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Knowledge, Attitude and Practices towards Brucellosis among Pastoral Community in Kenya, 2013

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Abstract:

Background: Brucellosis is a global zoonotic disease and a major public and animal health problem in many parts of the world, particularly in pastoral set up where livestock is a major source of livelihood and food. Effective prevention and control of brucellosis depends on knowledge, attitude and practices of the community. This study aimed to assess the knowledge, attitudes and practices related to brucellosis among pastoralists in Garissa.

Methods: The study was based on a cross-sectional study design, using a multistage sampling technique and a structured questionnaire was administered using a face-to-face interview to farmers aged 15 years and above.

Results: A total of 120 pastoralists were interviewed of which 90 (75%) were male; median age was 16 years (Range: 15 – 70 years); 102 (85%) were aged below 35 years and 95 (79%) had heard of brucellosis. Among those aware of brucellosis, 17 (18%) mentioned bacteria/germ as cause and 44 (46%) were informed through community health workers. Abortion was mentioned by 56 (59%) of respondents as main clinical sign of brucellosis in animals. Sixty-seven (71%) knew brucellosis as zoonotic disease of which 55 (82%) mentioned drinking of raw milk as main route of transmission. Fever was mentioned by 71 (75%) as main clinical symptom. Regarding attitudes and perceptions, 13 (14%) knew that brucellosis could be prevented in animals; 33 (35%) knew that it could be treated in humans; only eight (8%) would visit a health facility if they suspected brucellosis and 44 (46%) would do nothing if they had aborting animal in their herd. Regarding practices, 91 (96%) consumed raw milk in the past year; 72 (76%) assisted an animal during the birthing process of which 61 (75%) disposed fetal materials by dumping; and 34 (36%) participated in slaughtering an animal.

Conclusions: The study indicates that brucellosis remains a major public health problem among the pastoralists in this area. Though the community has fair knowledge on brucellosis, attitudes, perceptions and practices are poor. The study highlights the importance of increased provision of information about knowledge, attitude and practices regarding brucellosis in this area as one of the major strategies in prevention and control of brucellosis.

Keywords: Knowledge, attitude, practice, pastoralism, brucellosis

1. Introduction

Brucellosis remains amongst the most normally disregarded zoonotic diseases worldwide [1, 2]. The true incidence of Brucellosis in human and animals worldwide is obscure and the occurrence is expanding in low and middle income nations like Kenya [3, 4]. The bacterial pathogen is considered by US Centers for Disease Control and Prevention (CDC) as a category (B) pathogen that has potential for improvement as a bio-terrorism weapon with a capability of airborne transmission [5].

In animals, Brucellosis is thought to be a group or herd issue spread inside of the herd fundamentally by ingestion of contaminated materials. Venereal infection can likewise happen, primarily with *B. suis*. Congenital (in utero) or perinatal infection might likewise happen often resulting into latent infection. Spread between herds normally happens by introduction of asymptomatic chronically sick animals. Initial infection in female animals results in abortion and in long term, delayed or permanent infertility. The disease is considered chronic and infected animals continue to shed *Brucella* organisms following abortions, after subsequent parturitions and also in milk and colostrum [6].

Human transmission occurs through breaks in the skin following direct contact with contaminated animal tissues like blood, urine, vaginal discharges, aborted fetuses or placentas. Foodborne transmission occurs more often from consumption of raw milk and raw

