

**Title:** IMPACT AND CONSTRAINTS TO CONTROL RABIES IN KOLKATA THROUGH ONE HEALTH APPROACH

**Author:** UTPAL DAS

1. Department of Health, The Kolkata Municipal Corporation, Kolkata

**Keywords** One Health, Post Exposure Prophylaxis (PEP).

**Abstract** To control rabies, several anti rabies measures like humane control of stray dog population (ABC), anti-rabies vaccination (ARV) of both stray dogs and dog bitten citizens, administration of rabies immunoglobulin (ERIG), mass awareness programme etc. was undertaken by the Health Department, KMC within One Health framework along with the urban community participation in Kolkata, India. The reported cases of human rabies along with ARV of both stray dogs and dog bitten citizens, ERIG administration, number of sterilization of stray dogs were recorded and analysed throughout the five years of study since 2011. Decreasing trend of rabies in man and less demand of ARV and ERIG in cases of dog bitten citizens since 2013 were observed with the unique findings of more rabies affected citizens above 40years of age. Adopted anti rabies measures seems to be fruitful to reduce the demand for Post Exposure Prophylaxis (PEP). During the period of the study, a number of constraints and challenges has been experienced hindering rabies control programme; One Health Approach may be the best pathway to control rabies, if Government considers and intervenes with a few steps.

## Original Article

## IMPACT AND CONSTRAINTS TO CONTROL RABIES IN KOLKATA THROUGH ONE HEALTH APPROACH

UTPAL DAS

### ABSTRACT:

To control rabies, several anti rabies measures like humane control of stray dog population (ABC), anti-rabies vaccination (ARV) of both stray dogs and dog bitten citizens, administration of rabies immunoglobulin (ERIG), mass awareness programme etc. was undertaken by the Health Department, KMC within One Health framework along with the urban community participation in Kolkata, India. The reported cases of human rabies along with ARV of both stray dogs and dog bitten citizens, ERIG administration, number of sterilization of stray dogs were recorded and analysed throughout the five years of study since 2011. Decreasing trend of rabies in man and less demand of ARV and ERIG in cases of dog bitten citizens since 2013 were observed with the unique findings of more rabies affected citizens above 40 years of age. Adopted anti rabies measures seems to be fruitful to reduce the demand for Post Exposure Prophylaxis (PEP). During the period of the study, a number of constraints and challenges has been experienced hindering rabies control programme. One Health Approach may be the best pathway to control rabies, if Government considers and intervenes with a few steps.

**Key Words:** Rabies, One Health, Post Exposure Prophylaxis (PEP).

### INTRODUCTION:

Rabies a viral encephalitic disease causing almost cent percent fatality in absence of effective post exposure prophylaxis (PEP). The rabies virus is spread to human from animal bites since the virus is excreted in the saliva of the diseased animals. In developing countries, dogs are the predominant reservoir of infection (canine rabies) while other animals like bats, racoons and foxes are principle reservoirs of infection (sylvatic rabies) in developed countries<sup>1</sup>. Rabies is a neglected tropical disease and globally responsible for around 60000 human deaths annually. Its highest burden is experienced in some of the poorest regions of Asia and Africa where the disease prevalence is uniform across territories and of a stable pattern (NICD, loc. cit). Asia has the highest burden of human mortality due to endemic canine rabies with South Asia containing the maximum population at risk of infection<sup>2</sup>. The maximum incidence of Rabies has been reported from India with over 20,000 deaths per year<sup>3</sup>. As India is the hot bed of global rabies burden, there is an urgent need to revise the approaches to control rabies in dogs and prevention of rabies in man. India is moving towards the goal of "Dog mediated human rabies free World by 2030". In India, West Bengal is regarded as one of the Rabies endemic states along with Maharashtra, Andhra Pradesh and Tamil Nadu<sup>4</sup>. In order to make Rabies Free Kolkata, Health Department of The Kolkata Municipal Corporation (KMC) had started to give more emphasis on preventive anti rabies measures since 2011, based on One Health Approach. A retrospective study was conducted to assess the impact of anti-rabies measures to control rabies amongst the citizens of Kolkata along with the enlistment of the unfortunate

constraints experienced by the author during rabies control measures including few remedial steps.

