

## Review Article

# The road to rabies elimination in India by 2030: a review on the functionality of anti-rabies clinics in India

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### ABSTRACT

Rabies is the deadliest but preventable Neglected tropical diseases. Anti-Rabies Clinics (ARCs) are on the frontline in the management of animal bite cases and more research is needed to assess their operation. The present review is done to determine the extent of Anti- Rabies Clinic functionality in the country and to identify the prevailing gaps as to achieve the elimination of Rabies elimination by 2030. From 2010- 2025, a systematic search of scientific publications, on Medline and Google scholar was done on Anti- rabies clinic in India. Five articles were selected using the key terms “anti-rabies clinic,” “facility assessment,” “post-exposure prophylaxis,” “rabies biologicals,” and “India”. Articles were included if- in English language, full text availability and assessed one or more aspects of ARC functionality- minimum available facilities, staffing pattern, Minimum infrastructure, Logistics. Studies were excluded if they belonged to a non- Indian setting, animal and laboratory-based studies. Studies (n=3) depicted lack of availability of ARV and RIG. Some studies (n=2) reported on untrained staff in terms of low knowledge regarding post-exposure prophylaxis delivery and animal bite management. 2 studies reported non availability of wound washing facility. 1 study reported supply gap due to procurement and logistic issues. The review highlights that while some ARCs demonstrate best practices, systemic gaps persist, particularly in RIG supply and training. Strengthening cold chain management, expanding RIG availability, improving health worker training, and standardizing documentation are critical to meeting India's target of eliminating dog-mediated rabies by 2030.

**Keywords:** Rabies elimination, Neglected tropical diseases, Anti-rabies clinic

### INTRODUCTION

Rabies is a neglected tropical zoonotic disease transmitted through the rabid animal bite mostly by dogs. The disease is caused by the rabies virus (RABV), a member of the genus *Lyssavirus* belonging to *Rhabdoviridae* family.<sup>1</sup> It is a hundred percent fatal yet preventable disease if timely vaccination is undertaken.<sup>2</sup> Rabies is a societal zoonotic disease ravaging poor and remote human settlements disproportionately relative to urban rich communities.<sup>1</sup> In India it is mainly transmitted commonly by dogs and cats

(97%), followed by wild animals (2%) such as mangoose, foxes, jackals and wild dogs and occasionally by horses, donkeys, monkeys, cows, goats, sheep's and pigs, etc.<sup>3</sup> It is characterized by encephalitis and generalized paresis and has a high case fatality rate, with deaths occurring within 7–10 days after the onset of symptoms, in the absence of supportive care.<sup>2</sup> Interventions for global rabies control are multidisciplinary, with initiatives aimed at both human and animal populations. The most significant challenges are remote healthcare access, particularly in rural settings, and low dog vaccination

coverage. Madagascar reflects these challenges with high knowledge gaps and barriers to access, whereas Sri Lanka's successful One-Health strategy of mass dog vaccination and free post-exposure prophylaxis has resulted in dramatic decline in human rabies deaths.<sup>4,5</sup> India has progressed considerably in controlling rabies.<sup>6</sup> Goa's elimination program of rabies (2013-2019) illustrates the usefulness of an integrated "One Health" strategy, with mass dog vaccination (more than 426,000 doses given), public education, increased surveillance, and a hotline to report rabies.<sup>7</sup>

A third, large-scale study, estimating human rabies deaths and animal bites for the period 2022-2023, recorded 9.1 million animal bite cases (chiefly dog bites) and an estimated 5,726 human rabies deaths each year, a remarkable reduction from past decades, but still highlighting the persistent threat.<sup>8</sup> These results highlight the utmost importance of enhanced infrastructure, regular supplies, public awareness, and compliance with post-exposure prophylaxis guidelines to work towards the target of eliminating dog-mediated human rabies by 2030.

