

Knowledge and practices of residents in two north Namibian towns with regard to rabies and pet care

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Recent studies have highlighted the epidemiology of rabies in southern Africa and the unique nature of kudu rabies in Namibia. However, the serious effect on human populations in northern Namibia lacks focused attention. This study surveyed knowledge and awareness of rabies, including its prevention and pet care in two towns in the Oshana Region of Namibia. Of the 245 interviewed, two thirds owned at least one dog, while a third owned a cat. Eighty-one per cent allowed their animals to roam freely, while 14% reported having been bitten by a dog. The majority of those surveyed recognised that rabies is caused by a virus (53%), identified a dog bite as the main means of transmission (90.6%), cited wild animals as reservoirs (75.5%) and knew that dogs and jackals are significant reservoirs (96.3%). Only 35 (14.3%) identified the correct answers to all four questions. Most of the study participants (63.3%) received their information about rabies from the media. While 83% knew that free vaccines are available at government offices, only 37% had vaccinated their pets, and only 6% had been vaccinated themselves. The results indicate a general understanding of rabies, but focused education efforts are needed with respect to community members in order for specific points to be clarified. The high level of knowledge of vaccine availability, but low coverage, indicates the need for mobilisation with regard to at-risk populations. By building on what is already known, future programmes should successfully reach populations throughout northern Namibia and control rabies in the future.

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Introduction

Neglected tropical diseases are responsible for the morbidity and mortality of millions each year in sub-Saharan Africa, and are most commonly found in settings of poverty.¹ According to the World Health Organization (WHO), rabies, one of 17 principal neglected tropical diseases worldwide, threatens roughly three billion people a year, and claims an estimated 60 000 lives, despite being completely preventable.² Recent studies have highlighted the epidemiology of rabies in southern Africa and the action needed for elimination to take place within the region.³⁻⁷

Rabies has been reported since 1887 in Namibia, where it mainly occurs in the north where 70% of the human population resides, and involves domestic and wild animals. Rabies primarily affects jackal, kudu and cattle in the commercial farming central regions.^{8,9} The epizootic transmission of rabies among kudu is biologically unique and economically important for Namibia. Kudu represent the third largest asset value for game-farmed animals through trophy and game meat hunting and ecotourism,¹⁰ with an estimated value that is higher than that of sheep, goats and donkeys in the country combined.¹¹ Many studies have focused on the unique ecology of rabies in kudu.¹²⁻¹⁴ A recent study reported that two genetically distinct epizootic cycles exist in the country, one among dogs and jackals, and the other among kudu.¹⁵

The impact on economically important wildlife is intriguing, but little has been achieved with regard to reducing the impact of rabies in the populous northern parts of Namibia. Confirmed rabies cases in humans have ranged between five and 26 cases per year for decades.⁹ Eighty-three per cent of cases affect children aged 16 years and younger.¹⁶ In mid 2013, a conference was convened in Windhoek to officially seek funding to address the situation.¹⁷ This official focus on rabies highlighted the critical the need for baseline data on dog populations and other pets, the extent of knowledge about rabies in the local communities, and a general assessment of community capacity to deal with the rabies situation. The aim of this study was to investigate the current status of knowledge, awareness and prevention behaviour, as well as the experiences of pet owners in two northern populations in the Oshana Region of Namibia.

Method

Setting

In July 2013, a cross-sectional survey was conducted on residents in two towns; Ondangwa, a population of 36 846, and Ongwediva, a population of 34 065, 30 km apart, in the Oshana region of north-central Namibia.¹⁸ The two towns were purposively selected as the largest towns within this region and to facilitate transport for the principal interviewer.

Table I: The breakdown of sampling by specific groups for the two towns in northern Namibia (Pearson chi-square, p-value < 0.603)

Towns in northern Namibia	Farmer	Pet owner	No pets	Total
	n (%)	n (%)	n (%)	
Ondangwa	49 (39.8)	40 (32.5)	34 (27.6)	123
Ongwediva	43 (35.2)	47 (38.5)	32 (26.2)	122
Total	92 (37.6)	87 (35.5)	66 (26.9)	245

Ethical considerations

Ethical clearance was obtained from the Permanent Secretary and the Research Committee of the Ministry of Health and Social Services of Namibia. This study was carried out in partial fulfillment of the Bachelors of Science degree at the Polytechnic of Namibia. Informed consent was obtained from the participants who voluntarily agreed to partake in the study. Confidentiality and anonymity were explained to the participants, and their anonymity guaranteed.

