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Brucellosis: Community, medical and veterinary workers' knowledge, attitudes, and practices in Northern Uganda

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Abstract

Aim: This study aimed at determining the knowledge, attitudes, and practices of the community, medical and veterinary workers regarding brucellosis.

Materials and Methods: A cross-sectional study was conducted at selected health facilities in Apac, Gulu, Lira, and Pader districts of Northern Uganda using a standardized questionnaire. A total of 251 patients testing positive for brucellosis using the *Brucella* plate agglutination test, 59 medical and 29 veterinary workers were studied. Chi-square test at 95% confidence level was used to analyze data.

Results: Only 8% patients, 15.3% medical, and 21.4% veterinary workers were knowledgeable on transmission methods and symptoms for brucellosis and knowledge differed according to the level of education among patients (p=0.001), medical (p=0.001), and veterinary workers (p=0.012). Over 80% patients, medical and veterinary workers had a positive attitude. Only 8% patients, 13.6% medical, and 7.1% veterinary workers had good practices regarding brucellosis control.

Conclusion: Poor knowledge, poor practices, and positive attitude provide an opportunity for health education and policy formulation for the control of brucellosis. The prevalence studies of human and animal brucellosis are recommended to determine the magnitude of the problem.

Keywords: awareness, Brucellosis, patients, practitioners, Uganda.

Introduction

Brucellosis is a widespread zoonosis and has a great importance as a foodborne disease [1,2]. The disease often persists in the poorest and most vulnerable populations [3]. Brucellosis is a disease caused by bacteria belonging to the *Brucella* genus with six pathogenic species of which four including *Brucella melitensis*, *Brucella suis*, *Brucella abortus*, and *Brucella canis* are known to cause human disease [4-6]. Animals are the principal reservoirs of brucellosis and transmission to humans is by direct or indirect contact with infected animals or their products [7]. Human brucellosis affects any organ of the body with nonspecific symptoms and complications which are very diverse depending on the site of infection [4]. Diagnosing brucellosis can be problematic to a clinician who is unaware of the disease due to overlapping clinical manifestations and very often results into misdiagnosis [8]. Control of animal brucellosis results to a significant decline in human brucellosis [9]. Effective control requires adequate knowledge of causes, mode of transmission, signs and symptoms, as well as good attitudes and practices relating to the disease [10,11]. However, inadequate policies, funds, and awareness of the disease impose serious challenges [12].

Brucellosis widely occurs in Uganda and case reports of human disease with complications are on the increase [13-16]. Studies focusing on community awareness and perceptions about brucellosis have been conducted, but none has described the knowledge, attitudes, and practices of medical and veterinary workers in Uganda [15,16]. Knowledge, attitudes, and practices are critical in brucellosis prevention and control [11]. Good knowledge of transmission routes for brucellosis has a protective effect for human brucellosis infection [17]. Involving both medical and

veterinary sectors provide opportunities for collaboration in dealing with brucellosis in endemic countries such as Uganda and awareness among clinicians aid rapid diagnosis [18,19].

Without deliberate efforts to create awareness of brucellosis among the community, medical and veterinary workers who are key actors, incidences of the disease in Northern Uganda may increase further. This study, therefore, determined the knowledge and attitude of the community, medical and veterinary workers regarding brucellosis and identified their practices.

Methods

Ethical approval

Ethical approval was obtained from Gulu University Research Council (Ref No: GU/IRC/02/07/13) and the Uganda National Council of Science and Technology Reference No: HS 1442. Written consent was sought from all individuals before enrollment into the study.

Study area, participant selection and data collection tool deveopment

A cross-sectional study was conducted in post-conflict areas of Northern Uganda in the districts of Apac, Gulu, Lira, and Pader from March 2014 to February 2015. The study involved 17 public (not for profit) and private (for profit) out of the 244 health facilities present in the study districts [20-23]. The selection was based on capacity to test for brucellosis and willingness to participate in the study. The study targeted patients with fever, headache, joint pain, malaise, backache, fatigue, and loss of appetite visiting study health facilities. Medical personnel in the outpatient department (OPD) identified suspects and tested them with the rapid *Brucella* plate agglutination test. Patients with positive samples were enrolled for this study. Medical worker participants were staff in the OPD of the study health facilities including nurses, laboratory technicians, clinicians, and medical doctors. The study involved veterinary workers including willing veterinary doctors, animal husbandry officers, and veterinary assistants at the study district veterinary offices. All the participants were briefed on the study objectives and willing respondents signed consent form before enrollment.

