



# Hospitalization for dog bites in Poland between 2006–2020

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## Abstract

**Introduction and Objective.** Owning a dog or spending time around a dog have many benefits, but also pose a risk of being bitten or attacked. Currently, publications on dog bites and related factors come from both high-income countries and low- and middle-income countries. So far, no attempt has been made to assess this phenomenon in Poland. The aim of this study was to determine the number of such events and evaluate hospital medical assistance provided to dog bite victims in Poland in the period of 15 years between 2006–2020.

**Materials and method.** This cross-sectional study was based on the data from the Nationwide General Hospital Morbidity Study and cases with the code W54 (ICD-10) as the cause of hospitalization. As part of the analysis, victim demographical data, with an emphasis on city- and country-dwellers, as well as treatment variables were assessed.

**Results.** Between 2006–2020, 4,145 cases of hospitalizations for dog bites were found, of which approx. 42% occurred in 2020 during the COVID-19 pandemic and lockdowns. Most of the victims were children aged 0–9, and this is especially common among boys living in the countryside. It was found that regardless of the place of residence, there was a systematic decrease in hospitalization of men as they were older. In women, however, the decrease in hospitalization concerned only the age groups 0–39. Among older women, the percentage of hospitalization increased, especially among rural women aged 60 and over.

**Conclusions.** Hospital discharge records report a small number of dog bites. These are only the tip of the iceberg. The problem has a multi-factorial nature and requires epidemiological monitoring and further research on correlates and determinants, as well as preventive measures.

## Key words

public health, injuries, dogs, bites, COVID-19, epidemiology

## INTRODUCTION

Currently, dogs are the most popular pets worldwide. It was estimated that in 2018, the global population of domestic dogs reached 471 million; however, establishing the precise total number of dogs in the world is challenging due to the so-called free-ranging dogs – owned or unowned – roaming the streets and neighbourhoods. The largest number of domestic dogs live in the USA. In 2020, in the EU countries the largest populations of domestic dogs were recorded in Germany, UK and Poland (respectively: 10.7, 8.5 and 7.85 million) [1]. Romania and Poland had the highest share of dog-owning households in the European Union, with almost half of the population (42%) owning at least one dog in 2020 [2].

Since the late 1970s, scientific evidence has shown that pet ownership can have positive effects on people's physical and mental wellbeing [3], including the role of pets in decreasing the risk of cardiovascular diseases, depression or allergy among children. Particular attention is paid to the health benefits of the elderly owning a dog [4]. The use of therapy dogs to reduce stress and anxiety in individuals and in

different situations (e.g. crisis or dentistry interventions) is also increasingly more popular. However, having a dog entails problems in terms of daily care and costs. Owners' desire to treat their dogs with unnecessary antibiotics leads to antibiotic resistance [5]. Another significant problem is the risk of being bitten or struck by a dog, and such a risk applies also to people who do not have a pet. The potential consequences include knockdowns, scratches, open jagged wounds, bacterial infection, tetanus or rabies, or even death.

In the last decade of the 20th century, dog bite injuries began to be seen as a public health problem, initially in the veterinary and injury related literature [6]. They cause preventable public health issues with physical and emotional damage inflicted upon victims and hidden financial burden to the communities [7]. Currently, publications on dog bites and related factors are derived from both high-income countries (e.g. Australia, UK, USA) and low- and middle-income countries, as Bangladesh [8], India [9] and Iran [10]. In Poland, to-date, only one attempt has been made to assess the phenomenon [11].

## OBJECTIVE

The aim of this study is to conduct a descriptive analysis of hospitalizations for dog bite victims in Poland between

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2006–2020, based on the Nationwide General Hospital Morbidity Study, including victim demography and treatment characteristics.

## MATERIALS AND METHODS

This study is a population-based, cross-sectional analysis of hospital discharge records of dog bite victims between 2006–2020. The data were obtained from the National Institute of Public Health NIH – National Research Institute in Poland. With the exception of psychiatric hospitals, all hospitals are legally required to send anonymized discharge data to the Institute as part of the Programme of Statistical Surveys of Official Statistics. The analysis focused on: dog bite victim demographic data (number, gender, age, urban/rural place of residence), treatment characteristics (mode of admission, hospital ward, diagnoses, length of stay, mode of discharge), and urban vs rural victim characteristics (gender, age). Based on the International Classification of Diseases and Health Problems, 10th revision (ICD-10), all the hospitalization records with the W54 code (bitten or struck by dog) as the primary or secondary diagnoses were included in the study. In-depth analysis based on 3-characters codes from 54.0–54.9 was unproductive due to lack of these detailed codes in many records in databases.

