

# Epidemiological Study of Animal Bite Cases in Central India

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## Abstract

**Background:** In India, rabies, an ancient disease, remains a serious public health concern. Several causes cause high rates of death and morbidity from animal bites. The epidemiology of animal bites, rabies, and variables affecting post-exposure treatment are all included in an efficient rabies control approach. **Material and Methods:** The prospective cross-sectional study was conducted over 18 months, from July 2022 to December 2023. All people who reported animal bite incidents to the hospital's outpatient department, Cantonment's solitary hospital, were included in the study. A pretested questionnaire is used to collect the data. The data was calculated using suitable statistical tests (e.g., chi-square and Fisher's exact tests). **Results:** Most animal bite cases were male (68%), aged 16-45 years (59%). Stray dogs accounted for most bites (48%), slightly favouring provoked bites. The lower limb was the most common site of animal bite (51%) with a majorly grade 2 category bite (71%). The status of the vaccine was unknown in most of the cases (63%). **Conclusion:** The current study shows that stray dog bites, particularly unprovoked ones, remain a serious public health concern. Young males and children are disproportionately affected. Implementing population control strategies, mass immunizing stray dogs, encouraging pet vaccination, holding frequent educational events, and coordinating vaccine supplies with seasonal biting trends across healthcare institutions are all crucial steps in addressing this.

**Keywords:** Animal bite, Dog bite, Rabies, Epidemiology.

Received: 25 August 2025

Revised: 20 September 2025

Accepted: 13 October 2025

Published: 28 October 2025

## INTRODUCTION

The earliest human civilizations have extensive records of rabies, one of the oldest diseases known to man. Historians believe that the word "rabies" comes from either the Latin word "rabere," which means "to rage," or the Sanskrit word "rabhas," which means "to do violence".<sup>[1]</sup> Almost all warm-blooded animals, including humans, can develop deadly encephalitis from the acute viral illness rabies. Both wild and some domestic animals carry the virus, which is spread by their saliva to humans and other animals after bites, scratches, and licks on broken skin and mucous membranes. About 95% of human rabies cases in India are caused by dogs, with cats (2%), followed by jackals, mongooses, and others.<sup>2</sup> An estimated 59000 people are thought to die from rabies each year in more than 150 countries, with 95% of cases taking place in Asia and Africa.<sup>[1-3]</sup> An estimated 35172 people die from rabies each year, making it a significant burden in Asia. India is responsible for 35% of rabies deaths worldwide and 59.9% of deaths in Asia.

Asia has the greatest Post Exposure Prophylaxis (PEP) costs, with estimates reaching US\$1.5 billion annually.<sup>[4]</sup> Except for the Andaman & Nicobar and Lakshadweep Islands, rabies is endemic in India, and human cases are documented all year long.<sup>[5]</sup>

Over one million individuals acquire PEP annually, and it is believed that there are roughly 60 million stray or free-ranging dogs in the nation.<sup>[6,7]</sup> Appropriate postexposure prophylaxis (PEP) for all animal exposures can prevent

rabies. More than 15 million people worldwide, mostly from China and India, take rabies prophylaxis each year. Over US\$1.6 billion is thought to be spent globally on rabies prevention and control.<sup>[8,9]</sup> Due to a lack of systematic reporting in India, there is little information available regarding the incidence of rabies and animal bites despite the suffering and economic cost.<sup>[10]</sup> even though there are efficient preventative and control strategies for rabies, the lack of epidemiological data threatens their successful application. Accurately estimating the burden of disease, morbidity, and mortality and comprehending epidemiological patterns are essential for the success of any elimination effort. A robust epidemiological surveillance system is necessary for these.<sup>[11,12]</sup> Families and military members reside in approved areas and have access to a comprehensive health care system that includes referrals. Consequently, this demographic may provide information about dog bite incidents over time and associated risk factors, as well as suggestions for managing and preventing dog bite incidents. The current investigation was carried out to

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### DOI:

10.21276/amt.2025.v12.i3.148

**How to cite this article:** Diwate SU, Rai S, Huchchannavar RR, Yadav AK, Talkad S. Epidemiological Study of Animal Bite Cases in Central India. Acta Med Int. 2025;12(3):628-632.

evaluate the epidemiological profile of animal bite cases in confined areas.

