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Bovine Babesiosis and Its Status in Ethiopia: A Review

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Absract: Babesiosis is a tick-borne disease of cattle caused by the protozoan parasites. The causative agents of babesiosis are specific for particular species of animals. In cattle: *B. bovis* and *B. bigemina* are the common species involved in babesiosis. *Rhipicephalus* (*Boophilus*) spp, the principal vectors of *B. bovis* and *B. bigemina*, are widespread in tropical and subtropical countries. *Babesia* multiplies in erythrocytes by asynchronous binary fission, resulting in considerable pleomorphism. *Babesia* produces acute disease by two principle mechanism; hemolysis and circulatory disturbance. Affected animals suffered from marked rise in body temperature, loss of appetite, cessation of rumination, labored breathing, emaciation, progressive hemolytic anemia, various degrees of jaundice (Icterus). Lesions include an enlarged soft and pulpy spleen, a swollen liver, a gall bladder distended with thick granular bile, congested dark-coloured kidneys and generalized anemia and jaundice. The disease can be diagnosis by identification of the agent by using direct microscopic examination, nucleic acid-based diagnostic assays, *in vitro* culture and animal inoculation as well as serological tests like indirect fluorescent antibody, complement fixation and Enzyme-linked immunosorbent assays tests. Babesiosis occurs throughout the world. However, the distribution of the causative protozoa is governed by the geographical and seasonal distribution of the insect vectors. Recently *Babesia* becomes the most widespread parasite due to exposure of 400 million cattle to infection through the world, with consequent heavy economic losses such as mortality, reduction in meat and milk yield and indirectly through control measures of ticks. Different researches conducted in Ethiopia reveal the prevalence of the disease in different parts of the country. The most commonly used compounds for the treatment of babesiosis are diminazene diaceturate, imidocarb and amicarbalide. Active prevention and control of babesiosis is achieved by three main methods: immunization, chemoprophylaxis and vector control.

Key words: *Babesia* · Protozoa · Tick · Vector Control

INTRODUCTION

Ethiopia is one of the countries with the largest number of livestock in Africa and livestock production plays a major role in the development of Ethiopia's agriculture. Ethiopian livestock population is estimated to be 53.38 million cattle, 25.50 million sheep, 22.78 million goats, 6.21 million donkey, 2.08 million horse, 1.10 million camels, 0.39 million mules and 49.28 million poultry [1].

Tick-borne diseases and their vectors are wide spread in Ethiopia. They affect production in various ways, such as growth rate, milk production, fertility, the value of hides and mortality. Major cattle tick-borne diseases in Ethiopia are anaplasmosis, babesiosis, cowdriosis and theileriosis [2]. Ticks and tick borne diseases cause considerable losses to the livestock economy, ranking third among the major parasitic disasters after trypanosomes and end parasitism [3]. Furthermore, Babesiosis is one of the most important diseases in Ethiopia because it occurs sometimes in acute forms with serious recognized clinical manifestations yet lowering the productive performance of the affected animals [4]. Different researchers have reported the prevalence of bovine babesiosis from different area of Ethiopia.

Nevertheless, cattle productivity is low [5], this may be due to improper management, disease, nutritional deficiencies, harsh environment and genetic factors. Arthropod transmitted blood parasitic diseases are economically important vector-borne diseases of Ethiopia. Bovine babesiosis caused by an apicomplexan blood protozoan parasite, Babesia bigemina (family Babesiidae, order Piroplasmida), is transmitted by brevirostrate tick, Rhipicephalus microplus, causing significant morbidity and mortality in cattle and buffaloes [6].

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Babesiosis is caused by genus *Babesia* and it is adequate emphasis has been given to livestock disease, zoonotic tick-transmitted hemo-parasites of the protozoan particularly, to Bovine babesiosis, despite of its which are the second most common tick borne parasites devastating effect on cattle and other livestock's of mammals after the trypanosomes. It causes negative although researchers have been conducted in many parts effects on the health of the livestock including production of the Africa countries to determine prevalence of *Bovine* and productivity. It is the most important disease of Babesiosis, there was no efficient research work done in tropical and subtropical regions between 40°N and 32°S. Ethiopia. Therefore, the objective of this study was: to Both species (*B. bovis* and *B. bigemina)* are transmitted estimate the prevalence of bovine babesiosis and to transovarially by *Boophilus* ticks, which are initiated by investigate the risk factors associated with the disease in inoculation of sporozoite form of parasites into the the study areas. blood stream during the taking of a blood meal [6].

