



Prevalence of *Cysticercus bovis* in Cattle Slaughtered at Bishoftu Municipal Abattoir; Public Health Significance and Community Perception about Zoonotic Importance of Taeniosis in Bishoftu

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Abstract

A cross-sectional survey on bovine cysticercosis was carried out from October 2013 to April 2014 on 371 zebu cattle slaughtered at Bishoftu municipal abattoir to estimate the prevalence. Moreover, 140 residents in Bishoftu were sampled for a questionnaire surveys to assess the community perception and public health significance of the disease. Similarly, inventory of pharmaceutical shops and collection of retrospective laboratory data about human Taeniosis was made in the same town. The prevalence of *Cysticercus bovis* was found to be 7.8%. There was no significant association between the prevalence of *Cysticercus bovis* and sex and age of the cattle ($p > 0.05$). Of 62 total cysts collected 20 (32.26%) were found to be viable while the rest 42 (67.74%) found to be non-viable cysts. The anatomical distributions of the cysticerci were 37.1%, 27.42%, 22.58%, 6.45%, 4.84% and 1.61% in masseter muscle, tongue, triceps muscle, heart, diaphragm and esophagus, respectively. The overall prevalence of Taeniosis was found to be 80% in the town. The questionnaire survey clearly indicated that age category, occupation and habit of meat consumption were significantly associated with Taeniosis in humans ($p < 0.05$). 80% of the respondents were aware about Taeniosis and source of infection. The retrospective laboratory data in four years (2010 to 2013) revealed that out of 84,035 patients stool examined, 121 were positive for Taeniosis. Besides, an inventory of pharmaceutical shops during the four years revealed that a total of 98,818 taenicial drug doses worthing a total of 384,198.97 ETB were used. This study assured that *Cysticercus bovis*/Taeniosis was the problem of both humans and cattle in this study area. Therefore, it needs due attention to safeguard the public.

Keywords: Abattoir, Cattle, Community perception, *Cysticercus bovis*, Prevalence, Public health/zoonosis, Taeniosis

1. Introduction

It is well documented that a number of food born parasitic infections prevail worldwide (Dorny *et al.*, 2009). These parasitic diseases are highly prevalent in Sub-Saharan Africa and incur severe economic losses

by reducing productivity. Among highly prevalent diseases, *Taenia saginata*/ Taeniosis/bovine cysticercosis is one of the major parasitic diseases; which does not only lead to economic losses, but also adversely affect the public health (Fralova, 1982; Harrison and Swell, 1991).

The adult tapeworm, *T. saginata* occurs in the small intestine of the definitive host, man and the metacestode (*Cysticercus bovis*) is found in mostly striated muscles of cattle that serve as main intermediate host (Soulsby, 1982). Humans become infected by ingesting infected meat that has been inadequately cooked or frozen (Scandrett *et al.*, 2009). Most incidents arise in cattle as a result of direct exposure to proglottids and/or eggs shed from humans, but there have been some report of large scale outbreaks resulting from sewage-contaminated feed or forage (Wayne *et al.*, 2002). In cattle, heavy infection by *T. saginata* cysticercosis may cause myocarditis or heart failure (Gracey and Collins, 1992). Ingested eggs in cattle develop in to cysticerci, which can often be detected during meat inspection at routinely inspected localization sites of the parasite, including heart, skeletal muscles and diaphragm (Gracey *et al.*, 1999). The presence of cysticerci in muscles is not associated with clinical signs; however, the adult tape worm in man produced diarrhea, hunger pain, abdominal discomfort, loss of weight, constipation and nausea (Urquhart *et al.*, 1996).

In addition to human and animal health, economic loss is due to condemnation of heavily infected meat, restrictions of exports, treatment costs in human for Taeniosis (Scandrett *et al.*, 2009). Downgrading of carcasses which are subjected to refrigeration and cost of refrigeration and extra handling are also areas which indicate the economic effect of bovine cysticercosis/Taeniasis (Dorny *et al.*, 2009).

The epidemiology of the disease is associated with the cattle rearing system, age of cattle, meat inspection practice and habit of consumption of raw and undercooked meat. Low awareness and poor hygiene and sanitary infrastructures may facilitate transmission of the disease between animals and humans (WHO, 2006).

