

Original Research Article

Beneath the bark: mapping dog bite patterns and injury severity – a cross-sectional study at rural health training centre Santhpur, Bidar, Karnataka

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ABSTRACT

Background: Rabies is a vaccine-preventable, zoonotic, viral disease that invariably affects the central nervous system, with dogs responsible for virus transmission in up to 99% of human cases. India remains endemic for rabies and accounts for approximately 36% of global rabies deaths. Objectives were to describe the pattern and severity of injuries among patients presenting with dog bite complaints to rural health training centre.

Methods: A prospective cross-sectional study was conducted from February 2026 to May 2026 at RHTC Santhpur, Bidar. All 63 patients presenting with dog bite complaints were enrolled and data were collected using a structured questionnaire covering socio-demographic profiles, bite characteristics, wound categorization, and post-exposure management. Analysis was performed using Microsoft Excel 2022.

Results: Of the 63 patients, 46 (73%) were male. The most affected age group was 6-25 years (42.86%). The majority of bites occurred in the evening (38.1%) and stray dogs accounted for (52.4%) of bites. Unprovoked bites were predominant (77.78%). Lower limbs were the most commonly bitten site (71.4%). Category II wounds predominated (85.7%), while category III wounds constituted (14.3%). First aid with soap and water was performed by (98.4%) of victims. However, only (11.1%) of category III patients received rabies immunoglobulin (RIG).

Conclusions: Dog bites predominantly affect young, productive-age males, with a near-equal burden from stray and pet dogs. The critical gap in RIG availability for category III patients represents a serious public health concern requiring urgent systemic intervention.

Keywords: Dog bite, Post-exposure prophylaxis, Rabies, Rabies immunoglobulin, Rural health training centre

INTRODUCTION

Rabies is a vaccine-preventable, zoonotic, viral disease that invariably attacks the central nervous system. Once clinical symptoms manifest, the case fatality rate is virtually 100%, making it among the most lethal infectious diseases known to medicine. Globally, an estimated 59,000 people die from rabies every year, with the overwhelming majority of deaths occurring in Asia and Africa regions disproportionately burdened by poverty, free-roaming dog populations, and inadequate public health infrastructure.¹

India alone bears approximately 36% of the world's rabies deaths, contributing roughly 5,700 fatalities annually, with dogs responsible for transmission in nearly 99% of human rabies cases.¹ A landmark 2024 national community-based survey by Thangaraj et al, published in The Lancet Infectious Diseases, reaffirmed that a substantial proportion of dog-bite victims in India receive no anti-rabies vaccination (ARV) or fail to complete the prescribed course with 20.5% receiving no ARV at all and nearly half of those who initiated it not completing the regimen.² This persistence of incomplete post-exposure prophylaxis (PEP) uptake underscores the structural and

behavioural barriers that continue to threaten rabies elimination.

The global “zero by 30” initiative jointly championed by the WHO, the World Organization for Animal Health (WOAH), the Food and Agriculture Organization (FAO), and the Global Alliance for Rabies Control aims to eliminate dog-mediated human rabies deaths by 2030.¹ India’s National Action Plan for Dog-Mediated Rabies Elimination by 2030 has set ambitious targets; however, achieving them requires granular, facility-level, and community-level data on bite patterns, wound categories, and access to rabies biologicals especially rabies immunoglobulin (RIG), which is a critical component of PEP for Category III exposures but remains chronically under-available.³

Epidemiological studies from across India including Salem (Tamil Nadu), Kancheepuram (Tamil Nadu), Mysore (Karnataka), and Bangalore have collectively documented that dog bite victims are predominantly young adult males, that stray dogs are the predominant offending animals, and that lower-limb injuries are the most frequently reported anatomical site.⁴⁻⁷

However, most such studies have been conducted at tertiary care centres in urban or semi-urban settings, leaving a significant evidence gap for rural primary-care facilities in north Karnataka. With this context, the present cross-sectional study was conceived to generate evidence on the epidemiological profile of dog bite injuries at the rural health training centre (RHTC).

Objectives

To describe the pattern and severity of injuries among the patients presenting with dog bite complaints to rural health training centre.

METHODS

Study design and setting

A prospective, health facility-based cross-sectional study was conducted at the rural health training centre (RHTC), Santhpur, Bidar, Karnataka which is a health-care facility serving predominantly rural and agricultural catchment population.

Study period

The study took place from February 2026 to May 2026 (3 months).

