

BITES TO HUMANS CAUSED BY STRAY AND OWNED DOGS IN BELGRADE

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The study aimed to estimate the incidence of bites caused by stray and owned dogs in the population of Belgrade, the capital of Serbia in the period from 1st January 2003 to 31st December 2006. Also, the seasonal influence on dog biting was estimated for the same time period. All data on total, stray and owned dog bites in Belgrade in the analyzed period were obtained from the Institute for Infectious and Tropical Diseases of The Medical School in Belgrade and from the Secretariat for Environmental Protection of the City Assembly of Belgrade. The average annual incidence of bites caused by strays was 95.64 per 100 000 residents; 52.84 per 100 000 residents caused by owned dogs and 148.48 per 100 000 residents caused by both categories of dogs. In this period stray dogs caused a significantly higher ($P < 0.0001$) number of bites to humans than owned dogs. The average value for dog bites was 1507.50 ± 143.57 /year for strays and 832.75 ± 211.31 /year for owned dogs. The highest average value of total dog bites was observed in the spring months in 2005 (263.67 ± 28.01), as well in the spring months (497.33 ± 36.53) for two consecutive years (2005 and 2006). From the aspect of dog bites our results point to the following risk factors for residents in the Belgrade area: the first is the population of stray dogs without owners and the second is the population of irresponsible and uneducated owners of dogs.

Key words: stray dog, owned dog, bite, Belgrade

INTRODUCTION

Dog bites of humans are a very old and an important public health problem possibly derived from ancient times and the first contact of humans with dog ancestors and ancestors of modern dog breeds. As pets or as strays, dogs and cats are the commonest animals found in Belgrade, the capital of Serbia, as well in other European, Asian, American and Australian cities (Weiss *et al.*, 1998; Presutti, 2001; De Keuster *et al.*, 2006; Philipsen *et al.* 2006; Schalamon *et al.*, 2006; MacBean *et al.*, 2007). In 2001 Beaver *et al.* published a very interesting paper on a community approach to dog bite prevention. In the article authors suggested

that dog bites will never be reduced to zero although a well-planned proactive community approach can make a substantial impact (Beaver *et al.*, 2001). In the novel literature there are many scientific and professional papers which deal with dog bites in humans. They mainly relate on a severity on dog bites in humans, injured body regions, characteristics of the dogs, treatment of dog bite wounds in humans, complications of dog bite wounds, seasonal influence on dog bites, preventive measures and rabies control. It is clear that scientific and professional papers fully deal with demographic, clinical and epidemiological aspects of dog bites (Griego *et al.*, 1995; Overall *et al.*, 2001; Palacio *et al.*, 2005; Abuabara, 2006; Benson *et al.*, 2006; De Keuster *et al.*, 2006). Many of dog attacks are fatal for humans (Healey and Kieser, 2005; Chu *et al.*, 2006). It is well known that dog bites are associated with physical and psychological trauma, wound infections and the risk of zoonoses transmission (WHO/WSAVA, 1981; Ostanello *et al.*, 2005). Dog bites are a poorly understood (Feldman, 2004) and often underestimated (Voelker, 1997) public health problem. Approximately 1 in 20 dogs will bite a human being during the dogs' lifetime (Griego, 1995). Most dogs never bite a human, however, under certain circumstances, any dog is capable of inflicting harm (Presutti, 2001). For developing proper prevention strategies, it is important to understand the circumstances and characteristics of dog bites (Schalamon *et al.* 2006).

Hanna and Selby (1981) studied characteristics of the human and pet populations in animal bite incidents. They estimated that the highest incidence of bites occurred during the summer months and in the early afternoon and evening. Certain breeds of dogs were more frequently involved – German Shepherds, mixed breeds of German Shepherds, American Staffordshire terriers, Bull Terriers, Rottweilers, Dobermans, Great Danes, St. Bernards, Collies, Boxers, Cocker Spaniels, mixed breed dogs, working breeds and sporting breeds and blue/red heelers (Hanna and Selby, 1981, Wright, 1985, Unshelm *et al.*, 1993, Thompson, 1997) and other dog breeds (Schalamon *et al.*, 2006). A survey conducted by Ndon *et al.* (1996) in Milwaukee (USA) disclosed that the majority of the dog bites (67%) occurred during the spring and summer months. Similar results were obtained by Matter and Arbeitsgemeinschaft (1998) MacBean *et al.* (2004) and Ostanello *et al.* (2005).

