APCRI Journal
Volume 27, Issue 2- 2025, Pg. No. 16-20
Peer Reviewed & Open Access Journal

Review Article

# Combating Rabies through the One Health Approach: An Integrated Strategy for Prevention and Control

Ashwini Katole[1], Anupriya Jha[2], Purushottam Giri[3]

[1]Assistant Professor, Department of Community and Family Medicine (CFM), All India Institute of Medical Sciences (AIIMS), Raipur, Chhattisgarh, India
[2]Assistant Professor, Department of Community Medicine, Shri Balaji Institute of Medical Science (SBIMS), Raipur, Chhattisgarh, India
[3]Professor & Head, Department of Community Medicine, Indian Institute of Medical Science & Research (IIMSR) Medical College, Maharashtra, India
**DOI:** https://doi.org/10.24321/0973.5038.202511

## I N F O

**Corresponding Author:**
Ashwini Katole, Department of Community and Family Medicine (CFM), All India Institute of Medical Sciences (AIIMS), Raipur, Chhattisgarh, India
**E-mail Id:**
ashwini.katole@gmail.com
**Orcid Id:**
https://orcid.org/0000-0001-8976-8259
**How to cite this article:**
Katole A, Jha A, Giri P. Combating Rabies through the One Health Approach: An Integrated Strategy for Prevention and Control. APCRI J. 2025; 27(2): 16-20.

Date of Submission: 2025-08-04
Date of Acceptance: 2025-11-10

## A B S T R A C T

Rabies, a fatal yet vaccine-preventable zoonotic disease, continues to pose a significant public health burden, particularly in low- and middle-income countries of sub-Saharan Africa and Southeast Asia. Despite causing an estimated 59,000 deaths and over 3.7 million disability-adjusted life years (DALYs) annually, rabies remains neglected due to fragmented health systems, limited awareness, and inadequate access to vaccines. The One Health approach, which emphasises the interconnectedness of human, animal, and environmental health, offers a comprehensive framework for rabies prevention and control. This article explores the effectiveness of One Health interventions, including mass dog vaccination, integrated surveillance, community engagement, and cross-sectoral coordination. Case studies from Latin America, Bangladesh, and Rwanda demonstrate measurable successes in reducing rabies incidence through collaborative efforts. While challenges such as insufficient funding, manpower, and governance persist, scaling up One Health strategies—especially in endemic regions—remains essential for achieving the global goal of zero human deaths from dog-mediated rabies by 2030.

**Keywords:** Rabies, Prevention And Control, Zoonotic Disease, Dog Vaccination

## Introduction

Rabies is found to be the most dreaded zoonotic disease on account of its high case fatality and the suffering it inflicts on humans as well as animals. Rabies is vaccine-preventable but remains a public health challenge in numerous low- and middle-income countries (LMICs), especially in sub-Saharan Africa and Southeast Asia. An estimated loss of over 3.7 million healthy life years due to disability and premature death annually, and disproportionately affects children under age 15.[1]

Despite being 100% preventable through timely interventions, rabies remains neglected in many health agendas due to underreporting, lack of awareness, and poor infrastructure. Rabies is responsible for an estimated 59,000 fatalities annually, predominantly in rural and impoverished communities where access to health services and vaccines

is limited. The neglect is compounded by fragmented approaches that treat human, animal, and environmental health as separate domains, rather than interconnected systems requiring integrated action.[2]

Previously, traditional Rabies control efforts tended to concentrate on detached aspects of the human health system, such as Post-Exposure Prophylaxis treatments (PEP). However, in such strategies, no consideration is given to the zoonotic source and environmental transmission. This development has generated growing support for the One Health concept, which emphasises the interconnectedness of environmental factors, animal well-being, and human health.[3]

## The One Health Concept

The One Health multidisciplinary concept recognises that human health is intricately linked with animals and the environment. It advances an approach to health systems collaboration for the detection and control of public health threats that cross the human-animal-environment interface.[4]

