

Review Article

Review on Bovine, Small ruminant and Human Brucellosis in Ethiopia

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Abstract

A large number of published and unpublished research studies on Bovine, small ruminant and human Brucellosis from 2000–2017 were reviewed. Researches outside of Ethiopia also included to incorporate species of *Brucella* causing of diseases in Bovine, small ruminant and human. Risks associated with a disease also reviewed. Finally, status of the diseases in Ethiopia explained and future action recommended.

INTRODUCTION

Ethiopia is believed to have largest Livestock population in Africa, with the livestock population 53.99 million cattle, 49.56 million small ruminants, and 9.01 million equines and 50.38 million chickens [1]. Livestock industry plays an important role in the economy of the country. Human life is highly associated with livestock population in the different livestock production systems particularly in pastoral communities [2]. The threat of zoonotic diseases for human is high; of this zoonotic disease, brucellosis is the one affecting both human and livestock. In both pastoral and mixed (agro-pastoral) livestock production systems, people live closely with livestock making contact with different animal discharge and consumption of raw animal product lead to have a high incidence of brucellosis and thus, are at higher risk of acquiring the infection [3,4].

Consumption of contaminated foods and occupational contact remain the main sources of *Brucella* infection in human [5]. The disease is considered as one of the most widely spread zoonoses in the world [6]. Different studies [7,8,9,10] have indicated that brucellosis is prevalent in Ethiopia. Spread of this disease can also occurs through penetration of the intact skin and conjunctivitis, contamination of the udder during milking, grazing on infected pasture or consuming other feed with infected cows, contact with aborted fetuses and infected newborn calves [11]. According to previous studies conducted [12,13,14,15] the prevalence of human brucellosis documented was 34.9% and 10% in pastoral area of Borena (Ethiopia) and Yabello (Ethiopia) respectively. Therefore, the objective of this review is to gather fragmented information about Brucellosis in Cattle, small ruminant and human in Ethiopia (Figure 1).

REVIEW AREA

The review conducted in the east Africa, Ethiopia. Ethiopia is believed to have largest Livestock population in Africa, with the livestock population 53.99 million cattle, 49.56 million small

ruminants, about 0.92 million cows and 9.01 million equine and 50.38 million chickens [1].

ETIOLOGY, SOURCE OF INFECTION AND TRANSMISSION

Cattle brucellosis is caused by *B. abortus* causing high economic loss in many countries around the world [16,17]. It is mainly infective for cattle, but occasionally other species of animals such as sheep, swine, dogs and horses may be infected [11]. In sheep and goats, brucellosis is mainly caused by *B. melitensis*. *Brucellamelitensis* contains three biovars (biovars 1, 2 and 3). All three biovars cause disease in small ruminants, but their geographic distribution varies. In sporadic cases *B. abortus* infect small ruminant. *B. melitensis* is most commonly infects sheep and goats. Breed susceptibility is variable in sheep, but goat breeds are highly susceptible. *B. ovis* primarily affects rams [18]. *B. melitensis* causes disease primary among sheep and goats. The bacteria show a strong host preference although cross-species infections happen, particularly with *B. melitensis* [6].

The main clinical manifestations of brucellosis in cattle, sheep and goats are, as in all female reproductive failure, abortion and still birth of weak offspring. Abortion occurs as result of placentitis in adult cows between the fifth and ninth month of pregnancy, and four to five month of pregnancy in shoat. Even in the absence of abortion, profuse excretion of the organism occurs in the placenta, fetal fluids and vaginal discharges [11]. Main source of infections are ingestion of contaminated feed and premises. In addition, penetration of the intact skin and conjunctivitis and contamination of the udder during milking grazing on infected pasture or consuming other feed with infected cows/ewes and contact with aborted fetuses and infected new borne calves are the most common methods of spread [11,19]. Transmission of small ruminant brucellosis occurs in the same way in sheep and goats as in cattle, materials excreted from the female genital tract