Study population and sampling

This was a descriptive cross-sectional study, in which self-administered questionnaires were employed. Owing to the nature of the questionnaire, no one was excluded except those aged 18 and younger. The target sample size of 245 was calculated using a population size of 71 000, an estimated response distribution of 80%, an absolute error of 0.5 and a 95% confidence interval (CI). Because of similar population numbers, the required sample was divided between each town accordingly (Ondangwa, n = 123, and Ongwediva, n = 122).

The study population consisted of persons who had lived permanently in Ondangwa or Ongwediva. As the purpose of the study was to gather information from select populations in each town, inclusion criteria included inhabitants of the towns aged 18-64, who had lived there for at least five years, and who were either farmers, pet owners or those who did not own a pet. The survey was carried out using a purposive method to identify an equal number of each of the three categories already described. The breakdown of the participants for each city is presented in Table I. Potential participants were approached at specific public locations in open streets in an attempt to incorporate aspects of representativeness into the non-random sample and to ensure that everyone in each town had an equal opportunity to participate in the study.

Questionnaire design

The study questionnaire, consisting of closed questions, was partially adapted from other studies,¹⁹⁻²¹ and consisted of three sections:

- Information on the respondents and their experiences with dogs or cats.
- Questions relating to knowledge and awareness of rabies, including prevention.
- Questions about pet care practices (asked of pet owners only).

Because of difficulties with English, the questionnaire was also translated into the local language, Oshiwambo, to ensure that participants could understand. Questions were asked directly of older participants who

could neither read English nor Oshiwambo, and the answers were completed according to the responses given.

Statistical analysis

Data were entered into Microsoft® Excel® spreadsheets and analysed using SPSS® version 21. Pearson's chi-square test or Fisher's exact test (when the expected values were less than 5) were used for categorical data. Bivariate analyses assessed the associations between the population characteristics provided in the surveys and answers to specific questions. Odds ratios (OR) and 95% CI were calculated for all associations. P-values less than 0.05 were considered to be statistically significant.

Results

General characteristics and animal involvement

A total of 245 respondents were interviewed in two urban centres in northern Namibia (Ondangwa, n = 123 and Ongwediva, n = 122). The demographic and sociodemographic characteristics of the respondents are presented in Table II. The majority of the respondents were female with a primary or secondary education. There was higher representation in the younger age range (range 18-64, with 35 respondents aged 40 years or older). Two thirds of those interviewed owned at least one dog, while only a third owned a cat. Fourteen per cent reported being bitten by a dog in their lifetime. Only 5% were bitten or scratched by a cat.

Knowledge, awareness and prevention of rabies

The responses concerning knowledge, awareness and the prevention of rabies are summarised in Table III. Of those interviewed, the majority recognised that rabies is caused by a virus. A dog bite was identified as the main means of transmission, wild animals were cited as reservoirs for the virus, and dogs and jackals were known reservoirs in the stated areas. However, only 38% recognised the main symptoms of the virus. Those with an education [primary or secondary (OR 10.9, 95% CI: 1.4-84.6, p-value ≤ 0.022) or tertiary (OR 30.5, 95% CI: 3.7-250.9, p-value ≤ 0.001)] were significantly more likely to know that rabies was a virus. Males (OR 7.25, 95% CI: 1.65-31.9, p-value ≤ 0.009) and those aged 25-32 years (OR 4.29, 95% CI: 1.6-15.9, p-value ≤ 0.03) were significantly more likely to recognise that rabies is transmitted by a dog bite or bodily fluids. Besides recognising dogs or jackals as reservoirs, participants correctly identified cattle (n = 5) and kudu (n = 1), as well as incorrectly stating mice (n = 17) and people (n = 4) as reservoirs too. Ten participants did not name any animal as a reservoir. The majority

Table II: The characteristics and experiences with animals of respondents in two urban centres in the Oshana Region in northern Namibia

Variable	n (%)
Gender	
Male	99 (40.4)
Female	146 (59.6)
Age (years)	
18-24	87 (35.5)
25-32	92 (37.6)
≥ 33	66 (26.9)
Educational level	
No education	15 (6.1)
Primary or secondary	176 (71.8)
Tertiary	54 (22)
City	
Ondangwa	123 (50.2)
Ongwediva	122 (49.8)
Dog ownership	
Yes	163 (66.5)
No	82 (33.5)
Cat ownership	
Yes	91 (37.1)
No	154 (62.9)
Have you ever been bitten by a dog?	
Yes	34 (13.9)
No	211 (86.1)
Have you ever been bitten or scratched by a cat?	
Yes	12 (4.9)
No	233 (95.1)

(63.3%) reported that they obtained their information on rabies from the newspaper, television and/or radio, while 40% mentioned schools. Only 13.1% cited a government rabies awareness campaign.

