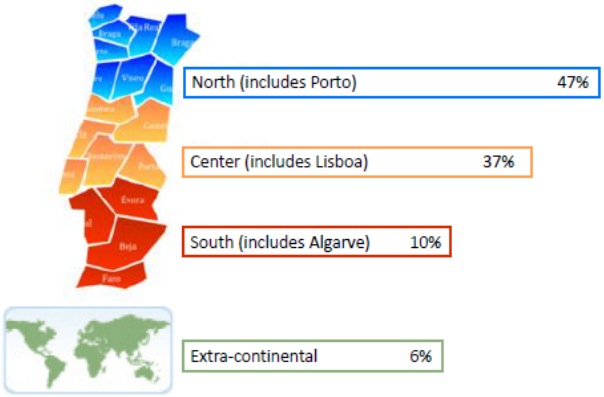

Figure 1. Geographical distribution of inquired cats

Regarding lifestyle, the vast majority of respondents identified their cats as "indoor only" (61.9%).In most cases (57.8%) cats were taken off the streets, and only 5.3% were commercially acquired in pet shops. None of the variables addressed in this sectionwas found to be statistically associated with asthma.

Feline asthma

Respiratory disease was only present in 18 (9.5%) of' cats, of which 16 were diagnosed with feline asthma. The mean age of the cats with respiratory disease (Table 2) was 6±3 years old, ranging from 1to 15 years. Their mean weight was 4±1kg, varying from 3up to 6kg.

Of those diagnosed with feline asthma, 43.8% (n=7/16) were diagnosed before the first year of age and 37.5% (n=6/16) between the second and the fifth year.

The signsthat owners more often associated with asthma crisis were respiratory wheezes and cough (Figure 2).

Table 2. Characterization of cats with respiratory disease studied by signalment, lifestyle and acquisition

Variable	Categories	Absolute frequency (Relative, %)
Breed	European	n=13 (72.2%)
	Siamese	n=3 (16.7%)
	Other	n=2 (11.1%)
Gender	Male	n = 9 (50.0%)
	Female	n = 9 (50.0%)
Reproductive status	Neutered	n = 17 (94.4%)
	Non-neutered	n = 0 (0%)
	No response	n = 1 (5.6%)
Age		
	< 3 years	n = 6 (33.3%)
	4 - 7 years	n = 6 (33.3%)
	8 - 11 years	n = 4 (22.2%)
	12 - 15 years	n = 2 (11.1%)
	> 15 years	n = 0 (0%)
Weight		
	< 2kg	n = 0 (0%)
	3 - 5kg	n = 15 (83.3%)
	6 - 8kg	n = 1 (5.6%)
	No response	n = 2 (11.1%)
Residence area	North mainland region	n = 10 (55.6%)
	Centre mainland region	n = 7 (38.9%)
	South mainland region	n = 1 (5.5%)
	Extra-continental	n = 0 (0%)
Lifestyle	Outdoor only	n = 0 (0%)
	Outdoor & indoor	n = 5 (27.8%)
	Indoor only	n = 13 (72.2%)
Acquisition	Street	n = 8 (44.4%)
	Pet shop	n = 3 (20%)
	Breeder	n = 1 (5.5%)
	Acquaintance	n = 6 (33.3%)

