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**Article Type:** Review Article

**Received:** 26/09/2020

**Published:** 15/10/2020

Open Access Journal of Biogeneric Science and Research
ISSN 2692-1081

***DOI:*** *10.46718/JBGSR.2020.04.000114*

# Prevalence and Economic Importance of Liver Parasites in Small Ruminants Abyssinia Export Abattoir, Bishoftu Ethiopia

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## Abstract

A cross-sectional study was conducted at Abyssinia export abattoir to identify and compare the prevalence of silesia hepatica and Cysticercus tenuicollis in small ruminants and to estimate the direct financial loss due to these organs condemnation. A total of 384 animals were examined using simple random sampling methods. Both antemortem inspection in the lairage and a thorough postmortem examination were carried out using standard examination procedures. Out of the total 384 small ruminants enrolled in this study, prevalence of silesia hepatica and Cysticercus tenuicollis was 79 (20.6%) were found to have various types of postmortem abnormalities that leads to organ condemnation. The prevalence rates were Cysticercus teniculosis that took the major share (13.5%) followed by Stelesia hepatica (7.01%). The organ condemnation rates did not show significant difference (P > 0.05) among age group, origin of animals and body condition scores. The financial loss due to edible organ and carcass condemnation was estimated to be 135040 Ethiopian Birr. The observation of such level of abnormalities and substantial economic loss with condemnation of affected organs warrants the institution of appropriate control measures during antemortem and postmortem examination following standard procedure. In order to reduce this loss, both government and private agencies should have work together on problem that are commonly identified on abattoir survey.

**Keywords:** Abattoir; Condemnation; Liver. Small ruminants

## Introduction

Ethiopia has the larger livestock population in Africa, estimated at 49 million head of cattle 47 millions of small ruminant, 2.7 million head of donkeys and about 76,000 of camel and 42 million chickens [1] here were approximately 57.8 million cattle, 28 million sheep, 28.6 million goats, 1.23 million camels and 60.5 million poultry [2]. Ethiopia's great livestock potential is not properly exploited due to different factors such as traditional management system, limited genetic potential, lack of appropriate disease control policy [3]. Each year a significant loss results from death of animals, inferior weight gain, condemnation of edible organs and carcass at slaughter [4].

An abattoir as a building for butchering can be a source of valuable information of the incidence of animal disease and condition. Some of which may be zoonotic. It is food factory whose primary animals to produce health, wholesome and clean products which are safe for human consumption. In adequate care of those food animals reduce their productivities and expose them to different forms of disease agent which may became hazardous to man and his environment [5]. It also provides information on the epidemiology of diseases on livestock to know to what extent the public is exposed to certain zoonotic diseases and estimate the financial losses incurred through condemnation of affected edible organs and carcasses. As meat is the main source of protein to man, it should be clean and free from diseases of particular public importance such as, tuberculosis and cysticercosis. Carcass and organs are also condemned to break the chain of some zoonosis which is not transmitted to human directly through meat like hydatidosis and other important diseases of animals such as fasciolosis [6].

The main causes of organ condemnation during

post mortem inspection in slaughter house are diseases originated by parasites, bacteria and viruses [7]. The effects of this infection in livestock include infertility, poor carcasses, reduce production and condemnation of the organ during postmortem meat inspection [8]. In ruminants, the high number of these helminthes infection (hydatidosis fascioliasis and lung worm) lead to great loss of organs and carcasses which are the source of animal protein, in addition to loss of production and performance of animals [9]. Therefore, the objective of this study was to detect the most common parasitic infections causing livers and lungs condemnation in small ruminants at Abyssinia Export Abbattoir of Bishoftu town.

## Literature Review

### Overview on Liver Parasites

Liver are important organs that are usually infected with these parasites. Parasitic infections in ruminants such as food-borne trematode infections and hydatidosis are endemic diseases caused by helminths that are responsible for great economic loss due to many disorders which results in mortality, reduction of milk production, loss of weight gain, cachexia, condemnation of livers and lungs, high susceptibility to secondary infections and getting public health at risk [10].

Liver fluke is a helminth parasite of mammals and a member of the Class Trematoda, It infects cattle, sheep, goat, horse, deer and humans as definitive hosts [11]. The ingestion of large numbers of infective stages of the parasite [12]. Once ingested, the outer cyst wall is removed mechanically during mastication. Rupture of the inner cysts occurs in the intestine leading hatching the metacercariae. The juvenile flukes then penetrate the intestinal mucosa and migrate to the predilection sites where they become adults after several weeks. There in the predilection site, they reproduce and exert effect causing damage and disease in the affected host [13]. The most common method of diagnosis is by faecal egg counts and pathological lesions in the liver during post mortem examination at the abattoir [14].