Unshelm *et al.* (1993) estimated that there has been a distinct influence of the owner on the behaviour of the dog. The reaction of the owner has a significant influence of the kind, frequency and seriousness of the accident. The spectrum reached from passive watching of the accident all the way to encouraging the dog to bite. Most owners did not absolve any kind of educational program with their dog. Almost 90% of the dogs have not been on a leash. Most of the incidents took place in public places and only 9% happened in parks (Unshelm *et al.*, 1993). In the law for handling and control of dogs in Berlin of September 29, 2004, there are 10 breeds of dogs supposed to be dangerous due to specific characteristics of their breed. According to Kuhne and Struwe (2006) the dangerousness of a dog's breed is not identical with the dangerousness of an individual dog. Also, a listing of breeds in the law is not the right way to reduce the potential dangerousness of a dog, especially in the private domain of their owners. These researchers thought

that it was more effective to support activities which include the training abilities of dog owners. Training by experts can enable dog owners to avoid conflict situations with their dog, or in case of conflict, to take appropriate actions (Kuhne and Struwe, 2006). According to Sinclair and Zhou (1995) most bite injuries can be prevented and the principal approach to community-wide bite prevention programs includes reducing the number of domestic animals roaming in the community (animal control) and teaching people to refrain from behaviors likely to provoke bites. Also, Sinclair and Zhou (1995) estimated that residents of urban counties (population greater than 100 000) had higher bite rates than residents of nonurban counties. According to Sacks *et al.* (1996) potential prevention of dog bites strategies include: educational programs on canine behavior, especially directed at children; laws for regulating dangerous or vicious dogs; enhanced animal control programs; and educational programs regarding responsible dog ownership and training. Results obtained by Ndon *et al.* (1996) suggested a need to educate the public about the magnitude of dog-bite problems, enforce leash laws and impound stray dogs.

The aim of this study was to assess the influence of stray and owned dogs in total cases of dog bites in Belgrade from 1st January 2003 to 31st December 2006 and a seasonal influence on dog bites from 1st January 2005 to 31st December 2006.

MATERIAL AND METHODS

All data on total, stray and owned dog bites in Belgrade in the analyzed period were obtained from the Institute for Infectious and Tropical Diseases of The Medical School in Belgrade and from the Secretariat for Environmental Protection of the City Assembly of Belgrade. The average annual incidence for total, stray and owned dog bites per 100 000 residents was calculated (1 576 124 residents in Belgrade).

A seasonal influence on dog bites in Belgrade was calculated from data obtained in a period from 1 January 2005 to 31 December 2006.

The results are expressed as a percentage of total cases of dog bites in a year (for stray and owned dogs), or as mean \pm SD for average annual or seasonal dog bites. One-way analysis of variance (ANOVA) was applied for seasonal influence on dog bites in Belgrade. When the ANOVA results were significant, Tukey HSD-test was used to determine the level of significance. The χ^2 test was used to determine the statistical significance between stray and owned dog bites. All computations were performed using the statistical software package VassarStats (Lowry Richard, 1998-2007, Vassar College, US).

RESULTS

Data on total, stray and owned dog bites to humans are given in Table 1. The total number of injuries in humans caused by stray and owned dogs in the period from 2003 to 2006 was 9361 with the average value of 2340.25 ± 489.90 per year.

Table 1. Dog bites in Belgrade from 1 January 2003 to 31 December 2006

Year	Total dog bites (N)	Stray dog bites		Owned dog bites		DF	95% CI	χ^2	P
		(N)	%	(N)	%				
2003	2442	1694	69.37	748	30.63	1	36.154 - 41.326	731.436	<0.0001
2004	1925	1345	69.87	580	30.13	1	36.841 - 42.639	606.429	<0.0001
2005	2565	1509	58.83	1056	41.17	1	14.966 - 20.354	159.287	<0.0001
2006	2429	1482	61.00	947	39.00	1	19.257 - 24.743	234.248	<0.0001
Σ	9361	6030	64.42	3331	35.58	1	27.468 to 30.212	1556.041	<0.0001
$\bar{x} \pm SD$	2340.25 \pm 283.53	1507.50 \pm 143.57		832.75 \pm 211.31		9359	681.977-667.523	^t 183.017	<0.0001
Average annual incidence per 100 000 residents	148.48	95.64		52.84		-	-	-	-

Note: CI - Confidence Interval; DF - Degree of Freedom

Table 2. Dog bites per season

Year	Parameter	Winter Months (W) XII + I + II	Spring Months (Sp) III + IV + V	Summer Month (Su) VI + VII + VIII	Autumn Months (A) IX + X + XI
2005	Total dog bites	484	791	710	580
	Stray+Owned $\bar{x} \pm SD$	161.33±25.15	263.67±28.01**A, **W	236.67±20.55*W	193.33±16.86
2006	Total dog bites	553	701	636	539
	Stray+Owned $\bar{x} \pm SD$	184.33±11.72	233.67±8.74	212.00±23.52	179.67±30.99
2005 + 2006	Total dog bites	1037	1492	1346	1119
	Stray+Owned $\bar{x} \pm SD$	345.67 ± 36.25	497.33 ± 36.53*A, **W	448.67 ± 42.77	373.00 ± 47.57

