

ORIGINAL ARTICLE

Epidemiology of animal bite reported at animal bite clinic during 2015-16 at a tertiary care centre of Himachal Pradesh.

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Abstract

Background: One health approach for rabies prevention in humans can be done only by targeting the animal source of the virus. Animal bite is the most common mode of transmission of virus to human being. **Objective:** to describe the epidemiology of animal bite among those attending the animal bite clinic of a tertiary care center of district Kangra, Himachal Pradesh. **Methods:** This hospital based descriptive study was carried out from March 2015 through February 2016 at Animal Bite Clinic of Department of Community Medicine, Dr. Rajendra Prasad Govt. Medical College, Tanda, Kangra, Himachal Pradesh. A pre-designed and pre-tested closed ended questionnaire was used. World Health Organization's category of animal bite was used to categorize the patients. **Results:** Males outnumbered females and around 30% were below 20 years of age followed by third decade. Majority of victims were students (31%) and in 61.1% the wound was localized in the lower extremities. Dog bite was reported in 86% cases. Stray animal bite resulted in 94.2% of category III bites. More than half of the victims were aware of local remedy to be done after bite and practiced it within 30 minutes of bite. **Conclusions:** Agent, host and environmental factor of animal bite studied in this study indicate that vaccination of animal, abolishing environment favorable for stray animals and awareness of early management of animal bite cases can lead to goal of elimination of rabies.

Keywords

Rabies; Dog bite; Prevention

Introduction

Rabies is a zoonotic disease which is still of low public health importance in India. It is a viral infectious

disease and always hundred percent fatal after onset. The dog is the main reservoir of rabies in India.(1) Rabies is transmitted to humans and other animals, through the saliva of infected animals and

in rare cases it can also be transmitted via organ transplantation.(2)

The million Deaths Study by verbal autopsy suggested that 12,700 deaths were due to furious type of rabies in India in 2005.(3) As per the survey of Association for Preventive and Control of Rabies in India (APCRI) from 1992-2001 from hospital data the majority of human deaths due to rabies occurred in adults and those belonging to low income group. (4) Approximate cost due to dog mediated rabies was calculated annually to be US\$ 8.6 billion and it varies by region.

Animal bite prevention, immunizing the pets and early management is the only measure to prevent occurrence of this fatal disease. India targets to make it rabies free by 2020 through "National Rabies Elimination Programme". (4) Animal bite and disease surveillance, reporting and coordinated efforts by veterinarians, health professionals and other sectors are the initial steps towards rabies free India.(5)

Aims & Objectives

To describe the epidemiology of animal bite among those attending the animal bite clinic of a tertiary care center of district Kangra, Himachal Pradesh.

Material & Methods

Study Design, setting and duration: This hospital based descriptive study was carried out from 1st March 2015 through 29th Feb 2016 at Animal Bite Clinic of Department of Community Medicine, Dr. Rajendra Prasad Govt. Medical College, Tanda, Kangra, Himachal Pradesh. Himachal Pradesh is the state in north India in the Himalayan region with diverse flora and fauna. Agriculture is the major occupation in the area. Urbanization and deforestation on the other hand is also increasing. Thus, human beings in this area are easily predisposed to both domestic and wild animals bite. The tertiary center caters to patients from district Kangra and neighboring districts Hamirpur, Chamba and Una.

Study Participants: All those who reported to animal bite clinic in department of community medicine between 9 am to 5 pm were reached to participate in the study and those who were not willing to participate were excluded from the study irrespective of age and sex. Also, those were excluded from the study who reported to emergency department during off time. A total of 246 patients were included in the study.

Ethical considerations: Investigators were aware of the ethics in biomedical research policy of ICMR (2006) and declaration of Helsinki revised in 2002. The ethical clearance was sought from the institute (Dr. RPGMC, Kangra at Tanda, H.P.) ethical committee for biomedical research. Keeping in view written informed consent of all participants were obtained before gathering any information. The information collected is kept strictly confidential and individual identity is not be disclosed under any circumstances. The study involves no risk to the subject and involves no financial burden. Result of the study is only be used for academic purposes and for framing recommendations for the improvement in services and for no other purpose.

