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Epidemiological Trends and Seasonal Patterns of Dog, Monkey, Cat and Snake Bite Cases: A Five-Year Retrospective Study from A Tertiary Care Centre in Northern India

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Abstract **Background:** Animal bite injuries are a significant public health problem, particularly in countries like India where close interaction between humans and animals is common. These injuries pose a risk of infections such as rabies and contribute to the burden on healthcare systems. Understanding the pattern of animal bite cases is important for planning effective prevention and control measures, especially in regions with unique environmental and ecological conditions. **Methods:** A retrospective record-based study was conducted at Indira Gandhi Medical College, a tertiary care hospital in Shimla. All reported cases of animal bites from January 2021 to December 2025 were included. Data were collected from hospital records maintained at the Anti-Rabies Clinic/Outpatient Department. Variables analysed included type of animal and year-wise, month-wise and seasonal distribution of cases. Data were compiled in Microsoft Excel and analysed using descriptive statistics. **Results:** A total of 19,695 animal bite cases were reported during the study period. Dogs were responsible for the majority of cases (54.4%), followed by monkeys (33.8%), cats (9.0%) and other animals (2.9%). The number of cases showed an increasing trend from 2021 to 2024, with a slight decline in 2025. Month-wise analysis revealed higher cases during July and August, while seasonal distribution showed a peak during summer (33.4%) followed by the monsoon season (30.2%). Monkey bites were notably high, reflecting local human-animal interaction patterns. Additionally, 304 snake bite cases were reported, showing year-to-year variation without a consistent trend. **Conclusion:** Animal bite cases remain a major public health concern in this region, with dogs and monkeys contributing to the majority of cases. The observed temporal and seasonal variations highlight the influence of environmental and behavioural factors. The findings emphasize the need for region-specific preventive strategies, strengthened awareness programs and improved animal control measures to reduce the burden of animal bite injuries.

Key Words Animal Bite, Dog Bite, Monkey Bite, Snake Bite, Seasonal Variation, Shimla

INTRODUCTION

Animal bite injuries are a common public health problem, especially in countries like India where humans and animals live in close contact. These injuries not only cause physical harm but also carry the risk of infections such as rabies, which remains an important health concern [1,2]. Even though rabies is preventable, animal bites continue to place a burden on healthcare systems due to the need for prompt treatment and follow-up [3,5].

Dogs are the most common cause of animal bite cases. However, bites from other animals such as monkeys, cats and other species are also reported in significant numbers [6-9]. In regions like Shimla, the pattern of animal bites is influenced by local conditions such as urbanization, tourism and increased interaction between humans and animals. Monkey bites, in particular, are frequently seen in such areas, likely due to closer contact between people and free-ranging monkeys [10,11].

In addition to these, snake bites also contribute to the overall burden of animal-related injuries. Although their frequency may be lower compared to other animal bites, they remain important because of their potential severity and need for timely medical care [12-15].

The occurrence of animal bite cases is not uniform throughout the year. It varies across different months and seasons, possibly due to changes in animal behaviour, breeding patterns, food availability and human outdoor activities. Studying these variations can help in identifying high-risk periods and planning preventive measures accordingly [16-19].

However, there is limited long-term data from hilly regions that clearly shows the distribution and trends of animal bite cases over time. Most available studies are short-term or do not include all types of animal exposures, which limits a complete understanding of the problem.

Therefore, the present study was conducted at Indira Gandhi Medical College to analyse the pattern of animal bite cases over a five-year period (2021-2025). The study includes bites from dogs, monkeys, cats, other animals, as well as snake bites and examines their distribution by year, month and season. This information may help in better understanding the local pattern of animal bite cases and support the development of more effective prevention and control strategies.

METHODS

Study Design and Setting

This was a retrospective record-based study conducted at Indira Gandhi Medical College, a tertiary care hospital in Shimla. The institute caters to a large population from urban as well as surrounding rural and hilly areas.

Study Period

The study included all reported cases of animal bites over a five-year period from January 2021 to December 2025.

Study Population

All patients presenting with a history of animal bite during the study period were included. This covered bites from dogs, monkeys, cats, other animals and snake bites as recorded in hospital registers.