## RESULTS

**Dog bite victim demographic data: number and gender.** In 2006–2020, there were a total of 4,145 cases of hospital medical assistance provided to dog bite victim – 2,100 men (50.7%) and 2,045 women (49.3%) (Fig. 1). During the 15 years of follow-up, more hospitalizations of women than men were recorded six times, including the year 2020 (924 and 825, respectively).

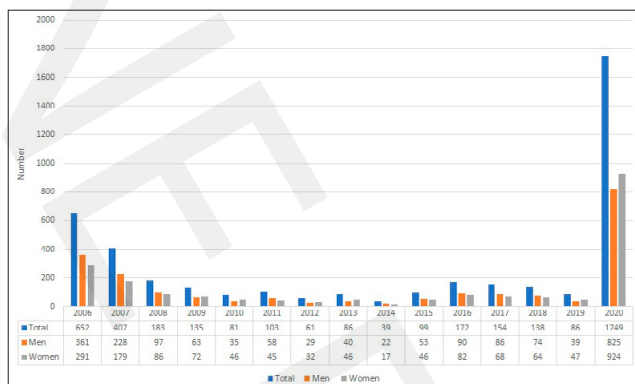


Figure 1. Number of hospitalized patients in total and by gender, 2006–2020

Yearly fluctuations in the number of hospitalizations were observed. The highest number was found in 2020 during the COVID-19 pandemic, i.e. 1,749 cases, which is about 10 times more than the average for the previous years.

**Age.** In the analysed period, the mean age of the victims ranged from 27.8–38.0, median – 16–38. The most numerous group, i.e. one-fourth of the victims (23.8%), were children aged 0–9 (Fig. 2). A small majority of this group (57.8%) were children aged 5–9 years. Adults aged 20 and over accounted for 58.3%.

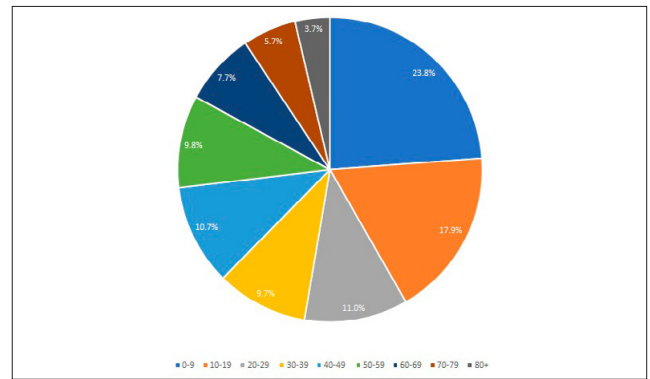


Figure 2. Percentage of hospitalized patients by age groups, 2006–2020 in total

**Place of residence.** A slight majority of hospitalized individuals were city-dwellers (61.4%) (Fig. 3). It was evident throughout almost all the years of observation.

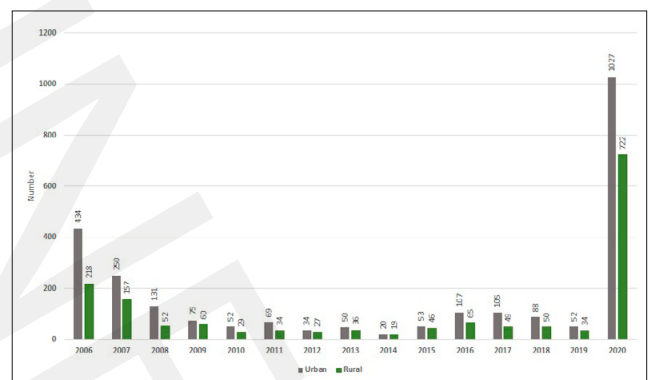


Figure 3. Number of hospitalized patients by place of residence, 2006–2020

**Treatment characteristics: mode of admission and hospital ward.** The vast majority of the victims were admitted to a hospital on an emergency basis (94.8%), usually without emergency medical services (ambulance). Medical assistance was provided mainly in emergency departments (68.2%), as well as general surgery, children's general surgery and orthopaedic trauma surgery wards (8.7%, 7.6% and 2.9%, respectively). Each year, emergency departments treated 23.5% to 82.6% of the victims (Fig. 4).

