

NARRATIVE REVIEW

Rabies control in Ghana: Stakeholders interventions, challenges and opportunities

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Abstract

Background: Rabies remains a significant public health issue in Ghana, predominantly affecting rural communities with limited access to health care and veterinary services. The disease is primarily transmitted through bites from infected domestic dogs and leads to many deaths worldwide each year. Despite various interventions, Ghana continues to struggle with rabies control and prevention. This narrative paper focuses on rabies control in Ghana, examining stakeholders' interventions, challenges faced, and opportunities available.

Methods: The paper reviews existing rabies control measures in Ghana, including dog vaccination efforts and One Health strategies. It also discusses the limitations of these interventions, such as minimal vaccination coverage, weak surveillance, and inadequate intersectoral coordination.

Results: Ghana has implemented dog vaccination campaigns, but coverage remains minimal. Additionally, weak disease surveillance, cultural perceptions, and inadequate coordination across sectors have hampered the country's ability to control rabies effectively.

Conclusion: Adopting One Health principles, which integrate human, animal, and environmental health efforts, is emphasized as a critical strategy to eliminate rabies in Ghana by 2030. By addressing these challenges and leveraging available opportunities, Ghana can strengthen its rabies control programs and work toward a rabies-free future.

KEYWORDS

challenges, ghana, interventions, one health, public health, rabies control

1 | INTRODUCTION

Rabies virus (RABV) which is the causative agent of rabies, causes damage to the central nervous system and is primarily transmitted through animal bites, scratches, or direct contact with the saliva of an infected animal.¹ The incubation period for rabies typically ranges from

2 to 8 weeks, though it can extend from several days to even years. Despite being preventable, rabies is almost invariably fatal once clinical symptoms appear.¹ Both domestic and wild animals can harbour the virus, but human infections are predominantly linked to domestic dogs, with children aged 5–14 years being particularly vulnerable.² Globally, rabies claims approximately 60,000 lives annually³. Postexposure

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prophylaxis (PEP) is administered to over 29 million individuals each year, preventing hundreds of thousands of deaths. Beyond its severe psychological impact, dog-mediated rabies imposes an annual economic burden of around US\$8.6 billion worldwide.³

Rabies remains prevalent in dogs and inadequately managed in low-income regions, with Asia and Africa accounting for about 95% of human rabies fatalities.^{4,5} The disease predominantly affects impoverished and rural communities that often lack the necessary resources and knowledge for effective rabies prevention and management.⁵ In Africa, rabies poses a significant threat to both human and animal health. Contributing to the high incidence of rabies on the continent is the low vaccination rate among domestic dogs, the primary virus vectors. Underreporting of rabies cases in these developing nations, particularly in Africa, is common due to limited laboratory capacity, cultural beliefs, and insufficient surveillance infrastructure.⁶

In Ghana, the frequent interactions between humans and domestic animals, especially dogs, sustain the serious concern of rabies transmission.⁷ Despite ongoing control measures, rabies continues to result in fatalities, disrupt communities, and strain the nation's health care system.⁷ Ghana's socioeconomic, cultural, and infrastructural challenges further complicate rabies control efforts hence the need to evaluate the current state and the opportunities to explore to achieve significant prevention and eradication by the year 2030. This narrative aimed to delineate the current rabies control measures in Ghana, analyze the obstacles these initiatives encounter, and explore potential strategies for enhancing rabies prevention and eradication by 2030. By thoroughly examining existing intersectoral efforts and identifying any deficiencies, this study endeavors to contribute to the development of more effective and sustainable methods for rabies control in Ghana.

