Original Article

A cross-sectional study of awareness and practices regarding animal bites in rural community, North India

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Abstract

Introduction: Repeated epidemiological studies to monitor trends of knowledge and practices are needed to guide strategies to control rabies. We conducted a study to assess the current knowledge, attitudes, and practices in relation to animal bites in the rural area of north India. **Methods:** House to house survey to collect data on animal bites was conducted among 300 households (assuming awareness regarding animal bites to be 25%, precision 95%, and power of 80%) from the rural area of Punjab, north India. A pretested semi-structured questionnaire comprising of items that explored sociodemographic details (age, educational qualification, occupation, socioeconomic status (assessed through Udai Pareek scale), and awareness regarding rabies, knowledge about first aid, attitude, and practices regarding anti-rabies vaccination (ARV) was used. Detailed questions were asked to those who owned pets. **Results:** A total of 300 households were included in the analysis. Among all respondents, 30.4% (117) had an episode of animal bite in their family giving a bite incidence rate of 78/1000 population. Bites were more frequent in males (65.8%, $n = 77$). The commonest site of the bite was lower limb (65%) followed by upper limb (21.4%), and head and neck (5.1%). The participants said that bites by pet animals (47%) are more common than those by stray animals (35.9%), followed by wild animals (12.8%). Almost 91% of respondents told that they would prefer govt. hospital for the treatment. Class I bite was most common (88.9%) followed by class II (8.5%) and class III (1.7%). A lot of respondents (41.4%) did not know about the symptoms of rabies in humans. Only 17.5% knew the appropriate wound care. Inappropriate practices like applying chilly (48.8%), lime (13.1%), tying the limb above the wound (5.1%), and others were common. Only 15.5% washed their wound with soap and water. Most of those who were bitten received post-exposure prophylaxis (PEP) (80%). Most of the respondents (98.3%) had heard about ARV but didn't know about the site of injection. Almost everyone (99.35) said that no awareness camps/programs had been conducted in their villages/school/health center to date. **Conclusion:** There is a high incidence of animal bites in rural areas. Awareness regarding the need for rabies vaccine of animals and PEP after an animal bite is quite high and is practiced. However, there is a lack of awareness regarding the course of action to be followed when an animal does develop rabies. Traditional and inappropriate practices of wound management persist and need to be countered. Improving the availability of ARV and rabies immunoglobulin through the public health system may further augment the uptake of PEP and completion of treatment while at the same time reducing out of pocket expenditure and the overall economic cost of rabies. Solid waste management in rural areas along with oral ARV is likely to reduce the incidence of rabies in rural areas.

Keywords: Animal bite, rabies, rabies vaccine

Introduction

"Rabies" word is derived from the Latin word "*rabere,*" which means to be mad, to rage, or to rave.[1,2] Rabies is one of the oldest yet often neglected zoonotic diseases responsible for approximately 59,000 human deaths and 3.7 million disability-adjusted life-years annually worldwide despite the availability of an effective human and animal vaccine.[3,4] Rabies has 100% fatality, once clinical

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symptoms appear.[5] Rabies in the dog is considered the source of 99% of human infection and poses a potential threat to more than 3.3 billion people worldwide.[6] Infected saliva of a rabid animal through a bite is the predominant mode of rabies virus entry in the human. The consequences of the introduction of rabies virus are determined by a number of factors like location of the wound, severity of the wound, amount of virus inoculated, and current and previous status of immunization.[7] The incubation period is around 1 week -3 months but in some cases more than one year has also been reported.[8] Chances of developing rabies are higher if bitten on the head, upper limb, lower limb followed by trunk, without post-exposure prophylaxis (PEP).[3,9-11] The long incubation period provides a window for effective PEP. Prompt PEP is almost 100% effective in human rabies prevention.[12] Food and Agriculture Organization of the United Nations, World Organization for Animal Health (OIE), Global Alliance for Rabies Control (GARC), World Health Organization (WHO), and country partners have targeted human deaths from dog-transmitted rabies by 2030 which is in harmony with goal 3 of sustainable development goals to end epidemics of communicable diseases including neglected tropical diseases by 2030.[6,13]

Some countries have achieved rabies-free status by vigorous campaigns of elimination, though the disease still occurs in 150 countries and territories.[13] The disease persists as it affects mostly rural population where the cause of death is often incorrectly or not recorded at all; surveillance system for human and animal rabies is weak and as a result, sufficient well-organized measures to prevent human and animal rabies are not undertaken. The vast majority of the estimated 59,000 deaths caused by rabies each year occur in rural areas of Asia and Africa[14] In India alone, 20,000 deaths are estimated to occur annually[15,16]