The questionnaire was developed drawing experience from studies elsewhere [10]. Each target group had specific questions on knowledge, attitude, and practices. The questionnaires had both close- and open-ended question(s). Knowledge on transmission pathways and symptoms for brucellosis in humans and animals were sought. While attitude regarding brucellosis was determined by assessing the feelings of respondents about the importance of brucellosis, need to test for brucellosis and educate the community on causes, transmission, symptoms, and control of brucellosis. To identify practices, patients answered questions on consumption of animal products and handling of suspected infectious materials. Information sought from medical workers included routine brucellosis testing and availability of test reagents at health facilities, and veterinary workers answered questions on the use of protective wear during animal examination and treatment. The questionnaire was pre-tested within the study area to assess clarity, logical sequencing of questions, and required time for completion. The questionnaire was filled by the participants who signed consent form and trained interpreters guided respondents who could not speak English. 30 min were allocated to complete and the questionnaire was retrieved immediately to avoid discussion and reference to other materials.

A participant was considered "knowledgeable" if stated three or more (out of five correct) pathways for brucellosis transmission in animals and humans and "poorly knowledgeable" if listed less than three. The participants who stated four or more clinical symptoms in animals and 10 or more in humans were regarded as "knowledgeable" and "poorly knowledgeable" if stated less. "Good/positive" attitude was considered if a participant agreed or strongly agreed with the provided questions about the importance of brucellosis, the need to test and educate the community on causes, transmission, symptoms, and control of brucellosis. "Good practice" for patients was considered if suspected materials were handled with protective gear and if consumed pasteurized milk products. "Good practice" for medical workers was considered if test reagents were available and routinely tested patients for brucellosis. While, "good practice" for veterinary workers was considered if a full protective gear (gum boots, gloves, overall) was worn while handling animals.

Statistical analaysis

Data were analyzed with SPSS (Version 16) using descriptive statistics. Categorical variables were presented as proportions. Finally, the effect of sociodemographic characteristics on knowledge, attitude, and practices was assessed using Chi-square test at 5% significance interval.

Results

Participants' knowledge regarding brucellosis

A total of 251 patients aged 10-84 years (mean - 36.9, standard deviation - 13.9) fulfilled the criteria for determining the level of knowledge among the community regarding brucellosis. Up to 53.4% (134/251) of participants were female and only 39.4% (99/251) of study patients had attained education beyond primary level. Although many (63.3%) of the participants had heard of brucellosis, only 8% (20/251) were knowledgeable on methods for brucellosis transmission and symptoms (Table-1). The participants' overall knowledge on brucellosis differed statistically significantly with age (p=0.014) and level of education (p=0.001) but not with gender. The number of patients with poor knowledge on brucellosis

was higher for participants with education above primary level than those below.

In total, 59 health workers participated in the study and 86.4% were males, 11.9% had bachelor degrees, and only 8.5% were medical doctors. Furthermore, 37.3% were laboratory technicians (1 female, 21 male), 33.9% were clinical officers (1 female, 20 male), and 20.3% were nurses (6 female, 6 male). The age of the health workers ranged from 33-56, 25-53, 22-43, and 23-51 for medical doctors, clinical officers, laboratory technicians, and nurses, respectively. Only 15.3% (9/59) of medical workers were knowledgeable on methods of transmission and symptoms of brucellosis (Table-1). Knowledge of medical workers differed statistically significantly with the level of education ($p<0.001$) and occupation ($p<0.001$). However, knowledge levels regarding brucellosis did not differ with age and gender of medical workers.

A total of 28 veterinary workers participated in the study. Only 7.1% were females and overall 60.7% were aged between 21 and 30 years. 75% were diploma holders working as animal husbandry officers, 17.9% certificate holders, designated as veterinary assistants and only 7.1% degree holders designated as veterinary doctors. Only 21.4% (6/28) of veterinary workers

Table-1: Relationship of education, occupation, age, and gender with patients' and medical/veterinary workers' knowledge and attitude regarding brucellosis.