Study population and sample size

All patients presenting to RHTC Santhpur with a complaint of dog bite during the study period were enrolled using universal sampling. A total of 63 patients were included.

Inclusion criteria

Patients presenting with a complaint of dog bite injury.

Exclusion criteria

(Patients presenting with other animal bites, Patients unwilling to provide written informed consent.

Data collection tool

A structured, pretested questionnaire was developed covering: (a) socio-demographic profile (age, sex, education and occupation); (b) bite characteristics (type of dog, time, location on body, provocation); (c) wound categorization as per WHO guidelines (category I-III); (d) immediate first-aid practices; and (e) post-exposure prophylaxis received.

Wound categorizations (WHO classification)

Category I: Touching or feeding animals; licks on intact skin (no PEP needed). Category II: Nibbling of uncovered skin; minor scratches without bleeding (vaccine needed). Category III: Single or multiple transdermal bites or scratches; licks on broken skin; contamination of mucous membranes; direct contact with bats (vaccine + RIG needed).

Ethical clearance

Institutional ethics committee clearance was obtained from Bidar Institute of Medical Sciences, Bidar; prior to commencement of the study with IEC approval letter No: 345/BRIMS/IEC/2026-1. Written informed consent was obtained from all participants (or guardians for minors).

Data analysis

All collected data were entered and analysed using Microsoft Excel 2022. Descriptive statistics (frequencies and percentages) were computed for all variables.

RESULTS

Socio-demographic profile

A total of 63 dog bite patients were enrolled. Males constituted (73%) of the study population and females (27%). The predominant age group was 6-25 years (42.86%), followed by 26-45 years (31.75%). Students (41.3%) and farmers (30.2%) were the most frequently affected occupational groups, reflecting the outdoor activities typical of this age and occupational profile. The illiteracy percentage was (12.7%) and (22.2%) were literate up to high school and (22.2%) educated up to pre-university course (Table 1).

Table 1: Sociodemographic details of the study population (n=63).

Socio-demographic variables	Category	N (%)
Age (years)	<5	05 (7.94)
	6-25	27 (42.86)
	26-45	20 (31.75)
	46-65	10 (15.87)
	>65	01 (1.59)
Sex	Male	46 (73.0)
	Female	17 (27.0)
Occupation	Student	26 (41.3)
	Farmer	19 (30.2)
	Homemaker	06 (9.5)
	Government job	03 (4.8)
	Private job	01 (1.6)
	Labour	02 (3.2)
	Unemployed	01 (1.6)
Education	Illiterate	08 (12.7)
	Primary school	08 (12.7)
	Middle school	12 (19.0)
	High school	14 (22.2)
	Pre-university	14 (22.2)
	Graduation	03 (4.8)
	Not started yet	01 (1.6)

Table 2: Frequency distribution of pattern of injury among dog bite victims (n=63).

Variables	Category	N (%)
Type of dog	Stray	33 (52.4)
	Pet	30 (47.6)
Time of bite	Early morning	08 (12.7)
	Morning	11 (17.5)
	Afternoon	11 (17.5)
	Evening	24 (38.1)
	Night	09 (14.3)
Site of bite	Lower limb	45 (71.4)
	Upper limb	14 (22.2)
	Trunk	04 (6.3)
Bite nature	Unprovoked	49 (77.8)
	Provoked	14 (22.2)
WHO wound category	Category I	00 (0.0)
	Category II	54 (85.7)
	Category III	09 (14.3)
Dog status post-bite	Alive	48 (76.2)
	Dead (natural)	01 (1.6)
	Killed	04 (6.3)
	Status unknown	10 (15.9)

Bite characteristics and injury pattern

Stray dogs were responsible for a slightly higher proportion of bites (52.4%) compared to pet dogs (47.6%). The evening hours (18:00-21:00) accounted for the

majority of bites (38.1%). The lower limb was the predominant bite site (71.4%), followed by the upper limb (22.2%) and trunk (6.3%).

A substantial majority of bites were unprovoked (77.8%). No category I wounds were recorded; category II wounds constituted (85.7%) and category III wounds (14.3%) of cases (Table 2).

Post-exposure prophylaxis and first aid

An encouraging finding was that (98.4%) of patients performed wound washing with soap and water as first aid. However, (81%) cleaned the wound for less than 5 minutes, which may be suboptimal. Among the category III patients requiring both vaccine and RIG, only 1 (11.1%) received RIG. The remaining 8 (88.9%) did not receive RIG due to its non-availability (Table 3).

Table 3: Post-exposure measures followed by dog bite victims.

