Epidemiological Mapping of Dog Bite Cases Reporting To Anti-Rabies Vaccination Out-Patient Unit of A Tertiary Care Hospital

Saurabha US[1], Ravindra S Kembhavi[2]

Author's Affiliation:
[1]Consultant Epidemiologist, IDSP, NCDC, Delhi; [2]Professor, Department of Community Medicine, Seth GS Medical College & KEM Hospital, Mumbai

Correspondence
Dr. Saurabha U S
us.saurabha@gmail.com

ABSTRACT

Context: Rabies remains a public health challenge in many parts of the world with over 90% of human rabies cases worldwide attributed to dog bites. In India the annual incidence of dog bite is 1.9%. The study was conducted to analyse the distribution of dog bite cases as per time, place and person.

Methodology: A cross-sectional study was conducted between Jan-2016 and Dec- 2017. A total of 228 victims of dog bite were interviewed. They were selected using systematic random sampling technique. Data was analysed using SPSS. Spot maps were prepared.

Results: The proportion of adults being bitten by dog was more than that of children. Most of the bites occurred after evening hours. There was similarity in the place of residence and place of occurrence of bite in 81% of the cases. A statistically significant association was seen between the type of occupation and place of occurrence of dog bite.

Conclusion: Epidemiological mapping of dog bite cases gives more insight to understand the problem and aids in planning control measures against occurrence dog bite. Most dog bites occurred at hours when the man dog interaction was highest. The individuals working in outdoor type of occupation are at high risk for dog bite.

Key words: Dog bite, epidemiological mapping, animal bite, ARV, neglected tropical disease.

INTRODUCTION

The close association between humans and domesticated dogs began atleast 12,000 years ago. Since then, people have been intimately involved in domesticating the wild dog into hunter, guard and companion. However, the domesticated dog retains many of its wild instincts, including behaviours that all too often lead to human attacks. Only now, however, are we beginning to gain a full understanding of the impact of dog bites on populations.[1] The domestic dog plays a pivotal role in rabies transmission. Domestic dogs are not only a part of our daily lives but also our immediate surroundings. This is important as it increases the interactions at animal-human interface and thus the likelihood of contracting zoonotic diseases.[2]

Rabies a neglected tropical disease is a preventable viral disease transmitted to humans through the bite of infected dogs that is invariably fatal once symptoms develop.[3] Rabies remains a public health challenge in many parts of the world with over 90% of human rabies cases worldwide attributed to dog bites. The Asian and African regions are over represented with their burden of human rabies, accounting for more than 95% of global deaths.[4] India is endemic for rabies accounting for 36% of the world's rabies deaths. The true burden of rabies in India is unknown, as per available in-

formation, it causes 18,000-20,000 deaths every year. [5] In India the annual incidence of dog bite is 1.9%.[6]

The commitment required to solve the problem of dog bite was lacking until recently. One of the reasons the disease has been neglected is because deaths are scattered and never amount to the kind of crisis that get epidemic top billing. India shares borders with six countries that are all rabies endemic, hence it is essential that India's rabies control efforts are co-ordinated regionally.

With the increase in the number of animal activists and non- governmental organization for the protection of animal rights, the management of this problem is not possible with a single strategy. The country has moved from Millennium Development Goals to Sustainable Development Goals, created a new national health policy for achieving universal health coverage, affordable health care and development of a sustainable environment, yet the issue of animal bite or dog bite is not addressed adequately in any of these. Only in the 12th five year plan was a national rabies control programme started.[7] There is a need to develop newer strategies for the control of dog bite

This study was conducted keeping in mind the problems faced by policy makers for control of dog bite and animal activist trying to protect the animal rights. In order to have a consolidated action plan for the proper management of dog bite cases it is was felt that epidemiological mapping of dog bite cases can help. This study was thus taken up with the main objective to analyse the distribution of dog bite cases as per time, place and person.

METHODOLOGY

A descriptive cross sectional observational study was conducted in Anti Rabies Vaccine (ARV) out-patient unit of a teaching medical college in a metropolitan city. The ARV OPD caters to all animal bite victims; it is functional on all working days in the afternoon. The study was conducted for 24 months (January 2016 to December 2017). This includes planning of the study, setting up of protocol, getting necessary approvals, data collection, analysis of data and data interpretation. Patients attending the ARV OPD for vaccination following dog bite were the study participants. The formula for calculation of sample size for a cross-sectional study with infinite population {$n=4pqN/e^2(N-1)+4pq$} was used, N was the cases reported to ARV OPD annually, p- proportion of stray dog bites, 63% taken from a study conducted previously by M K Sudarshan et al; e- was taken as 10% of p. [8] On final calculation, the sample size was estimated to be **228**.

