Original Article

Health-Seeking Behavior and Compliance to Post Exposure Prophylaxis among Animal Bite Victims in India

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Abstract

Background: In rabies endemic countries, where every animal bite is potentially a suspected rabid exposure, the exposed individuals should seek early and proper health care. It is also essential to complete the full course of postexposure vaccination to protect against rabies. **Objectives:** The study aimed at determining the health-seeking behavior of animal bite victims; assessing the perceived risk of rabies transmission from different animals and knowledge on its prevention and finding out the compliance to complete course of rabies vaccination and associated factors. **Methods:** A multi-centric, health facility-based survey was conducted during May 2017 to January 2018 in six regional-representative states involving 18 health facilities. Study participants were animal bite victims attending the health facilities. The data from all the study participants across the country were compiled and analyzed using descriptive statistics and Chi-square test to find out the association of factors influencing compliance. **Results:** Among a total of 529 animal bite victims, 83.6% sought postexposure prophylaxis coming directly to health facility; others visited nonallopathic/traditional healers/veterinarians/Auxiliary Nursing Midwifery before coming to health facility. The perceived risk of disease transmission and knowledge on the prevention of rabies was insufficient among the exposed victims. All participants were started with anti-rabies vaccination; the compliance rate for the full course of intramuscular rabies vaccination was 65.9% and for intra-dermal rabies vaccination, it was 85.1%. Among Category III exposures, only 46.2% received rabies immunoglobulin. **Conclusions:** Health-seeking behavior and compliance to complete course of anti-rabies vaccination is unsatisfactory, which has to be improved to prevent rabies.

Key words: Animal bites, compliance, health-seeking behavior, perceived risk, postexposure prophylaxis

Introduction

Animal bites to humans is a public health problem; posing a potential threat of rabies to over 3.3 billion people worldwide.[1] These exposures occur mainly in the underserved populations, both in rural and urban areas and has been documented for more than 4000 years.[2] Most cases occur in Africa and Asia; where a close habitation of large human and dog population is seen.[3] The World Health Organization's (WHO) south-east Asia region has more exposures than in any other part of the world; nearly, 1.4 billion people are at risk.[4] In India, an estimated 17.4 million animal bites occur annually, with an incidence of 1.7%.[5]

Rabies is a preventable disease and is the most amenable to control, as the appropriate tools for prevention, i.e., postexposure prophylaxis (PEP) are available.[6] In spite of the availability, nearly 80% of human rabies deaths occurred because the victims had not received early and completed PEP.[7]

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; simultaneously, PEP should be started immediately at the health-care facility.[8] Wound washing with soap/detergent and water, followed by application of virucidal agents to reduce the viral inoculum at

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the wound site; complete course of postexposure vaccination to induce antibodies which prevents the risk of virus entering peripheral nerves and wound infiltration of rabies immunoglobulin (RIG)/rabies monoclonal antibodies in all Category III exposures to neutralize the virus at the wound site. Early and complete PEP, including compliance to complete course of vaccination, will prevent rabies, even after high-risk exposure to potentially rabid animals.[9] The presently available study showed that the compliance to complete course of intra-dermal rabies vaccination (IDRV) was only 77%, which is grossly inadequate.[1]

The WHO has set a goal of eliminating dog-mediated human rabies by 2030. The strategic advisory group of experts of the WHO needed the current scenario of health-seeking behavior of exposed individuals and the use of rabies vaccines and immunoglobulin in rabies endemic countries.[10,11]

In this background, a countrywide, multi-centric study was done by the Association for Prevention and Control of Rabies in India with the technical and operational support from the WHO with the objectives to determine the treatment-seeking behavior of animal bite victims and the PEP received by them; assess the perceived risk of disease transmission from different animals and knowledge on rabies prevention and to find out the compliance to complete course of postexposure rabies vaccination and the associated factors.

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: 05.12.2016. A Technical Advisory Group was formed and methodology for conducting the study was approved.

Study area/setting

The study was conducted from May 2017 to January 2018 at six selected states, ensuring geoscatter distribution across different regions of the country, namely Himachal Pradesh and Bihar (North), West Bengal (East), Kerala (South), Madhya Pradesh (Central), and Gujarat (West).

