Epidemiological study of animal bite victims: A study from a tertiary care hospital of Central India

Arindam Maiti[1], Arvind Sharma[2], Sunita Patel[3], Ashish Mishra[4]

[1,4]*Postgraduate Resident, [2]Professor, [3]Assistant Professor, Department of Community Medicine, Netaji Subhash Chandra Bose Medical College, Jabalpur, Madhya Pradesh, India*

ABSTRACT

Background: Rabies is a dreadful viral zoonotic disease with potential threat caused by bite of animals such as dogs, cats, monkeys, and wild animals such as foxes and jackals with number increased from 42 lakhs in 2012 to 72 lakhs in 2020 as per integrated disease surveillance project. **Aims and Objectives:** The aim of the study was to identify the epidemiology and to find the association with the various factors among animal bite victims. **Materials and Methods:** This study was a cross-sectional study conducted among animal bite victims for a period of 1 year, till the completion of a desired sample size of 542 in a tertiary care hospital, Jabalpur. Data collection was done by means of pre-tested, self-structured questionnaire with face-to-face interview technique after taking written informed consent among them. Data entered in MS-Excel, descriptive and inferential statistical analysis was done using IBM-SPSS v27.0 software. **Results:** In this study, the mean age among the victims was observed to be 30.58 ± 17.30 years with the majority belonged to 21–30 years, that is, 22.32%. Maximum were bitten by dogs 86.72% with unprovoked type of bite 77.68% and Category-III type of wound 63.84% at lower limb 65.68% during monsoons 255 (47.05%). Those reported with unprovoked bite majority were adults 352 (83.61%); odds ratio $= 0.10(0.06–0.16)$; $P = 0.001$. **Conclusions:** Majority victims were adult males and were bitten by stray dogs with unprovoked type of bite during monsoon season. Those reported with unprovoked type of bite majority were adults, while provoked type among children and lower education level ones due to the difference in education, behavior pattern, and attitude toward animals.

Key words: Rabies; Epidemiology; Animal-bite; Unprovoked bite; Category-III wound

INTRODUCTION

Rabies is a dreadful viral zoonotic disease with potential threat and known from ancient times with both at urban and rural areas.[1] It is caused by bite of animals such as dogs, cats, monkeys, and wild animals such as foxes and jackals.[1] Animal bites occur due to self-defence, instinctive behavior of them, and their attempt to obtain food, which increases during the time of natural disasters such as hurricanes, floods, and droughts.[2]

Around 3.3 billion people around the globe are at risk of exposure, with 1.4 billion belonging to the World Health Organization's (WHO) Southeast Asia region. Majority of the cases were noted in the continents of Africa and Asia, where there is more interaction between human and dog population.[1] An estimation of 17.4 million animal bites occurs annually, with an incidence of 1.7% in India with still being an endemic country for Rabies.[1] As per Association of Prevention and Control of Rabies Infection, decade survey from data collected from hospital in isolation

Address for Correspondence:
Dr. Arvind Sharma, Professor, Department of Community Medicine, Netaji Subhash Chandra Bose Medical College, Nagpur Road, Jabalpur – 482003, Madhya Pradesh, India. **Mobile:** +91-9425408826. **E-mail:** drarvindsharmajbp@yahoo.co.in

majority of human Rabies deaths occurred among adults 64.7% with males 71.1%, maximally belonging to either poor or low-income group 87.6%.[3] As per integrated disease surveillance project the number of animal bites has increased from 42 lakhs in 2012–72 lakhs in 2020.[4] In India, every rabid animal bite is potential for causing Rabies. Although all age groups are susceptible, about 40% are seen among children <15 years, majority by dogs, which remains underreported. About 80% of Rabies prevalence is noted among the poor and vulnerable population due to a lack of notification, reporting, and awareness.[5] As per National Rabies Control Programme (NRCP), there are 229 clinically suspected deaths due to Rabies infection in the state of Madhya Pradesh from the year 2012–2020.[6]

Rabies is a disease of national neglect due to lack of proper organization and surveillance, under-reporting, frequent misdiagnosis, and lack of coordination among health sectors causing under-estimation of burden. It is considered as a disease of low public health priority and no national wide epidemiological survey has been undertaken.

Aims and objectives

This study was undertaken to identify the epidemiological factors and to find the association with various factors among the animal bite victims attending the tertiary care hospital.

