International Journal of Research in Medical Sciences
Khurana A et al. Int J Res Med Sci. 2026 Sep;14(9):3864-3869
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20263097

Original Research Article

Sociodemographic determinants, wound severity classification and economic impact of animal bites: a cross-sectional study at an anti-rabies clinic in rural Maharashtra, India

Ankur Khurana*, Vaishali Raje, Satish V. Kakade, Anjali Ghuge

Department of Community Medicine, KIMS, KVV, Karad, Maharashtra, India

Received: 13 May 2026
Accepted: 04 August 2026

***Correspondence:**
Dr. Ankur Khurana,
E-mail: ankurkhurana028@gmail.com

ABSTRACT

Background: Objectives were to study socio-demographic factors associated with animal bites, assess wound severity, and estimate work/school days lost.
Methods: A descriptive cross-sectional study was conducted at the anti-rabies clinic, Sub-District Hospital, Karad, among 400 new animal bite patients. Data were analyzed using descriptive statistics and Chi-square tests.
Results: Majority were males (66.3%), aged 18-45 years (41.8%). Severe Class III bites predominated (72.5%), mainly from street dogs (82%). Lower limbs were most affected (61%). Soap-and-water wound washing was reported by 38.5%. Anti-rabies serum was administered to 42.3% of patients. Students (58.6%) and skilled workers (29.3%) reported highest absenteeism (1-3 days). Daily wage loss was noted in 37.3%.
Conclusions: Animal bites, predominantly by stray dogs, cause significant morbidity and indirect economic burden through lost wages and school days. Strengthened rabies prophylaxis and community awareness are essential.

Keywords: Anti-rabies serum, Animal bites, *Lyssavirus*

INTRODUCTION

Animal bites are injuries caused by teeth or claws that breach the skin, exposing victims to saliva and body fluids, and thereby posing a risk of zoonotic infections such as rabies.[1] Rabies is an acute, progressive viral encephalitis caused by the *Lyssavirus*.[2] Once symptoms such as hydrophobia or paralysis appear, the disease is almost invariably fatal, with a case fatality rate near 100%.[3] Globally, rabies causes about 59,000 deaths annually, with dogs responsible for nearly 99% of human cases.[4,5] India contributes nearly 36% of global rabies deaths, disproportionately affecting children and economically productive males.[6,7] Maharashtra alone reported over 8.6 lakh animal bite cases in 2023.[8]

Although rabies is entirely preventable through timely wound washing and post-exposure prophylaxis (PEP), challenges persist.[9] Under-reporting and reliance on traditional remedies remain widespread[10]. India has adopted the National Action Plan for Dog-Mediated Rabies Elimination (NAPRE) under the global "Zero by 30" initiative, and rabies has been declared a notifiable disease in several states.[11] Yet, rising stray dog populations and limited access to healthcare continue to hinder effective implementation.

Beyond clinical outcomes, animal bites impose significant economic and educational burden. In this study, absenteeism was notably higher among students and skilled workers, with 1-3 days of school/work loss strongly associated with class III bites. This finding is partly confounded by repeated clinic visits required for full PEP schedule, rather than pain severity alone. Mild-to-moderate pain (scores 1-5) paradoxically more linked to absenteeism than severe pain, likely reflecting occupation-related factors such as students missing school due to wound care or fear rather than pain intensity.

Research gap

Despite national frameworks, limited evidence exists on the combined epidemiological determinants and indirect economic fallout of animal bites in rural Maharashtra. This study addresses that gap by analysing socio-demographic risk factors, wound severity, and productivity loss.

Rationale

Animal bites remain a major public health issue in India, with Maharashtra reporting one of the highest burdens. Despite rabies being preventable, gaps in wound care, prophylaxis, and awareness persist, while stray dogs continue to drive severe exposures. These injuries not only cause morbidity but also disrupt education and wages, highlighting the need to assess socio-demographic determinants, wound severity, and productivity loss.

Objectives

Objectives were to study socio-demographic factors associated with animal bites, to assess the severity of animal bites among patients approaching healthcare facilities and to estimate work/School days lost due to animal bite to evaluate economic loss.

METHODS

A descriptive cross-sectional study was conducted between April 2024 and October 2025 at the anti-rabies Clinic, Sau Venutai Chavan Sub-District Hospital, Karad Taluka, Satara District. The study included 400 consecutive new animal bite patients presenting for wound care and PEP. Follow-up cases and those reporting after the second vaccine dose were excluded.

Sample size

The sample size was calculated using the formula for estimating a single proportion:

$$N = \frac{Z^2 \times q}{d^2 \times p}$$

where p= prevalence of lime application as a traditional wound management practice (10.38%), $q = 100 - p$, $Z = 2$, and d= allowable error (30% of p). The minimum required sample size was 384, which was rounded to 400 to account for non-response.