2 | RABIES SITUATION IN GHANA

The animal rabies situation in Ghana dates back to the 1970s when it was previously reported that there were approximately 100 animal rabies cases yearly between 1977 and 1981, with an incidence of human rabies cases reaching 27 in 1981.⁷ As the years

progressed, nine cases of rabies were reported in Ghana in 2009, rising to 16 in 2011 and 18 in 2012, according to Rabies in West Africa (RIWA). Every year, there is a 100% case fatality rate. From 2009 to 2012, there were 19, 63, 51, and 47 occurrences of passively reported canine rabies; these cases were probably underreported because of inadequate surveillance methods.^{8,9} As seen in Figure 1 below, the Global Alliance for Rabies Control (GARC) data from 2006 to 2019¹⁰ indicates a significant incidence of rabies in dogs.

The RABV is believed to cause disease in approximately 0–60% of those patients that are exposed depending on the route of exposure.¹¹ Despite this, 123 clinically confirmed human cases were recorded by public health officials between 2000 and 2004. Moreover, “suspected” human rabies cases are rarely confirmed using a laboratory-based diagnosis, relying solely on a clinical diagnosis.¹² A study in Ghana revealed 76% of public health facilities did not have rabies vaccines for PEP. Furthermore, only 40% of health care providers could administer PEP to dog bite victims.¹³ A concerted effort by GARC has shown a trend analysis of rabies cases from 2015 to 2019¹⁰ as shown in Figure 2 below.

3 | EFFORTS TOWARD RABIES CONTROL

3.1 | Vaccination programs

For many years, efforts to vaccinate dogs against rabies in Ghana have been ongoing.^{7,8} However, these efforts have been sporadic and unsustainable, with control measures like dog vaccinations and stray dog elimination failing to establish a consistent impact. The rabies elimination program is spearheaded by two key agencies in Ghana. The Ghana Health Service (GHS) primarily oversees the clinical care of suspected and confirmed rabies cases, integrating rabies elimination into their broader initiative on Neglected Tropical Diseases.^{14,15} Meanwhile, the Ministry of Food and Agriculture (MOFA), through its Veterinary Services Directorate (VSD), is tasked with dog vaccinations and managing rabies prevention in animals. Ghana has implemented robust vaccination

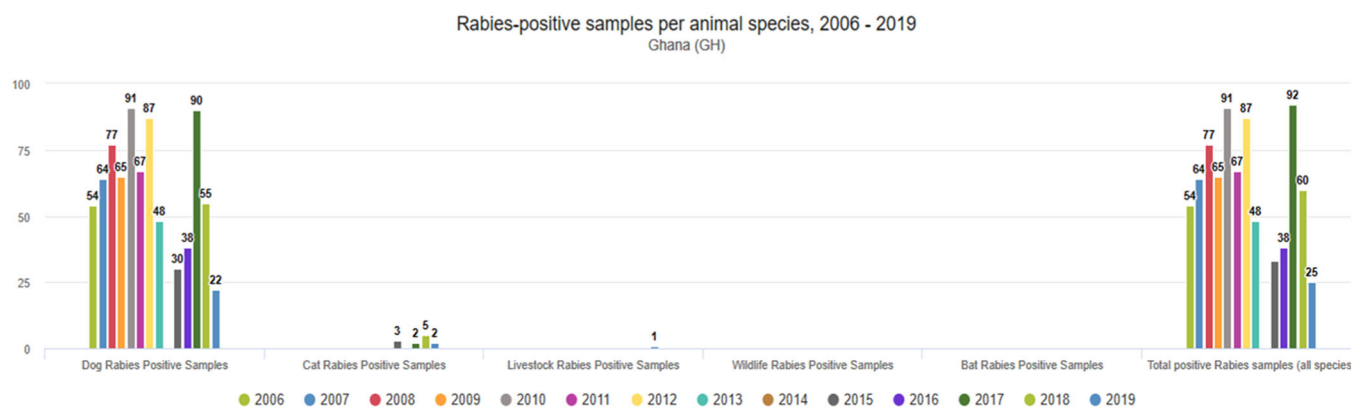


FIGURE 1 Animal rabies cases (2006–2019) (Global Alliance for Rabies Control¹⁰).

