Cat attacks towards people and/or animals, an educational pending task on pet's owners?

Valentina Medina-Barrera, Pedro Geraldo González-Pech*

Abstract: This study aimed to explore the context and the characteristics of domestic cats' (Felis catus) attacking their owners or other pets and their probable risk factors. A survey was targeted to persons perceiving that their cat attacked to people or/and animals. Only no-stray, healthy cats' information were included. 48 questions covered general information of the owners, and type of house; age sex, color, and medical record of cats; the context on which the aggression to people or other pet took place; handling habitudes in owner-cat interaction. Chi-square and Fisher test were used to compare the frequency of cat's characteristics between cats with and without attacks towards people and/or animals. Risk factors analysis was made with WinEpi©. The information of 154 cats was obtained, the 91.5% of owners declared to play with their cats, 63 cats performed attacks to people and/or animals in the past three months. 8 (5.2%) cats perceived by their owners as non-aggressive, in fact performed attacks towards people and/or animals. The most commons wounds reported were scratches and bites (68.2%), largely considered by owners (76.2%) as no needing medical revision. 62% of aggression events were preceded by vocalization and/or body posture changes of cats. A significant higher proportion of cats combining < 2years, and with nonexclusive litter box performed aggressions. Cats of age of < 2 years resulted with 4.7 to 32.2 more probabilities to perform aggression. The absence of other animals also resulted as risk factor. Owner attitudes minimizing cat aggression could imply the maintenance of unwanted behaviors in cats, also accidental aggression during human-animal interaction deserve deeper studies due to possible zoonosis risk to owners.

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UNIVERSIDAD DE CÓRDOBA

Valentina Medina-Barrera

Pedro Geraldo González-Pech*

Universidad Autónoma de Yucatán, Facultad de Medicina Veterinaria y Zootecnia, Carretera Mérida Xmatkuil Km 15.5, 97315, Mérida, Yucatán, México

* Email: pedro.gonzalez@correo.uady.mx

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HIGHLIGHTS

- The owner is the most determinant factor in cat aggression occurrence.
- Almost half of cats perceived as potentially aggressive by their owners attacked.
- Cats' vocal/body warnings precede most of attacks, but owners disregard them.
- Wounds caused by cats are minimized by owners itself implying a risk for zoonosis.
- It is urgent to educate the owners towards a good quality human-animal interaction.

INTRODUCTION

Cat attacks towards people, although less frequent than those caused by dogs (Steele et al. 2007) they are responsible for 2 to 50% of all cases of animal attacks worldwide (WHO 2018). This percentage is probably higher, as some studies report that the idea persists among owners that aggressive behavior is an inherent part of their cats as autonomous animals that are not 100% domesticated (Heath 2002). Normalizing the aggression carried out by these popular pets can be dangerous since they can carry more than 37 pathogenic agents for humans in addition to the physical damage (Lappin et al. 2019).

Some studies report that the risk of being bitten by a cat is more frequent in urban than non-urban areas (Sinclair and Zhou 1995). In contrast, when the study concerns cats from rural regions, predation behavior of feral, roamed, or stray cats rather than attacks on people seems to be the main issue (Krauze-Gryz et al. 2017; Loyd et al. 2017). In other hand due to the global demographic trend, with most of the population in cities, there is an increase in the density of cats and the potential risk of attacks and zoonoses. The latter may explain why stray cats have been extensively studied (Wright 1990; Uetake et al. 2014; Hwang et al. 2018).

Some studies also report the relevance of domestic cats in the attacks towards people or animals (Palacio et al. 2007). In a household context, many of the attacks caused by cats as pets occur as a defensive response of cats. For this reason, some authors such as Sinclair and Zhou (1995), made efforts to identify those behaviors of people that could prevent the stimulation of an attack toward people and/or animals in their cats. Such types of works should help to enhance cat-owners interaction aiming to prevent attacks by the cats. However, educational efforts could be undermined due to the emotional attachment of owners to their cats (Franck et al. 2022), which can be so strong as to lead the person to ignore warnings before the attack. Even if the way that owners interact with their pets can be different in each country (Jayasundara 2021; Kakuma et al. 2005; Foreman-Worsley et al. 2021) and each culture, people ignoring warnings could be a common trait.

