

## **An Epidemiological Study of Animal Bites in India: Results of A Who Sponsored National Multi-Centric Rabies Survey.**

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### **ABSTRACT**

**This was a WHO sponsored national multi-centric rabies survey and one of its objectives was to find out the incidence of animal bites, anti-rabies treatment practices, Pet dog population and their care. Twenty-one medical colleges chosen with geosscatter representation conducted the survey during February-August, 2003. The survey was conducted in 18 states, covering a population of 52,731 chosen randomly from 8500 households. The annual incidence of animal bites was high, 1.7% and it was more in rural areas (1.8%), children (2.6%) and poor/low income group (75%). The main biting animal was dog (91.5%), mostly stray (63%), followed by cat (4.7%).**

**A high proportion of bite victims did not wash their wounds with soap and water (39.5%), preferred Government hospitals (59.9%) and nerve tissue vaccine (46.9%). The use of rabies immunoglobulin was low (2.1%).**

**A single animal bite episode led to a loss of 2.2 man-days and the cost of medicines including anti-rabies vaccine was Rs.252 (US\$6). The recourse to indigenou treatment (45.3%) and local application to wound (36.8%) was quite prevalent.**

**About 17% of households reported having a pet/domesticated dog and the pet dog: man ratio was 1: 36. Pet dog care/management practices were not satisfactory with a low veterinary consultation**

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**(35.5%) and vaccination (32.9%). The situation was slightly better in urban areas. The people also reported the presence (83%) and menace (22.8%) of stray dogs. It is recommended to initiate appropriate community awareness and dog vaccination campaigns and effective stray dog control measures.**

Keywords : Animal bites, dog bites, rabies, anti-rabies treatment, indigenous treatment.

## INTRODUCTION

Human rabies continues to be endemic in India and according to a recent estimate about 20,000 persons die of this disease every year.<sup>1</sup> A majority of these deaths (about 97%) are attributed to bites from dogs, but animal bites are neither notifiable nor reported in the routine surveillance system. Consequently, the data on animal bites in the country is scanty, unreliable and controversial due to poor surveillance/reporting system. Hence, in the past attempts were made through different studies to obtain some valid and reliable data. However, these studies<sup>2-6</sup> conducted in different parts of India had the limitation of area specificity and their results could not be generalized or extrapolated.<sup>2-6</sup> Alternatively, data was obtained on the utilization of anti-rabies vaccines and sera in the country to indicate indirectly the problem of animal bites.<sup>7</sup> About 2.1 million people are known to receive post-exposure treatment annually.<sup>8</sup>

In this background as a component of the World Health Organization (WHO) project, assessing burden of rabies in India, it was planned to estimate the annual incidence of animal bites and know their management practices including the use of rabies immunobiologicals.

## MATERIALS AND METHODS

A WHO sponsored national multi-centric

rabies survey was conducted by Association for Prevention and Control of Rabies in India (APCRI) during February-August, 2003. This study broadly consisted of three components. (a) Medical survey, (b) Veterinary survey and (c) survey of rabies free islands of the country. The medical survey dealt with animal bites and human rabies deaths. The veterinary survey studied the problem of rabies in animals. The survey of rabies free islands assessed the rabies free status of these islands. A detailed report of this survey is available separately.<sup>1</sup> This paper elaborates on the epidemiological aspects of animal bites in India.

**Statistical Considerations :** The different studies conducted in the country provided a range of 2-19 per 1000 people per year as the annual incidence of animal bites. The survey expert group suggested that 15 per 1000 (or 1.5%) persons be considered as the annual incidence for this activity. The survey standards were fixed at 90% confidence level and 10% limit of error. This meant the sample size for  $z_{0.1} = 1.645$ ,  $p=0.015$  (or 1.5%),  $q (=1-p) =0.985$ ,  $L=0.0015$  (10% of  $p$ ); would be

$n= (1.645)^2 (pq/L^2) = 17,730$  or 20,000 people (whole number).

To overcome the design effect, twice the above calculated population viz. 40,000 was taken as the sample population to be surveyed.