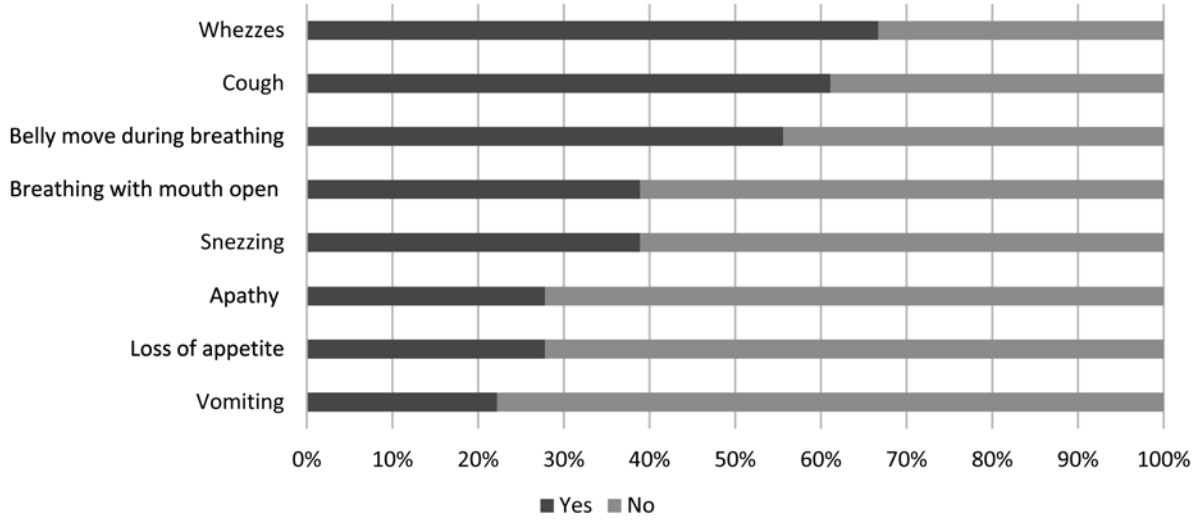

Figure 2. Signs associated with asthma crisis among diagnosed cats (n=16)

There are also situations in which the owners observed a worsening of clinical signsor that were associated with triggering an asthma crisis. As detailed in Figure 3, owners reported worsening of clinical signs mostly associated with season (specifically spring).

With the results gathered it was possible to identify some features of the disease in asthmatic cats, as displayed in Table 3. Crisis and medication intake were not frequent, with nearly half of the animals being under no medication.

Most cats had access to the outdoors in the paediatric age, and most did not develop any disease throughout that period.However, when they developed disease during the paediatric age, it was mainly asthma.

Stress

The frequency of the majorsituationsthat are commonlythe cat´s manifestations of stress as reported by respondent owners are displayed in Figure 4. To those that usually vocalize during traveling it was asked the frequency of the travelling, and most of them did it only about one to two times a year (83.3%).

Regarding other co-inhabitant animal as a potential source of stress, most of the enrolled cats lived with another cat(s) (68.3%), but co-inhabitants were also from other species, namely dogs, birds or small mammals. None of co-inhabitant cats were diagnosed with feline asthma, and the majority slept, ate and played together (Figure 5).

Table 3. Features of the disease in asthmatic cats

Variable	Categories	Absolute frequency (Relative, %)
Crisis frequency	1-2 times a year	n =7 (43.8%)
	Monthly	n =4 (25.0%)
	Weekly	n =1 (6.3%)
	Daily	n = 1 (6.3%)
	No response	n = 3 (18.6%)
Asthma medication	Yes	n = 9 (56.2%)
	No	n = 7 (43.8%)
Last medication	Daily	n = 2 (12.5%)
	Weekly	n = 1 (6.3%)
	Monthly	n = 1 (6.3%)
	In the last 6 months	n = 2 (12.5%)
	In the last year	n = 4 (25.0%)
	No response	n = 6 (37.4%)
Exterior access during pediatric age	Yes	n = 9 (56.2%)
	No	n = 3 (18.8%)
	No knowledge	n = 4 (25.5%)
Respiratory disease in pediatric age	Yes	n = 4 (25.0%)
	No	n = 6 (37.5%)
	No knowledge	n = 6 (37.5%)
Disease developed in pediatric age	Feline asthma	n = 4 (25.0%)
	No response	n = 12 (75.0%)