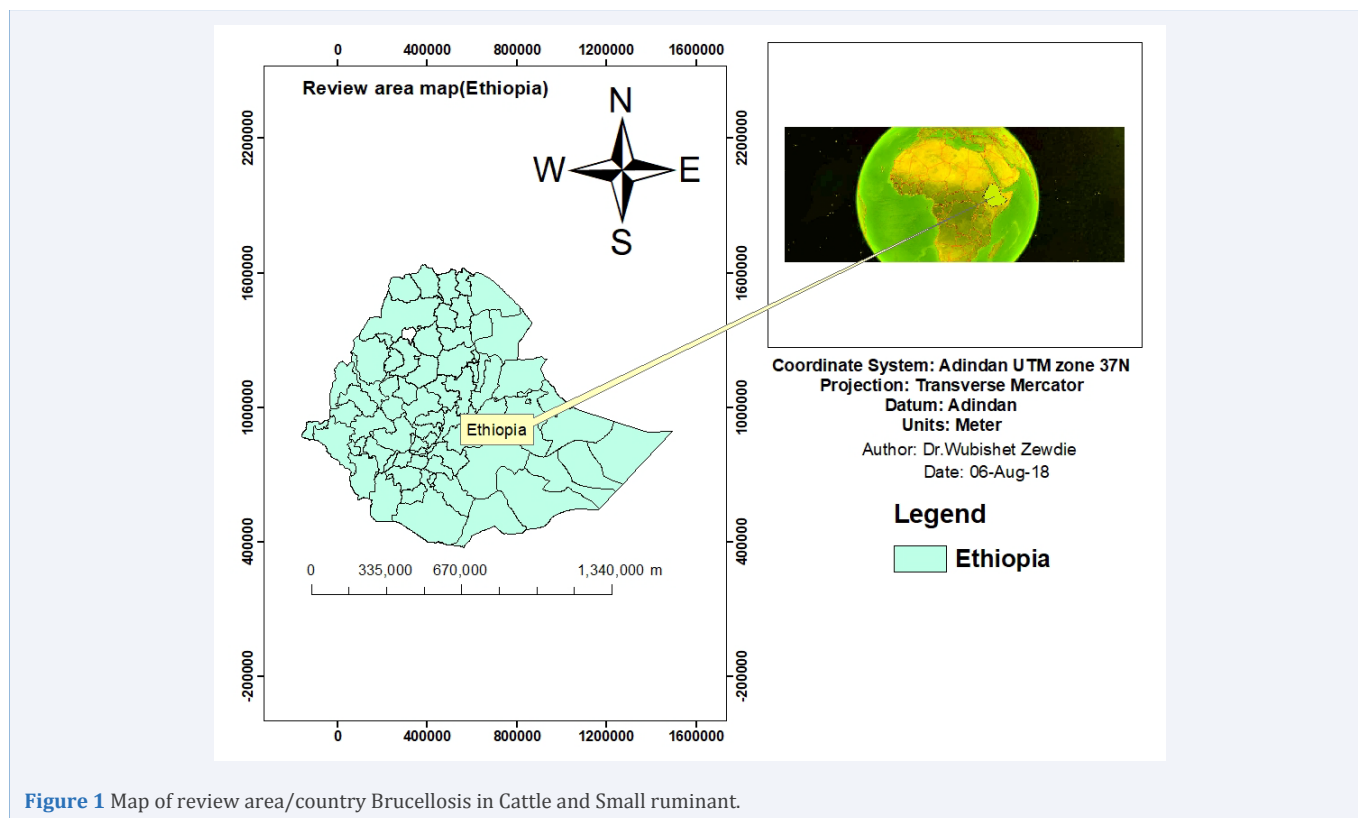


Figure 1 Map of review area/country Brucellosis in Cattle and Small ruminant.

forming the main supply of organisms for transmission to other animals and human. In acute infections, the organism is present in most major body lymph nodes. Adult male cattle may develop orchitis and brucellosis may be a cause of infertility in both sexes. While animals typically recover, and will be able to have live offspring following the initial abortion, they may continue to shed the bacteria [20].

The infection occurs via the mucous membranes, including oral nasopharyngeal, conjunctiva and genital mucosa, and also through cutaneous abrasions. Animals become infected through feed, water, colostrum, contaminated milk and, especially, by licking or sniffing at placentas and aborted fetuses. The spread of brucellosis during sexual activity plays a subordinate role. The primary shedding routes of *Brucella* organisms remain uterine fluids (lochia) and placenta expelled from infected animals [15,21,22,25]. In Ethiopia Brucellosis is prevalent in different species of animals with high prevalence in pastoral area of the country (Table 1 and Table 2).

