

Knowledge, attitudes and practices of habitants of the Kipushi territory on caprine and human brucellosis

Maryabo Kazembe Ghislaine ^{1, *}, Kabiyi Mwangi Leonie ¹, Kabwang-A-Mpalang Rosette ², Ntambue Mukengeshayi Abel ³, Kassamba Ilunga Eric ⁴ and Ngulu Nsasi Arthur ¹

¹ Department of Pre-clinical, Immunology and Infectious Diseases Service, Faculty of Veterinary Medicine, University of Lubumbashi, DR Congo.

² Department of Pre-clinical, Expertise service, Faculty of Veterinary Medicine, University of Lubumbashi, DR Congo.

³ Epidemiology and Reproductive Health Unit, School of Public Health, University of Lubumbashi, DR Congo.

⁴ Department of Biomedical Sciences, Faculty of Medicine, University of Lubumbashi, DR Congo.

World Journal of Advanced Research and Reviews, 2025, 25(01), 2037-2050

Publication history: Received on 14 December 2024; revised on 24 January 2025; accepted on 27 January 2025

Article DOI: <https://doi.org/10.30574/wjarr.2025.25.1.0249>

Abstract

Introduction: Brucellosis is a highly contagious disease that is one of the most widespread zoonoses in the world. The WHO estimates the annual global incidence of the disease at 500,000 cases. It is classified on the single list of serious animal diseases of the World Organization for Animal Health with significant repercussions on public health and the economy of most developing countries.

Objective: This study aimed to evaluate the knowledge, attitudes and practices of households raising goats in the context of human-animal cohabitation on caprine and human brucellosis in the Kipushi territory.

Methods: Our investigations were carried out in the territory of Kipushi, province of upper-Katanga, in the Democratic Republic of Congo (DR Congo). This study targeted households raising goats in the context of human-animal cohabitation, with the aim of evaluating their knowledge, attitudes and practices on caprine and human brucellosis. Data collection was done using interviews based on semi-open questions which were administered in these households. We interviewed 347 respondents in 4 different entities in the Kipushi territory, including 26.8% at the Kipushi Antenna, 27.9% in the Lumata village; 17.9% in Musoshi station village and 27.4% in Sambwa village to assess their knowledge on the symptoms of the disease, their attitudes towards prevent this pathology as well as their practices to prevent caprine and human brucellosis in the so-called territory.

Results: The respondents' good knowledge score on the symptoms of caprine and human brucellosis was 32.6%. The proportions of good knowledge of respondents according to the entities were 29.2% at the Kipushi Antenna, 32% in the Lumata village, 31.9% in the Musoshi station village and 33.5% in the Sambwa village. Regarding attitudes to prevent brucellosis, the score of good attitudes was 22.4% among respondents. This score was distributed according to the entities as follows: 23.5% at the Kipushi Antenna; 26.9% in Lumata village; 25.2% in Musoshi station village and 21.4% in Sambwa village. The score of good practices for combating brucellosis was 24.9%, with proportions of good practices of respondents according to the survey entities of 19.4% at the Kipushi Antenna; 23.7% in Lumata village; 29% in Musoshi station village and 26.3% in Sambwa village.

Conclusion: Our results revealed a low level of knowledge, attitudes and practices of caprine and human brucellosis among respondents in the Kipushi territory. We recommend capacity building by raising awareness among households that raise livestock in Kipushi territory on the acquisition of knowledge on zoonotic diseases and specifically on brucellosis before undertaking any family breeding.

* Corresponding author: Maryabo Kazembe Ghislaine.

Keywords: Knowledge; Attitudes; Practices; Brucellosis; Human Being; Goats; Kipushi; DR Congo