Arthropod transmitted hemo-parasitic diseases are economically important vector-borne diseases of tropical and subtropical parts of the world including Ethiopia. Ticks and tick-borne diseases (TBDs) affect the productivity of bovines and leads to a significant adverse impact on the livelihoods of resource-poor farming communities. Four main TBDs, namely anaplasmosis, babesiosis, theileriosis and cowdriosis (heartwater) are considered to be the most important tick-borne diseases (TBDs) of livestock in sub-Saharan Africa, resulting in extensive economic losses to farmers in endemic areas. They are responsible for high morbidity and mortality resulting in decreased production of meat, milk and other livestock by-products [7].

Babesiosis is a tick-borne disease of cattle caused by the protozoan parasites Babesia bovis, *B. bigemina*, *B. divergens* and others. Rhipicephalus (Boophilus) spp., the principal vectors of *B. bovis* and *B.bigemina*, are widespread in tropical and subtropical countries. The major vector of *B. divergens* is Ixodes ricinus [8]. Bovine babesiosis is the most important arthropod-borne disease of cattle worldwide that causes significant morbidity and mortality. It is the second most common blood-borne parasitic disease of mammals after the trypanosome [9].

Babesiosis is a haemolytic disease and characterized by fever (40-42°C) which may be sudden in onset, anemia, icterus, hemoglobinuria, listless, anorexic, jaundice and death [10]. Although some species of *Babesia* such as *B. microti* can affect healthy people, cattle parasites seem to cause disease only in people who are immunocompromised. *B. divergens* causes serious disease in humans who have had splenectomies [11]. Active prevention and control of Babesiosis is achieved by three main methods: immunization, chemoprophylaxis and vector control [10]. The use of genetically resistant cattle such as *B. indicus* can also decrease the incidence of disease [12].

Therefore, the objectives of this paper were;

- To review available literatures on bovine babesiosis.
- To highlight the status of bovine babesiosis in Ethiopia.

Bovine Babesiosis

Etiology: Babesiosis is an infectious tick- borne disease of livestock that characterized by fever, anemia, hemoglobinuria and weakness. The disease also is known by such names as bovine babesiosis, piroplasmosis, Texas fever, red water, tick fever and tristeza [13]. Bovine babesiosis caused by an apicomplexan haemo protozoan parasite under family Babesiidae, order Piroplasmida) [14]. It is caused by multiple species but three species found most often in cattle are *B. bovis*, *B. bigemina* and *B. divergens*. Additional species that can infect cattle include B. major, B. ovata, B. occultans and B. jakimovi [12]. Two species, *B. bigemina* and *B. bovis*, have a considerable impact on cattle health and productivity in tropical and subtropical countries [15]. Babesia belongs to protozoan parasites of the genus Babesia, order Piroplasmida, phylum Apicomplexa and subclass Piroplamsia and are commonly referred to as 'piroplasmas' due to the pear-like shaped merozoites which live as small parasites inside RBC of mammals [9].

Epidemiology

Geographical Distribution: Bovine babesiosis can be found wherever the tick vectors exist, but it is most common in tropical and subtropical areas [11]. *B. bovis* and *B. bigemina* are present in most areas of the world, with the greatest incidence between the latitudes of 32°N and 30°S, where their Boophilus tick vector commonly occurs [16].

B. bovis is usually found in the same general geographic area as *B. bigemina*, slightly different groups of ticks spread these two species and some differences in their distribution can be seen. For example, *B. bigemina* is more widely distributed than *B. bovis* in Ethiopia [12]. Generally both parasites, *B. bovis* and *B. bigemina*, have the same distribution, but in Africa *B. bigemina* is more widespread than *B. bovis* because of the ability of *B. decoloratus* and R. evertsi to also act as vectors for this species [16].