Inclusion criteria- All individuals attending the ARV OPD following dog bite and coming in contact with the interviewer for the first time.

Exclusion criteria- Individuals coming for subsequent doses of ARV and cases of animal bites other than dog bite. Systematic random sampling was the sampling technique adopted. All cases present on a particular day were arbitrarily numbered. Every alternative case was considered for this study. The first case was decided based on lottery method. Data was collected at the ARV out-patient unit, participants were included in study based on inclusion criteria; interview schedule was used for data collection; purpose of the study was explained using informed consent document/assent document and it was used for obtaining written consent from the participants.

Data analysis- Data obtained was entered in Microsoft Excel and was analysed using SPSS. Descriptive and analytical test like mean, median, mode, proportion and chi-square tests were used were ever appropriate. Mumbai- a metropolitan city where the study was conducted has been divided into 24 wards for administrative purposes and is named alphabetically. Mumbai city includes wards A, B,C , D, E , F/S, F/N, G/S and G/N. Western suburb includes wards H/W, H/E, K/E,K/W, P/N, P/S, R/S, R/C and R/N. Eastern suburb includes wards L, M/E, M/W, N, S and T.[6] This knowledge of wards and its division was used for the purpose of preparing spot maps. 'Other' was used in classifying the place when the residence / bite occurred outside Mumbai. To ensure comprehensive reporting of findings STROBE checklist was used.[9]

Ethics approval- Ethical clearance was obtained from the Institutional Ethic Committee of Seth GS Medical College and KEM Hospital. The reference number of the Ethics Committee approval letter is EC/16/2016 dt. 7th May, 2016. All participants were informed about the purpose of the study and their right whether to choose to participate or not in the study. A written informed consent was obtained from all participants. In case the participant was less than 18 years, assent document was used. All the participants were assured that privacy and confidentiality will be maintained and information being collected will be used only for research purpose.

RESULTS

The time, place and person distribution of a total of 228 dog bite victims attending the ARV OPD of a medical college was analysed.

In our study 18 % of the participants were below the age of 12 years and the remaining 82% were

adults above age of 12 years. Majority of the participants were male (83.3%) the female accounted for the remainder 16.7% of the study participants. The proportion of bites by stray dog (75.9%) was higher when compared with that of pet dog. Large proportion victims of dog bite in our study suffered category 2 bites (66.2%) and category 3 bites were seen in 14.5% of the cases. The type occupation of most of participants of our study was indoor jobs (40.85%). (Table 1)

The participants in our study belonged to Mumbai (Eastern suburb, Western suburb and Mumbai city) and few from outside of Mumbai. The maximum number of participants reporting to our study site was residing in Mumbai city (80.7%). Maximum bite reporting to our study site was those that occurred in Mumbai city (79.8%). In 81% of the cases, it was observed that there was similarity between the place of residence and place of occurrence of dog bite. It was observed that in most cases the bite occurred in or near the residence of the victim (58.3%) and in 22.8% of the bites occurred while the victim was in transit. (Table 2)

The dog bites occur throughout the day with maximum bites occurring at night, between 8:00pm and 12 midnight (25.9%), closely followed by evening hours between 4:00pm and 8:00 pm (23.7%). The least proportion of bites occurred between late night hours 12 midnight and 4:00 am (4.8%). A detailed analysis of the category 3 bites revealed most bites occurred in the evening hours, majority of the victims reported to the health facility within 24 hours of the bite, most of these bites occurred in the wards of Mumbai city (E, FS, FN, GS and HE). (Figure 1)

A statistically significant association was seen between age group and time of incidence. After the evening hours the bites were higher among children and adults. It was also observed that there was a statistically significant association between age group and place of occurrence of dog bite, children were most often bitten near their residence, and adults near residence as well as while they were in transit. There was no association seen between sex of the victim and the place of occurrence of dog bite. A statistically significant association was seen between the type of dog and place of occurrence, most of the stray dog bites occurred when the victim of bite was in transit. A statistically significant association was seen between the occupation of the victim of dog bite and the place of occurrence of dog bite; most of the participants engaged in outdoor occupations were bitten while they were in transit. (Table 3)

Table 1: Profile of victims of dog bite

Variable	Participants (n=228) (%)
Age group	
Child (<12 years)	41 (18)
Adult	187 (82)
Sex	
Male	190 (83.3)
Female	38 (16.7)
Type of dog	
Stray	173 (75.9)
Pet	55 (24.1)
Category of bite	
Category I	44 (19.3)
Category II	151 (66.2)
Category III	33 (14.5)
Type of occupation	
Indoor job	93 (40.8)
Outdoor job	71 (31.1)
Student	64 (28.1)

Table 2: Place of occurrence of dog bite

Place	Participants (n=228) (%)
Residence	133 (58.3)
Transit	52 (22.8)
Work place	19 (8.3)
Others	24 (10.5)

