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Pastoralism and the Issue of Zoonoses in Ethiopia

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Abstract
Pastoralism is a livelihood based on livestock rearing which is experienced by sedentary or mobile communities. In Ethiopia, Pastoralism is extensively practiced in almost two-thirds of the national land area. The livelihood of pastoral community of Ethiopia is mainly dependant on livestock production. Since the pastoralists have an intimate relationship with their animals, zoonotic infections, transmissible between humans and animals, are closely associated with pastoralism. Factors such as proximity to animals, food consumption behavior, problems related to contamination of milk and meat, inadequate supply of treatment drugs, harsh environmental conditions, and socioeconomic and cultural practices have exposed the pastoralists to different zoonotic diseases. The level of awareness about zoonoses in the pastoralists and also in the health professionals found in the pastoral areas of the country is low. Moreover, there is lack of diagnostic and therapeutic facilities for zoonotic diseases in the health centers and limited municipality abattoirs and hygienic milk centers. Even though zoonotic diseases are found in a significant rate in pastoral communities, there is often a general lack of focus with a subsequent failure to prioritize their control by human and animal health sectors. Therefore, integrated intervention among veterinarians, health professionals, governmental and nongovernmental bodies and the community is mandatory to effectively address the health problems. Community based programs such as health education on zoonoses, establishing diagnostic and therapeutic facilities of zoonotic diseases in the health centers and establishing municipality abattoirs and hygienic milk distributing centers is critical for zoonotic diseases control and prevention in pastoral areas of Ethiopia.
Keywords: Ethiopia, Livelihood, Livestock, Pastoralism, Zoonoses.

Introduction

Ethiopia has a great coverage of pastoral areas in which the livelihood of pastoral community is mainly dependant on livestock production (Admasu, 2003; Aweke *et al*., 2013). The pastoralists have an intimate relationship with their animals and zoonotic infections are closely associated with pastoralism (Zinsstag *et al*., 2006; Schelling *et al*., 2007).

Zoonoses are infections that are transmissible between animal and humans. These diseases have high incidence rates and cause significant morbidity and mortality cases worldwide. Zoonoses have important impacts on public health and livestock economies representing 61% of all infectious organisms known to be pathogenic to humans (Taylor *et al*., 2001).

Animals and humans are reservoirs of zoonotic infections, and the disease transmission occurs directly or indirectly between them. Infection can be transmitted directly due to contact with an infected animal host or indirectly through contact with a vector or vehicle (Acha and Szyfres, 2003). In countries that have a pastoral community, transmission of pathogens from livestock to pastoralists may occur through consumption of raw milk and meat or through obstetric work and other husbandry practices (Acha and Szyfres, 2003; Kahn, 2006).

Zoonotic diseases can be emerging, re-emerging which cause significant human morbidity and mortality that affect poor and marginalized communities in developing countries who live in close contact with animals. These diseases are under-diagnosed and underreported because no enough focus is given by clinicians as well as policy makers. Zoonotic diseases often share clinical features, particularly fever, with other more common diseases or require complex diagnostic tests to confirm their presence (WHO, 2010). Therefore, the general objective of this review is to show the association of pastoralism and zoonoses and the need for integrated collaboration between concerned sectors for control and prevention of zoonoses in the pastoral areas of Ethiopia.

Pastoralism in Ethiopia

Pastoralism is a livelihood based on livestock rearing which is experienced by sedentary or mobile communities. Nomadic pastoralism refers to an extensive form of pastoralism with a high degree of mobility. Traditional pastoral production systems of Africa can be classified as agro-pastoralism, sedentary pastoralism, semi-sedentary-pastoralism and nomadic pastoralism based on degree of mobility (Schwartz, 1993). In general, mobility is used to manage uncertainty and risks such as feed and water scarcity associated with drought and diseases in arid and semi-arid ecosystems (Admassu, 2003).

