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Prevalence of different aggression types and assessment of related determinants in a population of Iranian domestic dogs

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Summary

Prevalence of different aggression types and some related risk indicators were studied in 434 dogs presented to the School of Veterinary Medicine at Shiraz University over a one-year period (From March 2010 to June 2011). After taking case histories and examining all dogs, related questionnaires were completed for each dog and the nine classical types of aggression were evaluated. 25.3% of all cases had bitten at least one person or animal during their life. The most frequent aggression type was conflict (dominance) aggression (36.6%) followed by fear (20.9%) and protectiveness (20.9%) aggression, intraspecific (7.8%), medical (3.9%), redirected (2.6%), pain (2.6%), maternal (2.6%) and predation aggression (1.9%). Sex, age and indoor/outdoor keeping had a significant effect on conflict aggression. Males ($P<0.001$), more than 2 years of age ($P=0.001$) and outdoor dogs ($P=0.02$) revealed significantly higher levels of conflict aggression. The majority of the cases did not understand obedience orders of the owners and needed more training to obey properly. Raising the level of socialization of the pet and owner's knowledge about training principles may reduce these behavioral problems in Iran.

Key words: Dog behavior, Aggression, Behavior problem, Iran

Introduction

Aggression is a normal canine behavior. Abnormal canine aggression is defined as "normal aggressive behavior that becomes excessive or uncontrolled and is then seen as undesirable and potentially dangerous by humans" (Butcher *et al*., 2002). Canine aggression is the most common problem behavior seen by veterinary behaviorists and general veterinary practitioners (Landsberg, 1991; Wright, 1991; Wells and Hepper, 2000; Guy *et al*., 2001a, b; McGreevy and Calnon, 2010; Bennett *et al*., 2012). This problem adversely affects pets, the relationship between the pet and other animals, the pet and the owner, the pet and the community at large (Borchelt, 1983). Reliable data on the epidemiology of dog bites, and analysis of the prevalence of aggressive behaviors and their causes in pet dogs provides useful information and is necessary for designing effective strategies for the prevention of bite accidents (Overall and Love, 2001; De Keuster *et al*., 2006). However, results can vary depending on the geographical area and the source of data (Bennett and Rohlf, 2007; Blackwell *et al*., 2008). Many owners who are reluctant to take care of their dogs might be willing to keep them if there was improvement in their behavior (Marston and Bennett, 2003). Prevention of aggressive behavior is also important from a public health standpoint (Beaver *et al*., 2001).

The chances of a dog developing a behavior problem may depend upon a number of factors including, its breed, age, sex, neutered status, diet and owner knowledge about training (Landsberg, 1991;

Dodman *et al*., 1996; Landsberg *et al*., 2003; Bamberger and Houpt, 2006; Hart *et al*., 2006; Fatjo *et al*., 2007; Khoshnegah *et al*., 2011)

Studies regarding the prevalence of canine behavioral problems have been based on data from veterinary and animal behavior practitioners (Lindsay, 2001; Fatjo *et al*., 2006), or on information directly collected from pet owners (Campbell, 1986; O'Farrell, 1992). Previous studies suggested that only a small proportion of people owning a dog with problematic behaviors considered the latter severe enough to seek professional advice (O'Farrell, 1992). The reasons for not seeking help may include a lack of information on normal and abnormal dog behavior, a tolerant attitude toward their pets' behavior and, in the case of potentially dangerous dog breeds, the owners' concerns about possibly worsening the public reputation of these breeds (Fatjo *et al*., 2007). The use of owners as informants for dog behavior is a well-established and reliable way to collect information on dog temperament, based on the main assumption that owners are the persons who know their dogs best (Serpell and Hsu, 2001; Hsu and Serpell, 2003; Fatjo *et al*., 2007).

The data described in the present paper were obtained from 434 cases involving 110 aggressive dogs kept as companion animals. A preliminary classification scheme of aggressive behavior in the pet dogs is offered, and the incidence of each type of aggression is presented according to the reproductive status (intact/neutralized), keeping place (environment), sex and age.

Materials and Methods

Shiraz is located in the south of Iran with a population of 1,800,000. It is the capital of Fars province at the foot of the Zagros Mountains, 1500 meters above sea level, with a moderate climate and regular seasons (Statistical Center of Iran, 2010).

Four-hundred and thirty-four dog owners who visited the Small Animal Clinic of the Veterinary School of Shiraz University over a one-year period (From March 2010 to June 2011) were asked about the aggression behaviors of their dogs. Aggression is defined as the occurrence or likelihood of an escalating sequence of barking-growling-biting behavior. Accurate history and individual information on the dogs were gathered by prepared questionnaires.

