Knowledge, Attitude and Practices towards Paratuberculosis in Cattle and Sheep in Kericho County and Konoin Sub-County, Kenya

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ABSTRACT

A study was carried out to determine the knowledge, attitude and practices towards bovine and ovine paratuberculosis by farmers in Kericho County, Kenya. Semi-structured questionnaires were administered to 423 randomly selected households. Veterinary, medical and veterinary laboratory personnel in the County, and the national Director of Veterinary Services (DVS) were interviewed. Data was also obtained from seven Focus Group Discussion (FGD) conducted in the study area. The data was managed in such a way as to segregate the information on the knowledge, attitudes and practices towards paratuberculosis. The results were presented descriptively. The residents were predominantly of the Kipsigis community (96.1%) who practised mixed subsistence farming. Most (98.6%) of the cattle were reared for milk whereas the sheep (77.7%) were bred for sale. Resulst from the FGD and farmers revealed lack of knowledge of paratuberculosis as a disease of cattle or sheep and there was no local name for it. The veterinary personnel based diagnosis of the disease on laboratory examination, clinical and post mortem signs. The medical personnel did not associate the Mycobacterium avium paratuberculosis with any human disease and paratuberculosis was not among the top ten most reported diseases in Kenya by the DVS, due to unreliable diagnosis. Most farmers (55.7%) did nothing to their animals which had diarrhoea and only 3.7% sought assistance from veterinary personnel. Most farmers (98.6%) fed their animals on grass pastures and 72.8% left faecal materials from the livestock in the pastures. All lambs suckled their dams and during milking, 91.6% of the farmers allowed the calves to suckle. The key result of this study show that paratuberculosis is a poorly known disease in Kericho County and the farmers inadvertently exacerbate infection and spread of the disease by their attitude and practices. Definitive diagnosis should be carried out and extension services, together with best practices, implemented in order to manage paratuberculosis.

Key words: Paratuberculosis, knowledge, attitude, practices, Kenya

INTRODUCTION

Kericho County and Konoin Sub-County is a high potential highland in the southern part of the Rift Valley inhabited mostly by the Kipsigis Community which forms about 95% of the population (KNBS, 2010). The Kipsigis practise mixed farming of both crops and livestock. Of the livestock enterprises in the study area, dairy cattle are the most valued and milk is a favourite drink (DLPO, 2010). Sheep are reared together with the cattle and are regarded as sources of meat or disposable assets (ASDSP, 2014).

There has been a gradual increase in the number of suspected cases of paratuberculosis in the region including and surrounding Kericho County since the first case was diagnosed at the

Regional Veterinary Investigation Laboratory (RVIL) Kericho in 1976 (RVIL, 1977; RVIL, 2011). Paratuberculosis, also known as Johne's Disease, is a chronic, debilitating and incurable disease of ruminants caused by *Mycobacterium avium* subspecies *paratuberculosis* (MAP). The bacterium is shed in milk, colostrum (Streeter *et al*., 1995) and faeces of infected animals (Kreeger, 1991). It is a virtually neglected disease in Kenya yet it is slowly decimating livestock and probably wildlife.

Diagnosis of paratuberculosis in Kenya is mostly carried out by Ziehl Neelsen (ZN) staining which has low sensitivity, hence giving rise to many false negative results. Due to the persistent diarrhoea and unthriftiness associated with the disease, unsuspecting farmers tend to treat against helminthosis, gastroenteritis or nutritional diarrhoea (ingestion of lush pasture) without success. Paratuberculosis has the potential of causing significant losses to the livestock industry in the region in terms of losses in milk production in cattle, wool and mutton in sheep and reproduction in general. Losses are also incurred in cost of veterinary treatment due to uncertain diagnosis and chronic nature of the disease. Further, the disease is of public health concern as MAP is thought to be the aetiological agent of Crohn's Disease in humans (MacDonald, 1993) and has also emerged as an important pathogen in immune-compromised individuals, especially in HIV infections (Volberding and Sande, 2008). This study aimed at determining the knowledge levels, attitude and practices the farmers in Kericho County and Konoin Sub-County have towards paratuberculosis.