Data collection

Data were obtained using a structured, pretested questionnaire through face-to-face interviews. Information included socio-demographic variables (age, sex, occupation, residence, income), characteristics of the biting animal (stray/pet, vaccination status), and wound details. Injuries were classified according to WHO 2016 severity categories.

Socio-economic status

Socioeconomic status was assessed using the modified B. G. Prasad classification. For analysis, five classes were regrouped into three categories: Upper (Class I-II), Middle (Class III-IV), and Lower (Class V).

Pain assessment

Pain intensity was measured using a 0-10 pain rating scale, categorized as no pain, mild, moderate, or severe.

Ethical considerations

Ethical approval was obtained from the institutional ethics committee, Krishna Institute of Medical Sciences, Karad. Administrative permission was secured from the Medical Superintendent of Sub-District Hospital. Written informed consent was obtained from adult participants, and assent from parents/guardians for children under 12 years. Confidentiality and anonymity were strictly maintained.

Statistical analysis

Data were entered into Microsoft excel and analyzed using SPSS version 27.0. Descriptive statistics (percentages, proportions) summarized the data. Associations between variables were tested using Chi-square and Fisher's exact tests, with $p<0.05$ considered statistically significant.

RESULTS

Table 1 shows socio-demographic distribution: males (66.3%) and the 18-45 years age group (41.8%) were most affected. Rural residents had a higher proportion of Class III bites (76.8%), though not statistically significant.

Table 2 highlights animal factors: street animals accounted for 67.8% of cases, with dogs responsible for 82%. Class III bites were significantly associated with street dogs ($p=0.003$) and dog species ($p<0.001$). Lower limbs were the most common site (61%).

Table 3 presents wound management: 54.8% sought care within 6-24 hours. Soap and water washing was reported by 38.5%. Anti rabies serum was administered to 42.3%, significantly more in class III cases ($p<0.001$).

Table 4 shows work/school loss: 67% reported no absenteeism, but students (58.6%) and skilled workers (29.3%) had the highest 1-3-day losses. Wage loss was reported by 37.3%. Table 5 demonstrates clinical correlates: absenteeism was significantly associated with class III bites, pain scale scores, and ARS administration ($p<0.001$). Mild-to-moderate pain (scores 1-5) was paradoxically more linked to absenteeism than severe pain.

Table 1: Distribution of animal bite cases according to their socio demographic status and severity of bite.

Socio-demographic status	Severity of animal bite				Total		χ^2	P value
	Class 2		Class 3					
	N=110	%	N=290	%	N=400	%		
Residence								
Urban	53	30.3	122	69.7	175	43.8	2.630	0.268
Rural	38	23.2	126	76.8	164	41.0		
Urban slum	19	31.1	42	68.9	61	15.3		
Religion								
Hindu	103	28.1	263	71.9	366	91.5	0.890	0.345
Muslim	7	20.6	27	79.4	34	8.5		
Type of family								
Joint	75	27.7	196	72.3	271	67.8	1.634	0.442
Three generation	2	13.3	13	86.7	15	3.8		
Nuclear	33	28.9	81	71.1	114	28.5		
Sex								
Male	68	25.7	197	74.3	265	66.3	1.333	0.248
Female	42	31.1	93	68.9	135	33.8		
Age group (in years)								
1-17	23	24.5	71	75.5	94	23.5	6.923	0.074
18-45	52	31.1	115	68.9	167	41.8		
45-60	25	32.9	51	67.1	76	19.0		
>61	10	15.9	53	84.1	63	15.8		
Education								
Illiterate	4	14.8	23	85.2	27	6.8	4.782	0.188
Schooling	74	28.6	185	71.4	259	64.8		
Higher Secondary	20	34.5	38	65.5	58	14.5		
Graduation	12	21.4	44	78.6	56	14.0		
Occupation								
Unemployed	45	33.3	90	66.7	135	33.8	5.387	0.146
Unskilled	23	28.0	59	72.0	82	20.5		
Skilled	23	26.7	63	73.3	86	21.5		
Students	19	19.6	78	80.4	97	24.3		

Table 2: Distribution of animal bite cases according to animal status, wound characteristic and severity of animal bite.

Particulars	Severity of animal bite				Total		X^2	P value
	Class 2		Class 3					
	N=110	%	N=290	%	N=400	%		
Type of animal								
Street	62	56.4	209	72.1	271	67.8	10.414	0.003
Pet	48	43.6	79	27.2	127	31.8		
Wild	0	0.0	2	0.7	2	0.5		
Species of animal								
Dog	80	72.7	248	85.5	328	82.0	18.716	<0.001
Cat	27	24.5	25	8.6	52	13.0		
Wild	3	2.7	17	5.9	20	5.0		
Bite wound site								
Head, neck and face	2	1.8	12	4.1	14	3.5	7.456	0.059
Trunk	0	0.0	14	4.8	14	3.5		
Upper limb	40	36.4	88	30.3	128	32.0		
Lower limb	68	61.8	176	60.7	244	61.0		

Table 3: Distribution of animal bite patients according to wound management and severity of animal bite.

