REVIEW

Dog bites and attacks on athletes: lack of effective prevention mechanisms

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ABSTRACT

Athletes who train in public places in urban and rural areas are just as attacked and injured by dogs of known owners as they are by dogs with no owners, in a relatively equal proportion. The largest number of bites occurs in the summer, what makes up half of all bites, just when sports activity is most pronounced. Athletes who are most often exposed to potential attacks and bites are cyclists, long-distance athletes, marathon runners, recreational athletes, etc. both during training and competitions. Off-road cyclists are at a significantly higher risk of dog attacks because cycling takes place off-road, that is, away from urban areas. Dog attacks can adversely affect the psycho-physical readiness of athletes. In Bosnia and Herzegovina there have been no cases of injuries to athletes recorded by competent medical institutions or umbrella sports associations. It is necessary to work on more efficient administration (registration and recording of attacks and bites of dogs). It is of utmost importance to educate athletes on dog behaviour, the reasons for their aggressive behaviour and causal mechanisms of dog attacks as well as the first aid education, what can have a great impact on reducing further complications.

Key words: aggression, animals, first aid, marathon running, sports

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INTRODUCTION

A domesticated dog has successfully adapted for many purposes: as a pet, a running dog-sports dog, a dog in the service of military and police formations, a hunting dog (1). There is also a very large population of dogs, especially in underdeveloped countries, without owners-guardians, referred to as "stray dogs" (2,3). The loss of human support in this animal population causes a number of problems, from territorial status to food security. Existential threats activate mechanisms for self-preservation and return to natural patterns of behaviour resulting in a variety of adverse events (4). Uncontrolled movement of dogs on the roads causes traffic accidents; dogs usurp social peace by barking and they often attack people in packs, while their bites cause physical and mental injuries. Such a population of dogs has no veterinary supervision (2,5).

It has been observed that bites by dogs of known owners are increasing in the UK and Chile and pose a public health concern as they can result in serious injuries or even death (6,7). In addition, there may be negative implications for the well-being of the dog that has bitten; e.g. a dog owner waiving custody, placement in dog shelters, euthanasia, etc. (8-10). Despite numerous studies, it is difficult to prove why dogs bite, at what point of the event they do it and what profile of a person is particularly at risk (2).

People are just as attacked and injured by dogs of known owners as they are by dogs with no owners, in a relatively equal proportion (1,2,11). Dogs of known owners attack people in public areas, most often due to irresponsible behaviour of their owners (1). However, dogs of known owners are to a greater or lesser extent under health and veterinary supervision and are most often vaccinated against rabies, which is not the case with dogs without owners. Owned dogs eat adequate dog food, while stray ones most often look for food among the waste, so it can be assumed that stray dogs have a higher quantitative and qualitative presence of microorganisms, primarily in the mouth (4).

Various microorganisms are introduced into the tissue of the bitten person by a dog bite, which can consequently lead to an infection. The situation is especially serious if there is a risk of developing tetanus or rabies (12). The risk of bites in urban areas from aggressive dogs is high. In addition to the mentioned risks of the infection occurrence, dog bites also cause psychological trauma (2).

Some breeds of dogs (Bull Terrier, German shepherd, Cocker Spaniel, Pit Bull, Collie Rottweiler, Doberman Pinscher and Siberian Husky) have been identified as more aggressive than other breeds (13-15). However, all dogs can show aggressive behaviour under certain circumstances (13). A number of experts believe that most bites can be prevented. Bite victims misinterpret the behaviour of an anxious and/or fearful dog (16).

Intervention educational programs are practiced in some European Union countries aimed at educating children and adults about the behaviour of dogs, and about the signals that, for example, a dog is frightened and can bite (17-20). However, there is little research and evidence on whether and how this approach actually prevents bites (21).

Athletes during daily training, as well as active athletes, cyclists during competitions, are not exempt from the danger of dog attacks. Dog bites occur throughout the year, but most bites occur in the summer (22), accounting for half of all bites, just when sports activity is most pronounced (23).

Cyclists, long-distance athletes, marathon runners, recreational athletes, etc. are most often exposed to attacks, both during training and during competitions (24).

In general, there is a lack of reports on affected athletes both in Bosnia and Herzegovina (B&H) and worldwide. No reports of this kind have been published in B&H and so far no cases of injuries to athletes have been recorded by competent medical institutions. There is also no such information from umbrella sports associations and the like.

The aim of this paper was to point out the exposure of athletes, due to their specific work and movement, to dog bites and attacks, and the shortcomings of the injury record system in B&H, with the intention to progress towards better and more practical measures to improve public safety.

CONSEQUENCES OF BITE WOUNDS

There is a huge number of microorganisms living in the oral cavity of dogs, especially in the population of stray dogs. At the moment of the bite, together with saliva, the microorganisms are pressed into the injured tissue, most often

that of extremities, arms, legs, head or neck. A large number of bacteria with high virulence can immediately cause infection on this occasion (4). The force produced by dog's teeth during a bite varies between breeds, from 310 kPa to almost 31,790 kPa in specially trained dogs (25). Along with the superficial wound, skin, muscles, tendons, blood vessels and nerves can be damaged as well (26) that can permanently or temporarily remove athletes from sport fields.

In wounds of deeper bites there is a risk of contamination by tetanus spores and consequently by tetanus, especially if the wound is not treated properly (12, 23, 26). However, the greatest risk associated with dog bites is the risk of rabies in the event of injury by a rabid animal (27). Talan et al. (1999) (28) investigated the bacterial microflora of bite wounds in humans, and found the following isolated aerobic bacteria: *Pasteurella* sp.(50%), *Streptococcus* spp. (46%), *Staphylococcus* spp. (46%), *Neisseria* spp. (32%), and *Corinebacterium* sp. (12%).