MATERIALS AND METHODS

This was a hospital-based cross-sectional study conducted for a period of 1 year (August 2022–July 2024) among the animal bite victims reported to the tertiary care hospital.

Sample size

The sample size was calculated from a previous study conducted by Bhat et al.,[7] prevalence of animal-bite victims was found out to be 0.6%. Hence, using Cochran formula, $n = z^2_{\alpha/2} pq/d^2$ (Where, n=required sample size, $z2_{\alpha/2}$=1.96 at 95% confidence interval (CI), p=prevalence of animal-bite victims=0.6%=0.06, q=1-p=1–0.06=0.94, d=2% error), the sample size was found out to be 542.

Sampling technique

The animal bite victims reported to the hospital during the study period were taken 3 days a week till the desired sample size was achieved by means of purposive sampling technique.

Inclusion criteria

Animal bite victims those who gave willingness for consent to participate in the study.

Exclusion criteria

Victims with mental illness were excluded from the study.

Data collection procedure

Data collection was conducted by means of a pre-tested, self-structured questionnaire consisting of information such as sociodemographic characteristics (Age, gender, education, and occupation as per Modified Kuppuswamy scale 2021,[8] family type, socioeconomic status of the family as per Modified B.G. Prasad 2021[9]) and animal-bite characteristics (type of animal, place, time, date, day, season, provocation status during bite, if bite is of pet dog – vaccination status of dog), wound characteristics (type depth and WHO category of wound, which was identified by treating physician's opinion only during 1st time visit, but not for follow-up, number of bite marks and site of bite). It was done by means of face-to-face interview technique from the animal bite victims those attended to the Outpatient Department and Inpatient Department of Medicine, Surgery, Pediatrics and Casualty of the hospital. Data collection was done for 3 days a week till the desired sample size was achieved. A Pilot study was conducted among 30 animal bite victims those attended the hospital before main data collection procedure for validation of the questionnaire. Confidentiality of the identity of the victims was maintained and data was used only for research purpose.

Ethical clearance and consent

The study was conducted after taking prior permission from the Medical Superintendent of the hospital and after taking clearance regarding ethical ground from the Institutional Ethical Committee (IEC) from author's Institution (No. IEC/2022/8629-77, Jabalpur dated September 05, 2022). Data collection from the victims was done after taking informed consent from them in local language. In case the victim was of age group ≤15 years, an interview was taken from his/her attendant/guardian after taking prior consent.

Data analysis

Data entered in MS-EXCEL with descriptive and inferential statistical analysis was done by using IBM-SPSS v27.0 (IBM Corp. Released 2015. IBM SPSS Statistics for Windows, v27.0. Armonk, NY: IBM Corp. by taking help from Statistician). Results were interpreted by means of frequencies and percentages in tables and cross-tables along with calculation of Chi-square tests and odds ratio at 95% CI to find the strength of association and P-values (significant at P<0.05).

RESULTS

In this study among 542 animal bite victims reported to tertiary care Hospital, the mean age among the

victims reported to the hospital was observed to be 30.58±17.30 years. With maximum of the victims belonged to the age group of 21–30 years, that is, 121 (22.32%), while the least age group belonged to the age group of >70 10 (1.85%), with male predominance 398 (73.43%).

It was observed that majority of the victims were bitten by dogs while the least reported as tiger as referral (Figure 1).

In the study, among dog bites, majority bite victims reported were of stray dog bites, that is, 275 (58.51%) while rest due to pet ones 195 (41.49%). Among the pet dogs, from the response given by the victims, it revealed that majority of the dogs were vaccinated 106 (54.36%), while minimum 3 (1.54%) dogs' vaccination status was unknown during the time of bite.

In the present study majority were cases of unprovoked bites while the rest occurred due to provocation by the victims. Out of the provoked bite cases maximum were due to fun purpose and least occurred under the influence of alcohol. It was observed that majority of the animals were bitten during evening hours, while the minimum during nighttime. It was noted that majority of the bites among the victims reported were noted in rural areas and least in forest areas. This study revealed that the lower limb was the most common site of bite among the victims reported, followed by upper limb with minimum at trunk area (Table 1).

It was observed that majority of the victims reported with lacerated type of wound and minimum with lick on broken skin. Maximum of the victims reported with multiple number of bite marks with deep wounds. This study revealed that maximum of the victims reported with Category-III type of wound while least with Category-I type (Table 2).