This concept has gained prominence with the emergence and re-emergence of zoonotic diseases such as Ebola, avian influenza, and COVID-19, all of which demonstrate the need for a coordinated multisectoral response. The One Health High-Level Expert Panel (OHHLEP), established by WHO, FAO, WOAH, and UNEP, aims to institutionalise this model in policymaking globally. By fostering joint responsibility and resource sharing across sectors, One Health increases the efficiency and sustainability of disease control programmes.[5]

The World Health Organisation (WHO), the World Organisation for Animal Health (WOAH) – formerly OIE (Office International des Epizooties), the Food and Agriculture Organisation (FAO) and the Global Alliance for Rabies Control (GARC), amongst other major international bodies, have embraced One Health as a fundamental approach in the quest for rabies elimination.[6] In 2018, these organisations joined forces to launch the "Zero by 30" initiative, aiming to eliminate human deaths from dog-mediated rabies by the year 2030.[7]

## Rabies: Epidemiology and Transmission

Rabies is a viral disease affecting the nervous system, caused by a Lyssavirus, and is primarily spread through the saliva of infected animals, with domestic dogs being the main source. Rabies as a clinical manifestation is almost invariably fatal. About 99% of human rabies cases occur following bites of dogs.[1]

Uncontrolled dog population, poor vaccination and low awareness in communities maintain the disease in endemic areas. Wildlife species, such as bats and foxes, can also serve as reservoirs, especially in the Americas and parts of Europe. Post-Exposure Prophylaxis, if taken soon after an exposure, is 100% effective. Nevertheless, use of PEP is expensive and not always available, especially in remote regions, thereby emphasising the importance of prevention through animal vaccination and surveillance.[6,8]

## One Health in Action: Strategies for the Prevention of Rabies

### Mass Dog Vaccination

Shutting down the epidemic cycle through achieving at least 70% of the canine population vaccinated (so-called herd immunity) is the most cost-effective means of preventing human cases of rabies.[9] The One Health approach also facilitates integrated campaigns involving both the veterinary sector and public health agencies, together with local government bodies. For example, the One Health Secretariat in Bangladesh has facilitated countrywide dog vaccination campaigns since 2010, leading to a drastic reduction in human rabies deaths.[10]

Evidence from Tanzania also suggests that dog vaccination campaigns are scalable even in resource-constrained settings, particularly when supported by community-based volunteers and mobile vaccination units. Such campaigns not only reduce rabies incidence but also strengthen trust in public health authorities.[11]

### Integrated Detection and Reporting

Collaborative surveillance between the human and animal sectors for rabies is also often not yet established. The One Health approach encourages merged data systems and collaborative outbreak investigations, which lead to better disease tracking and rapid response. World Health Organisation encourages the sharing of data across sectors through tools such as the Rabies Epidemiological Bulletin (REB).[12]

Mobile-based reporting apps and digital dashboards have begun transforming real-time disease surveillance. Tools like DHIS2, used in East Africa, allow data from veterinary fieldworkers and hospitals to be centrally analysed to identify hotspots and mobilise resources faster.[13]

## Community engagement and Education

Educating communities to bring about behaviour change is a cornerstone of rabies prevention and control. One health approaches include public education messages, frequently delivered through community-based health workers, veterinarians, and school districts. In the Philippines, dog registration, leash laws, and school-based education have been linked to substantial decreases in the incidence of rabies.[14]

Effective campaigns often use local languages, storytelling, and visual media to increase uptake of key messages. In India, partnerships with NGOs have led to "Rabies-Free

ISSN: 0973-5038
DOI: https://doi.org/10.24321/0973.5038.202511

Schools" where students act as peer educators, amplifying outreach to households.[15]

## Coordination across Sectors

The success of One Health is dependent on political will and formal collaboration between ministries of health, agriculture, environment and education. Multistakeholder institutions at the national and sub-national level are vital to drive the coherence of policy, resource allocation and coordination response.[16]

Cross-border coordination is also critical, particularly in regions with porous borders and migratory animal populations. Initiatives like the South Asian Association for Regional Cooperation (SAARC) Rabies Control Network are working to standardise protocols and improve information exchange between member nations.[17]

