

A Study on the Characteristics of Animal Bites Reported at Immunisation Clinic of a Tertiary Care Centre in Thrissur District, Kerala

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Abstract

Background: Severe Context: Animal bites to humans are a public health problem, posing a potential threat of rabies. Rabies, once symptomatic, is almost universally fatal. Yet, deaths are preventable with timely provision of post-exposure prophylaxis.

Aims: To describe the characteristics of animal bites and to identify the delay between exposure and arrival at hospital among reported cases in three years.

Settings and Design: Record based study at a tertiary care centre in Thrissur, Kerala during 2019-2021.

Methods and Material: Details of the patients with history of animal bite were accessed from the records maintained at Immunisation Clinic.

Results: Among 164 victims, majority were males (55.5%). Cats (51.8%) were the most frequently involved animal followed by dogs (40.2%). 79.3% of animals were unvaccinated/with unknown vaccination status. Hands (37.2%) were the most common area involved in whole population and in children. More than half of the bites were category III (54.3%). 89% of victims reached hospital within 24 hours of exposure.

Discussion: There was no significant increase in number of cases in the three study years. The major involved animal was cat in this study, in contrast to various other studies. Increase in incidence of injuries in head and neck region and category III wounds in children was observed, which point towards severity of bite injuries in children. Although majority of victims reported to hospital without much delay, 11% of people failed to report on the first day, which demand the need of more public consciousness on animal bite and rabies.

Keywords: Animal bites; Rabies; Post exposure prophylaxis; Vaccination; Delay.

INTRODUCTION

Animal bites to humans are a public health problem; posing a potential threat of rabies to over 3.3 billion people worldwide.¹ These exposures occur mainly in the underserved populations, both in rural and urban areas and have been documented for more than 4000 years.² Most cases occur in Africa and Asia; where a close habitation of large human and

dog population is seen.³ In India, an estimated 17.4 million animal bites occur annually, with an incidence of 1.7%.⁴

Bite injuries range in severity from superficial abrasions, lacerations, and crush wounds to degloving injuries with major tissue loss, sometimes extending to the underlying bone.⁵ The more serious the bite wound is, the higher the probability of occurring adverse events is. The World Health Organization (WHO) classifies the bite wound into three categories according to its severity and recommends wound treatment and rabies vaccination for category II and category III exposures as well as rabies immunoglobulin administration for category III exposures.⁶

Factors that increase the risk of infection from an animal bite are: Bite in extremities with underlying

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venous and/or lymphatic compromise, bite involving the hand, bite near or in a prosthetic joint, cat bites, crush injuries, delayed presentation (greater than 6 to 12 hours for bites to the arm or leg and greater than 12 to 24 hours for bites to the face), puncture wounds and victim with diabetes mellitus or immunosuppression.⁷⁻⁹

Animal bite wounds are considered grossly contaminated; therefore, proper wound treatment is essential to prevent secondary infection. The affected skin surface should be cleansed, and the wound should be copiously irrigated with water, normal saline, or dilute povidone iodine solution, especially if the animal may be rabid.^{7,10,11}

Rabies is a fatal viral infection of mammals. The causative agents are members of the Lyssavirus genus, of which rabies virus (RABV) is the prototype.^{12,13} Domestic dogs cause over 95% of all estimated 59,000 human rabies deaths every year with the highest burden of disease in parts of Asia and Africa.¹⁴ Once symptomatic, it is almost universally fatal.¹⁵ Yet, deaths are preventable with timely provision of rabies post-exposure prophylaxis (PEP): wound treatment, rabies immunoglobulin (RIG), and vaccinations.¹⁶

OBJECTIVES

THE OBJECTIVES OF THIS STUDY ARE

- To describe the characteristics of animal bites reported at immunization clinic of a tertiary care centre in Thrissur district, Kerala during the time period January 2019 to December 2021.
- To identify the delay between exposure and arrival at emergency medicine department or immunization clinic for post exposure prophylaxis and treatment by the individuals reported during January 2019 to December 2021.

MATERIALS AND METHODS

Study Design: Record based study.

Study Setting: A tertiary care centre in Thrissur district, Kerala, India.

Study Subjects: Details of the patients who have reported to emergency department or Immunization Clinic with history of animal bite were accessed from the records maintained at Immunization Clinic.

Study Period: January 2019 to December 2021

Data collection: Data collection was started after obtaining clearance from the institutional research committee. Details of victims of animal bite incidents were obtained from the records maintained at Immunisation Clinic of the tertiary care centre in Thrissur district, Kerala.