In the Indian context, deep-rooted cultural and religious beliefs connected with rabies, poorly functioning health and civil registration system, misplaced faith on traditional medicine systems and home remedies hinder the use of appropriate and timely medical interventions to prevent rabies[16-21] Also, a study in medical interns showed that they have poor knowledge about appropriate management of animal bites[22,23] Hence, a multipronged strategy based on evidence from studies on knowledge, attitudes, and practices regarding rabies epidemiology, animal control, surveillance, laboratory diagnosis, and medical interventions is needed to monitor prevention, control, and eliminate rabies. Also, rabies is a fatal disease and animal bite and exposure to animals is very common in rural areas. It is also preventable by timely medical intervention. However, documented associated myths, cultural rituals, lack of knowledge about first aid, and management act as barriers to timely action and make it crucial to monitor the knowledge, attitudes, and practices associated with rabies at primary care level and these can significantly contribute in policy and decision making.

We conducted an observational study with the objective to assess the level of awareness regarding animal bite (pertaining to rabies), first aid measures, follow-up measures, cultural beliefs, and knowledge, attitudes, and practices regarding anti-rabies vaccines (ARV), vaccination of pets and health services utilization in the rural community of Punjab, north India.

Material and Methods

A community-based cross-sectional study was conducted in the villages of rural field practice area located in district Fatehgarh Sahib of Punjab, north India. Punjab is a small state with a population of 30.8 million, literacy rate and sex ratio of 75.8% and 833/1000 males, respectively, as against the national average of 73.2% and 940/1000 males, respectively. About 64% of the population resides in rural areas, engaged mostly in agriculture. Economically, Punjab is better placed than many other states of India. Per capita GDP of Punjab is INR 1,53,461 as against the national per capita GDP of INR 1,42,719. Punjab also has better health indicators than some other states reflected in an infant mortality rate of 21/1000 live births as against the national average of 33/1000 live births.[24]

Three hundred households with 1,501 individuals were included in the study. The sample size of 300 households was arrived at by assuming a 25% prevalence of appropriate knowledge, 95% precision, and power of 80%. The study was conducted between April 2016 and June 2016. Data were collected through a pretested semi-structured questionnaire comprising items that explored sociodemographic details (age, educational qualification, occupation, socioeconomic status (assessed through the Udai Pareek scale), and awareness regarding rabies, knowledge about first aid, attitude, and practices regarding ARV. Detailed questions were asked to those who owned pets. The research team was accompanied by village health workers. The interview was conducted from one key member of the household from whom information about all members was collected.

The study was approved by the Institutional Ethics Committee of PGIMER Chandigarh (MK/2906/study/525). Written informed consent was obtained from all the participants.

Results

A total of 300 households were included in the study. The mean age of respondents was 41.37 years (±14.2). The mean family size was 5 (+1.7), of the respondents164 (55.2%) were females. Around 48.8% of respondents were educated up to middle class, 40.4% up to senior secondary and 10.8% were graduates and above. Most families (37.7%, $n = 112$) were farmers by profession followed by laborers (28.6% $n = 85$), 16.8% were self-employed, 10.1%were in service, 2% were into business, and 4.7% had other means of livelihood. Most (45.5%) belonged to the middle socioeconomic class, followed by upper-middle-class (33.3%), lower (11.1%), and 10.1% were in the upper class [Table 1]. 66% ($n = 197$) of the households had a domestic animal. Among them buffalo was predominant 62.4% ($n = 123$) followed by cow 26.4% ($n = 52$), dog 9.1% ($n = 18$), and goat 0.2% ($n = 4$). Most of the pet owners (95.9%, $n = 189$) get their pets vaccinated

against rabies. Most (94.9%) of them had visited a veterinary hospital for pet checkups during the previous 1 year [Table 2].