Thus, this study aimed to explore the context and the characteristics of domestic cats' (Felis catus) attacking their owners or other pets and their probable risk factors.

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METHODS

Survey and exclusion criteria

The population targeted were persons perceiving having a cat with attacks toward people and/or animals in the past three months. The survey was restricted to cats' owners' residents of Mérida, Yucatán, México. It was distributed via social media during the summer of 2020 and responded to through Google Forms online. The cats were considered the sample unit and a

sample size of 140 was calculated for a descriptive study for qualitative variables and an unknown population (Aguilar-Barojas 2005), using a 99% of confidence level, an expected proportion of population showing the condition (attacking) of 30%, and high absolute precision of 0.1.

The survey excluded all owners with cats with current diseases or with recent surgical interventions. Also, feral cats, stray cats, or cats only present in the domicile for feeding were not included.

Questionnaire

The questionnaire was anonymous for the protection of the personal data of the respondents. It was organized into four sections: i) the first one included an informed consent statement, and questions about if the owner perceive their cat as aggressive or not (Do the owner remember if their cat performed some physical aggression like scratch or bite to some person or animal in the past three months?) , also questions about the type of house, the sector of the city, number of persons living in the domicile, and presence of children; ii) questions about the cats' status, their provenance, number of cats, age, sex, coat-color, neutered animals, vaccinations, presence of other pets in the domicile; iii) questions about the context of the aggression event, i.e. if this was during an owner-cat interaction like playing with the cat, offering food, etc., the behavior displayed by cats (body posture and vocalization), the person or pet attacked and the severity of wounds; iv) the last section was related to the handling, if the owner plays with them, or disposes of toys to them, the number of litter boxes available, if the litter box is only used for one cat (exclusive), or if the litter box is used for more than one cat (nonexclusive), etc. The items of the survey can be provided by the authors (in Spanish) under demand to the researchers interested.

Statistical analysis

While the survey was directed to owners with aggressive cats, it was proposed that in case of obtaining a similar or greater proportion of cats with and without attacks, the data would be analyzed as all animals having similar opportunities to display or not an attack.

For those cats' characteristics with majority for a trait (for example, 90% of female vs 10% of male cats) no statistical test was performed. For the rest, contingency tables were used to perform Chi-square tests to compare the characteristics between cats attacking or not towards people and/or animals. For data with cell values lower than five the Fisher Exact test was used. A Post-hoc power analysis performed in G*Power 3.1 software, for the generic Chi-square test with a sample of 154 indicated a power from 0.95 to 0.98 when using from five to two categories in contingency tables.

In addition, a risk factor analysis for observational studies was effectuated with the WinEpi© (De Blas et al. 2006) software. Thus, a case-control observational study with a 95% of confidence level was used to estimate the Odds ratio considering the characteristics reported by cats' owners as exposition factors.

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Only those significantly identified as risk factors are reported.

RESULTS

Owners' demography

A 57% of people that answered the survey mentioned being professionals, and 43% students. An 88% of the people declared having backyard in their house, the rest 9% reported do not dispose of backyard, and 3% lived in apartments.

Description of the attacking to people and/or animals

Despite that the survey was directed to persons that perceived having a cat that attacked to people and/or animals in the past three months, most of the cats 91/154 (59.09%) did not attacked and, only 63/154 (40.91%) attacked (Table 1). Thus, the data resulted limited in relation to the planned initial sample and determined that Chi-squared and Fisher test were preferred for the analysis of the information.

From 154 cats, 63 attacked in the past three months. 41.3% of them attacked people as well as other pets. 30% of the cats performed the attack towards adult people in the home, 17.5% to another cat, 6.3% to other animals (not cats), 3.2% to a child, and 1.6% to teenagers. 15 from 154 cats (9.7%) attacked exclusively towards animals (cats, dogs, birds etc). Wounds produced by cats were from light to severe scratches to light to strong bites in 68.2% of the cases, in another 9.5% only light bites, in 3.2% severe scratches with blood loss, in 1.6% strong bites with blood loss, in 1.5% only light scratches, 15.8% were not described. In most cases (76.2%), the wounds were considered by cats' owners as injuries which no require medical treatment. Additionally, 23.8% were reported as wounds treated at home.