Globally, there are 77 million human *Taenia* carriers, out of which about 40% live in Africa. Meanwhile, its prevalence is high in developing country particularly in sub-Saharan Africa (Fralova, 1985; WHO, 1995). In East African countries, prevalence rates of 30-80% have been recorded (Tembo, 2001). In developing countries, the incidence of human infection with *T. saginata* is also usually high, with the prevalence over 20 %; whereas in developed countries, the prevalence of cysticercosis is very much lower, usually less than 1 % (Bowman, 1995; Urquhart *et al.*, 1996).

In Ethiopia, several authors have reported its prevalence in a wide range of 2.5 % to 89.41 % and 3.11 % to 27.6 %, in humans and cattle, respectively (Tembo, 2001; Dawit, 2004; Hailu, 2005 and Abunna *et al.*, 2008). It is believed that the cultural habit of eating raw meat in the form of “*Kouri*”-meat cubes and “*Kitfo*”-minced meat in Ethiopia, has favored the spread of this disease (Tembo, 2001; Dawit, 2004 and Fufa, 2006). Even though different authors reported its prevalence in different areas in different times, recent updated report is very important in order to ensure the surveillance as well as the public health and economic importance of the disease.

Therefore, the objectives of this study were:

- To determine the prevalence of *Cysticercus bovis* in cattle slaughtered at Bishoftu municipal abattoir;
- To assess the public health and economic importance of Taeniosis/*Taenia saginata*;
- To assess community knowledge about the zoonotic importance of the parasite

2. Materials and Methods

2.1. Study design and Study population

The study was a cross-sectional type in which active abattoir survey, questionnaire to assess human Taeniosis and drug shop inventory were conducted. Additionally, retrospective laboratory data of human Taeniosis was collected from Bishoftu health centers. Study populations for active abattoir survey were cattle presented to the abattoir for slaughtering and routine meat inspection conditions. From those animals that daily came to the municipal abattoir, study animals were randomly selected and routinely inspected for cysticercosis. Animals slaughtered during this study were all of local breed.

2.2. Sampling method and Sample size determination

Sampling was conducted using random sampling method. The sample size of active abattoir survey was determined using the expected prevalence of bovine cysticercosis in Bishoftu 13.85% reported Getachew (1990), with 95% confidence interval at a desired absolute precision of 5% according to the formula given by Thrusfield (2005). Therefore, the required sample size was 184, but 371 cattle were sampled,

with the intention to increase the level of accuracy of determining the prevalence.

2.3. Study Methodology

2.3.1. Active Abattoir Survey

Active abattoir survey was conducted during detail meat inspection on randomly selected 371 cattle slaughtered at Bishoftu municipal abattoir. Before slaughtering, ante mortem inspection was carried out and the tag number of each animal was recorded. Ante mortem examination on individual animals was done for the assessment of body condition, age, sex, breed and their place of origin. During post mortem inspection, palpation of the organs followed by incision was made to examine for the presence of *C. bovis*, according to the guideline by Ethiopian Meat Inspection Regulation Notice Number 428 of 1972 and the Meat Control Act of Kenya (MOA, 1972). For masseter muscle, deep linear incision were made parallel to the mandible; the heart was incised from base to apex to open the pericardium and incision also made in the cardiac muscle for detail examination. Deep, adjacent and parallel incisions were made above the point elbow in the shoulder muscle (triceps brachii). One extensive incision into the fleshy part of diaphragm; and one deep longitudinal ventral incision of tongue were done. Examination of the kidney, liver, esophagus and the lung was also conducted accordingly. In positive cases, the site, the density and nature of the cyst were recorded and transported to the Parasitology laboratory in Addis Ababa University, College of Veterinary Medicine and Agriculture for confirmation of cyst viability. The cysts were incubated at 37°C using 40% ox bile solution diluted in normal saline for 1-2hrs (Gracey *et al.* 1999). After this, the scolex was examined under microscope by pressing between two glass slides. The cysts were regarded as viable if the scolex evaginates during the incubation period at the same time the scolex was checked whether it is *T. saginata* metacestode or other based on the size of cysticercus, absence of hook on the rostellum of the evaginated cyst (WHO, 1995).

2.3.2. Questionnaire surveys on Taeniosis

Identification of respondents for questionnaire survey was based on random selection of volunteers from Bishoftu (after five kebeles were randomly selected). The selection was based on different age, sex, and working conditions. Accordingly, 140 individuals were selected and interviewed. The potential risk

factors of Taeniosis such as habit of raw meat consumption, age, sex, religion, occupation, educational levels, presence and usage of latrine facilities especially toilet and knowledge of possible sources and prevention methods of Taeniosis were assessed. Specific questions regarding medical history related to traditional and modern taenicidal drugs use, clinical symptoms of Taeniosis and possible options were included in the questionnaire to assess community perception and to estimate the risk factors association with Taeniosis.