Data Analysis: Data was entered into a computerized Excel (Microsoft Excel 2010) spread sheet. Categorical variables were expressed as proportions and quantitative variables were expressed as mean and standard deviation. Analysis of data was done using appropriate statistical software.

RESULTS

There were a total of 164 participants in the study. As shown in Table 1, out of the total 164 participants, 91(55.5%) were male and 73(44.5%) were female. According to year of incident, 53(32.3%) occurred in 2019, 54(32.9%) occurred in 2020 and 57(34.8%) occurred in the year 2021. Among the study participants, 52(31.7%) participants were belonging to age category below 18, 43(26.2%) were of age group 18-30 years, 52(31.7%) were between 31-60 years and 17(10.4%) were 61 years and above. The mean age of the study participants was 30.48 with a standard deviation of 20.62. The maximum age of the study participants was 85 and the minimum was 1. Median age was 25.

Table 2 shows characteristics of the animal involved in the bite. Out of the total 164 incidents reported, 85(51.8%) participants suffered from cat bite, 66(40.2%) involved dog as the culprit animal. Rests of the bites were caused by rat (3%), monkey (1.2%), bat (1.2%), rabbit (0.6%), bandicoot rat (0.6%) and squirrel (0.6%). Bite was suffered from an unknown animal in 1 case (0.6%). Among the animals, 91(57.2%) were domestic, 59(37.1%) were stray and 9(5.7%) were wild. Out of the total animals, 34(20.7%) were vaccinated, 100(61.0%) were not vaccinated and vaccination status of 30(18.3%) animals were unknown. Out of the total 164 cases, in 12(7.3%) of cases, there was a history of the same animal biting other people or animals. In 152(92.7%) there was no history of biting other people or the history was unknown. 105(64%) of the bites were provoked and 59(36%) of the bites were unprovoked.

Table 3 depicts the characteristic features of the bite. Based on the site of bite, out of the 164 cases, 61(37.2%) was on the hands. Legs were involved in 31(18.9%) cases; feet were involved in 30(18.3%) cases.

Table 1 : Characteristics of the study participants (n = 164)

| Variable | Category | Frequency (n) | Percentage (%) |
|---|----------------|---------------|----------------|
| Gender | Male | 91 | 55.5 |
| | Female | 73 | 44.5 |
| Year of the animal bite incident | 2019 | 53 | 32.3 |
| | 2020 | 54 | 32.9 |
| | 2021 | 57 | 34.8 |
| Age category | Below 18 years | 52 | 31.7 |
| | 18-30 years | 43 | 26.2 |
| | 31-60 years | 52 | 31.7 |
| | Above 61 years | 17 | 10.4 |

Table 2: Characteristics of the animal involved

| Variable | Category | Frequency (n) | Percentage (%) |
|--|----------------------------|---------------|----------------|
| Type of animal | Cat | 85 | 51.8 |
| | Dog | 66 | 40.2 |
| | Rat | 5 | 3 |
| | Monkey | 2 | 1.2 |
| | Bat | 2 | 1.2 |
| | Rabbit | 1 | 0.6 |
| | Bandicoot rat | 1 | 0.6 |
| | Squirrel | 1 | 0.6 |
| | Unknown animal | 1 | 0.6 |
| Nature of animal | Domestic | 91 | 57.2 |
| | Stray | 59 | 37.1 |
| | Wild | 9 | 5.7 |
| Vaccination status | Vaccinated | 34 | 20.7 |
| | Not vaccinated | 100 | 61 |
| | Unknown vaccination status | 30 | 18.3 |
| History of biting other people or animals | Yes | 12 | 7.3 |
| | No/ Unknown | 152 | 92.7 |
| Circumstance of the bite | Provoked | 59 | 36 |
| | Unprovoked | 105 | 64 |

Table 3: Characteristic features of bite injury

| Variable | Category | Frequency (n) | Percentage (%) |
|--------------------------------------|---------------|---------------|----------------|
| Site where bite injury was sustained | Head and neck | 10 | 6.1 |
| | Torso | 2 | 1.2 |
| | Arms | 2 | 1.2 |
| | Forearms | 18 | 11 |
| | Hands | 61 | 37.2 |
| | Thighs | 10 | 6.1 |
| | Legs | 31 | 18.9 |
| | Feet | 30 | 18.3 |
| Category of bite | Category I | 3 | 1.8 |
| | Category II | 72 | 43.9 |
| | Category III | 89 | 54.3 |

Forearms were injured in 18(11.0%) cases and thighs were injured in 10(6.1%) cases. In 10(6.1%) cases, head and neck were the site of injury. Bite injury was sustained on torso in 2(1.2%) of the cases and in the arms in 2(1.2%) of the cases. 89(54.3%) bites reported were of Category III, 72(43.9%) were category II and 3(1.8%) were category I.