### Materials & Methods

To control Rabies, sustainable One Health Approach of The Kolkata Municipal Corporation includes:

- ◆ Sterilization of Stray Dogs (ABC)
- ◆ Anti Rabies Vaccination (ARV) of Stray Dogs
- ◆ Anti Rabies Vaccination of dog-bitten Citizens
- ◆ Administration of Rabies Immuno Globulin (RIG)
- ◆ Replacement of vat (open garbage) by waste Compactors
- ◆ Licensing of Pet dogs
- ◆ Mass Awareness Program with Community Participation

Generally stray and community dogs are captured from the pre-specified locality on routine manner and on complaint basis by the expert dog-catchers daily with looped stick and transported through six dog catching vans. Captured dogs are sheltered in Dhapa Dog Pound for neutering. After resting for few days, the dogs are operated by the experienced Veterinary Surgeons in routine manner under dissociative anesthesia. Subsequently the dogs are released in their own territory from where they were caught. After post operative follow-up and routine anti rabies vaccination maintaining the norms laid down by Animal Welfare Board of India (AWBI). At that time the dog has fully recovered and is fit for street life.

In Kolkata, from 15 Ward Health Units (WHU), anti rabies vaccination with or without Equine Rabies Immuno Globulin (ERIG) has been given to the dog bitten citizens at free of cost. As road-side open garbage is a source of food for stray dogs, hence, Kolkata Municipal Corporation (KMC) has been replacing open

vans step by step by waste-compact machine. Moreover, pet dog license registration has been made mandatory and it is the responsibility of the dog-owner, and evidence of current anti rabies vaccination of pet dog is an essential requisite to licensure. Generally throughout the year at a certain time interval, public awareness camp on rabies is being organized in different places of Kolkata with the involvement of the community focusing following points:

- ◆ Idea of responsible dog-ownership
- ◆ Idea of avoiding dog bites
- ◆ Awareness on duties of citizens after animal biting
- ◆ Q & A session

Anti rabies vaccination of stray dogs within a particular pre-specified borough and ward have been taken throughout the day with follow up for the next few days. Relevant data and information's on anti rabies measures was collected from Health Department (KMC). Also data of human rabies cases of Kolkata and two adjacent districts (South & North 24 Parganas) has been collected from Infectious Disease Hospital, Beliaghata, Kolkata.

#### Results & Discussion :

All the informations were tabulated and analyzed.

Table 1

Year wise Rabies cases of the citizens admitted in Infectious Disease Hospital, Beliaghata, Kolkata

Year	Number of Rabies Cases
2010	5
2011	4
2012	3
2013	2
2014	2
2015	2
2016	2

It is found that the incidences of human rabies cases started to decline from 2013 (Table 1).

Table 2

Year wise sex distribution of Rabies Cases

Year	Male	Female
2010	4	1
2011	3	1
2012	2	1
2013	2	0
2014	1	1
2015	1	1
2016	1	1

Significant difference ( $P < 0.05$ ) has been observed over the years on sex wise rabies cases (Table 2). Men were found more affected than women due to their outdoor activities for their occupational compulsion and simultaneously to their chance of greater exposure to stray dogs.

Table 3

Year-wise age distribution of Rabies Cases

Year	Age		
	0-20	20-40	>40
2010	2	1	2
2011	2	2	0
2012	0	0	3
2013	0	0	2
2014	1	0	1
2015	0	0	2
2016	0	0	2

Although age-wise difference was not much pronounced (Table 3), still significant difference has been found in some years. Citizens above 40 years of age was found to be affected more which may be due to highest urban population of this age group and it is an unique finding in urban human rabies case study.

Table 4

Year-wise Monthly distribution of Rabies cases

Year	Month
2010	Feb-1, Apr-1, Jul-2, Dec-1
2011	Mar-2, Jun-1, Oct-1
2012	May-1, Aug-1, Oct-1
2013	Aug-1, Dec-1
2014	Apr-1, Aug-1
2015	Nov-1, Jul-1
2016	Feb-1, July-1

Month-wise admission of rabies cases were found insignificant (Table 4) which might be due to variation of incubation period of rabies virus.

