

Appraisal of Surveillance of Human Rabies and Animal Bites in Seven States of India

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Abstract

Background: The key to understanding the burden of animal bites and rabies lies in accurate and timely data with the help of proper surveillance system across the country. Such a surveillance system needs to be evaluated also for a programmatic purpose. **Objectives:** The present study was conducted to appraise the surveillance system of human rabies and animal bites in seven states of India and also to describe the characteristics of human rabies cases in the states. **Methods:** The record-based study was conducted from July to December 2017. The survey team collected information about the surveillance status of human rabies from the infectious diseases hospitals and animal bites from integrated disease surveillance programme (IDSP) offices of the respective states for 2012–2016. At the national level, also number of animal exposures and the human rabies cases were collected from the Central Bureau of Health Intelligence and IDSP and compared for concordance. **Results:** There was a gross underreporting of human rabies from the states to Government of India, and there was no concordance in the reports of animal bites between the IDSP offices of the states and NCDC, New Delhi, India. There was a gradual decline in the reported cases of human rabies from the states during the 5-year period of 2012–2016, attributable to improvement in the overall rabies postexposure prophylaxis services. The documentation of information of the human rabies cases was poor in the infectious disease hospitals. **Conclusion:** The surveillance system on human rabies and animal bites in India has to be improved under the national rabies control program to eliminate rabies by the year 2030.

Key words: Animal bites, appraisal, human rabies, India, surveillance

INTRODUCTION

Animal bite injuries are useful indicators for assessing the risk of rabies virus transmission and the need for rabies postexposure prophylaxis (PEP).^[1] Understanding the epidemiology and surveillance of animal bites and rabies PEP is critical in implementing the control and elimination program.^[2]

Public health surveillance is the continuous, systematic collection, analysis, and interpretation of health-related data needed for the planning, implementation, and evaluation of public health practice.^[3] Such surveillance can document the impact of an intervention or track progress toward specified goals and monitor and clarify the epidemiology of health problems, to allow priorities to be set and to inform public health policy and strategies.^[4,5]

The World Health Organization (WHO), World Organization for Animal Health, Food and Agriculture Organization, and

Global Alliance for Rabies Control have established the “United Against Rabies,” as a global collaborative program that is working toward achieving the goal of “zero human rabies deaths by 2030.”^[6] Achieving a good and effective surveillance system for rabies in endemic countries, including India, is a major intervention in the strategic plan of the Alliance.^[7]

Surveillance is always linked to specific control activities and immediate response and is therefore distinct from monitoring. It is, therefore, critical to guide practical decisions for both disease control programs and public health actions.^[8,9] When the ultimate goal is elimination, surveillance is particularly required to certify freedom from disease and to inform decisions

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regarding the cessation or scaling back of control programs as well as budget allocation for prevention.^[10,11] In India, the existing Central Bureau of Health Intelligence (CBHI) portal captures the data on human deaths due to rabies from across the country. However, there is gross under-reporting as evident by the recent officially reported numbers of 113 and 86 respectively for 2015 and 2016.^[12] The weekly animal bite data is available on the Integrated Disease Surveillance Project (IDSP) portal.^[13] It is envisaged under the National Rabies Control Programme (NRCP) to further strengthen the reporting of animal bites and rabies deaths at IDSP and CBHI portal, respectively.

The key to understanding the epidemiology and burden of rabies lies in accurate and timely data; whereas, poor and discrepant data underestimate the true burden of rabies and negate the advocacy efforts needed to achieve control and elimination. In this context, it was planned to validate these two systems of reporting of human rabies and animal bites under the Indian Multicentric Rabies Survey (IMRS), 2017. The IMRS was a WHO funded project, conducted by the Association for Prevention and Control of Rabies in India (APCRI) with the specific objectives to appraise the surveillance system of human rabies and animal bites in India and to describe the characteristics of human rabies cases in the seven states of India.

MATERIALS AND METHODS

The study was initiated after getting the clearance from the Institutional Ethics Committee, Kempegowda Institute of Medical Sciences, Bengaluru, ref. no. KIMS/IEC/S15-2016 dated: December 05, 2016. The study was conducted as a part of the national survey on the programmatic experiences of rabies prevention and control in the country under IMRS, between July and December 2017. In this background, a geospatial representative sample of seven states for different regions of the country namely Himachal Pradesh (HP), Bihar, West Bengal (WB), Manipur, Kerala, Madhya Pradesh (MP), and Gujarat were chosen for the survey.