2.3.3. Inventory of pharmaceutical shops

Regarding the drug inventory, relevant information was gathered from volunteer pharmaceutical shops in Bishoftu town. Different human drug stores located in Bishoftu town were inventoried for the amount and cost of drugs sold for the treatment of human Taeniosis. During the study, inventory was conducted on three randomly selected private pharmaceutical shops and one public health center (Keta) existing in Bishoftu town. Accordingly, annual adult dose of taenicidal drug sales (based on prescription and patient complaints) in the years 2010 to 2013 were gathered to analyze the socio-economic impacts of Taeniosis in the area.

2.3.4. Retrospective Data

The retrospective data of human Taeniosis in the years 2010 to 2013 were collected and recorded. Accordingly, the record of Taeniosis positive patients were identified and summarized with the total number of stool examined patients from Bishoftu general hospital and Bishoftu health center.

2.4. Data Management and Analysis

Abattoir and questionnaire data were collected and were stored in to a computer on a Microsoft excel spreadsheet and analyzed using SPSS version 20 software program. The association between the risk factors and the outcome variables was assessed using chi-square (X^2) test. The abattoir data were summarized and prevalence was calculated for the area. Anatomical distribution of *C. bovis* and cyst viability were tabulated. Pharmaceutical inventory data and retrospective laboratory data were arranged, calculated (using calculator), tabulated and summarized.

3. Results

3.1. Abattoir Results

Out of 371 cattle inspected, 29 animals had got varying number of *Cysticercus bovis* with overall prevalence of 7.8%. The total of 350 males and 21

females were inspected and out of these, 27 (7.7%) and 2 (9.5%) respectively were positive for *C. bovis*. Similarly, out of 40 5years and 331 > 5 years old cattle, 6 (15%) and 23 (6.9%) were positive for *C. bovis* (Table 1). There is no significant association between *C. bovis* prevalence and both sex and age, since $p > 0.05$.

Table 1: Prevalence of *Cysticercus bovis* based on sex and age of the cattle

| Risk factors | No examined | No infected | Prevalence (%) | X ² | p-value |
|--------------|-------------|-------------|----------------|----------------|---------|
| Sex | | | | | |
| Male | 350 | 27 | 7.7 | 0.090 | 0.764 |
| Female | 21 | 2 | 9.5 | | |
| Total | 371 | 29 | 7.8 | | |
| Age | | | | | |
| 5 years | 40 | 6 | 15 | 3.211 | 0.073 |
| > 5 years | 331 | 23 | 6.9 | | |
| Total | 371 | 29 | 7.8 | | |

The total number of cysts identified was 62; among which 20 (32.26%) were live cysts while the rest 42 (67.74%) were dead cysts after performing viability test; and it was the tongue(7) which harbored the highest number of viable cysts followed by masseter muscle(6), triceps muscle(4), heart(2) and

diaphragm(1) (Table 2). But decreasing order of total number of cysts in respective organs is 23(37.1%), 17(27.42%), 14(22.58%), 4(6.45%), 3(4.84%) and 1(1.61%) in masseter muscle, tongue, triceps, heart, diaphragm and esophagus, respectively.

Table 2: Anatomical distribution and viability of cysts in different organs

| Organ | Total | Viable | Proportion (%) |
|-----------|------------|--------|----------------|
| Tongue | 17(27.42%) | 7 | 41.18 |
| Masseter | 23(37.1%) | 6 | 26.09 |
| Triceps | 14(22.58%) | 4 | 28.57 |
| Heart | 4(6.45%) | 2 | 50 |
| Diaphragm | 3(4.84%) | 1 | 33.33 |
| Esophagus | 1(1.61%) | 0 | 0 |
| Total | 62 | 20 | 32.26 |

3.2. Questionnaire Survey Results

Out of 140 respondents in Bishoftu, 80%, 80% and 78.6% were familiar with Taeniosis, source of infection and prevention methods, respectively (Table 3). More than half of them (57.1%) had been advised

in the past not to eat raw beef. This awareness is regardless of age and sex difference ($p > 0.05$), but there is significant association in educational level, those with no education having least knowledge ($p < 0.05$).

