

## Review Work on Bovine Cysticercosis and its Public Health Importance's in Ethiopia

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**Abstract:** Zoonotic affects of Bovine cysticercosis and its causative agents are metacestode stage of cestode and *Taenia (T) saginata* for humans. The reviewed result stated the cosmopolitan in its distribution of Bovine cysticercosis is common in the world. Distribution is associated with economic conditions, religious and close proximity of humans to cattle. Its life cycle is indirect and entirely dependent on the link between man and cattle. So this review indicated that any break the between human and cattle results in the total elimination of the parasite. Cysts of *Cysticercus (C.) bovis* is found anywhere in the carcass and viscera especially masseter, tongue, heart, triceps, inter costal muscles and the diaphragm are the most affected organs. In Ethiopia except the heart other organs are consumed at raw meat or under cooked. Most research result showed that man consumes these muscles containing viable *Cysticercus* and a tapeworm develop and poses a potential public health hazards than *Taeniasis*. The custom of eating raw or undercooked beef dishes and the habit of defecating in open fields and allowing cattle to graze in such fields made *Taeniasis* of human and cysticercosis of cattle in Ethiopia. The prevalence of the disease both in human and animals is high. *T.saginata* in small intestine of humans absorbs digested food and its proglottids migrate to different organs causing different signs. Economic loss from cysticercosis is determined by disease prevalence, grade of animals affected, potential market policy of cattle. In Ethiopia most Slaughtering practices are often carried out in the field in the absence of abattoirs. This allows the parasite to continue its life cycle in the coming future. Therefore avoiding the consumption of raw meat, slaughtering animals on the field and stop free grazing is the prevention measure of cysticercosis.

**Key words:** Bovine • *Cysticercosis* • Public Health • Zoonotic • Ethiopia

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### INTRODUCTION

Tapeworm infection has been recorded in 1500 years ago and the earliest human parasite. *T. saginata* is a worldwide zoonotic cestode whose epidemiology is ethnically and culturally determined with estimation of 50-77 million annually. Both adult and larval forms hazardously affect health of their respective hosts, either directly or indirectly accompanied with several secondary infections, particularly in human. The occurrence of metacestode stage larvae (*C.bovis*) in cattle musculature causes *bovine cysticercosis* while the adult worm in human small intestine is caused *Taeniasis* [1, 2]. It is cosmopolitan in its distribution and its life cycle is entirely dependent on the link between man and cattle. Cysts of *C. bovis* can be found anywhere in the carcass and viscera, but its described sites are predilection

(Masseter, tongue, heart, triceps, intercostals muscle and the diaphragm) and these organs except the heart are consumed raw and causes of public health hazard [3].

Transmission of the parasite is poor hygiene, primitive livestock husbandry practice and inadequate meat inspection, management and control policy [4]. *Bovine cysticercosis* and *Taeniasis* are common where hygienic conditions are poor and the inhabitants traditionally eat raw or insufficiently cooked or sun-cured meat [2]. The parasite is very common in Africa and endemic in Central and East African countries like Ethiopia, Kenya and Zaire [5]. The custom of eating raw or undercooked beef dishes such as *kourt*, *lebleb*, *kitffo* and the habit of defecating in open fields coupled with the tradition of allowing cattle to graze in such fields made *Taeniasis* of human and *cysticercosis* of cattle is common in Ethiopia [6]. A high prevalence of human infection in

different agro-climatic zones of the country has been reported [7]. Estimates made by different investigators on prevalence of *Taeniasis* in Ethiopia vary widely from 2% - 16% to over 70% [8].

Among the prevalent livestock diseases, zoonotic represents major constraint to the development of livestock productivity in Ethiopia. Of zoonotic diseases, *bovine cysticercosis* is the disease that remains a major public health problem in lower income and some industrialized countries [9]. *T. saginata* infection is usually asymptomatic. However, heavy infection often results in weight loss, dizziness, abdominal pain, diarrhea, headaches, nausea, constipation or chronic indigestion and loss of appetite. There can be intestinal obstruction in humans and this can be alleviated by surgery. The tapeworm can also expel antigens that can cause an allergic reaction in the individual. It is also rare cause of pancreatitis, cholecystitis and cholangitis [10]. FAO [11] stated that the disease causes the obstruction of the bowel, stomach-ache and migrating proglottids, inflammation of the appendix and the bile duct, unpleasant surprise when seen in the feces. Whereas Teka [6] stated that *Taeniasis* causes anal purities due to emerging tapeworm segments and, abdominal discomfort and digestive upset.