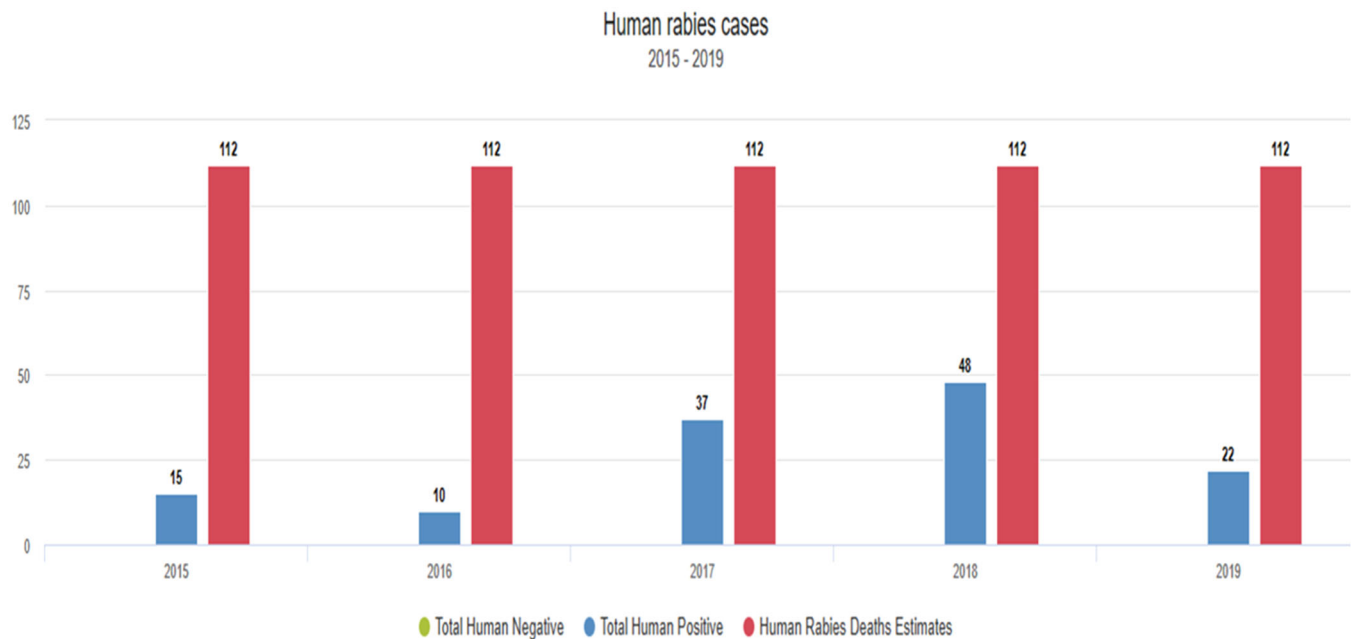


FIGURE 2 Human rabies cases (2015–2019) (Global Alliance for Rabies Control¹⁰).

campaigns targeting domestic dogs, the primary reservoirs of rabies. These campaigns, orchestrated by governmental agencies like the VSD and supported by international organizations such as the World Health Organization (WHO) and local NGOs like the Rabies Control Society Ghana, aim to achieve high coverage rates to establish herd immunity within the dog population. A notable example is the nationwide rabies vaccination campaign conducted in 2019 by the VSD and the Food and Agriculture Organization (FAO), which aimed to vaccinate over 1 million dogs across the country.¹⁶ These efforts focus on regions with high dog populations and rabies incidence, involving trained veterinary personnel administering inactivated rabies vaccines to dogs free of charge in both urban and rural areas.¹⁷

Additionally, PEP is readily available for individuals bitten by suspected rabid animals in Ghana. The GHS oversees the availability and accessibility of PEP across health care facilities nationwide, with community health workers in rural areas playing a crucial role in identifying and referring individuals for PEP.^{18,19} According to Sreenivasan et al.²⁰ access to PEP has improved in recent years, with efforts to decentralize PEP services and enhance capacity-building among healthcare providers in rural areas. This proactive approach is essential for preventing human rabies deaths following animal bites and is a vital component of Ghana's rabies control strategy.