milk products like cheese and yoghurt. However once in a while eating raw meat from infected animals may result into infection. Brucellosis is considered an occupational hazard and airborne transmission has been documented among personnel working in laboratories and among abattoir workers. Accidental inoculation with live vaccine (such as *B. abortus* Strain 19 and *B. melitensis* Rev.1) can likewise happen. Cases of venereal and congenital infections are also known to occur in humans [7, 8]. Incubation period following infection with Brucellosis in human varies from few days to several years. This is followed by clinical signs and symptoms mostly characterized by intermittent or undulant fever, headaches, weakness, profuse sweating, chills, depression and weight loss [9]. Brucellosis represents various difficulties in designing effective prevention and control programs. This is primarily due to the chronic or asymptomatic nature of the disease in both animals and humans, varied incubation period and often lack of laboratory confirmation [10, 11]. In pastoral communities where brucellosis is of most prominent significance due to close interaction between the pastoralists and their animals, population of animals in such set up are usually ill defined or unknown [10]. In Kenya, brucellosis is endemic in several parts of the country and evidence exists of increasing incidence and prevalence in both human and animals especially in pastoral areas in Kenya [12, 13]. Given that infected animals are the source of human infection, the increasing prevalence of human brucellosis probably reflects a similar trend in domestic animals. Due to nomadic pastoral lifestyle of the study community there is frequent mixing of animals on common grazing grounds or at water sources ensures maintenance of infection within and between herds. The eating habits and lifestyle of pastoralist also enhance transmission of brucellosis in humans thus making control of brucellosis both in livestock and humans challenging [14, 15]. Effective brucellosis control programs depends on understanding of prevalence, geographical distribution, risk factors for transmission and knowledge, attitude and practices of livestock owners [14]. Limited information is available on knowledge, attitude and practices of livestock farmers in this set up. This study aimed at assessing the knowledge, attitude and practices of sheep and goat farmers and owners in Garissa district in order to provide evidence based information geared towards prevention and control of brucellosis both in animals and humans.

2. Methods

2.1. Study Area and Population

The study was conducted in the pastoral County of Garissa which is low lying with altitudes ranging between 70m and 400m above sea level. The county is generally semi-arid and receives annual rainfall of between 150mm and 300mm. The communities in this region derive their livelihoods by selling livestock and livestock products and by product, and recently they have started growing food crops especially along river Tana which traverses the County. The rainfall in this area is unreliable and main sources of water for both livestock and humans are mainly permanent water points like bore holes, dams and seasonal shallow wells. The temperatures in the county are high ranging from 20°C to 38°C [16]. Human population is estimated as 623,060 and combined sheep and goat population is 1,322,457 animals [17].

2.2. Sampling Procedure and Sample Size Determination

Between October and November 2013, a cross sectional survey was conducted in randomly selected households located in 36 sub-locations of Garissa district to assess the knowledge and perception of the communities about brucellosis. With the help of the Local national government administrators, local elders, community animal health workers and veterinary office, the research obtained a list of households from all the sub-locations with estimated numbers of sheep and goats owned by each household. The primary sampling unit was the sheep and goats herds and the household lists acted as proxy for the number of herds in each sub-location. Due to logistic issues, a third of the sub-locations (12 sub-locations) from the 36 listed were selected using simple random sampling technique. Number of herds to sample in each sub-location was randomly selected proportionate to the number of herds in each sub-location. Once the number of herds per sub-location was determined, a systematic random sampling technique was used to select herds within each sub-location for sampling using the generated livestock owners list as a sampling frame. Study eligibility was based on willingness to be interviewed and being more than or equal to 15 years. Any livestock owner or representative not meeting any of the criteria was replaced with another farmer or representative from the sub-location list until the desired sample size in each sub-location was achieved. Sample size was estimated at 114 herds using a 16% herd prevalence of brucellosis in goats in Kajiado County [13], a 10% level of precision of the estimate, a design effect of 2 due to multi-stage sampling technique employed. Thrusfield formula for simple random sampling was employed [18].

