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ORIGINAL ARTICLE

Human Brucellosis in Garzeted Forest Areas: A Case of Bwindi Impenetrable Forest, Southwestern Uganda

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Abstract

Brucellosis is a zoonotic infection transmitted from animals to humans by ingestion of infected food products, direct contact with infected animals or inhalation of aerosols. *Brucella*, a facultative intracellular pathogen, has the ability to survive and multiply in phagocytes and cause abortion in cattle and undulant fever in humans. *Brucella* species especially *B. mellitensis*, *B. abortus* and *B. suis*, represent a significant public health concern and at present, *B. mellitensis* is the principle cause of brucellosis. The cross section study was conducted to determine the prevalence of Brucellosis and its risk factors. The participants came from the out patients department of the hospital in the month of December of 2012, January and February of 2013. The study was aimed to determine the prevalence of brucellosis, demographic distribution and risk factors. The study employed an interview guide to collect socio-demographic data and laboratory methods that is to say, titration of respondents' serum to obtain reactive samples respectively. The results showed that the prevalence was 10.7%. Socio-demographic results showed that females are more infected with brucellosis than males with prevalence 12.5% and 8.6% respectively. Consumption of animal products ranked first among risk factors for brucellosis in the community, followed by having animals at home, lacking animal houses, having a history of brucellosis in the family and lastly consuming unboiled milk. Considering the calculated prevalence and risk factors, it is clear that brucellosis is a big health problem in the community served by Bwindi Community Hospital, and therefore much work needs to be done in sensitization of community members and the hospital staff.

Keywords: Brucella, Zoonosis, Animal foods, Public health.

1. Introduction

Brucellosis is an infection transmitted from animals to humans (zoonosis) by ingestion of infected food materials, direct contact with an infected animal or inhalation of aerosols. The last method is remarkably efficient given the relatively low concentration of organisms needed to establish infection in humans and has attracted new attention to this old disease (Christopher *et al.*, 2010). *Brucella*, a facultative intracellular pathogen, has the ability to survive and multiply in phagocytes cells and cause abortion in cattle and undulant fever in humans (Cardoso *et al.*, 2006). *Brucella* species especially *B. mellitensis*, *B. abortus* and *B. suis*, represent a significant public health concern and at present, *B. mellitensis* is the principle cause of brucellosis in India (Christopher *et al.*, 2010).

Brucellosis is reported to be a common disease among livestock and people in sub-Saharan Africa and in general, the incidence is highest in pastoral production systems and decreases as herd size and size of landholding decreases (McDermott and Arimi, 2002). The prevalence and risk factors for *Brucella* infections are best understood for bovine brucellosis and to a lesser extent for caprine brucellosis. The occurrence and epidemiology of brucellosis in pigs is poorly understood. This species selective knowledge is also reflected in control activities. As with other public-sector animal health services, the surveillance and control of brucellosis in sub-Saharan Africa is rarely implemented outside southern Africa

(McDermott and Arimi, 2002). Brucellosis is even more ignored in humans and most cases go undiagnosed and untreated, leading to considerable suffering for those affected. Decision-making to determine the importance of brucellosis control relative to other public concerns and what brucellosis control strategies should be applied is urgently required. A strategy for how brucellosis decision-making might be considered and applied in future is outlined (McDermott and Arimi, 2002).

The prevalence of brucellosis in cattle has been reported to be 15.8% in Mbarara district of western Uganda in 2005 (Bernard *et al*., 2005). The disease is transmitted from animals to man through consumption of animal products for example poorly cooked meat, milk, cheese and butter (Kunda *et al.*, 2007) though it can also be contacted from exposure to animals and their carcasses (Minas *et al*., 2007).

In Kanungu district, natives are exposed to livestock since it is one of the occupations, thus being at risk of brucellosis, and in turn attend to BCH to receive medical help, suffer from brucellosis though its prevalence according to age, sex, occupation and geographical location is not known.