Table 3: Determinants of dog bite

| Variables	Place of occurrence of event (%)					P value
	Residence	Transit	Work place	Other	Total	
Age group						
Child	33 (80.5)	0 (0)	0 (0)	8 (19.5)	41 (18.0)	<0.001*
Adult	100 (53.5)	52 (27.8)	15 (8.0)	20 (10.7)	187 (82.0)	
Total	133 (58.3)	52 (22.8)	15 (6.6)	28 (12.3)	228 (100.0)	
Type of dog						
Pet	44 (80.0)	6 (10.9)	2 (3.6)	3 (5.5)	55 (24.1)	0.003*
Stray	89 (51.4)	46 (26.6)	13 (7.5)	25 (14.5)	173 (75.9)	
Total	133 (58.3)	52 (22.8)	15 (6.6)	28 (12.3)	228 (100.0)	
Occupation type						
Indoor job	52 (55.9)	21 (22.6)	8 (8.6)	12 (12.9)	93 (40.8)	0.005*
Outdoor job	34 (47.9)	25 (35.2)	6 (8.5)	6 (8.5)	71 (31.1)	
Student	47 (73.4)	6 (9.4)	1 (1.6)	10 (15.6)	64 (28.1)	
Total	133 (58.3)	52 (22.8)	15 (6.6)	28 (12.3)	228 (100.0)	

*Statistically significant
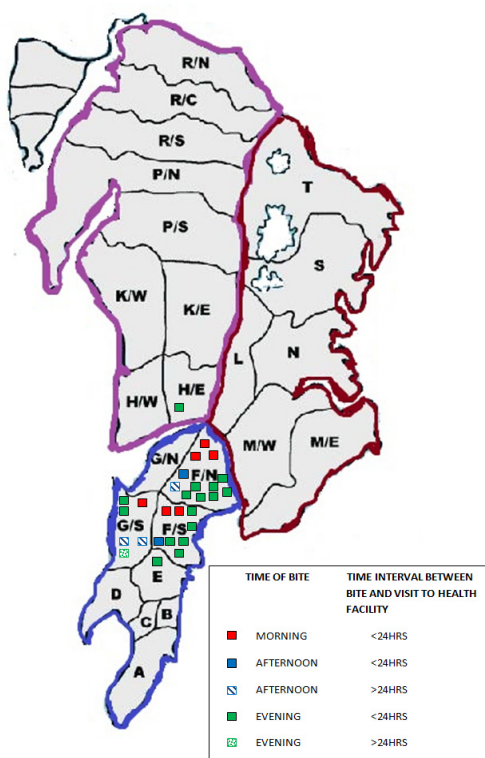
Figure 1: Spot map showing category 3 bites according to time, place and time interval to reach health facility. (Epidemiological map)

Source of outline map: IDSP Control Room, Dept of Community Medicine, Seth GSMC & KEMH

DISCUSSION

The present study was conducted on 228 dog bite victims attending ARV OPD of a tertiary care hospital in a metropolitan city. The epidemiological mapping as per time, place and person was done.

Majority of the participants of our study were above the age of 12 years, these findings are nearly similar to the finding reported by Vijayan C et al in their study where in 35.50%, 28.61%, 24.00% and 11.89% of cases belonged to middle age, old age, children and teenagers, respectively. Whereas, a study conducted by Sangamesh B Tondare et al reports otherwise, maximum participants belonged to the age group 1-10 years. The age group distribution helps in understanding the morbidity profile as well as economic implications of the morbidity on the society. [10] [11]

Most of the participants reporting to our site were residing in Mumbai city proper, similar was the case with locality where the bite occurred. This could be because of the proximity of the study site (which is also located in Mumbai city proper) to their place of residence or the locality where the event occurred. It was also observed that for a large proportion of the cases there was similarity in locality where the bite occurred and the residence of the participant; this observation can imply that the familiarity with the dog has very little or nil association with the occurrence of the dog bite.

More than half of the dog bites 58.3% of the bites occurred at or near the residence of the study participant, 22.8% of the bites occurred while the study participant was in transit. Harold B. Weiss et al conducted a survey in the Emergency Department in the United States of America in which it was reported that over half of the dog bite injuries (58%) occurred at home which is very much similar to our study. Dinah Seligsohn conducted a cross-sectional study in which the most common location for dog bites was mentioned as domestic environment. [112]

The distribution of time of occurrence of dog bite revealed 25.9% of the bites occurred at night (8-12), 23.7% of the bite occurred in the evening, as the day progresses the number of bites also increase and the fall in the number is seen only late night, this is probably because of decreased man dog interaction during that hour. Farah Asad Mansuri et al conducted a cross sectional study in Karachi in which they reported that the most commonly reported time of injury was late evening and early morning which is similar to our study expect for the number of bites early morning reported in our study is 8.8% which is slightly lesser than the reference study. [6]