Variable	Frequency (%)		χ^2	p value	Frequency (%)		χ^2	p value
	Poor knowledge	Knowledgeable			Poor attitude	Good attitude		
Participants (n=251)								
Gender			0.02	0.88			0.15	0.7
Male	108 (92.3)	9 (7.7)			18 (15.4)	99 (84.6)		
Female	123 (91.8)	11 (8.2)			23 (17.2)	111 (82.8)		
Qualification			11.5	0.001*			0.98	0.32
≤Primary	147 (96.7)	5 (3.3)			22 (14.5)	130 (85.5)		
>Primary	84 (84.8)	15 (15.2)			19 (19.2)	80 (80.8)		
Age group			10.6	0.014*			1.75	0.63
<18 years	8 (100)	0 (0)			1 (12.5)	7 (87.5)		
18-44 years	178 (94.7)	10 (5.3)			29 (15.4)	159 (84.6)		
45-64 years	34 (82.9)	7 (17.1)			7 (17.1)	34 (82.9)		
≥65 years	11 (78.6)	3 (21.4)			4 (28.6)	10 (71.4)		
Medical workers (n=59)								
Qualification			17.9	<0.001*			11	0.012*
Certificate	22 (100)	0 (0)			0 (0)	22 (100)		
Diploma	25 (86.2)	4 (13.8)			0 (0)	29 (100)		
Bachelor	2 (40)	13 (60)			1 (20)	4 (80)		
Postgraduate	1 (33.3)	2 (67.7)			0 (0)	3 (100)		
Occupation			19	<0.001*			11	0.012*
Clinical officer	17 (85)	3 (15)			0 (0)	20 (100)		
Laboratory technologist	20 (90.9)	2 (9.1)			0 (0)	22 (100)		
Nurse	12 (100)	0 (0)			0 (0)	12 (100)		
Doctor	1 (20)	4 (80)			1 (20)	4 (80)		
Age group			2.92	0.4			11	0.012*
21-30 years	22 (88)	3 (12)			0 (0)	25 (100)		
31-40 years	15 (83.3)	3 (16.7)			0 (0)	18 (100)		
41-50 years	10 (90.9)	1 (9.1)			0 (0)	11 (100)		
>51 years	3 (60)	2 (40)			1 (20)	4 (80)		
Gender			1.67	0.2			0.16	0.69
Male	42 (82.4)	9 (17.6)			1 (2)	50 (98)		
Female	8 (100)	0 (0)			0 (0)	8 (100)		
Veterinary personnel (n=28)								
Qualification			8.77	0.012*			-	-
Certificate	5 (100)	0 (0)			0 (0)	5 (100)		
Diploma	17 (81)	4 (19)			0 (0)	21 (100)		
Bachelor	0 (0)	2 (100)			0 (0)	2 (100)		
Age group			1.91	0.59			-	-
21-30 years	13 (78.5)	4 (23.5)			0 (0)	17 (100)		
31-40 years	4 (66.7)	2 (33.3)			0 (0)	11 (100)		
41-50 years	1 (100)	0 (0)						
>51 years	4 (100)	0 (0)						
Gender			0.59	0.44			-	-
Male	20 (76.9)	6 (23.1)			0 (0)	26 (100)		
Female	2 (100)	0 (0)			0 (0)	2 (100)		

*Significant at 5%

were knowledgeable on transmission and symptoms of brucellosis (Table-1). The knowledge regarding brucellosis among veterinary workers differed with level of education (p=0.012). However, no difference in knowledge levels was observed among the different age groups. Similarly, no difference in knowledge was observed between female and male veterinary workers (p>0.05).

Attitude of participants regarding brucellosis

Positive attitude regarding brucellosis control and prevention was recorded in 83.7% (210/251) of participants and did not differ with level of education, gender, and age (p>0.05). Almost all medical workers (98%) who participated in the study had a positive attitude regarding brucellosis. However, one male medical doctor aged over 51 had a negative attitude. All veterinary workers had a good attitude about brucellosis, particularly in regard to the importance, testing, and sensitizing communities. There was no difference in attitude observed among age groups, education level, and gender of veterinary workers (Table-1).

