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Barriers to Sustaining Dog Vaccination Campaigns against Rabies: Perspectives from Dog and Cat Owners and Other Stakeholders in Kisarawe District, Tanzania

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Abstract

Background

Rabies is caused by a neurotropic virus of the genus Lyssavirus of the family *Rhabdoviridae*, that affects all mammals. About 99% of the transmission of the virus to humans are due to bites from domestic dogs. Rabies is a neglected tropical disease that causes more than 59,000 human deaths each year in the world, particularly in Asia and Africa. It causes a loss of 3.7 million Disability Adjusted Years (DALYs) per year and about 8.6 billion USD of economic losses. Over 80% of susceptible dog populations remain unvaccinated in Africa, and as a result, rabies remains endemic in the continent. Dog vaccination, provision of post-exposure prophylaxis to people bitten by dogs and awareness are the major interventions to prevent and control rabies. Kisarawe district in Tanzania is considered to be among the hotspots for rabies as it borders the Nyerere National Park. Despite this fact, rabies vaccination coverage of dogs in Kisarawe remains low.

Objective

To explore barriers to sustaining dog vaccination campaigns against rabies in Kisarawe district, Tanzania.

Methods

This was an exploratory qualitative research design which was conducted in Kisarawe District, Pwani Region in Tanzania. A total of thirty-three in-depth interviews were administered to dog owners, cat owners, livestock officers and clinicians. Data were summarized and analyzed using a thematic approach, systematic coding and with the aid of NVivo v14 software for qualitative analysis.

Results

Six themes emerged that reflect perceptions of respondents: “Awareness on rabies disease”; “Prevention of rabies including post-exposure prophylaxis of a person bitten by rabid dog”; “Reasons for dog owners not to bring dogs for vaccination during the campaigns and Low turn up among dog/cat owners to vaccinate their dogs”, “inadequate knowledge among dog and cat owners on rabies protection by the vaccine”; “misconception that vaccine can do harm to dogs and cats; and “challenges facing livestock officers to vaccinate dogs”. Specific barriers include shortage of field staff, equipment and anti-rabies vaccines. In addition, low turn up among dog/cat owners to vaccinate their dogs during campaigns was a big barrier.

Conclusion

The study findings have revealed barriers to achieving high coverage of dog vaccination despite presence of vaccination campaigns in Kisarawe district. Education and awareness on dog and cat owners on vaccination against rabies should be conducted frequently while implementing a scheduled provision of free rabies vaccine. Vaccines, supplies, and related equipment should be always available and distributed for increased vaccination coverage.

Keywords: *Rabies, Barriers, Vaccination, Dog/Cat owners, Kisarawe, Tanzania.*

Introduction

Rabies is a serious public health problem in over 150 countries and territories, mainly in Asia and Africa. It is a viral, zoonotic, neglected tropical disease that causes tens of thousands of deaths annually, with 40% being children under 15 years (1). In Africa, where rabies is endemic, human rabies is mostly transmitted by domestic dog bites (2). Dog bites and scratches cause 99% of the human rabies cases, and can be prevented through dog vaccination and bite prevention (1). In preventing rabies, mass dog vaccination (MDV) is a valuable strategy to prevent the spread of rabies, and when deployed effectively, it can eliminate infection (3, 4). Sadly, over 80% of susceptible dog populations remain unvaccinated in Africa, and as a result, rabies remains endemic in the continent (5). In Tanzania, MDVs have been continuously conducted in villages using a central point (CP) approach, whereby dog owners voluntarily bring their dogs to CPs (6, 7). The campaigns are normally publicized locally one week in advance with a reminder using public address (PA) system the day before. In addition to MDV, creating awareness and knowledge on the prevention of rabies engages communities and empowers people to save themselves health-wise by seeking the care they need. This includes an understanding of how to prevent rabies in animals, when to suspect rabies, and what to do in case of a bite. Adequate knowledge of disease transmission among dog and cat owners is important for the success of vaccination programs (8). Poor knowledge about the dangers of rabies is one of the reasons for poor dog vaccination coverage (9-12). The perceived high cost of vaccination is an underlying reason for dog owners' hesitancy to vaccinate their dogs despite the relative low cost of such services (13). Other reasons for low coverage of vaccination against rabies include inadequacy in numbers of veterinary extension officers, distance from vaccination centers and difficulty in transporting dogs to vaccination centres (14).