Echinococcosis/hydatidosis is a zoonotic parasitic disease caused by the dog tape worm of Echinococcus and its larval stage, the hydatidcyst [15]. Helminthes (metacercaria) may be found on the surface waters and on vegetables through the use of manure produced from already contaminated faces. Humans drinking fresh untreated water or consuming raw vegetables which may not be properly washed or peeled containing metacercaria, a situation that is not uncommon in some parts of rural Africa, may become infected the larval form of E. granulosus in intermediate hosts that can also cause considerable economic losses and public health problems [16].

Ungulates, including sheep, cattle, goats, pigs and horses are intermediate hosts in which Hydatid cysts occur. Adult of the genus Echinococcus are found in the small intestines of dogs and other carnivores [17]. C. tenuicollis fibrous scars resulting from the migration of the larvae lead to condemnation of the viscera and disposal of other offals to which the mature bladder worms attach. There is no human health hazard, but the liver lesions are unsightly and affect the texture of the tissue, making it unsuitable for human consumption and the economic losses associated with condemnation of affected organs are significantly high. These infestations not only cause clinical disease and mortality but also cause economic losses through production losses and condemnation of whole carcass and organs at slaughter. The latter have a huge effect in countries like Ethiopia as export beginner and its effect were seen significant in different abattoirs [18].

### Cysticercus tenuicollis

Members of the family Taeniidae are the most important cyclophyllidean tapeworms. Different species of the genera Echinococcus and Taenia are responsible for major medical and economic losses in humans and animals [19,20]. In addition, one of the most prevalent Taenia species in livestock is the bladder worm T. hydatigena [20]. Mature Cysticerci have a smooth inner surface and contain only a single invaginated scolex, in contrast to hydatid cysts [21].

The prevalence of the C. tenuicollis infestation varies according to the geographical areas and generally reaches higher incidences in countries with a lower degree of sanitary control and with an uncontrolled wild carnivore population [22]. Cysticercus tenuicollis is a metacestode of Taenia hydatigena, for which the definitive hosts are dogs and wild canids. Its intermediate hosts are mainly goats, sheep, pigs, cattle, horses and deer. The adult form T. hydatigena releases eggs into the feces of definitive hosts, thus facilitating intake by ruminant animals while grazing. Once ingested, the eggs hatch in the small intestine and start to migrate to other visceral organs. Clinical signs in sheep and other ruminants infected with C. tenuicollis occur during the larval migration in the liver with different clinical signs on sick animals. Peritonitis, mostly in young animals, is observed and associated with weakness, sluggish and loss of appetite leads to loss of weight. In acute cases it is difficult to show any signs and the animal will be died. In chronic cases inflammation of peritoneal cavity with ascitis

was observed [23].

The Certain deep-rooted traditional activities have been described as a factor associated with the spread and high prevalence of the disease in some areas of the country. These can include the wide spread backyard slaughter of animals, the corresponding absence of rigorous meat inspection procedures, the long-standing habit of feeding domesticated dogs with condemned offal [24]. Most of the times a diagnosis is made at the abattoir. However, the effect of this infestation upon the hosts depends largely on the degree of the parasitism, the organs involved and the existence of other concurrent infections [25]. The success with the T. ovis recombinant vaccine has shown the potential for developing practical vaccines to assist in control of the important zoonotic species of taeniid cestodes.

### Stelesia hepatica

Stelesia hepatica is known as liver tapeworm with taxonomy class of Kingdom-Animalia, Phylum Platyhelminthics, Class Cestoda, Order-Cyclophyllidea, Family-Anoplocephallidae, Geneus-Stilesia and species Stelesia hepatica. It is an extremely common cestode parasite (90-100%) in sheep in many parts of Asia, Africa (South Africa) including Ethiopia with poorly understood epidemiology [26]. The adult parasite is found in the bile duct of sheep and goat as well in wild ruminants in large number at slaughter and causes neither clinical sign nor significant hepatic pathology but sometimes liver may show mild cirrhosis with thickening of the bile duct. It affects animals of all age and is considered non-pathogenic. Heavy infections are frequently seen in apparently healthy sheep and goat with almost complete occlusion of the bile duct, icterus, and other signs are not observed in live animals

### Financial Loss

An abattoir survey conducted from July 2012 to December 2012 by Yibar in two abattoirs of Bursa province, Turkey, showed that financial loss due to condemnation of liver by fasciolosis was 4042 USD. A study conducted in Arusha abattoir, Tanzania by Mwabonimana revealed that a direct financial loss incurred due to liver condemnation was estimated to 18,000 USD. According to the report of Swai and Ulicky [27] the direct financial loss associated with liver condemnation was 2,098 USD and 1,780 USD due to all causes and fasciolosis, respectively. A retrospective study by Suhair showed that the estimated financial loss due to condemnation of liver was 194.12 USD in Alkadroo abattoir, Sudan. In our country, the direct financial loss due to condemnation of liver was reported by various researcher from different area of the country: Asmare 170,676 ETB from Bahir Dar; Nurit 12,810 ETB from Kombolcha industrial abattoir and Getaw who reported 287,179.99 ETB in Hashim nur export abatttior, Bishoftu town.

