Original Article

Prevalence of Dog Bites in Rural and Urban Slums of Delhi: A Community-based Study

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Abstract

Background: Rabies is a fatal disease of the central nervous system caused by the bites of warm-blooded animals. One of the important methods of controlling rabies is by interventions to limit the number of dog bites, the most common source of transmission of rabies to humans in the community. Community-based data on dog bites are rare from India. **Aim:** The aim of this study is to determine the prevalence of dog bites and knowledge and practices relating to its management and prevention in an urban and a rural slum of North West Delhi, India.**Subjects and Methods:** A cross-sectional house to house survey of 500 households covering a population of 2887 individuals was conducted. The families were selected by systematic random sampling. A pretested and a prevalidated questionnaire was used. Chi-square test was applied for comparing proportions related to the categorical variables and *t*-test was used for comparing means. **Results:** The dog bite incidence rate for the study population for the last year was 25.2/1000 population with higher rates in urban (30.1/1000) than rural (19.6/1000) slum. Two-fifths of the dog bite patients did not wash the wound with soap and water. The practice of washing the wound with soap and water was significantly higher in urban than rural slum. One-fifth of the patients did not receive anti-rabies vaccine. There was lower coverage in rural than urban slum. A majority (79.0%) of the patients did not receive anti-rabies serum. **Conclusion:** A high prevalence of dog bites coupled with poor knowledge and dog bite management practices is a worrisome trend which policy makers should take into account to make India rabies free.

Keywords: Cross-sectional study, Dogs, Incidence, Rabies, Rabies vaccines, Slums

Introduction

Rabies, caused by bites of warm-blooded animals, is almost always fatal after the onset of clinical signs. The disease can efficiently be averted by avoiding contact with wild animals and postexposure prophylaxis (PEP).[1] Canine rabies causes approximately 59,000 human deaths globally, over 3.7 million disability-adjusted life years, and 8.6 billion USD economic losses annually.[2] Around 15 million animal bites requiring postexposure rabies prophylaxis, the majority by dogs, occur in India every year.[3]

There are little data on the incidence of animal bites from India. A study carried out a decade earlier had reported the national incidence of animal bites as 17.4/1000 population.[4] The World Health Organization (WHO) supports targets for elimination of human rabies transmitted by dogs in South-East Asia by 2020. In this region, a 5-year plan (2012–2016) aims to halve the currently estimated number of human rabies deaths in endemic countries.[5] Data regarding community-based estimates of dog bites are required to track progress of such

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measures but are lacking in India. The available studies on dog bites and rabies in India are mostly hospital-based, and limited to disease management.[6-8]

In this background, the present study aimed to determine the prevalence of dog bites in rural and urban slums of North West Delhi and assess the knowledge and management practices relating to dog bites and prevention of rabies.

Subjects and Methods

This cross-sectional community-based survey was conducted in one rural and one urban slum of North West Delhi between January and August 2014. The slums were from the rural and urban field practice areas of the Department of Community Medicine, Maulana Azad Medical College, Delhi. As the dog bite rate from Delhi in 2004[9] and from Tamil Nadu in 2014[10] were 25 and 80/1000 population per year, respectively, we did our sample size calculation based on the mid value of 50/1000 population. As the dog bite history of all the members in the selected households was being considered, a design effect 1.5 was used for reducing the clustering effect. Considering the incidence of dog bites as 50/1000 population per year, with a 20% relative error and design effect of 1.5, the sample size estimated was 2850. Considering the average family size as six, 475 households, rounded to 500 households, were to be surveyed. As the population was about 50,000 in each of the slums, 250 households were selected from each of the slums. Systematic random sampling was applied for selecting the houses: Starting from a randomly selected house, every 30th house was included in the study. If a house was found locked, the adjacent house was selected without disturbing the overall sampling procedure.

The head of the family was defined as the one who had the major say in household decision-making; or if she/he was not available, any other adult member of the family. The following data were collected:

- History of dog bite in the last year
- History of ever being bitten by a dog
- Management of all dog bites occurring in the last year
- Knowledge of management of dog bites
- Knowledge of prevention of rabies.