## MATERIALS AND METHODS

A military cantonment in Central India, a limited region with a population of about 15,000 people, including military personnel, their dependents, and a small number of civilians, served as the site of this hospital-based cohort research. The study was conducted over 18 months, from July 2022 to December 2023. All occurrences of animal bites in the community were reported to and handled by the cantonment's solitary hospital, which acts as the main medical institution for the whole population. By enabling thorough case capture, this consolidated healthcare system reduced underreporting. All people who reported animal bite incidents to the hospital's outpatient department during the study were included. Any instance of an animal bite met the inclusion criteria, regardless of the animal's kind, the bite's severity, or the patient's demographics. After being informed about the study in their native tongue, patients who refused to consent were not allowed to participate. The investigators interviewed each victim of an animal bite directly to gather data.

The following sociodemographic characteristics were collected in detail using a pretested and validated questionnaire: age, gender, domicile (rural or urban), occupation (civilian, dependent, or serving military), and educational attainment. Bite characteristics were noted, including bite time (among the following categories: morning: 0600–1200, afternoon: 1200–1700, evening: 1700–2200, and night: 2200–0600), bite kind (provoked or unprovoked), bite place, and bite category (Grades 1, 2, or 3 according to WHO categorization). Details about the animal were noted, including its type (pet dog, stray dog, cat, fox, rat, etc.), vaccination status (vaccinated, not vaccinated, or unknown), and post-incident status (living, dead, killed, or unknown).

Details of the incident were documented, including the bite site (e.g., the neighborhood, the residential welfare association complex, the market, or a street), prior history of animal bites, the interval between the bite and the start of

post-exposure prophylaxis (PEP), and the first aid (e.g., nil, water only, water plus soap, and wound treatments like Dettol, povidone-iodine, chili, or turmeric). The questionnaire was created to collect qualitative and quantitative data to ensure a thorough evaluation of the epidemiological profile of animal bite cases. Before the study, the questionnaire was pretested and validated to ensure the questions were relevant, clear, and reliable.

The local ethical committee of the hospital in the military cantonment approved the study. Before data collection, informed consent was obtained from each participant or their guardians in the case of children. Participant information was kept private throughout the study per the Helsinki Declaration and ethical standards for human research.

Microsoft Excel was initially used to organize and clean the data gathered from the questionnaires. Frequencies and percentages represented qualitative data, including bite details and sociodemographic traits. The mean and standard deviation (SD) were used to summarize quantitative data, including age. SPSS version 24 was used for statistical analysis. A 95% confidence interval (CI) was used to compute the annual incidence of animal attacks, which was expressed as cases per 1,000 people. Using suitable statistical tests (e.g., chi-square test and Fisher's exact test), associations between the bite type (provoked vs. unprovoked) and variables such as age group, animal type, vaccination status, and animal status were examined. P-values were reported to determine statistical significance ( $p < 0.05$ ).

## RESULTS

Approximately 15,000 people reside in the cantonment. The cantonment has not conducted a dog census. A single hospital typically meets all the population's medical needs. As a result, every case in the community is reported to the hospital's outpatient department. Over the course of the investigation, there were 91 instances of animal bites. The annual incidence of animal bites is 4 per 1000 people (95% CI: 1–10/1000 people). Table 1 lists the sociodemographic details of animal bite cases. The majority of the animal bite cases were male (68%), aged 16–45 years (59%), residing in the cantonment (100%). And most of them were educated till 12th standard (44%) and were dependents (54%).