2.3. Data Management

Information on knowledge about brucellosis which included awareness of brucellosis, sources of information on awareness, causes, awareness of brucellosis as a zoonotic disease, mode of transmission in both animals and humans, signs and symptoms in animals and human and prevention and control measures in animals and treatment in humans. Information collected on attitude and perceptions included attitude and perception on seriousness of brucellosis in human and animals, attitude towards prevention of brucellosis in animals and treatment in humans, attitude towards aborting animals and attitude and perceptions when someone suspects to have brucellosis. Information on practices included consumption of raw milk or milk products made from raw milk, participation in slaughtering or butchering an animal, assisting an animal during birth or removal of retained placenta or abortion and method of dumping of foetal materials after birth or abortion. Information on the socio-demographic characteristics of the participants was also included in the questionnaire. The questionnaire was translated from the original English version into the local language (Somali) and back translated to English by independent persons to ensure consistency, clarity and socio-cultural acceptability in the community.

During pre-testing, additional information was gathered and some of the questions were modified. The participants were interviewed in their local language by the principal investigator and trained research assistant. We entered and cleaned the data using Microsoft Excel 2010 (Microsoft, Seattle, WA, USA), and analyzed using Epi Info version 7 (CDC, Atlanta, GA, USA) and Microsoft Excel 2010. We calculated proportions for categorical variables and means and medians for continuous variables.

2.4. Ethical Issues

The study protocol approval was sought and obtained from Board of post graduate studies of Jomo Kenyatta University of Agriculture and Technology (JKUAT) and ethical clearance was sought and obtained from Kenyatta National Hospital/University of Nairobi-Ethics & Research Committee (KNH-UoN ERC). The study objective was explained to participants in their local language (Somali) and informed oral or written consent was obtained from each study participant who agreed to participate. Each participant was interviewed independently and measures were taken to assure collected data were properly stored, secured and confidentiality maintained.

3. Results

3.1. Socio-Demographic Characteristics of Participants

A total of 120 participants were interviewed to assess their knowledge, attitude and practices towards Brucellosis. The median age of the study participants was 16 years (Range: 15 – 70 years), with 102 (85%) aged below 35 years. There were 90 (75%) males; and 92 (77%) had no formal education. In regard to primary role of the study participants in management of the herd, 58 (48%) were herd owner, 38 (32%) were herders and 24 (20%) were involved mostly in milking animals in the herd. Eighty-three (69%) of the participants were married and 37 (31%) were single (Table 1).

3.2. Awareness and Cause of Brucellosis in Animals and Humans

Among the study participants, 95 (79%) had heard of brucellosis, 17 (18%) mentioned germs/bacteria as the cause of brucellosis, 38 (40%) did not know the cause, 14 (15%) mentioned food, and 13 (14%) mentioned water and wild animals. Among those who had heard of brucellosis, 44 (46%) was through community health workers, 19 (20%) from a family member, 19 (20%) religious leaders, eight (8%) from veterinary staff and five (5%) from local FM stations (Table 2).

3.3. Knowledge of Respondents' about the Animals Affected and Signs/Symptoms of Brucellosis in Animals

In regard to animal species affected by brucellosis, 62 (65%) mentioned goats, 47 (49%) sheep, 45 (47%) cattle and 32 (34%) camels. Fifty-six (59%) of respondents mentioned abortion as most common sign, 21 (22%) mentioned retained placenta, 20 (21%) swollen joints or hygroma and 11 (12%) mentioned mastitis or swollen udder and teats (Table 3).

3.4. Knowledge of Respondents on Modes of Transmission of Brucellosis to Humans

Concerning brucellosis being zoonotic disease, 67 (71%) of the respondents knew of this. Among these, 55 (82%) mentioned drinking raw milk as most common mode of transmission of brucellosis from animals to humans, followed by eating milk products from raw milk mentioned by 27 (41%) respondents. The least mode of transmission of brucellosis from animals to humans was slaughtering animals mentioned by 17 (26%) respondents (Figure 1).

3.5. Knowledge of Respondents on Signs/Symptoms of Brucellosis in Humans

Forty-six (48%) of the respondents knew a family member who had been diagnosed with brucellosis in the past, 43 (45%) knew somebody who is not a family member who had been diagnosed with Brucellosis and 38 (40%) respondents had themselves been diagnosed with brucellosis in the past. Concerning signs and symptoms in humans, 71 (75%) of respondents mentioned fever, 56 (59%) joint pains, 48 (51%) muscle pains, 45 (47%) loss of appetite and 38 (40%) chills (Table 4).