Study tool and Data Collection: A closed ended questionnaire was prepared and pretested among twenty cases. Later on necessary changes were made and it was divided into four parts. First part contained questions regarding demographic profile of cases and second part had information related to time of bite, place of bite, type of animal and site of bite. In third and fourth part, questions related to type of exposure, remedies given before reaching animal bite clinic and at the animal bite clinic were put forward. Data was collected by the co-authors and the principal investigator depending on whosoever was on duty at animal bite clinic. Once the patient was stabilized and treatment was started; then only the details of questionnaire were filled. The WHO criteria was used to classify the wound after bite.(6) Data collected in questionnaire was coded and entered to Microsoft office excel sheets and data was stored in the personal computer of principal investigator.

Data Analysis: Data stored in excel sheets were verified for any missing or wrong entries and then 244 entries were finally analyzed by using Epi Info 7. Results were obtained and continuous variables were summarized as means and SD, whereas categorical variables in the form of proportions and represented in the form of tables and figures. Chi square test was applied to test significance difference between proportions. Level of significance was set at 5%.

Results

Demographic description of participants and distribution of WHO category of bites: As per the WHO classification 91.4% (223) of the reported cases were classified as Category III and 7.4% in Category

II. Mean age of the participant was 34.89 ± 3.9 yrs. Among 244 participants 167 (68.4 %) were males. When we grouped the participants as per their age we found that majority of (20.5%; 50) patients belonged to 31 to 40 years of age followed by 11 to 20 yrs of age (20.1%; 49). Majority (71.7%; 175) of the patients hailed from district Kangra, as this study unit was located in district Kangra of Himachal Pradesh. We also found that majority of the participants (76; 31.1 %) were students followed by (51; 20.9 %) house makers, 12.7% (31) were farmers and 5.7 % (14) were tourists. Majority belong to (46.7 %; 114) families whose monthly income was between 10,000 to 15,000 INR, 33.6% (82) belonged to 15,000 to 20,000 INR group, and only 3.7 % (9) belong to < 5000 INR group. [Table 1]

Characteristics of WHO bite categories: Majority reported the timings of bite (41.8%; 102) between 10 am to 4 pm and 33.2% (81) were bitten between 4 to 10 am. Almost half (48.4%; 118) participants were bitten between May to August. Results also show that 48.4% (118) were bitten at their home and 23.8% (58) in the market. Market bite resulted in 96.6% of category III bites.

Majority of times the culprit was dog (86.5 %; 211) and 10.7% cases by monkey. Among these animals 44.7% (109) were pets and 42.6 % (104) were stray animals. Stray animal bite resulted in maximum of category III bites (94.2%) as compared to wild animal bite (87.1%) ($p:0.24$). Out of all these animals only 43 (17.6 %) were vaccinated and 165 (67.6%) of the animal's vaccination status was unknown. Among the unknown vaccination status 92.1% resulted in category III bite and 7.9% in category II as compared to 86% and 7.0% (cat III and II respectively) among vaccinated animals. ($p:0.01$)

In 24.6% (60) of the cases bite was provoked, which resulted in category III bite (95%) as compared to 90.2% among unprovoked ones ($p:0.43$). It was also reported that 71.7 % (175) were alive, 11.1% (27) were killed by people around, and 4.1% (10) died by themselves. All those 27 killed were dogs. [Table 2]

When we tried to localize the bite we found that majority (61.1 %; 149) were bitten in lower extremities [Figure 1]. Only 31.6% (77) of the participants had single wound and rest had multiple wounds.

Local treatment of wound: When we enquired about any previous history of animal bite we found that only 7 participants had previous history of

animal bite irrespective of time. We also found that more than half (56.6 %; 138) used local remedies within 30 minutes of bite. Wound was washed with soap by 114 (46.7%), 28 (11.5 %) applied some kind of antiseptic only, 27 (11.1%) washed their wound with water only, 20 (8.2%) did nothing to their wound, 10% used red chilies, turmeric powder and some herbs. Rest of the cases used multiple local remedies.

Treatment given at Animal bite clinic: All patients who were bitten were asked to wash their wounds again at animal bite clinic. Majority of those who reported to clinic (91.4 %; 223) were given immunoglobulin. Only 0.8 % (2) participants had adverse reaction to test dose of immunoglobulin but they were also given Immunoglobulin under supervision.