The arid climate in the lowlands of Africa is characterized by periodic droughts that are occurring frequently. The nomadic or transhumant way of life of pastoralists is the mode of production best suited to such unstable environment which enables strategic exploitation of seasonally available water sources and feed. A

significant portion of the pastoral populations are food insecure even in normal rainfall years. Environmental degradation, water scarcity, reduction in the quantity and quality of productive rangeland, inadequate animal and human health infrastructures created enormous stress on the life of traditional pastoralists. These conditions increasingly result in conflicts between groups competing over scarce resources (Admassu, 2003; Zinsstag *et al*., 2006).

In Ethiopia, pastoralism is extensively practiced in almost two-thirds of the national land area. The primary livelihood of pastoral communities is the management of livestock such as cattle, goats, sheep and camels. Livestock are critical to the well being of pastoral households in terms of income, savings, food security and employment. The sector is also important to the national economy, contributing 16% of total GDP, one-third of agricultural GDP, and 8% of export earnings. Improvements in the sector, therefore, have the potential to contribute significantly to national income and to the welfare of many poor pastoral families (Admassu, 2003).

Ethiopian pastoralist community are more than 12 million occupying 61% of the total land mass with more than 29 nationalities and ethnic groups. They inhabit land with natural resources and a wealth of cultural and traditional heritage that remains largely unexploited. Provided that livestock production is the major means of income, the pastoralists are seasonally mobile, adapted to harsh and extreme climates and are social network oriented. Human survival in these environments would be virtually impossible without livestock that provides for basic needs. The importance of livestock in these areas surpasses the mere fact of meeting basic needs, since they are traditionally seen as the basis of life, wealth and social respect. Pastoralists are geographically and socially marginalized groups, inhabiting large regions unsuitable for agriculture and infrastructural development (Thornton, *et al*., 2002; Aweke *et al*., 2013).

Pastoral livelihoods

The pastoral population of sub-Saharan Africa has been estimated at more than 50 million people (Coughenour *et al.*, 1985) while Ethiopia, Eritrea, Sudan, Djibouti, Somalia, Kenya and Uganda support around 16.5 million pastoralists (Bonfiglioli, 1992). Pastoralists in Africa tend to inhabit the semi-arid and arid regions of the continent and typically, they derive at least 50% of their food and income from their livestock (Swift, 1988). Movement is essential for pastoralists because low and erratic rainfall in dry land areas causes marked spatial and temporal variations in the grazing resource. Although criticized for many years for their apparent inefficiency and neglection of the environment, African pastoralism is increasingly viewed as a rational and productive use of a fragile environment (Mearns, 1996; Catley, 2002).

In addition to food and income producing, livestock play other social and cultural roles in pastoral communities. Livestock ownership affects wealth, status and decision making power and social events such as births, marriages and deaths often involve ceremonies which revolve around livestock. Moreover, Loans and gifts of animals are used to strengthen the mutual relationships among them (Catley, 2002).

The preferred food of all pastoral populations is milk and its products. Cereal is the most important staple food though it is not adequately produced in such areas. Meat, game and fish are added to the diet at less regular intervals. Animal products are important components of children's diet, as they provide high quality protein and are excellent sources of micronutrients (Davidson, 2002). Milk is an important source of essential elements for nomadic women and children (Zinsstag *et al*., 2002). In East Africa, pastoralists appear to be close to the lower threshold of reasonable nutritional status at most times their diet being low in energy, but adequate in protein (Galvin *et al*., 1994). Sugar has become a new important source of energy for pastoralists (Holter, 1988). Much of the research on African pastoral production has focused on problems of drought and economic development in which the health aspect is neglected (Fratkin *et al*., 1994; Zinsstag *et al*., 2002).