In the present study, maximum bites were noted during monsoon season with drastic fall during autumn and in winter with a minimum during spring season (Figure 2).
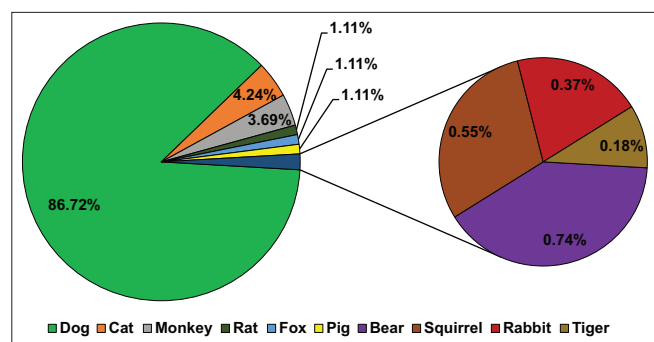

Figure 1: Percentage of different types of animal bite among the victims reported (n=542)

In the current study, the victims who reported with unprovoked bite majority were adults with no association and highly significant result. The victims who reported with provoked bites majority were males with no association

Table 1: Animal-bite characteristics among the victims reported to the hospital (n=542)

Variables	Frequency (n)	Percentage (%)
Provocation status		
Unprovoked	421	77.68
Provoked	121	22.32
Reason for provocation (n=121)		
Fun	107	88.43
Influence of someone	10	8.26
Influence of alcohol	4	3.31
Time of bite		
Morning (05:00–12:00 h)	112	20.66
Afternoon (12:00–17:00 h)	191	35.24
Evening (17:00–21:00 h)	208	38.38
Night (21:00–04:00 h)	31	5.72
Place of bite		
Rural	275	50.74
Semi-urban	170	31.37
Urban	77	14.21
Forest	20	3.68
Site of bite		
Lower limb	356	65.68
Upper limb	145	26.75
Multiple site	33	6.09
Back	3	0.55
Face	3	0.55
Trunk	2	0.37

Table 2: Showing wound characteristics, Category of wound, number of bite marks and site of bite among victims. (n=542)

Variables	Frequency (n)	Percentage (%)
Type of wounds		
Lick on intact skin	34	6.27
Lick on broken skin	1	0.18
Scratch/abrasion without bleeding	162	29.89
	33	6.09
Scratch/abrasion with bleeding	185	34.13
Lacerated	127	23.43
Punctured		
Wound Depth (n=507)*		
Deep	312	61.54
Superficial	195	38.46
*35 victims reported with licks on intact skin		
Number of bite marks (n=312)**		
Single	50	16.03
Multiple	262	83.97
**These number of victims reported with lacerated and punctured type of wound		
WHO Category of Wound		
Category-I	34	6.27
Category-II	162	29.89
Category-III	346	63.84

WHO: World Health Organization

and insignificant result. The victims who reported with unprovoked bites majority were educated till school with moderately strong association and highly significant result. Those victims who reported with provoked bites majority had education of school level with the association and highly significant result. Those reported with provoked bites majority were illiterate ones with moderately strong association and highly significant result. It was noted that the victims who reported bites due to provocation majority reported with Category II and III type of wounds with no association, and insignificant result (Table 3).

DISCUSSION

The present study conducted in a tertiary care hospital among a total of 542 animal bite victims reported to a tertiary care hospital of Jabalpur district where majority were dog bites, especially stray ones occurred without any

Figure 2: Seasonal trend of animal bite victims reported to the hospital (n=542)

provocation and maximum were bitten during evening time at urban area at lower limb region and reported with Category-III type of wound.

In the present study, it was observed that majority of the victims belonged to the age group of 21–30 years, that is, 121 (22.32%), while least among >70 years 10 (1.85%). The reason behind this is that majority of the victims remain outside for work to earn their livelihood and then among children because they do not develop defence mechanism against animal bite, whereas geriatric age group remains indoor. A similar result was noted in a study done by Kassiri et al.[10] Again a study by Bharathy and Gunaseelan[11] revealed that the majority of the bite victims belonged to age group of 11–20 years 21.49%. In the present study, it was noted that majority of the victims were males 398 (73.43%) and 144 (26.57%) females. Similar results were noted in studies done by Janatolmakan et al.,[12] This is because majority of the male victims remain outside for maximum time during a particular day for their livelihood and earning for their family, whereas females remain indoor for maximum time of the day as they are mainly involved in household activities.