## Material and Methods

### Study area

The study was conducted from December 2019 to April 2020 at Abyssinia Export Abattoir in Bishoftu town. It is located at 9 °N and 40 °E. It is 47 km South East of Addis Ababa, the capital of Ethiopia. The altitude is about 1850 m above sea level. It experiences bimodal patterns of Rainfall with the main rainy season extending from June to September with an average rainfall of about 800 mm. The mean annual minimum and maximum temperatures are 12.3 °C and 27.7 °C, respectively with an overall average of 18.7 °C. The mean relative humidity is 61.3%. The soil and climate are like those in many highland areas in Ethiopia. It is an important town where most governmental institutions, national and international research centres are located. Cattle, small ruminant, poultry and equines are the major livestock species kept with fast growing smallholder dairy production. Currently, the abattoir is one of the most facilitated modern export abattoirs in Ethiopia and is exporting meat of small ruminant [28].

### Study Design and Population

A cross-sectional study design was employed for this study. The study animals were all small ruminants brought to the Abattoir. They were only local breeds of both sheep and goat species and all age groups of both sheep and goats slaughtered for exporting to Arab Emirate. The study animals brought from different town and district by merchants for slaughters (Bale, Borana and Jinka). All studied animals were male and transported to the abattoir using vehicles or on foot depending on the site of collection. Antemortem and post mortem examinations are carried out for every animal.

### Sample size determination and Sampling method

By using systematic random sampling methods and 95% interval with required 5% precision, the sample size of both species of animals are determined by the formula of Thrusfield [29].

$$N=1.962\times Pexp(1-Pexp)$$

$$d2$$

$$n=1.962 * 0.5(1-0.5)=384$$

$$(0.05)2$$

Where, N- Required sample size, Pexp - Expected prevalence, d- Desired absolute precision, usually d is 0.05

at 95% confidence level and 5% expected error

### Abattoir survey

Active abattoir survey was conducted during routine meat inspection on randomly selected sheep and goats. During ante-mortem examination of each study animal was given an identification number and its age and origin was recorded. After slaughtering, post-mortem examination was carried out using standard procedures recommended by [27,30]. The age of animals was estimated based on the dentition formula as given by Abegaz and Awgichew. Sheep and goats with only one milk teeth were classed as young, and those with one to four pairs of permanent incisors as adult. The body condition (nutritional status) scoring was classified into three categories: poor (1, 2) (hide bound with obvious bony prominences and deep sunk tail base), medium (3) (ribs and other bony prominences noticeable on visual inspection but have fair fleshy background on palpation) and good (4, 5) (bony structures notable only on palpation) according to Abegaz and Awgichew & Thompson and Meyer.

During Post mortem inspection, Liver, lung and carcass were thoroughly inspected by visualization; palpation and making systematic incisions where necessary for the presence of cysts, adult parasites and other abnormalities responsible for study organs and carcass condemnation and the result are recorded. Gross pathological lesions are differentiated and judged according to the guidelines on meat inspection for developing countries and classified, approved as fit for human consumption, conditionally approved as fit for human consumption, totally condemned as unfit for human consumption and partially condemned as unfit for human consumption [31,32].

### Data Management and Analysis

All data collected from the slaughtered shoat were entered in to micro soft excel worksheet and were analyzed using Statistical Package for Social Science (SPSS) software version 20. Descriptive statics such as, percentage was used to determine the level of liver condemnation rate. The associations between the various potential risk factors like age, origin, sex and body condition of animal assed by Pearson Chi-square (X2) and p-value < 0.05 was considered as significant

## Results

### Overall Prevalence of liver parasite

A total of 64 sheep and 320 goats were examined at Abyssinia export abattoir for the presence of S. hepatica and C. tenuicollis. The overall prevalence of liver parasites in study area was 20.6% (79/384). The prevalence of S. hepatica 27 (7.03%) and C.tenuicollis 52 (13.54%) was recorded. The prevalence of C.tenuicollis was higher than Stelasia hepatica in study area. The prevalence of C. tenuicollis and Silesia hepatica was higher in the goats 65 (16.9%) than in sheep 14/384 (3.65%) (Table 1).