Data Source and Data Collection

Data were collected from the hospital records maintained at the Anti-Rabies Clinic/Outpatient Department. Relevant information was extracted using a pre-designed data collection format. The variables included:

- Type of animal responsible for the bite (dog, monkey, cat, other, snake)
- Year-wise distribution of cases
- Month-wise distribution
- Seasonal distribution

The data were entered into Microsoft Excel for compilation and analysis.

Operational Definitions

Seasons were categorized as:

- Winter: January-February
- Summer: March-June
- Monsoon: July-September
- Post-monsoon: October-December

Other animals included animal bites not categorized under dogs, monkeys or cats, as per the available records.

Data analysis

Data were analysed using simple descriptive statistics. Frequencies and percentages were calculated for different variables. The results were presented in the form of tables and figures to show the distribution of animal bite cases by type, year, month and season.

RESULTS

A total of 19,695 animal bite cases were reported during the five-year study period. Dogs were responsible for the majority of cases, accounting for 10,710 (54.4%) of all bites. Monkey bites were the second most common, contributing 6,649 (33.8%) cases. Cat bites accounted for 1,768 (9.0%) cases, while bites from other animals were relatively less common, with 568 (2.9%) cases. This shows that dog bites remain the leading cause, but monkey bites also form a substantial proportion of cases in this region (Table1, Figure 1).

The total number of animal bite cases showed a gradual increase over the years, from 2,461 (12.5%) in 2021 to a peak of 4,824 (24.5%) in 2024, followed by a slight decline to 4,550 (23.1%) in 2025. Dog bites were consistently the most common each year, with the highest number reported in 2024 (2,634 cases). Monkey bites also showed a similar rising trend, reaching their maximum in 2024 (1,628 cases). Cat bites increased steadily over time, with a noticeable rise in 2025 (576 cases). Bites from other animals remained comparatively low but showed some variation, with the highest number recorded in 2024 (164 cases). Overall, the data indicate an increasing trend in animal bite cases over the study period, especially between 2021 and 2024.

Table 1: Overall distribution of animal bite cases during 5-year period (2021-2025)

Type of Bite	Number	Percentage
Dog	10710	54.4
Monkey	6649	33.8
Cat	1768	9.0
Other	568	2.9
Total	19695	100.0

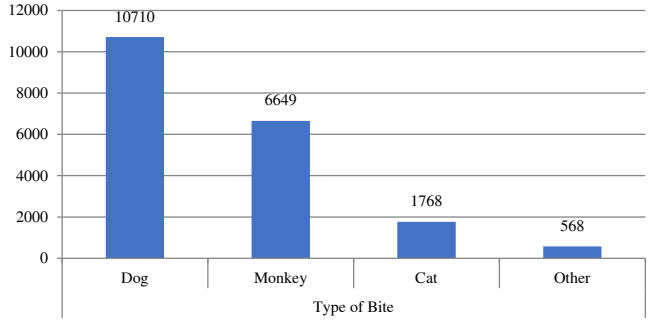

Figure 1: Overall distribution of animal bite cases during 5-year period (2021-2025)