Among all respondents, 30.4% (117) had an episode of animal bite in their family in the past one year giving a bite incidence rate of 78/1000 population. Animal bites are more frequent in males (65.8%, $n = 77$). The commonest site of the bite was lower limb (65%) followed by upper limb (21.4%) and head and neck (5.1%). The most common animal involved in the bite was a dog (87.1%) and other bites (12.9%) were by squirrel, rat, cat etc., there were two cases of snakebite. The participants said that bites by pet animals (47%) are more common than those by stray animals (35.9%), followed by wild animals (12.8%). Most of those who were bitten received PEP from government hospitals (50.4%) followed by the private hospital (29.9%), household treatment only (9.5%), and 2.6% from a local doctor and 7.6% did nothing. Almost 91% of respondent told that they would prefer govt. hospital for the treatment. Among types of bite, class I bite was most common (88.9%) followed by class II (8.5%) and class III (1.7%) among the respondents [Table 3].

The majority (98.3%) of respondents knew that animals could get rabies. The majority of the respondents (77.1%) knew that rabid animals may have symptoms of drooling of saliva along with unprovoked biting, roaming and barking (11.1%), erratic behavior with a craving to eat anything (3.7%), and 8.1% didn't know about the symptoms. Most (46.7%) of the participants responded that they will consult a veterinary doctor if their pets become rabid, 26.4% were in favor of killing the animal, 18.3% said they would get the animal revaccinated, and 8.1% did not know what is to be done. Only a few respondents (15.2%) didn't know what disease can be caused by the animal bite and 13.1% of respondents didn't know that humans could also get rabies. A lot of respondents (41.4%) did not know about the symptoms of rabies in humans. About 31.1% knew that there could be frothing from mouth, 16.1% knew about madness, 11.1% knew about hydrophobia. Regarding wound care, only 17.5% of respondents knew the appropriate care. Inappropriate practices like applying chilly (48.8%), lime (13.1%), cleaning with water and soap (15.5%), tying the limb above the wound (5.1%) were common. Most of the respondents (98.3%) had heard about ARV but 18.2% didn't know about the site of injection. The abdomen was mentioned as the site of injection by 51.9% but only17.2% of respondents mentioned shoulder as a site of injection. Almost 60% knew that person could die due to rabies [Table 4]. Almost everyone (99.35) said that no awareness camps/programs had been conducted in their villages/school/health center to date.

Table 1: Sociodemographic profile

Sex	
Female	164 (55.2%)
Male	133 (44.8%)
Education	
Upto middle	145 (48.8%)
Middle to higher secondary	120(40.4%)
Graduate and above	33 (10.8%)
Occupation	
Agriculture	112 (37.7%)
Laborer	85 (28.6%)
Self-employed	50 (16.8%)
Service	30 (10.1%)
Business	6 (2%)
Others	14 (4.7%)
Socioeconomic status	
Lower	33 (11.1%)
Middle	135 (45.5%)
Upper	30 (10.1%)
Upper middle	99 (33.3%)

Table 2: Characteristics of pet owners

	Yes	No
Pet domestic animal	197 (66.3%)	100(33.7%)
Buffalo	123 (62.4%)	
Cow	52 (26.3%)	
Dog	18 (09.1%)	
Goat	4 (02.2%)	
Pet domestic animals received ARV	189 (63.6%)	8(2.7%)
Animal had veterinary check-up in last 1 year	187 (63%)	10(3.4%)

ARV: Anti-rabies vaccine

Discussion

This study includes data from 300 households residing in a rural area and engaged predominantly in agriculture. The mean age of respondents was 41.37 years which was not much different from another study in which the mean age was 35 years. In our study, 55.2% of respondents were females which are in contrast to the finding of a study done by Tiwari *et al.*[24] About 66% of the respondents had a domestic animal in their house. Among them, buffalo was predominant (62.4%) followed by a cow (26.4%), dog (9.1%), and goat which is similar to the findings of other studies done in a rural area.[24] Data show that most of the pet owners 95.9% ($n = 189$) get their pets vaccinated to prevent rabies. Most (95%) of the pet owners visited the veterinary hospital for pet checkups during the last 1 year.

This study showed a high level of awareness regarding risk and clinical signs and symptoms of rabies in animals which is in line with findings of studies from other developing countries but is much higher than that reported by earlier studies from India.[24-27] This may in part be due to improved literacy rate over the past decades and also with the increasing penetration of information and communication technology permitting faster information exchange. However, only about half of the respondents said they would seek advice from the veterinarians in case their animals/livestock develop rabies.