The research question was: why was Kisarawe not able to sustain dog vaccination? Empirical evidence indicates that Kisarawe District was able to conduct vaccination campaign district-wide between the years 2011 – 2016, with the financial support from the Gates Foundation. At the expiration of this support, the dog vaccination campaign in the district became unsustainable and stopped. Kisarawe, has an estimated dog population of 4,062, giving a dog to human ratio of 1:30 for the district. Whereas the mass dog vaccination has been stopped for reason of lack of self-sustainability despite the fact that the district had a relatively large number of dogs, the underlying reasons and barriers to sustainability of dog vaccination is not clear and has yet to be explored. Therefore, this study was carried out to explore barriers to sustainability of dog rabies vaccination in Kisarawe district.

Methodology

Study area

This study was conducted in Kisarawe District located in Pwani Region in eastern Tanzania. The Pwani Region has an estimated human population of 1,098, 668 majority of whom are involved in agriculture (crop cultivation, livestock and fish farming) (15). Specifically, the Kisarawe district is subdivided into 16 wards with an approximate human population of 121,772 Kisarawe DC, personal communication) and a dog population of 4,062 giving a dog to human ratio of 1:30 for the district. Regarding animal diseases surveillance, Pwani Region is serviced by Temeke/Pwani Zonal Veterinary Services and the Tanzania Veterinary Laboratory Agency based in Dar es Salaam.

Study Design

An exploratory qualitative research design was conducted in Kisarawe District, Pwani Region, Tanzania. A qualitative exploratory design allows the researcher to explore a topic with limited coverage within the literature and allows the participants of the study to contribute to the development of new knowledge in that area (16). A total of thirty-three in-depth interviews (IDIs) were administered to dog owners and cat owners. Key informant interviews (KIIs) were also conducted with animal health personnel, clinicians, community leaders, religious leaders and chairpersons of the health committees.

Study Population

The study population for the IDIs was purposively selected using the following criteria: must be the head of households and be aged 18 years and above, and the household may or may not own a dog or a cat. The individuals who served as key informants for the KIIs were selected regardless of whether there was a dog or cat in the household or not.

Sample size and sampling method

Sample size

No specific sample size was set for this qualitative study but data were collected continuously until the saturation point was reached (i. e the point in data collection where no new themes or insights emerged from additional data, indicating that the sampled population reached was sufficient to capture the full range of perspectives on the topic being studied; essentially, any further data collection was unlikely to reveal any significantly new information, and can only be a rehash of previous set of information) (17).

Sampling technique

The study employed purposive sampling technique to obtain dog owners and non-dog owners in those sites where vaccination was being conducted. Purposive sampling was used because it enabled direct identification and selection of information-rich participants who relate to the research question.

Recruitment and training of the research assistants

All research assistants received prior training on data collection tools and dog and cat vaccination, with demonstrations conducted ahead of the field visit to Kisarawe district.

Data collection Methods

The selection of the two methods, the in-depth interviews (IDIs) and key informant interviews (KIIs) were to meet different objectives in contributing to the overall aim of the project. While the IDIs explore individuals' personal experiences, attitudes, and perceptions in detail, and it focuses on personal narratives, beliefs, motivations, and behaviors for keeping and interacting with dogs and cats, the KIIs were conducted to obtain expert knowledge, strategic insights, or contextual information from specialized people and community leads, including the subject-matter experts with a focus to get broader or institutional-level perspectives on policies, systems, and practices in Kisarawe District. Hence, the IDIs were targeted at dog owners and cat owners, while the KIIs were aimed at animal health personnel, clinicians, community leaders and religious leaders as specified above. Ownership of dogs and cats was irrelevant in the study to ensure that all opinions were captured using the IDIs, either with ownership, or non-owners who interact with dogs in the community. Furthermore, the selection criteria for IDIs were non-discriminatory for ownership of dogs or cats because the whole population of Kisarawe District has equal chance of being bitten by rabid dogs with fatal consequences and are therefore all in need of relevant risk communication and community engagement (RCCE) and awareness and information to develop mitigative measures against rabies.