The questionnaire was designed as a two-page format and each form received its own code. The first paragraph of the first page was dedicated to a general description and introduced goals and sentences aimed to encourage the owner's participation. Confidentiality was guaranteed for each respondent.

The second part of the questionnaire involved collecting the name, address and phone number of the owners and general information about the dogs such as name, age, sex, weight, neutered status and neutering age (Guy *et al*., 2001a). Besides information gathered about food type (raw, cooked and commercial) and keeping place which refers to, just in the home, just outside the home (garden, yard, …) or both (in and out of home) were included.

The next and main section contained 21 questions on the behavior of the cases, especially during aggression. Responding to many questions was possible by underlining the selected items.

The final section of the questionnaire was related to the veterinarian who was recording any abnormalities in the physical examination. Regardless of the number of dog visits during the course of the study, only one questionnaire was completed per dog. Besides the questionnaire, diagnosis of different aggression types was considered through interviews with relevant family members in order to obtain a detailed behavioral analysis of the problem. Behavioral analyses included a description of sequences of behavior, specification of stimuli (for example, eliciting, reinforcing, discriminative, aversive or contextual properties), history or development of the behavior and relevant medical history. Therefore, the type of aggression that was detected via history, questionnaire, family member interviews and home analyses was precisely recorded. A number of schemes have been used to clarify aggression, ranging from 2 to 11 categories. The following classification scheme was used for aggression: dominance, fear induced,

medical, protectiveness (material, owner, territorially), predation, maternal, redirected, pain induced, and intraspecific aggression. A brief description of the evaluated aggression types in the study has been cited in Table 1 (Beaver, 1983; Borchelt, 1983).

Distribution of the animals in different categories of each determinant (Table 2) was carefully evaluated. Due to the low number of cases in sub-categories of neutered dogs under each aggression type (imbalance distribution of observations), this factor was omitted from further analyses for finding the potential associations. Moreover, consumption of commercial diet as the third sub-category of feeding type and keeping animals in both indoor/outdoor environments were excluded from the statistical analyses for the same reason. Afterward, unconditional associations between each type of aggression, as our outcomes of interest, and the potential risk indicators including sex, age, living condition and feeding type were assessed using Chi-square tests. All statistical analyses were performed by SPSS statistical software (version 17) considering 0.05 as the level of significance.

Table 1: Brief description of 9 aggression types evaluated in the present study

Category of aggression	Definition of category
Conflict (dominance) aggression	May exhibit one or more postures of dominance such as stand over, direct eye contact (stare), tail and ear erect, or a tense or rigid posture accompanied by the occurrence or likelihood of growling, baring the teeth, snapping or biting. These postures are highly likely to be directed towards family members.
Fear-induced aggression	Is accompanied by postures of defensiveness, fear or submission, such as ears back, tail down or tucked between the legs, and approach/withdrawal. The dog typically barks to initial eliciting stimuli such as sounds outside the home, doorbell or knock, the sight of a stranger, children, animals, or an unusual-looking person. The dog growls or bites usually only when approached, particularly if approached quickly.
Protective aggression	Involves aggression in the context of protecting the home, yard, owner or some object. Sometimes accompanied by other types of aggression like dominance or fear elicited aggression.
Predatory aggression	The initial components of predatory aggression involve intense visual scanning and attending to the area where “prey” are anticipated, followed by stalking and chasing of a wide range of moving stimuli.
Redirected aggression	When a dog expresses his aggression to a particular object or person, he may suddenly redirect his aggression from that source to another, even though that latter person or object did not evoke the aggression.
Pain-elicited aggression	In this problem, the dog may growl, bare the teeth, snap or bite only when it experiences pain, for example, when groomed, medicated, or injured.
Intra-specific aggression	Typically, intra-specific aggression is inter-male or inter-female aggression (directed to other dogs). It may include barking, growling and biting in the context of dominance postures (for example, “stand-over” or staring), fear postures (for example, ears back, tail down), or in the context of possession.
Medical aggression	Aggressive manifestation because of medical problem (s) like epilepsy, hydrocephalus, mental lapse syndrome and etc.
Maternal aggression	This is aimed at anyone approaching the female with puppies or in false pregnancy.