Table 5

Data on ABC of stray dogs

Period	No. of Dogs	No. of Bitches	Total
Dec, 2012-Mar, 2013	251	229	480
Apr, 2013-Mar, 2014	945	783	1728
Apr, 2014-Mar, 2015	728	623	1351
Apr, 2015-Mar, 2016	802	640	1442
Total	2726	2275	5001

Table 6

Anti-Rabies Vaccination of stray dogs

Period	Number of stray dogs Vaccinated
2012-13	1980
2013-14	3208
2014-15	4029
2015-16	6005

For humane control of stray dog population, the CNR (catch-neuter-return) or TNR (Trap-Neuter-Return) tactic is the most practical one and Health Department, KMC has been trying to increase the quantum of ABC-ARV program year after year (Table 5 & 6) for creating a friendly stable rabies free stray dog society. Unlike post-menopausal osteoporosis in woman, removal of both ovaries in bitches has no untoward effect on bone density<sup>11</sup>.

Primary prevention of rabies requires vaccination of dogs as an essential prerequisite for virus management in animal populations by building sustainable herd immunity in dogs<sup>10</sup>. Also annual mass vaccination through organization of vaccination and awareness camp are the most effective means to control canine rabies<sup>7</sup>.

The application of anti-rabies serum (ARS) is only recommended in category III exposures (Table 9) following animal bites in the depth and around the wound since the rabies immunoglobulin has the property of binding with rabies virus resulting in its inactivation<sup>17</sup>.

**Table 7**  
Year-wise use of ARV for animal-bitten citizens

Year	Pharmaceutical brand		Total ARV doses used
	Veroxab	Rahipur	
2011-12	44000	6500	50500
2012-13	5000	41504	46504
2013-14	25000	—	25000
2014-15	4800	25600	30400
2015-16	—	8900	8900

**Table 8**  
Year wise use of ERIG for animal bitten citizens

Year	Anti rabies serum	Total ERIG used (ml)
2012-13	Equirab	478
2013-14	Equirab	7000
2014-15	Equirab	3500
2015-16	Equirab	2500

**Table 9**  
Post exposure treatment in animal bite management is classified into the following categories as per the national guidelines for rabies prophylaxis in India

Category	Type of contact	Type of exposure	Management
I	Touching or feeding of animals, Licks on intact skin	None	None, if reliable history is available
II	Nibbling of uncovered skin, Minor scratches or abrasions without bleeding	Minor	Wound management, anti-rabies vaccine
III	I. Single or multiple transdermal bites or scratches II. Licks on broken skin III. Contamination of Mucous membrane with saliva	Severe	Wound management, rabies Immunoglobulins, anti-rabies vaccine

The trend of demand of ARV and ERIG amongst the citizens is found to be decreased year after year (Table 7 & 8); It may be due to the fact that stray dog vaccination reduces the need and demand of PEP<sup>17</sup> and it is a good indication or sign of reducing animal bite, as well as success of anti rabies measures taken by the KMC. It seems also be due to regular organization of public awareness camp and involvement of mass community with sustained political commitment. Gradual reduction of PEP demand translate success in anti-rabies measures to some extent. The participation of Community is the corner stone of any health awareness program. Health Department, KMC advocates responsible dog ownership mainly through the movement restriction of their pets and annual ARV with renewal of license. After animal biting, public is also advised on proper wound-toileting and to take immediate advice of doctors from the nearest Ward Health Units for free administration of ARV and (or) ERIG and for which multi-lingual leaflets are also distributed amongst citizens. Wound-toileting and application of antiseptics destroy the outer coating of rabies virus<sup>7</sup>. Local management should be followed by

provision of both passive and active immunization to induce production of protective antibodies and inactivation of rabies virus<sup>17</sup>. It should be kept in mind, that there is no known contraindication to rabies vaccination and ARV is permitted even in pregnant woman and immunocompromised people<sup>18</sup>. Moreover, Health Department focuses on reduction in dog bite incidence by reducing stray dog population through ABC, improving knowledge in community through interactive session in awareness camps, reduction of undesirable stray dog-human interaction and use of soap and water for local wound toileting. Das (2010) observed various unscientific traditional myths and beliefs amongst rural people like application of turmeric with oil paste, chilly, cow-dung, paste of Karela leaves, antiseptic (Dettol) and lime application, cutting of another side in the hope of bleeding away toxins of dog bite, application of armlets etc. during rural case study after animal bite in man. In Kolkata, regular sensitization on PEP seems to develop better civic sense amongst the citizens which is reflected in the incidence of human rabies cases, as well as reducing demand of PEP amongst citizens.