Owner perception	n	The cat attacked	The cat did not attack
Think that their cat attacked towards persons and/or animals	56	55	1
Think that their cat did not attack towards persons and/or animals	98	8	90
Total	154 (100%)	63 (40.91%)	91 (59.09%)

Table 1. Number of cats that effectively attacked or not (towards persons and/or animals) and the owner perception about their pet in the three previous months.

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The attacks of cats were mainly displayed during the night (28.6%) and the afternoon (25.4%). The rest were reported at midday (17.5%), morning (11.1%) and, at any time (9.6%). Most of the attacks performed by cats took place during the interaction with people and other cats (46%), but also exclusively during people interaction (38.1%). Another 14.3% was during cat interaction with conspecifics and 1.6% without immediate prior interaction, for example when the person without addressing the cat passed close to it.

More than a half of the attacks (62%) were reported with vocalizations of the cats: a 38.1% with vocalization (growling or hissing) plus arched body, piloerection in the back, tail erection, and 23.8% with vocalization plus body tight and flattened, ears turned back. Another 22.2% with body flattened dilated pupils but no vocalizations, 11.1% flicking the tail rapidly from side to side, 1.5% with all the previously described, 1.6% with all the previously described except tail movements, and 1.7% with no description.

Owners' perceptions about the aggression of their cats towards people and/or animals

A significant correlation (P<0.0001, Coef. Corr. 0.88) was found between the aggression perceived by the owner and the real described attacks. Only one person having perceive their cat as aggressive when answered the 1st section of the questionary, but when they were demanded to describe the aggression in 3rd section of the questionary, they realized that the cat did not perform it, the cat did not attack. In the inverse situation, 5.2% of persons having perceive their cat as non-aggressive in the 1st section of the questionary, but when asked to remember details (3d section of the questionary) of the event, they realized that their cat effectively performed an attack towards people and/or animals, that he attacked.

Characteristics of cats that attacked or not to people and/or animals.

Some characteristics of the cats reported by their owners resulted in a majority for one trait. For example, 91.5% of the owners play with their cats whether the cat attacked or not to people and/or animals. Thus, no statistical analysis was performed for those traits, and they are only described. 81.1% of cats were Mestizo breed (non-defined breed), and 18.8% were Persian or Siamese. 88.9% sleep inside the domicile, 7.8% outside, and 3.2% in both places. 73.4% of cats have updated deworming, 25.9% more than six months from the last deworming, and 0.6% have not been dewormed., and 84.4% of the cats live with other animals in the household.

From the characteristics with statistical analysis performed, the biological characteristics of cats are shown in Table 2, the provenance, and prophylactic measures of cats in Table 3, and handling provided to cats in Table 4. In table 2 can be seen that cat with attacks towards people and/or animals are more numerous in the rank of age of two years or younger, compared to older

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Characteristics		The cat attacked	The cat did not attack	P value
Sex	Male	29	41	1.0000
	Female	31	42	
Age	< or 2 years	43	33	<0.0001
	> or 3 years	6	57	
Single coat color	Black	15	10	0.7353
	White	9	6	
	Yellow	5	4	
	Brown	5	3	
	Grey	4	6	
Others coat color	Tabby pattern	16	10	0.8111
	Black & white	7	8	
	Brown & white	6	5	
	White & yellow	2	1	
	Grey & white	2	3	
	Black & orange	0	1	
	Three colors	9	1	---

Table 2. Biological characteristics reported by owners of cats that attacked or not towards people and/or animals. P value of Chi-square or Fisher test

Provenance and prophylactic characteristics	The cat attacked	The cat did not attack	P value
Rescue from the streets	33	55	0.4077
Born in the household or another household	30	36	
Neutered	16	32	0.1748
No neutered	40	45	
Updated vaccination	57	16	<0.0001
>6 months from last vaccination	5	67	
Without vaccination	1	8	
<3 months from last visit to veterinary	23	42	0.3050
>6 months from last visit to veterinary	40	49	

Table 3. Provenance, and prophylactic characteristics reported by owners of cats that attacked or not towards people and/or animals. P value of Chi-square or Fisher test