Despite these efforts, sustaining high vaccination coverage rates and improving access to PEP in remote areas remain ongoing challenges.²¹ Continued collaboration and resource mobilization from government agencies, NGOs, and international partners are critical for advancing rabies control efforts. By maintaining and expanding these initiatives, Ghana aims to protect individuals and communities from rabies, contributing to the broader goal of eliminating rabies as a public health threat in the country.

3.2 | Policies and regulations

Legislation and policy frameworks play a critical role in shaping rabies control efforts in Ghana. The country has enacted laws and regulations related to animal health and welfare, including the Animals Act, of 1971 (Act 57), which provides regulations for the licensing and control of dogs and other animals. The VSD is responsible for enforcing these regulations, which encompass licensing requirements for pet ownership, stray animal control measures, and guidelines for the handling and transportation of animals.²² However, enforcement of these regulations may vary across regions due to resource constraints and capacity limitations.

In addition to legislative measures, Ghana has developed the National Rabies Control Strategy (NRCS) in collaboration with stakeholders, including the Ministry of Health, MOFA, and WHO. The NRCS outlines goals, objectives, and action plans to mitigate the burden of rabies in Ghana, focusing on areas such as surveillance, vaccination, community engagement, and capacity-building.²³ Implementation of the NRCS is ongoing, with periodic reviews and updates to adapt to changing epidemiological trends and emerging challenges.

These policy and regulatory frameworks provide a foundation for coordinated action and resource allocation in Ghana's rabies control efforts. By establishing standards for animal management and public health interventions, Ghana seeks to strengthen its capacity to prevent and respond to rabies outbreaks. However, challenges such as inadequate funding, limited institutional capacity, and gaps in enforcement remain barriers to effective implementation. Addressing these challenges requires sustained political commitment, stakeholder engagement, and investment in capacity-building initiatives.

3.3 | Research and surveillance

Surveillance systems and research initiatives are crucial for rabies control in Ghana. The GHS and the VSD oversee human and animal rabies surveillance, respectively.²² GHS coordinates human rabies surveillance through its Disease Surveillance Department, while VSD monitors animal rabies cases and vaccination coverage.²⁴ In addition to surveillance, research on rabies in Ghana focuses on epidemiology, diagnostics, vaccine development, and community perceptions.²³ Institutions like the Noguchi Memorial Institute for Medical Research (NMIMR) collaborate internationally to study RABV strains and evaluate control measures. For instance, a study by Tasiame et al.²⁵ reported an outbreak of dog-associated pig rabies, underscoring the risk posed by stray dogs. Studies also reveal significant gaps in public knowledge about rabies 25 and 26. Research in the Upper East Region showed that while 76.5% of dog owners were aware of rabies, only 52.7% knew about antirabies vaccination.²⁶ In Suhum Municipality, 82% of respondents were aware of rabies, but practices for disease prevention were poor, with only 7.1% of dog bite victims practicing proper wound cleansing.²⁷ These findings emphasize the need for comprehensive educational programs to bridge the gap between knowledge and practice across Ghana.

3.4 | Rabies awareness creation and education

Awareness creation and education are fundamental pillars of Ghana's rabies control strategy, complementing vaccination efforts and policy interventions. By fostering a culture of rabies awareness and promoting responsible pet ownership from an early age, Ghana aims to build resilient communities capable of effectively mitigating the threat of rabies.²⁸ Continued collaboration among stakeholders and targeted efforts to reach underserved populations are essential for achieving sustained behavior change and ultimately eliminating rabies as a public health concern in Ghana.²⁹

Various stakeholders, including government agencies, NGOs, and community health workers, engage in door-to-door campaigns, community meetings, and health fairs to disseminate information about the risks of rabies transmission and the importance of seeking medical care following animal bites.³⁰ These activities often utilize culturally appropriate communication materials, such as posters, leaflets, and radio broadcasts in local languages, to effectively reach diverse populations.³⁰