Selection of health facilities

Multi-Stage sampling was done in six representative states using the list of districts, taluka/block/tehsils as per the census of India 2011 database.[12] Simple random sampling technique was used to select one district within the state and one taluka/block/tehsil within the selected district, using the "Randbetween" function of Microsoft Excel software.[13] A total of 18 health facilities were selected from 6 states. In each state, three health facilities (Government/private) have anti-rabies clinic/providing PEP against rabies representing both urban and rural settings based on proportionate to the rural-urban population of that particular state.

Study subjects/sampling

The study participants included all the animal bite victims attending the selected anti-rabies clinics, excluding those who have a history of previous exposure to animal bites or receiving any PEP or preexposure prophylaxis (PrEP).

The sample size was calculated with compliance rate to anti-rabies vaccination based on a previous study[14] as 77%; 95% confidence level; allowable error (d) = 5% and assuming 15% drop-outs. The net sample size = 447 + 67 = 514 ≈ 525.

It was decided to include eligible study participants during the actual visit of facilities for data collection; at least 29 consecutive eligible study participants from each selected health facility were ensured. However, some health care facilities contributed larger study participants. Finally, a total of 529 eligible animal bite cases were recruited and studied.

Data collection and analysis

The data were collected at the facility level by trained investigators, including medical officers of the selected health facilities.

Informed consent was obtained from each study participant after explaining the purpose of the study and their role in the study as volunteers. For children, consent of parents/guardian was obtained. The data were collected using predesigned, pretested pro forma consisting of sociodemographic characteristics (e.g., age, gender, socioeconomic status, etc.,), characteristics of animal exposure (e.g., bites, type of animal, etc.,) and actions taken by the exposed victim following an exposure before coming to the health-care facility for PEP. The perceived risk of disease transmission from different animals and awareness on rabies prophylaxis and were also obtained from all the study participants/respondents in case of children.

All the participants were provided PEP as per the WHO recommendation, by the medical officer and the first dose of anti-rabies vaccine was started; subsequently, all were followed up for any adverse drug reactions on days 3, 7, 14, and 28 when they came for vaccination. All the study participants were informed regarding the subsequent dates of vaccination and telephonic reminder on the day of vaccination was given. In spite of that, if there are any drop-outs in the natural course of the vaccination; the reasons for such drop-out were recorded.

All the animal bite victims who completed the recommended course of anti-rabies vaccination were considered as compliant; whereas, those animal bite victims who discontinued the vaccination at any point during the recommended course (except those who discontinued vaccination after 3 doses, where the dog/cat remains healthy and alive for at least 10 days after the exposure) were considered as noncompliant or drop-outs. All the noncompliant cases were recorded and the reasons for incomplete vaccination course were found out by interviewing the noncompliant bite victims or their guardians through telephone.

The medical officer provided information regarding the bites to the veterinary team, to follow the biting animal for its health status. The Veterinary officer/animal welfare organization conducted the household survey, to get the information about

the biting animals and its vaccination status. Once the biting dog was traced, a collar was put up and was observed for 14 days. If the suspected dog died or became sick, then the brain samples were collected and submitted to OIE Twinned KVAFSU-CVA-Crucell Rabies diagnostic laboratory, Veterinary College, Bengaluru for the confirmation of rabies. Other biting animals were not observed as per the protocol since the natural history of the disease is known only in dogs and cats.

All the study participants were followed up for 90 days for their health status. After that, the respective medical officers sent all the original completed pro forma and questionnaire by speed post/courier to the project office. The data received from all the centers were compiled in an Excel sheet and analyzed using descriptive statistics such as frequency, percentages, and Chi-square test was used to find an association with the factors influencing compliance.

Results

The study included 529 animal bite cases at 18 health-care facilities (12 rural and 6 urban/15 Government, and 3 private) in the six project states, across the country. Among them, 65.8% were from rural and 34.2% from urban areas.

Among the bite victims, majority belonged to 15–59 years (66.7%) followed by <15 years (21.7%) and elderly ≥60 years (11.4%). Most of the bite victims had lacerations (51.9%) and abrasions (42.3%) and were commonly found on lower limbs (60.5%) and upper limbs (29.7%); other areas include the head, neck, face, and genitals.