1. Introduction

Brucellosis is a highly contagious disease which is one of the most widespread zoonoses in the world (1, 2). The WHO estimates the annual global incidence of this disease at 500,000 cases, and it is classified on the single list of serious animal diseases of the World Organization for Animal Health with significant repercussions on public health and the economy of most developing countries (3). Animals are the main important source of human brucellosis and transmission occurs by direct contact (especially among veterinarians, slaughterhouse workers and breeders) (4), by drinking unpasteurized milk and consuming uncooked or poorly cooked meat of sick animals (5). Although it is eradicated or in the process of being eradicated in many industrialized countries, this disease still being today a source of growing concern in developing countries in general and particularly in those whose diet and economy depends largely part of livestock (2). Indeed, the risks of transmission are very high in these latter countries where infection in animals is not yet under control and treatment by heating (pasteurization) of milk and dairy products is not systematic (6); Poor hygienic conditions as well as the very close contact of breeders with their animals (7) favor the transmission of animal brucellosis to humans. The territory of Kipushi being characterized by the breeding conditions in which breeders often cohabit with their animals, the main objective of our study is to determine the level of knowledge, attitudes and practices of breeders on caprine and human brucellosis in this territory.

2. Materials and methods

2.1. Site of research

This study was carried out in the territory of Kipushi, which is located at 27°20'30 E, 11°43'55 S, and 1200 m of altitude, in the province of upper-Katanga, in the Democratic Republic of Congo. The area is characterized by a tropical climate with an average annual temperature of 25°C and an annual precipitation of 1092 mm. The vegetation is dominated by shrub savannah and the soils are mainly ferralitic.

2.2. Materials used

For this purpose, we used the following materials:

- A survey questionnaire,
- An investigation sheet,
- A GPS device,
- A pen,
- A note book

2.3. Methods

A descriptive cross-sectional study was conducted from April 2019 to April 2022. Sampling was carried out in two stages: stratification based on the density of human-animal cohabitation, followed by systematic random sampling in four administrative areas : Kipushi Antenna, Lumata village, Musoshi station village and Sambwa village. The sample size (n=347 respondents) was calculated using the Thrusfield (8) formula.

2.4. Epidemiological data collection

The survey was carried out among goat-breeding households in the context of Human-Animal cohabitation using a semi-structured questionnaire. The data collected concerned knowledge of the symptoms of brucellosis, potential risk factors for transmission of the latter as well as practices to prevent the disease both at the level of inter-animal and zoonotic transmission.

2.5. Statistical analysis

Data were entered and analyzed using Microsoft Excel 2013. Frequencies were calculated.

2.6. Ethical considerations

This study received approval from the Ethical Committee of the University of Lubumbashi and authorization from the administrative and health authorities of the Kipushi territory. Written consent note was obtained from all participants. Data confidentiality was strictly respected throughout the study.

3. Results

3.1. Sociodemographic and environmental characteristics of respondents

Table 1 Sociodemographic and environmental data of respondents

Variables	Numbers	Frequencies (%)
Gender	347	100
Male		51.9
Femal		48.1
Entities	347	100
Kipushi Antenna		26.8
Lumata village		27.9
Musoshi station village		17.9
Sambwa village		27.4
Age-groups	347	100
Young (18-24 ans)		30.8
Adult (25-59 ans)		56.5
Old (60 ans et plus)		12.7
Occupation	347	100
Stateworkers		9.2
unemployed/libéral		50.4
student		12.4
Religious		0.6
housewives		27.4
Instruction level	347	100
Instructed		39.2
Non instructed		60.8
Religion	347	100
Christian		86.7
Muslim		13.3
Marital status	347	100
Single/divorced/widowed		32.6
Maried		67.4
Socio-economic status	347	100
Low		55.3

Middle		44.1
High		0.6

In all 347 households interviewed, 26.8% were from the Kipushi Antenna; 27.9% from Lumata village; 17.9 % from Musoshi station village and 27.4% from Sambwa village. Among them, 51.9% were men and 48.1% women. The age groups of respondents were proportioned as follows: 30.8% of respondents were young people (18-24 years old); 56.5% were adults (25 to 59 years old) and 12.7% were elderly (60 years and over). Of these respondents, 32.6% were single (divorced or widowed) and 67.4% were married. Our results show that 39.2% of respondents were educated and 60.8% uneducated. Among those surveyed, 86.7% were Christians and 13.3% Muslims. Respondents with a low socio-economic level were 55.3%; those with an average level were 44,1% and those with a high level were 0.6%.