Wound management	Severity of animal bite				Total		X^2	P value
	Class 2		Class 3					
	N=110	%	N=290	%	N=400	%		
Medical attention (in hours)								
<6	24	21.8	109	37.6	133	33.3	-	<0.001*
6-24	60	54.5	159	54.8	219	54.8		
24-48	18	16.4	20	6.9	38	9.5		
>48	8	7.3	2	0.7	10	2.5		
Pre-exposure vaccination								
Yes	3	2	11	3.8	14	3.5	-	0.766*
No	107	97.3	279	96.2	386	96.5		
Washing of wound with								
Only water	33	30	109	37.6	142	35.5	9.463	0.024
Soap and water	49	44.5	105	36.2	154	38.5		
Antiseptic solution	21	19.1	71	24.5	92	23		
Nil	7	6.4	5	1.7	12	3.0		
T. T. vaccine								
Given	67	60.09	204	70.3	271	67.8	3.250	0.071
Not given	43	39.1	86	29.7	129	32.3		
Anti-rabies serum								
Given	16	14.5	153	52.8	169	42.3	47.729	<0.001
Not given	94	85.5	137	47.2	231	57.8		

*Fisher exact test

Table 4: Distribution of patients by socio-demographic characteristics and total workdays lost.

Particulars	1-3 days		4-5 days		No Loss		Total		X^2	P value
	N=99	%	N=33	%	N=268	%	N=400	%		
Gender group										
Male	78	78.8	17	51.5	170	63.4	265	66.3	11.116	0.004
Female	212	1.2	16	48.5	98	36.6	135	33.8		
Occupation										
Unemployed	1	1.0	8	24.2	126	47.0	135	33.8	-	<0.001*
Unskilled	11	11.1	3	9.1	68	25.4	82	20.5		
Skilled	29	29.3	9	27.3	48	17.9	86	21.6		
Student	58	58.6	13	39.4	26	9.7	97	24.3		
Socio-economic group										
Upper SE class	46	46.5	12	36.4	120	44.8	178	44.5	-	0.854*
Middle SE class	50	50.5	20	60.6	136	50.7	206	51.5		
Lower SE class	3	3.0	1	3.0	12	4.5	16	4.0		
Loss of earning										
Nil	1	1.0	8	24.2	126	47.0	135	33.8		<0.001
Daily wages	35	35.4	10	30.3	104	38.8	149	37.3		
Medical leave	5	5.1	2	6.1	12	4.5	19	4.8		
Educational loss	58	58.6	13	39.4	26	9.7	97	24.3		

*Fisher exact test

Table 5: Distribution of patients according to wound status and the number of workdays lost.

Particulars	1-3 days		4-5 days		No loss		Total		χ2	P value
	N=99	%	N=33	%	N=268	%	N=400	%		
Medical attention										
<6 hrs.	36	36.4	10	30.3	87	32.5	133	33.3	-	0. 770*
6 hr-24 hrs.	52	52.5	22	66.7	145	54.1	219	54.8		
24 hrs-48 hrs.	9	9.1	1	3.0	28	10.4	38	9.5		
>48 hrs.	2	2.0	0	0.0	8	3.0	10	2.5		

Continued.

Particulars	1-3 days		4-5 days		No loss		Total		χ2	P value
	N=99	%	N=33	%	N=268	%	N=400	%		
Severity of bite										
Class 2	14	14.1	4	12.1	92	34.3	110	27.5	-	<0.001*
Class 3	85	85.9	29	87.9	176	65.7	290	72.5		
Pain scale										
1 to 5	68	68.7	24	72.7	179	66.8	271	67.8	-	<0.001*
6 to 10	22	22.2	5	15.2	24	9.0	51	12.8		
No pain	9	9.1	4	12.1	65	24.3	78	19.5		
ARS status:										
Received	54	54.5	23	69.7	92	34.3	169	42.3	23.216	<0.001
Not received	45	45.5	10	30.3	176	65.7	231	57.8		

*Fisher exact test

DISCUSSION

This study highlights the predominance of Class III bites (72.5%), which is consistent with earlier Indian reports showing a high burden of severe exposures.[9] Male predominance and the 18-45 years age group reflect higher outdoor activity and occupational risk, aligning with national surveys.[10] Stray dogs were the principal source of bites (82%), reinforcing the challenge of uncontrolled canine populations in rural and peri-urban settings.[11]

Health-seeking behavior revealed important gaps. Although most patients sought care within 24 hours, only 38.5% practiced recommended soap-and-water wound washing, and less than half of Class III cases received anti-rabies serum. These findings highlight deficiencies in adherence to WHO guidelines and underline the need for improved awareness and supply chain management.[12] The relatively low uptake of rabies immunoglobulin in severe cases remains a critical concern.