The first author collected the data by house to house survey using a pretested, structured and interviewer-administered schedule. The face and content validity of the questionnaire were established by revising the questionnaires following feedback from two experts in the field of rabies control. The respondents were not expected to be conversant with the terms "anti-rabies vaccine" (ARV) and "anti-rabies serum;" (ARS); therefore, they were asked about the site and the number of injections given. If the injection was administered at the site of the wound, we recorded it as ARS, and if it was administered over the deltoid, and the patient was called for repeated visits we recorded it as ARV. Verbal informed consent was obtained from all the study subjects. Confidentiality of the data was assured. Ethical clearance was obtained from the Ethics Committee of Maharishi Valmiki Hospital, Government of National Capital Territory of Delhi, India.

Statistical analysis

Data were entered into an MS Excel sheet and analyzed using SPSS version 17.0 (Chicago, IL, USA). In this paper, the data are presented in the form of proportions and mean (standard deviation [SD]). Odds ratio with 95% confidence interval (CI) was calculated to determine the statistical significance of the strength of the association.

Means were compared using independent *t*-test. Chi-square test was used to compare proportions. All tests were two-sided, and a $P < 0.05$ was considered statistically significant.

Results

A total of 2887 individuals (1427 from the rural slum and 1460 from the urban slum) were covered by surveying 500 households. The socioeconomic characteristics of the surveyed households are given in Table 1. Among those families with a pet dog (n = 23), the proportion of vaccinated dogs was 50% (5/10) and 38.5% (5/13) in rural and urban slums, respectively. Although 1.6 times higher for rural than urban slums, the odds ratio of the dogs being vaccinated was not significant (OR = 1.6, 95%CI: 0.302–8.489).

The total (urban and rural slum) dog bite rate for the last year was 25.2 per 1000 persons (95%CI: 20.2–31.7/1000) and

Table 1: Socioeconomic characteristics of the respondents surveyed

Socioeconomic characteristic	Rural slum *n* (%) (*n*=250)	Urban slum *n* (%) (*n*=250)	*P*
Total study population	1427	1460	
Years of schooling			
<5	107 (42.8)	77 (30.8)	<0.01
≥5	143 (57.2)	173 (69.2)	
Type of family[##]			
Nuclear	195 (78.0)	141 (56.4)	<0.001
Joint	55 (22.0)	109 (43.6)	
Religion			
Hindus/Sikhs	154 (62.0)	229 (91.6)	<0.001
Muslims	96 (38.0)	21 (8.4)	
Mean (SD) family income[#] (INR)	9130 (781)	9968 (401)	<0.001*
Mean (SD) number of family members[#]	6 (2)	6 (3)	0.99
Number of families with pet dog	10 (4.0)	13 (5.2)	0.26

Nuclear family is defined as a family with a married couple and their dependent children whereas a joint family consisted of members other than that defined by nuclear family, such as siblings of spouse, grandparents. *Significant at P<0.05, [##]Type of family has been divided into nuclear and joint. [#]Figures in parentheses in these rows indicate standard deviations. INR: Indian National Rupee, SD: Standard deviation

was lower in rural slum (19.6/1000, 95%CI: 14.2–29.4/1000) than urban slum (30.1 per 1000, 95%CI: 22.5–40.6/1000) but not statistically significant (P = 0.09). The mean (SD) age of persons with dog bites was 21.5 (16) years in urban, and 24 (14.6) years in rural slums. The proportion of people ever bitten by a dog was 68.5 per 1000 (95%CI: 56.6–82.6/1000) and 58.2 per 1000 (95%CI: 47.2–71.6/1000) in urban and rural slums, respectively (P = 0.26) with a total (urban and rural slum combined) rate of 63.4 per 1000 (95%CI: 55.1–72.9/1000). Among those ever bitten by a dog (n = 183), there was male preponderance (66.1%). Around two-fifths (42.1%, 77/183) of the dog bite cases did not wash the wound with soap and water, a practice significantly lower in rural (57.8%, 48/83) than urban (29.0%, 29/100) slum. Distribution of the participants who had ever been bitten by a dog, with respect to certain characteristics of the bite and their management practices to control rabies, is depicted in Table 2. Around one-fifth (38/183) of the dog bite cases did not receive ARV whereas ARS was not received by 71% (71/100) of the dog bite cases. Around one-fifth (40/183) of the respondents did not receive tetanus toxoid vaccination.