In the current study, it was observed that majority of the bite victims reported to the hospital were due to dogs 470 (86.72%) followed by cats 23 (4.24%) followed by monkeys 20 (3.69%) which may be due to fact that majority of the animal to human interaction occur due to dogs followed by cats. The similar result were noted
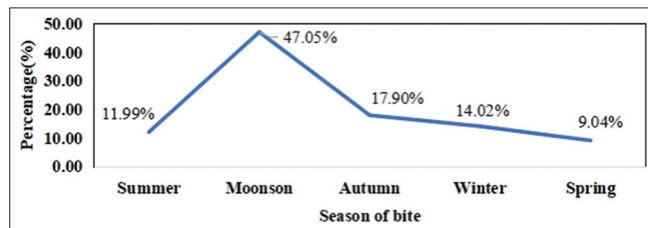
Table 3: Association of provocation status of bite with various factors among the victims. (n=542)				
Variables	**Unprovoked (n=421) n(%)**	**Provoked (n=121) n(%)**	**OR (at 95% CI); X²**	**p**
Age group (in yrs.)				
≤ 18 (n=148)	69 (16.39%)	79 (65.29%)	OR=0.10 (0.06-0.16)	0.001#
> 18 (n=394)	352 (83.61%)	42 (34.71%)	χ^2=113.219	
Gender				
Male (n=398)	303 (71.97%)	95 (78.51%)	OR=0.70 (0.43-1.14)	0.151
Female (n=144)	118 (28.03%)	26 (21.49%)	χ^2=2.061	
Education level				
School education* and Illiterates (n=409)				0.001#
School Education (n=340)	263 (86.80%)	77 (72.64%)	OR=2.47 (1.44-4.25) **	
Illiterate (n=69)	40 (13.20%)	29 (27.36%)	χ^2=11.222	
*Victims with education from primary to high school were considered as school education.				
Education level				
Graduation and above and school education (n=408)				
Graduation and above (n=68)	58 (18.07%)	10 (11.49%)	OR=1.69 (0.82-3.48) **	0.144
School education (n=340)	263 (81.93%)	77 (88.51%)	χ^2=2.13	
Education level				
Graduation and above and Illiterate (n=137)				
Graduation and above (n=68)	58 (59.18%)	10 (25.64%)	OR=4.20 (1.84-9.58) **	0.000 #
Illiterate (n=69)	40 (40.82%)	29 (74.36%)	χ^2=12.556	
Category of Wound				
Category I (n=34)	26 (6.18%)	8 (6.61%)	OR=0.92 (0.41-2.11)	0.861
Category II and III (n=508)	395 (93.82%)	113 (93.39%)	χ^2=0.03	

X₂: Chi-square test, OR: odds ratio, **OR>1: association present, #p value significant at *P*<0.05.

in studies done by Mishra and Bhandary[13] and Satapathy et al.,[14] Dissimilar result was noted in study by Jethani et al.,[1] where maximum victims reported due to dog-bites 93.66% followed by monkeys 2.4% (Figure 1). In this study, among dogs majority were due to stray dogs 275 (58.51%) which were similar to studies done by Khan et al.,[15] and Shivasakthimani et al.,[16] Dissimilar result was noted in study by Julka et al.,[17] where 70.5% were due to pet dog bite which may be due to difference in study participants as it was conducted among families owning pet dogs residing in high-end housing society of Delhi NCR, Faridabad.