Participants' practices regarding brucellosis

Only 17.1% of participants consumed pasteurized milk products and just 6.8% of handled aborted materials with protective wear (Table-2). Only 8% (20/251) of participants observed at least two of the good practices regarding brucellosis. Patients' practices differed statistically significantly with education level (p=0.004) and gender (p=0.043). More male patients had poor practices regarding brucellosis than females and more patients who attained above primary school education had good practices compared to those with lower education level (Table-3). While 44.1% of the medical workers reported the availability of reagents and equipment at health facilities and only 33.9% of specified testing for brucellosis (Table-2). However, only 13.6% of medical workers indicated both testing and availability of reagents and equipment for brucellosis at health facilities which was considered as good practice in this study. Medical workers' practices did not differ with level of education, occupation, age, and sex (Table-3).

In addition, <7% of the veterinary workers wore full protective gears (gloves, gum boots, and overalls) while handling animals. The good practices among veterinary workers differed statistically significantly with level of education (p<0.001). Good practices were observed more in the highly educated veterinarians than those with low qualifications (Table-3).

Discussion

This is the first study to assess knowledge, attitude, and practices of the community, medical and veterinary workers in Northern Uganda. Knowledge of brucellosis transmission and symptoms in humans and animals across the study groups was poor. The participants' knowledge on brucellosis differed statistically significantly with level of education (p=0.001). The number of patients with poor knowledge on brucellosis was higher for participants with education above the primary level than those below. This finding, however, points to a serious risk to communities in North Uganda whose literacy levels are low compared to other regions in the country. The Uganda National Household Survey 2012/13 reported Northern Uganda had the least number (3.1%) of persons aged ≥15-year-old with education level above secondary. As well, the region had the highest number (26.4%) of population with no formal schooling compared to 11.7% in central, 16.1% in eastern, and 20.0% in Western Uganda [24]. The education status of this region is not surprising since northern Uganda was under decades of violence and instability which left the education system devastated causing the region to have the least educated people. In addition, this study showed that participants aged 45 years and more had better knowledge regarding brucellosis than those below. This finding agrees with a recent study in Uganda where high knowledge regarding brucellosis was observed in persons above 45-year-old [15]. This could be due to accumulation in experience and insights about the disease that occurs with age.

Health workers in Northern Uganda also had poor knowledge on transmission and clinical presentation of brucellosis. However, the knowledge among this

Table-2: Practices of patients, medical and veterinary workers regarding brucellosis.

Good practices	Patients		Medical workers		Veterinary workers	
	Frequency (n-251)	Proportion (%)	Frequency (n=59)	Proportion (%)	Frequency (n=28)	Proportion (%)
Vaccinating animals	16	6.4	-	-	-	-
Hygienic handling of aborted material	17	6.8	-	-	-	-
Consumption of pasteurized milk products	43	17.1		-	-	-
Test for brucellosis	-	-	20	33.9	-	-
Availability of reagent and equipment	-	-	26	44.1	-	-
Testing and availability of reagent and equipment for						
Brucellosis	-	-	8	13.6	-	-
Wear all (gum boots, gloves, overall)	-	-	-	-	2	7.1
Wear gloves	-	-	-	-	3	10.7
Wear gumboots	-	-	-	-	14	50.0
Wear overall	-	-	-	-	9	32.1

Table-3: Relationship of education, occupation, age, and gender with patients' and medical/veterinary workers' practices regarding brucellosis.