ARCs are present in government sectors such as medical college hospitals, district hospitals, and other peripheral health institutions. These could be distinct separate entities with a board of "anti-rabies clinic" or merged with the OPD, injection rooms, casualty, etc. The set up varies in the private sector, where it is provided in an emergency room of a corporate hospital, nursing home, etc., or could be in the consulting room of a private medical practitioner. Preferably, ARCs must be easily accessible and should have all the requirements for Pre- and Post Exposure Prophylaxis with a standardized recording and reporting system. In addition to these facilities, the ARCs should have washing area, sufficient workforce, cold chain equipment and continuous power supply and generator backup.<sup>1</sup>

As these anti-rabies clinics provide life-saving PEP against rabies, the present review is conducted to determine the extent of Anti-Rabies Clinic functionality in the country and to identify the prevailing gaps as to achieve the elimination of Rabies elimination by 2030.

## METHODS

The review was conducted using the search engines Medline and Google scholar.

**Medline:** Fields used were- MeSH terms, Title/ Abstract. Boolean apparatus used were- OR, AND. The search strategy employed was (((("rabies"(MeSH Terms)) AND (anti rabies clinic (Title/Abstract))) OR (Model anti rabies clinic

(Title/Abstract)). This was done to identify articles covered by Medline that had the term "rabies" in "anti-rabies

clinics" or "model anti rabies clinics" in the title or abstract.

**Google scholar:** The search term used was "facility" evaluation of "anti-rabies clinic" for dog bite management. This wider search was used to try to catch more academic and grey literature on the subject.

Database searches were conducted between April 2025 to June 2025 (Figure 1).

Articles were included from 2010- 2025, in English language, full- text availability, and fulfilling any one of the domain in the Functionality at Ant rabies Clinic for minimum available facilities, i.e., minimum available facilities at ARC, Minimum staffing pattern at ARC, Minimum Infrastructure, Logistics.<sup>9</sup> Article were gradient excluded if they did not include any one of the domain in the Functionality at Ant rabies Clinic for minimum available facilities. A total of 129 published papers were found by the search. 122 articles were excluded as they were not relevant to the direct objective of reviewing the management of dog bites at the anti-rabies clinic. Full- text of the remaining 7 studies was assessed for eligibility which further excluded 2 studies as the full text was unavailable. The data extraction was performed on 5 studies which included the observational studies. All studies included in the data extraction were published between 2010 and 2025.

## Geographic focus

The studies including the functionality of the ARC involves data collection in the North, South, East, West and North- Eastern region, however the uniform data collection in all the regions is lacking. The studies included in the current research, along with the region is displayed in Table 1 and Figure 2.

