

Local Solutions Towards Rabies-Related Human Mortality Elimination by 2030 in the Menabe Region (Madagascar)

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Abstract

In Madagascar, rabies is a significant public health challenge. However, due to the underreporting of many cases and a lack of awareness about post-exposure prophylaxis, the number of rabies cases is likely underestimated. To address this issue, focus groups were conducted following successive awareness-raising sessions about rabies. The main aim of this study was to gain insight into how communities perceive the global goal of eliminating rabies-related human fatalities by 2030. This understanding would help identify effective strategies for addressing the problem. As part of these focus groups, a video in the local language (Malagasy) was presented to all participants, explaining key information about rabies, including its symptoms and what to do in case of animal bites. This video allowed participants to share their own experiences, express their perspectives on rabies surveillance, and suggest practical actions to achieve zero human deaths from rabies by 2030, within their communities.

The suggested actions can be summarized into themes (topics), which include improving access to medical care, educating relevant stakeholders, managing the local dog population, fostering collaboration among different stakeholders, reducing the number of stray dogs, implementing vaccination programs, enacting and enforcing relevant laws and regulations, managing dog bites and rabies cases, allocating and utilizing financial resources effectively, and examining local customs. The discussions typically framed these themes in terms of existing deficiencies or inadequacies. According to the insights gathered from these community-driven discussions, activities such as stakeholder education, awareness campaigns, and training should start promptly and continue over a long-term period. In this perspective on tackle rabies, issues related to financial resources were viewed as having a cross-cutting nature, offering potential solutions for short, medium, and long-term challenges. This study demonstrates that when people are well informed, they can recommend solutions that consider the specific realities of their municipalities and territories.

Keywords: Rabies; Knowledge; Attitudes; Practices; Community perception

Introduction

Rabies is a lethal viral disease that affects all mammals. Birds, reptiles, fish, and insects cannot transmit rabies. The disease spreads from an infected animal to humans primarily through a bite, scratch, or contact with open wounds, recent skin lesions, or mucous membranes. Human-to-human transmission has not been observed, and as such, animals exclusively serve as the reservoir for the virus. This reality underscores the importance of combating rabies in humans by focusing on the prevention and control of the disease in animals. The lower human impact of rabies, in comparison to other diseases, may contribute to the limited involvement of health ministries in some countries. In 2018, a global strategic plan was initiated by several nations to enhance rabies control efforts [1]. Sustainable Development Goal (SDG) 3.3 aims to eradicate epidemics of neglected tropical diseases,

including rabies, by 2030 [2]. To achieve this, goal an action plan has been developed based on a “One Health” approach, with the objective of rabies-related human mortality elimination. This ambitious endeavor was launched in 2015 through the “United Against Rabies” collaboration, which includes organizations such as the World Health Organization (WHO), the Food and Agriculture Organization of the United Nations (FAO), the World Organisation for Animal Health (OIE), and the Global Alliance for Rabies Control (GARC) [2,3]. This program for rabies control is sustainable and cost-effective for all countries, incentivizing various stakeholders to invest in its implementation.

Consistent long-term support is essential for the eventual eradication of rabies [4]. In Madagascar, rabies has been prevalent since at least the 19th century and remains a significant public health challenge. The country harbors wild forestry animals in the Menabe Antimena Reserve in the Morondava region, which could be both recipients and reservoirs of the rabies virus. These animals represent a risk through potential attacks and bites, particularly to humans and other susceptible species. Rabies prevention requires a thorough understanding of its reservoir, its transmission’s mechanisms, and the requisite behaviors and attitudes for people to adopt the following potential exposure. Surprisingly, there have been no investigations conducted thus far concerning how the Menabe region’s communities perceive the rabies surveillance system outlined by the Ministry of Health. Given these circumstances, it becomes crucial to assess communities perception of these measures. This research is specifically concentrated on a tourist-heavy region where interactions between wildlife, domestic animals, and both local residents and tourists occur on a daily basis.

The main aim of this research is to gain insight into the people’s perspective on rabies-related human mortality elimination by 2030. This will facilitate the identification of solutions that are tailored to the specific circumstances and needs of these communities.

The specific objectives are to:

- a) Understand the current rabies situation in the study area according to communities.
- b) Understand people’s visions on the actions to be taken to avoid human deaths related to rabies by 2030.
- c) Describe the main activities adapted to the local context to ensure that control and surveillance measures are well applied by the stakeholders.