The issue of zoonoses in Ethiopian pastoral areas

In developing countries, particularly Ethiopia has a great coverage of pastoral areas with inadequate veterinary and health infrastructures and facilities, low number of health professionals and less supply of medical inputs, the zoonoses issue is very critical. The livelihood of pastoral community of Ethiopia is mainly dependant on livestock production (Admasu, 2003; Aweke *et al*., 2013). Since the pastoralists have an intimate relationship with their animals, zoonotic infections, transmissible between humans and animals, are closely associated with pastoralism (Zinsstag *et al*., 2006; Schelling *et al*., 2007).

Factors such as proximity to animals, food consumption behavior, problems related to contamination of milk and meat, inadequate supply of treatment drugs, harsh environmental conditions, and socioeconomic and cultural practices have exposed the pastoralists to different zoonotic diseases (Swift *et al*., 1990; Zinsstag *et al*., 2006). Human behavior and level of education are further factors that may influence health status (Defo, 1996; MacPherson, 1994). Migration may put nomadic pastoralists at periodical risk of infection, especially around water points (Rahmann, 1996). Since the animal and human interface is very intimate and common event in the pastoral areas of Ethiopia, it is very difficult to address the health of animals and humans separately (Schelling *et al*., 2007; Zinsstag and Tanner, 2008).

The level of awareness about zoonoses in the pastoralists and also in the health professionals found in the pastoral areas of the country is very low (Angesom, 2015a). Even though the animal health assistants had better awareness about zoonoses, they did not collaborate with human health professionals to create awareness to the community. Moreover, those medical professionals who have a limited awareness on zoonotic diseases have never been diagnosed such diseases due to lack of diagnostic and therapeutic facilities in the health centers (Angesom, 2015b).

Zoonotic diseases reported in Ethiopian pastoral areas

There are many zoonotic diseases occurring in the livestock keeping communities in Ethiopia. Diseases such as bovine tuberculosis, anthrax, brucellosis, rabies, hydatidosis, toxoplasmosis, fasciolosis, sleeping sickness, rift valley fever, leptospirosis, leshmaniasis etc are commonly occurring in the pastoral community throughout the globe (WHO, 2010). In Ethiopian pastoral areas, there are zoonotic diseases reported by different researchers at different occasions. The isolation of *Mycobacterium tuberculosis* in goat suggests a potential transmission of the causative agent from human and warrants further investigation in the role of small ruminants in epidemiology of human tuberculosis in Afar region with 0.5% prevalence of small ruminant tuberculosis (Gezahegne *et al*., 2012). There is a report of 8.3% bovine tuberculosis in camels in the pastoral areas of eastern Ethiopia (Ashenafi *et al*., 2014). There is also a report of 11% prevalence of bovine tuberculosis in Afar region (Gezahegne *et al*., 2013). Another study done in bovine tuberculosis in Ethiopian Somali region showed that a prevalence of 10%, 1.9% and 0.7% in camel, goats and cattle, respectively (Gumi *et al*., 2011) and 5.5% and 7% in cattle in two districts of southern Ethiopia (Gumi *et al*., 2012).

A study done on brucellosis showed that a seroprevalnce of 5.71% in camels (Balcha and Fentie, 2011), 0.48% and 3.09% in sheep and goats, respectively in pastoral areas of Ethiopia (Tsehay *et al*., 2014). According to the study done on human brucellosis, 34.1% patients from Borana, 29.4% from Hamer, 3% from Metema tested positive in brucella IgM IgG^{-1} lateral flow assay (Genene *et al*., 2009). In addition, a seroprevalnce of 40.49% and 68.2% of camel toxoplasmosis has been reported in Fentale district of eastern Ethiopia and central Afar region of north eastern Ethiopia, respectively (Gebremedhin *et al*., 2014; Hadush *et al*., 2015).

The studies done on hydatidosis in Ethiopian pastoralist areas revealed 20.05% occurrence of hydatidosis based on the postmortem examination of cattle in eastern part of Ethiopia (Miheret *et al*., 2013), 65.47% and 23% in camels slaughtered in Addis Ababa (camels originated from Ethiopian pastoral areas) and Jigjiga manucipal abattoirs, respectively (Bayleyegn *et al*., 2013; Etana *et al*., 2014).