Table 3: Respondents about source of infection and prevention of Taeniosis in Bishoftu

| Question | Total | Awareness (yes) | % |
|------------|-------|-----------------|------|
| Taeniosis | 140 | 112 | 80 |
| Source | 140 | 112 | 80 |
| Prevention | 140 | 110 | 78.6 |

Out of 140 respondents, 68.6% had been suffered from Taeniosis at least once. There is no significant association between Taeniosis occurrence and religion, educational level, between sex and

knowledge with Taeniosis since $p > 0.05$, but there is significant association between meat consumption habit, age category and occupation since $p < 0.05$ (Table 4).

Table 4: Proportion of human Taeniosis and association with risk factors in Bishoftu

| Risk factors | Respondents | Suffered | Prevalence (%) | X ² | p-value |
|---|-------------|-----------|----------------|----------------|---------|
| Age category | | | | | |
| 20 | 38 | 18 | 47.4 | 13.508 | 0.001 |
| 21-40 | 75 | 54 | 72 | | |
| > 40 | 27 | 24 | 88.9 | | |
| Total | 140 | 96 | 68.6 | | |
| Sex | | | | | |
| Male | 96 | 68 | 70.8 | 0.725 | 0.394 |
| Female | 44 | 28 | 63.6 | | |
| Total | 140 | 96 | 68.6 | | |
| Occupation | | | | | |
| Students | 44 | 18 | 40.9 | 23.395 | 0.000 |
| Civil servants | 19 | 16 | 84.2 | | |
| Farmers | 16 | 14 | 87.5 | | |
| Merchants | 8 | 6 | 75 | | |
| Laborers | 53 | 42 | 79.2 | | |
| Total | 140 | 96 | 68.6 | | |
| Religion | | | | | |
| Christians | 119 | 81 | 68.1 | 1.883 | 0.390 |
| Muslims | 15 | 12 | 80 | | |
| Others | 6 | 3 | 50 | | |
| Total | 140 | 96 | 68.6 | | |
| Level of edu. | | | | | |
| No education | 11 | 11 | 100 | 6.106 | 0.107 |
| Informal | 9 | 7 | 77.8 | | |
| Elementary | 40 | 26 | 65 | | |
| High sch. & Above | 80 | 52 | 65 | | |
| Total | 140 | 96 | 68.6 | | |
| Meat consumption | | | | | |
| Raw beef, <i>kitfo</i> and <i>kitfolebleb</i> | 97 | 75 | 77.3 | 11.215 | 0.001 |
| Properly cooked meat | 43 | 21 | 48.8 | | |
| Total | 140 | 96 | 68.6 | | |
| Knowledge | | | | | |
| Yes | 112 | 79 | 80 | 1.003 | 0.317 |
| No | 28 | 17 | 20 | | |
| Total | 140 | 96 | 68.6 | | |

Among the interviewed people, 74 people used modern taenicidal drugs, 7 people used traditional

herbs, 14 people used both, but 45 people were never diseased and never used any drug.

3.3. Data of Inventory Pharmaceutical shops

This data was collected from Ethiopian Red Cross pharmacy, one health center and two private

pharmacies in Bishoftu from the year 2010 to 2013. This is summarized as follows (Table 5).

Table 5: Inventory of pharmaceutical shops in Bishoftu for the years 2010 to 2013

| Drug | 2010 | | 2011 | | 2012 | | 2013 | |
|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | Adult Doses | Cost (Birr) | Adult Doses | Cost (Birr) | Adult Doses | Cost (Birr) | Adult Doses | Cost (Birr) |
| Niclosamide | 13706 | 49654.02 | 14741 | 43864.95 | 13882 | 42159.02 | 11584 | 40444.11 |
| Praziquantel | 11257 | 24034.28 | 4788 | 22432.73 | 4534 | 21202.68 | 4837 | 23473.84 |
| Vermox | 4910 | 29461.92 | 4899 | 29392.97 | 4822 | 28933.37 | 4858 | 29145.08 |
| Total | 29873 | 168150.22 | 24428 | 95690.65 | 23238 | 92295.07 | 21279 | 93063.03 |

A total of 384198.97 Birr with 98818 total adult doses

3.4. Retrospective Laboratory Data

This data was laboratory record from one health center and one hospital in Bishoftu. From total of 84035 (35522 males and 48513 females) stool examined patients in the four years, 121 (45 males and 76 females) had been affected by Taeniosis.