Post-exposure measures	Category	N (%)
First aid (n=63)	Soap and water	62 (98.4)
	Only water	01 (1.6)
Additional antiseptic	Yes	08 (12.7)
Cleaning time (n=63)	<5 minutes	51 (81.0)
	5-10 minutes	12 (19.0)
RIG given (category III, n=09)	Yes	01 (11.1)
	No	08 (88.9)
Reason for RIG not given	Non-availability at RHTC Santhpur	

DISCUSSION

The present study enrolled 63 dog bite victims presenting to RHTC Santhpur, Bidar, over a three-month period (July-September 2025) using universal sampling. The findings illuminate several important epidemiological and clinical dimensions of dog bite injuries in a rural Karnataka setting, and invite comparison with both national and regional evidence published in recent years.

Sociodemographic profile

Males constituted (73%) of victims in the present study, finding that aligns with a broad and consistent pattern across the Indian literature. A retrospective geospatial analysis of dog bite cases from a tertiary care hospital in Mumbai reported (81.6%) male predominance while the large national community survey by Thangaraj et al similarly documented higher dog-bite incidence rates in males across all age groups and residential settings.^{2,8} Male predominance likely reflects occupational and behavioural factors: men and boys engage more in outdoor activities like farming, herding, street movement that bring them into proximity with free-roaming dogs.

The age distribution in the current study showed the highest burden (42.86%) in the 6-25-year age group, followed by the 26-45-year bracket (31.75%). Students constituted the largest occupational category (41.3%), followed by farmers (30.2%). Analogous age and occupational patterns have been reported from a rural RHTC-based prospective study in Ahmedabad, Gujarat (2023-2025), where most victims were in the economically and educationally active age groups.⁹ A community data from Assam also showed children ≤ 15 years accounting for 35% of cases and dependents as the most affected occupational group.¹⁰ This convergence across diverse geographies underscores the need for school-based and community-level awareness programmes as a primary prevention tool.

Dog type and bite nature

In this study, stray dogs accounted for (52.4%) of bites and pet dogs for (47.6%), a near-equal split that distinguishes our findings from many hospital-based studies where stray dog bites dominate. The Ahmedabad RHTC study found stray dogs responsible for (79.2%) of bites.⁹ While the Mumbai tertiary care study reported stray dogs in (74%) of cases and the Delhi community-based survey noted (75.5%) stray dog bites.^{8,11} The relatively high proportion of pet dog bites in Santhpur may reflect the intimate cohabitation of households with owned but unvaccinated dogs in rural settings, where leashing is uncommon and vaccination compliance among pet owners is low. It further emphasizes that rabies prevention strategies must address both stray dog population management and pet dog vaccination.

Unprovoked bites accounted for (77.78%) of incidents in this study, consistent with findings from the literature. The Mumbai study found (83.08%) of bites to be unprovoked and the Ahmedabad RHTC study recorded (78.3%) unprovoked bites.^{8,9} High rates of unprovoked biting are an important public health signal, suggesting either aberrant dog behaviour potentially due to undetected rabies in the offending animal or the unpredictable nature of stray dog encounters.

Anatomical site of bite

The lower limb was the predominant bite site (71.4%), followed by the upper limb (22.2%) and the trunk (6.3%). This pattern is not only consistent with the wider literature but nearly identical across multiple studies from different parts of India. The Ahmedabad RHTC study reported lower limb involvement in (71.9%) of cases.⁹ An institutional study from central India found lower extremity involvement in (60.8%) of victims.¹² and a study of animal bite victims in north India documented lower extremity bites as the most common site.¹³ The dominance of lower-limb injuries reflects the biomechanics of dog attacks typically lunge or snap at the closest body part, which is usually the leg in a standing or walking person. It also has practical implications: lower-limb wounds are

more easily contaminated with soil and organic matter, increasing the importance of thorough wound washing.

Time of bite and seasonality

Evening bites predominated in the present study (38.1%), followed by morning and afternoon (17.5% each). The Mumbai temporal trend analysis documented a high proportion of bites during February-April and noted that meteorological variables including temperature and humidity significantly influence bite rates, with two annual peaks identified.¹⁴ The Gujarat RHTC study noted a concentration of (45%) of its cases between September and November 2023, during the post-monsoon period.⁹ The evening predominance in present study may reflect the pattern of outdoor activity in a rural agricultural community farmers and labourers return from fields, children play outdoors, and free-roaming dogs are most active during evening hours. Understanding such temporal patterns can help for community awareness campaigns and ensure RHTC staffing aligns with peak incident periods.