In all, 62.6% (313/500) of the respondents had heard of rabies, 66.4% (166/250) among the rural respondents and 58.8% (147/250) among the urban respondents; the difference was not statistically significant (P = 0.08) The distribution of knowledge regarding dog bite wound management to prevent rabies among those who had heard of rabies is shown in Table 3. Around four-fifths (259/313) of those who had ever heard of rabies did not know about that injections are required after dog bites. Out of those who knew that injections are given (n = 54), only 1.3% (4/54) knew about the ARV. Around one-fourth (87/313) of the participants viewed traditional methods as effective in preventing rabies.

Table 2: Distribution of the dog bite cases in rural and urban slum with respect to certain characteristics of the bite and their management practices to prevent rabies

Dog bite characteristics and management practices	Rural area (n=83) n (%)	Urban area (n=100) n (%)	Total (n=183) n (%)	P
Number of animal bites ever in life				
1	69 (83.1)	93 (93.0)	162 (88.5)	0.02[$]
2 or more	14 (16.9)	7 (7.0)	21 (11.5)	
Number of animal bites last year				
0	54 (65.1)	56 (56.0)	110 (60.1)	0.11
1 or more	29 (34.9)	44 (44.0)	73 (39.9)	
Bleeding at site during last bite				
Yes	63 (75.9)	80 (80.0)	143 (78.1)	0.25
No	20 (24.1)	20 (20.0)	40 (21.9)	
Site of bite[#]				
Lower limbs	70 (84.3)	84 (84.0)	154 (84.2)	0.40
Other site	16 (19.2)	21 (20.0)	37 (20.2)	
Washed the wound with soap and water				
Yes	35 (42.2)	71 (71.0)	106 (57.9)	<0.001[$]
No	48 (57.8)	29 (29.0)	77 (42.1)	
Did you receive ARV as a PEP?				
Yes	59 (71.1)	86 (86.0)	145 (79.2)	<0.01[$]
No	24 (28.9)	14 (4.0)	38 (20.8)	
Did you receive tetanus toxoid?				
Yes	57 (68.7)	86 (86)	143 (78.1)	<0.01[$]
No	26 (31.3)	14 (14.0)	40 (21.9)	
Did you receive injection at the site/RIG of wound?				
Yes	15 (18.1)	38 (38.0)	53 (29.0)	<0.001[$]
No/don't know	68 (81.9)	62 (62.0)	130 (71.0)	

[#]Multiple responses were allowed, hence the total does not add up to the number of bite cases, [$]Significant at P<0.05. ARV: Anti-rabies vaccine, PEP: Postexposure prophylaxis, RIG: Rabies immunoglobulin

Discussion

This cross-sectional, observational study conducted in an urban and a rural slum of Delhi attempts a deconstruction

Table 3: Knowledge regarding rabies and its prevention among those respondents aware of rabies in rural (n=166) and urban slum (n=147) of North West Delhi

Knowledge characteristics regarding rabies and its prevention	Rural slum (n=166) n (%)	Urban slum (n=147) n (%)	Total (n=313) n (%)	P
Is rabies fatal?				
Yes	80 (48.2)	102 (69.4)	182 (58.1)	<0.001*
No/do not know	86 (42.8)	45 (30.6)	131 (41.8)	
Animals transmitting rabies[#]				
Dog	164 (98.8)	85 (58.0)	249 (79.6)	<0.001*
Cat	73 (44.0)	62 (42.0)	135 (43.1)	0.37
Rat	34 (20.5)	21 (14.2)	55 (17.8)	0.08
Monkey	97 (58.4)	55 (37.8)	152 (48.6)	<0.001*
First step after dog bite				
Wash the wound with soap and water	71 (42.7)	17 (11.5)	88 (28.1)	<0.001*
Wash the wound with water only	4 (2.4)	6 (4.0)	10 (3.2)	0.20
Seek help of qualified professional	43 (25.9)	85 (58.0)	128 (40.9)	0.16
Traditional methods	48 (28.9)	39 (26.5)	87 (27.8)	0.32
Is rabies treatable?		22 (15.0)	139 (44.4)	
Yes	117 (70.5)	125	174 (55.6)	<0.001*
No/do not know	49 (29.5)	(85.0)		
Aware of injections given after dog bite				
Yes	29 (17.5)	25 (17.0)	54 (17.3)	0.46
No	137 (82.5)	122 (83.0)	259 (82.7)	
	n=29	n=25	n=54	
If yes, which one?[#]				
Anti-rabies vaccine	17 (58.6)	11 (44.0)	28 (8.9)	0.20
Antirabies serum	3 (10.3)	1 (4.0)	4 (1.3)	0.19
Tetanus injection	22 (75.8)	13 (52.0)	25 (8.0)	0.11