## 2. Involvement of Medical Colleges

Twenty-one medical colleges participated in this survey. These medical colleges with proper geospatial were chosen giving due representation to all the regions of the country. A MD qualified (Assistant Professor or above) faculty from the Department of Community Medicine of these medical colleges was chosen by their respective Deans as Principal Investigators (PI) of the survey. These twenty one PIs were oriented to the survey proforma and methodology at a two-day WHO-APCRI workshop held in Bangalore in February 2003. However, one Principal Investigator from Shimla, Himachal Pradesh was trained later, after one of the trained PIs dropped out due to ill health. After the orientation workshop these trained principal investigators identified suitable surveyors in their respective medical colleges mostly postgraduates/interns and arranged an in-house briefing for them. Subsequently, each medical college randomly identified four communities, one urban and three rural population groups (wards, villages etc.) on the basis of 1: 3 urban: rural ratio based on national demographic distribution. In urban area, a ward/zone/area was chosen randomly after obtaining the list from the urban municipal corporation. In rural area, one of the three Primary Health Centres (PHCs) attached to the medical college was chosen randomly and the other two nearby PHCs (not used by medical college for rural health training) were identified.

## 3. Household Survey

In each of these communities, the survey was done as per WHO-EPI guidelines. The first household was randomly chosen in the centre of the community and the information was obtained by interviewing a reliable, responsible adult respondent. A set of structured and pre-tested schedules was used for recording the data. The reference period of enquiry was one year immediately preceding the date of the survey and the respondents provided the information mostly on memory recall and available records at home. After the first household, then every tenth household was chosen (by systematic random sampling) and the survey continued till 100 households in urban and 300 households in rural communities was covered. Consequently each medical college covered 400 households or about 2000 population based on an average family size of 5. Thus the total sample (or target) population of 40,000 was aimed to be covered from 21 medical colleges.

## RESULTS

### 1. Survey coverage

Twenty-one medical colleges from 18 states surveyed 84 communities (21 urban and 63 rural). A total of 8500 households were surveyed covering a population of 52,731 (132%) as against the target (sample) population of 40,000 (Table.1).

### 2. Profile of bite victims

Majority (75%) of bite victims belonged to poor and low-income group and obviously this was more pronounced in

rural areas (80.3%). The incidence of animal bite was nearly twice in children than adults. Males were more affected than females. The bite incidence was slightly more in rural areas than urban areas (Table.1).

**Table 1. Details of survey coverage and profile of bite victims**

Details	Urban	Rural	Total
<b>1. Survey coverage</b>			
States	-	-	18
Medical colleges	-	-	21
Communities	21	63	84
Households	2194	6306	8500
Population	12844	39887	52731
<b>2. Bite victims</b>			
a. Economic status (%)			
Poor and low income	59.7	80.3	75.0
Middle income	21.3	14.7	16.4
Upper income	18.8	4.4	8.1
Not assessed/reported	0.2	0.6	0.5
b. Annual incidence rate of animal bite (%)			
Children (<14 yrs)	2.1	2.6	2.5
Adults (≥ 14 yrs)	1.1	1.4	1.3
Total	1.4	1.8	1.7
c. Sex-wise distribution (%)			
Male	65.9	68.5	68.0
Female	33.0	31.3	31.7
Not specified	1.1	0.2	0.3

### 3. Biting Animal

The biting animals were predominantly dogs (91%) and were mostly stray, both in urban (60%) and rural areas (63.6%). The cats (4.7%), other peri-domestic animals (3.2%) and wild animals (0.3%) constituted a small proportion. Majority of biting dogs (60.8%) and cats (67.4%)

were reportedly alive after biting the people (Table.2).