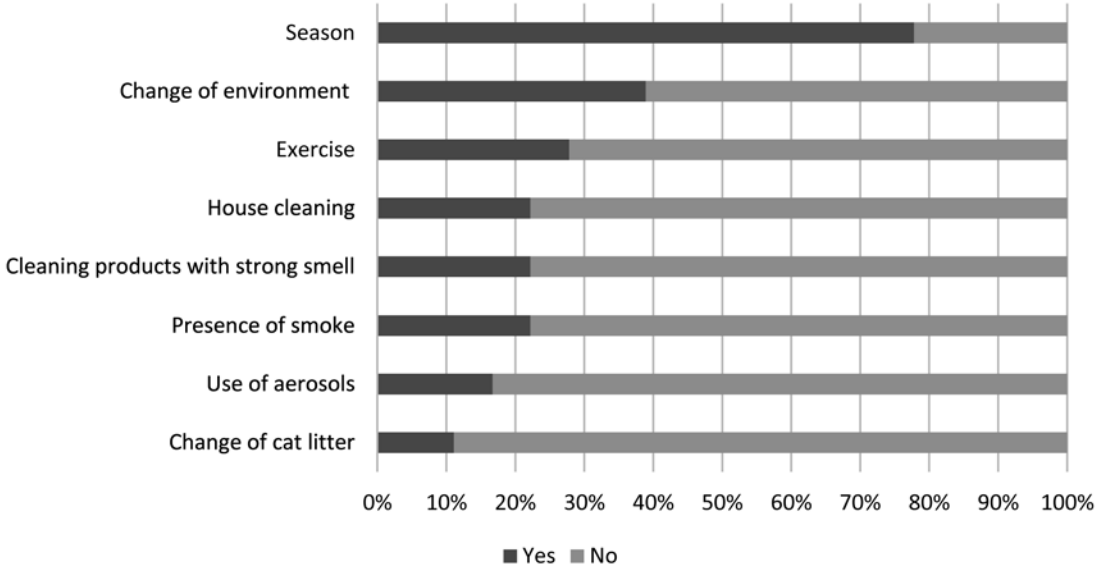

Figure 3. Circumstances associated with increased clinical signs or triggering crisis

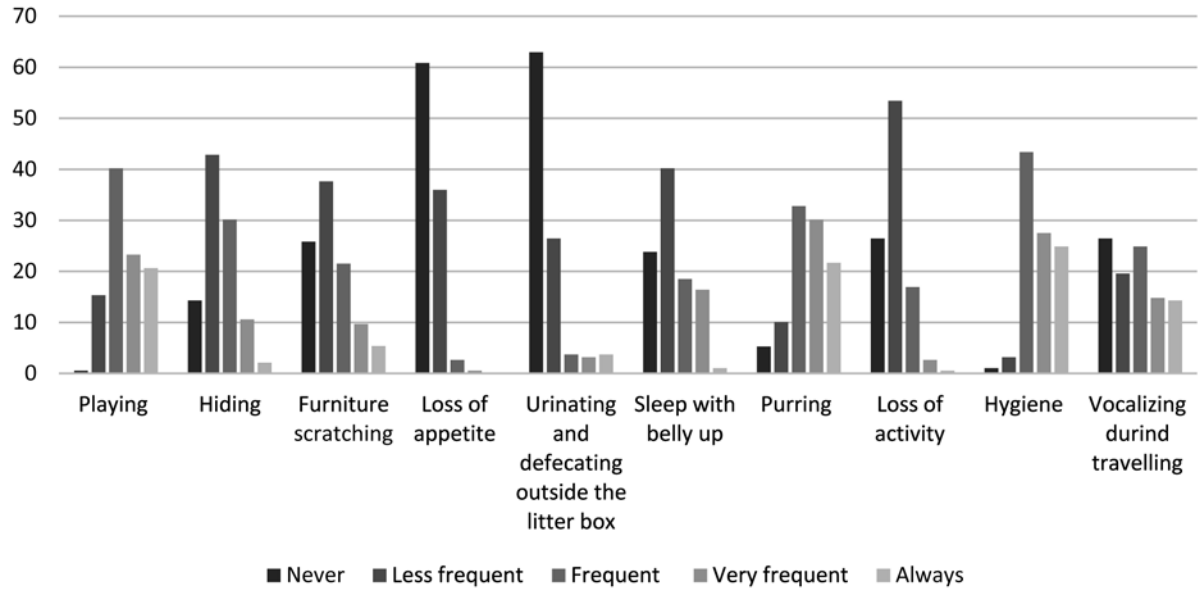

Figure 4. Relative frequency (%) of signs associated with cat stress, as reported by owners