3.2. Respondents' knowledge of brucellosis symptoms

Table 2 Knowledge of brucellosis symptoms by respondents

Variables	Numbers	Proportions (%)
Lack of appetite	347	100
Yes		44
No		66
Hyperthermia	347	100
Yes		12.7
No		87.3
Abortion among femals	347	100
Yes		39.5
No		60.5
Fatigue	347	100
Yes		28.8
No		71.2
Epididymitis	347	100
Yes		43.2
No		56.8
Knowledge score	347	100
Good		32.6
Bad		67.4

Overall, the score of good knowledge of respondents on the symptoms of brucellosis is 32.6% while that of poor knowledge is 67.4%. Respondents who recognized lack of appetite as one of the symptoms of brucellosis represented 44% while those who ignored it represented 66%.

Only 12.7% of respondents recognized hyperthermia as a symptom of brucellosis compared to 87.3% who did not recognize it.

Knowledge of epididymitis as a symptom gave a frequency of 43.2% while it was 56.8% among those who did not know it.

The frequency of respondents who recognized abortion in females as one of the symptoms of the disease was 39.5% while it was 60.5% among respondents who did not know it.

We had 28.8% of respondents who recognized fatigue among the symptoms compared to 71.2% of those who did not know it.

3.3. Association of knowledge on brucellosis symptoms with sociodemographic and environmental factors of respondents

Table 3 Frequencies of knowledge associated with sociodemographic and environmental factors of respondents (n=347)

Variables	Knowledge	
	Positives (%)	Négatives (%)
Kipushi Antenna	29.2	70.8
Lumata village	32	68
Musoshi gare station	31.9	68.1
Sambwa village	33.5	66.5
Sex		
Male	30.7	69.3
Femal	32.7	66.3
Age group		
young	33.2	64.8
Adult	30.4	69.6
Old	28.2	71.8
Occupation		
Unemployed /liberal	31.7	68.3
Housewife	33.3	66.7
Pupil /student	33.5	66.5
Employed	24.4	75.6
Religious	30	70
Education level		
uneducated	31.3	68.7
Educated	32.2	67.8
Religion		
Christian	31.6	68.4
Muslims	31.7	68.3
Socio-économique status		
Low	31.6	68.4
Average	31.8	68.2
High	30	70
Marital status		
Maried	32.1	67.9
Single	30.6	69.4

Legend: Positives = good knowledge; Negatives = Poor knowledge

The proportion of good knowledge of respondents according to the entities was 29.2% at the Kipushi Antenna, 32% at the Lumata village, 31.9% at the Musoshi station village and 33.5% at the Sambwa village. Only 30.7% among men had good knowledge of the symptoms of brucellosis and 32.7% among women. The age groups of respondents with good knowledge were proportioned as follows: 33.2% among young people; 30.4% among adults and 28.2% among the elderly. Depending on the occupations of the respondents, this study found a proportion of good knowledge of 31.7% among the unemployed (or liberals); 33.3% among housewives; 33.5% in the category of pupils and students, 24.4% among employees and finally 30% among religious people. According to the level of education, it was found that only 31.3% among the uneducated and 32.2% among the educated knew the symptoms of brucellosis. Our results show that 31.6% of Christians and 31.7% of Muslims were aware of the disease. The socio-economic level of the respondents gave a score of good knowledge of the disease of 31.6% among those with a low level, 31.8% among those with an average level and finally 30% among those with a high socio-economic level. According to the marital status of the respondents, only 30.6% of singles and 32.1% of married people had good knowledge of the symptoms of brucellosis.

3.4. Attitudes of respondents to prevent brucellosis

Table 4 Frequencies of attitudes to preventing brucellosis by respondents

Attitudes	Numbers	Fréquences %
Do you think that avoiding close contact with animals can prevent contracting human brucellosis?	347	100
Yes		26.2
No		73.8
Do you think that communal grazing would encourage contamination of caprine brucellosis?	347	100
Yes		31.4
No		68.6
Do you think that the ingestion of food soiled by animals would promote the contamination of caprine brucellosis?	347	100
Yes		48.7
No		51.3
Do you think that housing animals in a dirty environment would encourage contamination of caprine brucellosis?	347	100
Yes		29.7
No		0.3
Do you think that the consumption of raw or poorly cooked meat by humans can promote the contamination of human brucellosis?	347	100
Yes		28.8
No		71.2
Do you think that drinking unpasteurized milk can promote brucellosis contamination in both humans and animals?	347	100
Yes		28
No		72
Do you think that handling sick animals by humans can promote the contraction of human brucellosis ?	347	100
Yes		18.6
No		81.4