Host Range: Babesiosis commonly infect cattle, sheep, goats, horses, pigs, dogs and cats and occasionally man. More than100 known *Babesia* spp. have been identified which infect many types of mammalian host, out of these, 18 spp. cause disease in domestic animals [9]. *B. bovis* and *B. bigemina* are found in cattle, which are the main reservoir hosts. They also affect water buffalo (*Bubalus bubalis*) and African buffalo (*Syncerus caffer*) [9].

Risk Factors

Host Factor: Host factors associated with disease include age, breed and immune status [17]. Bos indicus breeds of cattle are more resistance to babesiosis than *Bos taurus*. This is a result of evolutionary relationship between *Bos indicus* cattle, *Boophilus* species and *Babesia* [18]. Because of natural selection pressure, indigenous populations, having lived for a long time with local ticks and tick-borne diseases, have developed either an innate resistance or an innate ability to develop a good immune response to the tick or tick borne hemoparasitic disease in question. Sheep were highly susceptible to *B. ovis* than goats. It is frequently stated that there is an inverse age resistance to *Babesia* infection in that young animals are less susceptible to Babesiosis than older animals; the possible reason is passive transfer of maternal antibody via colostrum [10].

The severity of the clinical babesiosis increases with age. So adult are more infected than calves [17].

Pathogen Factor: Strains vary considerably in pathogenicity; however, *B. bovis* is usually more virulent than *B. bigemina* or *B. divergens* [11]. Many Intra-erythrocyte hemoparasites survive the host immune system through rapid antigenic variation which has been demonstrated for *B. bovis* and *B. bigemina* [18].

Environmental Factor: There is a seasonal variation in the prevalence of clinical Babesiosis, the greatest incidence occurring soon after the peak of the tick population. Of the climatic factors, air temperature is the most important because of its effect on tick activity; higher temperatures increase its occurrence. Heaviest losses occur in marginal areas where the tick population is highly variable depending on the environmental conditions [18]. Babesiosis infection in cattle mostly reaches peak in summer (33.33%) [19].

Transmissions: *Babesia* species is transmitted by hard ticks in which *Babesia* passes transovarially, via the egg, from one tick generation to the next [10]. Ticks become infected when they ingest parasites in the blood of infected cattle. Bovine Babesiosis is principally transmitted by means of ticks. Tick vectors of *Babesia bigemina*: *Rhipicephalus microplus* (formerly *Boophilus microplus*) and *Rhipicephalus annulatus* (formerly *Boophilus annulatus*); *Rhipicephalus decoloratus*, *Rhipicephalus geigyi* and *Rhipicephalus evertsi* are also competent vectors. *Babesia bigemina* transmitted by feeding of adult and nymphal stages of one-host *Rhipicephalus* spp. ticks. Tick vectors of *Babesia bovis*: *Rhipicephalus microplus and Rhipicephalus annulatus; Rhipicephalus geigyi* is also a competent vector *B. bovis* transmitted by feeding of larval stages of one-host Rhipicephalus spp. ticks [20]. Inside the tick, Babesia zygotes multiply as “vermicules,’ which invade many of the tick’s organs including the ovaries; Babesia species are readily passed to the next generation of ticks in the egg. These parasites can sometimes be passed transovarially though several generations, although this varies with the species of Babesia and the species of tick [12].

B. divergens can survive in tick populations for at least 4 years even if cattle are not present. When an infected tick attaches to a new host, Babesia is stimulated to undergo their final maturation. *B. bovis* parasites usually become infective within 2-3 days after larval ticks attach and can be transmitted by larvae. In R. microplus, *B. bovis* does not persist after the larval stage. In contrast, *B. bigemina* matures in approximately 9 days after a larval tick attaches and it is only transmitted by nymphs and adults. All three stages of I. ricinus can transmit *B. divergens*. Babesia species can also be transmitted between animals by direct inoculation of blood. Biting flies and fomites contaminated by infected blood might act as mechanical vectors, although this method of transmission is thought to be of minor importance [11].