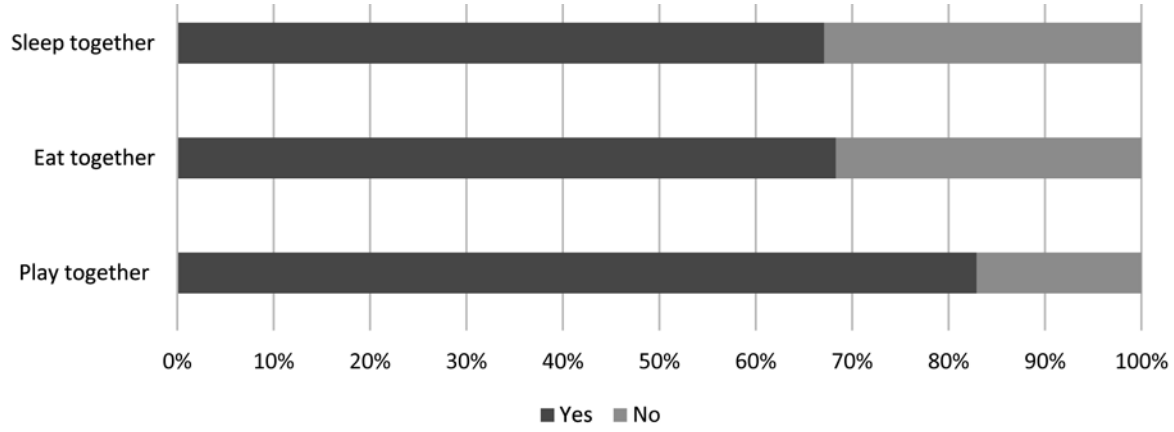

Figure 5. Stress related behaviors in the presence of co-inhabitating cats

Diseases correlated to stress had low prevalence (10.6%), with urinary tract disease symptomsas the most frequently reported one (65%). It was observed a significant association between lifestyle and stress *(P*=0.032). The smaller percentage of animals with disease (3%; n=2/62) were the ones that had access to both indoor and outdoor. Additionally, although not statistically significant, the correlation between stress-related diseases and asthma was close to significance *(P*=0.065).

Body condition

Most owners identified their cat as being in the ideal weight (54.4%) and active (84.4%). The majority did not give treats frequently to their cats (64. 2%) (Table 4).

It was possible to prove a significant relation between weight and age, Weight was significantly influenced by age*(P*< 0.01). There was no specific association found with asthma.

Environment

The majority of the respondents lived in an urban environment (55.6%). Among those living in urban areas, a public park or gardenexisted in 71.8% of cases, frequently (87.7%)less than 1 km away.

Regarding smoking habits, most respondents had no smokers in the house (66.1%), but of those who actually smoked, most did so in the areas to which the cat had access (48.4%).

Other indoor pollution sources included gas ovens or heaters (42.0%), fireplaces (36.5%) and aerosol-sources (28.0%).

Proximity with highways or freeways was observed in 32.3% of all enrolled cats, being in most cases at two to 5km away (61.4%) (Table 5).

Table 4. Characterization of body condition regarding all the studied population and cats with asthma/respiratory disease.

Variable	Categories	Absolute frequency (Relative, %)		P value
		Total cat population (n=189)	Cats with asthma/ respiratory disease (n=18)	
Body condition	Lean	n = 42 (22.2%)	n = 2 (11.1%)	*P*=0.38
	Ideal	n = 102 (54.0%)	n = 10 (55.5%)	
	Overweight	n = 44 (23.3%)	n = 6 (33.3%)	
	No response	n = 1 (0.5%)	n = 0 (0%)	
Activity	Active	n = 157 (83.1%)	n =13 (72.2%)	*P*=0.35
	Sedentary	n = 29 (15.3%)	n = 4 (22.2%)	
	No response	n = 3 (1.6%)	n = 1 (5.6%)	
Treat given	Frequent	n = 67 (35.4%)	n =4 (22.2%)	*P*=0.21
	Not frequent	n = 120 (63.5%)	n =14 (77.8%)	
	No response	n = 2 (1.1%)	n = 0 (0%)	

