RESEARCH PAPER | Economics | Volume : 4 | Issue : 8 | August 2014 | ISSN - 2249-555X

Socioeconomic Aspects of Brucellosis in Kuku Dairy Scheme, Khartoum State, Sudan

KEYWORDS: human brucellosis, socioeconomic, bovine brucellosis;

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ABSTRACT *A cross-sectional survey was conducted to estimate the cost of brucellosis in Kuku dairy scheme. A random sample of 30 cattle holdings was selected for estimating losses due to bovine brucellosis. On the other hand a sample of 176 volunteer was used to determine the losses due to human brucellosis. The result was that the herd infection rate was 90% and individual animal infection rate was 24.9% based on c-ELISA, Accordingly the total losses attributed to bovine brucellosis in the studied sample was US$ 247284.0 was due to milk loss and US$.8 due to infertility. The loss / cow /year accounted to US$ 434.3. For human brucellosis the infection rate was 2.3%. The cost per person was US$ 48.1. Males, the age group 15-30, milkers and those who reside in the farms are more susceptible.*

Introduction

Being considered one of the most important zoonosis, Brucellosis in animals and humans is worldwide distributed (Megid et al., 2010). Bovine brucellosis is usually caused by B. abortus which has seven different biovars (Lucero et al., 2008). Abortion is the main clinical sign in bovine which usually occurs from the 5th to the 8th month of gestation (Nicoletti, 1980). Abortion is usually followed by retention of placental and Metritis, which may cause permanent or transient infertility, alternatively to abortion, premature stillborn or weak calves may occur (Acha & Szyfres, 2003). Losses due to abortion or stillbirths, irregular breeding, loss of milk production and reduced human productivity are economic consequences of bovine brucellosis (Nicoletti, 1982). Economic losses for Argentina were estimated at US$60 million per year or US$1.20 per bovine when the prevalence was around 5%, and in Nigeria losses were estimated at US$575,605 per year or US$ 3.16 per bovine when the prevalence is 7% to 12% (Ajogi et al., 1998). In Sudan losses caused by bovine brucellosis in terms of decreased milk yield was estimated by Dafaalla (1962) at about 50%, late abortion causes a reduction of about 20-30%.

Humans are infected by B. abortus, B. melitensis, B. suis, B. canis, and marine mammal Brucella species. The disease is mostly caused by occupational exposure to infected animals or the ingestion of unpasteurized dairy products. Brucellosis can be a serious, debilitating and sometimes chronic disease that may affect a variety of organs. (CFSPH, 2007). Clinically human brucellosis is manifested by undulant fever; headache, night sweating, constipation, anorexia, chills and weakness. Malaise,insomnia, arthralgia,sexual impotence. Nervous signs and depression are also common (Megid et al., 2010).

Economic losses caused by the disease in humans are a consequence of the cost of hospital treatment, cost of drugs, patient out-of-pocket treatment expenses, and loss of work or income due to illness. In Spain, losses from hospital costs and lost pay were estimated at 787.92 pesetas per patient (Colmenero et al., 1989), while estimated costs per case in New Zealand were NZ$3,181 (Shepherd et al.,1980).

Methodology

Study area

Kuku Dairy Co-operative Scheme is located in Khartoum North, Khartoum State, Sudan. . The Scheme was established in 1963 on the nucleus of small milk producers co-operatives dated from 1953.The Scheme covers an area of about 2600 acres of flat leveled land. The whole project was established by American. The objective of the Scheme was to settle semi-nomadic animal owners and concentrate on the production of pasteurized milk.

The target populations

Two populations were targeted; the human population included all people working in the study area and the animal population included cattle population raised in the scheme.

Method of data collection

A sample of 574 cows from 30 holdings was selected based on Robinson (2003). The herd prevalence and the individual animal prevalence brucellosis were determined based on c-ELISA. A questionnaire sheet was used to collect data for each infected holding and each individual infected cow. For human population 176 individuals were sampled based on their willingness to participate in the study. The infection rate was determined by RBPT as screening test and c-Elisa confirmatory test. A master sheet was used to collect data from the infected persons.

The estimation of the economic losses

(A) Losses to due to bovine brucellosis =

Losses due to reduction of milk production + Losses due to infertility

Losses due to reduction of milk production:

Milk loss of seropositive aborted animals =

Number of aborted seropositive animals x average annual milk yield x 20% (Shepherd et al., 1979).

Milk loss of seropositive non aborted animals =

Number of non aborted seropositive animals x average annual milk yield x 10%. (Shepherd et al., (1979)

Cost milk lost:

Total quantity of milk lost =

Milk loss of seropositive aborted animals +Milk loss of seropositive non aborted animals.