**Table 2. Details of biting animals**

Biting Animal (%)	Urban	Rural	Total
• Dog	91.9	91.4	91.5
• (% Pet)	40.0	36.4	37.1
• (% Stray)	60.0	63.6	62.9
• Cat	4.9	4.7	4.7
• Monkey	2.7	2.1	2.2
• Pig	0	0.5	0.4
• Rat	0	0.7	0.5
• Cow	0	0.1	0.1
• Wild			
• Jackal	0	0.3	0.2
• Bear	0	0.1	0.1
• Others/not stated	0.5	0.1	0.3
<b>Fate of Animal (%)</b>			
• Dog			
• Alive	67.1	59.3	60.8
• Died	5.3	7.9	7.4
• Killed	5.9	13.0	11.6
• Unknown	21.7	19.8	20.2
• Cat (%)			
• Alive	66.7	67.6	67.4
• Died	0	5.9	4.7
• Killed	0	8.8	7.0

### 4. Anti-rabies treatment done

About one-third of bite victims (39.5%) washed their wounds with soap and water and this was much better in urban areas (48.6%) than rural areas (37.2%). The nerve tissue vaccine (NTV) formed the mainstay of treatment in urban (56.1%) and rural areas (44%). The usage of tissue culture vaccines (TCVs) was low

(30-42%) and rabies immunoglobulin (RIGs) very poor (2.1%) (Table 3).

A single episode of animal bite needed on average of 4-5 days / visits for anti-rabies treatment; the cost of medicines including vaccines, etc was Rs.252 (US \$ 6) and led to a loss of about 2.2 man-days.

The harmful practice of using local applicants to wounds was quite prevalent (36%), and also recourse to indigenous treatment (45%). Majority preferred Government Hospitals (59%) than to Private Hospitals (36%) (Table 3).

**Table 3. Details of Anti-rabies treatment done**

Anti-rabies treatment done	Urban	Rural	Total	
• Wound treatment (soap and water wash)	48.6	37.2	39.5	
NTV	56.1	44.0	46.9	
TCV	• 3 doses	32.6	29.7	30.5
	• 5 doses	41.9	42.9	42.7
• RIGs received	1.1	2.3	2.1	
• Local application to wound	36.2	36.8	36.8	
• Indigenous treatment done	35.1	47.9	45.3	
• Source of treatment				
Government	69.2	56.9	59.9	
Private	29.9	38.9	36.7	
Not stated	0.9	4.2	1.1	

### 5. Indigenous treatment practices

The most popular approach was resorting to magico-religious practices like faith healing, witchcraft etc (15.7%), followed by application of herbs (5.7%), red chilli powder (5.2%) and other substances to animal bite wounds (Table.4).

**Table 4. Types of indigenous treatments for animal bite wounds**

Type of Treatment	No.	%
• Magico-religious (faith healing, witchcraft, etc.)	144	15.7
• Application of Herbs	52	5.7
• Red chilli Powder	46	5.2
• Ayurvedic Treatment	28	3.1
• Consulting Quacks	13	1.4
• Application of Rukri gur (a product of molasses)	14	1.5
• Application of Turmeric Powder	11	1.2
• Application of Kerosene	9	0.9
• Clean dressing	8	0.8
• Heat Cauterization	7	0.7
• Others	6	0.6
• None	578	63.2
<b>Total</b>	<b>916</b>	<b>100.0</b>

### 6. Dog population, their care / management practices

A total of 1458 pet/domesticated dogs were reported by respondents of 8500 households and from a population of 52,731. About 16.9% of households had pet dogs and the pet dog: man ratio was 1:36.

The dog care and management practices were not satisfactory as veterinary consultation was low. This was 35.5% overall, 23.8% in rural areas. The ARV coverage was also poor overall (32.9%) and 22% for rural area. Besides the stray dog presence (83%) and menace (22.8%) was high. The municipal licensing of pet dogs was also very poor (Table 5) and only 4.3% pets.

