

## REPORT FROM FIELD

## An Epidemiological follow-up study of unpasteurized milk exposure from Rabid Cattle in a village of India

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### Abstract

**Background:** Possibility of acquiring rabies due to consumption of unboiled milk exists and specific research documenting containment plan for such epidemics does not exist. Vaccination policies and specific criteria need to be decided for such vulnerable groups. **Methods:** A longitudinal follow-up study of 146 persons after consumption of milk from rabid buffalo was done for four years from 2012 to 2016 in village situated on western coast of India. Post exposure prophylaxis (PEP) was provided to exposed population according to WHO Essen regimen. **Results:** Early identification and PEP was possible due to coordination between health and medical services, medical education and veterinary departments. Among 146 at risk people, PEP for four doses was completed by 89% and five doses by 71% respectively. No untoward events related to rabies were reported after four years surveillance. The community participation in surveillance and vaccine uptake was backbone of outbreak containment plan. Timely reporting of laboratory confirmed cattle death helped to identify potential impounding outbreak. **Conclusions:** Addition of intradermal regimen PEP to people exposed to unpasteurised/unboiled milk from rabid cattle should be done to existing guidelines for emergency situations to prevent panic, vaccine costs and rabies epidemic among community.

### Keywords

Rabies; Bovine Cattle; Un-pasteurized Or Un-Boiled Milk Consumption

### Introduction

Rabies is an acute viral disease that can cause fatal encephalomyelitis in virtually all the warm-blooded animals including man. The virus is found in wild and some domestic animals, and is transmitted through their saliva (following bites, scratches, licks on broken skin and mucous membrane). (1, 2) Rabies is

almost 100% fatal but it is fully vaccine preventable through prompt administration of post-exposure prophylaxis (PEP). (2-4)

Annually 59,000 deaths occur and 3.7 million DALYs are lost due to Rabies, mostly in Asia and Africa. (1, 5) An estimated 45% of all deaths from rabies occur in South-East Asia. The situation is especially pronounced in India, which reports about 18,000 to

20,000 cases of rabies a year and about 36% of the world's deaths from the disease. (6)

More than 97% rabies deaths are dog bite mediated but occasional cases due to exposure to other mammals or other causes cannot be ignored (3, 4, 7-9). Possibility of acquiring rabies due to consumption of un-boiled or unpasteurized milk from rabid cattle also exists. (10) The risk of neglected disease of rabies due to bovine exposure needs to be explored to frame post-exposure prevention and immunization policies. Increasing awareness of health workers is crucial for timely and appropriate management. (11) Documenting timely actions for rabies possible outbreak could be useful for containment plan.

There are no specific guidelines to assess such non-bite exposure groups. Should a large-scale exposure occur in the future, use of specific criteria and risk assessment for antirabies vaccination may prevent unnecessary use of scarce vaccine resources, whereas public awareness education might prevent future episodes and potential foodborne transmission. (12)

In the present communication, we report a rabies outbreak in cattle followed by consumption of milk by humans from rabid cattle.

### Aims & Objectives

Our aim is to summarize long term follow-up findings of population at risk after drinking unboiled milk from rabid cattle. We also explore results of post-exposure prophylaxis in vulnerable population summarising the protective measures undertaken to prevent rabies outbreak in humans.

### Material & Methods

**Study design:** This was a longitudinal follow-up study among population at risk after consumption of unpasteurised milk from rabid cattle. The cohort was followed for four years. The incubation period of rabies is variable from 5 days to several years (usually one year) (3); therefore, we followed cohort for as long as possible to rule out any prevailing foci of infection in area among animals which could later spill over to humans.

**Setting:** Exposure occurred in a rural area of village Dipla located in Vijalpore Block of Navsari district at latitude 21.0 0 E and longitude 72.7 0 in South Gujarat Region of India. Navsari health department informed Government Medical College, Surat (GMCS) on 14th April 2012 (5 days after first buffalo death); where experts from Community Medicine,

Medicine and Microbiology formed a Rapid Response Team (RRT) for epidemiological investigation, prevention and control activities. Veterinary Department was also consulted for integrated approach.