Materials and Methods

Study area

The study was conducted in Fokontany in four communes in the Menabe region of western Madagascar. These communes are Belo-Sur-Tsiribihina Centre, Marofandiliha, Tsimafana and Morondava Centre.

Study design and methodology

This research is a descriptive, cross-sectional, and community-centered investigation. Surveys were administered between

January 15th and January 22, 2021. Additionally, a comprehensive literature review was conducted, encompassing the analysis of relevant texts related to rabies control. Four different focus groups were convened, with each one corresponding to a specific municipality. The Three Horizons Method was employed for the collection, processing, and analysis of data acquire from these focus group sessions. This method is participatory designed to gather information from a particular audience about a defined target population.

Study population

The focus group participants were selected based on their availability and with an emphasis on diversifying their roles within the community, including veterinarians, Fokontany chiefs, nursing staff from basic health care centers, and law enforcement officers. Both male and female participants were included in these focus groups. This novel approach aims to empower local populations to envision a future where no human deaths due to rabies occur by 2030. Using a “backcasting” method, specifically the “three horizon method,” this approach involves assessing the current rabies situation, identifying existing strengths and weaknesses, and pinpointing strategies for change to achieve the desired goal. Four focus groups were conducted, in total with 57 participants, in four different communes: Belo-Sur-Tsiribihina Centre, Marofandiliha, Tsimafana, and Morondava Centre. Prior to each focus group, local authorities, including health care center managers and local administration officials, were informed about the study’s objectives and their approval was obtained. Additionally, each focus group participant was briefed on the study’s goals, provided their oral consent, and assured of their right to withdraw from the study at any time. Within each focus group, participants were encouraged to imagine an ideal scenario in which their municipality experiences no more human deaths due to rabies by 2030. They were asked to present an overview of the current rabies situation in their respective communes, and then were prompted to suggest actions for the short term (2021 to 2024), medium term (2024 to 2027), and long-term (2027 to 2030) to achieve this goal.

Data management and analysis

All the ideas generated during the focus group sessions were initially recorded in Malagasy-language sticky notes. These ideas were subsequently transcribed into French, with each idea occupying a single line, using Microsoft Excel 2010. A two-step coding process was conducted, beginning with open coding, which involved categorizing each idea according to its specific theme. Subsequently, axial coding was undertaken, which involved comparing the open codes to one another and aggregating them into broader thematic categories. This process aimed to identify the overarching thematic structures within the ideas.

Results

Main themes from focus groups

In total, 57 people participated in focus groups across four communes: 15 in Belo-Sur-Tsiribihina Centre, 20 in Marofandiliha, 15 in Tsimafana, and 7 in Morondava Centre. Upon analyzing the

insights shared by these participants within the broader study area, we identified ten overarching themes concerning strategies and actions essential for the eradication of human rabies. These themes encompass both current realities and prospective actions, which we refer to as “ideas.” These themes are Access to health care (9 ideas), Collaboration between stakeholders (23 ideas), education of stakeholders (69 ideas), Dog welfare (30 ideas), Legislation and regulations (26 ideas), Dog bites and rabies (6 ideas), Reduction of the dog population (17 ideas), Financial resources (16 ideas),

Customs (14 ideas), Vaccination (34 ideas). These themes are characterized by a variable number of past and present facts (current situation), as well as various visions of the future (near, medium and long term) to resolve them (Table 1). The ten thematic elements are evident in the current situation in 2021. For visions of the future, some themes appear only once in the timeline, while others persist across all three periods (H1,H2,H3), but through different actions to be taken to achieve human mortality-related to rabies eradication.

Table 1: Main themes and the number of ideas that characterize them.

Main Themes	H0: Current Situation (2021)	H1: Short-Term Vision (2021-2024)	H2: Medium-Term Vision (2024-2027)	H3: Long-Term Vision (2027-2030)	Total
Access to health care	6	1	0	2	9
Collaboration between stakeholder	11	6	0	6	23
Stakeholder education	16	45	2	6	69
Dog welfare	15	8	4	3	30
Laws and their enforcement	4	11	4	7	26
Dog bites and rabies	6	0	0	0	6
Reduction of the dog population	6	9	0	2	17
Financial resources	9	5	1	1	16
Customs	13	1	0	0	14
Vaccination	14	11	7	2	34
Total	100	97	18	29	244

The rabies situation in 2021 in the Menabe region: Past and current facts that can influence on the ongoing efforts to combat rabies