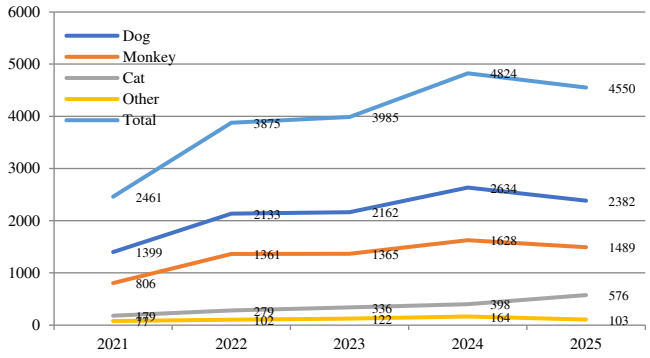

Figure 2: Year-wise distribution of animal bite cases

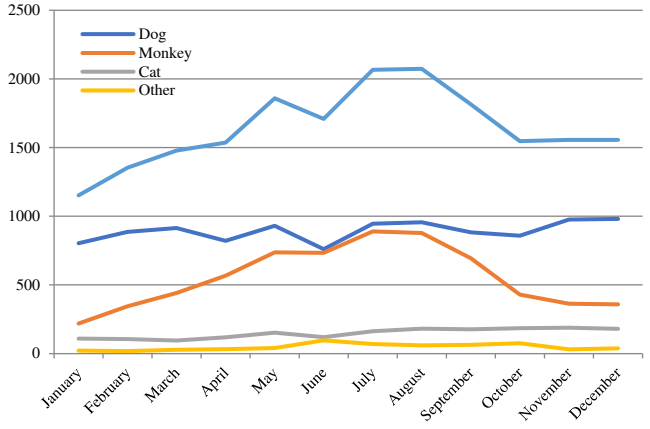

Figure 3: Month-wise distribution of animal bite cases

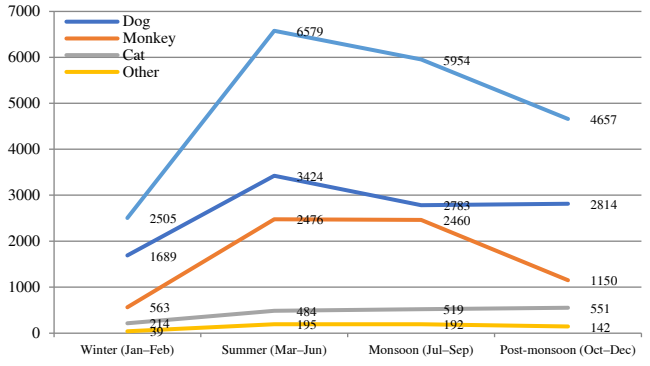

Figure 4: Seasonal distribution of animal bite cases

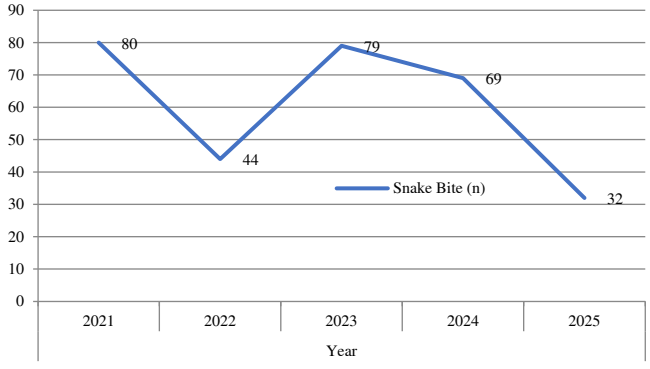

Figure 5: Year-wise distribution of snake bite cases (2021-2025)

Table-2:Year-wise distribution of animal bite cases by type

Year	Dog n (%)	Monkey n (%)	Cat n (%)	Other n (%)	Total n (%)
2021	1399 (13.1)	806 (12.1)	179 (10.1)	77 (13.6)	2461 (12.5)
2022	2133 (19.9)	1361 (20.5)	279 (15.8)	102 (18.0)	3875 (19.7)
2023	2162 (20.2)	1365 (20.5)	336 (19.0)	122 (21.5)	3985 (20.2)
2024	2634 (24.6)	1628 (24.5)	398 (22.5)	164 (28.9)	4824 (24.5)
2025	2382 (22.2)	1489 (22.4)	576 (32.6)	103 (18.1)	4550 (23.1)
Total	10710 (100)	6649 (100)	1768 (100)	568 (100)	19695 (100)

Table 3: Month-wise distribution of animal bite cases

Month	Dog n (%)	Monkey n (%)	Cat n (%)	Other n (%)	Total n (%)
January	803 (7.5)	219 (3.3)	109 (6.2)	21 (3.7)	1152 (5.8)
February	886 (8.3)	344 (5.2)	105 (5.9)	18 (3.2)	1353 (6.9)
March	914 (8.5)	441 (6.6)	95 (5.4)	27 (4.8)	1477 (7.5)
April	820 (7.7)	566 (8.5)	118 (6.7)	32 (5.6)	1536 (7.8)
May	930 (8.7)	736 (11.1)	152 (8.6)	40 (7.0)	1858 (9.4)
June	760 (7.1)	733 (11.0)	119 (6.7)	96 (16.9)	1708 (8.7)
July	945 (8.8)	890 (13.4)	162 (9.2)	69 (12.1)	2066 (10.5)
August	956 (8.9)	877 (13.2)	181 (10.2)	60 (10.6)	2074 (10.5)
September	882 (8.2)	693 (10.4)	176 (10.0)	63 (11.1)	1814 (9.2)
October	858 (8.0)	429 (6.5)	184 (10.4)	75 (13.2)	1546 (7.8)
November	975 (9.1)	363 (5.5)	188 (10.6)	30 (5.3)	1556 (7.9)
December	981 (9.2)	358 (5.4)	179 (10.1)	37 (6.5)	1555 (7.9)
Total	10710 (100)	6649 (100)	1768 (100)	568 (100)	19695 (100)