The economic and educational impact was notable. Students and skilled workers experienced the highest absenteeism, with wage loss reported by over one-third of patients. Absenteeism was significantly associated with Class III bites and ARS administration, reflecting repeated clinic visits required for the full PEP schedule rather than pain severity alone. Interestingly, mild-to-moderate pain was more strongly linked to absenteeism than severe pain, suggesting that occupation-related factors such as school absence due to wound care or fear may play a larger role than clinical severity. Similar indirect burdens have been emphasized in national rabies burden studies.[13]

Overall, the findings confirm that animal bites in rural Maharashtra are not only a clinical emergency but also a socio-economic challenge, demanding integrated medical, veterinary, and public health interventions. Strengthening wound care practices, ensuring universal availability of rabies immunoglobulin, and implementing community-level awareness and dog population control measures are essential to reduce both morbidity and indirect losses.

Limitations

This study was conducted at a single sub-district hospital anti-rabies clinic; therefore, the findings cannot be generalized to all of rural Maharashtra or India.

CONCLUSION

Animal bites remain a major public health challenge in peri-urban and rural Karad Taluka, predominantly affecting males in the productive age group and students. Stray dogs were the principal source of exposure, with nearly three-fourths of patients sustaining severe Class III bites. These injuries not only cause physical morbidity but also disrupt education and wages, particularly among students and daily wage earners. Despite most patients seeking care promptly, gaps in the universal administration of rabies immunoglobulin persist, contributing to indirect socio-economic burden.

Recommendations

Strengthening rabies prevention in rural Maharashtra requires a multi-pronged approach. Immediate wound washing with soap and water for at least 15 minutes must be emphasized through intensive community education. Ensuring uninterrupted availability and universal administration of rabies immunoglobulin for all Category III exposures is critical to reduce mortality. School-based awareness programs should target students, the group most affected by absenteeism, to promote safe behaviour around animals and proper post-bite practices.

Finally, adopting a One Health approach with coordinated municipal and veterinary action-through mass dog vaccination and Animal Birth Control programs-remains essential to control the stray dog reservoir and mitigate the socio-economic burden of animal bites.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Rupprecht CE, Hanlon CA, Hemachudha T. Rabies re-examined. Lancet Infect Dis. 2002;2(6):327-43.
2. Sudarshan MK, Madhusudana SN, Mahendra BJ, Rao NSN, Ashwath Narayana DH, Rahman SA, et al. Assessing burden of rabies in India: WHO-sponsored national multi-centric rabies survey. Indian J Community Med. 2007;32(3):193-7.
3. Patel S, Toppo M, Lodha R. An epidemiological study of animal bite cases in a tertiary care center of Bhopal city. Int J Med Sci Public Health. 2017;6(3):1-5.
4. Gogtay NJ. Wound management practices following dog bites in Mumbai. Trop Med Int Health. 2014;19(5):598-602.
5. Ghosh A, Pal R. Profile of dog bite cases in an urban area of Kolkata. Natl J Community Med. 2014;5(3):321-4.
6. Shipra KD, Sehrawat V. Rabies: Eliminating a deadly but preventable global disease. Bio Vet Innovator Mag. 2025;2:10.
7. Ministry of Fisheries, Animal Husbandry and Dairying. Stray dogs: Lok Sabha unstarred question no. 4870. Govt of India. 2025.
8. World Health Organization. Rabies: India. Geneva: WHO. 2025.
9. Gujalwar SV. Epidemiological profile of animal bite cases in Maharashtra. J Family Med Prim Care. 2019;8(2):604-9.
10. Sudarshan MK, Mahendra BJ. Epidemiological study of animal bites in India. J Commun Dis. 2006;38(1):32-9.
11. Satapathy DM, Sachdeva S. Epidemiological determinants of rabies in India. J Commun Dis. 2006;38(1):32-6.
12. Park K. Textbook of Preventive and Social Medicine. 28th ed. Jabalpur: Banarsidas Bhanot. 2025.
13. National Action Plan for Dog-Mediated Rabies Elimination (NAPRE). Govt of India. 2025.

Cite this article as: Khurana A, Raje V, Kakade SV, Ghuge A. Sociodemographic determinants, wound severity classification and economic impact of animal bites: a cross-sectional study at an anti-rabies clinic in rural Maharashtra, India. Int J Res Med Sci 2026;14:3864-9.