Do you think that the clandestine slaughter of animals can promote the contraction of human brucellosis ?	347	100
Yes		0
No		100
Attitudes' score		
Good		26.4
Bad		73.6

In this section, we present the frequency of respondents' attitudes to prevent brucellosis. Therefore, the score for good attitudes was 26.4% while that for bad attitudes was 73.6%. The frequency of respondents who knew that the ingestion of food soiled by animals could promote brucellosis contamination was 48.7% and those of respondents who did not know it was 51.3%;

Regarding the fact of thinking that housing goats in a dirty environment would promote the contraction of brucellosis, the frequency of respondents who recognized this attitude was 29.7% and those of respondents who did not recognize it was 70.3%;

The fact of thinking that a common pasture for goats could predispose them to contamination by brucella had a frequency of 31.4% among respondents who knew it and 68.6% among those who did not know it;

Drinking unpasteurized milk as a risk factor for human brucellosis contamination gave a frequency of 28% among respondents who recognized this attitude and 72% among those who did not recognize it;

The frequency of respondents who recognized that avoiding close contact with animals could prevent contracting the disease was 26.2% while among those who did not know, it was 73.8%;

Concerning the fact of thinking that the consumption of raw or poorly cooked meat by humans can promote brucellosis contamination, we recorded a frequency of 28.8% among respondents who recognized this good attitude and 71.2 % among respondents who did not know it;

Knowing that handling sick animals could promote contamination by brucella gave a frequency of 18.6% among respondents who knew this good attitude and 81.4% among those who did not recognize it;

All respondents (100%) did not know that practicing clandestine slaughter could promote the contraction of brucellosis.

3.5. Association of respondents' attitudes with sociodemographic and environmental factors

Table 5 Frequencies of attitudes associated with sociodemographic and environmental factors of respondents (n=347)

Variables	Attitudes	
	Positives (%)	Negatives (%)
Entities		
Kipushi Antenna	23.5	76.5
Lumata village	26.9	73.1
Musoshi station village	25.2	74.8
Sambwa village	21.4	78.6
Sex		
Male	48.5	51.5
Female	39	61
Age groups		
Young	38.2	61.8

Adult	39.2	60.8
old	36	64
Occupation		
Unemployed /liberal	38.5	61.5
Housewife	38	62
Pupil/student	38.6	61.4
Employees	40.3	59.7
Religious	30	70
Education level		
Uneducated	37.7	62.3
Educated	39.8	60.2
Religion		
Christian	38.1	61.9
Muslim	41.1	58.9
Socio economic status		
Low	37.5	62.5
Average	39.9	60.1
High	30	70
Marital status		
Married	45.1	54.9
Single	49.7	50.3

Legend: Positives= good attitudes, Negatives= bad attitudes

The proportion of good attitudes of respondents according to the entities was 23.5% at the Kipushi Antenna; 26.9% in Lumata village; 25.2% in Musoshi station village and 21.4% in Sambwa village. Among the respondents, 48.5% of men and 39% of women had good attitudes to prevent brucellosis. The age groups of respondents with good attitudes towards the disease prevention were proportioned as follows : 38.2% among young people, 39.2% among adults and 36% among the old. Depending on the occupations of the respondents, this study found a proportion of good attitudes of 38.5% among the unemployed (or liberals); 38% among housewives; 38.6% in the category of pupils and students; 40.3% among employees and finally, 30% among religious. According to the level of education, it was found that 37.7% among the uneducated and 39.8% among the educated had good attitudes towards disease prevention. Our results show that 38.1% of Christians and 41.1% of Muslims had good attitudes to prevent disease. The socio-economic level of the respondents gave a good attitude score of 37.5% among those with a low level; 39.9% among those with an average level and finally 30% for the category of respondents with a high socio-economic level. According to the marital status of the respondents, 49.7% of singles and 45.1% of married people had good attitudes towards disease prevention.

3.6. Practices of respondents for the fight against brucellosis

Practices that can help fight against brucellosis or prevent this disease gave a score of 24.9% frequency of good practices and 75.1% of bad practices among respondents.