Discussion

Man and animal interaction is dated back to Paleolithic era. Interaction is in form of domestic, farm use and pets. Human migration, change in farming practice, urbanization leading to deforestation predispose humans to wild and stray animals too. (7) These interactions sometimes lead to bite by animals to human beings. Considering animal bite as the disease the epidemiology of this bite can be studied in terms of the triad of agent, host and environment factors. Animal bite is the major source of transmission of rabies. The primary prevention of bite in the following section is focused on the three epidemiological factors.

Host factor: The human host factors susceptible for animal bite are studied in terms of age, sex, occupation, education and income. In our study the males outnumbered females and around 30% were below 20 years of age followed by third decade which was similar to other studies. (5,6,7,8,9,10,11) Men generally tend to be present outdoors for occupational and non-occupational activities hence are more predisposed. (8) Since younger age group presented in a large number it was obvious that majority will be students. Farmers and those with clerical jobs were next most affected. Tenzin *et al.*, in their study from tertiary centers of Bhutan also reported that school children were the most common victims of bite. (12) Probably it is the only group which comes out of their houses regularly. Suraweera *et al.*, in their analysis of deaths due to rabies due to animal bite reported majority of deaths among students and housewives. (9)

Lower extremities are the easy target for the animals as by reflex human beings use their limbs as a protective barrier from any attack. In our study 61.1% of the wound were localized in the lower extremities which is supported by Kishor M D *et al.*, from Gujarat who reported 64%(4) and 55.2% by Samanta M *et al.*, from north Bengal (10), 49.4% by Khazaei S *et al* from Iran(11) and 78% by Jain P *et al.*, from Lucknow.(13) A very high and low proportion of upper extremity bites were reported by Olaniran A *et al.*, from Nigeria (85%) and by Lyu C *et al.*, from California (35%) respectively.(14,15) Children usually tend to be bitten in and around head, neck and upper extremity due to short stature.

Agent factors: Dog was the perpetrator in majority cases that too pet dogs. In contrast Moumita S *et al.*, and Ghosh *et al.*, in their analysis reported majority of bites from stray animals.(10,16) Babazadeh T *et al.*, gave similar findings of majority of bites by pet dogs from Iran.(17) The setting of the current study and that from Iran was rural and Babazadeh *et al.*, mentioned that people did not keep the pet dogs at home.(17) The situation in our study was similar in the sense that the dogs are most of the times used as guard at the house, farm or with the sheep herds. Hence increase number of pet bites. However, the bites from stray animals resulted in large proportion of category III wounds as compare to other type of animals and similar results were observed in various studies. (4,11,14,18)

One health approach for rabies prevention in humans can be done only by targeting the animal source of the virus (for example, by vaccinating dogs).WHO recommends immunizing dogs as one of the measures to control rabies and in our study we found that only 17.6% animals were vaccinated and in more than two third cases status of vaccination was unknown. However this includes stray animals. Moumita S *et al.*, reported 1.7% dogs were vaccinated in their study (10) and 92.4% dogs' vaccination status was unknown. Irrespective of dog's vaccination status the bite victim is vaccinated in our country as the history of rabies vaccination in an animal is not always a guarantee that the biting animal is not rabid. (19) Provocation history was given in one fourth of bite cases; 95% of which resulted in Category III wound. It was also observed that 11.1% animals were killed by the patients' attendants, all of which were dogs. In contrast Moumita S *et al.*, in their study on rural children

reported 88.9% of the unprovoked cases (10) as well as similar results from a study by Lyu C *et al.*, conducted in California.(14)