**Table 1: Sociodemographic information of animal bite patients.**

Sociodemographic Characteristic	Frequency/Number	Percentage
Gender		
Male	62	68
Female	29	32
Residence		
Rural	91	100
Urban	00	00
Age (in years)		
0-5	07	08
6-15	26	29
16-45	54	59
> 45	04	04
Occupation		
Serving	40	44
Dependents	49	54
Civilians	02	02
Education		
0-9th	36	40

10th	05	05
12th	40	44
Graduate	10	11

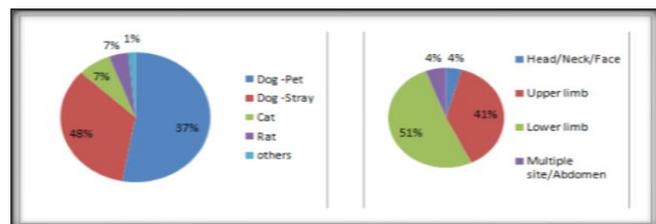


Figure 1: Types of animals and sites of animal bites

As shown in [Figure 1], stray dogs, which accounted for the majority of bites (48%), showed a fairly even distribution, slightly favouring provoked bites. And lower limb was the most common site of animal bite (51%), followed by the upper limb (41%), and multiple sites (4%). [Table 2] shows the profile of animal bites.

Table 2: Profile of animal bite (n=91)

Characteristic of Bite	Frequency/Number	Percentage
Time of Bite (hour)		
Morning (6 am-12 pm)	30	33
Afternoon (12 pm-5 pm)	09	10
Evening (5 pm-10 pm)	34	37
Night (10 pm- 6 am)	18	20
Type of Bite		
Provoked	50	55
Unprovoked	41	45
Fate of Animal Bite		
Alive	62	68
Killed/died	09	10
Unknown/unable to trace	20	22
Place of Animal Bite		
Around house	60	66
RWA complex	20	22
Market/street	11	12
Previous history of Animal Bite		
Yes	11	12
No	80	88
Category of Bite		
Grade 1	00	00
Grade 2	65	71
Grade 3	26	29
Time between Bite and Rabies PEP (hour)		
0-6	60	66
6-12	06	07
12-24	23	25
>24	02	02
First aid		
Nil	36	40
Water only	05	05
Water plus soap	50	55
Wound application		
Nil	53	58
Dettol/Povidone iodine	31	34
Chilli/Turmeric	07	08
Vaccination status of Animal		
Vaccinated	19	21
Not Vaccinated	15	16
Unknown	57	63

Table 3: Comparison of the nature of animal bite with age group

Parameters	Nature of bite		Total	p-value
	Provoked	Unprovoked		
Age-group				
0-5	05 (71.4%)	02 (28.6%)	07 (100%)	
6-15	18 (69.2%)	08 (30.8%)	26 (100%)	0.020
16-45	23 (42.6%)	31 (57.4%)	54 (100%)	
> 45	04 (100.0%)	0	04 (100%)	
Animal details				
Cat	04 (66.7%)	02 (33.3%)	06 (100%)	

Fox	0	01 (100.0%)	01 (100%)	
Rat	01 (16.7%)	05 (83.3%)	06 (100%)	0.208
Pet dog	21 (61.8%)	13 (38.2%)	34 (100%)	
Stray dog	24 (54.5%)	20 (45.5%)	44 (100%)	
Vaccination status				
Not vaccinated	08 (53.3%)	07 (46.7%)	15 (100%)	
Vaccinated	13 (68.4%)	06 (31.6%)	19 (100%)	0.408
Unknown	29 (50.9%)	28 (49.1%)	57 (100%)	
Animal status				
Alive	39 (62.9%)	23 (37.1%)	62 (100%)	
Dead	02 (50.0%)	02 (50.0%)	04 (100%)	0.024
Killed	0	5 (100.0%)	05 (100%)	
Unknown	09 (45.0%)	11 (55.0%)	20 (100%)	