*Table 1: Prevalence of liver parasites based on species*

| Species | No of examined animals | No of positive animals | Frequency | $X^2$ | P value |
|---|---|---|---|---|---|
| Goats | 320 | 65/384 | 16.9 | 0.08 | 0.78 |
| Sheep | 64 | 14/384 | 3.65 | | |

### Prevalence of liver parasites and different risk factors

The study revealed that prevalence rate in adult was slightly lower than prevalence rate in young animals. However, there was no statistically significant ($p > 0.05$) between age of the small ruminants in the study area. The prevalence rate of Stelasia hepatica in adult was higher than prevalence rate in young. The study revealed that the prevalence of C. tenuicollis was higher in the young than in adult. The study revealed that the C. tenuicollis 52(13.5%) was higher prevalent than Stelasia hepatica 27(7.03%) in study area (Table 2). The study included 251 medium and 93 good and 40 poor body conditioned small ruminants. Prevalence of the S. hepatica and C. tenuicollis based on the body condition basis indicated slightly higher rate of rejection recorded in medium 52(13.5%) and good body conditioned animals 19(4.95%). But the difference was not statically significant ($\chi 2 = 0.012$; $P = 0.994$) (Table 3A). The prevalence of liver parasite was prevalent in borana 33 (8.6%) than bale 30 (7.8%) and Jinka (4.2%) based on statistical analysis. However, there was no statistical signified different between origin of animals ($P>0.05$) (Table 3B).

*Table 2: Prevalence of Stelasia hepatica and C. tenuicollis based age and postmortem examination*

| Age groups | No of examined animals | No of animal positive | | $X^2$ (p value ) |
|---|---|---|---|---|
| | | *S.hepatica* | *C.tenuicollis* | |
| Young | 201(52.3) | 12(3.13%) | 27(7.03%) | 0.752 (0.687) |
| Adult | 183(47.7) | 15(3.91) | 25(6.501) | |
| Total | 384 | 27(7.03%) | 52(13.5%) | |

### Estimation of Financial Loss

The annual slaughter rate of AEA is 7600 sheep and 8400 goats and the average rejection rate of sheep and goats' liver at the abattoir in the current finding was 14.29%. The average cost of sheep and goat liver during the study period

*Table 3A: Prevalence of C.tenuicollis and St. hepatica based on body condition of animals*

| Body condition | No of animal examined | No of animal positive | $X^2$ (p value) |
|---|---|---|---|
| Good | 93 (24.2) | 19 (4.95%) | 0.012 (0.994) |
| Medium | 251(65.4%) | 52(13.5%) | |
| Poor | 40(10.4%) | 8 (2.1%) | |

*Table 3B: Prevalence of C.tenuicollis and St. hepatica based on body condition of animals*

| Origin | No of animal examined | No of animal positive | $X^2$ | p-value |
|---|---|---|---|---|
| Borana | 168 | 33 | 0.289 | 0.866 |
| Bale | 136 | 30 | | |
| Jinka | 80 | 16 | | |

was 50 ETB. And average rejection rate of sheep and goats lung at abattoir in the current finding was 0.86% and the average cost of sheep and goats lung during study period was 15 ETB. According to the above consideration, the average annual direct economic loss due to liver and lung condemnation in Abyssinia export abattoir was estimated to 135040 ETB (Table 4).

*Table 4: Estimation of Financial loss due to organ condemnation at Abyssinia Export Abattoir.*

| Organ | Annual capacity of the abattoir | Rejection rate | No. of organs condmentation | Average current price | Total (ETB) |
|---|---|---|---|---|---|
| Liver | 7600 sheep + 8400 Goat = 16000 | 14.28% | 2289 | 50 ETB | 114,400 |

## Disscusion

An important function of meat inspection in abattoir is to assist in monitoring diseases in the national herd and flock by providing feedback information to veterinary services, to control or eradicate diseases, producers, to produce wholesome products safely and to protect the public from zoonotic hazards. In the present study, the prevalence of Stelesia hepatca and C.tenuicolis in liver of small ruminants slaughtered at Abyssinia Export slaughter house was investigated and the magnitude of the direct economic losses caused by these parasites as consequence of liver and lung condemnation were estimated. The study revealed that parasites (C. tenuicollis and S. hepatica) are the principal causes responsible for the liver rejection in the abattoir. Losses from condemnation were assumed to occur since hepatic pathology is associated to infection that might have public health importance and aesthetic value. The present study has provided an overall prevalence of S.hepatica in small ruminants slaughtered at Abyssiniya abattoir to be 79(20.6%). The current study has indicated a close Prevalence compared to a study by Zelalem in HELMIX abattoir with a prevalence of 26.9%, Mulugeta and Mekonnen in ELFORA industrial abattoir with a prevalence of 32.3%, and Tesfaye, who reported 28.37% in Modjo modern export. The prevalence of infection in Borana animals was 8.59%, while at Bale and jinka animals were 7.8%. 4.2% respectively This study results there is no significant difference between parasite and origin of the animals the most probable reason be the same control measures applied in place, the level of community awareness created about the disease, education, nature of the pasture, the way of raising animals and levels of exposure and maturity.