A significant proportion of respondents (41.4%) did not know about the symptoms of human rabies. Only 17.5% of respondents knew the appropriate method of wound care after an animal bite. Guidelines advocate wound toilets with

Table 3: Victims and their practices

	Yes	No
Incidence of animal bite	117 (30.4%)	180 (60.6%)
Sex of the victims		
Male	77 (65.8%)	
Female	40 (34.2%)	
Site of bite		
Lower limb	76 (64.9%)	
Upper limb	25 (21.4%)	
Head and neck	6 (05.1%)	
Multiple sites	1 (00.8%)	
other areas	9 (07.7%)	
Place of treatment after bite		
Govt. Hospital	59 (50.4%)	
Private	35 (29.9%)	
Household treatment	11 (09.5%)	
Local doctor	3 (02.6%)	
Nothing	9 (07.6%)	
Details of biting animal		
Dog	102 (87.1%)	
Squirrel	5 (42.7%)	
Rat	3 (2.6%)	
Cat	3 (2.6%)	
Not specified	4 (03.4%)	
Type of biting animal		
Domestic	55 (47%)	
Stray	42 (35.9%)	
Wild	15 (12.8%)	
Pet	5 (04.2%)	
Nature of animal bite		
Class I	105 (89.7%)	
Class II	10 (08.5%)	
Class III	2 (01.7%)	
Fate of animal after bite		
Alive	56 (47.8%)	
Killed	15 (12.8%)	
Died	6 (05.1%)	
Unknown	40 (34.3%)	
Immunization status of biting animal		
Don't know	73 (62.3%)	
Immunized	26 (22.2%)	
Unimmunized	18 (15.4%)	

Table 4: Knowledge about rabies

	Yes	No
Can animals get rabies	292 (98.3%)	5 (1.7%)
Symptoms of rabies in animal		
Drooling of saliva, unprovoked bite	229 (77.1%)	
Don't know	24 (8.1%)	
Drooling of saliva, roaming, barking	33 (11.1%)	
Erratic behavior, craving to eat anything	11 (03.7%)	
Diseases can be caused by animal bite	252 (84.8%)	45 (15.2%)
Rabies	251 (99.6%)	
Hydrophobia	2 (00.8%)	
Can people get rabies	258 (86.9%)	39 (13.1%)
Symptoms of rabies in humans		
Don't know	123 (41.4%)	
Frothing from mouth	93 (31.3%)	
Madness	48 (16.1%)	
Hydrophobia	33 (11.1%)	
Immediate care taken of wound		
Apply red chilies	145 (48.8%)	
Clean with water and soap	46 (15.5%)	
Apply lime	40 (13.5%)	
Don't know	16 (5.4%)	
Tie the wound	15 (5.1%)	
Nothing	10 (3.4%)	
Others	20	
Have you ever heard about ARV	292 (98.3%)	5 (1.7%)
Site of injection		
Abdomen	154 (51.9%)	
Shoulder	51 (17.2%)	
Thigh	38 (12.8%)	
Don't know	54 (18.2%)	
Number of doses to be given		
1-5	173 (58.25%)	
6-10	22 (7.4%)	
11-15	33 (11.11%)	
>15	1 (0.34%)	
Don't know	68 (22.89%)	
What is to be done if you know that your pet domestic animal is rabid		
Consult veterinary doctor	4 (1.4%)	
Consult veterinary doctor	88 (29.6%)	
To be killed	52 (17.5%)	
Vaccination	36 (12.1%)	
To be separate from other animals	1 (0.3%)	
Don't know	16 (5.4%)	
Can rabies be treated	215 (72.4%)	36 (12.1%)
Don't know	45 (15.2%)	
Vaccination campaign or reduction program attendees	2 (0.7%)	

an ample amount of running water and soap to eliminate as much viral load as possible from the bite site. However, practices like applying chilly (48.8%), lime (13.1%), clean with water and soap (15.5%), tying the wound (5.1%) were quite prevalent which is similar to the findings of other studies[17,18] Following these practices may lead to delay in seeking proper medical care and PEP and may result in rabies. This shows that wound management practices have not changed much over the past decade. Community leaders and veterinary doctors can play a great role in raising education and awareness of the community as many individuals rely on their advice and most of the respondents in our study also visited them regularly. Introducing syllabi regarding rabies and appropriate wound management in school may be a cost-effective way of raising awareness against this deadly disease. Countries like Sri Lanka,[28] Malawi,[29] Indonesia,[30] and the Philippines[31] have incorporated rabies awareness in their school curricula to boost their rabies control efforts and have found good results. The incorporation of rabies education into school curricula is not simply a one-time educational event, but rather a sustained effort as information becomes disseminated throughout countries and regions each year without need for recurrent monetary resources. The state of Karnataka and Sikkim in