**Table 10**  
Year wise Rabies Cases Admitted in LD. Hospital,  
Kolkata from two adjacent Districts  
(South & North 24 Parganas)

Year	South 24 Parganas	North 24 Parganas
2010-11	11	3
2011-12	6	10
2012-13	7	3
2013-14	7	5
2014-15	4	6
2015-16	6	4

In the adjoining districts of Kolkata, only a few civic bodies and NGOs are involved in ABC & ARV program; but no systematic One Health Approach has not yet been taken in those areas, creating hindrance to set-up Rabies free Kolkata. Moreover, sylvatic or exo-anthrop cycle of Rabies already persists in South 24 Parganas district and table 10 also reflects more rabies patients from 24 Parganas (S).

To combat Rabies, conjoint effort of all civic bodies are required; otherwise intra district cross border infection would not be preventable. Through a long way to go, but the rabies cases of the citizens of Kolkata are found to decline since 2013, which could be a good indicator towards success of sustained anti-rabies measures with One Health Approach, as adopted by Health Department of The Kolkata Municipal Corporation. One Health algorithm seems to be the best pathway to control rabies coordinating Health Department with Veterinary and Medical setup along with Conservancy (Solid Waste Management) and Licence Department. Within a One Health framework, rabies is likely the best documented example for the added value of closer collaboration of human and veterinary medicine for the control of zoonotic diseases. In essence, One Health is a practical concept. It is a phrase that was coined a number of years ago to capture the fact that human, animal and environmental health are fundamentally connected. One Health Approach provides historic opportunity to make rabies history. But, if all the civic bodies of adjoining two districts don't take the facility of One health framework on anti-rabies measures conjointly, then it would be difficult to set-up "Rabies Free Kolkata" in near future. Hence, human rabies cases may be controlled in Kolkata, but could not be eliminated from Kolkata.

As this program is a continuous one, control and surveillance of rabies through this path of approach overcoming few challenges will make Louis Pasteur's dream a reality in near future.

#### **Constraints and Challenges:**

Followings are the observed overall unfortunate constraints and challenges influencing and hindering rabies control measures:-

- ◆ Absence of adequate rabies surveillance system (datapenia); Scarcity of data results in paucity of resources and consequent lack of evidence in animal and human hospitals, even in Teaching Institution
- ◆ Absence of an Integrated Bite Case Management (EBCM) approach
- ◆ Availability and scarcity of human and animal anti rabies biological outside the metro city
- ◆ Cost of human and animals anti rabies biological
- ◆ Lack of laboratory diagnostic capacity
- ◆ Less awareness amongst public regarding stray dog behavior, as well as for proper and timely PEP
- ◆ Resistance during catching and (or) releasing of community and (or) stray dogs
- ◆ Constraint to control sylvatic rabies
- ◆ Lack of dedicated man power with robust infrastructure in ABC-ARV program under local bodies for a focused and systematic ABC programme
- ★ More scientific involvement of NGOs in ABC-ARV programme

#### **Steps to be considered by the Government:**

Following points are to be considered to make 'Rabies free India'

- Requirement of notifiability of rabies in man & animal
- Conjoint enforcing of One Health Approach on anti-rabies measures through all the local bodies
- Improve communication between human health and veterinary division
- Awareness/Sensitization and orientation of civic representatives and common people regarding anti rabies measures
- Training of health care personnel for intradermal vaccination for rabies PEP for cost effectiveness
- Insist on adoption of stray dogs
- Inclusion of School health education on rabies and bite management
- Encourage research on chemo-sterilization and immune-sterilization or contraception of stray dogs for cutting of cost and relatively easy application
- Use of oral rabies vaccine for mass vaccination specially for free-ranging wild life

In a holistic manner, the unified paradigm 'One Health Approach' must take the full opportunity to make Rabies history.

#### **Acknowledgement:**

Author is thankful and grateful to The Chief Municipal Health Officer, The Kolkata Municipal Corporation and Superintendent, Infection Disease Hospital, Beliaghata, Kolkata for providing data with necessary help and cooperation for this study.