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Handling characteristics	The cat attacked	The cat did not attack	P value
Toys are available	22	40	0.3386
Toys are not available	41	51	
Presence of other cats	10	24	0.2586
Presence of dogs	33	45	
Presence of other animals	20	22	
Nonexclusive litter box	19	49	0.0129
Exclusive litter box	38	37	
No reported	6	5	

Table 4. Handling characteristics reported by owners of cats that attacked or not towards people and/or animals. P value of Chi-square or Fisher test

Characteristics	Logarithmic approximation	Chi-square approximation	Odds Ratio*
Age < 2 years	4.7 – 32.2	5.2 – 29.1	12.4
Born in the household or another household and age < 2 years	5.4 – 75.4	6.1 – 66.7	20.1
Rescue from the streets and age < 2 years	2.5 – 54.6	3.0 – 44.6	11.6
No presence of other animals	1.4 – 15.6	1.5 – 14.4	4.7
Exclusive litter box	1.3 – 5.3	1.3 – 5.3	2.6

Table 5. Single or combined characteristics identified as risk factors according to the information reported by owners of cats that attacked or not towards people and/or animals. Only odds ratio with result significative at confidence level of 95%, and valid limits of their logarithmic approximation

animals (P<0.0001). Also, more cats with attacks towards people and/or animals had an updated vaccination (P<0.0001, Table 3), and had exclusive litter box compared to cats that not attacked (P=0.0129, Table 4).

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Risk factors for the cat attack towards people and/or animals

In table 5 is shown those characteristics that resulted significant in the risk estimation analysis. An age lower than two years presents 4.7 to 32.2 more probabilities (using the limits of logarithmic approximation) than older cats for performing attacks. While the provenance resulted not significantly different in the Chi-square analysis (Table 3) the cats born in the household or rescued from streets have more probabilities of attack if they have 2 years age or less (Table 5). The absence of other animals in the house also resulted in an increase in the risk of attack.

DISCUSSION

Owners' perception about the aggressiveness of their cat

Due to the scarce information about cats performing attacks against their owners or other pets in the house, the present study was planned as exploratory and, a sample size of 140 cats was required. With the surveys it was obtained information of 154 cats, 40.9% of them performed some kind of aggression. Even if this proportion was larger than the 30% planned for an unknown population, it can be considered lower than expected for a survey that was directed to "owners remembering their cat perform some physical aggression like scratch or bite to some person or animal in the past three months". As result of having in the owners' survey 59.1% of cats without performing attacks the power of analysis was limited. In consequence, the Spearman correlation (association test) between cats that have or not performed attacks and their characteristics must be cautiously considered. Also, data analysis with contingence tables were preferred for this type of data.

The owners' perception about aggression events addressed in the 1st section of the questionary resulted with a good and significant correlation with the effective aggression described by them in the 3rd section. Only one person perceived having a cat that attacked to a person and/or animal when in fact the cat did not perform it (Table 1). Nevertheless, 5.2% of the owners perceived their cat as without aggression event but their cat displayed such behavior (Table 1). The latter is in accord to the study of Franck et al. (2022) who reported the aggression of cats as a minimized issue by some owners.

Context of the attack reported by the owners.

Most of the attacks occurred in the afternoon and at night, which is consistent with the fundamentally crepuscular and nocturnal habits of domestic cats, even if they can be on activity during the day (Zailema 2021). In the present study most of cats' attacks were reported during the interaction with people or other cats and only a few proportions (1.6%) were displayed without immediate prior interaction. This confirm the results of the study of Alabort et al. (2017) and Palacio et al. (2007) where the interaction or owner provocation was the more common situation for the appearance of aggression.

Is the attack normalized by the owners?