4. Discussion

In the current study, the prevalence of bovine cysticercosis was 7.8%, which is comparable to the findings of Nigatu (2004) in Addis Ababa abattoir (7.5%), Getachew and Ashwani (2013) in Mekelle (7.23%) and Dawit (2004) in Gondar (4.9%). But the current prevalence was greater than from the findings of Tembo (2001) in central Ethiopia (3.11%), Getachew (2008) in Jimma (2.93%) and Nuraddis and Firew (2012) in Addis Ababa municipal abattoir (3.6%), but lower than the findings of Alemu (1997) in Bahr-Dar (19.5%), Abunna *et al* (2007) in Hawassa (26.25%) and Mesfin and Nuraddis (2012) in Hawassa municipality abattoir (22.9%). This may be due to the fact that the incidence of *C. bovis* varies from place to place and also reflects the expertise of meat inspectors, inexperienced meat inspectors could most likely miss out quite number of viable cysticerci, which blend with the pinkish-red color of the meat and be passed for human consumption (Adugna *et al.*, 2013). Moreover, in the routine inspection of beef carcasses, there is practical limitation to the number and degree of incisions permissible, for gross mutilation lowers the marketability of the carcass, as a result many infestations remain undetected.

According to the current study, the most affected organ with the highest number of cysts was masseter muscle (23, 37.1%) (Table 3.1.3) in agreement with Abunna *et al* (2008) and Mesfin and Nuraddis (2012), but not in line with the findings of Getachew (1990) in Debre zeit, Tolosa *et al* (2009) and Gomol *et al* (2011) in Jimma municipal abattoir and Nuraddis and Firew (2012) in Addis Ababa municipal abattoir. Masseter muscle was followed by tongue (17, 27.42%), triceps muscle (14, 22.58%), heart (4, 6.45%), diaphragm (3, 4.84%) and esophagus (1, 1.61%), respectively. These preferred predilection sites for the cysts of *Cysticercus* were similar to earlier reports in Ethiopia (Hailu, 2005; Adugna *et al.*, 2013) and various endemic areas (Anosike, 2001; Cabaret *et al.*, 2002; Opara *et al.*, 2006). The higher incidence of *Cysticercus bovis* in some muscles is attributed to increased blood flow due to increased activity, masseter muscle for example is muscle of mastication and similarly tongue is the most prehensile organ in cattle (Scandrett *et al.*, 2009).

Of the total cysts collected, 20 (32.26%) were viable while the rest 42 (67.74%) were non-viable, however, viability test of the cysts revealed that it was the tongue (7) which harbored the highest number of viable cysts followed by masseter muscle(6), triceps muscle(4), heart(2) and diaphragm(1) which is in agreement with Mesfin and Nuraddis (2012), but it is not in agreement with the reports of Abunna *et al* (2008) and Nuraddis and Firew (2012) who reported the triceps muscle to be the first to harbor *C. bovis*, however, their reports agreed with higher number of dead cysts than live ones.

In this study, there was no significant association between age group ($p > 0.05$) and this result is in agreement with Hailu (2005), Nuraddis and Firew (2012) and Mesfin and Nuraddis (2012) but not concurs with the observations of Gomol *et al* (2011). The possible reason for this might be any age group of animals has close susceptibility to *Taenia saginata* eggs, and the animals that were brought to the abattoir were nearly the same adult to old age. There was also no significant association observed between sex ($p > 0.05$) in accordance with reports of Kebede *et al* (2008), Gomol *et al* (2011) and Mesfin and Nuraddis (2012) and in contrary to Nuraddis and Firew (2012). Human Taeniosis was a wide spread health problem in the Bishoftu town reaching the proportion of 68.6% which was comparable with the reports of Dawit (2004) (69.2%) and of Abunna *et al* (2008) (64.2%); but less than the report of Hailu (2005) in Gondar 79.5% and Tembo (2001) in different agro-climatic zones of Ethiopia (89.41%), and higher than the reports of Mesfin and Nuraddis (2012) in Addis Ababa (44%), Dawit and Temesgen (2013) in Shire Indesilassie, Northern Ethiopia (62.5%) and Tesfaye *et al* (2012) in Wolaita Soddo (62.5%).

There was no significant association between proportion of Taeniosis in knowledge of disease similar to Dawit and Temesgen (2013), educational level similar to Regassa *et al* (2009), sex and religion in agreement with the finding of Tesfaye *et al* (2012). This could be due to the long time cultural habit of eating raw meat particularly that of *kourt* and *kitfo* in many social groups including those of educated and even health and veterinary professionals.