**Case Definition of Rabies:** A subject presenting with an acute neurological syndrome (i.e. encephalitis) dominated by forms of hyperactivity (i.e. furious rabies) or paralytic syndromes (i.e. dumb rabies) progressing towards coma and death, usually by cardiac or respiratory failure, typically within 7–10 days after the first sign, if no intensive care is instituted. (3)

**Data collection:** Preliminary House to House survey of village was done with pre-designed semi structured questionnaire to identify houses with history of milk consumption from the rabid buffalo. People who were having positive history were defined as on risk. The Rabid cattle owners who had been in contact and caring for the animals were also classified as on risk. Closed houses were covered by telephonic communication at time and personal meeting was done separately afterwards to obtain personal history.

A total of 146 people were defined to be at risk from consuming milk from rabid buffalo. The entire masses of people on risk were advised to be enrolled for post exposure prophylaxis irrespective of age and sex. The post-exposure prophylaxis was given according to WHO recommended five dose 'Essen' Regimen (1-1-1-1-1) consisting of one dose administered intramuscularly in deltoid region on each of days 0, 3, 7, 14 and 28. (3) Day 0 is the day of start of vaccination.

Support from different departments of health and medical education was obtained. The investigation team was consisting of experts from Health Services, Community Medicine (Public Health), Physician, Veterinary Doctors and Microbiology. As Rabies is a 100% fatal disease and no clear guidelines are available for determining the exposure risk posed by consuming milk from rabid cattle, various experts, determined the exposure required active immunization with AntiRabies Vaccine (ARV) without any immunoglobulins (2-4). Rabies immunoglobulins were also provided to cattle owners and handlers (2-4).

Local health worker and community volunteers were assigned the role of first hand informer by weekly reports. The whole situation in village was actively monitored by Epidemic Medical Officer and Primary

Health Centre Medical officer for four years. The detailed survey was conducted of all households and family members at the end of four years.

**Community Support:** In depth interviews were conducted with cattle owner and stake holders like dairy owner, local shop keeper and local community members to explore the history of cattle disease and their milk business channels.

Meeting with other stake holders like ASHA worker (local Health worker), Male health worker, Anganwadi workers, village head and volunteers was done to obtain community support. Standard Case Definition from WHO guidelines was used to identify any case of Rabies in community. (3)

**Animal surveillance:** Observation of cattle shade and all the animals of the society was done actively for three months and passively for one year.

**Ethical Considerations:** This public health response was undertaken to prevent rabies epidemic by Government of Gujarat. According to Government regulations, a written consent is not required for the activities performed under national health programs and considered beneficial for people.

## Results

On taking history from the cattle owner, two deaths were reported among a total of approximately 40 cattle head. First buffalo developed loss of appetite followed by aggression and death on 9th April 2012. The buffalo was not giving milk. Another buffalo owned by the same man also developed similar signs and symptoms. This buffalo was milked and milk was mixed with the milk of other cattle to be distributed as usual. However, the symptoms became more pronounced with severe aggression in diseased animal. Due to this they had to keep it separate from all other cattle. This time they consulted a veterinary Doctor who suspected rabies in the buffalo. The buffalo died after five days of first animal death on 14th April during afternoon hours. The milk of buffalo suffering from rabies was mixed with milk of other cattle and distributed for consumption to people. This turn of events created a situation of fear of impending outbreak among general population of village.

Histopathological examination, at Veterinary Sciences and Animal Husbandry college, Department of Pathology, revealed presence of perivascular cuffing, congestion, degenerating neurons and intracytoplasmic eosinophilic inclusion bodies in

neuronal cell body confirming viral disease Rabies in the dead buffalo.

Household survey was carried out for whole village comprising of 637 households with a population of approximately 2000. After preliminary survey, 146 people of the 35 households having history of consumption of milk from rabid cattle (16 consumed raw milk while rest consumed milk in form of tea) or handling of rabid cattle were enrolled to start with post exposure prophylaxis on 13th April 2012. Population at risk was advised PEP ([table 1](#)). Approximately half population was between 16 to 45 years of age and 57% were females.