While some dog and cat owners used the centralized locations, owners of dogs and cats, who did not bring their animals out for vaccinations for various reasons, were approached at their residences with the aid of the focal persons who were familiar to the village. All the interviews at the vaccination centers were held at a circumscribed locations within the vicinity of the vaccination centres, where the participants were comfortable. We used the interview guides, which were prepared in English and translated into Kiswahili for the interviews in the field. The interview guide contained questions that explored barriers to vaccination, and perceptions towards rabies prevention and control.

For the KIIs, the individual interviews were to triangulate details from the IDIs and to get more insights and knowledge on practices, attitudes and perceptions of the community.

Trustworthiness and credibility of the qualitative data

To gather trustworthiness and credibility of the interviews and the ensuing data from the IDIs, we carried out prolonged engagement spending sufficient time to build rapport with participants to foster openness and honest responses, most responses were triangulated with answers from the KIIs. We also carried out some spot check of responses by sharing summaries and inferred meaning and interpretations with participants to verify accuracy and ensure their perspectives are correctly captured. Each used transcript for data capture, the coding and themes were reviewed by at least two researchers in the team. Similarly, all the data captured in the field were kept available in paper or audio-recorded format for audit trail. Finally, since all the interviewers were trained prior to the field interviews, and used the standardized guide, we believed that this should minimize inconsistencies arising from personal bias or interpretations and ensure uniformity (18).

Data management and analysis

Data management

All data generated or synthesized from the study were entered on a Microsoft Excel spreadsheet, filtered, curated and stored securely. All notes compiled during in-depth interviews were stored securely in locked filing cabinets in a room with restricted access at Muhimbili University of Health and Allied Sciences (MUHAS) for data security purposes. All data generated as part of this study, which were entered into an electronic database were anonymized and accompanied with unique identifiers.

Data analysis

Data was analyzed using conventional qualitative content analysis (19). Using qualitative content analysis, we conducted subjective interpretation of the content of text through a systematic process of coding and identification of themes or patterns. The method was flexible and pragmatic for developing and extending knowledge of the human experience of health and illness (20). Digitally-recorded and transcribed (verbatim) details from the IDIs interviews were entered into a coding software “Nvivo v14” to support the coding process (21, 22). Data analysis was aided by NVivo v14 software since it enhanced the *rigour and depth of research findings* by making it easier to extract significant insights and patterns from various sources. For details, data were coded with the Kiswahili transcripts aimed at remaining close to the text.

Codes were then translated into English for the wider scientific team members. Codes were labels or short phrases assigned to specific sections of text or data to categorize and identify recurring themes or concepts, essentially acting as a way to organize and summarize the meaning of the data to facilitate analysis and interpretation; representing key ideas extracted from the participant's responses. These allowed the researchers to identify patterns and connections within the data. We read the interview transcripts several times to identify the meaning units. Finally, codes were combined to form categories that were manifest as content. Similar data points, identified during the coding process, that share common characteristics or themes, which allowed the researchers to organize and interpret complex information by classifying related pieces of data together within a broader concept or idea were grouped together as 'Categories' (Example in Table 1 below).

Table 1. Example of coding process

Meaning unit	Condensed meaning unit	Codes	Category	Theme
As I know, for the dog to be overactive, inhaling a lot and barking, biting with salivation, and red eyes. It can be one of the symptonms and signs of rabies. That is what I know may be experts , doctors can know more about that.	Symptoms for rabid dogs. Has overreactive, barking, biting, salivation and inhaling a lot. Has red eyes. Never seen rather than hearing	Rabid dog has salivation. Rabid dogs inhale a lot. Rabid dog has red eyes. Have never seen.	Signs of a rabid dog.	Awareness of rabies disease

(Source: Field data, 2021)