There was significant association between proportion of Taeniosis in age category, old group having significantly higher prevalence, in agreement with Mesfin and Nuraddis (2012). This might be because of frequency of consumption of raw meat related to difference in the availability of money in different age groups and in some families children were not allowed to eat raw beef. The significant association of Taeniosis in meat consumption habit was in fact that raw meat consumption exposes individuals to Taeniosis. This is similar to the findings of Tembo (2001), Abunna *et al* (2008) and Regassa *et al* (2009). There was also significant association between Taeniosis prevalence and occupation, being significantly high in farmers, similar to Mesfin and Nuraddis (2012). This might be because of financial availability and frequency of exposure depending on

the occupation for example; backyard slaughtering was mostly exhibited by farmers.

Regarding community awareness, most of the respondents (80%) were aware of Taeniosis and about source of infection of humans, similar with the report of Tesfaye *et al* (2013) from Jimma South Western Ethiopia (82.3%); and the major clinical symptoms they observed were proglottids in stool, weight loss, nausea, weakness and discomfort in the abdomen. The 78.6% of the respondents were familiar with the prevention methods of the disease. They replied as the main source of infection for humans was consumption of raw and undercooked beef; and the possible measures of prevention could be properly cooking meat, deworming animals while fattening, slaughtering animals in abattoir to be inspected carefully, environmental hygiene by constructing toilets and using drugs after infection. This awareness is regardless of age and sex difference ($p > 0.05$), but there is significant difference in educational level, those with no education having least knowledge ($p < 0.05$). Even though they were aware of, they were still consuming raw beef due to deep rooted cultural habit and by considering the disease as non-fatal and could be cured by using drugs after consumption of the beef. Most of them used modern drugs from pharmacies and health stations. Some of them also used traditional herbs like “*kosso*”, “*enkoko*” and “*alenquata*”. The reason for preferring of the drug of their choice was mainly availability even though efficiency and low cost of the drugs were some of the reasons as their response.

Most of the respondents (108, 77.1%) did not owned cattle, but most of them (120, 85.7%) had been slaughtering cattle in the form of “*kircha*” using backyard slaughtering method, and 69.29% of them had been consuming raw and undercooked meat, which could be contributing factor for the high prevalence of Taeniosis in the community.

The four years (2010 to 2013) record of laboratory in two health centers of Bishoftu town indicated that out of 84035 stool examined patients, 35522 males and 48513 females, 121 (45 males and 76 females) were affected by Taeniosis. The rate of prevalence of Taeniosis was higher in females than males this is because the total number of females examined was greater than that of males.

One of the possible sources of information to evaluate the economic impact of the disease is to carry out inventories of pharmaceutical shops, which may not indicate the actual loss. The inventories of two pharmaceutical shops, Ethiopian Red Cross Society pharmacy and one health center in Bishoftu town, which comprises four years record from 2010 to 2013, indicated that 98,818 total adult doses of taenicial drugs worthing 384,198.97 ETB with an average of 96,049.70 ETB per annum, which is about two fold of two years data report of Tesfaye *et al* (2012) in Wolaita Soddo (40.200.80 ETB). This showed direct proportionality with number of years in which the data was collected. Depending on the current result, it is worthy to say that Taeniosis diminishes household financial resources. The most commonly used taenicial drugs in the area were Niclosamide, Praziquantel and Mebendazole (vermox).

5. Conclusion and Recommendations

This study showed the occurrence of bovine cysticercosis in Bishoftu municipal abattoir and Taeniosis in Bishoftu town. Even though the majority of the respondents were aware about the disease, they did not stop consumption of raw and undercooked beef which is the most important source of infection. There was also backyard slaughtering practice which could be considered as the contributing factor for zoonosis. Taeniosis caused some financial losses increasing the demand of taenicial drugs by the infected persons. So the disease causes public health and financial problems that need serious attention in order to keep the health of the public. Therefore, the following points should be fulfilled:

- Increasing the awareness of the community about the health and economic impact of Taeniosis through continuous education of the public is very important.
- Construction of abattoirs should be supported with adequate facilities such as lighting and refrigeration.
- Backyard cattle slaughter (*kircha*) should be discouraged.
- There should be close and strong collaboration between medical and veterinary professionals to reduce the impact of the disease in both human and cattle population.