Age group showed a statistically significant relationship with the nature of the bite ( $p = 0.020$ ). Provoked bites were more common among younger age groups, particularly in children aged 0–5 (71.4%) and 6–15 (69.2%). In contrast, the 16–45 age group experienced more unprovoked bites (57.4%), while all bites in individuals over 45 years were provoked. The status of the animal at the time of or after the incident was also significantly associated with the nature of the bite ( $p = 0.024$ ). Bites from animals that were still alive were mostly provoked (62.9%), whereas all bites from animals that were subsequently killed were unprovoked. This suggests a potential link between aggressive animal behaviour and the decision to kill the animal post-incident. On the other hand, the type of animal did not show a statistically significant association with bite nature ( $p = 0.208$ ), although certain trends were observed. Similarly, vaccination status of the animal did not significantly influence the nature of the bite ( $p = 0.408$ ) [Table 3].

## DISCUSSION

Perhaps due to their greater participation in outdoor activities, men (68%) were more impacted than women (32%). The studies done by Jain et al and Shelke et al. also reported similar results.<sup>[13,14]</sup> Provoked bite was 55% in our sample, significantly higher than the 14.9% in the Ravish et al. study.<sup>[15]</sup> A significant worry is that 66% of animal attacks happened within a 50-meter radius of a dwelling, compared to 10.9% in research by Marathe N et al.<sup>[11]</sup> In our survey, bites happened 37% of the time at night. Research by Marathe N et al found a similar highest biting rate of 46% in the evening.<sup>[11]</sup> Around 44% victims were serving soldiers, and 54% were dependents (children/parents/wife). 12% (n=11) victims had a previous history of animal bite.

Up to ten days of observation, 68% of the animals remained alive, 22% could not be located, and 10% had been killed or died. Our study's greater percentage of Category II dog bites (n=65, 71%) was comparable to a survey by Shivasakthimani R et al, in which 71.7% of the wounds were Category II.<sup>[16]</sup> Since the lower limbs are the most accessible, most bites (n = 46, 51%) occurred there, followed by the upper extremities (n = 37, 41%). Similar results of a majority of lower limb bites were seen in studies by Jagadish et al. (64.5%) and Shivasakthimani R et al. (63.80%).<sup>[16,17]</sup>

Mass vaccination of dogs is the most effective measure to control rabies and prevent human death. In our study, only 21% pet dogs were found vaccinated, and the remaining pet

owners were encouraged to vaccinate their dogs at the nearest Govt veterinary health centre, which is 1.5 km from our hospital. The maximum number of animal bite cases were by dogs (n=78, 85%) (Stray n=44, 48%, Pet=34, 37%), followed by cats, which is similar to the findings of Sudershan et al, where dogs were the most common (95.8%) biting animal.<sup>[10]</sup>

It is important for the effectiveness of rabies treatment that the PEP treatment be as early as possible after an animal bite. In our study, 66% victims received rabies PEP within 0- 6 hrs, and 29% of animal bites were of grade 3 bite, while in a study conducted by Sahu et al, 34.9% victims received PEP within 0-6 hrs, and 7.6 % of animal bites were of grade 3 bite.<sup>[18]</sup> These types of bite require both vaccine and rabies immunoglobulin, which were timely administered in our study. Also, completion of the full vaccine course was ensured through continuous monitoring and personal interviews with victims and health education.

First aid following an animal bite, such as washing with soap and water, was done in 55% and wound application with dettol/povidone iodine in 34%, adequate washing for 15 minutes (those who used soap + water) in (n=16,32%) victims in our study. The awareness among teachers in a survey conducted by Choudhary Sumitra Swain et al was 44.61%.<sup>[19]</sup> Washing a dog bite/animal bite wound with soap + water reduces viral load and mortality by as much as 50%. Keeping this importance in mind, all victims reported in our study were immediately subjected to 15 15-minute washes with soap plus water under tap and application of povidone iodine.