Details of children (age less than 12 years) who sustained animal bite injury is shown in Table 4. Out of total 43 children reported, 28(65.1%) sustained cat

bite, 14(32.6%) sustained dog bite and 1(2.3%) suffered from monkey bite. Among the animals involved, 26(63.4%) were domestic, 14(34.1%) were stray and 1(2.4%) was wild. According to the category of bite, 27(62.8%) were category III, 15(34.9%) were category II and 1(2.3%) was category I. Based on the site where bite injury was sustained, 17(39.5%) were on hands, 11(25.6%) on feet, 5(11.6%) on legs, 4(9.3%) on head and neck, 3(7.0%) on thighs, 2(4.7%) on forearms and 1(2.3%) on torso.

Table 4: Details of children who sustained animal bite injury (n=43)

| Variable | Category | Frequency (n) | Percentage (%) |
|------------------|--------------|---------------|----------------|
| Type of animal | Cat | 28 | 65.1 |
| | Dog | 14 | 32.6 |
| | Monkey | 1 | 2.3 |
| Nature of animal | Domestic | 26 | 63.4 |
| | Stray | 14 | 34.1 |
| | Wild | 1 | 2.4 |
| Category of bite | Category I | 1 | 2.3 |
| | Category II | 15 | 34.9 |
| | Category III | 27 | 62.8 |

| Site where bite injury was sustained | | | |
|--------------------------------------|----|------|--|
| Head and neck | 4 | 9.3 | |
| Torso | 1 | 2.3 | |
| Forearms | 2 | 4.7 | |
| Hands | 17 | 39.5 | |
| Thighs | 3 | 7 | |
| Legs | 5 | 11.6 | |
| Feet | 11 | 25.6 | |

The time delay between animal bite and arrival at emergency department/immunisation clinic of the hospital is depicted in Table 5. Out of the total 164 study participants, 104 (63.4%) reached hospital within 12 hours of the incident, whereas 42 (25.6%) reached within 12 to 24 hours. 8 (4.9%) individuals reported within 24 to 48 hours. A delay of more than 48 hours occurred in 10 (6.1%) cases. Among

the 104 individuals who reported within 12 hours, a major portion (n=94; 90.3%) reported within 6 hours from the incident. The mean hours of delay from animal bite to reporting at hospital was 15.13 with a standard deviation of 28.703. Median hours of delay was 5. Delay in reporting to hospital after the bite incident ranged from 0.25 hours (15 minutes) to 212 hours (8 days and 20 hours).

Table 5: Delay (in hours) from animal bite incident and reporting at hospital

| (n= 164) | | | |
|--|--------------------|---------------|----------------|
| Variable | Category | Frequency (n) | Percentage (%) |
| Delay (in hours) from animal bite incident and reporting at hospital | Within 12 hours | 104 | 63.40% |
| | 12 to 24 hours | 42 | 25.60% |
| | 24 to 48 hours | 8 | 4.90% |
| | More than 48 hours | 10 | 6.10% |

DISCUSSION

Animal bites are an important cause of mortality throughout the world and they constitute a major health problem in India, especially Kerala in recent times. In a developing country like India, close inhabitation of humans and animals increase the incidence of animal bites. Therefore, the present study was designed to address the characteristics of animal bites reported at an immunization clinic of a tertiary care centre in Thrissur district, Kerala, India during the time period January 2019 - December 2021. The major topics discussed in the study were the characteristics of the animal involved in the bite incident, features of the bite, and the delay between exposure and arrival at the hospital for post exposure prophylaxis.

The results of this study show that the number of cases reported in the years 2019, 2020 and 2021

were almost similar with slight increment. In the present study, 55.5% of the affected individuals were male. This data is in agreement with a study done in five counties of Kenya during 2011-2016 period where 57% were males¹⁷ and another study in Sicily, Italy between 2012 and 2015 in which 53% were males¹⁸, although some other studies reported even higher incidence among males. The mean age of cases in Najafabad, Iran was 31.28 ± 15.34 and in Sicily, Italy was 34.8 ± 6.6 SD which is similar to this study.^{18,19} The incidence of animal exposure was 31.7% in individuals below 18 years and 57.9% belonged to age category 18-60 years. These results approximated the data by *Sahu* et al., who reported epidemiological characteristics of patients attending for rabies post exposure prophylaxis at Infectious disease hospital of Luck now, India.²⁰