For the handling of sick animals, the frequency was 42.4% among respondents who declared that they practiced this means of combating disease and 57.6% among respondents who did not practice it;

For the variable "Cook meat thoroughly before consumption", the frequency was 28.8% for respondents who practiced this means of control and 71.2% among respondents who did not;

For avoiding cohabitation with animals under the same roof, the frequency was 33.1% among respondents who practiced this means of combating brucellosis and 66.9% among those who were unaware of it;

The frequency was 24.8% among respondents who pasteurized milk to combat this disease and 75.2% among those who did not;

Among respondents who avoided close contact with animals, the frequency was 33.7% compared to 66.3% among those who did not.

Concerning the wearing of PPE as a means of combating brucellosis, the frequency was 28.5% among respondents practicing this means and 71.5% among those who did not practice it;

For the existence of a vaccination calender, the frequency of respondents using this good practice was only 0.9% compared to 99.9% among respondents who did not use it;

Finally, the frequency was only 6.6% among respondents who sought assistance from a veterinarian when necessary in their breeding and 93.4% among those who did not do so.

Table 6 Frequencies of brucellosis control practices by respondents

Variables	Numbers	Fréquences (%)
Evoid close contact with animals	347	100
Yes		33.7
No		66.3
Do not handle sick animals	347	100
Oui		42.4
Non		57.6
Avoid cohabiting with animals under the same roof	347	100
Yes		33.1
No		66.9
Wearing PPE	347	100
Yes		28.5
No		71.5
Be assisted by a vet in the breeding	347	100
Yes		6.6
No		93.4
To have a vaccination calender	347	100
Yes		0.9
No		99.1
Pasteurize milk before drinking	347	100
Yes		24.8
No		75.2
Cook meat thoroughly before consumption	347	100
Yes		28.8
No		71.2

Practices score		100
Good		24.9
Bad		75.1

Legend: PPE = personal protective equipment, Positives= good practices, Negatives=bad practices

3.7. 3.6. Association of respondents' practices with sociodemographic and environmental factors

Table 7 Frequencies of respondents' practices associated with sociodemographic and environmental factors (n=437)

Variables	Practices	
	Positives (%)	Negatives (%)
Entities		
Kipushi Antenna	19.4	80.6
Lumata village	23.7	76.3
Musoshi station village	29	71
Sambwa village	26.3	73.7
Sex		
Male	45.8	54.2
Femal	47.1	52.9
Age groups		
Young	26.6	73.4
Adult	25.7	74.3
Old	16.1	83.9
Occupation		
unemployed/liberal	23.4	76.6
Housewife	24.2	75.8
Pupil /student	27.9	72.1
Employee	25	75
Religious	30	70
Education level		
Uneducated	31.6	68.4
Educated	327	67.3
Religion		
Christian	13.1	86.9
Muslim	13.3	86.7
Socio economic status		
Low	22.4	77.6
Average	26.1	73.9
High	30	70
Marital status		
Maried	29.8	70.2
Single	33.1	66.9

The proportion of good practices of respondents according to the survey entities was 19.4% at the Kipushi Antenna; 23.7% in Lumata village; 29% in Musoshi station village and 26.3% in Sambwa village. The age groups of respondents with good practices for disease prevention were 26.6% among young people; 25.7% among adults and 16.1% among the olds. Depending on the occupations of the respondents, this study found a proportion of good practices of 23.4% among the unemployed (or self-employed); 24.2% among housewives; 27.9% in the category of pupils and students; 25% among employees and finally 30% among religious people. According to the level of education, it was found that only 31.6% among the uneducated and 32.7% of the educated had good practices for disease prevention. Regarding gender, 45.8% of men and 47.1% of women had good practices to prevent brucellosis. Our results show that 13.3% of Muslims and 13.1% of Christians had good practices to prevent the disease. The socio-economic status of respondents gave a good practice score of 22.4% among those with low status; 26.1% with an average status and finally 30% for the category of respondents with a high socio-economic status. According to the marital status of the respondents, only 33.1% of singles and 29.8% of married people had good practices for disease prevention.