*Significant at P<0.05, [#]Multiple responses question

of the incidence of dog bites in the context of knowledge and practices regarding its management and prevention. The annual incidence of dog bites is much higher than that reported in another study (4/1000) conducted in 2005 in Delhi by Lai *et al*.[11] Dog bite incidence rates in our study were higher in comparison with WHO sponsored multicentric nationwide study (17/1000) conducted in 2003.[4] Highlighting the large disparities in dog bite incidence rates in different areas of the country, a study in 2003 by Agarvval and Reddaiah[12] in the adjoining state of Haryana reported findings similar to ours. Population density and dog density-based area mapping may be required to understand the issue of dog bite incidence. In high-burden areas, prioritization in rabies prevention and control efforts would be required.

Compared to data from other countries such as USA and Australia, the proportion of households keeping dogs as pets in our study was much lower.[13,14] This may be because these slums already have overcrowded houses due to their lower socioeconomic status where it is not possible to keep a pet dog. Scientific data from India regarding the prevalence of pet dog ownership and the reasons behind it are lacking.

A majority of the patients with animal bites were males in the current study. Other studies from India are consistent with the findings of our study.[11,12] As males are the main earners of the families, they are outside their homes for relatively longer periods and so have higher risk of exposure to stray dogs.

More than half of the patients with dog bite washed the wound with soap and water; this was significantly higher in urban compared to rural slum. This is higher than that reported by Lai *et al*. in 2005.[11] The difference may be due to the increased awareness and knowledge of the respondents as well as the health care providers, probably due to the various rabies-related Information, Education, and Communication campaigns run by the government and Municipal Corporations of Delhi. Because the urban–rural divide is clearly visible, it can be hypothesized that the IEC strategy needs a rethink for rural slums.

The postexposure prophylactic immunization rate among dog bite cases was high (79.2%), and it was found to be significantly higher in urban than rural slum. Access to anti-rabies clinics and awareness may be higher in urban slums. The data from Delhi in 2005 for ARV for PEP after dog bite cases were reported to be 32.5%, suggesting that there has been a rise in the proportion of dog bite cases receiving ARV as PEP.[11] Enhanced availability and access of these services in the general community may be responsible for this. Delhi Government Hospitals and some Municipal Corporation Dispensaries provide ARV and immunoglobulins free of cost to dog bite cases coming to their health centers. In recent days, there has been an increase in the IEC activities of the Delhi Government regarding prevention and control of rabies (personal observation). We hypothesize that the increase in the proportion of dog bite cases receiving ARV might be due to these factors. In spite of the increase in the proportion of dog bite cases receiving ARV, recent studies from India[15] and other countries[16] have reported another related issue: Delayed administration of PEP, which is another cause of concern, as delays can lead to the vaccines not being able to give full protection. In the present study, we did not study the duration between dog bite occurrence and giving the first dose of ARV.

Tetanus injection was received by a relatively large majority of the dog bite patients. The WHO guidelines state that no booster is needed if the last dose of the primary series, or of subsequent booster injections, is given <5 years in the past for dirty wounds or <10 years for clean wounds.[17]

Most of the dog bite patients from these slum areas do not have any record of past immunizations. It is recommended that in the absence of any available reliable history of tetanus toxoid vaccination, a booster dose should be given.[18]

Of those who knew about injections being given after dog bites, very few knew that it was an ARV. The education level of the respondents in the slums was poor, and even though they knew that injections are given after dog bites, they were not sure that they were specifically for protection against rabies.

Traditional methods were also considered effective by a large proportion of the respondents. These methods usually comprise faith healers, herbal remedies for local wound application, and so on. High prevalence of such methods has been reported in other studies as well.[19] Traditional methods lead to delay in seeking proper medical management of the dog bite wound.[20]

We recommend that both dog bite incidence and its management with respect to rabies prevention should be studied further. Both these factors taken together will help in identifying the priority geographical areas for rabies control and prevention policies.

Limitations of the study

This is a localized study, and its results should not be generalized beyond the slums in which it was conducted. The ever-bitten dog bite incidence rate may be an underestimate due to recall bias.