## Functionality of Anti rabies Clinic (ARC)

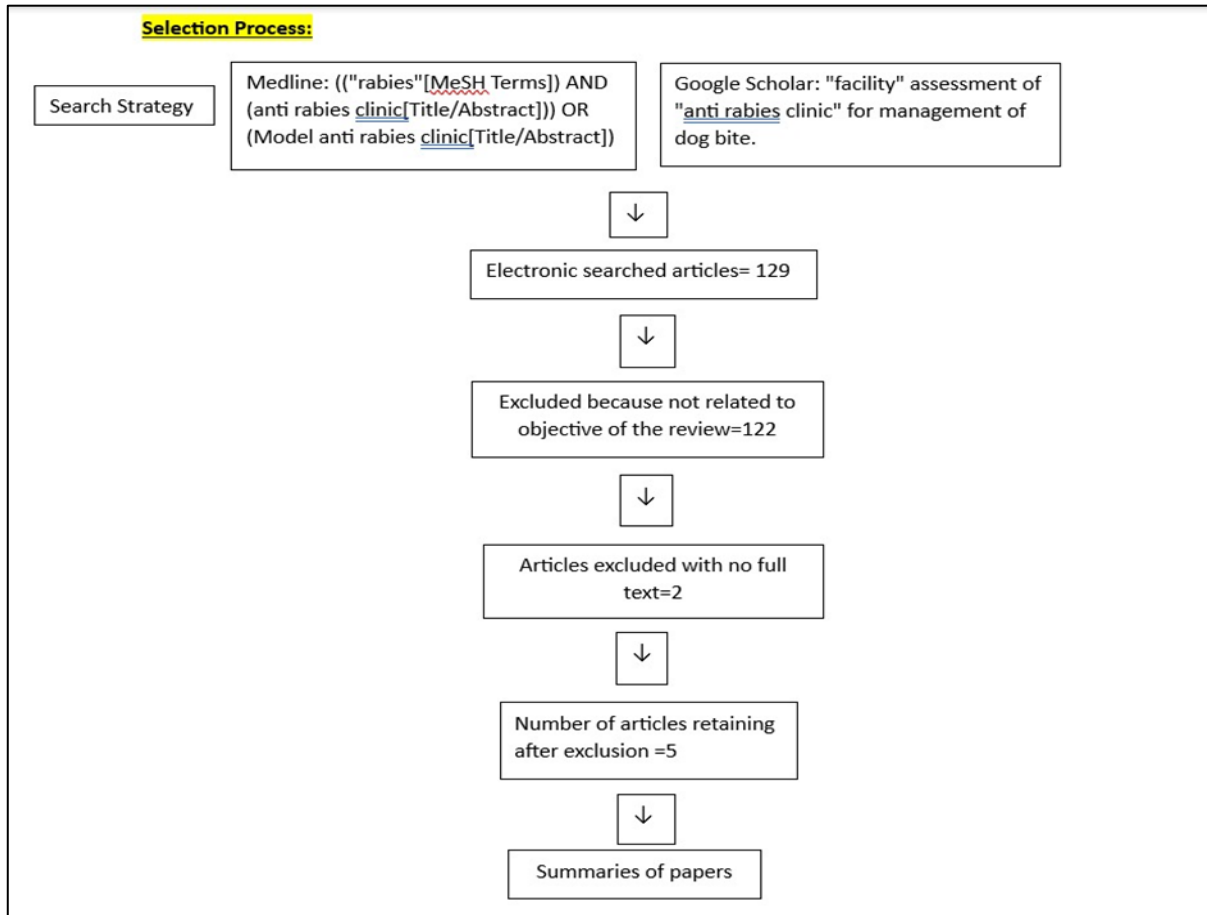
The functionality of ARC on the four domains as per NRCP, i.e., Minimum available facilities at ARC, Minimum staffing pattern, Minimum Infrastructure, Logistics, is outlined below in Table 2.

### Minimum available facilities at ARC

Majority of the studies (n=3) talked about the availability of rabies biologicals for post- exposure prophylaxis, i.e., Anti-rabies vaccine and ERIG. (Figure 3). Studies conducted in 15 states across the North, East, South, West, Central and North- Eastern regions reported that only one- third of the public facilities had 7- 20 days/year stock out, whereas, the 95 % tertiary hospitals had uninterrupted ARV supply. However, RIG availability was observed in only 20% of the public health facilities and stock duration was 30-60 days/ year. RIG was unavailable in over 75% of PHCs, whereas, ARV and

RIG together were available in only 11.6% of facilities. Animal bite registers were present in 62.1% of ARCs<sup>2</sup>; and stock registers in 69.9%<sup>2</sup>.<sup>1</sup> Study talked about the record keeping in ARC and revealed that

only 17.1% of the ARCs had PEP case forms showing an inconsistent implementation of the bite registers and reporting. One study reveals that only 58.2% facilities had a separate wound washing area.<sup>2</sup>



**Figure 1: Figure showing the selection process of articles.**

**Table 1: Number of publications on anti-rabies clinic in India, by region (n=5 publications).**

S. no.	Author	Title	Region	Year of publication
1.	Navaneeth S et al	Availability of anti-rabies vaccine and rabies immunoglobulin in Indian health facilities: a nationwide cross-sectional health facility survey	E, W, N, S, C, NE	2025
2.	Ravish HS et al	Assessment of post-exposure prophylaxis services for animal exposures in healthcare facilities of a municipal corporation	E, W, N, S	2023
3.	Dinesh PS, Preeti PS, Vikas B, Arvind KS	Anti-rabies vaccine compliance and knowledge of community health worker regarding animal bite management in rural area of Eastern India	E	2021
4.	Mysore KS, Ravish SH	Facilities and services of postexposure prophylaxis in anti-rabies clinics: a national assessment in India	E, W, N, S, C, NE	2019
5.	Ashwath ND, Hanumanthaiah, Ravish SH	Assessment of procurement, distribution, availability, and utilization of rabies biologicals for postexposure prophylaxis in seven states of India	S	2019