Ethical Consideration

The study got ethical clearance from MUHAS Institutional Review Board, number MUHAS-REC-08-2021-801. Both written and verbal consent were obtained from participants to be interviewed using a standard consent form. Only participants who agreed to the written or verbally agreed informed consent were interviewed. Participants protection regulations according to Declaration of Helsinki were observed. Before the interview, the interviewer explained to each participant and guaranteed that there will be 'no risk, harm or threat that should be imposed on study participants and their privacy, autonomy and confidentiality in view of their participation in the interview'. Furthermore, informants were also assured that their written informed consents will not reveal their names during the reporting or publication process and only anonymized responses and unlinked quotations were used to maintain confidentiality and privacy. All written informed consent forms were stored and locked in a cabinet to ensure confidentiality. Permission to do the assessment in Kisarawe district was obtained from the President's Office, Regional Administration and Local Government (PO-RALG), the Regional Administrative Secretary in Kibaha and the Kisarawe district council and its wards namely Kisarawe, Msimbu, Kiluvya, Liluvya, Masaki, Kazimzumbwi, Kibuta, Mambo, Boga, Maneromango, Msanga, Chole, Kurui, Marui, Vihingo, Mafizi and Vikumburu.

Results

Socio demographic characteristics

The majority of the participants were males with education background of approximately grade seven, and a mean age of 40 years.

Six themes emerged that reflected perceptions of participants including the following: a) "awareness on rabies disease", b) "prevention of rabies and how to care for a person who has been bitten by a rabid dog", c) "reasons for dog owners not to bring dogs for vaccination and Low turn up among dog/cat owners to vaccinate their dogs", d) "inadequate knowledge on rabies protection by the vaccine", e) "anticipation of harm due to vaccination" and f) "challenges facing livestock officers to vaccinate dogs".

Awareness on rabies disease

The assessment on the awareness of rabies involved the level of understanding of the disease, modes of transmission and common cause of the disease. The findings presented varying knowledge of the condition from individual perspectives. There was a varying definition of rabies among the study participants from a complete 'no awareness' to comprehensive

understanding in terms of definition, cause and modes of transmission based on the phrases below.

> *"The way I understand, rabies is a disease that affects dogs, I understand the dog, cat or fox suffer from that diseases or and if it happens that you are bitten, you get that disease"* (Dog owner, Kiluvya).
>
> "*Rabies is a disease that a dog gets if the dog did not get his annual vaccine*" (Hamlet Executive Officer).
>
> "*I understand rabies as a disease that when a dog who has not been vaccinated bits a person, it can cause a disease to the person that is very difficult to treat*" (Village chairman).
>
> "*What I know is that a dog can have rabies and it is usually a problem when they bite you. Also, the dog with rabies usually just roams around the streets, but there are also many dogs in the streets so it's not easy to know which one has or doesn't have rabies*" (Non dog owner Kiluvya).
>
> *"I understand rabies as the disease that a dog that have it can infect the other dog by biting it, hence, they all become rabid. Also, when a dog with rabies bites a human being, that person also gets rabies"* (Dog owner Kiluvya).
>
> "*Rabies is a disease that is transmitted from a rabid dog to a person when it bites him/her and it causes death and sometime an immediate death. Therefore, it is a very dangerous disease*" (Chairperson of Health Committee).
>
> "*Rabies is when someone get bitten by a rabid dog, the person gets sick and if he won't get immediate medical help, he may end up dead or may become crazy*" (Cat owner Kiluvya).

Participants described rabies as the disease that is transmitted by a dog to another dog or human being. The extent of the knowledge varied where some participants regarded it as a deadly disease that required immediate interventions. They also reported that unvaccinated dog is the main source of transmission of rabies.

The respondents described symptoms that a dog with rabies may display, to how an infected person with rabies will be in terms of outcomes. Some of the respondents expressed that the animals would behave differently than they normally would have behaved.

> *"I have heard that rabid dogs usually exhibit excessive salivation. The signs of the rabid dogs usually have salivation and inhaling, its eyes are red, but I have never seen it" (*Non dog owner, Kiluvya).

"*As I know, the dog with rabies will show signs of being overactive where is jumping around and barking several times. Among other signs is when a dog is being over dull where it is rather shy or hiding*" (Dog owner, Kiluvya, Madukani).

"*The dog is barking most of the time and also has saliva drooling from its mouth*" (Village chairperson, Makurunge).

Together with the signs and the symptoms, the respondents also described their knowledge on rabies transmission. The respondents provided similar descriptions on the mode of transmission whereas the most described mode is through an infected dog biting another uninfected dog or a human being.