Morbidity and Mortality: Morbidity and mortality vary greatly and are influenced by prevailing treatments employed in an area, previous exposure to a species/strain of parasite and vaccination status. In endemic areas, cattle become infected at ayoung age and develop a long-term immunity. The introduction of Babesia infected ticks into previously tick-free areas may also lead to outbreaks of disease [20].

In endemic areas where tick transmission is high year round, animals tend to become infected when they are young, do not become ill and become immune. This endemic stability can be upset and outbreaks can occur if climate changes, acaricide treatment or other factors decrease tick numbers and animals do not become infected during the critical early period. Outbreaks are also seen in areas where cold seasons interrupt tick- borne transmission for a time, as well as when susceptible animals are introduced to endemic regions or infected ticks enter new areas [12].

In naive cattle, susceptibility to disease varies with the breed. B. indicus cattle and B. indicus B. Taurus crosses are more resistant than B. taurus. Recently, variable susceptibility to *B. bovis* was also reported in some Bos taurus cattle: approximately 28% of a population of adult animals was susceptible to infection but resistant to clinical signs. In fully susceptible breeds, up to half or more of untreated adults and up to 10% of treated adults may die. Once hemoglobinuria develops, the prognosis is guarded. Infections with *B. bovis* are generally more likely to be fatal than infections with B. bigemina or *B. divergens* and CNS signs suggest a poor prognosis [11].

Life Cycle: The life cycle of all Babesia species is approximately similar but slight difference exists because in some species transovarial transmission occur (Babesia spp. sensu stricto) while not in other species (Babesia microti) [21]. Cattle are infected by feeding ticks, which inoculates sporozoites that invade erythrocytes where they transform into trophozoites that divide by binary fission (merogony). The erythrocyte membrane breaks down and the released merozoites invade new cells resulting in an intra-erythrocytic cycle. Following a tick blood meal, gametocytes develop in the tick gut, which fuse to form diploid zygotes. Zygotes invade the digestive cells and probably basophilic cells where they undergo successive round of multiplication before emerging as haploid kinetes. The kinetes migrate to many other organs including the ovaries where further division occurs. After egg hatching, the kinetes migrate to the salivary gland where they transform into multi-nucleated stages (sporogony) which later form sporozoites [7].

According to Saad *et al.* [21] Babesia species generally complete their life cycle in 3 stages.

- Gamogony (in the tick gut gametes fusion and formation)
- Sporogony (in salivary glands asexual reproduction occur) and Merogony.

Pathogenesis and Clinical Signs: Despite, being closely related and transmitted by the same Boophilus ticks, Ba. bovis and Ba. bigemina cause remarkably different diseases in cattle. In *B. bovis* infections, the disease pathology can be both due to overproduction of pro-inflammatory cytokines and the direct effect of red blood cell destruction by the parasite. During an acute infection, macrophages activated by the parasite produce pro-inflammatory cytokines and parasitocidal molecules [7].

Babesia produces acute disease by two principle mechanism; hemolysis and circulatory disturbance. During the tick bite, sporozoites are injected into the host and directly infect red blood cells. In the host, Babesia sporozoites develop into piroplasms inside the infected erythrocyte resulting in two or sometimes four daughter cells that leave the host cell to infect other erythrocytes. It invades erythrocyte and cause intravascular and extravascular hemolysis. The rapidly dividing parasites in the red cells produce rapid destruction of the erythrocytes with accompanying haemoglobinaemia, haemoglobinuria and fever. This may be so acute as to cause death within a few days, during which the packed cell volume falls below 20% which will lead to anemia. The parasitaemia, which is usually detectable once the clinical signs appear, may involve between 0.2% up to 45% of the red cells, depending on the species of Babesia [10].

The clinical signs vary with the age of the animal and the species and strain of the parasite babesiosis are seen in adults; animals younger than 9 months usually remain asymptomatic. Strains vary considerably in pathogenicity; however, *B. bovis* is usually more virulent than *B. bigemina* or *B. divergens* [11].

B. bovis is the most pathogenic of the bovine Babesia. In animals with acute *B. bigemina* infections are not as virulent as those of *B. bovis*, however the parasites may infect 40% of the red cells [13].