6. References

- Abunna, F., Tilahun, G., Megersa, B. and Regassa, A. (2007): Taeniasis and its socio-economic implication in Hawassa town and its surroundings, Southern Ethiopia. *East African Journal of public health*, **4**: 73-79.
- Abunna, F., Tilahun, G., Megersa, B., Regassa, A. and Kumsa, B. (2008): Bovine cysticercosis in cattle slaughtered at Hawassa municipal abattoir, Ethiopia: prevalence, cyst viability, distribution and its public health implication. Faculty of Veterinary Medicine, Hawassa University, Ethiopia. *Zoonosis and Public health*, **55**: 82-88.
- Adugna, T., Yacob, H., Dinka, A. and Getachew, T. (2013): Bovine cysticercosis and human taeniosis in South-West Shoa zone of Oromia Region, Ethiopia. *Ethiopian Veterinary Journal*, **17**: 121-133.
- Alemu, M. (1997): Bovine Cysticercosis Prevalence Economic and Public Health Importance at Bahir Dar Municipality Abattoir. DVM Thesis, Faculty of Veterinary Medicine, Addis Ababa University.
- Anosike, J. (2001): Some observations on *Taenia saginata*/cysticercosis in slaughter cattle in Nigeria. *International Journal of Zoonoses*, **2**: 82-89.
- Bowman, D. (1995): Georgis' Parasitology for Veterinarians: 6th Edition, W.B. Saunders Company. Pp113-228.
- Cabaret, J., Geerts, S., Madeline, M., Ballandonne, C. and Barbier, D. (2002): The use of urban sewage sludge on pastures: The cysticercosis threat. *Veterinary Researches*, **33**: 575-597.
- Dawit, G. and Temesgen, M. (2013): Risk factors and Public health significance of cysticercosis in cattle and human in Shire Indasilassie District, Northern Ethiopia, Aksum University, Ethiopia. *Advances in Biological Research*, **7**: 282-287.
- Dawit, S., (2004): Epidemiology of *T. Saginata* Taeniasis and Cysticercosis in North Gondar Zone. DVM Thesis, Faculty of Veterinary Medicine, Addis Ababa University, Debre Zeit, Ethiopia.
- Dorny, P., Praet, N. Gabriel S. (2009): Emerging food-borne parasites. *Veterinary Parasitology*, **163**: 196-206.
- Fralova, A. (1982): Epidemiology of Taeniasis. Zoonosis control collection of Teaching Aids for International Training Course, Moscow.
- Fralova, A. (1985): Taeniosis. In: Lysenko. A., Zoonoses control. Moscow: UNEP publication. Pp 192-235.