[Figure 1](#) illustrates the position of houses in the village where milk from rabid cattle was consumed. The house of cattle death is also depicted in [map figure](#). Some people used to come to the house of cattle owner to get milk while other people were given milk at their home by the cattle owner and his family members.

The PEP of five doses was advised according to 'Essen' Regimen (1-1-1-1-1) consisting of one dose administered intramuscularly in deltoid region on days 0, 3, 7, 14 and 28. (3) [Table 2](#) shows, 130 (89%) completed four doses of ARV and 105 (72%) completed five doses of ARV.

Active daily surveillance was done for first 10 days followed by active surveillance on Day 14 and 28. All the people were healthy post four years with no rabies related mortality. There were no rabies related Death among cattle on history from the cattle-owner.

## Discussion

Till date, no human cases have been reported due to consumption of milk from rabid animals but the theoretical possibility of outbreak of Rabies due to consumption of un-boiled or unpasteurized milk from cattle suffering due to rabies cannot be ignored. The existing national and WHO guidelines does not assess non-bite or raw milk exposure (2,3). Almost no research is available globally to understand management plan of exposure to potentially infected material from an rabid cattle (4,12).

In the present study, initially the rabies outbreak seems to occur in buffalo due to bite of a rabid dog when it went for grazing in nearby wild and uninhabited forest area. Following which both cattle died and diagnosis of rabies was confirmed on histopathological examination. Rabid cattle's milk

was mixed with other cattle for distribution therefore an outbreak alert was issued in the area. This led to widespread fear amounting to panic among village population especially cattle owners. Subsequently, the follow-up of people who consumed milk from rabid cattle was done. Most of the people gave history of consuming milk after boiling and only 16 persons consumed raw milk. But rabies is fatal therefore all people on risk were offered PEP for rabies free of cost under the Government supply for five doses according to Essen regime (3). No human case was identified during the surveillance period of four years. No history of similar deaths among cattle of the area was reported.

Similar mass vaccination after consumption of dairy products from cattle with suspected rabies or handling of rabid animals and contact with confirmed rabies patients has been reported in Bhutan and elsewhere in the world (12).

Estimating the risk of human rabies from milk consumption is a challenge for public health officials as the cost of rabies PEP is high and controlled studies in humans are neither feasible nor ethical. In an era of ever-increasing health care costs, innovative approaches are needed to identify scientifically valid and ethical methods of estimating the risk of human rabies transmission so that unnecessary vaccination can be avoided when it is not indicated. (13)

In our research approximately 90% took four and 70% people completed five doses of recommended PEP. Studies indicate that 4 vaccine doses can elicit adequate immune response and a fifth dose of vaccine did not contribute to more favourable outcomes. This may be reason for protection of all people (14).

Another factor decreasing the risk of rabies may be natural containment by dilution of milk with milk from other healthy cattle.

All village people were invited for an education session where hazards of raw milk consumption were discussed. People were educated for sign & symptoms of rabies in animal & human. They were requested to report the cases that had similar signs and symptoms from the community. They were also informed where to consult if they find any of the symptoms. Unboiled and unpasteurized milk may lead to many type of diseases especially zoonoses therefore appropriate care should be taken to boil milk before consumption (15).

Thus, outbreak of bovine rabies and its risk to human population was contained with the help of health education, surveillance and prompt PEP. The interdepartmental coordination and community participation by local people in health education, surveillance and vaccine uptake was the backbone of outbreak containment plan.

### Conclusion & Recommendation

Present study concludes that exposure to milk from rabid animal leads to panic situation among community and cannot be ignored. To prevent any rabies case among human there is need of providing PEP. However, no death has been noted during this entire exercise, vaccination policies and specific criteria need to be decided for such vulnerable groups by more research as a universal policy. Behaviour of raw milk consumption makes people vulnerable to other zoonotic diseases as well. PEP with intradermal regimen following milk exposure should be added to the existing rabies prophylaxis guidelines to cut vaccine costs, prevent panic and epidemic among population.