METHODOLOGY

Area of study

Kericho County and Konoin Sub-County of Bomet County, which together formed what was administratively known as Kericho District, had a human population of 758,339 in 2009 (KNBS, 2010), annual rainfall is between 1,400 mm and 2,000mm and covers an area of 2,479Km^2. The study was carried out between February and April 2015. It had 330,903 cattle and 84,905 sheep distributed in 191,237 households. Exotic cattle breeds such as Friesian, Ayrshire and Guernsey, and crosses between exotic and indigenous are reared for dairy purposes. Dorper is the most common sheep breed. Breeding is mostly by use of communal bulls or rams and artificial insemination is limited to farmers who can afford the service (ASDSP, 2014). An estimated 42.8% of the population live below poverty line (KNBS, 2010) and a larger percentage depends almost solely on subsistence mixed farming.

A sample size of 384 households was determined using the formula described by Dohoo *et al.,* (2009) but it was increased by 10% to 423 households to account for non-response and population projections from the 2009 Census. Focus Group Discussions (FGDs) were held with 6-8 key informants in animal health and resident members of communities in each of the seven Sub-Counties in the study area. Names of heads of households that kept both cattle and sheep were obtained from the FGD participants. Random selection of the required number of households was carried out from the pool of names received.

Data collection and management

The FGDs provided information about households and paratuberculosis using a checklist. Semi-structured questionnaires were administered to selected household heads to capture the knowledge, attitudes and practices towards paratuberculosis data. Private and public veterinary and medical personnel, Officer-in-charge of the regional veterinary laboratory and the Director of Veterinary Services were interviewed to provide information on the disease and farmers'

perceptions and practices. Data was stored in MS Access 2007 and analysed using MS Microsoft Excel 2007. The data was arranged in such a way as to segregate the information on the knowledge, attitudes and practices towards paratuberculosis. The results are presented descriptively in form of figures, pie charts or tables.

RESULTS

Residents in the area under study were predominantly (96.1%) of the Kipsigis Community. Most (95.7%, 405/423) respondents practiced mixed farming where livestock and crops were grown in the same farms. The average acreage owned by each household was 4.6 acres whereas the average number of animals per household was 6.66 head of cattle and 5.07 sheep. Most (98.6%) of the cattle were reared for milk whereas the sheep were bred for sale (77.7%). Both cattle and sheep in 69.2% (292/423) of the households were over 2 years old. Of the cattle, 34.2% (144/423) were lactating while 25.1% (103/423) were either pregnant or had stopped lactating. Milking was carried out manually in 91.6% of the households and calves allowed to suckle in 92.3% of the homesteads. Sheep were allowed to suckle their lambs freely. Humans were very much in contact with faecal material, drank contaminated water from ponds, pools and rivers and also drank milk from the cows, sometimes without boiling.

Knowledge about paratuberculosis from Focus Group Discussions and by farmers

None of the FGDs knew of a livestock disease called Johne's disease or paratuberculosis. However, when clinical and post-mortem signs characteristic of the disease (diarrhoea, increased appetite, gradual emaciation and thickened intestinal mucosa) were listed to them, they all confirmed that they had encountered them. When asked if the disease had a local name, they replied in the negative. In all the FGDs diarrhoea was associated with helminthosis and lush pastures. Also, diarrhoea, whether acute or chronic, was acknowledged as one of the most important conditions in livestock. The clinical signs associated with diarrhoea included reduction in body weight and condition, and lowered milk yield. It was unanimously acknowledged that some animals with diarrhoea were dull and weak while others had voracious appetite and drunk much water. In one FGD the diarrhoea in some animals was refractive to treatment and animals ended up dying. The FGDs unanimously stated that incidences of diarrhoea were more during the rainy season but there were a few cases that persisted during the dry period. East Coast Fever (ECF) was ranked the most important disease and profuse diarrhoea fifth in terms of costs and losses they caused (Table 1).