Babesia bovis infections are characterised by high fever, ataxia, anorexia, general circulatory shock and sometimes also nervous signs as a result of sequestration of infected erythrocytes in cerebral capillaries. Anaemia and haemoglobinuria may appear later in the course of the disease. In acute cases, the maximum parasitaemia (percentage of infected erythrocytes) in circulating blood is less than 1%. This is in contrast to *B. bigemina* infections, where the parasitaemia often exceeds 10% and may be as high as 30%. In *B. bigemina* infections, the major signs include fever, haemoglobinuria and anaemia. Intravascular sequestration of infected erythrocytes does not occur with *B. bigemina* infections. The parasitaemia and clinical appearance of *B. divergens* infections are somewhat similar to *B. bigemina* infections [22].

In animals with acute *B. bigemina* only a relatively small proportion of cases are fatal. In contrast, mortality rates over 50% are common for animals infected with *B. bovis* Infections in cattle are and characterized by fever, anorexia, listlessness, dehydration and progressive hemolysis and may be followed by hemoglobinuria and hemoglobinemia resulting in jaundice Both *B. bigemina* and *B. bovis* have the above-named clinical signs in common, but show differences in pathogenesis and manifestation. Hence *B. bigemina* can be characterized as a peripheral babesiosis with severe anemia, whereas *B. bovis* often induces a visceral babesiosis because of thrombus formation [16].

Diagnosis: Babesiosis can be diagnosed by identification of the parasites in blood or tissues, polymerase chain reaction assays (PCR), serology, or transmission experiments. Babesiosis should be suspected in cattle with fever, anemia, jaundice and hemoglobinuria [11].

Direct Microscopic Examination: Microscopic examination still cheapest and fastest methods used to identify Babesia parasites. Identification of the different stages of the parasite in mammalian or arthropod host tissues can be used for direct diagnosis purpose. Thin and thick Blood Smears Blood smear examination has been considered to be the standard technique for routine diagnosis, particularly in acute cases, but not in sub-clinical infections where the parasitemia is usually much lower [10].

Species differentiation is good in thin films but poor in the more sensitive thick films. This technique is usually adequate for detection of acute infections, but not for detection of carriers where the parasitaemias are mostly very low. Parasite identification and differentiation can be improved by using a fluorescent dye, such as acridine orange, instead of Giemsa [8].

Blood film examination requires very much expertise to differentiate between Babesia species from one or more animal species which look similar under stained preparation [23].

Samples from live animals should preferably be films made from fresh blood taken from capillaries, such as those in the tip of the ear or tip of the tail, as *B. bovis* is more common in capillary blood. Babesia bigemina and *B. divergens* parasites are uniformly distributed through the vasculature. If it is not possible to make fresh films from capillary blood, sterile jugular blood should be collected into an anticoagulant such as lithium heparin or ethylene diamine tetra-acetic acid (EDTA). Samples from dead animals should consist of thin blood films, as well as smears from cerebral cortex, kidney (freshly dead), spleen (when decomposition is evident), heart muscle, lung and live [8].

Indirect Diagnostic Method: When parasites occur at densities below the sensitivity of direct method employed or cannot be directly demonstrated in a biological sample due to the life cycle in the host, in those cases indirect methods of diagnosis are used, which include serological tests either used for detection of antibodies or antigens. Among the various serological tests, most important once include complement fixation test (CFT), indirect fluorescent antibody technique (IFAT) and enzyme-linked immunosorbent assay (ELISA) [23].

Blood smears are not reliable for detection of carrier animals; in these cases molecular detection methods, or serological diagnostic procedures to demonstrate specific antibodies, are required [16]. Serology is most often used for surveillance and export certification. Antibodies to Babesia are usually detected with an indirect fluorescent antibody (IFA) test or enzyme-linked immunosorbent assay (ELISA). Complement fixation has also been used and agglutination assays (latex and card agglutination tests) have been described. Serological cross-reactions can complicate the differentiation of some species in serological tests [12].

Polymerase chain reaction (PCR) assays can detect and differentiate Babesia species and are particularly useful in carriers. Immuno-fluorescent and immune-peroxidase labeling have also been described. These parasites are found within RBCs and all divisional stages ring (annular) stages, pear shaped (pyriform) trophozoites either singly or in pairs; and filamentous or amorphous shapes can be found [11].