BRUCELLOSIS IN HUMANS

Human can acquire the disease from animals as result of contact between humans and livestock [3]. In addition, it also reported from professional who has close contact with animal and animal products [7,29]. Farmers or pastoralists live in close contact with their animals and often consume fresh unpasteurized dairy products [3,8,43]. Furthermore, pastoralists handle aborted cases with bare hand which is main source of the disease in the rural and pastoral area of the country, Ethiopia [9,12,15]. Brucellosis reported in different parts of Ethiopia, by different researchers (Table 3).

Due to sharing of the same housing enclosures, brucellosis is a significant health risk for the entire community. It is readily transmissible to humans, causing acute febrile illness undulant fever which may progress to a more chronic form and can also produce serious complications affecting the musculoskeletal, cardiovascular, and central nervous systems. Brucellosis is a zoonotic bacterial disease caused by *Brucella spp.* It is primarily a disease of animals whereas humans are accidental hosts [6]. The disease is one of the most widespread zoonotic and is endemic in many countries. It is also considered a neglected zoonotic by the WHO [44].

ETIOLOGY OF HUMAN BRUCELLOSIS

The genus *Brucella* are gram-negative, facultative intracellular, coccobacilli, non-motile and non-spore-forming bacteria [45]. Currently, there are eleven species of *Brucella* causing brucellosis in different species of animals and human. In human, most prevalent cause of brucellosis is *Brucellamelitensis* followed by *B. suis*, *B. abortus* and *B. canis*. However, other species of bacteria are also pathogenic to human [46,47].

SOURCE AND TRANSMISSION BRUCELLOSIS IN HUMAN

The key sources of human brucellosis are the major food-producing animals: cattle, sheep, goats, pigs and cow [46]. The possible means of acquisition of brucellosis in human include: person-to-person transmission, occupational exposure usually resulting from direct contact with infected animals, and food-borne transmission [6]. It is transmissible from animals to humans through contaminated milk, raw milk products, meat or

Table 1: Prevalence of small ruminant brucellosis in different parts of Ethiopia.

Species	Study area	Test used	%	References(Source)
An				
Small	Amhara region	CFT	4.89	[24]
	Pastoral area of Ethiopia	RBT/I ELISA	1.9/9.7	[25]
	Afar region	RBT/CFT	9.4/4.8	[26]
	Sumali region	RBT/CFT	1.64/1.51	[27]
	Sumali region	RBT/CFT	1.72/1.37	[28]
Small Ruminant Brucellosis	Modjo abattoir	RBT/CFT	1.99/1.76	[29]
	Kombolcha	CFT	0.7	[30]
	Borena, Oromia	CFT	3.3	[23]
	Somali region	CFT	0.07	
	Afar region	CFT	1.9	
	Somali, Eastern Ethiopia	RBPT/CFT	1.72/1.37	[28]
	Yabello, Oromia	RBPT/I-ELISA	11.3/9.6	[31]

Table 2: Prevalence of Bovine brucellosis in different parts of Ethiopia.

Species	Study area	Test used	%	References(Source)
Cattle/Bovine Brucellosis	Sidama zone, SNNP	CFT	2.46	[32]
	Urban/pre-urban dairy farm	CFT	1.9	[33]
	Breeding farm	CFT	1.5	
	Commercial dairy farm	CFT	2.4	
	Amhara region	CFT	4.63	
	Central Oromia	CFT	2.9	[35]
	Yabello, Oromia	RBPT/CFT	4.1/1.2	[15]
	Tigray Region	CFT	7.7	[36]
	BenshangulGumuz	RBPT/CFT	1.2/1	[37]
	East Wellega Zone, Oromia	RBPT/CFT	2.96/1.97	[38]
	Central Ethiopia	RBPT/CFT	3.3/2	[39]
	Bahirdar, Amhara region	RBPT/CFT	1.2/0.4	[40]
	Gonder, Amhara region	RBPT/CFT	5.4/4.9	[41]
	Borena, Oromia	CFT	4.7	[2]
	Jijiga, Somali	CFT	3.0	[2]
	South Omo, SNNP	CFT	3.4	[2]
	Shinile, Somali	CFT	6.6	[2]
	Alage, Oromia	c-ELISA	2.2	[42]
	Yabello, Ethiopia	RBPT/I-ELISA	10.3/8.2	[31]

Table 3: Prevalence of human brucellosis in different parts of Ethiopia.