*Cysticercosis* affects both the health of the consumer and country's economy, which approaches 30% if allowance is made for the loss in the carcass weight and the cost of freezing of the infected meat [12]. Generally loss from *cysticercosis* is determined by disease prevalence, grade of animals affected, potential market policy of cattle and treatment cost for detained carcasses. The average annual loss due to taenicial drugs for treatment in Ethiopia was estimated to be 4,937,583 Ethiopian birr [12-14]. Inadequate health education and low availability of taenicides are the major obstacles for the control infections in Ethiopia [12, 15].

In foreign trade, Ethiopia is placed to export live animals to the Middle East North and West Africa. This is a major public and animal health problems that transmitting *T. saginata/Cysticercus* [16]. Therefore the objective of this review is to highlight the status, control, prevention strategies and public health and economic impacts of the disease of *bovine cysticercosis* in Ethiopia.

### **Bovine Cysticercosis**

**Etiology:** Bovine cysticercosis is a disease that affects the musculature of cattle and is caused by the metacestode stage of human intestinal cestode, *T. saginata* [17]. Taxonomic classification: *T. saginata* and its metacestode,

*C. bovis*, the unarmed beef tapeworm, is classified under the kingdom of Animalia, phylum of Platyhelminthes, class of Cestoda, order of Cyclophylidea, family of Taeniidae, genus of Taenia and species of *T. saginata* [18-20].

Morphology of the adult tapeworm of *T. saginata* is a large ribbon shaped, multi segmented and white flat worm usually 4-15 m long consisting of thousands of segments (Proglottids) arranged in a chain [20, 21]. Its body divided in to three distinct parts consisting of head (Scolex), neck and strobilla [3]. The head or scolex is bearing the attachment organs, a short unsegmented neck and chain of segments. The chain is known as strobilla and each segment as proglottids. Unlike other taenicides, the head (Scolex) has no rostellum or hooks. The proglottids are continually budded from the neck region and become sexually mature as they pass down the strobilla. Each proglottid is hermaphrodite with one or two sets of reproductive organs [18].

*Taenia* eggs passed in the stool or discharged from ruptured segments, spherical in shape, very resistant and remaining for 6 months in pasture and vegetables, 5 weeks in water, 10 weeks in stool or hay and 12 weeks in silage sludge. *Taenia* eggs measure about 30-45  $\mu\text{m}$  in diameter; contain an oncosphere (Hexacanth embryo) bearing three pairs of hook; have a thick, brown, radially striated embryophore or 'shell' composed of hooks; and has outer oval membranous coat true egg shell lost from fecal eggs [19]. The larval stage, or metacestode also referred to as "beef measles", are found in all striated muscles of the intermediate host. *Cysticercus bovis* is a small, pea-sized oval in shape [20], translucent and contains a single white scolex that is morphologically similar to the scolex of the future adult tapeworm. They are contained in a thin, host-produced fibrous capsule [19].

### **Epidemiology**

**Host range:** Cattle are the preferred intermediate hosts and humans are the only final hosts of *T. saginata*. Cattle of all ages are susceptible; however, young age groups are more susceptible. Parasitism sometimes observed in other ruminants (Like sheep, goats, antelopes, gazelles and buffaloes) but *Cysticercus* development is unlikely [15]. Geographic distribution and status of *Taeniasis* is constituted a serious in the developing countries but less recognized for public health problems [2]. In, *Bovine cysticercosis* has a cosmopolitan distribution and is very common in Africa. It is highly endemic in areas of Central and East African countries like Ethiopia, Kenya and Zaire [5]. The custom of eating undercooked beef dishes

Table 1: *Bovine cysticercosis* in different parts of Ethiopia

Place	Percent Prevalence	Reference
Addis Ababa	13.3%	[22]
DebreZeit	13.85%	[21]
Mekelle	7.23%	[26]
Amhara National Regional State	18.49%	[22]
Bahir Dar	19.4%	[26]
Nekemta	21.7%	[13]
Gondar	4.9%	[14]

such as *kourt*, *lebleb* and *kitffo* and the habit of defecating in open fields coupled with the tradition of allowing cattle to grazing fields made *Taeniasis* of human and *cysticercosis* of cattle is common in Ethiopia [6]. A high prevalence of human infection in different agro-climatic zones of the country has been reported [7].