Public Health and Economic Significance of Bovine Babesiosis

Public Health Significance: Human babesiosis was first described in 1957 but is now known to have worldwide distribution. The increase in reported cases is likely due to increases in actual incidence as well as increased awareness of the disease [20].

Although some species of Babesia such as B. microti can affect healthy people, cattle parasites seem to cause disease only in people who are immunocompromised. *B. divergens* causes serious disease in humans who have had splenectomies. This infection is rare; in Europe, approximately 30 cases had been reported as of 2003. It is characterized by the acute onset of severe hemolysis, hemoglobinuria, jaundice, persistent high fever, chills and sweats, headache, myalgia, lumbar and abdominal pain and sometimes vomiting and diarrhea. Shock and renal failure may also be seen. *B. divergens* infections in humans are medical emergencies. They usually progress very rapidly and most cases in the past ended in death within a week. With modern, antiparasitic drugs and supportive therapy, the case fatality rate is approximately 40%. Mild cases may resolve with drug treatment alone [11].

To prevent infection with *B. divergens*, immune-compromised individuals should be careful when visiting regions where babesiosis is endemic, especially during the tick season. Exposure to ticks should be prevented by wearing appropriate clothing (e.g., long-sleeved shirts and long pants) and tick repellents. Skin and clothing should be inspected for ticks after being outdoors and any ticks found should be removed. There is no definitive evidence that *B. divergens* can infect immune-competent individuals, or those who are immunosuppressed but not splenectomized. *B. bovis* may also be zoonotic, but this is uncertain. At least some historical cases attributed to *B. bovis* were probably caused by *B. divergens* [12].

Economic Significance: Bovine Babesiosis causes most serious economic loss to the livestock industry, endangering half a billion cattle across the world [21]. Babesiosis, especially in cattle has great economic importance, because unlike many other parasitic diseases, it affects adults more severely than young cattle, leading to direct losses through death and the restriction of movement of animals by quarantine laws. The disease is also a barrier to improving productivity of local cattle by cross-breeding due to the high mortality of genetically superior but highly susceptible cattle, especially dairy cattle, imported from Babesia free areas. The consequence is that the quality of cattle in endemic areas remains low, therefore impeding the development of the cattle industry and the wellbeing of producers and their families [10].

Prevention and Control: Active prevention and control of Babesiosis is achieved by three main methods: immunization,

Chemo-prophylaxis and vector control. Ideally, the three methods should be integrated to make the most cost effective use of each and also to exploit breed resistance and the development and maintenance of enzootic stability [10]. Eradication of bovine babesiosis has been accomplished by elimination of tick vector in areas where eradication of tick is not feasible or desirable; ticks are controlled by repellents and acaricides [24].

Reduce the exposure of cattle to tick and regular inspection of animals and premises. Cattle develop a durable, long-lasting immunity after a single infection with *B. bovis*, *B. divergens* or *B. bigemina*, a feature that has been exploited in some countries to immunize cattle against Babesiosis [22]. Babesia can be prevented and controlled by using different types of vaccine e.g. live vaccine, killed vaccine and others. Most live vaccines contain specially selected strains of Babesia (mainly *B. bovis* and *B. bigemina*) and are produced in calves or in vitro in government supported production facilities as a service to the livestock industries [8].

Live, attenuated strains of *B. bovis*, *B. bigemina* or *B. divergens* are used to vaccinate cattle in some countries. These vaccines have safety issues including the potential for virulence in adult animals, possible contamination with other pathogens and hypersensitivity reactions to blood proteins. They are best used in animals less than a year of age to minimize the chance of disease. In some cases, vaccination of older cattle is necessary (e.g., if susceptible cattle are moved into an endemic area). Older animals should be monitored closely after vaccination and treated if clinical signs develop. In some countries, animals may be vaccinated in the face of an outbreak. The use of genetically resistant cattle such as B. indicus can also decrease the incidence of disease. Natural endemic stability is unreliable as the sole control strategy, as it can be affected by climate, host factors and management [12].