"*Someone gets infected by being bitten or scratched by a dog or a cat. Also, when a dog is bitten by another dog with rabies, it may get infected*" (Village Chairperson).

"*Someone can get rabies when a dog bites a person, that's the way that I know someone may get rabies, I don't know if it can be transmitted in any other way*" (Non-dog owner Kiluvya).

"*Rabies is transmitted when a rabid dog infects another dog by biting it. And when this happens, it can even bite a person and that person will start behaving like a dog and it progress that way. So, you can kill the dog and the person from the point it started*" (Dog owner, Kiluvya).

The correspondents provided similar description of rabies transmission where they mostly describe the transmission as when an infected dog cause trauma such as biting or scratching to either another dog or to a person. Soon after obtaining the infection the infected person/animal will start displaying signs and symptoms including being dull or hyperactive for a dog where they may bark most of the time, violence and an infected person may present as being crazy or acting like the way the dogs act.

Prevention of rabies and how to care for a person who has been bitten by a rabid dog

Participants also provided their views on how rabies can be prevented. Most of the study participants expressed that vaccination of dogs and cats is the best way to prevent rabies.

"Another way is to vaccinate more often like today. This campaign is good, it helps a lot as you can see other people have manage to come. They have walked from far away, but others did not manage to come. For example, my neighbour keeps dogs and use them for his farm activities. He might lack information of the today's vaccination. Next time advertise at least for three to four days" (Dog owner Kiluvya Madukani).

"Rabies is prevented by vaccinating the dogs and the cats just like the way you brought the vaccines" (Cat Owner King'azi Kiluvya).

"I think you need to send the dog to respective places such as to the veterinarians and explain to them the symptoms the dog is displaying and I think they will vaccinate the dog" (Dog Owner King'azi Kiluvya).

"Rabies can be prevented by vaccinating your dog, ensure cleanliness and hygiene and providing enough food for your dog" (Non-dog owner kinga'zi kiluvya).

Reasons for dog owners not to bring dogs for vaccination and low turn up among dog/cat owners to vaccinate their dogs

The assessment of reasons for poor attendance of rabies vaccination for the dogs and cats, and for dogs and cats' owners not to send their dogs for vaccination regularly revealed the following: express lack of knowledge, associated cost and distance to vaccination centres as the primary reasons for not sending their pets for vaccination.

"Most of the dog or cat owners usually take these things for granted, or don't want to spend money for vaccination. We do not it as serious as it is needed and the animals may be roaming around like stray dogs/cat" (Non-dog owner King'azi Kiluvya).

Study participant also commented that some individuals take their dogs for granted where they do not act responsibly towards their dogs as they take it for granted. Lack of responsiveness was expressed by other study participants, and it was one of the reasons for having many owned but stray dogs in the streets. Participants also expressed lack of knowledge and low cost but could still be high for some individual and therefore do not send their dogs/cat for vaccination.

"I think there are two reasons…firstly is lack of knowledge and secondly is cost. For example, in the past I sensitized neighbors to vaccinate their dogs…the vaccine was very cheap, but they said they cannot afford it" (Leader, Makurunge).

Also, some respondents expressed that distance and lack of transport was also a challenge that influenced low turn up for vaccination.

"It's mainly because the health centers are from here and you have to look for means of transport to reach there which is a cost that many cannot afford, and a good example of the willingness is the good turn up of the people here today after bring the services close to us" (Non-dog owner, King'azi Kiluvya).

Along with distance factor and cost of transportation to reach to the health centers, another frequent reported challenge for vaccination that was encountered from the study participants was cost where they reported high expenditures that are required to cover for vaccination. The respondents expressed that the cost of acquiring materials.

> "*Yes, cost is another issue that makes people not to send their dogs for vaccination, for example if you tell someone that it may cost five or ten thousand Tsh (≈ US$ 2 – 4) to vaccinate the dog, they see it as expensive and opt not to just leave them at home rather than sending for vaccination*" (Cat owner, King'azi Kiluvya).

"No, if I have a dog and hear that there are people providing free vaccine, I will take my dog there for vaccination" (Non-dog owner, Maneromango).