Majority of the biting animals were dog (68.6%) followed by cats (25.3%) and other animals such as monkey, jackal, mongoose, and cow; only 8.7% of the biting animals were known to be vaccinated against rabies. Among the biting animals, only 31 (5.86%) dogs were followed up due to logistical reasons/feasibility for 14 days by the veterinary team to know the rabid status of biting animal. All the observed animals were healthy and alive after 14 days of quarantine. Among the exposed, 83.6% sought PEP coming directly to the health facility, the remaining 16.4% visited nonallopathic/traditional healers/veterinarians before coming to the health facility [Table 1].

The perceived risk of transmission of rabies from different animals in the present study was inadequate; the high risk of rabies transmission from dog and cat was perceived only by 69.1% and 14.4%, respectively, and perceived risk from other animals varied among the study participants [Table 2].

Similarly, the awareness of bite victims on prophylaxis against rabies was also inadequate. Only 76.2% had heard about rabies; of which only 65.8% knew about the severity of the disease. The practice followed after the exposure was insufficient with regard to wound wash (64.5%), similarly, only 36.7% of the study participants had knowledge about correct doses of antirabies vaccine for PEP and only 20.6% knew about RIG infiltration to all bite wounds with bleeding. Most of them, i.e., 73.7% were aware of receiving PEP on time; but only 6.7% of them knew about PrEP.

Table 1: Practices and health-seeking behavior of the animal bite victims (n=529)

Practices and health-seeking behavior	n (%)
Wound/s washed	
Water	133 (25.1)
Water and soap	203 (38.4)
No	174 (32.9)
Not sure	19 (3.6)
Local antiseptics applied	
Yes	91 (17.2)
No	396 (74.9)
Don't know	42 (7.9)
Irritants applied to wound/s (n=124)	
Turmeric/coffee/chili powder	73 (13.8)
Plant sap/coin	20 (3.8)
Cow dung/mud	3 (0.6)
Calcium carbonate (lime)	28 (5.3)
Health-seeking behavior	
Came directly to health facility	442 (83.6)
Visited nonallopathic/local practitioner	43 (8.1)
Consulted veterinarian first	28 (5.2)
Visited a traditional healer first	11 (2.1)
Visited ANM first	5 (1.0)

ANM: Auxiliary nursing midwifery

All 529 animal bite cases were provided PEP at the respective health facilities, and the anti-rabies vaccination was started. Since all 13 Category I exposures were apprehensive about the animal exposure, they were also provided anti-rabies vaccination. Majority of the participants had Category III exposures (54.4%); among whom, only 46.2% were infiltrated with RIG, because of short/no supply and perceived less severity of the wounds by the treating physician [Table 3]. All the participants were followed up for any adverse drug events. 14.2% had minor adverse drug events, namely pain, numbness, itching, redness, rash, body ache, malaise, nausea, and fever, which subsided without any complication.

The overall compliance to complete course of vaccination was 78.8%, namely 65.9% for intramuscular rabies vaccination (IMRV) and 85.1% for IDRV. On further analysis, the compliance to IDRV was found to be higher than IMRV and the difference was found to be statistically significant ($\chi^2 = 25.76$, $P < 0.005$) [Table 4]. The compliance rate for full course of anti-rabies vaccination was significantly associated with the occupation ($\chi^2 = 4.7$, $P < 0.02$) and place of residence of the bite victim ($\chi^2 = 4.4$, $P < 0.03$). Similarly, the compliance rate was also significantly associated with the biting animal ($\chi^2 = 17.3$, $P < 0.01$), fate of biting animal ($\chi^2 = 18.9$, $P < 0.01$); type of exposure ($\chi^2 = 6.9$, $P < 0.05$), category of exposure ($\chi^2 = 6.5$, $P < 0.01$), and circumstance of exposure ($\chi^2 = 3.4$, $P < 0.03$).