In the present study, majority of the bites were of unprovoked type 421 (77.68%) which may be due to sense of understanding and act among the victims. This is similar to studies done by Khan et al.,[15] and Venkatesan et al.,[18] In this study, regarding vaccination status majority of the pet dogs were vaccinated 106 (54.36%) which may be due to proper awareness among the victims reported to the hospital. Dissimilar result was noted in study by Bharathy and Gunaseelan[11] where 33.59% of the dogs were vaccinated, 13.67% unvaccinated while 52.74% of victims did not knew the vaccination status. In this study, majority of the animal bites occurred during evening time 208 (38.38%) which may be due to the fact that animals at that particular time of day remain at starvation phase due to lack of food. Furthermore, majority of the victims return home from their workplace in exhausted or unconscious state. Similar results were noted in studies by Sreenivas et al.,[2] Dissimilar result was noted in study by Shivasakthimani et al.,[16] where majority of the bites occurred during night time, which may be due to inadequate illumination. It was observed that majority of the bites occurred at rural areas 275 (50.74%) which may be due to the fact that as it was a Tertiary care hospital, majority of the victims from rural areas were referred here for treatment. A similar result was noted by Satapathy et al.,[14] Dissimilar result was observed by Janatolmakan et al.,[12] where majority of bite victims were reported from urban areas which may be due to different study setting. In the present study, maximum of the bite site was noted at the lower limb, followed by upper limb and then at multiple sites of body, that is, 356 (65.68%), 145 (26.75%), and 33 (6.09%) respectively. In this study, 0.37% of the victims reported with trunk bite while 0.55% both for face and head region. This may be due to the fact that animals get the most common site to access, that is, legs/lower limbs during bite, while during defence hands were the common part utilized leading to the second most common site for bite while face, head and neck region becomes difficult for access by the animals. Similar results were noted in studies done by Mishra and Bhandary[13] and Shivasakthimani et al.[16] Dissimilar result was observed by Janatolmakan et al.,[12] where majority bite site was noted at the upper limb 49.5%

(Table 1). In the current study, majority of the victims reported with WHO Category-III wounds 346 (63.84%) followed by Category-II type 162 (29.89%). Again, study by Mishra and Bhandary[13] revealed that majority were of Category-II type of wound, that is, 70% followed by Category-III 30% (Table 2).

In the present maximum, bites were noted during monsoon season 255 (47.05%) with drastic fall during autumn and in winter with a minimum during spring season 49 (9.04%), which may be due to the fact of the increase in mating rate among animals during rainfall. This finding is similar to study by Alberghina et al.[19]

In the current study, the victims reported with unprovoked bite majority were adults 352 (83.61%), the result is found to have no association OR=0.10 (0.06–0.16), with highly significant at P=0.001. This may be due to differences in behavior pattern and attitude toward animals. Those victims reported with provoked bites majority had education of school level 77 (88.51%), the result is found to have an association present OR=2.47 (1.44–4.25) and highly significant at P=0.001. This may be due to fact of education level among the victims reported to the hospital. It was noted that the victims who reported bites due to provocation majority reported with Category II and III type of wounds 395 (93.82%), the result is found to have no association, OR=0.92 (0.41–2.11) and insignificant at P=0.861. This may be due to the change in the behavior pattern of animals due to any kind of stimuli leading to severe form of wound (Table 3).

The present study conducted in a tertiary care setting, so the results of this study cannot be generalized, as cases from primary, and secondary health care setups along with private sectors are missing in the study so a community-based study is required in near future.

Limitations of the study

The present study conducted in a tertiary care setting, so the results of this study cannot be generalized, as cases from primary, and secondary health care setups along with private sectors are missing in the study so a community-based study is required in near future.

CONCLUSION

This study concluded that majority of the animal bite victims reported were of adult males, unemployed, and maximum were bitten by stray dogs with unprovoked type of bite during evening time belonging to rural areas and suffered from Category-III type wound, most commonly during monsoons and on weekends due to breeding season and maximum outing among victims occur. The

victims reported with unprovoked type of bite majority were adults, while provoked type among children due to difference in behavioral pattern and attitude toward animals.

RECOMMENDATIONS

There should be proper display of Information Education Communication (IEC) charts/posters at healthcare facilities, community, and at public places such as bus stands, railway stations, and roadsides to increase awareness regarding Rabies. Animal birth control and Mass Vaccination Campaigns must be implemented for reduction in animal bite cases by the joint collaboration of animal welfare board and Veterinary Department under NRCP.

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Authors' Contribution:
ArM- Data collection, data analysis, statistical analysis, and interpretation, preparation of figures, manuscript preparation and submission; **AS-** Definition of intellectual content, literature survey, prepared first draft of manuscript and implementation of study protocol; **SP-** Concept, design, editing and manuscript revision; **AsM-** Coordination and manuscript revision.

Work attributed to:
Department of Community Medicine, Netaji Subhash Chandra Bose Medical College, Jabalpur, Madhya Pradesh, India.

Orcid ID:
Arindam Maiti - https://orcid.org/0000-0001-5722-8813
Arvind Sharma - https://orcid.org/0000-0003-4567-6920
Sunita Patel - https://orcid.org/0000-0001-9179-2768
Ashish Mishra - https://orcid.org/0009-0000-6793-0980