The majority of those interviewed would present to a doctor if bitten by a dog. Only two said that they would visit a traditional healer first. While 84% knew that a vaccine was available for rabies, and 83% were aware that a vaccine was available free of charge at government offices, only 37% had vaccinated their pets and only 6% had been vaccinated themselves. Of the 66 who had vaccinated their pets, Ondangwa residents were twice as likely to have vaccinated their animals (OR 2, 95% CI: 1.08-3.73, p-value ≤ 0.027). Of the 14 participants who had been vaccinated for rabies, 64.3% (n = 9) were female, 71.4% (n = 10) were aged 25 years and older, all had a primary education or higher, and 71.4% (n = 10) were from Ondangwa. Interestingly, those from Ongwediva (OR 4.6, 95% CI: 2.09-10.12, p-value ≤ 0.000) and those with an education (OR 8.96, 95% CI: 2.99-26.81, p-value ≤ 0.0001) were significantly more likely to know that the rabies vaccine was available

Table III: Knowledge, awareness and prevention behaviour concerning rabies by participants in two urban centres in the Oshana Region in northern Namibia

Variable	n (%)
Recognised that rabies is caused by a virus	
Yes	130 (53.1)
No	115 (46.9)
Identified a dog bite as the principal means of transmission	
Yes	222 (90.6)
No	23 (9.4)
Were aware that convulsions and/or hydrophobia are the major symptom of rabies	
Yes	93 (38)
No	152 (62)
Knew that dogs and/or jackals are major reservoirs of rabies	
Yes	236 (96.3)
No	9 (3.7)
Were aware that wild animals can transmit rabies	
Yes	185 (75.5)
No	60 (24.4)
Were aware of where to go for help when bitten by a dog	
Doctor	241 (98.4)
Traditional healer	2 (0.8)
Uncertain	2 (0.8)
Knew that a vaccine exists to prevent rabies	
Yes	207 (84.5)
No	38 (15.5)
Had vaccinated their pet (pet owners only)	
Yes	66 (36.9)
No	113 (63.1)
Had vaccinated themselves for rabies	
Yes	14 (5.7)
No	231 (94.3)
Knew that the rabies vaccine is available free of charge at government offices?	
Yes	203 (82.9)
No	42 (17.1)

free of charge at government offices. Those with a primary or secondary education (OR 4.2, 95% CI: 1.11-15.67, p-value < 0.035) and those with a tertiary education (OR 4, 95% CI: 1.88-8.36, p-value ≤ 0.000) were more likely than those without an education to have vaccinated their pets.

Only 14.3% (n = 35) of the 245 participants correctly recognised the four main knowledge points, namely that:

- Rabies is a virus.
- Rabies can be transmitted by a bite and/or direct contact with bodily fluids.
- The principal symptoms include fear of water and/or convulsions.
- Dogs or jackals are principal reservoirs of infection.

Of those who knew the answers to all four questions, 57.1% (n = 20)

Table IV: Characteristics of the participants, based on reasons for owning a cat

Characteristics	Why do you keep a cat?	
	As a pet	To control mice
Gender		
Female	40/56 (71.4%)	20/34 (58.8%)
Male	16/56 (28.6%)	14/34 (41.2%)
Age group		
16-24	13/56 (23.2%)	11/34 (32.4%)
25-32	19/56 (33.9%)	12/34 (35.3%)
33 and older	24/56 (42.9%)	11/34 (32.4%)
Educational level		
No education	8/56 (14.3%)	3/34 (8.8%)
Primary or secondary	35/56 (62.5%)	24/34 (70.6%)
Tertiary	13/56 (23.2%)	7/34 (7.8%)
City*		
Ondangwa	44/56 (78.6%)	0/34
Ongwediva	12/56 (21.4%)	34/34 (100%)

*Pearson chi-square, p-value < 0.05

were females, all had a primary education or higher, 85.7% were aged 33 years and younger and 60% lived in Ondangwa.