In most of the studies done in other states of India and all over the world, the predominant

biting animals were dogs.¹⁹⁻²² The animals involved in the biting incidents in the present study were predominantly cats (51.8%) and then dogs (40.2%). This difference might be attributable to regional variations and inclusion of scratches in addition to bites in this study (according to WHO categorization⁶), since both are risk factors for development of rabies. Majority of the animals involved were domestic (57.2%) which is in correspondence with the study done by *Amiri* et al. in Najafabad, Iran.¹⁹ It is of most importance that 79.3% animals were unvaccinated/ with unknown vaccination status. A study done in Swat district, Pakistan showed that most of the bites (87.6%) were unprovoked which stands true in this study also.²³

Regarding the site of bite injury, hands were the most common area involved in overall population (37.2%) and in children aged less than 12 years (39.5%). This finding is similar to the studies done by *Sheikholeslami* et al. in Rafsanjan, Iran²² and *Wangoda* et al. in Kampala, Uganda.²⁴ Children below age of 12 had an increase in incidence of bite injuries to head and neck (9.3%) compared to adults (4.9%). The incidence of bite injury to head and neck area was even higher (29.4%) in children aged less than 5 years. Most of the bite injuries fell under category III (54.3%) followed by category II (43.9%) which corresponds to the study done by Bashir et al. in Kashmir.²⁵ Anyhow in children less than 12 years of age, the incidence of category III bites were even higher (62.8%). These findings point towards severity of bite injuries in children.

Another aspect of the present study was to determine the latency in visiting the emergency department or immunization clinic of the hospital for post exposure prophylaxis and treatment measures. The mean hours of delay in a study conducted by *Sheikholeslami* et al. in Rafsanjan, Iran was 15.1+29.8 hours, which is in close proximity to this study.²² Majority of victims (89%) reported within 24 hours of the incident including the 63.4% victims who reported within 12 hours post exposure. Similar findings were observed in the studies done in Lucknow of India and Najafabad of Iran.^{19,20} However the number of people reporting to hospital after 48 hours was higher (18.9%) in a study conducted in Swat, Pakistan compared to our study (6.1%).²³ Delay in reporting to hospital ranged from 15 minutes to over 8 days in this study. Still 11% of people failed to report on the first day, which demand the need of more public consciousness on animal bite and rabies. In order to decrease the latency, awareness campaigns along with the use of electronic media highlighting

the severity of disease and availability of highly effective vaccination should be emphasized upon.

Our study had some limitations as do most observational studies. As the current data were collected from patients visiting the tertiary care centre for PEP, cases of less severity and those with poor economic status that could have attended primary/Secondary health centres or private clinics and were not represented, attributing to some selection bias and hence, might not be generalized to other areas with varying health seeking behaviours.

CONCLUSION

In summary we found that the majority of bites occurred in males and the animal most commonly involved was cat. Increase in incidence of injuries in head and neck region and category III wounds was observed in children, which point towards severity of bite injuries in children. Since most of the animals were unvaccinated or with unknown vaccination status, the necessity and seriousness of vaccinating owned animals and controlling wandering owned and stray animals for disease control should be emphasized. Although majority of victims reported to hospital without much delay, more than one-tenth of people failed to report on the first day. In order to reduce the incidence of animal bites and the risk of contracting a fatal disease like rabies, health education about rabies and post exposure prophylaxis should be conducted.

REFERENCES

1. World Health Organization. Weekly epidemiological record. Rabies Vaccines: WHO position paper No. 16. Wkly Epidemiol Rec 2018;93:201-20.
2. Tarantola A. Four thousand years of concepts relating to rabies in animals and humans, its prevention and its cure. Trop Med Infect Dis 2017;2:e5.
3. Knobel DL, Cleaveland S, Coleman PG, Fèvre EM, Meltzer MI, Miranda ME, et al. Re-evaluating the burden of rabies in Africa and Asia. Bull World Health Organ 2005;83:360-8.
4. Sudarshan MK, Madhusudana SN, Mahendra BJ, Rao NS, Ashwath Narayana 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;11:29-35.
5. Rothe K, Tsokos M, Handrick W. Animal