CLINICAL MANIFESTATIONS OF BITE WOUNDS

Skin lesions are the most common injury, and they are often accompanied by bleeding. According to the research conducted by Talan et al. (1999) (28), out of 50 patients with bite wounds, 60% were with tooth impression only, 10% were minor perforations with lacerations, and 30% were a combination of both. Hematomas around the bite wound are usually evident. The most common is purulent infection without abscess formation (58%), accompanied nonpurulent wounds with cellulitis, lymphangitis, or both (30%), and abscesses (12%). Limited and painful movements of fingers and joints occur if the wound is located on the extremity, which gravitates close to the region of or is directly situated on the joint. Swelling and redness in the area of the injury are not uncommon (4,6). Microorganisms isolated from infected bite wounds are similar to those isolated from the oral cavity of dogs (29).

ATHLETE INJURIES CAUSED BY DOG ATTACKS

Athletes during exercise, as well as during competition, often encounter various adverse effects including various injuries. Ten percent of surveyed professional and recreational athletes were bitten by a dog or were hit by thrown objects (30). There is a wide range of different profiles of athletes who are potential targets of stray dogs or dogs of known owners. The most vulnerable are athletes, cyclists, marathon runners, and various profiles of recreational athletes, who train or compete in open public areas.

Off-road (mountain) cycling tends to increase in popularity in different regions (31,32). This sport involves coaching and competition, mostly in subrural and rural areas. Off-road cyclists are at a significantly higher risk of dog attacks, as cycling usually takes place off-road, away from urban areas (32). In such environment there is no presence (or it is very reduced) of any audience or security services. Such environment can often favour the attack of aggressive stray dogs on this profile of athletes, whose population in this area is often large. At a particular risk is the group of cyclist individuals who are notably separated from the largest group of cyclists who compete with each other (32).

A particularly aggravating circumstance for such cyclists is that they do not notice the potential danger during exercise or competition, or are often physically exhausted, or because they have headphones on they do not hear the barking of dogs attacking them (32). Two case studies (32) described one cyclist attacked and bitten on the knee by a stray dog, and in another one recreational cyclist was attacked by a sheepdog.

Cyclists who recreationally practice this sport come in various interactions with dogs, often get various injuries directly or indirectly. It can be assumed that injuries are not rare in the dog-bicycle interaction which resulted in, on average 3500 visits to the emergency department per year in the period from 2006 to 2015 (33). More serious injuries occurred when cyclists hit dogs that had been curled up or when they tried to avoid such a dog. The most serious injuries occurred when a person rode a bicycle while simultaneously leading a dog on a leash (33).

PSYCHOLOGICAL TRAUMA IN BITTEN ATHLETES

Dog bites can have an adverse effect in terms of the appearance of feelings of intense fear, helplessness or horror, which ultimately often leads to many symptoms of post-traumatic stress disorder (PTSD) (34,35). Every athlete attacked by a

dog has presumably suffered a greater or lesser intensity of fear. Ultimately, this has adversely resulted in the success achieved, or will negatively affect the psycho-physical readiness of a potential athlete in future competitions. We have not found any research in the available literature that has dealt with this issue.

Most scientific reports describe the problem of the occurrence of fear in children, with negative consequences after dog attacks. Numerous studies indicate that this risk to children's health is underestimated in paediatric care, as they are the most vulnerable group in this regard (36). The reason why PTSD occurs in some children is not known. It is evident that this is closely related to the intensity, character and aggressiveness of the animal attack (37). Attacked people can become victims of dog bites and suffer significant emotional trauma, reliving for years the memories of fear and pain caused by an aggressive dog attack (36, 38).

CAUSAL MECHANISMS OF DOG ATTACKS

There are very complex factors associated with dog bites, victim behaviour and/or dog behaviour prior to the bite. It is evident that most scientific reports elaborate on the problem of dog attacks and bites solely on the basis of clinical and hospital data (6). There are insufficient data in the literature about the behavioural and legislative aspects of bites as well as the consequences for dogs, which is of importance for improving our understanding of dog bites.

The causal mechanisms of the bite will be clarified after a detailed analysis of factors surrounding the incident, i.e. the dog bite (2). Westgarth and Watkins (2015) (21) and Chen et al. (2016) (39) prefer education in the first place on how to actually deal with dog bites, because it is an essential benefit that reduces the consequences of injuries. In that sense, the results of a retrospective study of Notari et al. (2020) (40) suggest that educational programmes for owners of dogs are fundamental tools to reduce aggression risk factors and prevent aggression. In addition to prevention, advice can be provided on how the victim should behave during the bite, to keep injuries to a minimum, how to deter the dog from further attacks, and how to seek adequate help.

In conclusion, dog bites are a serious public health problem, which, among other things, has negative implications for the animals in question, such as abandonment, confiscation or euthanasia. This paper provides an opportunity to shed light on the circumstances of dog bites in order to progress towards better and more practical measures to improve public safety, and especially for the interaction between athletes and dogs.

It is necessary to take a set of measures and activities for more efficient administration (registration and recording of dog bites and attacks), and based on adequate data obtained by future scientific research, in the near future, organize various types of education to reduce unwanted cases. It is necessary to educate athletes regarding dogs and the reasons for their aggressive behaviour, and to educate them on providing necessary first aid on the spot, after an injury by a dog, that can have a great impact on reducing further complications. Tailored educational programs would help raise awareness, with the goal of reducing the frequency of this risk. In particular, in this case, the risk related to professional and recreational athletes would be reduced, just as that observed in a broader context and to public health as a whole.

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