Estimates made by different investigators on prevalence of *Taeniasis* in Ethiopia is vary widely from 2% - 16% to over 70% [8]. Low availability of taenicides is a constraint and the use of herbal drugs do not eliminate this parasite from human population and the proglottids the fecal matter resulting in *cysticercosis* in the cattle [6]. Bovine *cysticercosis* has been reported from different parts of the country (Table 1).

**Risk Factors of Taeniasis:** The prevalence of *Taeniasis* is associated with different risk factors. The potential risk factors of *Taeniasis* are: habit of raw meat consumption, age, sex, religion, educational level and presence and usage of sanitary facilities especially toilets. Different scholars have controversies regarding to disease prevalence in association with such risk factors.

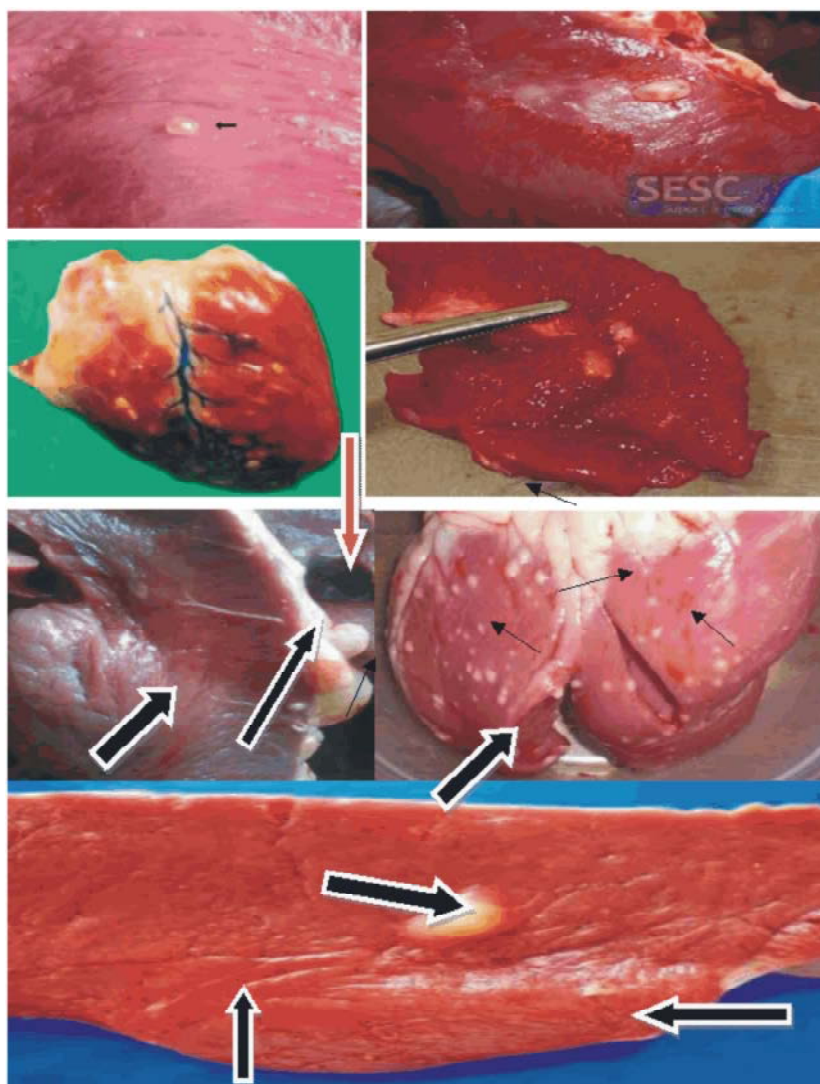


Fig. 1: *Cysticercus bovis* cyst distribution in different organs

Most researchers underline that there is higher prevalence of *Taeniasis* in those who consumes raw meat than those having cooked meat dishes [7, 22, 28-26]. But no significant variations were observed between age, sex and religion. In contrast, Megersa *et al.* [25] reported in such a way that *Taeniasis* has significant association with ages of individuals, indicating higher prevalence of infection in adult people. The possible suggestion for this case is that adults has habit of raw meat consumption than younger, as young's are not allowed to consume raw meat and adults have income that afford in consuming raw meat like *kurt* which may be expensive for young individuals. In contrast to Abunna *et al.* [22] and Hailu [26] reported *Taeniasis* has significant association with sex. Prevalence is higher in males than females. This could be due to economic reasons and cultural practices in that males do not prepare their dish at home, rather consume at restaurants and butcheries and prevalent in those who do not use latrines [22]. Distribution of metacestode in different organs: The metacestodies are found throughout the edible parts of the carcass which includes masseter muscles, cardiac muscles, triceps muscles, thigh muscles, shoulder muscles, diaphragm, intercostals muscles, liver, heart, tongue, lung and kidney [20, 24, 28, 30]. The tongue, masseter muscles, heart muscles, triceps muscles and thigh muscles were the main predilection sites of the cysts [23]. Abunna *et al.* [22] reported these cysts in heart (29.2%), shoulder muscle (25.3%), masseter muscle (26.7%), tongue (10.4%), diaphragm (5.4%), liver(1.4%), lung (0.9%) and kidney(0.5%) while Kebede [31] reported cysts from tongue (0.61%), masseter muscles (0.59%), shoulder muscles (0.26%), heart (0.26%) and liver (7.45%).

The prevalence of *bovine cysticercosis* reported by various researchers may be an underestimate since many infections go undiagnosed as reporting was exclusively based on routine meat inspection and the procedure described under Meat Inspection Regulation Notice Number 428, 1972 by Government of Ethiopia is not followed strictly at most of the abattoirs.