**Table 5. Characteristics of dog population and their care/management**

Details	Urban	Rura	Total
1. Households with pet dog (%)	16.2	17.2	16.9
2. Pet dog : Man ratio	1 : 35	1 : 37	1 : 36
3. Dog care management (%) yes response			
• Veterinary consultation	71.3	23.8	35.5
• ARV given	66.1	22.0	32.9
• Dog collar	58.1	28.1	35.5
• Dog leash	63.0	31.0	38.9
• Dog notice	6.2	1.9	3.0
• Municipal license	10.7	-	4.3
4. Stray dog information (%)			
• Presence (yes)	78.4	84.5	83.0
• Menace (yes)	22.8	22.8	22.8

## DISCUSSION

This is the first ever-planned rabies survey conducted at the national level. However, there are reports of some studies conducted previously in different parts of the country. Based on mathematical modeling attempts have been made by using available animal bite incidence data to estimate the human rabies incidence in Tanzania, Asia and Africa.<sup>9,10</sup>

In this survey the main biting animal was dog, followed by cat and other animals and this observation is seen uniformly in other studies too.<sup>2-6</sup> The animal bites mostly affected the urban poor and the rural people and they continue to be vulnerable to rabies mortality. The children being smaller in size, mischievous and less defensive had more bites and so also adult men probably because of their outdoor work. Similar findings were made in other studies too.<sup>3-6</sup>

The annual incidence of animal bites was 1.7% (or 17 per 1000 persons) which was quite high as compared to a survey in 4 cities conducted by National Institute of Communicable Diseases (NICD), Delhi in 2000, which reported a 6-month incidence of 2.1 per 1000 population.<sup>2</sup> However, as per the criteria of WHO<sup>11</sup> all these bites were considered as 'possibly exposed to rabies' as rabies was not confirmed in the biting animals for various practical limitations. Similarly, the mean annual dog bite incidence in Tanzania was 12.5 cases per 100,000 people.<sup>9</sup> The higher incidence (1.7/100) of animal bites seen in this survey could be due to this being a more focused study on rabies, a better recall and reporting by respondents. Also, the incidence of dog and other animal bites are mostly determined by population densities of dogs and other animals and people and other socio-cultural factors. In this survey, a high pet dog: man density of 1: 36 was observed. The presence and menace of stray dogs was reportedly more in this survey, but a count of their population was considered beyond the scope of this study and hence was not done. Overall, it appears that the dog population density seems to be quite high in this country with an estimated 28 million pet dogs alone which is a projected figure assuming that the situation and related factors are the same in the country as it is in the study population. On similar corollary the annual animal bite load was about 17.4 million (plus) for a one billion (plus) population of this country.

Majority of bite victims (60%) did not

even wash their wounds with soap and water which is quite alarming and this calls for concerted health education of people through mass media of television and radio. The sheep brain vaccine formed the mainstay of anti-rabies vaccination and Government hospitals were preferred as the bite victims were poor. However, following the discontinuation of sheep brain vaccine in December 2004 by Government of India, it is hoped that the coverage of modern cell culture vaccines will improve in the country.

On an average a single episode of animal bite led to a loss of 2.2 man-days and the cost of medicines including ARV was Rs. 252/- (US \$ 6), which is a burden for the majority of victims who are poor. When this was extrapolated to the annual animal bite load of 28 million, it costs Rs.2 billion approximately.

Another disturbing feature was the recourse to indigenous forms of treatment by about 46% of bite victims. All these practices of local applicants to wounds like herbs, red chilli powder, molasses, etc. are harmful. Similarly, the compliance to completion of a full course of vaccine, to both sheep brain vaccine and cell culture vaccine was low (40%). These also need to be highlighted in the awareness campaigns of the masses. The use of life saving rabies immunoglobulin was very low (2.1%).

About the care and management of pet dogs by the people, it revealed to be very unsatisfactory. The vaccination of the pet dogs was about 33% and it was better in urban areas (66%) as compared to rural

areas (22%). This also needs more emphasis through mass awareness, vaccination campaigns and effective stray dog control measures to reduce the incidence of rabies in the country.

In conclusion, the dogs were the main biting animal, affecting mostly the children and men from poor communities. The pet dog care and management were not satisfactory. The bite victims did not do proper wound care and mostly depended on Government Hospitals for anti-rabies vaccination and majority did not complete the full course. The use of life saving RIGs was abysmally low. The indigenous treatment including harmful applicants to wounds was quite prevalent. All these call for concerted efforts for a mass awareness campaign.

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