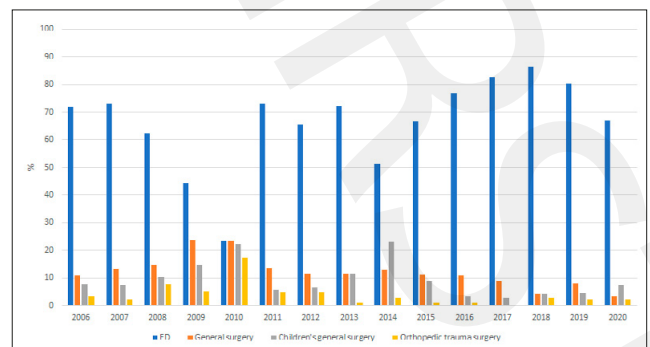
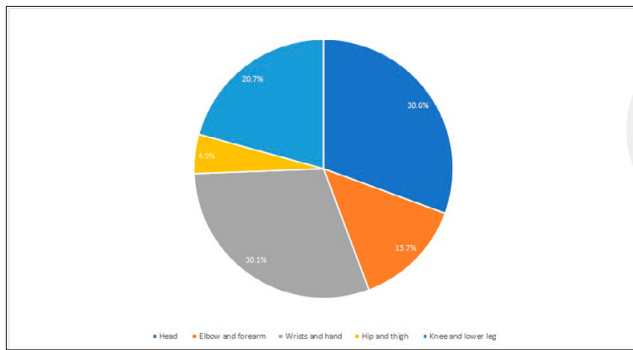


Figure 4. Percentage of hospitalized patients by hospital ward, 2006–2020.

**Diagnoses.** Most incidents concerned injuries to the head (30.6%), wrist and hand (30.1%), followed by injuries of the lower leg, forearm and thighs (Fig. 5).



**Figure 5.** Percentage of traumatic diagnoses among hospitalized patients, 2006–2020 in total

**Length of stay.** Most of the victims (79.1%) stayed in the hospital for so-called ‘zero days’, i.e. they did not stay for the night and were served and discharged before the end of day. The remainder were admitted. Only 14 people (0.3%) stayed in the hospital for more than 30 days. The longest 60-day stay was recorded in 2007 in an 82-year-old man in the surgical ward.

**Mode of discharge.** On discharge, most of the victims (76.8%) were referred to further outpatient treatment. When it amounted to one-fifth (19.2%), it was considered that the service provided was the end of the diagnostic and therapeutic process. The hospital stay ended in the death of 5 patients (Tab. 1).

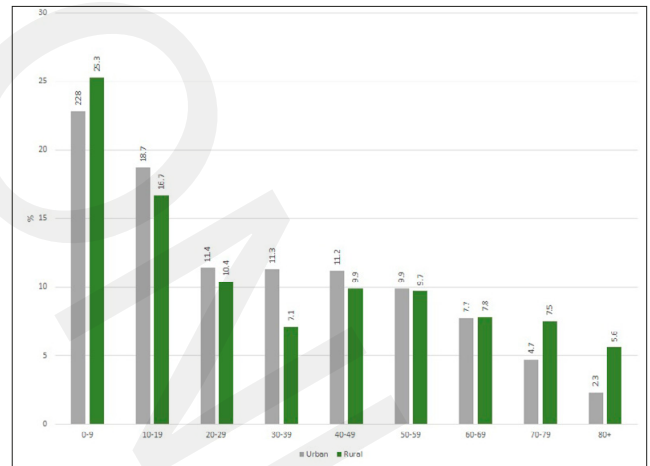
**Table 1.** Information on patients who died as a result of being bitten or struck by a dog