Table 2: Distribution of the number and percentage of 434 dogs under study by their main determinants

Dog factor		n	%
1	Sex		
	Male	227	52.3
	Female	190	43.8
2	Neutered		
	Male	8	1.8
	Female	9	2.1
3	Age		
	<2	246	56.7
	>2	188	43.3
4	Living condition		
	Indoor	238	54.8
	Outdoor	152	35
	Both	44	10.2
5	Food type		
	Raw	119	27.4
	Cooked	287	66.1
	Commercial	28	6.5

Results

Sex, age, food type, living condition and neutered status of the cases are summarized in Table 2.

The number and proportion of dogs that exhibited each kind of the mentioned aggression problems are presented in Table 3. In response to the question: "Has your dog ever bitten any person or animal?" 25.3% (110/434) of responders replied positively. Thirty-one dogs were diagnosed as exhibiting 2 types of aggression. Ten dogs exhibited 3 types and two were complicated by 4 types of aggression. So in these 110 dogs referred to the Small Animal Clinic of Shiraz University, 153 different types of aggression were diagnosed. The main aggression problem diagnosed was conflict (dominance) aggression (12.9% (56/434) of all dogs or 36.6% (56/153) of all aggressive types).

Fear and protectiveness aggressions were the second most common types; each one has been found in 7.4% (32/434) of all dogs and 20.9% (32/153) of all aggressive types. The most common types of protectiveness were territorial (19/434), material (14/434) and owner (9/434), respectively.

Intraspecific aggression was detected in 2.8% (12/434) of all dogs and 7.8% (12/153) of all aggressive types. Medical aggression was seen in 1.4% (6/434) of the dogs and 3.9% of aggressive types. Redirected, pain and maternal aggression were found in similar numbers: 0.9% (4/434) and 2.6% (4/153) of aggressive types for each of these types.

Table 3: The total number and prevalence (%) of each aggression type in 434 dogs under study

Aggression classification		n	%[a]
1	Conflict (dominance)	56	12.9
2	Fear	32	7.4
3	Medical	6	1.4
4	Protectiveness[b]	32	7.4
	Material	14	3.2
	Owner	9	2.1
	Territory	19	4.4
5	Predation	3	0.7
6	Redirected	4	0.9
7	Pain	4	0.9
8	Intraspecific	12	2.7
9	Maternal	4	0.9

[a] Each percentage (proportion of different aggression types) is resulted from dividing n by the total number of dogs (434). [b] Protectiveness was divided into 3 distinct categories as shown in the table

Predation aggression was found in 0.7% (3/434) of dogs and 1.9% (3/153) of all aggressive types.

Forty-seven percent of aggressive dogs did not know obedience orders (sit, come, stay and down) at all and 42% did not perform them correctly.

Male dogs showed significantly more conflict aggression ($P<0.001$) than females (Table 4). Although males were more frequent in the protectiveness group, this difference was not statistically significant ($P=0.14$). Due to the low number of sterilized dogs in the sample, the influence of sterilization on the occurrence of aggression was not included in the analyses.

Adults (more than 2-year-old) exhibited more conflict aggression ($P=0.001$) (mean age 3.1 years) than puppies and juveniles (less than 2-year-old) (Table 4).

Conflict aggression was significantly higher in dogs with outdoor access (outdoor keeping) ($P=0.02$) than those living indoors (apartment). Although protectiveness and intraspecific aggression were more common in outdoor dogs ($P=0.369$ and $P=0.302$,

Table 4: Distribution of 434 dogs under study in different sub-categories of the main recorded determinants by the proportion of each aggression type