This cross sectional study was conducted to determine the prevalence of Brucellosis. It was conducted in the outpatient department (OPD) of Bwindi Community Hospital (BCH) during the months of January and February (2012). The study was aimed at determining the prevalence of brucellosis, demographic distribution and risk factors.

2. Methods

2.1 Setting

Uganda is situated on the equator in East Africa, bordering South Sudan, Kenya, the Democratic Republic of Congo, Rwanda, and Tanzania. As of 2014, Uganda's population was 34.9 million with an annual growth rate of 3.03%, bringing the population to an estimated 42.4 million by 2020 (UHDS, 2014). Uganda has 112 districts and Kanungu district is found in the south western region, bordering with the Democratic Republic of Congo (DRC). The study was conducted in Bwindi Community Hospital, which serves a community of about 30,000 people in three counties of Kanungu district in south western Uganda. The hospital has a 100 bed capacity, and serves as a referral hospital for clients from Kanungu district and the surrounding areas including DRC.

2.2 Ethical Considerations

An ethics clearance form from the faculty of medicine research and ethics committee was filled and submitted together with the proposal to the faculty research and ethics committee for approval and an approval letter was issued to the researcher.

Permission was sought from the medical superintendant of Bwindi Community Hospital as well as the head of the OPD department, through the ethics and research committee of the hospital and the researcher was given a clearance letter before carrying out the research.

Respondents were given a thorough verbal explanation about the study and were given a consent form, well translated into Rukiga, the local language, where they signed, having known the relevance of the study. Confidentiality was highly observed as respondents were identified with study numbers and not names.

2.3 Data Collection

The participants came from the out patients department of the hospital in the month of December of 2012, January and February of 2013. The study covered a total of 177 participants as calculated using the formula of Kish and Leslie (1987). The study included all patients that presented at the OPD with symptoms of febrile conditions and consented to participate in the study. However all patients that presented without any symptom of febrile conditions were not considered for the study.

The study employed an interview guide to collect socio-demographic data and laboratory methods that is to say, titration of respondents' serum to obtain reactive samples respectively. Random plain tube blood samples were collected aseptically by veni-puncture from respondents and tested for *Brucella* antibodies using the rapid agglutination test and titer method. For the titer method, serial dilutions of serum from respondents were made, treated with the *Brucella* antigen, incubated for 24 hours and microscopically examined for agglutination.

The *Brucella* antigen kits were procured from cypress diagnostics and the testing procedure was controlled with both positive and negative controls. All titres were carried out to avoid the prozone phenomenon. Data was analysed using Microsoft excel and statistical package for social scientists (SPSS) version 20.

3. Results

3.1 Socio-demographic Results

The study involved a total of 177 respondents, 96 (54.2%) of whom were female and 81 (45.8%) were male. All respondents came from ten parishes of the catchment area of Bwindi Community Hospital as –

Table 1: Distribution of reactive samples by age group

Age group	Number of reactive samples	Percentage
Under ten	3	15.8
10-19	1	5.3
20-39	7	36.8
40-59	5	26.3
60-100	3	15.8
Total	19	100