A record-based study was conducted by a team of expert public health personnel regarding the continuous, systematic collection, analysis, and interpretation of surveillance system of human rabies and animal bites in India; by visiting the isolation/infectious diseases hospitals (IDH) at the state capitals (except at Gujarat, it was Surat) of seven states, i.e., HP, Bihar, WB, Manipur, MP, Gujarat, and Kerala and collected the information of number of human rabies admissions made in these hospitals in the past 5-year period of 2012–2016. The details of the human rabies cases which included residence, age, sex, biting animals, location of bite wounds, wound wash given and PEP received were collected and entered into an Excel sheet. The documentation of information of the patient, i.e., the completeness/quality of the data by the medical officers in the IDH was also assessed. Similarly, the team visited the offices of IDSP in these states' headquarters (except in Gujarat, it was Surat) and collected information about the number of animal bites reported during the same period of 2012–2016.

Likewise, the study team also visited the CBHI and IDSP headquarters, New Delhi, India, to collect the information available from these states on the reported number of animal exposure and the human rabies cases at the national level. The data collected by the survey team from the study states with regards to animal bites and rabies cases were cross-validated against the data received from the respective states to the CBHI and IDSP headquarters, Government of India; to assess the accuracy (quality) of the data reported and compiled at the national level.

The data received under this survey from all the centers across the country were compiled in an Excel sheet and analyzed using descriptive statistics such as frequency and percentages. The proportion of animal bites and human rabies in India was calculated using population as per the census of India 2011 database as the denominator.^[14]

RESULTS

The available reports on the animal exposure and the number of human rabies were collected from all the seven states and from IDSP and CBHI National Headquarters, New Delhi, for 5 years. The results of the study were as follows:

Surveillance on animal bites

The data obtained by the survey team from the IDSP offices in the seven states were cross-tabulated against the same data obtained from the IDSP headquarters at NCDC, Delhi, for 2012–2016 as shown in Table 1.

Overall, there was a steady increase in reporting of animal bite cases during these 5 years. Among the states, Gujarat and Kerala reported a higher numbers signifying good surveillance and PEP facilities. The scenario was poor in Manipur, where the dog bite incidence is low, and this could possibly be due to the practice of dog meat consumption, poor rabies vaccine supplies, etc.

The concordance of the local data availed from the study and the central data from IDSP headquarters was seen only in 43% (12/28) of instances.

Surveillance on human rabies

The data collected by the study team from all the seven states were cross-tabulated against the data of CBHI, Government of India, New Delhi, India.

Despite, the study team visiting only isolation hospital/ward in a hospital at the state capital (except in Gujarat, it was Surat city) it was found that except in three instances; there was gross under-reporting of the disease from the states to CBHI, New Delhi, throughout the study period of 2012–2016, as shown in Table 2.

Animal bites vis-a-vis human rabies

Finally, the data obtained from the IDSP (animal bites reported from the government hospitals providing PEP) were linked to human rabies cases (from the isolation hospitals of the state capitals in the government) from the states for epidemiological evaluation [Table 3].

Table 1: Animal bites reported from seven states of India during 2012-2016

States	Reported animal bites									
	2012		2013		2014		2015		2016	
	IDSP	APCRI	IDSP	APCRI	IDSP	APCRI	IDSP	APCRI	IDSP	APCRI
HP	12,683	12,683	11,412	11,412	13,880	13,880	23,909	23,582	34,975	34,975
Bihar	414,344	703,925	418,911	419,503	622,333	401,291	268,600	262,776	398,284	341,065
WB	224,512	186,896	257,378	212,455	284,748	251,203	331,989	268,727	401,511	407,393
Manipur	498	498	1728	1728	1568	1568	4450	7337	3020	2708
Kerala	106,722	NA	116,457	62,280*	146,803	119,191	149,201	125,385	129,089	135,217
MP	94,274	94,274	127,467	127,467	223,315	223,315	229,825	229,825	196,515	196,515
Gujarat	319,824	NA	305,332	NA	333,246	NA	362,033	NA	376,183	NA
Total	1,172,857	998,276	1,238,685	834,845	1,625,893	1,010,448	1,370,007	917,632	1,539,577	1,117,873

APCRI denotes for data obtained from the states by the WHO-APCRI survey team. *From April. IDSP stands for the data obtained from the IDSP office, NCDC, New Delhi; APCRI: Association for Prevention and Control of Rabies in India, WHO: World Health Organization, NA: Not available, IDSP: Integrated disease surveillance project, HP: Himachal Pradesh, WB: West Bengal, MP: Madhya Pradesh