Type of aggression (outcomes of interest)	Sex		Age		Living condition		Feeding type	
	Male (%)	Female (%)	<2 year (%)	>2 year (%)	Outdoor (%)	Indoor (%)	Raw food (%)	Cooked food (%)
1 Conflict (dominance)	42 (18.5)[a*]	11 (5.8)	20 (8.1)	36 (19.1)[*]	27 (17.8)[*]	23 (9.7)	17 (14.3)	36 (12.5)
2 Fear	15 (6.6)	13 (6.8)	20 (8.1)	12 (6.4)	10 (6.6)	20 (8.4)	9 (7.6)	20 (7)
3 Medical	3 (1.3)	3 (1.6)	4 (1.6)	2 (1.1)	3 (2)	3 (1.3)	2 (1.7)	4 (1.4)
4 Protectiveness	19 (8.4)	9 (4.7)	14 (5.7)	18 (9.6)	14 (9.2)	16 (6.7)	6 (5)	24 (8.4)
Material	8 (3.5)	5 (2.6)	6 (2.4)	8 (4.3)	3 (2)	10 (4.2)	4 (3.4)	10 (3.5)
Owner	5 (2.2)	2 (1.1)	3 (1.2)	6 (3.2)	4 (2.6)	4 (1.7)	3 (2.5)	5 (1.7)
Territorially	10 (4.4)	7 (3.7)	8 (3.3)	11 (5.9)	9 (5.9)	7 (2.9)	7 (5.9)	11 (3.8)
5 Predation	2 (0.9)	1 (0.5)	1 (0.4)	2 (1.1)	2 (1.3)	0 (0)	2 (1.7)	1 (0.3)
6 Redirected	2 (0.9)	2 (1.1)	1 (0.4)	3 (1.6)	2 (1.3)	0 (0)	2 (1.7)	2 (0.7)
7 Pain	2 (0.9)	2 (1.1)	1 (0.4)	3 (1.6)	2 (1.3)	2 (0.8)	0 (0)	4 (1.4)
8 Intraspecific	5 (2.2)	6 (3.2)	4 (1.6)	8 (4.3)	5 (3.3)	4 (1.7)	4 (3.4)	8 (2.8)
9 Maternal	0 (0)	4 (2.1)	2 (0.8)	2 (1.1)	3 (2)	1 (0.4)	1 (0.8)	5 (1)
Total	227	190	246	188	152	238	119	287

[a] The percentages are the result of dividing each number (cell) by the total number of dogs in that special category, e.g. in this cell 18.5% is resulted from 42 divided by 227 (the total number of male dogs).
[*] Statistically significant ($P<0.05$), in 0.05 level of significance

respectively) and fear aggression was more common in apartment dogs (P=0.51), these differences were not significant.

Discussion

The present study provides valuable information about the occurrence of each type of aggression and factors that may be associated with these problems in a veterinary clinical sample of domestic dogs in and around the city of Shiraz. Questionnaires and analyses demonstrated the prevalence of different types of aggression in pet dogs in Shiraz, Iran. The owner's ability to report accurately on their dog's behavior may not be guaranteed but for reduction of bias due to owner perception, questions were formulated in a straightforward way and included some explanations to the owners with a detailed description of the relevant behavioral signs (Table 1).

Aggression is one of the most serious canine behavior problems (Wells and Hepper, 2000; McGreevy and Calnon, 2010) and the most common cause for dog referral to behavioral clinics (Mugford, 1995).

In referral practice, the majority of cases of canine aggression directed toward owners have traditionally been attributed to problems with "dominance", or the dog attempting to achieve a higher social rank among household members (Borchelt, 1983; Landsberg, 1991). Guy *et al*. (2001a) showed that dominancy is the predominant etiology for the worst bites to the owners (42.4%). Borchelt (1983) declared conflict (dominance) aggression as the second most common aggressive problem with 20% of these cases. Beaver (1983) found conflict aggression to be the most frequent type diagnosed, expressed by 59.2% of the dogs with aggression. Similarly, the most common aggression type recognized in this study was conflict (dominance) aggression (36.6%).

In wild and feral canine groups there is a need for order. The whole group contributes to maintaining territory, finding food and catching it but without some kind of hierarchy, there would also be constant competition for mating rights or the spoils of a hunting expedition (Landsberg *et al*., 2003). Competitive (dominance) aggression involves challenges for social position between dogs or between human and dog. Humans who are dominated by their pet cannot take food from the animal, put a collar on it, or follow through on a command (Beaver, 1983).

Although adopting dogs has significantly increased in the Iranian population, especially in large cities, no sufficient educational sources are available for the owners.

Additionally, many owners treat their dogs like a family member or a child with an incorrect manner. Therefore, lack of training knowledge, experience and discipline put the dog in a high rank in the family or pack. In this study, surprisingly, most of the owners (89%) said that their dogs did not know obedience orders or need more

training. Inappropriate attitude toward dogs and providing what they want, in addition to leaving them free (without supervision) in their territory and no training sessions may have led to high prevalence of conflict (dominance) and possessiveness aggression in pet dogs (Beaver, 1983; Wright, 1991). Besides these reasons, the lower percentage of conflict aggression in other reports may be due to owners' unwillingness to highlight these behaviors (such as biting and growling) in their dogs.

Beaver (1983) found that fear-induced aggression is the third most common type in aggression cases (10%). In the present research, fear aggression was about 21% and the second most common type of aggression, as well as being higher in comparison with Beaver's (1983) study, but close to Borchelt's (1983) study, that found fear-elicited aggression in 23% of aggressive behavior problems.