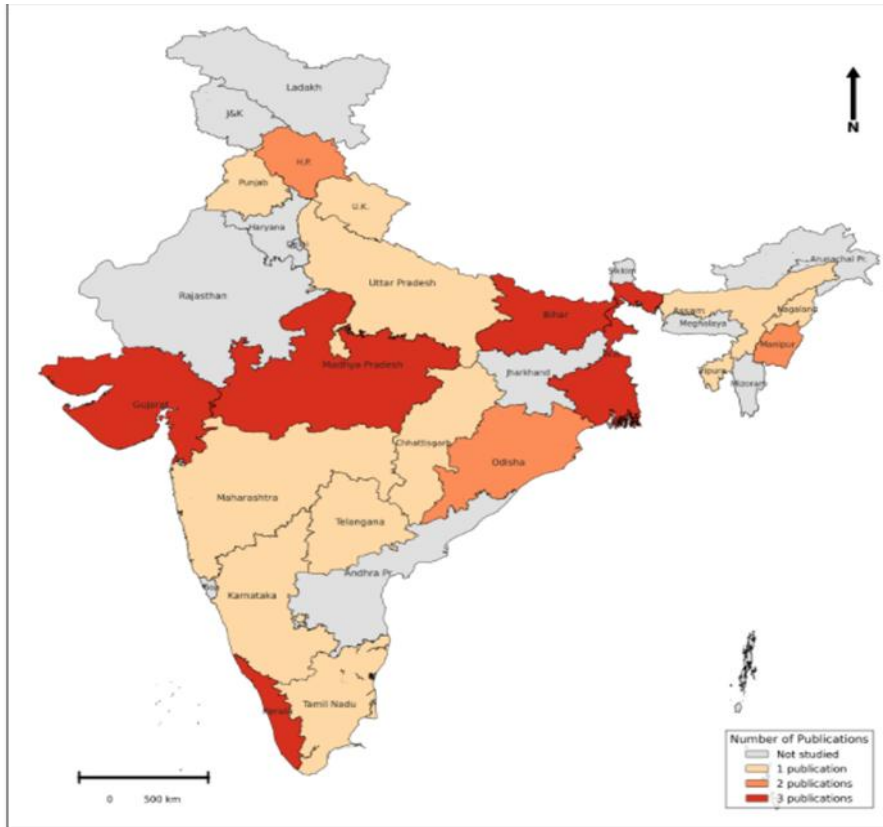


Figure 2: Map showing the number of publications on anti-rabies clinic in India, by region.