**Source of Infection and Mode of Transmission:** As man is the source of parasites, human habits are responsible for the spread of *bovine cysticercosis*. In areas with trance human or nomadic systems, these habits are conditioned by the way of life and animals are exposed to infected feces. Infection of cattle is associated with directly to the non-hygienic disposal of stool by infected humans or indirectly by the use of human sewage on pasture as fertilizer [27]. Man's customs and traditions of consuming

raw, sun-cured and inadequately cooked beef dishes like *kourt*, *lebleb* and *kitffo* in Ethiopia, containing viable *cysticerci* perpetuate human infection [6]. Man cannot spread *Taeniasis* to his own species. Management of animals in their natural environment predisposes them to infection. Cattle grazing communally have a higher risk of picking up *T.saginata* eggs as they are frequently in contact with the human feces compared to commercial herds. The risk of cattle coming into contact with *T.saginata* eggs is much higher when cattle are at pasture [15]. In developing countries like Ethiopia, cattle are reared on extensive scale, human sanitation is poorly developed which makes the incidence of *T.saginata* infection in humans very high. Calves are infected usually in early life, often with in the first few days after birth from infected stockmen whose hands are contaminated with *Taenia* eggs [6, 28].

**Life Cycle:** The life cycle of *T.saginata* is indirect where the definitive host is human and intermediate hosts are cattle [20]. Typically, the tapeworm life cycle consists of an adult tapeworm in the final human host. It also produces proglottids segment containing a considerable number of eggs which are shed on defecation. *Taenia* eggs containing an embryo (Oncosphere) are spread into the environment through sewage and may be orally ingested by the intermediate hosts (Cattle). In cattle the embryo move from the intestine to striated musculature. Here they develop into small vesicles called *cysticerci* containing one protoscolex, head of the future adult tapeworm [27]. The metacestode are found throughout the edible parts of the carcass which included masseter muscles, cardiac muscles, triceps muscles, thigh muscles, shoulder muscles, diaphragm, intercostals muscles, liver, heart, tongue, lung and kidney, [20, 24, 25]. The tongue, masseter muscles, heart muscles, triceps muscles and thigh muscles are the main predilection sites of the cysts [24]. Prevention of human *Taeniasis* and *bovine cysticercosis* is achieved by interrupting the life cycle of the parasite [6].

**Pathogenesis and Clinical Manifestation:** Disease in human: Human *Taeniasis* is manifested as mild non-specific gastrointestinal illness including symptoms of abdominal pain, digestive disturbance, nausea, diarrhea and anorexia [9]. The tapeworm utilizes nutrition of man thus causing great loss of nutrient in the hosts. Presence of large number of *T.saginata* causes enteritis [31].