* – groups are significantly different; P < 0.05
 ** – groups are significantly different; P < 0.01
 2005 – HSD[0.05] = 60.38; HSD[0.01] = 82.54
 2006 – HSD[0.05] = 54.46; HSD[0.01] = 74.44
 2005+2006 – HSD[0.05] = 107.59; HSD[0.01] = 147.07

In this period stray dogs caused the significantly higher ($P < 0.0001$) number of bites to humans than owned dogs. The average value for dog bites was $1507.50 \pm 143.57/\text{year}$ for strays and $832.75 \pm 211.31/\text{year}$ for owned dogs. The highest incidence of total dog bites was observed in 2005 (1509 cases). In all years the incidence of injuries caused by stray dogs was higher and significantly differed from the incidence of injuries caused by owned dogs ($P < 0.0001$).

In the observed period of four years the average annual incidence of total dog bites was 148.48 per 100.000 residents. The average annual incidence per 100 000 residents of stray dog bites in the period of four analyzed years was 95.64 bites/100 000 residents/year. For owned dog bites the average annual incidence in the period of four analyzed years was 52.84 bites/100.000 residents/year.

In Table 2 the seasonal influence on total dog bites (stray and owned dogs) was shown. The highest average value of total dog bites was observed in the spring months in 2005 (263.67 ± 28.01) as well in the spring months for two years together (497.33 ± 36.53). These values are significantly different from the average value of total dog bites in the winter ($P < 0.01$; 161.33 ± 25.15) or in the autumn months ($P < 0.05$; 193.33 ± 16.86) in 2005 and in the autumn months in two years together ($P < 0.05$; 373.00 ± 47.57). Also, the average value of total dog bites observed in the summer months in 2005 (236.67 ± 20.55) significantly differs ($P < 0.05$) from the average values of total dog bites observed in winter months in the same year (161.33 ± 25.1462). The seasonal influence of dog bites to humans is clearly observed in Figure 1. The lowest average values of dog bites were in the winter and in the autumn months in both analyzed years.