Table 5. Characterization of environment regarding all the studied population and cats with asthma/respiratory disease

Variable	Categories	Absolute frequency (Relative, %)		P value
		Total cat population (n=189)	Cats with asthma/ respiratory disease (n=18)	
Urban vs. Rural	Urban	n = 105 (55.6%)	n =8 (44.4%)	p=0.30
	Rural	n = 84 (44.4%)	n =10 (55.5%)	
Smoking	Yes	n = 52 (27.5%)	n = 5 (27.8%)	p=0.50
	No	n = 125 (66.1%)	n = 13 (72.2%)	
	No response	n = 12 (6.4%)	n = 0 (0%)	
Pollutant industries	Yes	n = 19 (10%)	n = 4 (22.2%)	p=0.07
	No	n = 170 (90%)	n = 14 (77.8%)	
Highways/ freeways	Yes	n = 61 (32.3%)	n = 6 (6.4%)	p=0.92
	No	n = 128 (67.7%)	n = 12 (66.7%)	

Presence of nearby pollutant industries only occurred for 10.1% of the participants and most of them were 2to 10km away (62.5%). Although close to significance *(P*=0.07), the presence of these industrieswas not correlated to asthma in enrolled cats.

None of the remaining environmental factors showed to be significantly associated with asthma.

Finally, in the last question that inquired if anyone living in the household had asthma, most answered negatively (78.8%). In addition, 93% of asthmatic individuals did not owned or lived with an asthmatic cat.

DISCUSSION

This study enrolled a considerable number of animals (n=189), nevertheless most of the parameters tested did not had a statistically significant association with feline asthma. This was probably because of the small number of asthmatic cats (n=16) and the fact that feline asthma is frequently underdiagnosed. In fact, asthma was present in approximately 8.5% of the animals analysed, which is slightly superior to the results found in literature: 1-5% (Venema, 2010; Kettner, 2018; Rosenberg and Druey, 2018). A possible justification may lie in the fact thatthe questionnaire was disseminated online as being a study regarding respiratory disease in cats. It is also important to mention that the diagnosis of feline asthma was not confirmed.

There is an increasing incidence of asthma, in both humans and cats, living in the same housing conditions (Neo and Tan, 2017). In addition, consideringthe studies conducted in humans, most are focused in treatment and not so much in prevention. It would be important to conduct further studiesto try to understand if exposure to the same risk factors can lead to the development of the disease both in humans and cats or even if cats could be used as sentinels for the disease in humans (Neo and Tan, 2017).

Although most of the associations proposed were not statistically proven,this study enabled us to better characterize cats with respiratory disease, namely asthma.Such as reported in previous studies (Venema and Patterson, 2010; Kettner, 2018; Rosenberg

and Druey, 2018) no correlation was found between asthma and the breed, age or sex of the cats, probably given the reduced number of enrolled asthmatic cats. However, other studies found a higher prevalence in the Korat (19%) and Siamese (7%) breeds (Vapalahti et al., 2016).

Disease prevalence in the different Portuguese areas, which was not studied up until now, was higher in the north mainland region (55.5%), although no significant association was found between asthma and a Portuguese region in particular.

It was observed that respiratory wheezes and coughingwere the most frequently reported signsassociated with asthma crisis. Season was the main reported leading cause ofworsening of clinical signs, probably related to aeroallergenslike pollens and fungal spores. These aeroallergens, usually associated with spring,are capable of inducing bronchial obstruction therefore increasing asthma symptoms in humans (D'Amato et al., 2005), and probably also in cats.

Other aspects of the cat's life have also been hypothesized as being associated with asthma, namelypaediatric exposure to pathogens. In both human and feline immunity, benefits were found with exposure in the paediatric period and the development of diseases (Heller et al., 2014; Toskala and Kennedy, 2015), although recurrent respiratory infections in infancy has been correlated with the development of asthma in humans later on (Arshad et al., 2005; Subbarao et al., 2009). A previous study (Heller et al., 2014) determined that exposure to allergens in early neonatal period of the cat, until the fourth to sixtieth month of age, prevented the development of airway eosinophilia when exposed to the same allergens later onespecially in children. Rodent and human studies suggest an opportunity to \"prevent\" asthma in the perinatal period. The aims of this study were to create a more \"natural\" model of feline asthma by exposing offspring of asthmatic queens to Bermuda grass allergen (BGA.In the cited study, no statistical association between early exposure to allergens and asthma was found, although most of the animals in the study evidenced paediatric exposure and did not develop any respiratory disease in early life nor in adult life.