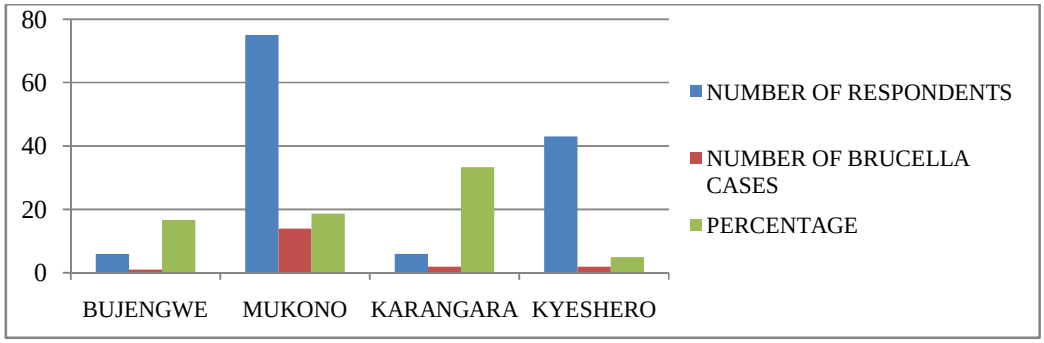

Fig 1: The prevalence of brucellosis by parish

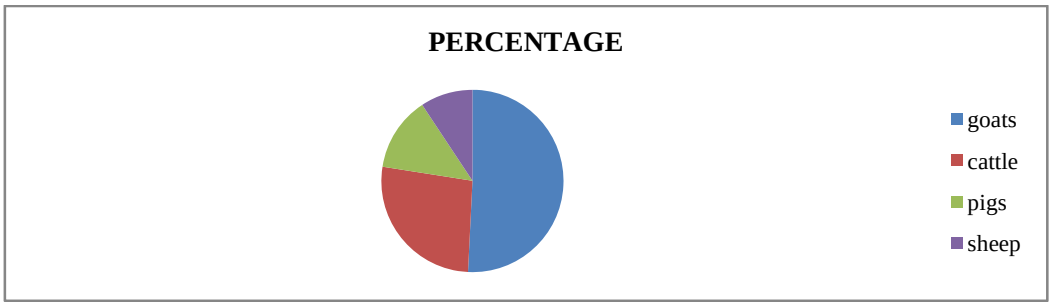

Fig 2: A pie chart showing the percentages of different animals among the sample population

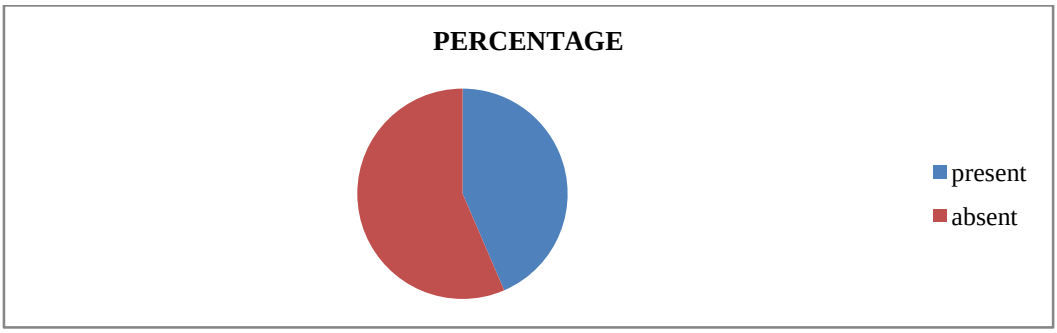

Fig 3: A pie chart showing coverage of animal houses among the sample population.

summarized in Fig 1. 75 respondents came from Mukono parish, 43 from Kyeshero parish, 16 from Ntungamo parish, 11 from Kihembe parish, 9 from Nyamigoye parish, 6 from Bujengwe parish, 6 from Kishenyi parish, 4 from Karangara parish, 4 from Burema parish, and 3 from Buremba parish, with percentages of 42.3%, 24.3%, 9.0%, 6.2%, 5.1%, 3.4%, 3.4%, 2.3%, 2.3% and 1.7% respectively.

Out of the 177 respondents, 135 (76.3%) reported to have animals at their homes, and only 42 (23.7%) reported not to have animals. The most reared animals were goats with 120 (50.8%) respondents reporting at least to have goats in their homes, followed by cattle, pigs and sheep, with 63(26.7%), 31(13.2%) and 22(9.3%) respectively. This is summarized in Fig 2.