In pursuit of the Zero by 2030 goal, the Schools of Veterinary Medicine of the Kwame Nkrumah University of Science and Technology (KNUST) and the University of Ghana engage students in community education and vaccination drives.³¹ Recognized by the WHO for their efforts, KNUST students conducted outreach in the Ashanti region in June 2022, providing free rabies vaccinations for over 270 dogs and cats and educating communities about the importance of responsible pet ownership, bite prevention, and immediate response to bites.³¹ Additionally, rabies education is integrated into school curricula through collaborations between the

Ministry of Education, the Ministry of Health, and NGOs,³² Programs like "Rabies Education for Kids," initiated by the Ghanaian Red Cross Society, use interactive sessions, games, and storytelling to teach primary school students about rabies prevention and responsible pet ownership.

3.5 | Efforts by NGOs and international organizations

In 2015, a coalition of global health organizations—the WHO, the FAO, the World Organization for Animal Health (OIE), and the GARC—unveiled an ambitious plan to eradicate human deaths from dog-mediated rabies by 2030. As a committed member of GARC, Ghana embraced the Stepwise Approach toward Rabies Elimination (SARE) to track and drive its progress toward this life-saving goal.¹⁶

While Ghana mandated dog vaccination by law, early efforts were hampered by weak enforcement and fragmented national coordination. Frantic efforts of SARE and numerous NGOs, policy-makers have since sharpened their focus on rabies control. By the close of 2017, the formation of the One Health Technical Working Group (OHTWG) marked a pivotal step. This group is dedicated to crafting a national One Health policy and enhancing integrated surveillance and control of zoonotic diseases, including rabies. Similar to other developing nations, previous government-led vaccination campaigns faltered due to financial constraints and sustainability issues.^{24,33,34} Ghana faces significant hurdles such as managing the stray dog population and securing the cooperation of pet owners for vaccinations.

Breakthrough ACTION has propelled rabies control efforts in Ghana to new heights by conducting the nation's first canine census, an essential step for data-driven vaccination campaigns.³⁵ In collaboration with other associations like RIWA and AngloGold Ashanti Malaria Control Limited (AGAMal), Breakthrough ACTION melds rabies surveillance with other community health initiatives, such as malaria control, to enhance data collection and boost public awareness. Their multifaceted approach includes training community health workers, disseminating educational materials, and launching public education initiatives to help people identify rabid dogs and prevent rabies. These efforts are all geared toward achieving a rabies-free Ghana by 2030.³⁵ Through these concerted efforts and cross-sector partnerships, Ghana is making notable strides toward the ambitious goal of eradicating rabies, thus ensuring the health and safety of both its human and animal populations.

3.6 | Challenges to rabies control in Ghana

One significant barrier to rabies control in Ghana is the lack of reliable data and systematic analysis, which perpetuates rabies as a neglected condition within society. In the 1980s, Ghana launched a vigorous campaign to vaccinate dogs against rabies, but this initiative lacked sustainability¹. The burden of vaccination costs falls on individual dog