Table 1: Ranking* of cattle diseases by Focus Group Discussions per Sub-County in Kericho County and Konoin Sub-County of Bomet County

Disease	Sub-County							
	Kericho East	Kericho West	Kipkelion East	Kipkelion West	Sigowet/Soin	Buret	Konoin	Average Ranking
East Coast Fever	1	1	1	1	1	1	1	1
Foot and Mouth Disease	3	2	2	3	2	2	3	2
Mastitis	2	4	3	5	3	3	2	3
Anthrax	4	5	5	2	4	4	5	4
Profuse diarrhoea	6	7	7	4	6	5	6	5
Lumpy Skin Disease	5	3	4	10	5	8	8	6
Milk Fever	10	6	6	6	7	10	4	7
Helminthosis	8	8	8	7	8	6	7	8
Anaplasmosis	7	9	10	9	9	7	9	9
Babesiosis	9	10	9	8	10	9	10	10

*The diseases were ranked in descending order of importance from 1-10 (1-most important, 10-least important)

The FGDs also ranked diseases in sheep. Helminthosis was the most important, followed by chronic diarrhoea (Table 2).

Table 2: Ranking* of sheep diseases by Focus Group Discussions per Sub-County in Kericho County

Disease	Sub-County							
	Kericho East	Kericho West	Kipkelion East	Kipkelion West	Sigowet/Soin	Buret	Konoin	Average Ranking
Helminthosis	1	1	1	1	1	3	1	1
Chronic diarrhoea	2	5	3	4	5	2	2	2
Coughing/ Sneezing	6	6	2	2	4	1	3	3
Foot rot	3	3	5	5	3	4	5	4
Sheep ked	4	4	6	3	2	6	4	5
Eye infections	5	2	4	6	6	5	6	6

*The diseases were ranked in descending order of importance from 1-6 (1-most important, 6-least important)

Only 2.4% (10/423) of the farmers knew or had heard of a disease called Johne's disease or paratuberculosis; eight from the laboratory report and two from the field veterinary personnel. Farmers ranked East Coast Fever as the most important disease, followed by Foot and Mouth Disease, helminthosis third and profuse diarrhoea fourth (Table 3).

Table 3: Ranking* of cattle diseases by livestock farmers in Kericho County

	Rank								
Disease	1	2	3	4	5	6	7	8	9
East Coast Fever	273	58	12	2	1				
Foot and Mouth Disease	55	89	24	9	1				
Helminthosis	26	44	23	4	2				
Profuse diarrhoea	24	44	51	15	3				
Babesiosis	3	3			2	1			
Anaplasmosis	2	8	3		1	1			
Black Quarter		3	5	3				1	
Anthrax		1			1				1
Others	23	24	21	7	1	1	1		

*Farmers to ranked 1-9 (1-Most important, 9-Least important) the listed diseases according to how important they were in terms of overall losses they cost. The figures within the table are the numbers of farmers who ranked the diseases respectively. Many farmers did not know some of the diseases listed and so could not rank them. They named other diseases not on the list and ranked them too.

Farmers ranked helminthosis as the most important sheep disease, followed by diarrhoea as summarised in Table 4.

Table 4: Ranking* of sheep diseases by livestock farmers in descending order of importance

	Rank			
Disease	1	2	3	4
Helminthosis	121	15	2	
Diarrhoea	35	9		
Enterotoxaemia	4			
Anaplasmosis				1
Others	10	8	1	

*Farmers ranked 1-4 (1-Most important, 4-Least important) the listed diseases according to how important they were in terms of overall losses they cost them. The figures within the table are the numbers of farmers who ranked the diseases respectively. Many farmers did not know some of the diseases listed and so could not rank them. They named other diseases not on the list and ranked them too.

More than half of the farmers felt that diarrhoea was caused by lush pastures while just over a quarter attributed it to helminthosis. Infections accounted for 10% of the causes of diarrhoea according to the respondents (Figure 1).