Conclusions

High prevalence of dog bites coupled with poor knowledge and dog bite management practices to control rabies is a worrisome trend which the policy makers working to make India rabies free should take into account.

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Conflicts of interest

There are no conflicts of interest.

References

1. WHO. World Survey of Rabies No. 32; 1996. Available from: https://www.extranet.who.int/iris/restricted/bitstream/10665/64429/1/WHO_EMC_ZDI_98.4.pdf. [Last cited on 2015 Apr 03].
2. 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:e0003709.
3. 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.
4. Sudarshan MK. Assessing burden of rabies in India. WHO sponsored national multi-centric rabies survey (May 2004). Assoc Prev Control Rabies India J 2004;6:44-5.
5. WHO Fact Sheet. Geneva: World Health Organization. Available from: http://www.who.int/mediacentre/factsheets/fs099/en/. [Last accessed on 2013 Nov 27].
6. Gogtay NJ, Nagpal A, Mallad A, Patel K, Stimpson SJ, Belur A, *et al.* Demographics of animal bite victims & management practices in a tertiary care institute in Mumbai, Maharashtra, India. Indian J Med Res 2014;139:459-62.
7. Ghosh A, Pal R. Profile of dog bite cases in an urban area of Kolkata, India. Natl J Community Med 2014;5:321-4.
8. Umrigar P, Parmar GB, Patel PB, Bansal RK. Epidemiology of animal bite cases attending municipal tertiary care centres in Surat city: A cross-sectional study. Natl J Community Med 2013;4:153-7.
9. Agarwal N, Reddajah VP. Epidemiology of dog bites: A community-based study in India. Trop Doct 2004;34:76-8.
10. Venkatesan M, Dongre AR, Kalaiselvan G. An epidemiological study of animal bites and envenomings in a rural district of Tamilnadu, India. Online J Health Allied Sci 2014;13:4. Available from: http://www.ojhas.org/issue52/2014-4-4.html. [Last cited on 2015 Sep 05].
11. Lai P, Rawat A, Sagar A, Tiwari KN. Prevalence of dog-bites in Delhi: Knowledge and practices of residents regarding prevention and control of rabies. Health Popul Perspect Issues 2005;28:50-7.
12. Agarvval N, Reddaiah VP. Knowledge, attitude and practice following dog bite: A community-based epidemiological study. Perspect Issues 2003;26:154-61.
13. The Humane Society of the United States. Pets by the Numbers: Pet Ownership Survey Data and the HSUS's Estimates on Pets Adopted from or Euthanized in U.S. Shelters in 2012, 2013. Available from: http://www.humanesociety.org/issues/pet_overpopulation/facts/pet_ownership_statistics.html. [Last accessed on 2015 Sep 04].
14. Australian Companion Animal Council Inc. Pet Ownership Statistics. Available from: http://www.acac.org.au/pet_care.html. [Last accessed on 2015 Sep 04].
15. Joseph J, Sangeetha N, Khan AM, Rajoura OP. Determinants of delay in initiating post-exposure prophylaxis for rabies prevention among animal bite cases: Hospital based study. Vaccine 2013;32:74-7.
16. Khazaei S, Rezaeian S, Soheylizad M, Gholamaliee B. Factors associated with delay in post-exposure prophylaxis in bitten people. Med J Islam Repub Iran 2014;28:158.
17. World Health Organization. Tetanus Vaccine. International Travel and Health. World Health Organization; October, 2015. Available from: http://www.who.int/ith/vaccines/tetanus/en/. [Last cited on 2015 Oct 29].
18. World Health Organization. Current WHO Guide for Rabies Pre and Post-Exposure Treatment in Humans; 2002. Available from: http://www.who.int/rabies/en/WHO_guide_rabies_pre_post_exp_treat_humans.pdf. [Last accessed on 2015 Sep 05].
19. Jain P, Jain G. Study of general awareness, attitude, behavior, and practice study on dog bites and its management in the context of prevention of rabies among the victims of dog bite attending the OPD services of CHC Muradnagar. J Family Med Prim Care 2014;3:355-8.
20. Salve H, Rizwan SA, Kant S, Rai SK, Kharya P, Kumar S. Pre-treatment practices among patients attending an Animal Bite Management clinic at a primary health centre in Haryana, North India. Trop Doct 2015;45:123-5.