3.6. Respondents' Attitude/Perception towards Brucellosis

A total of 63 (67%) of the respondents thought that brucellosis is a serious disease in animals whereas 61 (64%) thought that it is a serious disease in human. Only 13 (14%) respondents thought that brucellosis can be prevented in animals. Among these, six (46%) mentioned vaccination, four (39%) contacting veterinary office and three (31%) isolation of sick/aborting animals. In regard to treatment of brucellosis in humans, 33 (35%) thought that brucellosis in human can be treated/cured. Out of these, 14 (42%) mentioned visiting a health facility, eight (24%) seeking divine intervention (prayers), six (18%) consuming herbal medicine and five (15%) would purchase medicine from a local chemist. When confronted with an aborting animal in the herd, 44 (46%) will do nothing, 16 (17%) would treat the animal with antibiotics, 11 (12%) will sell the aborting animal, 10 (11%) will consult veterinary office for advise, eight (8%) will isolate the animal from the herd and five (5%) will slaughter the animal (Table 5).

3.7. Respondents' Self-Reported Practices' towards Brucellosis

Regarding practices towards Brucellosis, a total of 91 (96%) of the respondents consumed raw milk in the past year, 72 (76%) assisted an animal during birthing process or abortion or removal of retained placenta, 46 (48%) introduced new animals into sheep and goat herd, 34 (36%) participated in slaughtering/butchering an animal, 30 (34%) lend their male animals to other farmers for breeding and

13 (14%) consumed milk products processed from raw milk and. Among those who assisted an animal during the birthing process, 61 (75%) disposed of fetal material by dumping and none used any protective clothing (Table 6).

3.8. Sources on More Information on Brucellosis

A total of 92 (97%) of the respondents believed that they were not sufficiently informed about brucellosis and required more information on brucellosis. The most favored mode of receiving information on brucellosis was through the local FM radio stations mentioned by 36 (39%) of respondents, 23 (25%) favored religious leaders, 18 (20%) local community meetings (barazas) and 15 (16%) community health workers/community animal health workers (Figure 2).

4. Discussion

The results of this community-based cross-sectional study showed that Brucellosis is known by the general community in the present study area, since more than three quarters of the study respondents had heard of Brucellosis. This is similar to findings of previous studies done in Uganda among pastoral communities living along lake Mburo; in Egypt among cattle and Buffalo farmers in a village in Nile Delta region and among small ruminant farmers in the peri-urban areas of Dushanbe Tajikistan in which 99.3%, 83.2% and 57% of the respondents' had heard of Brucellosis. However, the awareness of Brucellosis among study participants in Uganda and Egypt were higher compared to our study but that in Tajikistan was lower [19-21]. In contrast to this finding, a study done among small-scale dairy farmers in an urban and peri-urban area of Tajikistan and another one done among urban and peri-urban dairy and non-dairy farming households in Kenya found that most respondents had not heard of Brucellosis. In the Kenyan study, 30% of dairy respondents and 22% of non-dairy respondents knew of the existence of brucellosis whereas in Tajikistan 85% of the respondents had never heard of brucellosis [22, 23]. Perhaps an explanation as to why the pastoral community are more aware of Brucellosis compared to farmers in urban or peri-urban areas could be due to their close proximity and interaction with animals resulting into in-built indigenous knowledge over years which is subsequently passed down from one generation to the next. Despite a higher proportion of the study participants had heard about Brucellosis, majority had little or no knowledge about the cause of the disease. Less than a fifth of the participants correctly mentioned germ/bacteria as cause of brucellosis. Poor knowledge regarding etiology of brucellosis could negatively impact on respondents' preventive and control methods of Brucellosis in both humans and animals due to misconception on the cause.