Pet owners

Of the 179 persons who owned a pet, 49.2% (n = 88) owned dogs only, 8.9% (n = 16) owned cats only, and 41.9% (n = 91) had both (Pearson chi-square, p-value ≤ 0.0001). Those with pets were twice as likely to own a dog than a cat (OR 2.2, 95% CI: 1.84-2.57, p-value ≤ 0.000).

Of the 163 participants with dogs, 56.4% (n = 92) were females, 71.2% (n = 116) were aged 25-32 years, 91.4% (n = 149) had a primary education or higher, and 49.1% (n = 80) lived in Ongwediva. Of those with dogs, 15.3% (n = 25) owned a dog solely as a watchdog, 1.2% (n = 2) solely as a source of meat and 5.5% (n = 9) solely as a pet, while 78% (n = 127) did so for all three reasons (as a watchdog, a meat source and as a pet). Of the 10 respondents who specifically owned a dog as a source of meat, eight were females, eight farmers, seven had a primary or secondary education, eight were from Ondangwa, and all of them were an even spread of age.

Of the 91 participants with cats, 61.5% (n = 56) owned cats as pets, and 38.5% (n = 37) did so to control mice. Sixty-seven per cent (n = 60) were female, 73.3% (n = 66) were aged 25 years and older, 87.8% (n = 79) had a primary education or higher, and 51.6% (n = 47) lived in Ongwediva. The differences between the participants by reasons for keeping a cat are summarised in Table IV. Notably, 79% of participants in Ondangwa kept cats as pets, while 100% in Ongwediva kept cats to control mice (p-value ≤ 0.0001).

Of the respondents who owned animals, 69% (n = 125) of those who suspected their dog of having rabies would kill the animal and throw it away, while 22.9% (n = 41) would cut off the head and send it to a diagnostic laboratory. Six per cent (n = 10) would isolate the animal from others, 1.1% (n = 2) would kill it and eat the meat, and 0.6% (n = 1) would let the animal run free. Eighty-one per cent (n = 145) allowed their animals to roam freely. 12.3% (n = 22) tied their pets up inside the house, and 5.6% (n = 10) allowed them to move about freely, both inside and outside the home. The remaining two participants either housed their pet in a cage or tied it up outside.

Discussion

This cross-sectional study was conducted to assess the knowledge, awareness and prevention behaviour of residents in two towns in northern Namibia with regard to rabies. To the authors' knowledge, this is the first attempt since Laurenson et al²² to focus on northern Namibian communities which are most affected by canine rabies. While considerable focus continues to revolve around the unique epizootic cycle involving kudu and its economic importance,¹²⁻¹⁵ little has been reported on the human populations who have known about and experienced rabies outbreaks for decades.¹³ The results of this study, even though based on a small sample, could inform education programmes on gaps in community knowledge and prompt strategic discussions to improve vaccination coverage in human and companion animal populations in Namibia.

Knowledge and awareness

Similar to other studies that have been carried out in Africa^{5,23} and other parts of the world,^{24,25} it was encouraging to discover that participants with an education were more likely have a basic knowledge and awareness of rabies, as well as a good understanding of other animals involved in the local rabies epizootiology. However, the results highlight a need for focused education efforts to clarify specific points and assist individuals to internalise the facts. The disseminating function of the media is important and was highlighted. An important discovery was that higher priority should be given to strengthening the role of the education system, as achieved by others.^{26,27}

Prevention-seeking behaviour

A high proportion of the participants knew that a rabies vaccine was available and would seek medical help directly. This is an encouraging result which has not been reported in other African countries, where only a low number knew that there was a vaccine, and where the majority sought help from traditional healers when bitten by a dog.^{20,23} Although encouraging, the discrepancy between those who knew that a free vaccine was available at government offices (84%) and those who were actually vaccinated (6%), or who had vaccinated their pets (37%), was similar to that reported in other African studies.^{21,28} Again, like knowledge variables, vaccination was closely linked with educational level. In the case of personal vaccination, it was also linked to gender, as well as differences between the two towns. While those from Ongwediva were more likely to know that a rabies vaccine was available free of charge at government offices, Ondangwa residents were more likely to have been

vaccinated and to have vaccinated their pets. This dramatic difference between the towns may simply be owing to the fact that there is a lack of veterinary facilities in Ongwediva. These differences point directly to the need to take a vaccine to communities to ensure the necessary 80% coverage recommended by the WHO, as identified in other studies.^{26,27}

Of those who owned pets, only 20% would send the dog's head to the diagnostic laboratory if they suspected the animal of having rabies, while most would kill it and throw it away. Two participants stated that they would kill and eat the diseased animal. Again, this highlights the need for veterinary services to become more involved in education processes with respect to communities, especially through the media which appears to be an important source of information for these populations.