Table 2: State-wise human rabies cases reported in India during 2012-2016

States	2012		2013		2014		2015		2016	
	CBHI	APCRI	CBHI	APCRI	CBHI	APCRI	CBHI	APCRI	CBHI	APCRI
HP	2	3	0	2	1	3	2	2	0	0
Bihar	0	93	0	86	0	69	1	82	4	58
WB	80	36	57	55	52	50	47	42	47	52
Manipur	0	1	0	17	0	17	0	8	0	1
MP	3	11	9	13	2	14	11	11	0	NA
Gujarat	7	15	3	14	0	13	8	12	1	11
Kerala	7	13	8	11	5	10	7	10	2	5
Total	99	172	77	198	60	176	76	167	54	127

APCRI denotes for data obtained from the states by the study team; CBHI stands for the data obtained from the CBHI office, New Delhi; NA: Not available, APCRI: Association for Prevention and Control of Rabies in India, CBHI: Central bureau of health intelligence, HP: Himachal Pradesh, WB: West Bengal, MP: Madhya Pradesh

Characteristics of human rabies cases in the survey states

Despite time constraints of the study, still an effort was made to obtain the records from IDH MRD; 99 out of 127 cases which had complete data were analyzed. The overall results of the 99 cases in the year 2016 are shown in Table 4.

Majority of cases were from rural areas (77%), males (83%), and adults (74%). The most common biting animal was dog (83%), the bite being more on the head (12%), and some (27%) had received few doses of ARV.

The documentation of information of the patient was poor in the IDH wards by the medical officers. As a result, a detailed analysis could not be done.

DISCUSSION

Rabies is an acute viral encephalomyelitis caused by RNA *Lyssavirus* belonging to family *Rhabdoviridae*.^[15] It is a neglected zoonotic disease which affects the poor people, living in remote rural areas and slums of the developing world.^[16] The WHO estimates that over 90% of the global human rabies deaths occur in Asia and Africa.^[17]

Rabies continues to be a major public health problem throughout India; with an estimated 20,000 human deaths

Table 3: Proportion of animal bites cases and human rabies cases from seven survey states in India during 2012-2016

Reported cases	Year				
	2012	2013	2014	2015	2016
Proportion of animal bites*	0.26	0.28	0.35	0.36	0.39
Human rabies cases	172	198	176	167	127

*Proportion of animal bite cases against the census population of the respective surveyed state

and 17.4 million animal bites annually.^[18] It is a disease which is most amenable to control, as the appropriate tools for prevention, i.e., PEP are available.^[19] In rabies endemic country like India, where every animal bite is potentially suspected as rabid exposure, the exposed individuals should seek early and proper health care to prevent the disease.^[20]

In this background, Government of India has launched NRCP in 12th 5-Year Plan with the objectives to reduce human deaths due to rabies; to implement a consensus strategy for control of rabies in dogs and to cut down the transmission of rabies. NRCP has both human and animal component.^[21] One of the important strategies adopted for the human component is the strengthening of the surveillance system. The State Nodal

Table 4: Characteristics of human rabies cases admitted to infectious disease hospitals, 2016 in the surveyed states of India (n=99)

Characteristics	States	HP	Bihar	WB	Manipur	Kerala	MP	Gujarat	Total
		Total cases							
		0	53	43	1	1	-	1	99
Area	Urban	-	5	14		1		1	21
	Rural	-	48	29					77
	NR/NK	-			1				1
Sex	Male	-	48	34		1			83
	Female	-	5	9				1	15
	NR/NK	-			1				1
Age	Adult	-	36	36	1	1			74
	Child (≤14 years)	-	17	7				1	25
Animal	Dog	-	46	35		1		1	83
	Cat	-	1						1
	Wild animal	-	4	3					7
	NR/NK	-	2	5	1				8
Bite site	Head	-	5	6				1	12
	Trunk	-	1						1
	Upper limb	-	6	1					7
	Lower limb	-	3	3					6
	Groin	-		1					1
	UK/NR	-	38	32	1	1			72
ARV	Received	-	11	15				1	27
	Not received	-	24	12		1			37
	NR/NK	-	18	16	1				35
RIG	Received	-		5					5
	Not received	-		20		1		1	22
	NR/NK	-	53	18	1				72
Outcome	Died	-	6	43	1	1		1	52
	LAMA	-	47						47

HP: Himachal Pradesh, WB: West Bengal, MP: Madhya Pradesh, LAMA: Left against medical advice, NR/NK: Not recorded/not known, ARV: Anti rabies vaccine, RIG: Rabies immunoglobulin