Variables	Frequency (%)		χ^2	p value
	Poor practices	Good practices		
Patient participants (n=251)				
Gender			4.1	0.043*
Male	112 (95.7)	5 (4.3)		
Female	119 (88.8)	15 (11.2)		
Qualification			8.5	0.004*
≤Primary	146 (95.4)	6 (4.6)		
>Primary	85 (86.9)	14 (13.1)		
Age group			5.7	0.13
<18 years	6 (75)	2 (25)		
18-44 years	175 (93.1)	13 (6.9)		
45-64 years	36 (87.8)	5 (12.2)		
≥65 years	14 (100)	0 (0)		
Medical workers (n=59)				
Qualification			5.5	0.14
Certificate	21 (95.5)	1 (4.5)		
Diploma	25 (86.2)	4 (13.8)		
Bachelor	3 (60)	2 (40)		
Postgraduate	2 (67.7)	1 (33.3)		
Occupation			3.7	0.3
Clinical officer	17 (85)	3 (15)		
Laboratory technologist	20 (90.9)	2 (9.1)		
Nurse	11 (91.7)	1 (8.3)		
Doctor	3 (60)	2 (40)		
Age group			0.6	0.9
21-30 years	21 (84)	4 (16)		
31-40 years	16 (89.9)	2 (11.1)		
41-50 years	10 (90.9)	1 (9.1)		
>51 years	4 (80)	1 (20)		
Gender			1.5	0.23
Male	43 (84.3)	8 (15.7)		
Female	8 (100)	0 (0)		
Veterinary personnel (n=28)				
Qualification			28	0.000*
Certificate	5 (100)	0 (0)		
Diploma	21 (100)	0 (0)		
Bachelor	0 (0)	2 (100)		
Age group			1.3	0.74
21-30 years	16 (94.3)	1 (5.7)		
31-40 years	5 (83.3)	1 (16.7)		
41-50 years	1 (100)	0 (0)		
>51 years	4 (100)	0 (0)		
Gender			0.2	0.68
Male	24 (92.3)	2 (7.7)		
Female	2 (100)	0 (0)		

*Significant at 5%

group differed significantly with occupation and level of education. The nurses were the least and the doctors were the most knowledgeable about brucellosis. This situation is appalling since in Uganda, health centers II and III, which are very close to the communities, are entirely managed by nurses. It could be possible that some patients who visit these health facilities suffer from brucellosis but with the absence of doctors, proper diagnosis, and treatment of the disease could be hampered. Only, 21.4% of veterinary workers were knowledgeable in regard to transmission and symptoms of brucellosis. This finding parallels a study in Nigeria and could be attributed to their professional training [25]. In general, veterinary workers are thought to be knowledgeable on issues of brucellosis owing to their professional training. However, such poor knowledge among veterinary workers in this study points to brucellosis being a neglected disease in Uganda thus its importance not probably emphasized during professional trainings in the country.

Interestingly, this study revealed a positive attitude among all study groups. This finding provides an opportunity for community education. However, the good attitude did not translate into good practices across all the study groups. The bad practices recorded in this study are a great risk for human infection. Many participants engaged in bad practices, not surprising though since Northern Uganda is ranked as the poorest [26]. Reports elsewhere show that poor people live closer to their animals and are prone to

consuming unpasteurized milk, poorly prepared meat from infected animals and lack access to protective gears for handling aborted or full-term parturition wastes [27]. This also confirms an earlier study which reported irregular brucellosis screening due to the inconsistent supply of test reagents and kits in a major hospital in Uganda [16]. The absence of test kits at health facilities may indicate brucellosis is a neglected disease in Uganda. Similarly, only 7.1% of veterinary workers engaged in good practices. This finding is in agreement with a study elsewhere, which reported that the positive attitude, and the good knowledge of veterinarians did not translate into good practices [10].

Since the current study dealt with only suspected brucellosis patients and did not cover all health facilities for spatial analyses, the results from this study have to be interpreted cautiously. Nevertheless, this study provides valuable information to support programs for control of brucellosis.

Conclusion

Knowledge and practices regarding brucellosis were poor among all study groups but attitude was good. Education was shown to positively influence knowledge and practices. There is an opportunity to improve brucellosis control through continuous training on issues relating to the disease among key actors. Studies to determine the prevalence and local factors for brucellosis occurrence could provide valuable information in the development of cost-effective strategies to minimize disease risk exposure.

Authors' Contributions

HMN was involved in the development of the concept, study design, data collection, analysis, and writing of the paper. JE and DOO helped to develop the concept, supervised the study, and critically revised the paper. GWN participated in the study design and data interpretation, revised the paper and approved the final version. JMK participated in the acquisition of the data, revised the paper and approved the final version. DO and JN participated in the development of the concept study design and the drafting and final revision of the paper. All authors read and approved the final version of the paper.

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Competing Interests

The authors declare that they have no competing interests.

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