Table 2: Perceived risk of rabies transmission from different animals among the exposed

Biting animal	Perceived risk of rabies transmission 1=No/little risk of rabies→5=Very high risk of rabies				
	1	2	3	4	5
Dog (*n*=349)	13 (3.7)	9 (2.6)	36 (10.3)	50 (14.3)	241 (69.1)
Cat (*n*=257)	77 (30.0)	31 (12.1)	36 (14.0)	76 (29.5)	37 (14.4)
Livestock (*n*=235)	137 (58.3)	25 (10.6)	43 (18.3)	25 (10.6)	5 (2.2)
Mongoose (*n*=232)	102 (44.0)	27 (11.6)	56 (24.1)	28 (12.1)	19 (08.2)
Monkeys (*n*=231)	90 (39.0)	41 (17.7)	35 (15.2)	15 (06.5)	50 (21.6)
Bats (*n*=227)	138 (60.8)	32 (14.1)	32 (14.1)	11 (04.8)	14 (6.2)
Rodents (*n*=231)	162 (70.1)	25 (10.8)	9 (3.9)	10 (04.4)	25 (10.8)

Figures in parenthesis indicates percentage

Table 3: Characteristics of postexposure prophylaxis received by the animal bite victims (*n*=529)

Characteristics of PEP	*n* (%)
WHO exposure category	
I	13 (2.5)
II	228 (43.1)
III	288 (54.4)
Anti - rabies vaccine	
Route of administration	
Intramuscular	173 (32.7)
Intradermal	356 (67.3)
Brand of ARV	
Abhayrab (PVRV)	359 (67.9)
Rabipur (PCECV)	128 (24.2)
Vaxirab N (PCECV)	42 (7.9)
Rabies immunoglobulin: Category III exposures (*n*=288)	
Administered	
Yes	133 (46.2)
No	155 (53.8)
Type and brand (*n*=133)	
HRIG	
Berirab P	4 (3.0)
PlasmaRab	2 (1.5)
ERIG	
Equirab	112 (84.2)
Premirab	15 (11.3)
Site of administration (*n*=133)	
Exclusive local infiltration	75 (56.4)
Local and systemic	55 (41.3)
Only systemic injection	3 (2.3)
Other treatment given* (*n*=529)	
Wound irrigation	207 (39.1)
Wound dressing	127 (24.0)
Tetanus toxoid	379 (71.6)
Antibiotics	149 (28.2)
Pain medication	128 (24.2)
Admission to hospital	10 (1.9)

*Multiple responses. PEP: Postexposure prophylaxis, WHO: World Health Organization, ARV: Anti rabies vaccine, PVRV: Purified verocell rabies vaccine, PCECV: Purified chick embryo cell vaccine, HRIG: Human rabies immunoglobulin, ERIG: Equine rabies immunoglobulin

The reasons for noncompliance were loss of wages (32.1%), forgotten dates (17.86%), long distance to health facility (14.3%), negligence (9.3%), high cost incurred (6.3%), nonavailability of vaccines (3.6%), and others including interference with school timings, out of station and not properly advised.

All the 529 study participants who received PEP at the health-care facility were followed up for 90 days and were found to be healthy and alive.

Discussion

This study assembled the new evidence on the present scenario of health-seeking behavior and PEP received by bite victims as well as compliance and clinical outcomes.

The present study showed that the health-seeking behavior of the exposed was unsatisfactory; since 16.4% visited nonallopathic/local practitioners/traditional healers/consulted veterinarians/ANMs/others before coming to health-care facility. Similarly, a study from Kolkata among 257 people residing in the rural area showed that only 73.2% of the exposed individuals would like to go to allopathic doctor, whereas other 26.7% would like to visit some local practitioners/religious practices.[15] Likewise, a study conducted on suspected rabid dog bite cases in Ethiopia including 655 cases showed that only 77.4% of them visited health facility directly to receive PEP.[16] All these studies showed that the health-seeking behavior was inadequate and have to be improved by means of continuous social and behavior change communication activities. Increased awareness engages communities and empowers people to save themselves by seeking proper health care.[17]

The present study also showed that only 36.7% of the study participants had correct awareness on full course of antirabies vaccine for PEP. Likewise, a knowledge, attitudes, and practices study on prevention of rabies from Berhampur also showed that only 14.9% knew about correct doses of anti-rabies vaccine, 2.9% knew about RIG and only 0.9% knew about PrEP.[18] Other study from Uttarakhand among 162 health workers also showed that, only 15.1% ANMs and 21.7% Multipurpose health Workers (MPWs) knew about full course of anti-rabies vaccination.[19]

The perceived risk of transmission of rabies from different animals in the present study was also inadequate; the high

Table 4: Compliance to postexposure vaccination among the bite victims (*n*=529)