Officer should implement the activities of human component of the National Rabies Control Programme in their respective states, by coordinating with state Health officials and Integrated Disease Surveillance Programme (IDSP) for implementation of activities and to strengthen surveillance of animal bite management and rabies.^[22]

Disease surveillance in India gained momentum following the outbreaks of cholera in Delhi (1988) and plague in Surat, Gujarat (1994). From the year 2012, IDSP (started as a project in 2004) is in operation, and it is intended to generate and detect early warning signals of impending outbreaks and help initiate an effective response in a timely manner. The program aims to facilitate and enhance its use in health planning, management, and evaluation of disease control strategies. It covers 18 diseases and conditions across all states/union territories of India and includes dog bites as one of them. The appointment of 36 veterinary officers, one for each state/union territory, is completed to cover zoonotic diseases including animal bite and human rabies under a “one health” approach.

In the present study, the surveillance of animal bites in the study showed that, the concordance between the respective

state IDSP report and the available records at the IDSP, NCDC headquarters was seen only in 43% of instances thus showing substantial data variability; which calls for better/improvement of consistency (quality) in the reporting system under IDSP. The study also showed that, to some extent the bite load in an area/community; it also reflects on the availability of rabies vaccines in the hospitals as cases come only to avail antirabies treatment that is offered mostly free of cost. It must be noted that it does not reflect the true load of animal bites in a community as it does not cover private hospitals, self-treatments, indigenous, and traditional healers.

The present study also showed that there was an uncoordinated state of surveillance between the states and the national level with substantial data variability and an underestimation of the burden of animal exposures and the risk of disease. A single visit to an isolation hospital/ward in the state capital (except in Gujarat) resulted in identifying more than twice (366 cases of CBHI vis-a-vis 840 cases of APCRI survey) the number of human rabies cases from the state. This summarizes the current scenario of poor human rabies surveillance in the states and its reporting to the central government, i.e., CBHI.

Besides these data are institution-based/passive surveillance that has inherent limitations of iceberg phenomenon of a disease in a community/population as compared to an active community-based surveillance that was undertaken by WHO-APCRI survey, in 2003.^[23]

It is well known that good PEP services reduce the rabies burden in a population. It can be seen that there is a decline in the human rabies cases in the isolation hospitals across the states; vis-a-vis reasonably improved PEP services during 2012–2016, that is indirectly reflected by the increase in the number of animal bites reporting to health-care facilities. In this context, the new initiative under the NRCP to establish linkage with the IDH to improve human rabies surveillance through IDSP using modified P form is a welcome move.

Similarly, a study from Kenya on epidemiology and surveillance of human animal-bite injuries and rabies PEP showed that the bite-incidence in their study was 289 bites/100,000 persons.^[24] Another study from the Eastern region of Ghana revealed that the annual incidence of 172 cases per population of 100,000 and also showed that a parallel and uncoordinated system of rabies surveillance is maintained by the health and veterinary services, with gross disparities in the number of reported events and overall impression of underreporting.^[25]

All the above studies showed that there was no concordance in the reporting. Therefore, surveillance data should be reported through appropriate channels according to published protocols to facilitate timely data-sharing and analysis, through the existing National Electronic Surveillance or Health Management Information Systems for infectious disease reporting. There is a need to introduce a simple structured format to facilitate the uniform recording of correct and complete desired information in the various IDH in the country.

A good and effective surveillance system is important for achieving the elimination of dog-mediated human rabies by 2030, i.e., the absence of a human death from dog-mediated rabies for at least 24 months in a country that is operating and continues to maintain adequate surveillance for rabies and demonstrates an effective rabies control program in human and animal populations.

The present study also showed that the documentation of information of the patient was poor in the IDH wards by the medical officers and as a result of which detailed analysis could not be done. This calls for the direction from the respective state to the medical officers working at the IDH for proper and complete documentation of human rabies cases.

CONCLUSION

The surveillance of animal bites and human rabies and reporting to the headquarters is deficient and needs vast improvements. Likewise, these data are institution-based/passive surveillance that has inherent limitations of the iceberg phenomenon of a disease in a community/population as compared to an

active community-based surveillance. Therefore, to plan further interventions, it would be worthwhile to conduct a special disease survey/surveillance, in 2020 (on the lines of WHO-APCRI survey done in 2003–2004) for immediate re-estimation of the burden of human rabies in the country; this is for the consideration of Government of India/WHO.

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Conflicts of interest

There are no conflicts of interest.

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