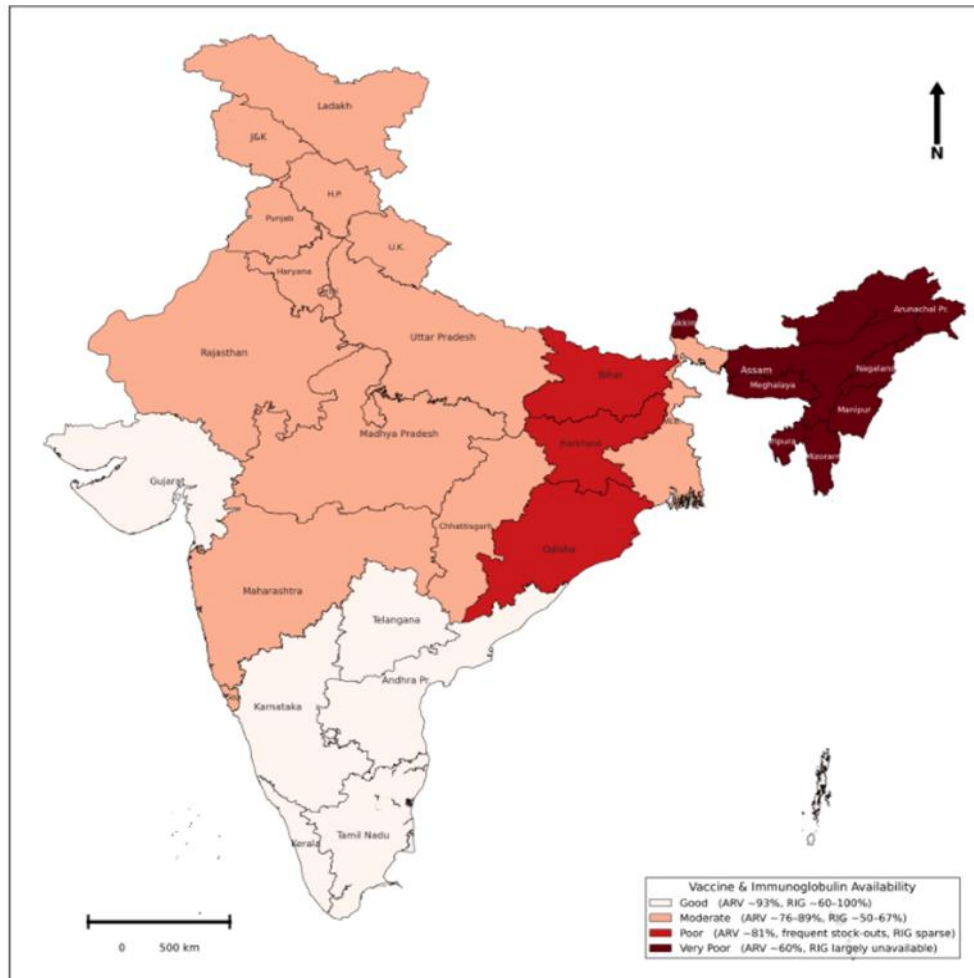
Table 2: Functionality of anti-rabies clinics as per NRCP.

Functionality of anti-rabies clinic	Finding	Summary	Region
<b>A. Minimum available facilities at ARC:</b>			
<b>1. Availability of ARV and RIG</b>	ARV availability varies across states. Low availability of RIG, especially in PHCs. Stock-outs are common.	79.7% and 20.3% of public facilities had ARV and RIG availability, respectively. <sup>1,5</sup> and had RIG <sup>5</sup> 25 municipal centres had 7–20 days/year stock out of ARV and 30–60 days/year <sup>4</sup> of RIG <sup>4</sup> . <sup>1,4</sup> 95.1% of tertiary hospitals had uninterrupted ARV supply. <sup>5</sup> RIG unavailable in over 75% of PHCs. <sup>2</sup> ARV+RIG together available in only 11.6% of facilities. <sup>5</sup>	E, W, N, S, C, NE*
<b>2. Availability of animal bite register, stock register and reporting formats</b>	Weak monitoring and documentation.	Animal bite registers in 62.1% of ARCs <sup>2</sup> ; Stock registers in 69.9% <sup>2</sup> ; 17.1% had PEP case forms. <sup>2</sup>	
<b>B. Minimum staffing pattern at ARC</b>	Many ARCs lack formally trained personnel on knowledge-practice linkage in PEP delivery; most rely on informal or on-the-job training.	88 MOS assessed; KAP score <75% in multiple areas. <sup>4</sup> Only 54.4% correctly categorized wounds <sup>4</sup> ; 68% staff lacked formal training. <sup>2</sup>	E, W, N, S
<b>C. Minimum infrastructure</b>	Satisfactory in public facilities. Sub optimal wound	54.3% had wound washing facilities <sup>2</sup> 100% ARCs had cold chain facilities <sup>2</sup> ; 97.1% used domestic refrigerators <sup>2</sup> ; 83.5% of centres used domestic refrigerators <sup>2</sup>	E, W, N, S, C, NE

Continued.