## Examples of One Health "Wins"

### Latin America

It has withstood the tide on account of the strength derived from several years of multisectoral collaboration. From 1983 - 2012, human rabies cases due to dog bites declined by more than 95% as a result of organised mass dog vaccination campaigns and public awareness.[18]

The Pan American Health Organisation (PAHO) played a central role in coordinating and funding the rabies elimination strategy across countries like Mexico, Brazil, and Colombia. The inclusion of animal health workers in primary health teams helped integrate dog vaccination with regular community health visits.[19]

### Bangladesh

Adopting the One Health approach in 2010, Bangladesh has vaccinated more than 2 million dogs and trained thousands of health workers. Death from human rabies decreased from more than 2,000 in 2010 to less than 200 in 2020.[10]

The success was also due to the inclusion of academic institutions like Chattogram Veterinary and Animal Sciences University (CVASU), which contributed to training and surveillance innovation.[20]

## Rwanda

Rwanda created a national One Health Steering Committee and an integrated rabies control plan, which included contributions from the human and animal sectors. With this method, it has enhanced reporting, vaccine access and cross-border surveillance.[21]

Rwanda's school curriculum also includes zoonotic disease education, which fosters early awareness among children and enables a community-wide culture of prevention.[22]

## Challenges Operationalising One Health for Rabies

Although it holds promise, some barriers stand in the way of realising One Health approaches:

- **Lack of funds and resources:** Many LMICs have no economic strength to support long-term mass dog vaccination or integrated surveillance systems.
- **Fragmented governance:** Jurisdictional battles between ministries can undermine coordination.
- **Insufficient manpower:** Limited skilled professionals in veterinary public health and zoonotic diseases weaken the effectiveness of the One Health response.
- **Cultural barriers:** In some areas, dogs are thought of negatively, and/or traditional healing beliefs can slow access to care.[23]

Overcoming these barriers depends on global assistance and local commitment to rabies prevention measures.

## Recommendations and Future Work

In order to realise the "Zero by 30" objective, there needs to be:

- **Reinforcing Intersectoral Governance:** Institutionalise One Health coordination mechanisms with defined responsibilities.
- **Maintain Dog Vaccination Campaigns:** an 70% coverage Ensure financial and logistical support to reach and sustain 70% vaccination coverage.
- **Invest In Workforce Development:** Train personnel in epidemiology, veterinary science and zoonotic disease control.
- **Harness Technology:** Apply mobile applications and geospatial tools for surveillance and tracking.
- **Increase Community Involvement:** Include communities, local leaders, educators and animal welfare agencies in planning and programmes.
- **Supporting Operational Research:** Assess the cost-effectiveness and impact of One Health interventions.[24]

## Sterilisation of dogs and the One Health approach

**Goa's One Health Approach to Rabies Control:**

In 2019, the state of Goa became India's first state to eliminate human dog-mediated rabies as a part of the One Health approach. There was also a significant reduction in canine rabies cases by 92%. The implementation of the rabies programme was cost- effective and set an example of how rabies elimination is achievable. The programme gives a strong amalgam of strong leadership, technical support and other multisectoral collaboration.[25]

The state of Goa implemented a multi-faceted One Health strategy to eliminate human rabies deaths, consisting of three core components:

**ISSN: 0973-5038**
**DOI: https://doi.org/10.24321/0973.5038.202511**

- **Mass Dog Vaccination:** Mass vaccination of both pet dogs and stray dogs to achieve at least 70% coverage through the rabies programme. The mobile teams are using smartphone technology to achieve the vaccination in specific geographic areas.
- **Public Education:** Rabies awareness programmes were conducted to reach a large number of people, especially children and dog owners. It gives education and awareness regarding dog bite management and the importance of vaccination.
- **Intensified Surveillance:** The tracking of both human and animal cases of rabies was established to monitor the cases of rabies, assess the effectiveness of control measures and detect any potential outbreaks early.[25]