Study area	Study population	Test used	Prevalence (%)	Reference(Source)
Amhara region	Febrile patient	Rapid Slide Agglutination Test	2.6	[9]
Borena, Oromia	Pastoralist	IgM/IgG lateral flow assay	34.1	[12]
Hamer, SNNP	Pastoralist	IgM/IgG lateral flow assay	29.4	[12]
Matama, Amhara	Pastoralist	IgM/IgG lateral flow assay	3	[12]
Jimma, Oromia	Febrile patient	CFT	3.6	[8]
Addis Ababa	Professionally Exposed people	2- Mercapto Ethanol Test (2-MET)	4.8	[7]
Amhara region		CFT	5.3	[34]
Sidama, SNNP		CFT	3.78	[32]
Adamitulu, Oromia	Livestock owners	RBPT/CFT	2.15/2.15	[10]
Yabello, Oromia	Pastoralists	CFT	10.0	[15]
Yabello, Oromia	Pastoralists	RBPT/i-ELISA	11.6/3.6	[31]
Jimma zone, Oromia		RBPT/CFT	2.1/0.0	[43]

direct contact with infected animals [48]. In endemic countries humans get infected mainly by drinking unpasteurized milk and/or exposure to aborted fetuses, placentas or infected animals [49].

Person to person transmission is rare, but it suggested being transmitted by close personal or sexual contact. Of more potential significance is transmission through blood donation/tissue transplantation, Bone marrow transfer in particular carries a significant risk [6]. Clinical manifestation among humans is acute febrile illness which may persist and develop into a chronic disease with serious complications, such as joint illness, organ failure and symptoms of mental illness [6,50]. The mortality rate is relatively low, especially when the patient is treated with adequate antibiotics; however, this is not the case for everyone in low income countries [11].

RISK FACTOR OF BOVINE AND SMALL RUMINANT BRUCELLOSIS

Susceptibility to Brucellosis can be also influenced by age, sex, breed, reproductive status and *Brucella* species infecting [9,11]. It is reported by different researchers that females manifest higher prevalence of Brucellosis [8,10]. On the other hand, the results in extensive production system and higher herd also reported higher prevalence of Brucellosis in cattle [2,34].

RISK FACTOR OF HUMAN BRUCELLOSIS

The risk of disease and its severity is to a significant extent determined by the type of *Brucella* to which an individual is exposed. It influenced by the species of host animals acting as source of infection [6]. Brucellosis poses an occupational risk for farmers, veterinarians, abattoir workers, laboratory personnel, and others who work with animals and consume their products [6,41]. They can acquire disease from cattle, sheep, goat and cows through direct contact with blood, placenta, fetuses or uterine secretions while milking, handling infected animal fetus/placenta and other secretions [47].

Factors that expose human to *Brucella* infection are ingesting of raw animal product, contact with aborted materials and working with specimen/infected animal products. This is usually the main source of brucellosis to human by ingestion of fresh milk or dairy products prepared from unheated milk [51,52]. Undercooked meat products can also transmit the disease [51]. However, muscle tissue usually contains low concentrations of *Brucella* organisms but liver, kidney, spleen, udder and testis may contain much higher concentrations [6]. Cow, sheep, goat or cow milk contaminated with *B. melitensis* is particularly hazardous as it is drunk in fairly large volume and may contain large numbers of organisms [6, 46]. Airborne transmission of *Brucella* to humans has also been documented by inhalation of contaminated dust, contact with infected animal body fluids or tissues are other source of infection in clinical laboratories and abattoirs infection [6,14,51].

CONCLUSIONS

From this review it is concluded that Brucellosis exists in Ethiopia with higher prevalence in pastoral area. This calls for

urgent capacity building of regional laboratories and hospitals to diagnosis diseases. In addition, national wide epidemiological surveillance of diseases is an urgently required action including species isolation and characterization in Ethiopia with high emphasis to pastoral areas of country. For both human and animal brucellosis, extension services (awareness creation) to community should address to reduce or illuminates the impacts of risk human infection and spread of diseases between animals. Furthermore, collaboration among medical, veterinary and public health professionals is an important issue to control this disease both in animal and human.

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