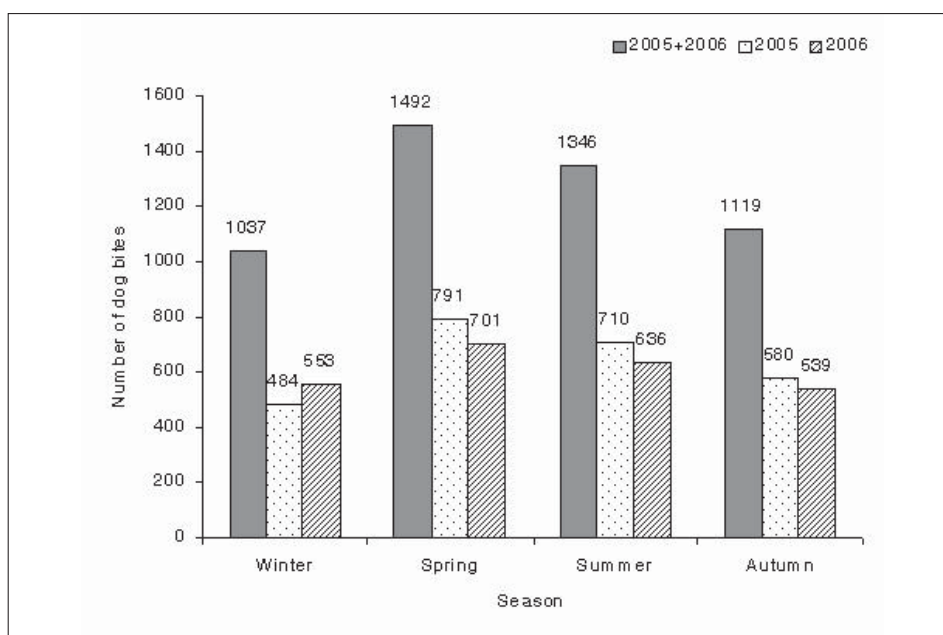


Figure 1. Dog bites in 2005 and 2006

DISCUSSION

Statistically computed data on dog bites in Belgrade disclosed very significant influence of stray dog bites compared to owned dogs in all analyzed years ($P < 0.0001$). It is not a surprising matter for Belgrade as since September 2006 there was not a well planned community program for stray dogs control. At the same time it is very worrying that there are a great number of owned dog bites to humans. This fact discloses an irresponsibility of dog owners in Belgrade and affirms the data of Unshelm *et al.* (1993) that the owners influenced the behaviour of dogs. According to Unshelm *et al.* (1993) the spectrum reactions of the owners reached from passive watching down to encouraging the dog to bite. Most owners did not absolve any kind of educational program with their dog. There is a similar situation with dog owners in Belgrade. The majority of owned dogs are not on a leash. Also, according to Sinclair and Zhou (1995) most bite injuries can be prevented and the principal approaches to community-wide bite prevention programs include reducing the number of domestic animals roaming in the community (animal control) and teaching people to refrain from behaviors likely to provoke bites. According to Kuhne and Struwe (2006) in dog bites prevention programs it is more effective to support activities which include the training of abilities of the dog owners.

With an annual incidence per 100 000 residents of dog bites (148.48/100 000/year) today, Belgrade can be compared with Guelph (160/100 000/year) in Canada in the period from 1986 to 1987 (Szpakowski *et al.*, 1989) or Malaga in Spain (Rufino Gonzales, 1990) in the period from 1984 to 1988 (150/100 000/year). In Switzerland an annual dog injury incidence rate of 192.5 per 100 000 population was estimated by Matter and Arbeitsgemeinschaft (1998). This value is higher than the annual incidence of dog bites in Belgrade but it was estimated about 12 years ago and for the whole territory of Switzerland. The significant lower average yearly incidence of dog bites and scratches (58.4 per 100 000 residents) was estimated by Ostanello *et al.* (2005) in Bologna between 1 January 2000 and 31 December 2002. However, according to these authors Bologna has a population of about 380 000 residents.

Our results on seasonal influence on dog bites also support findings of Hanna and Selby (1981, Ndon *et al.*, 1996, Matter and Arbeitsgemeinschaft, 1998, MacBean *et al.*, 2004, Ostanello *et al.*, 2005) that majority of the dog bites occurred during the spring and summer months.

According Beaver *et al.* (2001) dog bite data are not really statistics, therefore the actual number of bites that occur in a community is not known, especially if they did not result in serious injury.

Nowadays a population of stray dogs in Belgrade is not well defined in actual laws. Therefore, it is not clear what a stray dog is. Is it a dog without owner, a unrestrained dog, a freeroaming dog with known and registered owner, or a owned dog with unregistered owner?

From the aspect of dog bites our results point to following risk factors for residents of Belgrade. The first is a population of stray dogs without owners. The second is a population of irresponsible and uneducated owners of dogs. It is

urgent to adopt a law for handling and control of dogs in Belgrade similar as those in other European cities.

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UJEDI PASA LUTALICA I PASA POZNATIH VLASNIKA U BEOGRADU

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SADRŽAJ

Cilj rada je bilo utvrđivanje slučajeva ujeda ljudi od strane pasa lualica i pasa poznatih vlasnika na teritoriji grada Beograda u periodu od 1. januara 2003. do 31. decembra 2006. godine. U radu je utvrđen i sezonski uticaj na učestalost pojave ujeda građana od pasa. Podaci o ujedima pasa su dobijeni od Insituta za infektivne i tropske bolesti Medicnkog fakulteta u Beogradu i Sekretarijata za zaštitu životne sredine Skupštine grada Beograda. Prosečni godišnji broj slučajeva ujeda pasa lualica na 100.000 stanovnika iznosio je 95,64, pasa poznatih vlasnika 52,84, dok je prosečan ukupan broj ujeda iznosio 148,48 slučajeva na 100.000 stanovnika u ispitivanom vremenskom periodu od četiri godine. U istom periodu psi lualice su naneli znatno veći broj ujeda od pasa poznatih vlasnika ($P < 0,0001$). Prosečan godišnji broj ujeda za pse lualice iznosio je $1507,50 \pm 143,57$, a za pse poznatih vlasnika $832,75 \pm 211,31$. Najveća prosečna vrednost ukupnog broja ujeda pasa zabeležena je u proleće 2005. godine ($263,67 \pm 28,01$), kao i u toku prolećnih meseci ($497,33 \pm 36,53$) za obe godine zajedno (2005. i 2006. godina). Sa aspekta opasnosti od ujeda pasa, dobijeni rezultati ukazuju na prisutnost dva rizična činioca za građane Beograda: prisustvo pasa lualica i prisustvo neodgovornih i needucovanih vlasnika pasa.