Environmental factors: Morning and evening hours were the peak time for bite and that to from months of May to August in our study. Similar results were reported in a study where burden of bites by dogs and other animals were assessed by Lyu C *et al.*, in California(14) as well as another study by Khazaei S *et al.*(11) Sreenivas *et al.*, in their study from Bangalore reported majority of both adult and pediatric bite cases were observed in the month of May and October quoting the reason that majority of the children are being exposed to animals at the time of vacations. Probably because most of them remain outdoor, especially while playing. (20) Borkar *et al.*, in contrast reported the seasonal variation of animal bite cases from tribal area during the months of winter.(21) Analysis of three year record from Rajasthan also demonstrated that majority of cases were reported in winter and summer.(22) Majority of the participants in our study were bitten at or around their home. This was contradictory to expectations that students being a majority may be bitten at either market or outside their house which was presented by Lyu C *et al.* in their study.(14) In the current setting the peak biting months correspond to summer and rainy season in the valley and it has been observed that animals specially dogs remain aggressive during summer months and people tend to be more of outdoor during season either due to field or recreation activities. This predisposes them to bites. (23)

Secondary prevention: More than half (56.6%) of bite victims in the current study used local remedies within 30 minutes of bite out of which only 46.7% washed their wound with soap and water as per WHO recommendations. (5) Also around 10% of the patients used red chilies powder, turmeric powder and some herbs. This was in contrast to a study by Kishore MD *et al.*, from Gujarat which reported that 56.4% did nothing to their wound before reporting to health center. (4) The observational study on children attending tertiary center of North Bengal reported that in 66.67% cases toileting of wound was done prior to visit to animal bite clinic and around 10% applied various Ayurvedic formulations. (10) Majority of the participants reported or were referred to animal bite clinic within 6 to 8 hrs of bite for specialized opinion which in majority were category III bites and required passive immunization.

Equine immunoglobulin in the dose of 40 IU/Kg body weight was infiltrated around the wound and rest was given intramuscularly away from wound.(5) The results of the current study cannot be generalized as the animal bite clinic located in a tertiary care centre catered to patients who were referred for immunoglobulin i.e. for category III bites. Anti rabies vaccine is available at all peripheral health institutions of Himachal Pradesh but immunoglobulin is available at secondary and tertiary care centers.(4,10,11,13)

Conclusion

The demographic details in current study point towards children and people from low economic class being most affected by animal bite. Morning and evening hours; from May through August was the peak time for bite. Dog was the perpetrator in majority cases that to pet dogs. Less than half of the study population cleaned their wounds with soap and water. Preventive intervention should be planned keeping in mind these strata of society. Immunization of pets especially dogs as well as stray dogs still appeared to be the most feasible solution. Awareness among general public about animal bite is the key to early diagnosis and treatment approach.

Recommendation

Policy makers need to focus on public health laws where pet owners as well as local government bodies both are responsible and accountable for these animals. Easily available food in open dustbins of local markets as well as shelters especially during their breeding period for stray dogs needs to be eliminated. Mandatory sterilization of street dogs as well as monkeys by the concerned authorities to control their population burst is required immediately. For Secondary prevention ample provision of Anti Rabies Vaccine as well as immunoglobulin up to the Primary Health Centre level so the recommended treatment may be provided immediately without out of pocket expenditure even in the remotest of the areas. The awareness activities can be integrated with any of the national programmes (Reproductive and Child health). Co ordination with other sectors is must for example, schools to generate awareness, veterinary department for control of animal bite and sterilization drive, municipal corporation and Panchayati raj institutions to promote cleanliness drive to prevent stray animals.

Limitation of the study

The results based on observations from single centre that too a tertiary center represents only the tip of an iceberg. Hence category three bites were observed in majority as they approached the center for immunoglobulin administration. Multi centric observational analysis including all the tiers of health system will provide a better picture of the state.

Relevance of the study

Animal bite cases leading to rabies are still neglected in developing countries. Research is limited as the database on epidemiology of bites is small and majority from single centers. Through this study we look forward for initiation of animal bite registries.

Authors Contribution

All authors have contributed equally.