4. Discussion

4.1. Respondents' knowledge of brucellosis symptoms

The results of this study revealed a score of good knowledge of the symptoms of brucellosis by the respondents of 32.6%. This level of knowledge is low compared to that reported by Harbi and colleagues (9) which was 70.5% in the Qassim region (Saudi Arabia). On the other hand, the score that we found is close to that found in a similar study carried out among health workers by Hlaing and colleagues (10) and which was 28% of workers knowing the symptoms of brucellosis. Our results could be explained by the lack of public health promotion in terms of mass awareness, particularly on zoonotic diseases in general and on brucellosis in particular in the Kipushi territory. Broken down by entity, our results showed that there were 29.2% of respondents from the Kipushi Antenna with good knowledge of the symptoms of the disease, 32% of respondents from Lumata village; 31.9% of those in Musoshi station village and 33.5% of those in Sambwa village. This variation in the level of knowledge per entity was also mentioned by Awah-nukum et al. (11) and would, if applicable, probably be the result of the difference in socio-cultural life between communities.

Our results showed that 30.7% of male respondents and 32.7% of female respondents had good knowledge about the symptoms of brucellosis. These results are in agreement with those found by Ghugey et al (7) in India and by Lindahl et al. (12) in Tajikistan, where there was almost no big difference between the two sexes in the level of knowledge, attitudes and practices about brucellosis.

Taking into account the age groups of respondents, 33.2% of young people; 30.4% of adults and 28.2% of elderly people had good knowledge of the symptoms of brucellosis. The results related to the occupations of the respondents showed a good level of knowledge of 31.7% among the unemployed; 33.5% among pupils/students, 33.3% among housewives, 30% among religious people and 24.4% among employees. Furthermore, 32.2% of the educated knew the manifestations of the disease compared to 31.3% of the uneducated. The proportion of Christians who experienced the disease was 31.6% while that of Muslims was 31.7%.

There was no great divide in knowledge of brucellosis symptoms between respondents with low economic status (31.6%), those with medium economic status (31.8%) and those with high economic status (30%). The same observation was made for marital status where 32.1% of married people had good knowledge compared to 30.6% of single people. These results are in agreement with those found by Adeyemi et al. (13) in Benin but are in contradiction with those found by Arif et al (14) in Pakistan and Njuguna et al. (15) in Kenya where there was a positive correlation between the level of education and the level of knowledge of brucellosis.

4.2. Attitudes of respondents on brucellosis

The results on respondents' attitudes to preventing brucellosis showed that only 26.4% had good attitudes to preventing the disease. This score is in agreement with that found by Ghugey et al. (7). On the other hand, it is in disagreement with those found by Kasiime et al. (16) in Uganda and Musallam et al. (17) in Jordan. Our results could probably be explained by the ignorance of the inhabitants of Kipushi on the importance of preventing zoonotic diseases due to the fact that they have never been made mass aware of preventive behaviors against brucellosis, which is yet effective for promote behavioral changes in a community. This is why Salisu et al (18) recommended in their study to promote educational campaigns and training programs for the long-term management of brucellosis.

Taking into account the entities, 23.5% of Kipushi Antenna respondents; 26.9% of those of Lumata village; 25.2% of those from Musoshi station village and 21.4% of those from Sambwa village had good attitudes to preventing the

disease. This variation in attitudes by entity is consistent with that found by Adeyemi et al. (2024) in their study on farmers' perceptions of bovine brucellosis in Benin. According to Abbasi et al., (19) who conducted a study similar to ours in Iran, good awareness throughout an entire territory would almost standardize the level of knowledge and would reduce the risk of contamination of infectious diseases. In our study, 48.5% of male respondents had good attitudes compared to 39% of female respondents. These results are in agreement with those of Marin et al. (20).

Taking into account the age group of respondents, 38.2% of young people, 39.2% of adults and 36% of old people had good attitudes towards preventing disease. Regarding the occupations of the respondents: 38.5% of the unemployed; 38.6% of pupils/students; 38% of housewives; 30% of religious and 40.3% of employees had good attitudes. In relation to the educational level of the respondents, our results showed that 39.8% of the educated had good attitudes to preventing disease compared to 37.7% of the uneducated. The proportion of Christians who had good attitudes was 38.1% and that of Muslims was 41.1%. The proportions of good attitudes were 37.8% among those with low economic status, 39.9% among those with medium economic status and 39.9% and 30% among those with high economic status. Regarding marital status, the results showed that 45.1% of married people had good attitudes compared to 49.7% of single people. Overall, all the results we found here corroborate with those of Adeyemi and colleagues (13). On the other hand, Mligo and colleagues (21) in their study carried out in Tanzania found a higher score of good attitudes to prevent and control human brucellosis.