The main sources of information on Brucellosis in this study area was community health workers (CHWs) followed by family members. Contrary to this finding, the study in Uganda and the two studies in Tajikistan found main source of information to be from friends/relatives [19, 21, 22]. Few participants in the current study mentioned mass media (radio/TV) as a source of information about Brucellosis, which was similar to the studies in Uganda and Tajikistan. This findings implies the powerful role the community health volunteers play in terms of relaying important health messages to nomadic pastoralists in this area who in most circumstances have challenges in accessing basic health care services. Deliberate moves should therefore be undertaken to incorporate the two in all aspects of health care education for the pastoralists.

Based on results of this study, the respondents' had basic knowledge about the animal species affected and signs/symptoms of brucellosis in animals. In this regard, about two thirds mentioned goats, close to a half sheep and cattle, and majority were not aware that camels could be affected. This findings contrast with the findings of studies in Tajikistan [22] where 82% of respondents knew that cattle, sheep and goats could be affected and the study in Egypt [20] in which 98.1% mentioned cattle, 86% sheep and 85% goats. However, our study was fairly in agreement with another study in Tajikistan [21] in which two thirds mentioned that all animals could be affected. With regards to clinical signs of Brucellosis in animals, more than half of the respondents mentioned abortion as the major clinical sign. This finding was in agreement with findings of a study done among pastoralists in Kaduna state in Nigeria and the study in Egypt in which 94.4% and 59.5% of respondents mentioned abortion as the major clinical sign [20, 24]. However our finding was different from that done in Tajikistan where only 11% of respondents' mentioned abortion as a clinical signs of Brucellosis in animals [21]. Knowledge of the animal species affected and signs/symptoms of brucellosis in animals are crucial because it positively impacts on farmers' practices towards prevention and control measures of brucellosis in both animals and humans.

More than two third of our study participants knew that Brucellosis is a zoonotic disease, findings which were similar to those in previous studies conducted in Tajikistan, Egypt, Nigeria and Uganda [20-22, 25]. However, our findings contrasted those of studies done in Ghana and Nigeria which found very low awareness of zoonotic nature of Brucellosis [24, 26]. In our study, among those who were aware of the zoonotic nature of Brucellosis, consumption of raw milk and raw milk products and handling of aborted fetuses were the top most modes of transmission of Brucellosis from animals to humans. The respondents' response regarding consumption of milk as a mode of transmission was comparable to findings in Egypt and Uganda [19, 20]. However in the current study, the respondents' had low awareness on other modes of transmission such as handling of aborted fetuses and fetal membranes, consumption of raw or undercooked meat, assisting animals during parturition and slaughtering animals; most of which have been identified in many studies as major risk factors for transmission of Brucellosis from animals to humans [27, 28]. Such low knowledge on mode of transmission of Brucellosis from animals to humans have been documented elsewhere [21, 24, 26]. Good knowledge of mode of transmission of Brucellosis from animals to humans has been shown to have a protective effect towards human infection as shown in a hospital based matched case control study done in Kyrgyzstan [29].

In the current study, the majority of the study participants identified fever, joint pains and muscle pains in that order as the major signs and symptoms of Brucellosis. This was consistent with the findings of a previous study in Kyrgyzstan where fever and joint pain (locally known as "Tajik") were mentioned as main signs and symptoms of Brucellosis in humans [21] as well as a study in Nigeria

where all respondents knew signs and symptoms of Brucellosis in humans [25]. However, the finding of the current study is different from the results of previous studies conducted in other parts of Nigeria and in Ghana [24, 26] where almost all participants were not aware of signs and symptoms of Brucellosis in humans. The respondents' basic knowledge about the signs and symptoms of Brucellosis in humans could have significant impact if the community knowledge is enhanced thus reducing diagnosis and treatment delay which in the long run will prevent sequelae and prolonged human suffering.