Year	Gender	Age	Length of stay
2007	Man	88	19
	Woman	81	2
	Woman	85	33
2011	Man	78	32
2020	Woman	70	10

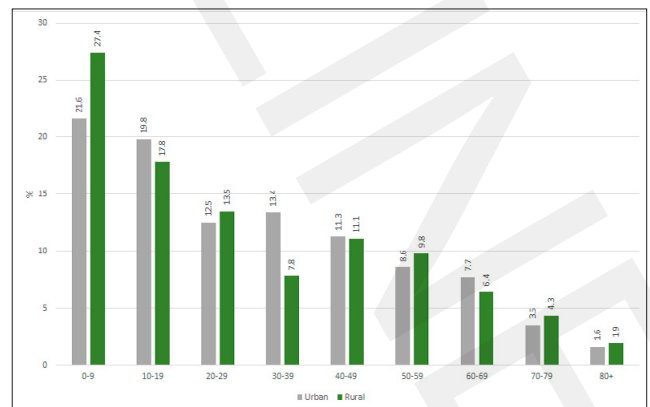
### Demographic characteristics of urban vs rural victims.

One-fifth, i.e. 22.8% of the urban victims were 0–9 years old, while the remaining 70.2% were 10–69-years-old; 7% were 70- years-old or more. Among rural victims, these age groups accounted for 25.3%, 61.6% and 13.1%, respectively (Fig. 6). Among men, regardless of their place of residence, boys aged 0–9 were the most numerous group of hospitalized patients, with boys from rural areas hospitalized slightly more often than boys from cities (27.4% vs 21.6%, respectively). Among men, there was a noticeable decrease in the number of hospitalizations with age (Fig. 7).

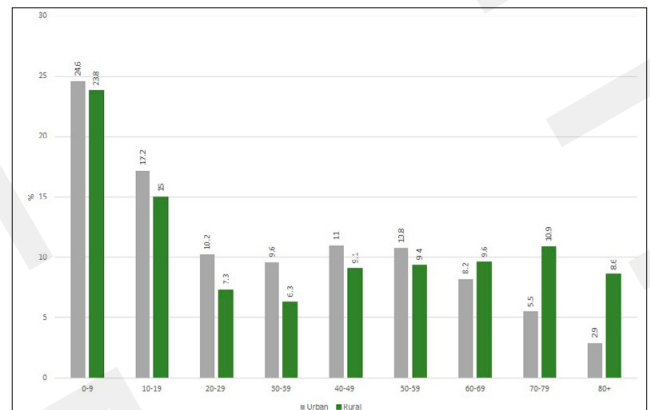
Among women, regardless of the place of residence, girls aged 0–9 were also hospitalized most often. However, the differences between the hospitalization of girls from urban and girls from rural areas were negligible (24.6% and 23.8%). Contrary to men, there was a noticeable increase in the number of hospitalizations of women aged 40 and over (Fig. 8).



**Figure 6.** Percentage of hospitalized city- and country-dwellers by age groups, 2006–2020 in total



**Figure 7.** Percentage of hospitalized men, city- and country-dwellers by age group, 2006–2020 in total



**Figure 8.** Percentage of hospitalized women, city- and country-dwellers by age groups, 2006–2020 in total

## DISCUSSION

As a rule, dog bite treatment involves washing the affected areas with soap and water, inspecting the wound and applying a clean, dry dressing. If tissue continuity is interrupted, one should immediately see a doctor. The appearance of fever, pain, redness or swelling also requires an immediate visit to a doctor. However, seeking professional help, no matter whether it is primary healthcare or hospital, depends on numerous

factors, such as own / known or somebody else's / unfamiliar dog, severity of the injury, knowledge and awareness of the risk, previous experience, and access to medical care in broad dimensions of technical, geographical, economic and social aspects. For this reason, the actual burden of dog bites is undoubtedly greater than that estimated from hospital discharge records. The number of hospitalizations recorded identified in this study is just the tip of the iceberg of dog bite injuries. The iceberg phenomenon describes a situation in which a large percentage (portion) of a problem is subclinical, unreported or hidden. This thesis confirms the results of a survey conducted in households in Cheshire, UK [12].