The present study identified significant associations between animal bite nature, age group ( $p = 0.020$ ), and animal status ( $p = 0.024$ ). Provoked bites dominated in younger age groups (0–5: 71.4%; 6–15: 69.2%), while unprovoked bites were more common in the 16–45 group (57.4%). All bites in those >45 were provoked. Bites from living animals were mostly provoked (62.9%), while those from killed animals were unprovoked (100%). Animal type ( $p = 0.208$ ) and vaccination status ( $p = 0.408$ ) showed no significant associations. Compared to studies done by Pal R et al (67.2% unprovoked, 50.8% stray) and Sachdeva A et al (78.7% unprovoked, 80.5% stray), this study found fewer stray dog bites (48.4%) and a balanced provoked-unprovoked split for dogs.<sup>[20,21]</sup> The high unprovoked rates in prior studies align with findings for the 16–45 group, indicating stray animal risks. Animal status findings suggest culling follows unprovoked bites, a topic unexplored in prior studies. Unknown vaccination status (57/91) poses a rabies risk assessment challenge, echoing stray bite issues in previous studies. Regional stray population or control differences may explain bite prevalence variations.

**Limitations of the study:** The study's results cannot be applied to the general public because the subjects were restricted to a single military cantonment. Better community-based research is required to understand the burden and epidemiology of animal bites.

## CONCLUSION

The present study concludes that many military personnel and families are at risk of dog bites in military stations. Medical officers must know the correct regimen for post-exposure, pre-exposure, and re-exposure prophylaxis and gaps between doses as per national programmes. Post-exposure prophylaxis, along with continuous IEC activity like first aid, importance of immediate vaccination, Dog psychology (Furious/Dumb Rabies-Rabies in Dogs) in the form of posters, small videos in Units/RWA Complexes/schools, must be implemented. Vaccination of pet dogs/cats and stray dogs should be encouraged/emphasized through private veterinary clinics/government centres to prevent this 100% fatal disease. The administrative authorities were also sensitized regarding sterilizing stray dogs through the Animal Birth Control Centre.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