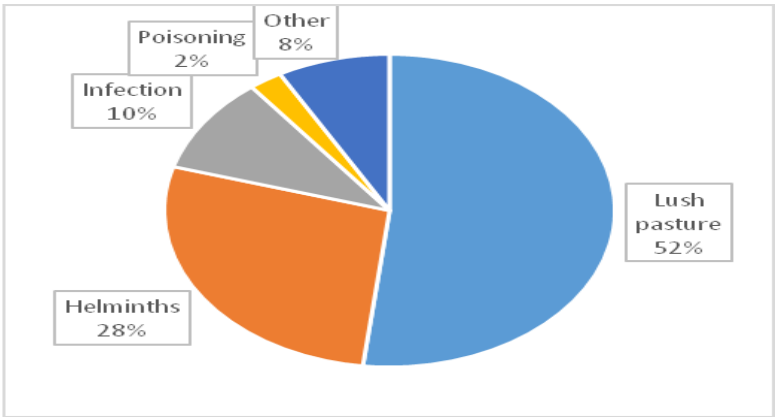

Figure 1: Causes of diarrhoea in cattle and sheep according to livestock farmers in Kericho County and Konoin Sub-County, Kenya

Attitude towards paratuberculosis from Focus Group Discussions and by farmers

Participants in the FGDs assumed that diarrhoea was caused by helminths, contaminated feed or lush pastures, and treated with anthelmintics, oral antibiotics, chemical absorbents and dry feed, respectively in that descending order of effectiveness. Farmers were largely indifferent when their animals had chronic diarrhoea as 55.7% of them did nothing and the rest carried out various interventions based on their perceptions on what the animals were suffering from. About a quarter of the farmers (24.5%) culled the animals because they did not know what the problem was, 7.7% kept on trying new drugs by trail and error, 3.7% changed the veterinary personnel handling their sick. 3.2 % thought it was worm infestation and kept changing anthelmintics, 1.7% thought it was a contagious disease and fed the sick animals separately and 0.8% turned to herbal treatment, thinking that conventional medicine had failed. Due to the indifferent attitude most farmers had, only 2.4% undertook the cost of taking samples to the veterinary laboratory.

Practices towards paratuberculosis from Focus Group Discussions and by farmers

Apart from the practices carried out by farmers based on their attitudes towards paratuberculosis, the FGD participants said farmers who opted to treat their animals would either buy drugs from veterinary chemists where they were readily available, use herbs obtained from herbalists or traditionally known, or use non-conventional methods of treatment. For instance, in one of the FGDs it was reported that some farmers treated diarrhoea by giving the affected animals, engine oil from vehicles.

Farmers grazed their animals in communal grounds and public lands (48.5%), or on the pastures in the homestead (40.1%). The rest (11.4%) practiced zero-grazing. To treat against diarrhoea, 53.6% of the farmers said they would give anthelmintics, 12.8% would change the grazing ground, 12.1% would give drier feed and 3.6% did nothing.

Only 2.2% of farmers took samples to the veterinary laboratory for diagnosis. However, 58.6% thought they knew the cause of diarrhoea from experience, 36.2% called in veterinary personnel and 1.7% did nothing about it. Only five out of 423 (1.2%) farmers carried out post mortem when their animals died from diarrhoea.

Virtually all (98.6%) the farmers fed their animals on natural grass pastures in and out of the homestead and supplemented with either Napier grass (77.6%), concentrates (73.3%), crop products like maize stocks or potato vines (39.5%), leaves from trees such as bananas (29.2%) or purchased hay or silage (8.9%). Faecal material from cattle and sheep was disposed of as summarized in Table 5. The most common fate of faecal wastes was to leave it in the pastures, followed by refurbishing of mud houses.