Vaccine schedule	Intramuscular vaccination Essen regimen (*n*=173), *n* (%)	Intradermal vaccination Updated TRC (*n*=356), *n* (%)
Day 0	173 (100)	356 (100)
Day 3	172 (99.4)	336 (94.4)
Day 7	164 (94.8)	323 (90.7)
Day 14	139 (80.3)	NA
Day 28	114 (65.9)	303 (85.1)

Since there is no day 14 dose for intra-dermal rabies vaccination. NA: Not applicable, TRC: Thai red cross

risk of rabies transmission from dog and cat was perceived only by 69.1% and 14.4%, respectively. Similarly, another study from a rural community of Gujarat showed that 98.6% individuals knew about its transmission by dog bites; whereas, only 31.1% perceived from the cat, 26.6% from monkey and 25.7% from fox.[20] All the studies showed that the perceived risk of disease transmission was inadequate, which has to be improved by mass communication.

In the present study, majority of the exposed individuals had Category III exposures; but only 46.2% were infiltrated with RIG, because of shortage/no supply and perceived less severity of the wounds by the treating physicians. Similarly, a study from government tertiary care hospital in South Karnataka conducted among 5327 animal bite victims showed that 82% had Category III exposures; among whom, only 29% received RIG.[21] The above studies showed that there is a need for training the treating physicians regarding the importance of RIG infiltration as a life-saving measure in all Category III exposures and to make the availability of RIGs on a continuous basis.

The compliance to complete course of anti-rabies vaccination for PEP was only 65.9% for IMRV and 85.1% for IDRV. Similarly, a study conducted at Berhampur, Odisha on IDRV showed that the compliance rate to complete course of vaccination was 65%.[22] Another study from Rohtak, Haryana conducted also showed that the compliance to complete IDRV course was 86.2%.[23] Similarly, a study done in nine health-care facilities at Haiti, including 690 animal bite victims showed that the compliance to IMRV was only 55%.[24] All these studies showed that the compliance to complete course of vaccination is inadequate for a fatal disease, and this needs to be addressed on a priority basis to work toward the goal of eliminating dog-mediated human rabies by 2030.[25]

The present study also revealed that the major reasons for noncompliance to complete course of anti-rabies vaccination were mainly socioeconomic factors; such as loss of wages, long distance for health facility, high cost incurred, interference with school timings, forgotten dates, out of station, and nonavailability of vaccines. Similarly, another study from urban slums of Chennai among 301 participants also showed that the compliance to IDRV was only 55.1% with the factors influencing noncompliance being loss of wages, forgotten dates, and interfering with school timings.[26] A study from anti-rabies clinic, Government hospital, Nagpur also showed that the compliance to complete course of IMRV was 73.5%, major factors being loss of wages, forgotten dates, cost incurred, and distance from the hospital.[27]

All these studies showed that there were many factors which have to be addressed to prevent rabies. Every bite victim has to be motivated through proper social and behavior change communication to complete the full course of vaccination, and telephonic reminders can be given to all animal bite victims regarding their next dose of vaccination. Similarly, to facilitate the completion of PEP; antirabies vaccines should be made continuously available at all government hospitals and to be provided free of charge to all animal bite victims, and hence that they can continue their course in any hospital, near their house/school/work place without interfering with their working hours/school timings and they need not lose their wages.

The present study also showed that only 5.86% of the biting dogs could be followed up due to logistical reasons/feasibility by the veterinary team to know the rabid status. This shows that the integrated bite case management, which involves conducting investigations of suspected rabid animals and sharing information with both human and animal health investigators for appropriate risk assessment, are resource-intensive and not easy to do in countries where there are fund restraint and incomplete logistics support.[28]

In the present study, all the exposed individuals who received the PEP at the health-care facility were found to be healthy and alive. Likewise, a study from Bangalore on clinical efficacy of PEP in confirmed rabies exposures, including 95 study participants showed that all of them were healthy and alive after 1 year of completing PEP.[29] These studies showed that PEP is effective in preventing rabies among exposed individuals.

Conclusions

The health-seeking behavior regarding early and correct PEP is unsatisfactory; moreover, the provision of PEP was also insufficient in many anti-rabies clinics across the country. Therefore, there is a need for regular Social and Behavioral Change Communication and provision of complete PEP to all exposed victims throughout the year in line with Sustainable Development Goal 3.8 to achieve Universal Health Coverage.[30]

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Conflicts of interest

There are no conflicts of interest.

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