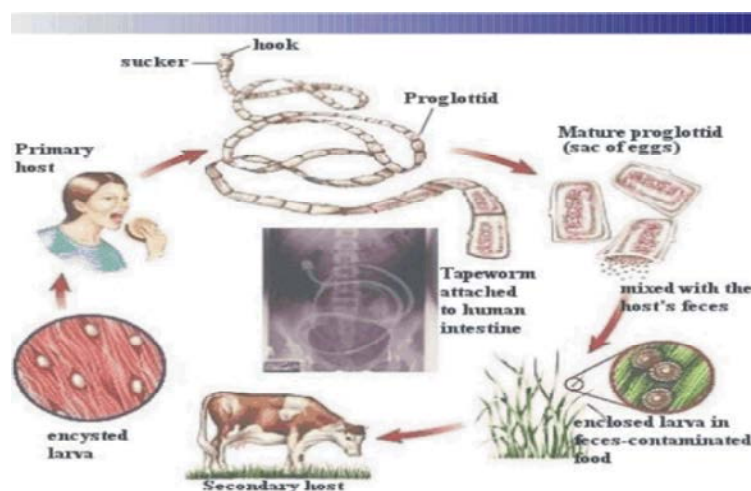


Fig. 2: Life cycle of *T. saginata* (Source: slide share)

**Disease in Cattle:** *Cysticercus* does not cause clinical signs in cattle even in heavy infections [27]. Under natural condition the presence of *cysticerci* in the muscle of cattle is not associated with clinical signs although experimentally calves given massive infection of *T. saginata* eggs have developed severe myocarditis and heart failure associated with developing *cysticerci* in the heart which may cause death between 14 to 16 days [9]. Heavy infection in cattle may result in fever, gastroenteritis, muscle stiffness and weight loss particularly in young animals [11].

**Diagnosis in Human:** Since there is no characteristic clinical picture of *T. saginata* infection, diagnosis in man is based on laboratory findings. Due to its asymptomatic nature, the disease is rarely diagnosed clinically. The condition is suspected when the patient visits a physician with a complaint of crawling sensation in the perianal area [31]. Signs and symptoms of *Taeniasis* are rather vague and finding the eggs is the best method of determining whether a person has a taeniid infection. But identification of species cannot be made from the eggs, because they are so similar. The exact species identification of *T. saginata* is made by examination of the scolex or proglottids that show typical species characteristics. Examination of the feces will help to find out presence of adult proglottids [19, 15].

Modified floatation methods have been attempted in diagnosing *Taeniasis*, but the high specific gravity of *Taenia* eggs and confounding debris in the assayed matrix decreases the sensitivity of detection. Molecular techniques for detecting low numbers of *Taenia* eggs are still being developed [19, 15]. In general we should focus on the following morphological features in *T. saginata* diagnosis: whereas Proglottids: species identification is

done by observing gravid proglottids. Gravid segments of *T. saginata* show more than 13 uterine branches upon microscopic examination and lacks hooks [31].

**Diagnosis in Cattle:** Meat inspection: inner and outer masseter muscles, the tongue and the heart are incised and examined [31]. During inspection, each predilection sites were inspected according to the guide line by Ministry of Agriculture [31] as follows; for Masseter muscle the deep linear incisions were made parallel to the mandible; the tongue was examined from base to top, the hearts were incised from base to apex to open the pericardium and incision was also made into cardiac muscle for detail examination. Deep, adjacent and parallel incisions were made above the point of elbow in the shoulder muscles. Examination of kidney, liver and immunological diagnosis in detection of serum level of specific antibodies (IgG, IgM) was conducted [30].

**Differential Diagnosis:** According to Tembo [7] the metacestode found in cattle should be differentiated from *Sarcocyst species* which form white, soft nodules with 4-6 mm in diameter found mainly in the esophagus and in the heart and other muscles. Whereas the length of *Onchocerca dukei* is 3-6 mm in diameter which form intramuscular and subcutaneous nodules that are firm to touch and reveal worms when sectioned. *Cysticercus dromedaries* (*C. cameli*) is the metacestode of *T. hyenae* which is twice as large as *C. bovis* measuring 12-18 mm in diameter, pearly white in color and possesses a double row of hooks on the lateral invaginated scolex.