Table 4: Seasonal distribution of animal bite cases

Season	Dog n (%)	Monkey n (%)	Cat n (%)	Other n (%)	Total n (%)
Winter (Jan-Feb)	1689 (15.8)	563 (8.5)	214 (12.1)	39 (6.9)	2505 (12.7)
Summer (Mar-Jun)	3424 (32.0)	2476 (37.2)	484 (27.4)	195 (34.3)	6579 (33.4)
Monsoon (Jul-Sep)	2783 (26.0)	2460 (37.0)	519 (29.4)	192 (33.8)	5954 (30.2)
Post-monsoon (Oct-Dec)	2814 (26.3)	1150 (17.3)	551 (31.2)	142 (25.0)	4657 (23.6)
Total	10710 (100)	6649 (100)	1768 (100)	568 (100)	19695 (100)

Table 5: Year-wise distribution of snake bite cases (2021-2025)

Year	Snake Bite	Percent
2021	80	26.3
2022	44	14.5
2023	79	26.0
2024	69	22.7
2025	32	10.5
Total	304	100.0

The distribution of animal bite cases varied across different months. The highest number of total cases was observed in August (2,074; 10.5%) and July (2,066; 10.5%), followed by May (1,858; 9.4%). The lowest number of cases was reported in January (1,152; 5.8%). Dog bites were relatively evenly distributed throughout the year, with slightly higher numbers in the later months such as November and December. Monkey bites showed a clear increase during the mid-year months, particularly in July and August. Cat bites were more frequent in the later months, especially from October to December. Bites from other animals showed some variation, with a noticeable rise in

June. Overall, the findings suggest that animal bite cases tend to increase during the middle months of the year.

Seasonal analysis showed that the highest number of animal bite cases occurred during the summer season (6,579; 33.4%), followed by the monsoon season (5,954; 30.2%). The lowest number of cases was recorded in winter (2,505; 12.7%). Dog bites were most common during summer (32.0%), while monkey bites were also highest during summer (37.2%) and remained high during the monsoon season (37.0%). Cat bites were more frequent in the post-monsoon period (31.2%). Bites from other animals were also highest during summer (34.3%). These findings indicate that warmer months, particularly summer and monsoon seasons, are associated with a higher number of animal bite cases.

A total of 304 snake bite cases were reported during the study period. The highest number of cases was recorded in 2021 (80; 26.3%), followed closely by 2023 (79; 26.0%). There was a decrease in cases in 2022 (44; 14.5%), followed by a moderate number in 2024 (69; 22.7%). The lowest number of snake bite cases was reported in 2025 (32; 10.5%). Overall, the trend shows some fluctuation in snake bite cases over the years, with no consistent increasing or decreasing pattern.

DISCUSSION

The present study provides a detailed analysis of animal bite cases reported over a five-year period at Indira Gandhi Medical College. The large number of cases (19,695) observed during the study period clearly indicates that animal bites remain a significant and ongoing public health problem in this region. Such injuries not only lead to physical trauma but also require timely medical management to prevent complications such as rabies, thereby placing a continuous burden on healthcare services.

In the present study, dogs were responsible for more than half of the cases (54.4%), which is in line with observations reported from various parts of India. The dominance of dog bites can be attributed to the large population of stray as well as domestic dogs and their close interaction with humans in both urban and rural settings. However, a notable finding of this study is the high proportion of monkey bites (33.8%). This is higher than what is usually reported in many other regions and highlights the unique epidemiological pattern in Shimla. The increased frequency of monkey bites may be due to factors such as habitat encroachment, feeding of monkeys by tourists and local residents and easy availability of food waste, which encourage monkeys to move closer to human settlements. This changing pattern emphasizes the need to address monkey-related human-animal conflict as an important component of animal bite prevention strategies in this region [10-12].