A statistically significant association was seen between age group and time of incidence 39% of the bites occurring in children occurred in the evening hours between 4pm and 8pm, this coincides with the play time of the children. Most adults (28.3%) were bitten at night, this the hour most are heading home from work. Farah Asad Mansuri et al conducted a study which reports the most common time of dog bite is late evening and early morning which is in coherence with our study. A study conducted by Karla Georges and Abiodun Adesiyun reports children were bitten mostly in the afternoon (59.9%) which is different from our study finding. [613]

The comparison of age group and place of occurrence of dog bite showed a statistically significant relationship between the two variables. Most children and adults in our study were bitten at or near their place of residence. The adults were also bitten while they were in transit i.e., travelling to work, walking towards bus station / railway station. A study conducted by Dinah Seligsohn reported the predominant situation of dog bite among children in was the domestic environment, these findings are in coherence with our study findings. [12]

The sex of the study participant and the place of occurrence of dog bite showed no statistically significant association. Even though most women in the study were homemakers the proportion of men and women being bitten in and near their residence were nearly equal.

The type of dog and the place of occurrence of dog bite showed a statistically significant association. Most of the dog bites wherein a pet dog was the biting animal occurred at or near the residence of the individual. A study conducted by Dinah Seligsohn reported that most of the dog bites by family occurred in domestic environment and the relative risk for this was 4.9 which was statistically significant.[12]

Comparison of occupation type with place of occurrence of dog bite showed a statistically significant association. Most of those involved in outdoor jobs were bitten while they were in transit than those who were in indoor jobs.

CONCLUSION

Based on the results of our study the outdoor workers should be identified as high-risk individuals for dog bite. A detailed spot map will help us exactly identify the locality where the incidence of dog bite is highest, this can knowledge can utilize to create dog free zones. This can be further achieved by linking with the Swaccha Bharat Mission so that there is no garbage in these areas, which tend attract dogs. Information, Education and Communication activities can be undertaken at all busy areas (near schools, railway stations, bus depots, gardens and at signals) signage's can be utilised for this purpose.

ACKNOWLEDGEMENT

REFERENCES

1. Weiss HB, Friedman DI, Coben JH, Friedman DI, Coben JH. Incidence of Dog Bite Injuries Treated in Emergency Departments. JAMA 1998;279:51–3.

2. Shah V, Bala D V, Thakker J, Dalal A, Shah U, Chauhan S, et al. Epidemiological determinants of animal bite cases attending the anti- rabies clinic at V S General Hospital , Ahmedabad. Healthline 2012;3:66–8.

3. World Health Organization. Neglected tropical diseases − Summary. Geneva:2016.

4. World Health Organization. Driving Progress Towards Rabies Elimination - Results of GAVI's Learning Agenda on rabies and new WHO position on rabies immunization. Geneva:2018.

5. World Health Organization. Regiional Office for South-East Asia. Rabies.New Delhi, India: 2018.

6. Asad Mansuri F, Muhammad Ashraf Jahangeer Al-Saani S, Ahmed Khan W, Islam N. Epidemiological features of dog bite and its awareness among victims: Report from Abbasi Shaheed Hospital Karachi. ASH KMDC 2016;21:88–93.

7. National Rabies Control Programme - National Health Portal Of India. Available at: https://www.nhp.gov.in/ national-rabies-control-programme_pg. Accessed on June 27, 2019.

8. Sudarshan MK, Mahendra BJ, Ashwath Narayan DH. A community survey of dog bites, anti-rabies treatment, rabies and dog population management in bangalore city. J Commun Dis 2001; 33(4): 245-51.

9. STROBE (Strengthening The Reporting of OBservational Studies in Epidemiology) Checklist. Availabe at: https:// www.elsevier.com/__data/promis_misc/ISSM_STROBE_C hecklist.pdf. Accessed on June 1, 2019

10. Vijayan C, Kumar A. Assessing the burden of human dog bite cases in Puducherry, India. Int J Curr Res 2016;8:40589–93.

11. Tondare SB, Tondare MB, Maka SS, Usturge SM, Tondare AB. Injuries due to dog bites : a cause of concern. Int Surg J 2016;3:1456–9.

12. Swedish University of Agricultural Sciences. Dog bite incidence and associated risk factors A cross-sectional study on school children in Tamil Nadu. Seligsohn D. 2014.

13. Georges K, Adesiyun A. An investigation into the prevalence of dog bites to primary school children in Trinidad. BMC Public Health 2008;8:1–7. doi:10.1186/1471-2458-8-85.