Out of the 177 respondents, 100(56.5%) reported not to have animal houses in their homes and only 77(43.5%) reported to have animal houses as illustrated in Fig 3. A total of 155(87.6%) respondents reported to be consumers of animal products. 22(12.4%) respondents reported not to consume any animal product. Meat was the most consumed animal product followed by milk and ghee, with 155(48.7%), 115(36.2%) and 48(15.1%) respondents reporting to at least consume the products respectively. No respondent reported to consume either yoghurt or 'eshabwe'.16 (9.04%) respondents reported to consume unboiled milk while 161(90.96%) reported not to take unboiled milk. On the other hand, 26(14.7%) respondents reported to have a history of brucellosis while 151 (85.3%) had no history of brucellosis.

The number or reactive samples from the respondents was found to be 19 out of the total 177 respondents involved in the study. This puts the general prevalence of brucellosis at 10.7%. Out of the 19 respondents whose samples tested reactive, 12 were females and 7 were males. This puts the prevalence by sex to be 12.5% in females and 8.6% in males. Among the 19 respondents whose samples were reactive, 14 of them were from Mukono parish while 2, 2 and 1 were from Karangara, Kyeshero and Bujengwe parishes respectively. The rest of the parishes did not have any of their respondents having a reactive sample. This indicates that Karangara parish had the highest prevalence of 33.3%, followed by Mukono, Bujengwe and Kyeshero with prevalences of 18.7, 16.7 and 4.7 respectively. The most affected age group was 20-39, followed by 40-59 with a prevalence of 36.8% and 26.3% respectively.

4. Discussion

A total of 177 respondents were included in the study and 19(10.7%) tested positive while 158(89.3%) tested negative for brucellosis. This gave a general prevalence of 10.7% whereas similar studies in patients with febrile conditions were done in a big hospital in Kampala, the capital city of Uganda, and the prevalence of human Brucellosis was found to be 13.3% (Mutanda, 1998). The prevalence of brucellosis by sex, 63.2% for females and only 36.8% for males, is in agreement with Makita *et al.* (2011), in whose study, it was found out that 60% of the seropositive patients were female and only 40% were male. The age group with the highest prevalence was 20-39, which is comparable with the mean age of *Brucella* cases got by Makita *et al.* (2011), 32.9 years. This makes one falling in this age group at risk of catching *Brucella*.

Closeness with animals and consumption of their products has been mentioned as risk factors for brucellosis (Cheesbrough, 2006). However, consumption of unboiled milk stands out among others since 5 out of the 19 respondents with reactive samples consumed unboiled milk. This indicates that one who consumes unboiled milk stands a risk of suffering from brucellosis, as indicated by Cheesbrough (2006), that those who drink fresh milk from animals stand a high risk of infection with brucellosis. Still consumption of animal products stands to be a risk factor, as human brucellosis can occur when man ingests *Brucella* in infected raw milk, fresh cheese, cream or any other milk products, because large numbers of the organism are released into milk of those animals that are infected with the organism (Cheesbrough, 2006). Considering constant interaction with animals and sharing shelter, this is in agreement with the results of a cross sectional study that was carried out in Tanga, Tanzania, where risk factors were found to be occupation, and contact with livestock (Swai and Schoonman, 2009).

Having a history of brucellosis in the family was discovered as another significant risk factor because 7 out of 19 respondents with reactive samples confessed to have had brucellosis in their families. This was the same case in Peru, where a household survey was conducted among members of families that had *Brucella* patients, and it was found that the prevalence of Brucellosis was at 7.3% (Mendoza-Núñez *et al.*, 2008). It was in the same study that household members were found to be an important risk group, and that closeness with a *Brucella* patient is a risk factor.

5. Conclusion

There is need to test for brucellosis for any person that presents with signs and symptoms of febrile conditions whether at OPD or on hospital wards in order to avoid mis-management of such patients. There is still need to sensitize the community about this finding of brucellosis in their community, as it is a preventable illness. The significance of this study was to provide research based facts on brucellosis to the

Bwindi community and health workers of Bwindi Community Hospital.

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