

Submitted: 09/06/2025

Revised: 14/06/2025

Accepted: 15/06/2025

Published: 31/07/2025

A global call to action: Strengthening rabies control efforts

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Rabies is a zoonotic disease caused by the *lyssavirus*. Although it is preventable through vaccination, it kills around 59,000 humans and thousands of animals globally each year (Hampson *et al.*, 2015; WHO, 2018). Rabies is not only an animal health issue but also a significant public health concern because of its high fatality rate and economic impact. As a result, rabies control efforts have been prioritized globally, with policies directed toward eliminating dog-mediated human rabies by 2030. Leading organizations such as the WHO, WOA, FAO, and GARC are working towards rabies control and have made some progress. Despite these efforts, several hurdles remain, and still around 150 rabies-endemic countries have yet to make significant progress. The goal of “Zero by 30” remains elusive and represents a missed opportunity. Urgent actions and new approaches are necessary to achieve this goal.

Rabies control programs have primarily focused on vaccinating susceptible animal populations to halt transmission from animals to humans (Acharya *et al.*, 2021; Shafaati *et al.*, 2023). However, we believe that vaccinating susceptible animal populations is unrealistic, especially in low- and middle-income countries (LMICs) where other health priorities exist and rabies is considered a neglected disease. Therefore, we suggest shifting the emphasis to immunizing high-risk human populations with safe and effective vaccines. This is because eliminating rabies virus circulation is difficult due to limited surveillance activities, and in some cases may be unrealistic, as the virus may persist in wildlife reservoirs that remain subclinical despite carrying the rabies virus.

Vaccination of susceptible populations, particularly dogs, has been a major tool against rabies. However, achieving the minimum required vaccination coverage of 70% is often unmet in rabies-endemic countries, such as Nepal. Moreover, there are pockets of under-immunization or no immunization in these countries, which serve as fertile ground for the virus to proliferate,

posing a serious threat to rabies elimination. Targeted approaches to address these areas are critical.

The control measures must focus on the source animals—specifically, animal reservoirs—and pathways of transmission. Even if we immunize large numbers of animals, without establishing herd immunity in the susceptible animal population, there remains a risk of rabies outbreaks through the reintroduction of the virus from neighboring areas. International travel, including the movement of companion animals, presents a risk of reintroducing rabies from endemic countries to countries that are either free or are working towards elimination. This risk must be considered when implementing rabies control programs.

In contrast to the current approach of vaccinating owned and community dogs, a new strategy—the “hotspot approach”—involving targeted measures to vaccinate susceptible animal populations in high-risk areas with a focus on the optimal utilization of available resources will help achieve herd immunity and block pathways of transmission. The un/underimmunized populations are often located in resource-poor regions of Asia and Africa, characterized by challenging geography, dysfunctional health care systems, and socioeconomic marginalization. Addressing the social determinants of these populations and targeting immunization programs for these groups are critical to successful rabies elimination. To increase vaccine uptake in these pockets of under-immunization, it is necessary to employ effective communication strategies involving influential community leaders and religious figures, using culturally appropriate language to build trust and confidence in immunization. However, eliminating rabies in those un/underimmunized areas will pose logistical challenges, be highly expensive, and excruciatingly difficult.

Many LMICs face difficulties in coordinating and integrating activities across decentralized human and animal health systems because of a lack of coherent regulatory policies. Although scientific communities

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are committed to controlling rabies, progress is often hindered by insufficient political will and sustainable financing (Lankester *et al.*, 2014).

Rabies control strategies must take into account local socioeconomic contexts, as a one-size-fits-all approach is not effective for rabies control. Understanding social determinants—such as poverty, social exclusion, and marginalization—and their interactions offers opportunities for targeted mitigation strategies.

Elimination of rabies requires regional cooperation because the efforts of a single country are insufficient. Even if a country successfully eliminates rabies, incursions from neighboring endemic regions always remain a threat. Therefore, innovative targeted approaches are essential for effectively reducing the prevalence and transmission of rabies.

Conflicts of interest

The authors declare that they have no known competing financial interests or personal relationships that could have influenced the work reported in this paper.

Funding

None.

Authors' contribution

Krishna Prasad Acharya: conceptualization, investigation, writing-original draft, writing-review & editing. Francesco Branda: investigation, writing, original draft, writing, review, and editing. Sarita

Phuyal: investigation, writing-original draft, writing-review, and editing.

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