Treatment: Imidocarb are the drug of choice for bovine babesiosis, which can prevent clinical infection up to 2 months [21]. Sick animals should be treated as soon as possible with an antiparasitic drug. midocarb(Imizol) and the allied drug amicarbalide are effective babesiocides for cattle at the dose rate of 1-3 mg/kg and5-10 mg/kg body weight respectively [24].

Treatment is most likely to be successful if the disease is diagnosed early; it may fail if the animal has been weakened by anemia. A number of drugs are reported to be effective against Babesia, but many of them have been withdrawn due to safety or residue concerns [11].

The first specific drug used against bovine Babesiosis was Trypan blue, which is a very effectivecompound against *B. bigemina* infections, however, it did not have any effect on *B. bovis* and it had the disadvantage of producing discoloration of animal's flesh, so it is rarely used. Diminazene aceturate, which is widely used currently in the tropics as a Babesiacide, was withdrawn from Europe for marketing reasons [10].

Table 1: Prevalence of bovine babesiosis from different area of Ethiopia

Area	Diagnostic Methods	Prevalence	Reference
Western Ethiopia(Benishengul Gumuz)	Microscopic Examination	1.5%	[4]
Southern Ethiopia (Borena)	Microscopic Examination	16.9%	[9]
South Western Ethiopia (Harar)	Microscopic Examination	23%	[25]
Central Ethiopia (Bishoftu)	Microscopic Examination	0.6%	[26]

Blood transfusions and other supportive therapy may also be necessary. Chemoprophylaxis with one drug (imidocarb) can protect animals from clinical disease while allowing the development of immunity. However, there are concerns about residues in milk and meat and this drug is not available in all countries [11].

Status of Bovine Babesiosis in Ethiopia: Tick-borne diseases and their vectors are wide spread in Ethiopia. They affect production in various ways, such as growth rate, milk production, fertility, the value of hides and mortality. Major cattle tick-borne diseases in Ethiopia are anaplasmosis, babesiosis, cowdriosis and theileriosis. Ticks and tick borne diseases cause considerable losses to the livestock economy, ranking third among the major parasitic disasters after trypanosomes and endoparasitism [3]. Furthermore, babesiosis is one of the most important diseases in Ethiopia because it occurs sometimes in acute forms with serious recognized clinical manifestations yet lowering the productive performance of the affected animals [4].

CONCLUSION AND RECOMMENDATIONS

Different studies indicated that there was high burden of ticks in the different part of the country. However, the attention given to control the infestation had not been sufficient. Acaricide application is the main method of tick control in many areas. Studies also revealed high prevalence of ixodid tick infestation in different regions. These pose huge economical and health constraint to the farmers and the animals. Concordantly, several new babesia parasites have recently been recognized and cases of human babesiosis have been increasingly reported in geographical areas where the presence of Babesia spp. in enzootic cycles was obvious for decades but where the risk for humans of acquiring Babesia spp. Either from ticks or from human blood products was not known before. Most importantly, human babesiosis may become progressively more important for the steadily increasing population of highly susceptible immune-compromised individuals and should be regularly considered in the differential diagnosis of infection or fever of unknown origin, especially, in splenectomized patients and in individuals with recent transfusion of blood products. The need for better diagnostics is obvious and laboratories require broad access to reliable tests such as IFAT and PCR for timely diagnosis in suspected cases better molecular detection and strain typing of parasites is also necessary to clarify the epidemiology of zoonotic Babesia spp. and whether their virulence or enhanced transmissibility is potentially strain-dependent.

In light of the above conclusion the following recommendations are forwarded:

- The owners should be supervise their cattle especially in the beginning and in the time of rainy season and provide appropriate treatment.
- To overcome the problems owner should be using pasture management, the right dosage and application of acaricides and rearing resistance breeds should be practiced in the combination with agricultural research institutions.
- Future studies can be done to know the burden of ticks and tick borne disease. Studies are therefore urgently needed to better characterize the distribution and medical relevance of these pathogens in many parts of the Ethiopia.
- Government should provide intervention and research to develop long lasting prevention and control strategies to get rid of the ticks.

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