**Treatment:** There are a number of taenicial drugs available in the market for treating *Taeniasis* in human. The most widely used systemic drugs for the treatment of

Table 2: Traditional *anticestodal* drugs

No.	Local name	Scientific name	Parts of plants used
1	<i>Bisana</i>	<i>Corton macrustachys</i>	Bark(hard outer cover)
2	<i>Duba firie</i>	<i>Cucurbita pepo: the pump kin</i>	Seed
3	<i>Enkoko</i>	<i>Embelia schimperi</i>	Fruit
4	<i>Kosso</i>	<i>Hygenia abyssinica</i>	Flower
5	<i>Metre</i>	<i>Glinus lotoides</i>	Seed
6	<i>Wogert</i>	<i>Silen macrosclen</i>	Root

*T. saginata* in Ethiopia is niclosamide and praziquantel [13, 19]. Niclosamide is effective at dose rate of 2000mg and damages the worm that a purge following therapy often produces the scolex. Praziquantel at a dose rate of 5-10mg per kg also has been reported highly effective but the scolex is partially digested and often not recovered [19]. Other drug used in treatment of *Taenia saginata* is mebendazole followed by purgatives like magnesium Sulphate to expel the dead worms [18].

**Traditional Knowledge of Taeniasis Treatment:** As stated by Ahmed [13], most people, especially rural inhabitants use different types of traditional herbal drugs as routine self-deworming practices. In cattle, compounds treatment such as albendazole (50mg per kg), praziquantel (50mg / kg), mebendazole (50mg/ kg) can be given but they are not fully effective [31]. Some of the traditional drugs used are shown in Table 2.

**Importance of the Disease:** Public health importance: *Taenia saginata* is a very long (3-15 meters in length) tapeworm parasite, whose adult form is found attached to the small intestinal tracts of human beings. In man it has been known to live for 20 years within a single individual. It is an intestinal parasite of cattle and humans, causing *Taeniasis* in humans. It is found globally and most prevalent where cattle are raised and beef is consumed. It is relatively common in Africa, Eastern Europe, Southeast Asia and Latin America. Humans are infected by as a result of poor hygiene [1]. *Taeniasis* has debilitating effect on people who already have live of protein deficiency diets suffer from iron deficiency and infested by hook worm [11]. *T. saginata* in small intestine of humans absorbs digested food and its proglottids migrate to different organs causing different signs [20].

*T. saginata* infection is usually asymptomatic. However, heavy infection often results in weight loss, dizziness, abdominal pain, diarrhea, headaches, nausea, constipation or chronic indigestion and loss of appetite. There can be intestinal obstruction in humans and this can be alleviated by surgery. The tapeworm can also expel antigens that can cause an allergic reaction in the individual. It is also rare cause of pancreatitis, cholecystitis and cholangitis WHO [10] and FAO [11]

stated that the disease can also cause obstruction of the bowel, stomach-ache and migrating proglottids cause inflammation of the appendix, inflammation of the bile duct, unpleasant surprise when seen in the feces; whereas Teka [6] stated that *Taeniasis* in humans causes anal purities due to emerging tapeworm segments but with severe infection humans may experience increased appetite or loss of appetite, abdominal discomfort and digestive upset. Generally, according to WHO [10], adult *Taenia* parasites located in the intestinal tracts of people can pose a variety of problems including:

- Non-specific intestinal disturbances - tapeworms can produce some non-specific signs of intestinal discomfort and pain (e.g. colic signs) in humans. Vomiting may also result.
- Non-specific appetite changes - tapeworms can cause some people to go off their food or to become fussy or picky about their eating habits (This appetite loss is possibly the result of such factors as abdominal pain and nausea). In contrast, certain other individuals develop a ravenous appetite in the face of heavy tapeworm infestations because they are competing with the parasite/s for nutrients (They need to physically eat more to provide enough nutrition for both themselves and the worms).
- Body weakness, headaches, dizziness, irritability and delirium.
- Malnutrition - very large numbers of adult *Taenia* tapeworms present in the intestinal tracts of man can result in the malabsorption of nutrients. This can cause the tapeworm-parasitized individual to not receive the nutrition it needs (i.e. to not absorb its food properly), resulting in malnourishment, weight loss, ill-thrift and poor growth.
- Poor hair quality - severe malnutrition and malabsorption of vitamins, minerals and proteins can result in reduced quality of the hair.
- Intestinal irritation - when an adult tapeworm inhabits the small intestine of human, it finds a suitable site along the lining of the intestinal lumen and grasps on to it using suckers. This spiky tapeworm grip is irritating to the wall of the small intestine, creating discomfort for the host and alterations in intestinal motility. Note that *T. saginata*, sometimes called the 'unarmed tapeworm', lacks a spiny rostellum so is not quite so damaging to the human intestine.
- Intestinal blockage - it is possible for massive tapeworm infestations to block up the intestines of children, producing signs of intestinal obstruction (e.g. vomiting, shock and even death). This is not

common, but it can occur if worm burdens are large and/or if someone deworms the infested children, killing all of the worms in one hit (The tapeworms all die and let go of their intestinal attachments at the same time, resulting in a vast mass of deceased tapeworms flowing down the intestinal tract all at once and causing blockage).