## REFERENCES:

1. Dogel, K., and Medina, F.X. (1999) Economics of human and canine Rabies elimination: Guidelines for Programme orientation. *Bull. World Health Organ.*, 68: 281-291. [PubMed]
2. Cleaveland, S.; Fèvre, E.M.; Kiuru, M.; Coleman, P.G. (2002). Estimating human rabies mortality in the United Republic of Tanzania from dog bite injuries. *Bull. World Health Organ.*, 80, 304-310. [PubMed]
3. Das, U. (2009). Profile of dog bite cases among domestic animals and its management in rural West Bengal. *Indian J. Vet. Public Health* 1:100-104.
4. Das, U., Maji, A.K. and Saravati, A. (2014). Effect of Rabies Control Programme in rural West Bengal - an approach towards Rabies free India by 2020. *APCRI Journal* 15 (2): 24-26.
5. Gogal, W. & Wright, A.E. (2011). Human Rabies in the WHO Southeast Asia Region: Forward steps for Elimination. *Astr. Prev. Med.* 10:4081/2011/383870. *Epub* 2011, Sep. 21. *Pub Med* PMID: 21991437. *PubMed Central* [PMCID: PMC3178116] [PubMed]
6. Kröber, D.L., Cleaveland, S., Coleman, P.G., Fèvre, E.M., Mekker, M.I., Miranda, M.I., Shaw, A., Zinsstag, J., Medina F.X. (2009). Re-evaluating the burden of rabies in Africa and Asia. *Bull. World Health Org.*, May, 2009, 83: 360-8.
7. Lechenne, M., Miranda M.I., Zinsstag, J. (2015). Integrated Rabies Control. In *One Health: The Theory and Practice of Integrated Health Approaches*. CAB: Wallingford, UK, 2015, p. 176.
8. Lechenne, M.; Ouedraogo, A.; Nansingar, K.; Minakem, R.; Mounirani, E.; Rives, G.; Hattendorf, J.; Mota, D.D.; Allbrook, I.O.; Zinsstag, J.; et al. (2016). Operational performance and analysis of two rabies vaccination campaigns in N Djamena, Chad. *Vaccine*, 34, 571-577. [CrossRef] [PubMed]
9. Maji, A.K., Das, U., Ansh Kumar, Roy, S. and Bhattacharya, S. (2015). Effect of pantothenic acid on calcium metabolism in fish in ABC programme. *Abst. Published in Sevanti, 17<sup>th</sup> National Conference of APCRI, Hyderabad, July 4<sup>th</sup> & 5<sup>th</sup>, 2015.*
10. Maji, A.K. & Das, U. (2016). Role of Veterinarians with approach towards Rabies free India by 2020. *Abstract No.023, Sevanti published in 18<sup>th</sup> National Conf. of APCRI (APRICON 2016), NIMBANS, Bangalore, 9-10<sup>th</sup> July, 2016, p.14.*
11. Mendken, R.; Kariaga, Y.; Dramanguwa Mote, D.; Mekker, M.I.; Warrason, P.; Zinsstag, J. (2009). Effectiveness of dog rabies vaccination programme: Comparison of owner-charged and free vaccination campaign. *Epidemiol. Infect.* 2009, 137: 1558-1567.
12. National Institute of Communicable Diseases (2007). *Zoonotic Diseases of Public Health Importance*. New Delhi, P.140.
13. Sadashan, M.K. (2005). Assessing burden of rabies in India WHO sponsored national multicentric rabies survey 2000. *Ind J. Com. Med.* 30: 106-101.
14. Torvis, W.K. and Wood, M.P. (2012). Human and animal rabies prevention and control cost in Bhutan, 2001-2008: The cost-benefit of dog rabies elimination. *Vaccine*, 31, 260-270. [CrossRef] [PubMed]
15. Usdinanga, E.A., Mekker, M.I., Tran, C.H., Atkins, C.Y., Etkerit, M.D., Miller, M.F., Adrien, P., Williams, R.M. (2017). Cost-effectiveness evaluation of a novel integrated bite case management program for the control of human rabies, Haiti 2014-2015. *Am. J. Trop. Med. Hyg.*, 96: 1307-1317. [CrossRef] [PubMed]
16. WHO (2015). *Global Elimination of Dog-Mediated Human Rabies: The Time is Now!* WHO, Geneva, Switzerland.

## ANNOUNCEMENT

The APCRI Journal is published every six monthly, in January and in July every year. Articles are solicited by the Editor from the Scientific Community, on different aspects of Rabies. Please visit the APCRI Journal Website - [www.apcrijournal.org](http://www.apcrijournal.org) for Manuscript Guidelines.

Please Contact : Dr. Amlan Goswami, Editor, APCRI  
28-A, Gariahat Road, 2nd Floor, Flat No. 2-A  
Kolkata-700 029, INDIA  
Phone : 91-33-24405826. Mobile : 91 9830212694  
E-mail : [amlan\\_kolkata29@rediffmail.com](mailto:amlan_kolkata29@rediffmail.com)