Losses due to reduction of milk production =

Volume : 4 | Issue : 8 | August 2014 | ISSN - 2249-555X

Total quantity of milk lost x average price of milk/ton.
Losses due to infertility:
Number of calves lost due to infertility =
Number of seropositive cow x 0.15 (Reduction in fertility of the seropositive cow based on Zinsstag (2005).
Cost of infertility:

Number of calves lost due to infertility x weaning weigh (kg) x meat price (kg /Lbw)

(b) Losses due to human brucellosis:
Total loss = transport cost + examination fees + diagnosis fees + medication cost.

(c) Total financial losses:
Total financial losses= Losses due to bovine brucellosis + Losses due to human brucellosis.
Results and Discussion
Cost of bovine brucellosis
Based on the epidemiological result the herd prevalence rate was 90% and 143 cow out of 574 (24.9%) examined cows were proved to be infected.

Cost item	US$	US$
Milk lost of aborted cows	52989.4	
Milk lost of non aborted cows	194294.6	
Total milk loss		247284.0
Calves loss due to infertility		1981.8
249265.8Total loss		
Loss/holding		8308.9
Loss/cow		434.3

Table 1: Financial losses due to bovine brucellosis in kuku dairy Scheme (US$)

The number of seropositive aborted cows of 17 (12%).
The study revealed that the estimated amount of milk lost from 17 seropositive-aborted cows accounted to 7.9 tons, and that from 126 non aborted cows accounted to 29.3 ton accordingly the total milk lost per year was 36.2 tons.

The very high cost of bovine brucellosis in the present study compared to US$1.20 per bovine in Argentina and US$ 3.16 per bovine in Nigeria (Ajogi et al., 1998) may be attributed to the high prevalence rate and to high lactating cross bred cows in the current study.

Cost of human brucellosis
Based on the confirmatory test c-ELISA, Four people out of 176 (2.3%) were found to be actively infected. All of them had common symptoms of Fever, headache and arthralgia. In addition one of them suffers from night sweating, moreover two persons complained from fatigue.

Social dimension of brucellosis
The results showed that the infection rate in males (10.8%) was higher compared to female (0.6%). The age group 15-30 was the mostly (9.7%) affected followed by the age group 31-45 (1.7%), no other age group was affected. Milkers were found to be the most frequently affected by the disease (8%) followed by the farmers and laborers (2.2%) and finally the veterinary practioners (1.2%). Those who resided inside farms were found to be the most affected (8%) while those who reside outside the farms constituted 3.4% of the infected people. Apart from the illiterate who constitute 2.3%, the infection rate declines with education. The infection rate was 6.3%, 1.1% and 0.6% for the primary educated, secondary attendants and university graduates respectively.

The increased susceptibility observed in respect to age and sex could be attributed to the very nature of population studied which characterizes by reduced number of females and children due to tough work in dairy farms. Moreover, the findings of increased susceptibility to brucellosis at high risk occupationally linked to cattle, those who reside inside farms, those of lower education and those have no information about zoonotic diseases, these findings are in consistence with Salari (2003), Al-Ani (2004), Atmaca (2004), Cetinkaya (2005) and Serra & Viñas (2004). They concluded that agricultural workers are relatively at high risk for infection with brucellosis.

Risk factors associated with Human brucellosis
Possible risk factors for infection with brucellosis are summarized in table 2. The results in the table showed that consumption of raw milk and handling of abortion materials were the most frequent risk factors that the study subjects have been exposed to.

The risk factors reported in the present study are in agreement with those of Huber &Nicoletti (1986) and Zowghi et al., (1992), who concluded that consumption of raw milk poses potential hazard for human health, particularly for transmission of brucellae

Table 2: Risk factors for human infection with brucellosis

Risk factors	No.	%	+ve
Consumption of raw milk	163	92.6	20(12.3%)
Hand abrasions	77	43.8	20(13.1%)
Handling of placentas and aborted fetuses	158	89.8	18(11.4)

The financial cost of human brucellosis
The financial cost of human brucellosis consists of the cost of transport, clinical examination,

Table 3: The Financial Cost of Human Brucellosis (US$)

Description	Cost/ patient	Total cost	%
Transport cost	12	48	25
Examination cost	20	80	42
Diagnosis cost	6	24	12
Medication cost	10.1	40.4	21
Total cost	48.1	192.4	100

laboratory diagnosis and the cost of treatment. Table 3: displays these costs per patient as well as to all infected individuals.

Conclusion
It was concluded that in addition to the public health hazard, brucellosis in Kuku dairy scheme exerts an extra cost burden to the farmers which justifies adoption of control strategy to mitigate such burden.

Volume : 4 | Issue : 8 | August 2014 | ISSN - 2249-555X

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