The present study showed that a considerable proportion of the study respondents perceived that Brucellosis was a serious disease in both animals and humans. However, despite this high perception of risk, most respondents' had unfavorable attitude towards prevention of Brucellosis in animals and treatment of Brucellosis in suspected humans. Regarding respondents' opinion on actions most would take when confronted with an aborting animal in their herd, majority would do nothing about it whereas others would attempt treating the animal with antibiotics or sell the animal. Very few mentioned isolation of the animal or seeking veterinary services. Failure to isolate suspected animals has been cited as one of the major risk factors for transmission of Brucellosis within and between herds as susceptible animals can become infected through contact with infected animals aborted tissues or consumption of pasture or water contaminated with aborted materials [30]. Frequent migration of pastoralists with their animals increases the chances of different herds coming into contact with other potentially infected herds thus spreading diseases [31, 32]. This is more important when considering the high levels of infectiousness of *Brucella* species making practices such as sharing grazing land and drinking water points by pastoral communities a major transmission pathway of Brucellosis between different herds [33-35]

The study participants indicated that the communities in the present study area are engaged in risky practices that could expose them to infection with Brucellosis. Nearly all respondents consumed raw milk, about three quarter assisted animals during abortions or parturition and handled aborted materials/fetal membranes and a third participated in slaughtering or butchering an animal. Of those who assisted aborting animals, three quarter dumped the aborted materials and none used any protective clothing. Such risky practices have been shown to be important risk factors for Brucellosis transmission to human [12, 27, 28, 36, 37]. Female animals infected with *Brucella* spp. excrete high concentrations of the organism in their milk, placental membranes and aborted fetuses [6, 30]. Goats have also been shown to have prolonged secretion of *Brucella* organisms in milk compared to sheep [38]. Furthermore, *Brucella* species have been shown to survive in aborted fetuses, manure and water for periods of up to 150 to 240 days [39]. Therefore, there is a high risk of transmission of the pathogen between animals and from animals to humans through direct contact with contaminated materials such as fetal membranes, aborted fetuses, manure and other animal products. Introduction of new animals into the herd without quarantine and borrowing or lending breeding males to other farmers or even taking a female to be served at a neighbor's farm have been identified as major risk factors for transmission of Brucellosis within and between herds as shown in studies in several places [40-46].

5. Limitations of the study

Although the present study provides important information on the knowledge, attitude and perception of the pastoralists in Garissa district, it has limitations. The major limitation of the study was the small sample size which could affect the power of the study and external validity of the findings making it impossible to generalize findings even to the whole of Garissa district except the villages which were included in the study. Self-reporting on practices by the respondents was also subject to recall bias and the face-to-face-interview situation, while enabling full response rates on all variables as well as participation of livestock keepers most of whom were illiterate, might have additionally enhanced this type of bias in assessing attitudes and behaviors.

6. Conclusion

The results of this study revealed that pastoralists in the study area had low level of knowledge about the causative agent but some moderate knowledge on the main symptoms of Brucellosis in animals and human. In addition, the study showed moderate level of overall knowledge, unfavorable attitude and poor practices towards Brucellosis. At present, there is no officially coordinated program for control of brucellosis in Kenya. Understanding of the knowledge, perceptions and practices have been defined as important pillars regarding the feasibility and the acceptability of potential measures that might be instituted. Enhanced public health education on the cause, symptoms and mode of transmission of Brucellosis would be important towards the prevention and control of Brucellosis in the present study area. This can be achieved by targeted messages in local FM radios and integrating the community health volunteers in control and prevention efforts. However for effective control of Brucellosis in the present study area, an integrated approach should be promoted that takes into account the relationship between humans, animals and environment in the context of "One Health approach".

6.1. Competing Interests

The authors declare that they have no competing interests.