Functionality of anti-rabies clinic	Finding	Summary	Region
	washing practices.	54.3% ARCs had wound wash facilities <sup>2</sup>	
<b>D. Logistics</b>			
<b>1. Type of RIG used</b>	Mostly equine RIG; human RIG limited to few centres.	63.2% ERIG use <sup>2</sup> ; 36.8% HRIG use <sup>2</sup>	E, W, N, S, C, NE
<b>2. Route of ARV administration</b>	Mixed ID and IM use variable adherence to updated regimens.	60.2% used ID in public sector <sup>5</sup> ; 54.3% IM use in ARCs <sup>2</sup>	

\*E=East, W=West, N=North, S=South, C=Central, NE=North East



**Figure 3: Map showing the vaccine availability in India.**

*Minimum staffing pattern at ARC*

The review of the studies reveals that many ARCs lack formally trained personnel, and most rely on the informal training. In the study conducted in Southern region, 88 Medical Officers were assessed on Rabies Knowledge, Attitude and Practice, which revealed a score of <75%.<sup>4</sup>

Another study in Western region revealed that 68% of the staff lacked formal training.<sup>2</sup> In terms of animal bite wound categorization, as revealed by the study only 54.4% could correctly categorize the wound.<sup>4</sup> These

studies depict a low knowledge- practice linkage in the PEP delivery.

*Minimum infrastructure*

All the ARCs had cold chain facilities, out of which 97% used domestic refrigerators. 54.3% had separate are for wound washing facilities.<sup>2</sup> (Figure 4).

*Logistics*

One study talked about the tissue culture anti- rabies vaccine approved by the DGCI for ID/IM route and

revealed that 60.2% of the ARCs used Intra- dermal route of vaccine administration in the public sector and 54.3% use Intra- muscular route in the ARC.<sup>2</sup>

## DISCUSSION

India is on a mission to eliminate human rabies by 2030, the current state of research in support of this goal has not been comprehensively analysed. With the inclusion of ARV into the essential drug list, it reaffirms Government's commitment to deal with the deadly disease.<sup>3-10</sup> Here, we provide a literature review on the research on the functionality of Anti rabies clinics in India. We found significant gaps in the geographic coverage of research as well on the domains of the minimum available facilities that should be present in the Anti- rabies clinic, as per the NRCP.<sup>9</sup> Since the invention of Neural tissue anti- rabies vaccine manufactured in India in 1907, to identifying rabies as a priority disease in 2007, and the release of national guidelines on rabies prophylaxis by the Government of India and revised from time to time, Rabies control in the country has reaffirmed its efforts by the launch of NAPRE IN 2021.<sup>3</sup>

The call for action in 2015, set a goal of "zero human dog- mediated rabies deaths by 2030", worldwide. The joining of the forces of four organisations- the World Health Organization (WHO), the World Organization for Animal Health (OIE), the Food and Agriculture Organization of the United Nations (FAO) and the Global Alliance for Rabies Control (GARC), as the United Against Rabies collaboration, and are determined to reach the global target of "Zero human deaths due to dog- mediated Rabies by 2030". Worldwide, harmonized processes are required to acknowledge and measure country progress towards this goal.<sup>3</sup> Globally, Mexico is the only country that has been validated by the WHO for eliminating rabies as a public health problem.<sup>11</sup> The reasons attributed to it include mass dog vaccination coverage, political will, sustained program implementation, application of timely, proven strategies and surveillance, and gradually shifting responsibility and leadership for rabies control from the national to state level.<sup>12</sup> The experience from the Western hemisphere also outlines these strategies.<sup>13</sup>

In India, the experience from the state measures implemented in Goa, i.e., the One Health Approach has resulted in the elimination of canine rabies in the region. The implementation of mass dog vaccination, education of the community, strengthened dog surveillance were few of the measures undertaken in the state.<sup>3</sup> Under NRCP, maintenance of a regular uninterrupted supply of Anti Rabies Vaccine (ARV) and Anti Rabies Serum (ARS) up to PHC level for timely Anti Rabies PEP for all Animal bite victims, establishment of Model Anti Rabies Clinics at District Level are the mainstay for the elimination of the disease in the country.<sup>9</sup>

## CONCLUSION

Research into rabies in India is limited considering the long-standing impact of the disease on human health in the country. In order to achieve the goal of eliminating all human rabies deaths by 2030, more applied research is needed to address the gaps in the Anti rabies clinics across the country. The integration of Human health, Animal health and Environment, the key concepts in One-Health is need of the hour.