The analysis of the current context allows an assessment of the strengths and weaknesses in the rabies control in the Menabe region. Notably, an examination of the 2021 status concerning the combat against rabies reveals a multitude of distinct observations, predominantly pertaining to issues that are distributed disparately across ten primary thematic areas. The foremost considerations for the 2021 situation revolve around challenges associated with the education of stakeholders involved in the rabies control initiative, encompassing awareness-raising campaigns and training. Subsequently, issues associated with dog management, including difficulties in feeding and restraining dogs, as well as vaccination protocols for both humans and animals, also feature prominently in the evaluation. Moreover, customs-related problems constitute a noteworthy dimension of concern. Regarding access to health care, the observations made by the participants pertain to the challenges associated with obtaining healthcare services, including issues “veterinarians do not treat dogs” or the fact that there is “no rabies medication in the district” or the reality that people have “no possibility of transport to go to the Rabies Treatment Centre (RTC)”.

Regarding the cooperation among the stakeholders engaged in rabies control, different points are underscored, among which that there is “no collaboration with the different services”, “insufficient collaboration”, or the idea that “rabies was never mentioned during the management meeting with the Regional Health Services”. Concerning the education of stakeholders, issues arise concerning shortages, inadequacies, or the absence of awareness-raising initiatives, exemplified by a “lack of awareness campaigns”. Frequently when discussing failure, as exemplified by the fact that “communications about rabies have failed.” The sole favorable aspects emphasized pertain to the past, transient endeavors, such as the “existence in the past of awareness campaigns for people”. The absence of awareness or a deficiency in knowledge among the stakeholders engaged rabies control becomes evident through ideas like “people don’t know that there are laws related to dogs care and bites”, or “people don’t know what rabies is” or “people don’t know the importance of rabies vaccines “. In the context of the study area, the topic of dogs welfare is only addressed in a single favorable aspect, specifically “migrants take good care of their dogs”. Regarding the remaining issues, they present significant challenges. For instance, “there are no vaccination records for registered dogs”, or “it is difficult to tie up dogs”.

Dogs hold a significant role within society, and the challenges experienced by their caregivers are frequently emphasized through remarks such as “people breed dogs to protect themselves against dahalo¹ but do not treat them”. In the context of laws and regulations, participants express their points of view and opinions through statements such as “there is no law indicating that dogs cannot be killed after biting” or that there is a “inadequacy in the enforcement of vaccination legislation”. Alternatively, in opposition to the prescribed course of action, there is “no action on rabies by the town hall main responsables and veterinarians”. The subject of dog bites engenders a divergence of opinions. Some people said that “very few dogs die” from rabies in their communes or that “there are no cases of rabies” even if they that “dog bites are frequent” in the past. The topic of decanization reduction, akin to the issue of dog bite incidents, is approached from a dual perspective. This involves examining both the formal absence of decanization oversight by decentralized state entities (such as municipalities and veterinary services) and the spontaneous decanization efforts made by local communities. Notably, administrative decanization efforts appear to be endorsed, while community-led initiatives have been devalued and substantiated by specific instances. For example “people kill suspicious dogs”, or “people kill dogs that bitten people” and then “throw slaughtered dogs into the forest”. The topic of financial resources is explored in conjunction with various other themes, such as decentralization, as an illustrative instance, “we don’t have enough money to buy Strychnine²”. For vaccination, some participants think that “there is no budget for the vaccine”.

People noticed that customs are often limitations to dogs isolation, because “it is impossible to tie dogs up because of traditions” and “it is impossible to put on collars because of traditions”. The presence of traditional practitioners in the study area interferes with recommendations when exposed to bites. Some participants indicated that “people believe in traditional practitioners” and “there are traditional practitioners who treat the dogs bite “. The fact that “dogs are taboo for some people” also means that “dogs have no value” for these people. Due to these customs, when a veterinarian provides health care to dogs, that is considered as prioritizing dogs over humans, and “veterinarians risk losing their job” if they treat dogs. The issue of traditions is inherently complex, as it highlights a traditional method of bite care and poses a problem for veterinary practice. For vaccinations, the issues mentioned encompass a range of diverse concerns, including the “lack of information on vaccination”, or that there is “no vaccination scheduled for dogs”. However, testimonies about the past show that “there have already been vaccination campaigns in some districts of Menabe region”.