India have also introduced information about rabies in school curricula recently.[32]

Most (80.3%) of the bite victims in our study had started PEP. About 30% of the animal bite victims took PEP from the private sector and about 15% took inappropriate treatment for managing the wound. Uptake of PEP is much higher than the previously reported PEP initiation rates[18] About 90% of the respondents indicated that they would prefer taking treatment from the public sector. ARV is provided free of cost in the public health system in India. India produces sufficient ARV, however, the availability of ARV in rural areas suffers due to logistical problems. Ensuring the availability of free ARV in the public health system is likely to enhance coverage and completion rate with PEP. This may also be aided by rapid scale-up of intradermal use of ARV which is estimated to save up to 60% of the cost associated with ARV[4]

The incidence of the animal bite was quite high in our study as this is a predominantly agrarian rural community living in close contact with animals and livestock. Other studies have reported a higher incidence of a dog bite in urban areas as compared to the estimates from a multicentric study in 2004[17,18] This means that the animal bite incidence is dynamic and context-related, and hence, different strategies of rabies control have to be deployed in different contexts. High incidence of bites by stray and wild animals poses a significant risk in rural areas as the chances of interaction of stray animals with wild animals is high. A recent study in Punjab has demonstrated that the incidence of animal rabies is much higher than previously estimated.[33] Most developed countries have been able to bring rabies under control through strict leash laws, mandatory vaccination of domestic animals, elimination, sterilization, vaccination, and control of strays and mass oral vaccination of wild animals. Strategies like animal birth control-ARV (ABC-ARV) have yielded good results in defined urban territories like Jaipur,[34] Chennai,[35] and Jodhpur[36] but are unlikely to be very effective in rural areas where boundaries are ill-defined, animal population turnover is higher and territories of animals may be spread over wider areas. Oral vaccination may be a good strategy to be adopted in rural areas where census and tracking of stray and wild animals is difficult and accepted strategies of ABC-ARV may be logistically very difficult. Another common practice in northern India is the practice of dumping solid waste, including animal carcasses, at common mounds called *badda rori,* on the outskirts of the villages. This invites stray dogs and wild animals to the vicinity of human residence and increases the possibility of rabies transmission. Hence solid waste management, including disposal of animal carcasses, needs to be an important component of stray dog population control in rural areas.

The high incidence rate of animal bites and higher than previously estimated burden of animal rabies also indicates a possibility that many unrecorded cases of human rabies might be occurring in the rural populations. It is likely that most such cases are not brought to the notice by the authorities as the civil registration system in India is not very robust, especially in rural areas.[19] Establishing a surveillance network to have better estimates of human and animal rabies burden shall ensure appropriate guidance for the control and prevention of rabies.

National Rabies Control Program, initiated in 2015, employs a multipronged strategy of raising awareness regarding rabies, the importance of timely vaccination, ensuring availability of ARV and serum in rural areas and should pay rich dividends in terms of human life saved. Also, close collaboration with animal husbandry departments to build on the "One Health" concept shall promote regular vaccination of domestic animals and livestock, control of strays, and oral vaccination of wild animals, hence, reducing economic loss due to the death of livestock. Modeling estimates have shown that increasing canine vaccination levels to at least 70% reduces the cost of PEP, and hence, in rabies control without allocation of additional resources whereas focusing mainly on enhancing PEP coverage leads to cost escalation.[4] Rabies control activities have been successfully implemented in the state of Tamil Nadu where, in addition to public health surveillance, animal census and implementation of dog licensing rules, other targeted interventions including waste management, animal birth control, and ARV, awareness campaigns, and widespread availability of ARV at public health facilities have shown that it is possible to implement a successful "One Health" program in an environment of strong political will, evidence-based policy innovations, clearly defined roles and responsibilities of agencies, coordination mechanisms at all levels, and a culture of open information exchange[35]

Conclusion

There is a high incidence of animal bites in rural areas. Awareness regarding the need for rabies vaccination of animals and PEP after an animal bite is quite high and is practiced. However, there is a lack of awareness regarding the course of action to be followed when an animal does develop rabies. Traditional and inappropriate practices of wound management persist and need to be countered. Improving the availability of ARV and rabies immunoglobulin through the public health system may further augment the uptake of PEP and completion of treatment while at the same time reducing out of pocket expenditure and the overall economic cost of rabies. Solid waste management in rural areas along with oral ARV is likely to reduce the incidence of rabies in rural areas.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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