- and human bite wounds. *Dtsch Arztebl Int.* 2015;112(25):433-442.
6. World Health Organization. WHO guide for rabies pre and post exposure prophylaxis in humans. 2010.
 7. Morgan M, Palmer J. Dog bites. *BMJ.* 2007;334(7590):413-417.
 8. Fleisher GR. The management of bite wounds. *N Engl J Med.* 1999;340(2):138-140.
 9. Stevens DL, Bisno AL, Chambers HF, et al; Infectious Diseases Society of America; Practice guidelines for the diagnosis and management of skin and soft-tissue infections [published corrections appear in *Clin Infect Dis.* 2006;42(8):1219, and *Clin Infect Dis.* 2005;41(12):1830]. *Clin Infect Dis.* 2005;41(10):1373-1406.
 10. Centers for Disease Control and Prevention. Rabies. http://www.cdc.gov/rabies/medical_care/index.html. Accessed June 19, 2013.
 11. Oehler RL, Velez AP, Mizrachi M, Lamarche J, Gompf S. Bite-related and septic syndromes caused by cats and dogs [published correction appears in *Lancet Infect Dis.* 2009;9(9):536]. *Lancet Infect Dis.* 2009;9(7):439-447.
 12. World Health Organization. WHO expert consultation on rabies, third report. *World Health Organ Tech Rep Ser.* 2018;1012:195.
 13. OIE. Chapter 2.1.17, Rabies (Infection with Rabies virus and other Lyssaviruses) OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals.
 14. Hampson K, Coudeville L, Lembo T, Sambo M, Kieffer A, Attlan M, et al. Estimating the global burden of endemic canine rabies. *PLOS Negl Trop Dis.* 2015;9(4):e0003709 10.1371/journal.pntd.0003709.
 15. Rupprecht CE, Briggs D, Brown CM, et al; Centers for Disease Control and Prevention; Use of a reduced (4-dose) vaccine schedule for postexposure prophylaxis to prevent human rabies: recommendations of the Advisory Committee on Immunization Practices [published correction appears in *MMWR Recomm Rep.* 2010;59(16):493]. *MMWR Recomm Rep.* 2010;59(RR-2):1-9.
 16. World Health Organization., WHO Expert Consultation on Rabies. Second Report. World Health Organization technical report series. 2013;(982):1-139. Epub 2013/09/28.
 17. Ngugi JN, Maza AK, Omolo OJ, Obonyo M. Epidemiology and surveillance of human animal-bite injuries and rabies post-exposure prophylaxis, in selected counties in Kenya, 2011-2016. *BMC Public Health.* 2018 Aug 9;18(1):996.
 18. Alberghina D, Virga A, Buffa SP, Panzera M. Incidence and characteristics of hospitalizations after dog's bite injuries in Sicily (Italy) between 2012-2015. *Vet Ital.* 2017 Dec 29;53(4):315-20.
 19. Amiri S, Maleki Z, Nikbakht HA, Hassanipour S, Salehiniya H, Ghayour AR, et al. Epidemiological Patterns of Animal Bites in the Najafabad, Center of Iran (2012-2017). *Ann Glob Health.* 2020 Apr 7;86(1):38.
 20. Sahu KK, Manar MK, Singh SK, Singh H. Epidemiological characteristics of patients attending for rabies post-exposure prophylaxis at the infectious diseases hospital of lucknow, India. *J Glob Infect Dis.* 2015 Mar;7(1):30-2.
 21. Singh J, Jain DC, Bhatia R, Ichhpujani RL, Harit AK, Panda RC, et al. Epidemiological characteristics of rabies in Delhi and surrounding areas, 1998. *Indian Pediatr.* 2001 Dec;38(12):1354-60.
 22. Sheikholeslami NZ, Rezaeian M, Salem Z. Epidemiology of animal bites in Rafsanjan, southeast of Islamic Republic of Iran, 2003-05. *East Mediterr Health J Rev Sante Mediterr Orient Al-Majallah Al-Sihhiyah Li-Sharq Al-Mutawassit.* 2009 Apr;15(2):455-7.
 23. Munibullah, Habibullah, Rashid HB, Mushtaq MH, Sadiq S, Hasan S, et al. Incidence of Animal-Bite Injuries Registered in Public Hospitals of Post-Conflict Swat District, Pakistan in 2014. *Am J Trop Med Hyg.* 2021 Jan;104(1):329-37.
 24. Wangoda R, Nakibuuka J, Nyangoma E, Kizito S, Angida T. Animal bite injuries in the accident and emergency unit at Mulago Hospital in Kampala, Uganda. *Pan Afr Med J.* 2019;33:112.
 25. Bashir K, Haq I, Khan SMS, Qurieshi MA. One-year descriptive analysis of patients treated at an anti-rabies clinic-A retrospective study from Kashmir. *PLoS Negl Trop Dis.* 2020 Aug;14(8):e0007477.