## REFERENCES

- National Centre for Disease Control, Directorate General of Health Services, Ministry of Health and Family Welfare. Government of India. 2021. National action plan for dog-mediated rabies elimination from India by 2030 [Internet]. Available from: <https://tr-asia.woah.org/app/uploads/2022/12/india-napre-rabies.pdf>. Last accessed on 07.09.2025.
- National Centre for Disease Control. National Guidelines for Rabies Prophylaxis, 2019, National Rabies Control Programme [Internet]. Available from: <https://ncdc.mohfw.gov.in/wp-content/uploads/2025/06/Rabies-Guidelines.pdf>. Last accessed on 07.09.2025.
- World Health Organization. Rabies in South-East Asia [Internet]. Available from: <https://www.who.int/southeastasia/health-topics/rabies>. Last accessed on 07.09.2025.
- World Health Organization. Control of neglected tropical diseases. Available from: <https://www.who.int/teams/control-of-neglected-tropical-diseases/rabies/epidemiology-and-burden>. Last accessed on 07.09.2025.
- Nale TN, Mishra D, Tiwari S, Shewale AD, Balasubramanian S. Marching towards Rabies-free India: Challenges and way forward. *Epi-Dis-Phere*. 2025;1(1):50-55.
- Lodha L, Ananda AM, Mani RS. Rabies control in high-burden countries: role of universal pre-exposure immunization. *The Lancet Regional Health – Southeast Asia*. 2023;19:100258. DOI: <https://doi.org/10.1016/j.lansea.2023.100258>
- Acharya KP, Subedi D, Wilson RT. Rabies control in South Asia requires a One Health Approach. *One Health*. 2021;12:100215. DOI: <https://doi.org/10.1016/j.onehlt.2021.100215>
- Park K. Park's Textbook of Preventive and Social Medicine. 28th ed. Jabalpur: Banarasidas Bhanot; 2025; p330.
- Haradhanalli, Shankaraiah R, Hanumanthaiah, Narayana A, Varadappa, Sanjay T. Cost of rabies post exposure prophylaxis in different healthcare settings in six states of India. *Indian J Public Health*. 2019;63(5):44-7.
- Sudarshan MK, Madhusudana SN, Mahendra BJ, Rao NSN, Ashwathnarayana DH, Abdul Rahman S et al. Assessing the burden of human rabies in India: results of a national multi-center epidemiological survey. *Int J Infect Dis*. 2007;11(1):29-35. DOI: <https://doi.org/10.1016/j.ijid.2005.10.007>
- Marathe N, Kumar S. Epidemiological study of animal bite victims in Central India: a cross sectional institutional study. *Int J Community Med Public Health*. 2016;3(1):78-82. DOI: <https://doi.org/10.18203/2394-6040.ijcmph20151220>
- Sudarshan, Kalappa M, Narayana A, Hanumanthaiah D. Appraisal of surveillance of human rabies and animal bites in seven states of India. *Indian J Public Health*. 2019;63(5):3-8.
- Shelke SC, Kamble MS, Niwal A. Epidemiological determinants of animal bite cases attending the anti-rabies immunization (ARV) OPD in Sassoon hospital, Pune. *Int J Basic Appl Med Sci*. 2015;5(2):98-101
- Jain M, Prakash R, Garg K, Jain R, Choudhary M. Epidemiology of animal bite cases attending anti-rabies clinic of a Tertiary Care Centre in Southern Rajasthan. *J Res Med Dent Sci*. 2015;3(1):79-82.
- Ravish HS, Kumar P, Ramya MP, Kumari N, Jitin S. PEP Seeking Behaviour In An Urban Poor Locality. *APCRI Journal* 2019;20(2):30-5.
- Shivasakthimani R, Vinoth GCD, Ravivarman G, Murali R. Compliance of anti-rabies vaccine among dog bite victims in an urban slum of Chennai: a cross sectional study. *Int J Community Med Public Health*. 2018;5(4):1487-91. DOI: <https://doi.org/10.18203/2394-6040.ijcmph20181222>
- Cacodcar JA, Agarkar NS, Pradhan SS. Epidemiological profile of animal bite cases attending Primary Health Centre, Sanquelim for Rabies PEP. *APCRI Journal*. 2019;20(2):36-9.
- Sahu KK, Manar MK, Singh SK, Singh H. Epidemiological characteristic of patients attending for rabies post-exposure prophylaxis at the infectious diseases hospital of Lucknow, India. *J Glob Infect Dis*. 2015;7(1):30-2. DOI: <https://doi.org/10.4103/0974-777x.150888>
- Swain CS, Behera TR. Assessment of knowledge on animal bite and its first aid measures among school teachers in the urban field practice area of S.C.B Medical college, Cuttack. *APCRI Journal*. 2020;22(1):12-7.
- Pal R, Vegiraju V, Hazra D, Nekkanti AC, Abhilash KP. Compliance rate of anti-rabies vaccination in patients presenting with an animal bite. *Int J Acad Med* 2022;8(4):199-204. DOI: [http://dx.doi.org/10.4103/ijam.ijam\\_54\\_22](http://dx.doi.org/10.4103/ijam.ijam_54_22)
- Sachdeva A, Vinay, Kumar T, Yadav G, Tondwal J. Epidemiological profile and management practices of animal bite cases in a tertiary care hospital of Haryana: A cross-sectional study. *J Family Med Prim Care*. 2023;11(12):7886-90. DOI: [https://doi.org/10.4103/jfmpc.jfmpc\\_549\\_22](https://doi.org/10.4103/jfmpc.jfmpc_549_22).