At the same time, the researchers use various measures of the scale of the problem, and the incidence rate is calculated based on an emergency department cohort [13], hospital admissions [14] or bite case records [15]. This causes problems when comparing the data. In the current study, in 2020 the standardized hospitalization rate in urban inhabitants reached 4.7 per million and for rural inhabitants 5.14 per million.

The annual changes in the number of hospitalizations found in this study are difficult to explain *ex-post*. An increase in hospitalizations in 2020, during the COVID-19 pandemic, was also recorded in the UK and the USA, especially with regard to children. This is believed to be the result of implementing public health measures against the COVID-19 pandemic, such as lockdowns, school closure, and 'stay at home' orders. Isolation at home had an impact on stress, anxiety and human behaviour, increased the likelihood of undesirable relationships with a dog, and prolonged exposure to a dog [15, 16].

The results obtained show that most of the victims were children aged 0–9, especially boys. This is consistent with the results of many other studies, e.g. from Spain, the UK and Australia. Research from the USA shows that children under 9 suffered the greatest burden of injuries, with children under 6 being at the highest risk of more severe injuries involving the head, neck, and face [13, 17, 18]. There are data that showed boys aged 6–14 accounted for 2.24 times more bites than same-aged girls [19], and that there is a relationship between behaviour disorders and dog bites in male individuals [20].

Although children clearly constitute a dog bite risk group, it must not be forgotten that the majority (approx. 60%) of victims are adults, of which one-third are people aged 60 or more, especially women. Based on the data from England, where the increase in dog bite hospitalization in recent years was caused by adult rather than childhood cases [14]; a similar situation can be expected in Poland. Additional striking warning results from a significant increase in the number of European fatalities due to dog attacks in 1995–2016 [21]. This suggests the need to monitor the problem.

Most of the dog bite victims were served before the end of day, and only 1 in 5 was admitted to hospital. A wide and typical spectrum of injuries was reported, with a high frequency of injuries to the upper extremities and head. Head and neck injuries, unlike upper extremity wounds, pose a greater risk of mortality, particularly in the paediatric population [22, 23]. However, in this study, deaths were found only in the elderly, suggesting a negative impact of comorbidities on post-bite prognosis. This issue should be addressed more thoroughly by further research on the anatomical distribution of dog bites by victim gender and age.

An extended analysis by place of residence showed a variation in the age of the victims in different settings. Generally, in cities, individuals aged 10–49 were more susceptible to bites and hospitalization, while in rural areas it was children aged 0–9, and the elderly aged 70 and more. Potential reasons for this differentiation may include culturally conditioned greater or lesser care for the victim. This differentiation also requires further research, including qualitative methods.

Regardless of the place of residence, a clear decrease in the hospitalization of men was observed as they were older. This may be related to the shorter life expectancy of men than women by about 7 years. It may also be due to the characteristics of the injury. It is known that older victims over 65 are more frequently struck than bitten [24]. For men who are more obese than women at this age, this carries a relatively lower risk of fall and injury. On the other hand, among women, there was a decrease in hospitalization in the age group 0–39, followed by an increase in the older age groups. These differences also require further studies.

## CONCLUSIONS

Between 2006–2020, a total of 4,145 cases of hospitalizations for dog bites were found, of which approx. 42% occurred in 2020 during the COVID-19 pandemic and lockdowns. These numbers are just the tip of the iceberg. Most of the victims were children aged 0–9, and this is especially common among boys living in the countryside. It was found that, regardless of the place of residence, there was a systematic decrease in hospitalization of men as they were older. In women, however, the decrease in hospitalization concerned only the age group 0–39. Among older women, the percentage of hospitalization increased, especially among rural women aged 60 and over.

This study does not exhaust the numerous aspects of the dog bite problem. This subject matter should be analysed not only from the perspective of the victim, but the whole triad of victim and his/her behaviour + animal (e.g. sex, age, size, breed, neutering status) + scenario (e.g. location, situation, dog owner).

Since the problem has a multifactorial nature, the public health perspectives are valuable for diagnosis and prevention. The results obtained indicate, first of all, the need to monitor the problem and epidemiological trends of this problem and to deepen the analysis through data disaggregation in quantitative research, as well as conducting qualitative research.

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