The year-wise distribution of cases showed a gradual rise from 2021 to 2024, followed by a slight decrease in 2025. This increasing trend may reflect a combination of factors such as improved reporting, growing population, expansion of urban areas and increased interaction between humans and animals. It is also possible that better awareness and access to healthcare facilities have led to more cases being reported over time. The slight decline observed in 2025 may indicate some improvement in preventive measures or natural variation in case occurrence. Another important observation is the steady increase in cat bite cases, especially in the later years. This may be associated with changing lifestyles, increased pet ownership or greater interaction with domestic animals [7,9,11].

The month-wise distribution of cases in this study showed clear variation, with the highest number of cases reported during the middle months of the year, particularly in July and August, followed by May. In contrast, the lowest number of cases was observed in the winter months. This pattern suggests that environmental and behavioural factors play an important role in the occurrence of animal bites. During summer and monsoon months, people tend to spend more time outdoors and there is increased tourism in places like Shimla, leading to greater human-animal interaction. At the same time, animals may become more active during these periods due to breeding cycles and availability of food, which may increase the chances of aggressive encounters. The relatively lower number of cases in winter may be due to reduced outdoor activity and less interaction with animals [10-12].

Seasonal analysis further supports these findings, with the highest proportion of cases occurring during summer (33.4%) followed by the monsoon season (30.2%). Dog and monkey bites were particularly high during these seasons, indicating that these animals play a major role in seasonal variation. Cat bites were more common during the post-monsoon period, which may be related to behavioural patterns of domestic animals. These findings highlight the importance of considering seasonal trends while planning public health interventions, as preventive measures can be strengthened during high-risk periods.

Snake bite cases, although fewer in number (304 cases), showed variability over the years without a clear increasing or decreasing trend. This suggests that snake bites may be influenced more by environmental conditions such as rainfall, vegetation and human exposure to natural habitats rather than consistent yearly patterns. Despite their lower frequency, snake bites remain clinically important due to their potential severity and need for urgent medical care [12-15].

Overall, the findings of this study show that the pattern of animal bite cases in this region is influenced by multiple factors, including local ecology, human behaviour and seasonal variations. The high burden of dog and monkey bites, along with the presence of other animal exposures, indicates that a multi-faceted approach is required for prevention. This includes public awareness regarding safe behaviour around animals, discouraging feeding of wild animals, proper waste management and strengthening of existing rabies control programs.

CONCLUSIONS

The present study highlights that animal bite cases remain a significant public health concern in this region, with dogs being the most common source, followed by a substantial proportion of monkey bites. The findings also show a rising

trend over the years and clear seasonal variation, with higher cases during summer and monsoon months. The noticeable contribution of monkeys and other animals indicates that the pattern of animal bites in this area is influenced by local environmental and behavioural factors. Overall, the study emphasizes the need for a broader and region-specific understanding of animal bite epidemiology to effectively address this ongoing problem.

Strengths and Limitations

The present study has the advantage of including a large number of cases over a five-year period, which provides a reliable understanding of trends and patterns. The inclusion of different types of animal bites and analysis across time and seasons adds to the strength of the study. However, certain limitations should be considered. Being a hospital-based study, it may not include cases that did not seek medical care, leading to possible underestimation of the true burden. In addition, detailed information regarding the circumstances of bites, severity and patient characteristics was not available in the records.

Implications for Public Health

The findings of this study have important public health implications. There is a need for targeted awareness programs focusing on prevention of dog and monkey bites, especially during high-risk seasons. Measures such as control of stray dog population, regulation of feeding of monkeys and improving waste management can help reduce human-animal interaction. Strengthening of anti-rabies services and ensuring timely post-exposure prophylaxis are also essential. Region-specific strategies, particularly for areas like Shimla, are important for effective control of animal bite cases.

Recommendations

Based on the findings, there is a need for strengthened public health measures focusing on prevention and early management of animal bites. Community awareness programs should be conducted to educate people about safe behaviour around animals and the importance of seeking timely medical care. Control measures for stray dogs and strategies to reduce human-monkey interaction, such as proper waste management and discouraging feeding of monkeys, should be implemented. In addition, anti-rabies services should be further strengthened to ensure availability and accessibility of post-exposure prophylaxis. Seasonal trends identified in the study should be considered while planning targeted interventions during high-risk periods.

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Ethical Statement

As this was a record-based study using anonymized data, patient confidentiality was maintained throughout. No personal identifiers were recorded or used during data analysis.

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