Timely reporting of cattle death helped to identify potential impounding outbreak. Early identification and PEP among mass was only possible due to coordination between departments like health and medical services, medical education and veterinary.

### Limitation of the study

Ethically and morally all people at risk should be covered by preventive measures, therefore, we cannot comment that what would have happened to exposed persons without vaccination.

### Relevance of the study

Globally we do not have any research describing the exposure to unboiled milk from rabid animals. The current study summarizes long term follow-up findings of people of a village exposed to rabid cattle. Intradermal pre-exposure prophylaxis for rabies can help to protect people with limited resources of vaccines only.

### Authors Contribution

AM: Concept and Design, Acquisition of data, analysis, interpretation of data, drafting and reviewing for intellectual content and final approval. JKK: Concept and Design, interpretation of data, final approval; SG& MD: Design, Acquisition of data, analysis, final approval; BC &AG: Acquisition of data, Concept of study, Interpretation and final approval

**References**

1. Human rabies transmitted by dogs: current status of global data, 2015. *Wkly Epidemiol Rec.* 2016 Jan 15;91(2):13-20. English, French. PubMed PMID: 26775296. [\[PubMed\]](#)
2. Ministry of Health & Family Welfare Gol. National Guidelines for Rabies Prophylaxis and Intra-dermal Administration of Cell Culture Rabies Vaccines. New Delhi: National Institute of Communicable Diseases, Directorate General of Health Services, Ministry of Health & Family Welfare, Government of India, New Delhi; 2007.
3. W HO. WHO Expert Consultation on Rabies: Second Report. WHO Technical Report Series 982 World Health Organization; 2013.
4. Ministry of Health & Family Welfare Gol. National Rabies Control Programme: National Guidelines on Rabies Prophylaxis. New Delhi: National Institute of Communicable Diseases, Directorate General of Health Services, Ministry of Health & Family Welfare, Government of India, New Delhi.; 2015.
5. Hampson K, Coudeville L, Lembo T, Sambo M, Kieffer A, Attlan M, Barrat J, Blanton JD, Briggs DJ, Cleaveland S, Costa P, Freuling CM, Hiby E, Knopf L, Leanes F, Meslin FX, Metlin A, Miranda ME, Müller T, Nel LH, Recuenco S, Rupprecht CE, Schumacher C, Taylor L, Vigilato MA, Zinsstag J, Dushoff J; Global Alliance for Rabies Control Partners for Rabies Prevention.. Estimating the global burden of endemic canine rabies. *PLoS Negl Trop Dis.* 2015 Apr 16;9(4):e0003709. doi: 10.1371/journal.pntd.0003709. eCollection 2015 Apr. Erratum in: *PLoS Negl Trop Dis.* 2015 May;9(5):e0003786. PubMed PMID: 25881058; PubMed Central PMCID: PMC4400070. [\[PubMed\]](#).
6. Kole AK, Roy R, Kole DC. Human rabies in India: a problem needing more attention. *Bull World Health Organ.* 2014 Apr 1;92(4):230. doi: 10.2471/BLT.14.136044. PubMed PMID: 24700986; PubMed Central PMCID: PMC3967582. [\[PubMed\]](#).
7. Zhu JY, Pan J, Lu YQ. A case report on indirect transmission of human rabies. *J Zhejiang Univ Sci B.* 2015 Nov;16(11):969-70. doi: 10.1631/jzus.B1500109. PubMed PMID: 26537216; PubMed Central PMCID: PMC4642879. [\[PubMed\]](#).
8. Dutta JK. Oral transmission of rabies in cow: milk consumers protected by immunisation. *J Assoc Physicians India.* 1996 Aug;44(8):584. PubMed PMID: 9251441. [\[PubMed\]](#).
9. Madhusudana SN, Mani R, Ashwin YB, Desai A. Rabid fox bites and human rabies in a village community in southern India: epidemiological and laboratory investigations, management and follow-up. *Vector Borne Zoonotic Dis.* 2013 May;13(5):324-9. doi: 10.1089/vbz.2012.1146. Epub 2013 Mar 8. PubMed PMID: 23473223. [\[PubMed\]](#).
10. Centers for Disease Control and Prevention (CDC).. Mass treatment of humans who drank unpasteurized milk from rabid cows--Massachusetts, 1996-1998. *MMWR Morb Mortal Wkly Rep.* 1999 Mar 26;48(11):228-9. Erratum in: *MMWR Morb Mortal Wkly Rep* 1999 Apr 9;48(13):274. PubMed PMID: 10220255. [\[PubMed\]](#)
11. dos Remedios CG, Miki M, Barden JA. Fluorescence resonance energy transfer measurements of distances in actin and myosin. A critical evaluation. *J Muscle Res Cell Motil.* 1987 Apr;8(2):97-117. Review. PubMed PMID: 3298315. [\[PubMed\]](#).
12. Tenzin, Sharma B, Dhand NK, Timsina N, Ward MP. Reemergence of rabies in Chhukha district, Bhutan, 2008. *Emerg Infect Dis.* 2010 Dec;16(12):1925-30. doi: 10.3201/eid1612.100958. PubMed PMID: 21122223; PubMed Central PMCID: PMC3294548. [\[PubMed\]](#).
13. Vaidya SA, Manning SE, Dhankhar P, Meltzer MI, Rupprecht C, Hull HF, Fishbein DB. Estimating the risk of rabies transmission to humans in the U.S.: a Delphi analysis. *BMC Public Health.* 2010 May 26;10:278. doi: 10.1186/1471-2458-10-278. PubMed PMID: 20500896; PubMed Central PMCID: PMC2887820. [\[PubMed\]](#).
14. Rupprecht CE, Briggs D, Brown CM, Franka R, Katz SL, Kerr HD, Lett SM, Levis R, Meltzer MI, Schaffner W, Cieslak PR; Centers for Disease Control and Prevention (CDC).. Use of a reduced (4-dose) vaccine schedule for postexposure prophylaxis to prevent human rabies: recommendations of the advisory committee on immunization practices. *MMWR Recomm Rep.* 2010 Mar 19;59(RR-2):1-9. Erratum in: *MMWR Recomm Rep.* 2010 Apr 30;59(16):493. PubMed PMID: 20300058. [\[PubMed\]](#).
15. Gadaga BM, Etter EM, Mukamuri B, Makwangudze KJ, Pfukenyi DM, Matope G. Living at the edge of an interface area in Zimbabwe: cattle owners, commodity chain and health workers' awareness, perceptions and practices on zoonoses. *BMC Public Health.* 2016 Jan 28;16:84. doi: 10.1186/s12889-016-2744-3. PubMed PMID: 26822888; PubMed Central PMCID: PMC4730767. [\[PubMed\]](#)