4.3. Respondents' practices on brucellosis

The results of the respondents' practices showed that 24.9% of them had good practices in combating brucellosis. Taking into account the distribution by entity, 19.4% of Kipushi Antenna respondents; 23.7% of those of Lumata village; 29% of those from Musoshi station village and 26.3% of those from Sambwa village had good practices to fight against the disease. This variation in respondents' practices by entity is comparable to that found by Adeyemi et al. (13). Furthermore, 45.8% of male respondents had good practices compared to 47.1% of female respondents.

Taking into account the age group of respondents, 26.6% of young people; 25.7% of adults and 16.1% of elderly people had good practices in fighting the disease. These results are in agreement with those found by Mligo et al. (21) in Tanzania. On the other hand, they disagree with those found by Marin et al. (20) in Sudan. We think that young people and adults would take care of the breeding more than the old ones since they still have the strength. Concerning the practices of the respondents in relation to their occupations, 23.4% of the unemployed; 27.9% of pupils/students; 24.2% of housewives; 30.0% of religious and 25% of employees had good practices.

We did not observe an influence of the level of education on the practices of the respondents because our results showed that 32.7% of the educated and 31.6% of the uneducated had good practices in fighting the disease. The proportion of Christians who had good practices was 13.1% and that of Muslims was 13.3%.

The proportions of good practices among respondents were 22.4% among those with low economic status, 26.1% among those with medium economic status and 30% among those with high economic status. It is the same with regard to marital status where the results showed 29.8% of married people and 33.1% of single people with good practices.

Overall, our results revealed very low scores regarding good practices to prevent brucellosis by the respondents. This helps explain the very high seroprevalence rates of caprine (26,9%) and human (20,2%) brucellosis which were observed in the same entities of the Kipushi territory and during the same survey period (5).

5. Conclusion

Our results revealed low scores of good knowledge of brucellosis symptoms by respondents (32.6%), good attitudes to preventing the disease (26.4%) and good practices to combat brucellosis (24.9%). Given the results obtained in this study, and with a view to controlling animal and human brucellosis in the Kipushi territory, we recommend that households breeding in the context of human-animal cohabitation regularly visit the competent services in order to acquire knowledge about the symptoms of zoonotic diseases, their means of transmission and good practices to prevent them.

Additional studies are necessary to assess the importance of the health and economic repercussions of animal and human brucellosis in the Kipushi territory.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