Inadequate knowledge of rabies protection through the vaccination of dogs and cats

Inadequate knowledge of rabies protection was a factor that was raised by many respondents. Several study participants reported that people do not know the importance of vaccinating their dogs as seen in the quotes below.

> *"Yes, they have been instructed like that each village but they do not know the importance of vaccine. We need to train as early as possible and when there is Mass Dog Vaccination campaign, the turn-up becomes huge since they have been educated"* (Leader Bembeza).
>
> *"Some people think that their dogs cannot get rabies, they believe other people's dogs will get the disease but not theirs"* (Dog owner, Makurunge).

Among the recommended action, respondent advised as seen in the quote below to do frequent announcement on vaccination so as to educate the community on the importance of rabies vaccination to the dogs and cats.

> *"You need to broadcast this kind of information more often so that people may broaden their understanding"* (Non-dog owner, King'azi Kiluvya).
>
> "*Yes, it is important to train them on how to keep dogs. They have to know well on how the dog can be kept*" (Religious Leader, King'azi Kiluvya).

Training or providing education on proper management procedures for dogs and cats was one of the recommended actions that will help in improving vaccination.

Anticipation of side-effects of dog vaccines

On the reasons for low vaccination turn ups, study participants expressed that some individuals have negative perception of the vaccine. Anticipation of harmfulness of the vaccine was one of elaborated factors as quoted down below.

> *"Some people say even human vaccines have problems so, they think if they vaccinate their dogs that may get problems"* (Cat owner King'azi, Kiluvya).

Challenges facing livestock officers to vaccinate dogs

Participants in study reported to face challenges such as delayed feedback from the authorities, e.g. '*we reported incidence, but we did not get any feedback like they can bring vaccine on a certain day*'. Furthermore, participants reported that due to delayed responses, they sometimes make arrangement to get animal vaccines, and at a cost to the dog and cat owners, they brought their dogs and cats for vaccination.

> *"That is what we have been struggling with because our government when you get disasters of being bitten by the dog among people. We reported but we did not get any feedback like they can bring vaccine on a certain day, maybe we shall do this but nothing. They just received the reported. They just received the report and they said that they will work on it. It is true that, they did not work on the report, as a result we got the vaccine for TSh 3000 and they brought their dogs for vaccination" (Health officer, Bembeza).*

Discussion

In this study we explored the barriers to dog and cat vaccination including the low level of knowledge about vaccination, associated costs and factors of distance to vaccine centres in Kisarawe district. Similarly, we evaluated the awareness of the disease, mode of transmission, signs and symptoms, prevention and how to care for a person infected with rabies.

The findings suggest that community awareness of rabies transmission and its clinical presentation has been shaped by long-standing public health messaging and past interventions, including veterinary outreach and rabies awareness events. While participants broadly recognized rabies as a severe and fatal illness transmitted through dog bites, their understanding was primarily shaped by visible symptoms in animals—such as excessive salivation or abnormal behavior—and dramatized portrayals of rabies in humans, such as barking or running erratically.

This community-level perception appears grounded more in observable and late-stage manifestations of the disease than in biomedical knowledge. Notably, none of the participants described rabies as a viral infection, nor did they mention early, nonspecific symptoms such

as fever or malaise. This gap may delay recognition and timely care-seeking, as illness is only associated with advanced neurological symptoms.

These patterns highlight a persistent disconnect between scientific understanding and community interpretations of disease, despite ongoing awareness efforts. The influence of veterinary officers and annual events like World Rabies Day may have contributed to a general recognition of the disease's seriousness, but they appear insufficient in deepening understanding of the disease's pathology or its early clinical warning signs. Similar knowledge gaps were reported in a study by Kankya et al. (2022) in Uganda, underscoring the need for more targeted and culturally relevant health education strategies that go beyond general awareness to improve early detection and prevention practices (23).

The community's emphasis on dog vaccination and basic animal care as key preventive measures suggests some level of awareness regarding rabies control strategies. However, the disconnect between knowledge and consistent practice indicates deeper structural and behavioural barriers. Despite the recognized importance of mass dog vaccination (3, 4), low turnout for vaccination campaigns, as reported by participants, points to persistent gaps in community engagement, trust, and accessibility.