6.2. Acknowledgements

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Annexure

Variable	Frequency n (%)
Age group	
15-24	53 (44)
25-34	49 (41)
35-44	14 (12)
>45	4 (3)
Gender	
Male	90 (75)
Female	30 (25)
Education level	
None	92 (77)
Lower primary	25 (21)
Upper primary	3 (2)
Primary role in Herd	
Herd owner	58 (48)
Herding	38 (32)
Milking	24 (20)
Marital status	
Married	83 (69)
Single	37 (31)

Table 1: Distribution of demographic characteristics of respondents in Brucellosis knowledge, attitude and practices assessment, Garissa 2013 (n=120)

Variable	Frequency n (%)
Heard of Brucellosis*	
Yes	95 (79)
No	25 (21)
Cause of Brucellosis	
Don't know	38 (40)
Bacteria/germs	17 (18)
Food	14 (15)
Wild animals	13 (14)
Water	13 (14)
Source of information on Brucellosis	
Community Health Workers	44 (46)
Relatives/family member	19 (20)
Religious leaders	19 (20)
Veterinary staff	8 (9)
Local FM stations/media	5 (5)

Table 2: Distribution of responses of participants on awareness, cause and source of information on brucellosis, Garissa 2013 (n= 95) * Subsequent analysis based on those who had heard of Brucellosis

Variable	Frequency n (%)
Animal species affected*	
Goats	62 (65)
Sheep	47 (49)
Cattle	45 (47)
Camels	32 (34)
Signs and symptoms of brucellosis*	
Abortions	56 (59)
Retained Placenta	21 (22)
Hygroma/Swollen joints	20 (21)
Swollen udder/Mastitis	11 (12)

Table 3: Responses of participants on animal species affected by brucellosis and signs and symptoms of brucellosis in animals, Garissa 2013 (n= 95) *Multiple responses were permitted

Variable	Frequency n (%)
Brucellosis diagnosis	
Family member diagnosed with Brucellosis in the past	46 (48)
Person not family member/relative diagnosed with Brucellosis	43 (45)
Respondent diagnosed with Brucellosis in the past	38 (40)
Signs and symptoms*	
Fever	71 (75)
Joint pains	56 (59)
Muscle pains	48 (51)
Loss of appetite	45 (47)
Chills	38 (40)
Headache	37 (39)
Night sweat	33 (35)
Fatigue	29 (31)
Malaise	29 (31)
Vomiting	14 (15)
Painful scrotum in men	14 (15)
Diarrhoea	12 (13)
Blurred vision	9 (10)
Miscarriage in women	7 (8)
Nausea	4 (5)

Table 4: Responses of participants on Brucellosis diagnosis and signs and symptoms in humans, Garissa 2013 (n= 95)
*Multiple responses were permitted

Attitudes and perceptions	Frequency n (%)
Attitude and Perception on Brucellosis seriousness	
Serious Disease in Animals	64 (67)
Serious Disease in Humans	61 (64)
Attitude and perception towards brucellosis prevention in animals	
Brucellosis can be prevented in animals	13 (14)
Prevention by vaccination	6 (46)
Prevention by contacting veterinary office	4 (31)
Prevention by isolation of sick and aborting animals	3 (23)
Attitude and perceptions towards suspected human brucellosis	
Brucellosis can be cured in humans	33 (35)
Seek Prayers	14 (42)
Visit health facility	8 (24)
Consuming herbal medicine	6 (18)
Visit local chemist and purchase medicine	5 (15)
Attitude and perceptions towards aborting animals	
Do nothing	44 (46)
Treat aborting animals with antibiotics	16 (17)
Sell the animal	11 (12)
Inform veterinary office	10 (11)
Isolate the animal	8 (8)
Slaughter the animal	5 (5)

Table 5: Responses of participants on attitude and perceptions towards Brucellosis, Garissa 2013 (n= 95)

Practices of Respondents	Frequency n (%)
Consumption of raw milk	91 (96)
Assisted an animal during birthing/abortion/removal of retained placenta	72 (76)
Disposal of fetal materials	
Dumping	61 (75)
Burning	11 (25)
Burying	0 (0)
Use protective clothing	0 (0)
Participation in slaughtering/butchering an animal	34 (36)
Introduction of new animals into sheep and goat herd	46 (48)
Quarantine new animals	0 (0)
Lend male animals to other sheep and goat herds for breeding	30 (32)
Processing of raw milk products	13 (14)