- Fufa, A. (2006): Study on the prevalence of Bovine Infection, Cysticercosis in Hawassa municipal abattoir and *Taenia saginata* in Hawassa town and its surroundings, South Ethiopia. MSc Thesis, Addis Ababa University, Faculty of Veterinary Medicine, Debre Zeit, Ethiopia.
- Getachew, A. (2008): A study on the prevalence and public health importance of *C. bovis* in Mekelle abattoir. DVM thesis, Mekelle University, Mekelle, Ethiopia.
- Getachew, A. and Ashwani, K. (2013): Cysticercosis in cattle and its public health implication in Mekelle City and surrounding areas, College of Veterinary Medicine, Mekelle University, Ethiopia. *Ethiopian Veterinary Journal*, **17**: 31-40.
- Getachew, B. (1990): Prevalence and significance of *Cysticercus bovis* among cattle slaughtered at Debre Zeit abattoir. DVM Thesis, Faculty of Veterinary Medicine, Addis Ababa University, Debre Zeit, Ethiopia.
- Gracey, F. and Collins, S. (1992): Meat hygiene. 5th Edition, Bailliere Tindal, London. Pp. 413-420.
- Gracey, J., Collins, D. and Huey, R. (1999): Diseases caused by helminthes and arthropod parasites. In: Meat Hygiene, 10th Edition. W.B.Saunders Company Ltd., London. Pp673.
- Gomol, T., Achnef, M., Basazenuw, B. and Mersha, C. (2011): Cyst viability, Body site distribution and Public health significance of Bovine cysticercosis at Jimma, South West Ethiopia. *Global Veterinarian*, **7**: 164-168.
- Hailu, D. (2005): Prevalence and Risk Factors for *Taenia Saginata* Cysticercosis in Three Selected Areas of Eastern Shoa. M.Sc Thesis, Faculty of Veterinary Medicine, Addis Ababa University, Debre Zeit, Ethiopia.
- Harrison, L. and Sewell, M. (1991): The Zoonotic Taeniae of Africa. In: Parasitic Helminths and Zoonoses in Africa, London, Unwin Hyman. Pp. 54-56.
- Kebede, N., Tilahun, G. and Hailu, A. (2008): Prevalence of *Taenia saginata* cysticercosis in cattle slaughtered for meat at Addis Ababa abattoir, Addis Ababa University, Faculty of Veterinary Medicine, Addis Ababa, Ethiopia. *Journal of Tropical Animal Health and Production*, **41**: 291-294.
- Mesfin, B. and Nuraddis, I. (2012): Prevalence of *Cysticercus bovis* in Hawassa municipal abattoir and its public health implication, Jimma University, School of Veterinary Medicine, Ethiopia. *American Eurasian Journal of Scientific Research*, **7**: 238-245.
- MoA (1972): Meat Inspection Regulations. Legal Notice No-428: Negarit Gazeta, Addis Ababa, Ethiopia.
- Nigatu, K. (2004): *Cysticercus bovis*: Development and evaluation of serological tests and prevalence at Addis Ababa abattoir. MSc Thesis, Faculty of Veterinary Medicine, Addis Ababa University, Debre Zeit, Ethiopia.
- Nuraddis, I. and Frew, Z. (2012): Prevalence of *Taenia saginata* Cysticercosis in cattle slaughtered in Addis Ababa municipal abattoir, Jimma University, School of Veterinary Medicine. *Global Veterinaria*, **7**: 467-471.
- Opara, M. N., Ukpung, U. M., Okoli, I. C. and Anosike, J. C. (2006): Cysticercosis of Slaughtered Cattle in Southeastern Nigeria. *Annals of New York Academy of Sciences*, **1081**: 339-346.
- Regassa, A., Abunna, F., Mulugeta, A. and Megersa, B. (2009): Major metacestodes in cattle slaughtered at Wolaita Soddo Municipal abattoir, Southern Ethiopia: prevalence, cyst viability, organ distribution and socio-economic implications. *Tropical Animal Health Production*, **41**: 1495-502.
- Scandrett, B., Parker, S., Forbes, L., Gajadhar, A., Dekumyoy, P., Weikagul, J. and Haines, D. (2009): Distribution of *Taenia saginata* cysticerci in tissues of experimentally infected cattle. *Veterinary Parasitology*, **164**: 223-231.
- Soulsby, E. (1982): Helminths, Arthropods and Protozoa of Domestic Animals. 6th Edition, Baillieretindal, London, Philadelphia.
- Tembo, A. (2001): Epidemiology of *T. Saginata* Taeniasis and Cysticercosis in Three Selected Agro Climatic Zones in Central Ethiopia. Msc Thesis, Faculty Of Veterinary Medicine, Addis Ababa University & Free University Of Berlin, Debre Zeit, Ethiopia.
- Tesfaye, D., Sadado, T. and Demissie, T. (2012): Public Health and Economic Significance of Bovine Cysticercosis in Wolaita Soddo, Southern Ethiopia. *Global Veterinaria*, **9**: 557-563.
- Tesfaye, D., Fekede, D., Tigre, W., Regassa, A. and Fekadu, A. (2013): Perception of the public on the common zoonotic diseases in Jimma, South Western Ethiopia. *International Journal of Medicine and Medical Sciences*, **5**: 279-285.
- Thrusfield, M. (2005): Veterinary epidemiology. 3rd Edition, Black well Science, Ltd, UK. Pp. 231-234.
- Tolosa, T., Tigre, W., Teka, G. and Dorny, P. (2009): Prevalence of bovine cysticercosis and Hydatidosis in Jimma municipal abattoir, South West Ethiopia. *Journal of Veterinary Research*, **76**: 323-326.

- Urquhart, G., Armour, J., Duncan, J., Dunn, A. and Jennings, F.(1996): Veterinary Parasitology. 2nd Edition, Blackwell Science,London. Pp. 120-137.
- Wayne, L., John, B., Dave, B. and Brad, S. (2002): Outbreak of *Cysticercus bovis* (*Taenia saginata*) in feedlot cattle in Alberta. *Canadian Veterinary Journal*, **43**: 227-228.
- WHO (1995): Food Technologies and Public Health. Geneva, Switherland. Pp. 223.
- WHO (2006): Investing in health research and development report of the committee on health research relating to the future intervention options, Geneva, Switzerland. Pp. 278.

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