Future perspectives: Actions to be taken and sustained

For the future perspectives, some ideas and actions to be set to achieve the goal of zero human deaths related to rabies by 2030

were suggested by focus group participants. According to the communities, the most important actions to be taken as solutions in the short term mainly concern the education of stakeholders on rabies (45 ideas), legislation and regulations (11 ideas) and vaccination (11 ideas). In the medium term, the most important actions concern vaccination (7 ideas), legislation and regulations as well as their application (4 ideas) and dog welfare (4 ideas). In the long term, legislation and regulations (7 ideas), stakeholder education (6 ideas) and collaboration between stakeholders (6 ideas) are the themes for which a significant number of actions need to be carried out. According to the focus group participants, most of the actions to be taken in the short term must continue over time. People are therefore often highlighted actions to be strengthened in the medium and long term.

The theme of access to health care would be solved by strengthening the actual health care system. So according to participants “we must have a Rabies Treatment Center in each district” or proceed with the “ establishment of more hospitals”. For collaboration between stakeholders, the solutions to be implemented are the establishment and strengthening of collaboration, particularly “Cooperation between the animal health sectors, human health sectors and Menabe région décision-makers”, “Involvement of local political authorities (Cities mayors and Fokontany³ chiefs)”, “Involvement of the Ministry of the Environment”, “Mobilisation of Helath Community Workers”, “Involvement of the Ministry of the Environment, “We need to strengthen the communication with the Pasteur Institute of Madagascar” which works throughout Madagascar on public health. Regarding the education of the stakeholders, information, communication and training actions are recommended. For example, people said, “we must communicate with dog owners about rabies existing treatments” or that “recruitment of sensitizing agents” or “rising people awareness on rabies negative the consequences” are required solutions.

For the dog’s management, the most important actions to be carried out according to participants are related to the reduction and control of the dog demography such as, “tying up dogs with owners”, “we must have other methods of contraception for dogs”, or the “availability of legalized booklets for dogs by the Ministry of health”. In relation to laws and regulations and their application, restrictive measures, for examble, “the Malagasy government should constraint veterinarians to do their job well” in spite of customs. Participants also think less restrictive measures such as “the dog owners must follow the standards (vaccine, collar, booklet)”.

Regarding the dog population control, some participants proposals are that “decanization should be done once a year” or “stray dogs should be killed”. The topic of financial resources practically touches on other topics such as “there should be funding for the purchase of strychnine”, “rabies vaccines should be free”,

¹Dahalo is a term used in Madagascar to refer to cattle rustlers or cattle thieves.

²Strychnine is a highly toxic chemical compound, used by veterinarians for decanization in Madagascar.

³Fokontany is the smallest administrative level in Madagascar.

“there should be a budget related to animals with the municipality”, etc. In terms of customs, a definitive resolution is not available, but for participants “we must detach ourselves from negative traditional practices” that contribute to maintaining rabies. The challenges associated with immunization can be addressed through various approaches, including the establishment of an efficient organizational framework: “Free Vaccination Campaign”, “Availability of vaccines at the health district level”, are required.

For the focus group participants efforts should be focused on raising awareness on rabies. The aim would be to enhance positive aspects, like the reduced number of the dogs bite, and work towards the overarching goal of achieving “zero dog bites”. In 2021, some concerns were brought up, and participants suggested that their potential solutions for the future must be implemented as soon as possible. In the future, in order to reach rabies-related human mortality elimination by 2030 in the Menabe Region (Table 2).

Table 2: Summary of the current rabies situation and participants’ vision of future actions.

Main Themes	The Current Situation (2021)	Vision for the Future (2021-2030)
Access to health care	Difficulties in accessing care	Strengthening access to health care
		Adoption - Addition of budget
Educating stakeholders	Weakness-Lack of awareness	Reinforcement of hygiene-cleanliness measures
		Information-Communication-Training
	Ignorance-Ignorance of the population	Adoption-Addition of budget
		Achievement-Raising awareness
Dog welfare	Good dog management Difficulties in managing dogs	Adoption-Application of laws and regulations
		Information-Communication-Training
Collaboration between stakeholders	Absence-Lack of collaboration	Dog Reduction-Control
		Establishment-Strengthening collaboration
		Information-Communication-Training
Reduction of the dog population	Absence-Insufficient decanization	Adoption-Addition of budget
		Adoption-Enforcement of laws
	Existence of decanization	Decanization
		Absence-Vaccine Insufficiency-Vaccination
Laws and regulations	Absence-Non-Enforcement of laws	
		Adoption-Enforcement of laws
	Absence-Insufficient activities	Establishment-Strengthening collaboration
		Adoption-Enforcement of laws
Dog bites and rabies	Absence-Weakness of rabies cases	Establishment-Strengthening collaboration
	Existence of dog bites	Information-Communication-Training
Financial resources	Short-Insufficient budget	Adoption-Addition of budget
		Establishment-Strengthening collaboration
Customs	Custom-Tradition issues	Disconnect from traditional practices
		Information-Communication-Training