- Intestinal perforation - rarely, adult *Taenia saginata* can perforate the intestinal wall, ending up inside of the host's abdominal cavity. This can result in life-threatening abdominal inflammation and infection and septicemia.
- Appendicitis, biliary obstruction and pancreatitis - rarely, adult *Taenia saginata* (Beef tapeworms) can migrate up into the duct systems of the pancreas and biliary tract (Bile duct), producing blockages and painful inflammation of these regions. Some may even enter the appendix and cecum, causing nasty inflammation of these regions (Termed appendicitis and typhlitis respectively). This can result in life-threatening complications that may require surgical correction.
- Perineal or anal irritation- the migration of tapeworm segments from the anuses of infested individuals can result in itching and irritation of the anus.

**Economic Importance:** Economic loss from *cysticercosis* is determined by disease prevalence, grade of animals affected, potential market policy of cattle and treatment cost for detained carcasses. Attempts to reduce the prevalence of *T. saginata* in humans and their *cysticerci* in cattle may have a considerable impact on the economics of meat production industries. *Cysticercosis* in cattle is a significant food safety problem and causes economic loss in food production. This will be particularly important where export industries are involved, since most importing countries have stringent regulations designed to prevent the importation of infected meat [5]. The cost implication can be broken down into those involved in treating human *Taeniasis* and cattle carcasses (Cost of freezing, boiling) or condemned, as well as the cost involved in the inspection procedures. The average annual loss due to taenicial drugs for treatment in Ethiopia was estimated to be 4,937,583 Ethiopian birr [13- 14].

**Control and Prevention:** Control of *cysticercosis* aimed at breaking the epidemiological cycle of *T. saginata* infection. This involves cattle and humans, the intermediate host and final host respectively [15].

**In Cattle:** Sanitary measures are important to ensure:

- ©Improvement of livestock farming techniques, for example, the establishment of cattle farms with controlled hygienic conditions in which the animals do not have access to pasture contaminated by human feces [29].
- ©Reinforcement of veterinary inspections during slaughter in abattoirs and more meat inspection both in municipal slaughter houses and slaughter establishments at markets.
- ©Vaccination of cattle would be the most cost-effective control strategy. It has been shown that the *T. saginata* oncosphere extracts and oncosphere secretions produce a high level of protective immunity to challenge infections with *T. saginata* eggs [29]. More recently, an 18kDa *T. saginata* oncosphere secreted and surface expressed adhesion molecule *HP6* was used to successfully vaccinate calves against oral challenge with *T. saginata* eggs. However, no vaccine is currently marketed.

**In Human:** control of infection in human is based on

- Diagnosis of carriers and treatment with a taeniides (e.g. Niclosamide or praziquantel) to eliminate the parasite that is the source of contamination for the environment and cattle.
- Improvement of personal hygiene and installation of good sanitary accommodation for family use.
- Enhance environmental hygiene and suitable drainage of waste water.
- Continuous public health education of the population, stressing the danger of consumption of uncooked or partially cooked beef.
- Mass education to use latrines and avoid eating of raw meat.

## CONCLUSION

*Cysticercosis* is an important zoonotic disease that affects both human and animals in Ethiopia. The prevalence of the disease both in human and animals is high and economically significant. Nowadays, since there are accustoms of eating raw meat, lack of knowledge about ways of disease transmission, backyard slaughtering of animals especially during holydays, ignorance incision of meat by meat inspectors and lack of sanitation can give a great favor for continual existence of the parasite within the human and animal population.

### Recommendations:

- There should be public awareness about the health and economic importance of the disease through social and public media.
- Avoid eating of raw meat (*Kurt, lebleb* and *kitffo*) that is not inspected by well experienced meat inspector.
- Infected meat and meat products must be undergoing the processes of freezing and boiling.
- There should be strong and close collaboration between medical and veterinary professionals to reduce impact of the disease both in humans and animals.
- The community should use latrines to improve personal as well as environmental hygiene.
- Untreated human feces should not be used as fertilizers.
- Strict routine meat inspection of slaughtered animals should be carried out.
- Further researches should be conducted on the epidemiology and control strategies of cestode in Ethiopia.

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