## Recommendations

Developing strong legislation and regulations for dog management is essential, including estimating dog population numbers in each municipal area, town, and village committees under city administration. It is also important to initiate and maintain mass dog vaccination programs for the next three consecutive years while ensuring a sufficient supply of vaccines. In addition, region-wise public awareness campaigns and information-sharing activities should be strengthened at different levels. The extension and capacity-building of rabies diagnostic laboratories, along with joint surveillance activities, are also necessary. Finally, strong political commitment and adequate resource allocation are required to ensure effective implementation of these measures.

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## REFERENCES

1. Sudarshan MK, Madhusudana SN, Mahendra BJ, Rao NSN, Ashwath Narayana DH, Abdul Rahman S, et al. Assessing the burden of human rabies in India: results of a national multi-center epidemiological survey. *Int J Infect Dis*. 2007;11(1):29-35.
2. WHO. Rabies. Geneva: WHO. 2023. Available at: <https://www.who.int/news-room/fact-sheets/detail/rabies>. Accessed on 07 February 2026.
3. National Centre for Disease Control. National Action Plan for Rabies Elimination (NAPRE) from India by 2030. New Delhi: Ministry of Health and Family Welfare. Available at: <https://ncdc.gov.in>. Accessed on 07 February 2026.
4. Rajeev M, Edosoa G, Hanitriniaina C, Andriamandimby SF, Guis H, Ravalohery JP, et al. Healthcare-seeking behavior and dog-bite management in Madagascar: challenges for rabies control. *PLoS Negl Trop Dis*. 2019;13(1):e0007179.
5. Gunawardena GS, Randika WU, Wijesinghe W, Ratnayake R, Abela-Ridder B, Wimalaratne O. Achieving sustained rabies elimination in Sri Lanka: a One Health approach. *Viruses*. 2021;13(9):1743.
6. Abela-Ridder B, Knopf L, Martin S, Taylor L, Torres G, De Balogh K. 2018: the beginning of the

- end of rabies?. *Lancet Glob Health*. 2018;6(7):e644-5.
7. Mirasol RC, Ghosh S, Sudarshan MK, Taylor LH, Lobo D, Manoharan A, et al. Rabies elimination in Goa, India: a proof-of-concept study. *PLoS Negl Trop Dis*. 2020;14(2):e0008132.
  8. National Centre for Disease Control. Animal bite and human rabies surveillance report: India 2022–2023. New Delhi: Ministry of Health and Family Welfare; 2024. Available at: <https://ncdc.gov.in>. Accessed on 07 February 2026.
  9. National Rabies Control Programme. National Action Plan for Rabies Elimination from India by 2030 (NAPRE). New Delhi: Ministry of Health and Family Welfare, Government of India. 2021. Available at: <https://ncdc.gov.in/showfile.php?lid=703>. Accessed on 07 February 2026.
  10. WHO. WHO adds antiretroviral medicines to the Model List of Essential Medicines. Geneva: WHO. 2002. Available at: <https://cdn.who.int/media/docs/default-source/essential-medicines/fair-price/chapter-medicines.pdf>. Accessed on 07 February 2026.
  11. WHO. Mexico's feat against rabies through cross-sectoral collaboration is possible in other countries. Geneva: WHO. 2020. Available at: <https://www.who.int/news/item/07-08-2020-mexico-s-feat-against-rabies-through-cross-sectoral-collaboration-is-possible-in-other-countries>. Accessed on 07 February 2026.
  12. United Against Rabies Forum. How Mexico achieved rabies-free status. 2022. Available at: <https://unitedagainstrabies.org/news/how-mexico-achieved-rabies-free-status/>. Accessed on 07 February 2026.
  13. Hampson K, Coudeville L, Lembo T, Sambo M, Kieffer A, Attlan M, et al. Estimating the global burden of endemic canine rabies. *PLoS Negl Trop Dis*. 2015;9(4):e0003709.

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