Pet care and experiences

Study participants were twice as likely to own a dog than a cat. This high percentage of dog ownership was similar to levels reported in Madagascar,²¹ but not in Tanzania, where only 14% of households owned dogs.^{29,30} While the majority of owners allowed their dogs to roam freely, which is very common worldwide,^{19,21,26,28,31-33} reports of dog bites were relatively low when compared with those in other countries.^{20,31}

Reasons for owning a dog were also similar to others given in Africa-focused studies.^{19,21,32,34} Having a pet as a watchdog was the main reason for owning one, followed by companionship. Laurenson et al,²² in the only other study in Namibia to report on animal ownership, reported that northern Namibians in the Tsumkwe area kept dogs to herd animals and for hunting purposes, although officially this is illegal in Namibia. Other reasons given for owning dogs in Africa were that they were deterrents for baboons, elephant, lions and leopards in rural Zimbabwe,¹⁹ as well as a source of income through the sale of puppies in Nigeria.³⁵ In general, there appears to be little connection to companionship, love and affection, which are the reasons often cited by pet owners in Western countries.^{32,36} In fact, the president of South Africa once stated that it was "unAfrican" to care for one's dog.³⁷ Therefore, the concept of a pet is vastly different in various communities. Interestingly, 10 individuals specifically mentioned that they kept dogs as a meat source. While follow-up confirmation is needed to clarify answers, owning dogs as a source of meat has also been reported in Nigeria,²⁰ Sierra Leone,³⁴ the Democratic Republic of the Congo and Zimbabwe.³⁸

Assessment pertaining to cat ownership and the differing reasons for owning cats was unique in this study, compared to those provided in other African-based studies. In this cohort, cat owners who kept cats as pets were mainly female and those with a higher education. Asked why they kept them, the majority of cat owners in Ondangwa wanted them as pets, while 100% of those in Ongwediva kept them to control mice populations. This difference was curious as the same questionnaire was used in both places. The cities are only 30 km apart, so it can be assumed that any cultural differences would be minimal, but future studies should evaluate word meanings and cultural connotations behind the word "pet".

Limitations

While attempts were made to reduce limitations in this study of a short duration with limited resources, it was difficult to identify true regional

trends and establish risk factors from a small, non-random sample. This study demonstrated that a good level of knowledge of rabies and its transmission existed in small-town populations in northern Namibia. A well-established, household-based study, developed using the WHO standards across the northern regions of Namibia, would provide a solid baseline for future strategies.^{24,26,27,29} While limited in scope, this study also highlighted some unique aspects of pet ownership in northern Namibia which are uncommon to other parts of Africa.

In conclusion, this study is a first step to developing a baseline of knowledge regarding what communities in northern Namibia know about rabies and how they care for their pets. Many constraints limit the feasibility of rabies elimination in Africa.³⁹ A general lack of awareness about the disease is a major difficulty, and often derives from lack of dissemination of information by government agencies.³⁹ This study identified two important aspects that could be built upon in the future, namely that a basic knowledge exists in Namibian communities which could be enhanced, and that media successfully disseminates information about rabies in northern Namibia which could also be improved, while building on basic knowledge in the education system. The fact that so many of the respondents knew that a vaccine was available, and yet only a few used it, speaks directly to both a lack of priority and to the difficulties faced by many with regard to travelling to the vaccine sites.³⁵ The principal means of successful coverage in other countries includes mobilisation of the veterinary services to where people live, in order to attain the 80% coverage necessary to eliminate rabies in a community.²⁶ By building on the positive aspects highlighted in this study, future programmes should be able to successfully reach populations throughout northern Namibia, and achieve the goal of controlling rabies in the future.

Conflict of interest

The authors have no commercial or other association that might have posed a conflict of interest.

Declaration

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