Table 5: Fate of faecal wastes from the livestock in homesteads in Kericho County and Konoin Sub-County

Disposal method	No. of Farmers	% of Farmers	Ranking
Left in the pastures	302	72.8	1
Refurbishing mud houses	251	60.5	2
Application to other non-pasture crops after heaping	209	50.4	3
Application to other no-pasture crops directly	136	32.8	4
Application to Napier grass after heaping	104	25.1	5
Application to Napier grass directly	103	24.8	6
Sold away	4	1	7
Other	3	0.7	8

*Farmers listed down all the fates of faecal wastes in their homesteads. The number of farmers that responded to this question was 414

Public and private veterinary personnel

According to public veterinary personnel, diarrhoea was the most common disease in sheep while in cattle, it was the fourth. It was caused either by ingestion of lush pastures, helminths or gastroenteritis. The personnel confessed that 50% of the times, they would misdiagnose paratuberculosis by clinical signs and 30% of the times when based on post mortem signs. They were unanimous that farmers had poor knowledge of Johne's Disease. The private veterinarians stated that because of the gradual and intermittent nature of paratuberculosis, farmers almost always kept on hoping that the problem of diarrhoea would resolve itself with time. According to them, profuse projectile diarrhoea was thought by farmers to be due to witchcraft or had foreign materials in the rumen which prevented digestion.

Samples were not routinely taken to the veterinary laboratory by veterinary personnel due to high transport costs and also lack of reliable diagnosis. The respondents stated that farmers almost always associated diarrhoea with either helminthosis or feeding on lush pastures. Most farmers thought that they knew the cause of diarrhoea and did not need to seek for confirmation from the laboratory or professionals. As such, the farmers managed the situation by either administering anthelmintics bought over the counter from veterinary chemists or by giving them drier feed. From the experiences of the veterinarians, it was common for farmers to allow their calves to suckle during milking until they were weaned or the cows dried. Diagnosis of paratuberculosis was obtained by private veterinary practitioners mostly from clinical signs and the histories given by animal owners. The private practitioners would send samples to the veterinary laboratory or carry out post mortem when they deemed it necessary.

Report by the County Officer-in-Charge of the Regional Veterinary Investigation Laboratory,

Johne's Disease was the fourth most reported disease at the RVIL Kericho. The average number of animals diagnosed by ZN staining of faecal samples was 11 in number per year but with a peak of 106 cases in bovine and 4 cases in sheep in 2009. Only 2% of samples brought to the laboratory were for paratuberculosis testing. Farmers brought samples to the RVIL Kericho either by instruction from their veterinary professionals or out of desperation after unsuccessful treatment.

Report by the Director of Veterinary Services at the National level

The DVS stated that paratuberculosis was not among the 10 most important animal diseases in Kenya. This was due to the fact that the methods used for diagnosis were not conclusive and also that few reports on the disease were made since there was generally poor awareness about it in the country. There were no concerted efforts towards prevention and control of the disease nationally but individual clinicians would recommend culling for animals which were suspected or found to have it. Kericho was among the top ten Counties with cases of Johne's Disease annually.

Report by Medical doctors manning public or private health facilities

Despite the fact that all the hospitals had records of persons with chronic diarrhoea, none of them had diagnosed Crohn's Disease. All the doctors reported that the patients who were received annually at the hospitals with chronic diarrhoea were mostly adults. There were no diagnostic tests in the hospitals for Crohn's Disease in the area under study. The chronic diarrhoea was said to be most common in patients suffering from HIV/AIDS and was often refractive to antibiotic treatment.

DISCUSSION

Absence of a local name for paratuberculosis is an indicator of ignorance of the disease by the communities in the area under study. This is understandable since the characteristic signs associated with the disease (OIE, 2011; CFSPH, 2017) happen to be common in several other diseases. Poor knowledge of Johne's Disease by farmers in Kericho County and Konoin Sub-County most likely plays a big impact on the spread of the disease. This was partly contributed by poor extension services, inaccurate diagnosis and under-utilization of the laboratory. The FGD participants and farmers associated diarrhoea in livestock with helminthosis but also appreciated that there was diarrhoea that was refractive to anthelmintic treatment. This lent credence to the observation that animals suffering from paratuberculosis were mistakenly treated for helminthosis (Waruiru, *et al.,* 2000; Velasova, *et al.,* 2017) and was corroborated by the information from the field and laboratory veterinary personnel. That paratuberculosis was refractive to antibiotic treatment did not make matters any better and as the farmers moved from one treatment to another in vain, the pathogens were being spread uninhibited. Animals could not be culled as recommended due to misdiagnosis, in the process, increasing the pathogen load in the environment. Lack of knowledge by the farmers had other effects in the epidemiology of the disease. It influenced the attitude that farmers had towards the disease. Majority of them were indifferent and did nothing. The chronic, gradual progression and intermittent nature of the clinical signs made the farmers think it was a transient condition and they would therefore not be alarmed. These observations agree with studies carried out by Mulder (2007) who noted that the Kipsigis are largely agro-pastoralists who generally keep large herds of animals and have the tendency of doing little to animals with mild clinical signs that did not affect their production significantly. Clinical diagnosis of paratuberculosis is as uncertain as is laboratory diagnosis (Nielsen, 2014; Chaubey, 2016). Diagnosis of the disease