Khoshnegah *et al*. (2011) showed that 30.2% (111 out of 368 cases) of the clinical cases in the city of Mashhad, Iran had a fearfulness behavior problem. Socialization deficits are arguably the most prominent factor in the development of aggression in physiologically normal dogs (Haug, 2008). Growling and barking (due to fear) could be reinforced to biting over time (Haug, 2008). Dogs can be socialized during the sensitive period between 3 and 12-16 weeks of age (Wright, 1991).

In Iran, due to the lack of sufficient information regarding how to train a dog, socialization and limitations for keeping, and, especially, dog park, where dogs can gather in a social setting, this behavior problem is very common.

Campbell (1986) and Beaver (1994) found that territorial aggression (28.7, 18.1%, respectively) and owner protection (21.8, 15.7%, respectively) are the most common forms of aggression noticed by owners. These two types of aggression were 12.4 and 5.8% of all aggressions in this study, but they were not the most common.

In the present study, aggression in males was significantly higher than in female dogs. Although females showed more fear and intraspecific aggressions compared to male dogs, it was not statistically significant. The results related to the influence of sex on fear and intraspecific aggression were compatible with most of the other investigations of dog bite or interviewing cases presented for aggression. Behavioral specialists have repeatedly identified male dogs as forming the majority of their caseload, particularly in "conflict" aggression (Beaver, 1983; Borchelt, 1983; Reisner *et al*., 1994; Guy *et al*., 2001b; Fatjo *et al*., 2007), but there appears to be no clear relationship between sex and fear-induced aggression (Borchelt, 1983; Landsberg, 1991).

Higher incidence of aggression in male dogs can be a function of several factors including genes, gonadal and extragonadal hormones, neural organization, body size and weight. Dominance-related aggression is also correlated with adult baseline levels of androgens (Leshner, 1978). Other types of aggression such as fear-related aggression and predation should be less influenced by androgens since these behaviors serve functions of equal importance to males and females.

Podberscek and Serpell (1997) found that highly aggressive dogs were more likely to be slow in obeying commands. In this study, as mentioned before, the majority of owners (89%) reported that their dogs did not know obedience orders, or needed more training. Dogs that respond variably or selectively to obedience commands may be either confident or perceive that they, rather than the owners are in control (Landsberg *et al*., 2003).

Fatjo *et al*. (2007) found that the mean age of aggressive dogs when referred was 3.29 years, close to that of 3.7 years found in a study at the Animal Behavior Clinic at Cornell University (Bamberger and Houpt, 2006). In this survey, adult dogs (over 2-year-old with mean age: 3.1 years) exhibited more dominance aggression than those under 2-year-old. One of the limitations of the resulted risk indicators of conflict was that we did not control for the potential confounding effect of sex on evaluating the association between age and conflict.

Our study showed that commercial foods are not routinely used for pet dogs in Shiraz (less than 6.3% of our population). Therefore, the influence of commercial diet on occurrence of aggression was omitted from all statistical analyses. In the present

study, outdoor dogs that were exclusively kept outside the home showed more conflict aggression than indoor dogs that were kept just inside home. In addition, protectiveness and intraspecific aggression were more prominent ($0.05<P<0.1$) in outdoor dogs, but were not statistically significant. Outdoor keeping may provide more sources for dogs with no or less owner supervision, making them prone to higher ranking and dominance aggression. Besides, owners who keep dogs to protect their house or company's yard and garden, perhaps, prefer aggressive dogs.

This paper presents the first survey on aggression classification and its possible risk indicators in a population of Iranian domestic dogs in the south of Iran. According to the results, more than one fourth of dogs referred to clinic had a history of biting. Conflict (dominance) aggression is introduced as the most common type, followed by fear and protectiveness aggression. Sex, age and indoor/outdoor keeping of the dogs only affected dominance aggression. Males, adults (over 2-year-old) and outdoor dogs showed more significant conflict aggression. Aggression is not a simple phenomenon and several underlying risk indicators and stimuli may lead to different forms of aggression. Although a variety of factors are involved in the development of this problem, we think socialization deficits and lack of puppy classes, limited knowledge about training and owning dogs play a major role in this behavior problem, especially canine dominance aggression in Iran. Owners should learn more about their pets and principles of training; they should also be encouraged to ask for professional help at the early stages of the problem, before their dogs can hurt another animal or human.

Conducting further systematic research on controlling factors underlying these problems, their treatment and prevention is recommended.

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