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Tables

TABLE 1 DEMOGRAPHIC DESCRIPTION OF PARTICIPANTS AND DISTRIBUTION OF WHO CATEGORY OF BITE (N=244)

	WHO Categories			Total	p value
	I N (%)	II N (%)	III N (%)	N (%)	
Total	3 (1.2)	18 (7.4)	223 (91.4)	244 (100)	
Sex					
Male	2 (1.2)	10 (6.0)	155 (92.8)	167 (100)	0.47
Female	1 (1.3)	8 (10.4)	68 (88.3)	77 (100)	
Age groups (years)					
≤10	1 (4.3)	1 (4.3)	21 (91.3)	23 (100)	0.70
11-20	0	6 (12.2)	43 (87.8)	49 (100)	
21-30	0	4 (11.4)	31 (88.6)	35 (100)	
31-40	1 (2)	4 (8)	45 (90)	50 (100)	
41-50	1 (3.8)	1 (3.8)	24 (92.3)	26 (100)	
51-60	0	2 (5.7)	33 (94.3)	35 (100)	
61-70	0	0	21 (100)	21(100)	
71 and older	0	0	5 (100)	5 (100)	
Occupation					
Agriculture	2 (6.5)	1 (3.2)	28(90.3)	31 (100)	0.30
Business	0	1 (5.6)	17 (94.4)	18 (100)	
Clerical job	0	2 (5.6)	34 (94.4)	36 (100)	
House maker	0	7 (13.7)	44 (86.3)	51 (100)	
Retired/ Pensioner	0	0	18 (100)	18 (100)	
Student	1(1.3)	6 (7.9)	69 (90.8)	76 (100)	
Labourer	0	1 (7.1)	13 (92.9)	14 (100)	
Income (INR)					
<5000	0	1 (11.1)	8 (88.9)	9 (100)	0.89
5000-10,000	0	1 (3.6)	27 (96.4)	28 (100)	
10,000-15,000	1	9 (7.9)	104 (91.2)	114 (100)	
15,000-20,000	2 (2.4)	7 (8.5)	73 (89.0)	82 (100)	
>20,000	0	0	11 (100)	11 (100)	

TABLE 2 CHARACTERISTICS OF WHO BITE CATEGORIES

	WHO Categories			Total	p value
	I	II	III		
Month of bite					
Jan-Apr	0	7 (11.5)	54 (88.5)	61 (100)	0.24
May-Aug	3 (2.5)	6 (5.1)	109 (92.4)	118 (100)	
Sep-Dec	0	5 (7.7)	60 (92.3)	65 (100)	
Rabies vaccine prophylaxis					
No	3 (1.3)	18 (7.6)	216 (91.1)	237 (100)	0.71
Yes	0	0	7 (100)	7 (100)	
Place of bite					
At home	1 (0.8)	11 (9.3)	106 (89.8)	118 (100)	0.65
Market	0	2 (3.4)	56 (96.6)	58 (100)	
Around their house	2 (3.5)	4 (7.0)	51 (89.5)	57 (100)	
Work Place	0	1 (12.5)	7 (87.5)	8 (100)	
Agriculture filed	0	0	3 (100)	3 (100)	
Animal species					
Dogs	3 (1.4)	14 (6.6)	194 (91.9)	211 (100)	0.99
Cat	0	0	2 (100)	2 (100)	
Monkey	0	4 (15.4)	22 (84.6)	26 (100)	
Rat	0	0	1 (100)	1 (100)	
Bear	0	0	2 (100)	2 (100)	
Cow	0	0	1 (100)	1 (100)	
Eagle	0	0	1 (100)	1 (100)	
Time of bite					
10 am-4 pm	1 (1.2)	7 (8.6)	73 (90.1)	81 (100)	0.92
4 pm-10 pm	1 (1.0)	6 (5.9)	95 (93.1)	102 (100)	
10 pm- 4am	1 (1.9)	5 (9.6)	46 (88.5)	52 (100)	
4 am- 10 am	0	0	9 (100)	9 (100)	
Animal was vaccinated					
Yes	3 (7.0)	3 (7.0)	37 (86.0)	43 (100)	0.01
No	0	2 (5.6)	34 (94.4)	36 (100)	
Unknown	0	13 (7.9)	152 (92.1)	165 (100)	
Provocation for bite					
Yes	0	3 (5)	57 (95)	60 (100)	0.43
No	3 (1.6)	15 (8.2)	166 (90.2)	184 (100)	
Type of animal					
Pet	3 (2.8)	8 (7.3)	98 (89.9)	109 (100)	0.24
Stray	0	6 (5.8)	98 (94.2)	104 (100)	
Wild	0	4 (12.9)	27 (87.1)	31 (100)	

Figures

FIGURE 1 SITE OF ANIMAL BITE