Current risky conditions in pastoral areas of Ethiopia

The risky conditions that thought to support spread of zoonotic diseases in these areas are common practices such as traditional husbandry and poor management practices, mixing of wild animals with farm animals and unrestricted movement and living of pastoralists together with their animals. In addition to this, consumption of raw milk and meat together with handling of sick animals and animal products with bare hand facilitates transmission of zoonotic diseases such as tuberculosis (Mengistu *et al*., 2010), brucellosis (Angesom, 2015a), hydatidosis (Dawit *et al*., 2013), toxoplasmosis (Angesom, 2015b; Hadush *et al*., 2015) etc to the pastoralists.

. In Ethiopian pastoral areas, traditional type of food animal slaughtering and selling milk and milk products in non hygienic methods are common practices which defiantly downgrade the hygiene, safeness and wholesomeness of food of animal origin. Consumption of such contaminated food which may contain biological, chemical or physical agent or hazards has the potential to cause on adverse health effect. Carcasses of dead animals remain in and around villages. This creates problems in terms of human and animal health by contaminating soil and drinking water (Philpott *et al*., 2005).

There were no adequately established municipality abattoirs generally in the pastoral areas of the country. All animals used for human consumption were slaughtered in traditional (backyard) method in the absence of professional supervision. All hotels and restaurants slaughter food animals in their home without inspection. Besides, the pastoral communities have the habit of consuming raw milk and undercooked meat. Consumption of uninspected raw or undercooked animal origin foods may favor the transmission of disease from animal to human (Acha and Szyfres, 2003; Philpott *et al*., 2005).

Awareness and practice of Ethiopian pastoral community towards zoonoses

Majority of the pastoral community have no knowledge about the major zoonotic diseases and its method of transmission to human such as tuberculosis (Mengistu *et al*., 2010; Ashenafi *et al*., 2014), brucellosis (Angesom, 2015a), toxoplasmosis (Angesom, 2015b; Hadush *et al*., 2015), hydatidosis (Dawit *et al*., 2013) etc. In addition, they live together with their animal which is the major means of transmission of zoonotic diseases through respiratory route, excreta and contact. They have pet animals such as dog and cat in their homes which are the main means of zoonotic disease transmission to humans. Majority of the community consume raw meat and unpasteurized milk, handle aborted fetus with bare hands and dispose birth or aborted materials by throwing it in

the field (Bekele *et al*., 2013; Angesom, 2015a).

Different studies on pastoralist areas showed that, majority of the community has no detailed and accurate knowledge on zoonotic importance of animal diseases. This low awareness is a limiting factor if prevention and control strategies are to be implemented and it also predisposes the community for the disease (Bekele *et al*., 2013; Angesom, 2015a). In addition, the community is highly exposed to these diseases because of high probability of acquiring the disease from different sources such as untreated water, raw meat, unpasteurized milk and handling birth materials in bare hand (Dubey, 2010; Dehkordi *et al*., 2013) which are the major means of transmission of the disease to human being.

Awareness of health professionals about zoonoses

Most of the animal health professionals have knowledge on source of infection, transmission, treatment, control and prevention of zoonotic diseases of animal origin. However, all of them had never diagnosed the disease in animals and never tried to teach the community because of lack of collaborative works and programs with the medical professionals. On the other hand, majority of the medical professionals have limited knowledge of zoonoses and none of them had ever diagnosed zoonotic diseases such as brucellosis, toxoplasmosis, hydatidosis etc in humans and the reason for the diagnosis problem was lack of facility and no attention was given to the diseases next to lack of awareness (Dawit *et al*., 2013, Angesom, 2015b).

