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The effect of domestic waste accumulation on the prevalence of rabies in kirkuk city the period 2023

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Abstract

Dog bites are a public health problem, especially in low and middle-income countries, including Iraq, where epidemiological studies on dog bites and rabies have been widespread in recent times due to waste accumulation and the large number of stray dogs. A descriptive cross-sectional study used a time, person and place epidemiological model. The highest incidence rate was in males (72.287%), while the incidence rate in females was (25.712%). As for the residential area, Kirkuk City had the highest incidence (52.605%), followed by Al- Hawija district, with an incidence rate of (26.754%). The age group most susceptible to dog bites is 11-20 years, and the age group is 1-10 years, respectively (30.785%) and (22.863%) respectively. The lower extremities were the leading body site exposed to bite injuries, which constituted (48.158%), followed by the upper extremities (43.988%). The months of March, April and May showed the highest percentage of dog bites (14.732%), (13.829%) and (13.759) respectively. It was also found that the highest injuries were recorded within the age group 11-20, which was 443 and a percentage of 30.783%, followed by the age group 1-10, which was 329 and a percentage of 22.863%. The problem of dog bites is considered one of the important health problems in Kirkuk city, which mainly affects males under the age of twenty, as more than four-fifths of the victims did not complete the recommended preventive vaccination against rabies. Developing a strategic preventive health plan to prevent and control this health problem is strongly required.

Keywords: Rabies; Epidemic; Waste; Kirkuk City

1. Introduction

Rabies is a zoonotic viral illness that affects the central nervous system and can be prevented with vaccination. Dogs account for around 99% of human rabies transmission instances. Children between the ages of 5 and 14 are the predominant victims of the illness [1]. The illness affects mammals, such as dogs, cats, cattle, and wildlife animals. The illness is transferred to people and animals by saliva, typically through bites, scratches, or contact with mucous membranes (e.g., eyes, mouth, or open wounds). The condition is nearly universally fatal upon the manifestation of clinical signs [2–3–4].

The worldwide financial burden of rabies is estimated at over US$ 8.6 billion per year, encompassing lost lives, livelihoods, medical expenses, and other expenditures, along with unquantified psychological suffering [5]. Rabies is present on every continent except Antarctica and is predicted to result in about 59,000 fatalities globally each year. Nevertheless, recorded case counts frequently diverge from estimates owing to underreporting [6]. Rabies, a disregarded tropical ailment, predominantly impacts marginalized communities. Despite the availability of highly effective human vaccinations and immunoglobulins, access is sometimes limited for people in need or unable to purchase them [7]. In 2018, the average expense for post-exposure prophylaxis was approximated at US$108, excluding

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travel expenses and missed wages, posing a financial strain on those earning US$1–2 daily. Almost 29 million individuals are administered the human rabies vaccination annually [8].

The existence and proliferation of feral dogs is significant. Free-roaming dogs frequently rely on the availability of food, housing, which stems from human carelessness and irresponsibility, particularly about access to refuse as a food source [9]. The burgeoning canine population is intricately connected to urbanization, the rise in residential trash generation, and inadequate garbage treatment in commercial establishments, alleyways, and city streets [10]. The human-to-dog ratio in Asia and metropolitan regions of Africa is calculated at 7.5:1 and 21.2:1, respectively. Nonetheless, this ratio may be elevated in regions adjacent to urban areas due to the increased influx of dogs into urban living in pursuit of food and shelter possibilities [11]. The current study aimed to diagnose dog bites in Kirkuk City, Al-Hawija, Al-Dibs, and Daquq district, compare them, and identify the role of waste accumulations on the spread of dog bites. And the role of stray dogs in the prevalence of dog bites.

2. Materials and Methods

This study assessed dog bite incidents documented in the Infectious Diseases Unit of the Kirkuk Health Department over eight months from January 1, 2023, to August 31, 2023. The recorded data were analyzed and juxtaposed with other data sources to enhance the precision of the acquired information. A descriptive cross-sectional investigation was conducted utilizing the time-person-space epidemiology model. This descriptive epidemiological model effectively delineates the demographic attributes of illnesses and health-related occurrences based on the available data. The health authority's clearance was secured. The subsequent factors were examined: Temporal parameters, including months, to elucidate the incidence of dog bites over time and to analyze the trend of this health issue within the governorate. Dog bites were categorized based on their locations throughout the districts of the governorate. Victim-related factors, including personal characteristics such as gender, age, and places of dog bites (exposure), were examined [12-13-14].

2.1. Statistical Analysis

This study employed the Statistical Analysis System (SAS, 2010) to examine the impact of various variables on the qualities under investigation. The means were compared using the least significant difference (LSD), whereas the percentages were analyzed with the Chi-square test [15].

3. Results and Discussion

Through the current study, as shown in Table (1), the number of samples infected with rabies reached 1439. The highest infection rate was recorded in males at 72.287% of the total infected samples, and the lowest infection rate was recorded in females at 25.712%. The reason is that males are more exposed to dog bite injuries because males are more exposed to the external environment than females and dealing with the environment outside the home, especially in eastern and developing countries where old customs and traditions control it, and this is consistent with the study Tidman et al.,2022 and Awuni et al.,2019 [16-17].