Discussion

Many themes (topics) came out from this study and reveal that many challenges still need to be addressed to eradicate rabies in areas where there is an interface between humans, domestic animals and wild animals like Menabe region (Madagascar). In remote areas we performed our study, physical accessibility to health care is a major concern, because some people live far from the health care centers or hospitals and it is difficult to reach, due to many reasons related to road trip. In fact, our study area has only a national road connecting Morondava where the Rabies Treatment Center is located to remote communes, where focus groups were conducted. As a result, travel costs to reach health care facilities

are affordable for people. The stakeholder’s education was often underlined as a priority and should concern all stakeholders involving in rabies control in Menabe region. People do not always understand how rabies is transmitted or how it can be prevented [5].

The focus group participants do not have much information on laws related to dogs and rabies our awareness campaign before focus groups gave information to each participant before focus groups gave information to each participant. The dogs management and control are dog owner’s responsibility, but many dogs have to feed themselves from the remains found in dumps and are not cared for. Despite the presence of veterinarians who can treat animals,

many owners do not have their dogs treated or vaccinated, as caring for a dog is often misinterpreted because taboo and should dogs not deserve any attention. This is why people think that veterinarians could lose their clients if they treat dogs. Traditional practitioners also influence official health care access regarding rabies, as some people prefer to seek traditional bite treatments rather than of medical care. This behavior negatively affects post-exposure prophylaxis in cases when an animal bites a human.

The reduction of the dog demography is only considered from the perspective of the culling of stray dogs and biting dogs. Dogs' castration was not mentioned as a solution for rabies control by the participants. Raising awareness campaigns and the integration of this solution by veterinarians could help control the dog demography if it is accepted by the population. For vaccination, dog owners may not be aware of their dogs' vaccination importance or may not have the opportunity to do so (due to lack of financial means, or access to vaccines, etc.). Rabies affects both humans and animals, so regular vaccination of dogs and cats can also contribute to human health. The potential implementation of oral rabies vaccination in dogs using bait as a strategy for rabies eradication may warrant consideration. However, it is imperative to prioritize comprehensive food security initiatives beforehand, particularly in the regions of southern Madagascar where our study is conducted, given the prevalent issue of food insecurity. The potential use of meat as bait for animals could potentially lead to dissatisfaction in the Menabe region community.

The presence of laws and surveillance protocols in case of dog bites does not guarantee their implementation. So the Malagasy government might inform all stakeholders involving in rabies control. It would then be possible to move on to the adoption and application of new laws. Collaboration between stakeholders is essential to allow public health authorities and veterinarians to work together to control rabies. About dog bites and people post-exposure prophylaxis, health personnel may not clearly explain to victims who come in the health care centers the post-exposure prophylaxis vaccination advantages. This is crucial, given that people lack awareness that rabies serum, when administered following a bite, is designed to safeguard who has been bitten. Furthermore, it is important to explain that once the disease is confirmed, there are no available treatments.

Conclusion

The main objective of this study was to gain insight into the people's perspective on rabies-related human mortality elimination by 2030. Our study involved four communes in the Menabe region (Madagascar). The diversity of the participants is an asset but given the non-random selection of the entire population of these communes and the small sample size, the solutions that appear to be implemented in order to definitively appreciate their effectiveness. However, the participants explained dissatisfaction with the current situation in 2021, about rabies control, regarding

the difficulties underlined. The study participants emphasize the necessity for future assessments of the methods employed thus far. They recognize the importance of involving local stakeholders through initiatives such as training, awareness campaigns, and communication efforts. Collaborative efforts among stakeholders are seen as pivotal components of a strategy aimed at achieving the complete elimination of human deaths resulting from rabies by the year 2030. The different perspectives of the people in these four communes can be extended to the whole of Madagascar, if we perform similar studies in other sites, to identify the most recurrent themes at the country level. In One Health perspective, rabies risk perception, communication, and management are crucial for effectively addressing the complexities of rabies-related human mortality elimination by 2030.

Author Contributions

KD, and RV contributed with to the conception design and implementation of the study.

KD, RV, RVM and RAF performed the data collection.

KD, RV, RVM and RAF reviewed the results.

KD performed the data analysis and wrote the first draft of the manuscript.

KD, RV, RVM and RAF reviewed the draft of the manuscript and wrote sections of it. All authors contributed to manuscript revision, read, and approved the submitted version.

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