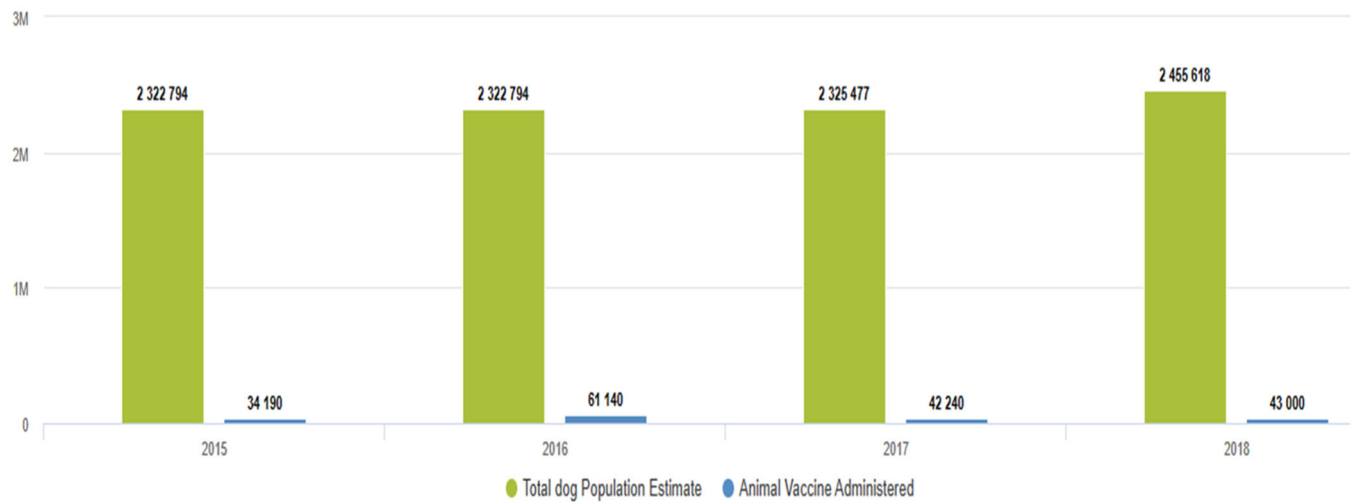


FIGURE 3 Dog population and rabies vaccination coverage (2016–2018).¹⁰

owners, leading to alarmingly low vaccination rates of 5%–30% from 2000 to 2013.²⁴ Furthermore, the inconsistent supply of PEP heightens the risk of rabies outbreaks.

The inadequacy of data on rabies incidence and canine vaccinations compounds the challenge. Rabies surveillance was only integrated into the Integrated Disease Surveillance and Response (IDSR) system in 2012, resulting in significant underreporting of the disease. The scarcity of systematically collected and analyzed data on dog bites and rabies is a critical reason for the continued neglect of this deadly disease.^{34,35}

The country's stray dog population, which is estimated to be large, contributes to the spread of the disease. Additionally, there is a lack of awareness among the public regarding the importance of rabies control measures, which further hinders efforts to combat the disease.^{36,37} The GARC in the 2022 report¹⁰ displayed the disparities between the dog population estimates in Ghana and the vaccination coverage as displayed in Figure 3 below. Despite the disparities shown, a major problem is the fact that the accurate statistics on the animal population especially owned dogs as well as stray dogs in Ghana is still unknown. Hence poses a significant challenge to the appropriate means of securing and administering rabies vaccines to dogs for better nationwide coverage.

The surveillance system in Ghana is weak, with underreporting and poor data quality being major issues.^{38,39} Regrettably, Ghanaian veterinary services, like those in several other developing African nations, are still diagnosing rabies using Sellers' stain that is not specific to the *Lys-savirus* species, as compared to the fluorescence antibody test which serves as a confirmatory diagnostic method.¹² The lack of reliable data and systematic analysis makes it difficult to track the spread of rabies effectively and assess the impact of intervention strategies.⁴⁰ Another significant challenge is the limited availability of diagnostic facilities and vaccines, which hinders prompt and effective response to suspected rabies cases, potentially increasing mortality rates.⁴¹

Additionally, there is a lack of coordination between institutions responsible for human and animal health, leading to discrepancies in

rabies data and complicating the development of a comprehensive understanding of the disease's spread and impact.³⁵ The absence of a well-coordinated human-animal-environment interface further complicates efforts to control rabies, both within and across countries.³³ Another significant challenge to rabies control is the cultural aspect. In Ghana, the demand for dog meat in some aspects of the Northern regions necessitates frequent human-dog interaction, which raises the risk of rabies transmission, particularly as dogs are often captured from areas with low vaccination coverage.⁴² Furthermore, the informal and unregulated trade of dog meat facilitates the spread of rabies across regions without the enforcement of health checks and vaccinations.⁴²

4 | OPPORTUNITIES

Ghana has several strategies to manage rabies, including the One Health model, community participation, legislative changes, international partnerships, and technological advances. Advances in vaccine technology, such as oral and heat-stable vaccines, can make rabies immunizations more affordable and accessible, potentially increasing vaccination rates and aiding in the fight against rabies. Leveraging mobile health (mHealth) solutions can provide real-time rabies surveillance, reporting, and data collection, while also disseminating educational materials and raising public awareness about rabies prevention and management.