Most of cat attack towards people and/or animals (62%) took place after body/vocal warnings of cats and despite that resulted in wounds as scratch and bites, in most attack cases (76.2%), the cat's owners considered no need for medical intervention. The latter could be a public health concern due to the risk of zoonotic diseases that can be transmitted by the cat, such as the scratch disease (Pérez-Martínez et al. 2010). But, why to ignore a warning signal emitted by the cat? At least four factors could be involved: i) ignorance or unawareness about the vocal and body language of cats, a situation that can encourage the maintenance of behavior disorders in the cat by their owner (Zailema 2021); ii)

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a normalization of aggression, seen as inherent part in the cat's nature (Heath 2002), because the cat is perceived as an independent animal (Hirsch et al. 2022); iii) higher animal-bond has been reported as correlated with owners' tolerance to aggression (Bulgakova et al. 2017), iv) the cultural phenomena recently named as online cat-related media consumption, where cats' videos have the potential to animate its audiences (Myrick 2015). In the latter case, playing or aggression behavior of cats could be neatly presented to the audience as the same trait, when in fact they are not. Nevertheless, in the present study the playing activity was not comparable between cats that attacked towards persons/animals or not, because practically all the owners (91.5%) reported playing with their cats. Even if playing with the cat deserve more research, it can be considered that all these factors reflect the educational task that still should be done towards owners to get-out from normalization of attacks caused by cats.

Significant characteristics and risk factors in cats with aggression events

The characteristics with a significant ($P<0.0001$) difference between cats with and without attacks against people and/or animals, were cats of less than two years of age (Table 2), cats with their vaccination scheme update, and cats with exclusive litter box (Tables 3 and 4. respectively); the animals with these traits showed a greater proportion of attacks. Younger cats tend to be more active and with higher frequencies of playing behavior than older cats (Delgado and Hecht, 2019), which could promote to the owners to engage interaction (a 91.5% of owners in the present study play with their cats) underestimating or minimizing the fact that some aggression can occur as part of the normal repertoire of playing behavior (hunt or fight simulation) in cats (Chapman 1991; Curtis 2008). Unfortunately, permissive behavior of the owners towards cat aggression can contribute to the establishment and maintenance of inappropriate or unwanted behaviors in cats (inadvertent reinforcement (Denenberg 2021). It was interesting that from those cats with attack towards persons and/or animals, they were more numerous cats with their vaccination scheme updated compared to the non-updated. Probably the owners of those cats feels that their pet are more protected, and that there is not a problem receiving bites or scratches from vaccinated cats. This finding deserves in deep research that will be addressed in future works. In other hand, even if the cat had a vaccinated update scheme, the scratch disease transmission, or other microorganisms like Pasteurella are not necessarily covered in the common veterinary schemes of vaccination.

Concerning the risk factors, as expected due to the results formerly discussed, the age less than two years resulted significative to the presence of cats' aggression whether the cat was born in the household or rescue from streets. Despite that a major proportion of the cats' owner play with their pets, the latter did not result as a significant risk factor, but the absence of playing did, as well as the absence of other animals in the house. The lack of socialization has been described in other studies (Zailema 2021) as a relevant factor that may conduct to behavioral disorders in the domestic cats and could be related to this finding. Finally, from the cats that attacked towards persons/animals, in 38 the litter box was exclusive and in 19 the litter box was nonexclusive (Table 4).

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Exclusive litter box resulted as a risk factor for the presence of the attacks (Table 5) and was contrary to the expected. It is well known that competing for resources like the litter box, could trigger a redirected aggression among cats and reach to the persons. That is why providing more than one choice of litter box to the cats is recommended as a good measure to prevent fights between cats (Ellis et al., 2013). Thus, this result should be taken with caution due to the limited sample size. But also, the exclusive use of litter box in the present study doesn't mean that there is an extra box available, but that every cat has one box. In consequence, for the cats with exclusive litter box, there was no extra boxes available, and the competition also could be present.

CONCLUSION

While limited in the extrapolation of the results due to the sample number, the present exploratory study suggests that owner minimizing accidental aggression during the interaction with young cats, could imply the maintenance of unwanted behaviors in their cats, in addition that the attacks could represent a public health concern. The attitudes of owners in their interaction with cats and the owners' knowledge about zoonotic risk through scratches deserve more investigation.

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DECLARATION OF COMPETING INTEREST

The authors declare that they have no competing interests.

DATA AVAILABILITY STATEMENT

The information employed and/or analyzed in the current study are available from the corresponding author on reasonable request.

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ETHICAL APPROVAL

Authors declare that all experimental procedures complied with ethical standards in accord with the EU Directive 2010/63/EU for animal experiments.

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Valentina Medina-Barrera

Pedro Geraldo González-Pech