Table 1 Distribution of dog bite victims by gender

Gender	Number	Percentage
Males	1069	72.287%
Females	370	25.712%
Total	1439	100%

According to the residential areas, that the highest infection was recorded in Kirkuk City 757 with an infection rate of 52.605%, followed by Al- Hawija district 385 with an infection rate of 26.754%, while Al-Dibs district recorded the lowest infection rate of 127 with a rate of 8.825% table (2). The reason is due to the population concentration, which is higher than the rest of the districts of Kirkuk Governorate, as well as the accumulation of waste in public and residential areas and random housing, which made the city a haven for the presence of large groups of stray dogs that roam between the shops and alleys of Kirkuk city, transmitting diseases, epidemics and dog bites. This is consistent with the study of Awuni et al.,2019; Ghosh et al.,2020 and Tiwari et al.,2019 [18-19-20].

Table 2 Distribution of being bitten by dogs according to the location of the people

Residential area	gender		Number	percentage
	Males	Females		
Kirkuk City	545	212	757	52.605%
Hawija	277	108	385	26.754%
Daquq	122	48	170	11.813%
Al-Dibs	91	36	127	8.825%
Total	1035	404	1439	100%

Through the distribution of the infected according to the site of injury, the lower extremities area recorded the highest number of injuries, 693 and a percentage of 48.158%, followed by the upper extremities area, 633 and a percentage of 43.988%, and the trunk area witnessed the least number of injuries 47 and a percentage of 3.266% table (3). The reason is that dogs attack humans more often from the side than from the right and left extremities. Hence, the lower and upper extremities are alternately more susceptible to injury than the head and trunk, consistent with the study of Smith et al.,2019 ; Acharya et al.,2019 and Economides et al.,2002 [21-22,23].

Table 3 Distribution of infected according to the location of the dog bite

location of the dog bite	Number of samples	percentage
Lower limbs	693	%48.158
Upper limbs	633	%43.988
Head and face	66	%4.586
Trunk	47	%3.266
Total	1439	%100

The current study also recorded, according to the study months and through Table (4), that the highest incidence of dog bites was in March 212 with a rate of 14.735%, then April and May respectively 199 and 198 with a rate of 13.829% and 13.759%, and the lowest incidence was recorded in June 113 with a rate of 7.851%, where we notice that the highest rates were recorded in the spring months due to the provision of suitable conditions for the presence of dogs and the availability of food and a safe place for them, as well as the coincidence of the breeding season when dogs are more ferocious and aggressive, which makes the person present in places where dogs gather more vulnerable to being bitten by a dog or attacked by dogs. The reason for the lower rate in June is that dogs are less active and energetic and hide in shaded areas during the day in the summer months due to the high temperature, and this is consistent with the study of Rowan & Kartal 2018; Bedford,2019 and Bhalla *et al*.,2021 [24-25,26].

The present study indicate that the highest incidence of dog bites occurred in the age group 11-20 years, with 433 cases at a rate of 30.765%, followed by the age group 1-10 years, with 329 cases at a rate of 22.863%. The lowest incidence was observed in the age group 61-70 years, with 57 cases at a rate of 3.961% table (5). This is due to their failure to remain at home and engage with dogs, their juvenile conduct, their strong affinity for dogs, and their inexperience with animals, which may lead them to overlook that playful behaviour can provoke anger or a defensive response from a dog, consistent with the findings of Jaganmohan, 2018; Visvanathan et al.,2007 and Brookes et al.,2020 [27-28,29].

Table 4 Distribution of dog bite victims according to study months

Months	gender		Number of infected	percentage
	Males	Females		
January	130	51	181	12.579%
February	137	27	164	11.396%
March	150	62	212	14.735%
April	160	39	199	13.829%
May	152	46	198	13.759%
June	80	33	113	7.851%
July	145	37	182	12.646%
August	115	75	190	13.207%
Total	1069	370	1439	100%

Table 5 Distribution of infected by age

Age	Number of infected	Percentage
1-10	329	22.863%
11-20	443	30.785%
21-30	212	14.732%
31-40	208	14.454%
41-50	123	8.547%
51-60	67	4.656%
61-70	57	3.961%
Total	1439	100%

According to Table (6), the highest incidence of dog bites according to the type of dog causing the dog bite was due to stray dogs 1088 and a percentage of 75.608%, while the lowest incidence was due to owned dogs 351 and a percentage of 24.391%. The reason for this is that stray dogs come into contact with food waste collected between the general population areas, especially in cities, including the city of Kirkuk in recent times, where we have noticed an increase in the number of stray dogs in shops and alleys of the city in an unnoticeable manner and without this phenomenon being treated by specialists, which led to these dogs attacking people and transmitting serious diseases to them and increasing the incidence of dog bites[30-31]. The reason for the low incidence of owned dogs is that these dogs receive health care and periodic vaccinations from their owners under the supervision of a specialized veterinarian who periodically monitors the health of these dogs. Also, owned dogs stay home and do not go to the streets and alleys except with their owners. They are less in contact with public places, which reduces the possibility of being bitten by a dog compared to owned dogs [32,33]

4. Conclusions

Dog bites are a common health problem in Kirkuk city. The number of people bitten by dogs reached 1439 during the year 2023, and there is no apparent difference in dog bite attacks according to the months of the study. It is difficult to estimate the number of dog bites accurately because many cases are not adequately reported. People bitten by dogs' range in age from 11 to 20 and are of both sexes, male and female.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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