WHO wound category and severity

An important finding of the present study is that (85.7%) of victims had category II wounds (no bleeding but skin broken or scratch) and (14.3%) had category III wounds (bleeding bites). No category I exposures were recorded, which may reflect a health-seeking bias that mild lick-on-intact-skin exposures (category I) are less likely to prompt a health facility visit. This contrasts with several urban and tertiary-care studies that report a much higher proportion of category III exposures: the central India study recorded (89.4%) category III bites and the north India anti-rabies clinic study found the majority were category III and unprovoked.^{12,13} The lower proportion of category III injuries at RHTC Santhpur could reflect a genuinely lower severity in rural community or may indicate under-recognition and under categorization of wound severity at the primary-care level, warranting training of health workers in WHO exposure classification.

Post-exposure measures and the rabies immunoglobulin gap

A striking and concerning finding is that (98.4%) of victims washed the wound with soap and water, an encouraging indicator of first-aid compliance. However, of the nine category III patients, only one (11.1%) received rabies immunoglobulin (RIG). The reason documented was the non-availability of RIG at RHTC Santhpur. This is consistent with the national picture: a nationwide health-facility survey published in *The Lancet Regional Health-Southeast Asia* (2025) found RIG available in only (20.3%) of public-sector health facilities across India, with the lowest availability at the primary healthcare level.³ Even in Delhi, a nationwide community survey found RIG coverage among category III bite cases to be persistently low, with a 2017 study finding only (4%) of category III victims receiving immunoglobulin and a 2019 multi-

centric study showing only (46.2%) coverage.¹¹ The inadequate RIG administration in the present study is thus not an isolated failure but reflects a systemic supply-chain and procurement deficit that places category III patients at unacceptable residual risk of rabies. This finding demands urgent policy action to stock RIG at community health centres and PHCs as a minimum standard of care.

The geospatial and state-wise analysis of dog bite burden in India from 2018 to 2023 by Janekunte et al highlights that Karnataka reported 3.6 lakh dog bite cases in 2024, with 42 rabies deaths underscoring the magnitude of the problem in the state and reinforcing the urgency of improving PEP access at rural facilities.¹⁵

The one health model and way forward

The success of the rural rabies prevention project documented by Sudarshan et al demonstrates that a coordinated One Health approach integrating mass dog vaccination, human PEP, and community education can eliminate human rabies deaths.¹⁶ This experience is directly relevant to India's National Action Plan for Dog-Mediated Rabies Elimination by 2030.

The prospective design, use of a standardized semi-structured instrument and universal sampling over a defined study period are strengths of this study. The facility-based approach captures all presenting cases and enables systematic data collection on wound characteristics and immediate management.

The study is limited to a single RHTC, restricting generalizability to the wider district or state. The three-month study period may not fully capture seasonal variation in bite incidence. Selection bias is inherent in any health-facility-based study, as victims with mild injuries or those who sought care at private facilities or practised self-care are not captured. Longer follow-up would also allow assessment of ARV completion rates and downstream outcomes.

CONCLUSION

This prospective cross-sectional study at RHTC Santhpur, Bidar, documents the epidemiological pattern of dog bite injuries in a rural Karnataka setting. Dog bites predominantly affect young, productive-age males, with comparable contributions from stray and pet dogs. Unprovoked bites predominate and the lower limb is the most commonly affected site. While first-aid practices are largely appropriate, the critical non-availability of rabies immunoglobulin for category III patients represents the most urgent public health concern identified in this study.

Recommendations

Ensure uninterrupted availability of human rabies immunoglobulin (HRIG) at RHTC, all community health

centres and PHCs, in line with the National Guidelines for Rabies Prophylaxis (2019).

Conduct structured school-based and community IEC activities targeting students and farmers, the two most heavily burdened occupational groups covering wound-washing practices, PEP adherence, and the danger of unprovoked dog bites.

Mandate and enforce dog licensing and proof of current vaccination for all pet dog owners at the Gram Panchayat level, to reduce pet-dog-related bites, which constituted nearly half of all cases in this study.

Train healthcare workers in WHO bite/exposure classification to ensure accurate triage and appropriate administration of both anti-rabies vaccine and RIG.

Adopt a One Health approach by integrating human and veterinary surveillance, mass dog vaccination, and animal birth control consistent with the national rabies elimination strategy.

Establish a robust surveillance and reporting system for animal bites at the district level.

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Conflict of interest: None declared

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