**Tables**

**TABLE 1 AGE AND SEX WISE DISTRIBUTION OF POPULATION AT RISK**

Distribution of population given Anti-Rabies Vaccine	
Age Group (in Completed Years)	Number (percentage %)
0-5 years	6 (4.1%)
6-15 years	36 (24.7%)
16-45 years	68 (46.6%)
46-60 years	21 (14.3%)
Above 60 years	15 (10.3%)
Sex wise distribution	Number (percentage %)
Female	84 (57.5%)
Male	62 (42.5%)
<b>Total</b>	<b>146 (100.0%)</b>

**TABLE 2: COVERAGE OF PEOPLE DEFINED TO BE AT RISK BY POST-EXPOSURE PROPHYLAXIS**

	Number of people who received PEP	Percent of original cohort (146) who received PEP	Number of original cohort lost for PEP*	Percent of original cohort lost for PEP
1st Dose (0 day)	146	100	0	0
2nd Dose (3rd day)	146	100	0	0
3rd Dose (7th day)	142	97.3	4	2.7
4th Dose (14th day)	130	89	16	11
5th Dose (28th day)	105	71.9	41	28.1

**Figures**

**FIGURE 1 MAP OF LOCAL AREA SHOWING POSITION OF HOUSES IN VILLAGE DIPLA**