Even though there are no studies analysing possible correlation between asthma and stress in cats, in humans evidence exist that suggests a casual association between both (Reinero, 2011; Toskala and Kennedy, 2015). For example, in children living in the north hemisphere there is a predictable annual exacerbation of symptoms every September, correlated to seasonal allergens and possibly to the stress of returning to school (Subbarao et al., 2009). Thus, it could be reasonable to assume that in cats other stress-related circumstances could lead to exacerbation of clinical signs (Atkinson, 2018; Mariti et al., 2017). It is worth mentioning that,in the present study, the association of stress related diseases with asthma was close to significance *(P*=0.065).

An association was also described with asthma and obesity in humans (Venema and Patterson, 2010; Toskala and Kennedy, 2015). However, Subbarao et al. (2009) suggested that such relation might be casual given their mutual increase. Associated with obesity, a sedentary lifestyle was also positively associated with asthma symptoms in humans (Beasley et al., 2015). Nevertheless such significant association was not found in the present study.

Although there are studies relating a rural environment to a reduced risk of development of asthma in childrensuch relation was not found in this study. On the other hand it was observed an increased prevalence of asthma in humans in urban areas for diverse factors like vehicle emissions and industrialization (D'Amato et al., 2005; Beasley et al., 2015). Although no positive association between asthma and urban area residence was determined, the association between proximity with pollutant industries and occurrence of feline asthma was close to significance *(P*= 0.07). Along with industries, tobacco smoke, chemicals, and highways are recognized as producers of different pollutants that can lead to the development of the disease and that are associated with increasing respiratory symptoms in children (D'Amato et al., 2005; Taylor et al., 2017; Lin et al., 2018;). Nevertheless, such associations were not found to be significant in the current study.

Lastly, it was asked if someone in the house was diagnosed with asthma, however such association was not found.

This study provided important information regarding overall housing and health conditions of Portuguese cats. Most of the cats are of European or mixed breed and sterilization is a common practice, among the cats enrolled in the study. In addition, most of the cats (61.9%) live exclusively indoor which is in line with the previously described (64%; GFKTrack. 2Pets, 2015). As for stress-related parameters most of

them were very low or even non-existent, suggesting that studied cats have a low level of stress, or at least they were not detected by the criteria used to evaluate this parameter.

Likewise, obesity was not frequent, with the majority of responses indicating an ideal body condition of the cats.Nonetheless, these results must consider that ownersanswered the questionnaire, which can influence body-conditioning scoring results. Owners most frequently consider their animals as having an ideal body condition even when a graphic chart is used (Eastland-jones, German, Holden, Biourge, and Pickavance, 2014)

CONCLUSIONS

This questionnaire-based study directed to Portuguese-speaking owners of cats focused on respiratory diseases, namely asthma. The study showed that most of studied cats were of mixed breed and neutered, living indoor exclusively, mainly in urbanareas and from the north mainland region. According to the owner's perception, the cats were mostly active and with the ideal weight. The clinical signs more often associated with asthma crisis were respiratory wheezes and cough, whereas the worsening of such clinical signs occurred mostly in spring. Stress symptoms were not common, but the correlation between stress-related diseases and asthma was close to significance. A mixed lifestyle was associated with less symptoms of stress. Although close to significance, the presence of pollutant industries was not associated to asthma in the enrolled cats. Finally, in most of the houses in which an asthmatic cat lived in, no owner or other co-inhabitant had asthma.

It would be important to do further research in this subject, with higher number of enrolled animals, to try to understand if such results are transversal to different study populations and eventually identify further predisposing and conditioning factors that may be involved in the disease both in cats and in humans and if the housing conditions may be determining for the development and exacerbation of other diseases.

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CONFLICT OF INTEREST

None declared.

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