The findings reflect a broader challenge commonly seen in rabies-endemic regions: preventive knowledge may exist in theory, but uptake remains constrained by factors such as weak health communication, limited outreach from veterinary services, financial barriers, and entrenched perceptions around dog ownership. This disconnect suggests that awareness alone is insufficient to drive behavioural change in the absence of enabling systems and sustained public health messaging.

The reported reliance on animal health professionals as information sources indicates a critical entry point for future interventions. Strengthening the role of veterinary extension services and integrating them more actively into community health platforms could enhance both coverage and credibility of rabies control efforts. Additionally, campaign strategies must go beyond episodic awareness days to include localized, culturally relevant education and incentivized participation. These findings align with those of Bayene et al. (2018), who also identified cost, misperception, and weak promotion as significant deterrents to preventive uptake in similar settings (14). Addressing these systemic issues will be essential to closing the gap between awareness and effective community-level rabies prevention.

The limited knowledge and poor uptake of dog and cat vaccination observed in this study underscores persistent systemic and behavioural challenges in rabies prevention at the community level. While mass dog vaccination is globally recognized as a cost-effective intervention, its success depends not only on availability but also on sustained public

awareness, affordability, and logistical accessibility. The disconnect between awareness and action among pet owners suggests a need to rethink both how rabies risk is communicated and how vaccination programs are operationalized.

Misinformation, low risk perception, and logistical hurdles emerged as significant deterrents to vaccine uptake. For many owners, misconceptions about vaccine safety or the relevance of vaccination for their pets reduced motivation to engage. These attitudes likely stem from insufficient community engagement strategies, inconsistent messaging, and lack of visible public health leadership in promoting animal vaccination as a collective responsibility.

Structural barriers—including transportation difficulties, cost concerns, and distance from vaccination sites—further compound the issue. These findings mirror those reported in similar settings across Africa and the Middle East, where low prioritization of preventive veterinary care is frequently linked to socioeconomic constraints and limited-service coverage (9, 10, 14, 24). In many cases, owners are not unwilling to vaccinate but are unable to do so under existing conditions.

The recurring theme across these studies is the need for more inclusive and supportive public health approaches—ones that integrate community-level education, mobile vaccination strategies, and policy incentives to reduce cost and access barriers. Without targeted investment in both demand generation and service delivery infrastructure, rabies control efforts are unlikely to reach the necessary coverage thresholds. These findings highlight the broader issue of underfunded veterinary public health systems and point to the need for stronger multisectoral coordination in the context of one health approach, especially in resource-limited settings.

Conclusion and recommendations

This study highlights significant gaps in community knowledge, attitudes, and practices related to rabies prevention and vaccination in Kisarawe district. While awareness of rabies as a deadly disease exists—shaped by visible clinical symptoms and public health messaging—understanding of the disease's early signs and viral nature remains limited. More critically, this awareness has not consistently translated into preventive action due to a confluence of structural, informational, and behavioral barriers.

Low vaccine uptake is influenced by misconceptions, low risk perception, and practical challenges such as distance to vaccination sites, transport costs, and inadequate outreach by veterinary services. These challenges are emblematic of broader issues in rabies-endemic

settings, where limited health infrastructure, under-resourced veterinary systems, and episodic awareness campaigns fail to drive sustained behavioral change.

Closing these gaps will require a shift from general awareness to more targeted, community-centered strategies that combine education, mobile vaccine delivery, and supportive policies to reduce access barriers. Strengthening the visibility and credibility of veterinary professionals, integrating culturally appropriate health communication, and ensuring consistent government support for mass dog vaccination campaigns are critical steps. Ultimately, a multisectoral, equity-focused approach is essential to achieving meaningful and sustained reductions in rabies transmission and improving both animal and human health outcomes.

Declarations

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Conflict of interest

The authors declare that there are no conflicts of interest.

Authors Contribution

GRM conceptualized the study, collected data, analysed data and wrote the first draft of the manuscript. DK conceptualized the study , collected data, analysed the data and provided comments of the manuscript versions. HM, MS, FF, JK, NM,HN, RM, conceptualized the study and provided inputs of the manuscripts versions. JK, MM,AN,JB,KS and RS, provided comments of the manuscript versions.

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