was carried out by the ZN staining technique but whose sensitivity is low (Dugassa and Demisie, 2014). This effectively compounded the problem of poor knowledge about the disease by the farmers who could not be given prompt, accurate diagnosis and advise. Okuni (2013) has reviewed the occurrence of paratuberculosis in Africa and states that the disease is largely unknown in the continent due to poor knowledge of it by farmers and inefficient veterinary and extension services. The disease was perpetuated by poor or wrong animal husbandry practices. For instance, the production system whereby cattle and sheep were grazed in the pastures and the faecal material left to decompose in the same pastures was common, and this probably encouraged cross-infection among the species. Studies have shown that sheep and cattle are susceptible to strains of MAP of either species (Muskens, 2001; Fernández *et al*., 2014; Schwarz *et al*., 2017). *Mycobacterium avium paratuberculosis* has been suspected to be the causative agent of Crohn's Disease in man (El-Zaatari, *et al.,* 2001) and is thought to be zoonotic (Naser *et al.*, 2004). It has emerged as an important pathogen in immune-compromised populations (Kaplan *et al*., 2008) and is the most commonly isolated mycobacterial antigen in HIV infected individuals (Volberding and Sande, 2008). Diagnosis for Crohn's Disease was not carried out at all in the hospitals. Farmers in Kericho County may be at great risk in contracting it since 60.5% of the households used faecal material to refurbish their mud houses and heaped the manure or applied it to the crops using bare hands. Water sources such as wells, ponds and rivers were most probably contaminated by the MAP found in the farms and pastures.

CONCLUSION AND RECOMMENDATIONS

Knowledge of Johne's Disease in Kericho County was poor, to the extent that the community did not have a local name for it. This lack of knowledge partly lay in the inadequate awareness campaigns and extension services on the ground. Efforts, both locally and nationally should be put in place to improve awareness, extension services and disease control.

The attitude of farmers towards paratuberculosis was largely influenced by the fact that they had poor knowledge of the disease. They were largely indifferent and took few specific and effective measures to prevent, identify or control the disease. Misdiagnosis by both field personnel and the laboratory played a role in the way the farmers regarded the disease. The laboratory should carry out diagnostic tests with high sensitivity and specificity such as culture or PCR for paratuberculosis. According to the OIE records (OIE, 2018), paratuberculosis in Kenya is recorded as absent. This effectively relegates paratuberculosis to a neglected disease. There is need for Kenya to declare paratuberculosis as present and an important disease so as to enable more funds to be availed for managing it.

With poor knowledge of the disease, the farmers inadvertently carried out practices that exacerbated it, such as grazing the animals in pastures laden with faecal material, grazing different species of livestock together, poor hygiene, poor handling of livestock manure and allowing the calves to suckle. Drinking from water sources that could be contaminated with faecal material, manual milking and drinking un-boiled milk are potential risks of contracting Crohn's Disease. Farmers need to be informed and trained on better animal husbandry, hygiene and adopt production systems that curtail the infection and spread of Johne's Disease.

ACKNOWLEDGEMENT

We acknowledge National Commission for Science, Technology and Innovation, Kenya for partial sponsorship of the study and the Director of Veterinary Services for institutional support in sample collection and analysis.

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