### Keeping Andaman and Nicobar Rabies-Free with a One Health Approach:

The Andaman and Nicobar Islands have a special geographic area, as they are isolated from the rest of the land and also free from reservoir animals as a result, it is a Rabies-free part of India. Along with that, the main focus is on the prevention of entry of the disease by a strict biosecurity and surveillance system at the entry points.[26]

- **Geographical Advantage**: The Andaman and Nicobar Islands have been rabies-free historically due to their geographical isolation and lack of reservoir animals.
- **Preventative Measures:** The main focus is on preventing the introduction of the rabies virus and the active control campaigns, like those in Goa.
- **Biosecurity and Surveillance:** This involves control over the entry of animals and potentially infected materials into the islands to maintain their rabies-free status, which is very helpful to control rabies among humans as well as in animals.[26]

## Conclusion

Eradicating rabies is possible, but it entails moving away from siloed, sectoral responses to comprehensive, integrated solutions. The One Health initiative offers a strong platform to tackle rabies at its source – through the control of animal reservoirs, enhanced surveillance and community engagement. Successes in Latin America, Bangladesh and Rwanda demonstrate what countries can do when they stay the course and work together. Achieving our core objective of ending human deaths caused by dog-mediated rabies globally by 2030 will rely on our ability to bring the One Health vision to life at all levels, from global to village.

**Conflict of Interest:** None

**Source of Funding:** None

**Declaration of Generative AI and AI-Assisted Technologies in the Writing Process:** None

**Author's Contribution:** Conceptualization: A K and P G, Manuscript writing: A K and A J, Manuscript Editing: P G

## References

1. World Health Organization. Rabies [Internet]. Geneva: World Health Organization; 2023. [Last accessed on 20th June 2025] Available from: https://www.who.int/news-room/fact-sheets/detail/rabies
2. Hampson K, Coudeville L, Lembo T, Sambo M, Kieffer A, Attlan M, et al. Estimating the global burden of endemic canine rabies. PLoSNegl Trop Dis. 2015;9(4):e0003709. [Google Scholar]
3. Okello AL, Bardosh KL, Smith J, Welburn SC. One Health: Past successes and future challenges in three African contexts. PLoS Negl Trop Dis. 2014;8(5):e2884. doi:10.1371/journal.pntd.0002884.[Google Scholar] [PubMed]
4. Mackenzie JS, Jeggo M. The One Health approach—Why is it so important? Trop Med Infect Dis. 2019;4(2):88. [Google Scholar][PubMed]
5. World Health Organization. One Health High-Level Expert Panel (OHHLEP). Geneva: World Health Organization; 2021. Available from: https://www.who.int/groups/one-health-high-level-expert-panel. [Accessed 2025 Jun 20].
6. Global Alliance for Rabies Control. One Health approach [Internet]. GARC; 2022 [cited 2025 Jun 20]. Available from: https://rabiesalliance.org
7. World Health Organization, Food and Agriculture Organization of the United Nations, World Organisation for Animal Health, Global Alliance for Rabies Control. Global strategic plan to end human deaths from dog-mediated rabies by 2030. Geneva: World Health Organization; 2018.
8. Lembo T, Hampson K, Kaare MT, Ernest E, Knobel D, Kazwala RR, Haydon DT, Cleaveland S. The feasibility of canine rabies elimination in Africa: dispelling doubts with data. PLoS neglected tropical diseases. 2010 Feb 23;4(2):e626.[Google Scholar][PubMed
9. .Cleaveland S, Lankester F, Townsend S, Lembo T, Hampson K. Rabies control and elimination: a test case for One Health. Vet Rec. 2014;175(8):188-93.[Google Scholar][PubMed]
10. Ahmed K, Yasmin R, Rahman M, Sattar A, Paul SK, Faruque M, et al. One Health approaches to control