Table 6: Responses of participants on practices towards Brucellosis, Garissa 2013 (n= 95)

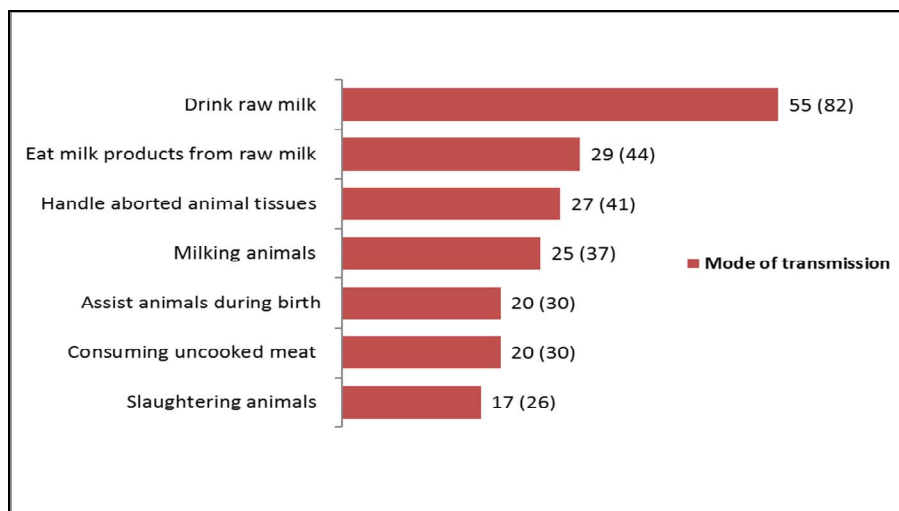


Figure 1: Responses of participants on mode of transmission of Brucellosis in humans, Garissa 2013 (n= 67)

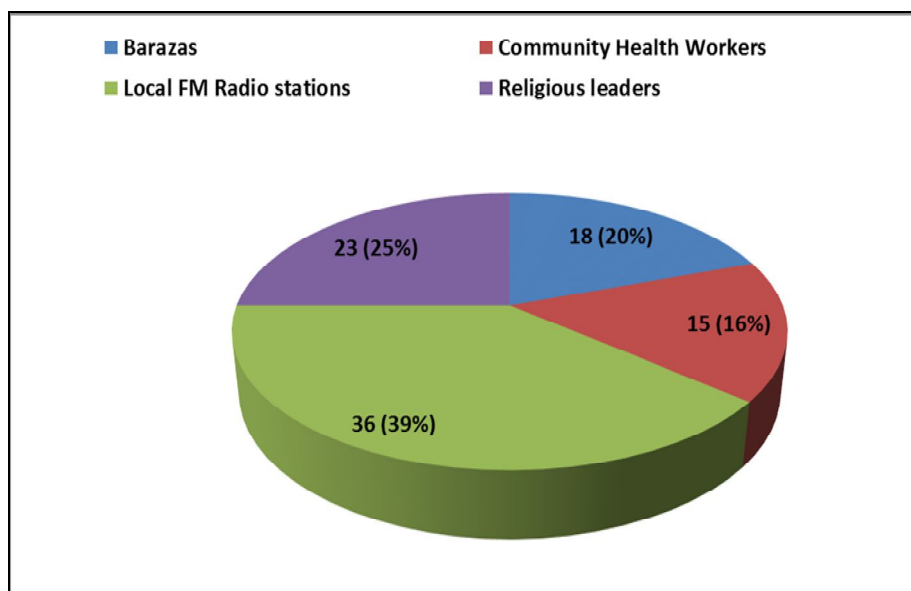


Figure 2: Responses of participants on practices towards Brucellosis, Garissa 2013 (n= 95)