- [1] Ariza J, Corredoira J, Pallares R et al. Characteristics and risk factors for relapse of brucellosis in humans. *Clin. Infect. Dis.* 1995; 20:1249.
- [2] WHO. Brucellosis in humans and animals. World Health Organization; 2006, 86p.
- [3] WOA. Bovine brucellosis. Manual of Diagnostic Tests and Vaccines for Terrestrial Animals. Paris : Oie, 586; 2013, pp. 1–35.
- [4] Racloz V., Schelling E., Chitnis N., Roth, F. Persistence of brucellosis in pastoral systems. *Rev Sci Tech Off Int Epiz.*, 2013, 32: 61–70.
- [5] Maryabo K, Kabiyi L, Kabwang R, Ntambue A, Ngulu A. Evaluation of Seroprevalence and Associated Risks of Caprine and Human Brucellosis in the Kipushi Territory, DR Congo: Public Health Implications. *Am. J. innov. res. appl. sci.* 2025; 20(1): 26-34.
- [6] Godfroid J, Nielsen K, Saegerman C. Diagnosis of Brucellosis in Livestock and Wildlife. *Croat Med. J.* 2010; 51(4) : 296–305.
- [7] Ghugey SL, Deshmukh JS, Ghugey AV, Chaudhari SP, Ghugey AV. Knowledge, attitude, and practice on brucellosis among the rural population in Nagpur, Maharashtra, India. *J Prim Care Spec* 2024;5:88-95.
- [8] Thrustfield M. *Research in Public Health : A Practicsl Guide.* Oxford University Press, 2018.
- [9] Harbi A A, Almarshad A S, Alaqeel O A, et al. Knowledge, Attitudes, and Practices Regarding Brucellosis Among the General Population in Qassim Region, Saudi Arabia: A Cross-Sectional Study. *Cureus* 2023; 15(7) : e41461. doi :10.7759/cureus.41461
- [10] Hlaing SS, Kubota S, Makita K, Win YT, Myint HT, Kono H. Association of farmers' knowledge, attitude and practices with bovine brucellosis seroprevalence in Myanmar. *Anim Biosci.* 2024; 37(3) :547-554. doi: 10.5713/ab.23.0273.
- [11] Awah-Ndukum J, Mouiche MMM, Bayang HN, Ngu Ngwa V, Assana E, Feussom KJM, Manchang TK, Zoli PA. Seroprevalence and Associated Risk Factors of Brucellosis among Indigenous Cattle in the Adamawa and North Regions of Cameroon. *Hindawi Veterinary Medicine International Volume.* 2018; 10 : 85-96 doi.org/10.1155/2018/3468596
- [12] Lindahl E, Sattorov N, Boqvist S, Magnusson U. A Study of Knowledge, Attitudes and Practices Relating to Brucellosis among Small-Scale Dairy Farmers in an Urban and PeriUrban Area of Tajikistan. *PLoS ONE.* 2015; 10(2): e0117318.
- [13] Adeyemi DSD, Bothon FTD, Boko KC, Koutinhoun BG, Farougou S. Farmers' perceptions of bovine brucellosis in Benin. *Vet World.* 2024;17(2) : 434-447. Doi : 10.14202/vetworld.2024.434-447.
- [14] Arif S, Thomson PC, Hernandez-Jover M, McGill DM, Warriach HM, Heller J. Knowledge, attitudes and practices (KAP) relating to brucellosis in smallholder dairy farmers in two provinces in Pakistan. *PLoS ONE* 2017, 12(3) : e0173365.
- [15] Njuguna J.N., Gicheru M.M., Kamau L.M. and Mbatha P.M.: Incidence and knowledge of bovine brucellosis in Kahuro district, Murang'a County, Kenya. *Trop. Anim. Health Prod.*, 2017, 49(5): 1035–1040.
- [16] Kansiime C., Mugisha A., Makumbi F., Mugisha S., Rwegu I.B., Sempa J., Kiwanuka, S.N., Asiimwe B.B. and Rutebemberwa E. Knowledge and perceptions of brucellosis in the pastoral communities adjacent to Lake Mburo National Park, Uganda., *BMC Public Health*, 2014, 14: 2412.

- [17] Musallam II, Abo-Shehada MN and Guitian J. Knowledge, attitudes, and practices associated with brucellosis in livestock owners in Jordan. *Am J Trop Med Hyg.* 2015; 93(6): 1148-1155.
- [18] Salisu U. S., Kudi C. A., Bale J. O. O., Babashani M., Kaltungo, B. Y., Baba, A. Y., Yusuf, M. S. and Jamilu Y. R. Risk Factors and Knowledge of Brucella Infection in Camels, Attitudes and Practices of Camel Handlers in Katsina State, Nigeria. *Nigerian Veterinary Journal* 2018; 39 (3) : 227-239.
- [19] Abbasi-Ghahramanloo A. et al. Knowledge, attitudes, and practices regarding brucellosis in a rural population : A cross-sectional study. *Heliyon* 2024; 10(6) : e28041
- [20] Marin M, Shereen A, Tumwine G, Kankya C, Nasinyama G and Jubara A. Knowledge, attitude and practices of brucellosis among slaughterhouse and community animal health workers in Wau, Western Bahr el Ghazal State, South Sudan. *Scholars J Agric Vet Sci.* 2017; 4(11): 442-451.
- [21] Mligo BJ, Sindato C, Yapi RB, Mathew C, Mkupasi EM, Kazwala RR et al. Knowledge, attitude and practices of frontline health workers in relation to detection of brucellosis in rural settings of Tanzania: A crosssectional study. *One Health Outlook* , 2022; 4:1.