of zoonoses: the prospects for rabies control in Bangladesh. One Health. 2021;13:100300. doi: 10.1016/j.onehlt.2021.100300.
11. Sambo M, Cleaveland S, Ferguson H, Lembo T, Simon C, Urassa H, Hampson K. The burden of rabies in Tanzania and its impact on local communities. PLoS Negl Trop Dis. 2013;7(11):e2510. [Google Scholar][PubMed]
12. World Health Organization. Rabies epidemiological bulletin [Internet]. Geneva: World Health Organization; 2024 [cited 2025 Jun 20]. Available from: https://www.who.int/initiatives/rabies-bulletin.
13. District Health Information System (DHIS2) [Internet]. Oslo: University of Oslo; 2023 [cited 2025 Jun 20]. Available from: https://dhis2.org.
14. Davlin S, Lapiz SM, Miranda ME, Murray K. Factors associated with dog rabies vaccination in Bohol, Philippines: results of a cross-sectional cluster survey conducted following the island-wide rabies elimination campaign. Zoonoses Public Health. 2013;60(7):494-503. [Google Scholar][PubMed.
15. Mission Rabies India. Rabies-Free Schools initiative [Internet]. 2023 [cited 2025 Jun 20]. Available from: https://www.missionrabies.com/india.
16. Taylor LH, Nel LH. Global epidemiology of canine rabies: Past, present, and future prospects. Vet Med Res Rep. 2015;6:361–71.[Google Scholar][PubMed]
17. SAARC Rabies Control Network. Regional guidelines for rabies prevention. Kathmandu: SAARC; 2022.
18. Schneider MC, Aguilera XP, Barbosa da Silva Junior J, Ault SK, Najera P, Martinez J, Requejo R, Nicholls RS, Yadon Z, Silva JC, Leanes LF. Elimination of neglected diseases in Latin America and the Caribbean: a mapping of selected diseases. PLoS Negl Trop Dis. 2011 Feb 15;5(2):e964. [Google Scholar][PubMed]
19. Pan American Health Organization. Rabies elimination program overview. Washington (DC): Pan American Health Organization; 2023. Available from: https://iris.paho.org/handle/10665.2/58961. Accessed 2025 Dec 24.
20. Chattogram Veterinary and Animal Sciences University (CVASU). Annual report: Rabies surveillance and training initiatives. Chattogram: Chattogram Veterinary and Animal Sciences University; 2022.
21. Rwego IB, Babalobi OO, Musotsi P, Nzietchueng S, Tiambo CK, Kabasa JD, Naigaga I, Kalema-Zikusoka G, Pelican K. One Health capacity building in sub-Saharan Africa. Infect Ecol Epidemiol. 2016;6:34032. [Google Scholar][PubMed]
22. Rwanda Education Board. Integrating zoonoses in primary school curriculum. Kigali: Rwanda Education Board; 2022.
23. .Wallace RM, van der Faast R, Ramos M, Serpell JA. Cultural factors and rabies awareness: perspectives from Latin America. Curr Trop Med Rep. 2017;4(1):1–13.
24. Fooks AR, Banyard AC, Horton DL, Johnson N, McElhinney LM, Jackson AC. Current status of rabies and prospects for elimination. Lancet. 2014;384(9951):1389-99. [Google Scholar][PubMed]
25. Gibson AD, Yale G, Corfmat J, Appupillai M, Gigante CM, Lopes M, Betodkar U, Costa NC, Fernandes KA, Mathapati P, Suryawanshi PM, Otter N, Thomas G, Ohal P, Airikkala-Otter I, Lohr F, Rupprecht CE, King A, Sutton D, Deuzeman I, Li Y, Wallace RM, Mani RS, Gongal G, Handel IG, Bronsvoort M, Naik V, Desai S, Mazeri S, Gamble L, Mellanby RJ. Elimination of human rabies in Goa, India through an integrated One Health approach. Nat Commun. 2022;13:2788. [Google Scholar][PubMed]
26. Isloor S, Mani RS, Jayakrishnappa MB. Assessing rabies-free status of Andaman, Nicobar, and Lakshadweep Islands, India. Indian J Public Health. 2019;63(Suppl 1):S48-50. [Google Scholar][PubMed]

**ISSN: 0973-5038**
**DOI: https://doi.org/10.24321/0973.5038.202511**