Integrated collaboration between veterinary and other concerned sectors

The purpose of integrated collaborative intervention is to combine actions of veterinarians, health professionals, governmental and nongovernmental bodies and the community. This joint veterinary and health services helps to reach pastoralists in remote zones, address their health problems, reduce separate health costs and increase acceptance (Angesom, 2016). Single and separate approaches could not be achieved mainly due to financial constraints. If jointly employed, potential multiuse facilities, personnel and equipments of veterinary, education, human health, water and environmental services could be actively shared (Majok and Schwabe, 1996). Veterinarians and other community animal and human health workers are the most extensively distributed manpower with a higher degree of education and that they are likely to reach livestock owners in most rural areas (Ward *et al*., 1993; Majok and Schwabe, 1996).

Control of zoonoses and disease surveillance

Even though zoonotic diseases are found in a significant rate in pastoral communities, there is often a general lack of focus with a subsequent failure to prioritize their control by human and animal health sectors. These diseases affect the health and livelihood of the livestock keepers by hampering the health and productivity of livestock by causing infertility, morbidity, mortality, low milk yields and rendering inedible meat. Control of these diseases is usually possible which is best undertaken and feasible in terms of cost through the domestic animal reservoir. Control and elimination, however, may require other interventions in humans (using preventive chemotherapy or case management), increased public awareness to reduce contacts between humans and animals and modification of the environment to eliminate populations of intermediate or definitive hosts (WHO, 2010).

An expanded view of veterinary medicine towards public health issues such as zoonoses and food hygiene and safety, is defined with the term veterinary public health. These professionals may be responsible on the basis of legislation for assuring and coordinating, the control and effective surveillance in the field of major zoonoses, as well as for the safety and quality of animal foodstuffs and by products, destined either for the local market or for export to other countries. Veterinary and public health services should collaborate to address the potential health problems of the pastoral community, zoonoses, by sharing the expensive diagnostic laboratories and therapeutic facilities (Shears, 2000; Majok and Schwabe, 1996; OIE, 1995; Schelling, 2002).

Health education

Health education, especially on zoonoses (Ward *et al*., 1993), could be another branch of collaboration between veterinary and public health services. The substantial accomplishment of health education could be capitalized by public health officials if the veterinary sector could be convinced to share its acceptance and contact with nomadic pastoralists (Majok and Schwabe, 1996). The zoonoses lessons learned with the training and follow up of paraveterinarians on a large scale in most developing countries could be extended to the training programmes for community health workers (Schelling, 2002).

Conclusion

In Ethiopia, Pastoralism is extensively practiced in almost two-thirds of the national land area. The livelihood of pastoral community of Ethiopia is mainly dependant on livestock production which made the pastoralists to have an intimate relationship with their animals and zoonotic infections, transmissible between humans and animals, are closely associated with Pastoralism. Factors such as proximity to animals, food consumption behavior,

problems related to contamination of milk and meat, inadequate supply of treatment drugs, harsh environmental conditions, and socioeconomic and cultural practices have exposed the pastoralists to different zoonotic diseases. The level of awareness about zoonoses in the pastoralists and also in the human health professionals found in the pastoral areas of the country is very low. Moreover, there is lack of diagnostic and therapeutic facilities for zoonotic diseases in the health centers and limited municipality abattoirs and hygienic milk centers. Even though zoonotic diseases are found in a significant rate in pastoral communities, there is often a general lack of focus with a subsequent failure to prioritize their control by human and animal health sectors. Therefore,

- Integrated and collaborative intervention among veterinarians, health professionals, governmental and nongovernmental bodies and the community is mandatory to effectively address the health problems of the community
- Veterinary and public health services should collaborate by sharing the expensive diagnostic laboratories and therapeutic facilities for prevention and control of zoonotic diseases
- Community based programs such as health education on zoonoses, establishing diagnostic and therapeutic facilities of zoonotic diseases in the health centers and establishing municipality abattoirs and hygienic milk distributing centers is critical for zoonotic diseases control and prevention in pastoral areas of Ethiopia.

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