Community participation is crucial for improving rabies monitoring, prevention, and response. Techniques like One Health and participatory epidemiology empower residents to report rabies cases, vaccinate animals, and promote ethical pet ownership, thereby enhancing the effectiveness and resilience of rabies control efforts. Legislative and policy campaigns can strengthen rabies control laws and procedures, with civil society organizations and professional associations advocating for the prioritization of rabies control by policymakers and stakeholders.

International cooperation can further enhance rabies management in Ghana by facilitating information sharing, resource mobilization, and technical assistance for surveillance, immunization campaigns, research, and capacity-building. Research and innovation funding is essential for developing evidence-based rabies control strategies, with collaboration between academia, government, and the private sector fostering innovation. Adopting One Health principles promotes a holistic approach to rabies control, integrating human, animal, and environmental health to improve surveillance, research, and community involvement. Through these combined efforts, Ghana can work toward eliminating rabies and protecting public health.

Initiatives from Universities such as exemplified by KNUST School of Veterinary Medicine is needed in fighting rabies. These initiatives include opening a veterinary hospital, encouraging veterinary students to adopt pets, advocating for animal welfare in the Sekyere Central District, creating a postgraduate program on One Health at the German-West African Center for Global Health and Pandemic Prevention (G-WAC), partnering with other veterinary institutions in Germany, Ghana, Sierra Leone, Nigeria, and Cameroon, and planning an outreach. By partnering across sectors, improving monitoring systems, undertaking interdisciplinary research, incorporating communities, and implementing vaccination programs as used in the anthrax outbreak control in Ghana,⁴³ the country can succeed in eliminating rabies.

5 | CONCLUSION

Rabies control in Ghana is shaped by a mix of interventions, challenges, and opportunities. Despite efforts in vaccination programs, awareness campaigns, policy formulation, and research, persistent issues in healthcare infrastructure, surveillance systems, vaccination coverage, public awareness, and policy implementation still hinder effective rabies prevention and mitigation. However, integrating One Health principles can address the interconnectedness of human, animal, and environmental health, promoting collaborative, interdisciplinary approaches to disease prevention and control. Focusing on securing accurate data on animal populations in the country, coupled with improving the rabies disease surveillance systems, fostering collaborative research work, engaging communities, building capacity, and advocating for better policies on animal ownership and vaccinations, Ghana can strengthen its rabies control measures and work toward the goal of rabies elimination in the country.

AUTHOR CONTRIBUTIONS

Benjamin Obukowho Emikpe: Conceptualization; methodology; writing—original draft; supervision; writing—review and editing; investigation. **Derrick Adu Asare:** Writing—review and editing; writing—original draft; investigation; data curation. **William Tasiame:** Writing—review and editing. **Sylvester Segbaya:** Writing—review and editing. **Prince Nana Takyi:** Data curation; writing—review and editing; writing—original draft. **Emmanuel Allegye-Cudjoe:** Writing—

review and editing; supervision. all authors have read and approved the final version of the manuscript.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study including the epidemiological data, intervention strategies, implementation challenges, and outcomes related to rabies control in Ghana are publicly available from the sources that have been duly acknowledged and referenced. The corresponding author had full access to all of the data in this study and takes complete responsibility for the integrity of the data and the accuracy of the data analysis.

TRANSPARENCY STATEMENT

The lead author Benjamin Obukowho Emikpe affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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