The result of this study indicated that there was no significant difference between organ condemnation and body condition of animals. This finding is agree with Muleta and Mekonnen, in ELFORA abattoir, as body condition did not have significant difference and disagree disagree with who reported body condition was significant difference. This variation might due to sampling time, feeding habits and immunity status.The current result also indicated that there was no significant difference in parasitic cause of organ condemnation and age of animals. This finding agree with the work reported by Mesfin and Mekonnen and Ezana and disagree with study done by Gamachis and Hailegbrel who reported higher in young than adult. This may be due to both of them have the same management system.

## Conclusion and Recommendations

The present study, it concluded that certain parasitic disease (C. tenuicollis, S. hepatica) were associated with the condemnations of liver and lung in Abyssinia Export abattoir, at Bishoftu city. From the total 384 examined small ruminants 79 (20.6) were found to have these parasitic disease leads to organ condemnation. But the other variables (age, animal origin and body condition) included in the study did not show significant difference ($P > 0.05$) to the outcome variable. Thus, the disease has also considerable economic effect in addition to implication of public health hazard that need effective preventive and control strategies to avoid the problem. In conclusion, strategic deworming of animals in areas where specific disease prevalence is high coupled with good animal husbandry should be practiced. Training of abattoir workers on procedures how to dispose the offal properly should be given. Immediate, safe and controlled elimination of all condemned abattoir materials should be practiced. Moreover, integrated preventive measures to the

different cause of organ condemnation should be applied to reduce unnecessary financial loss in small ruminant industry.

## References


1. Central Statistical Agency (2009) Federal Republic of Ethiopia central statistical agency, agricultural sample survey 2008/2009 (2001 E.C.): Report on livestock and livestock characteristics, statistical bulletin. pp. 446-465.
2. CSA (2012) Agricultural sample survey Volume II, Report on livestock and livestock characteristics, Central Statistic Authority, Addis Ababa, Ethiopia. p. 35-49.
3. Ayele S, Assegid W, Belachew H, Jabbar MA, Ahmed MM (2003) Livestock marketing in Ethiopia: A review of structure, performance and development initiatives.
4. PACE-Ethiopia (2003) Experiences and the way. Forward on community-based Animal Health Service deliveryin.
5. Cadmus SIB, Adesokan HK (2009) Causes and implications of bovine organs/offal condemnations in some abattoirs in western Nigeria Ibadan: Department of Veterinary Public Health and Prevention Medicine, Faculty of Veterinary Medicine, University of Ibadan, p. 1-2.
6. Shegaw S (2008) The study on causes of organ condemnation in slaughtered cattle at Mekelle abattoir. DVM thesis, Mekele University, Faculty of Veterinary Medicine, Mekele, Ethiopia.
7. Jobre YF, Labego R, Tiruneh G, Abeb, Drchies PH (1996) Hydatidosis in three selected regions in Ethiopia. An assessment trial on its prevalence, economic public health importance, Revue De Medicine Veterinary 147: 797-804.
8. Odero Joseph, Japhet Magambo, Eberhard Zeyhle, Helen Kutima, Lucy Ndahi, (2015) Prevalence of cystic Echinococcosis and its economic Significance in Domestic Small Ruminants in Selected Abattoirs in Belgut, Kenya. Arch Animal Husb & Dairy Sci 1: 4.
9. Taylor M, Coop R, Wall R (2013) Veterinary parasitology. (3rd edn), Oxford, UK.
10. Alemu Y, Merkel RC (2008) Sheep and goats' production and Handbook for Ethiopia. p. 2.
11. Ansari-Lari .M, Moazzeni M (2006) A retrospective survey of liver fluke disease in livestock based on abattoir data in Shiraz, South of Iran. Prev Vet Med 73: 93-96.
12. Sargison ND, Scott PR (2011) Diagnosis and economic consequences of tricla- bendazole resistance in Fasciola hepatica in a sheep flock in south-east Scotland. Vet Rec 168: 159.
13. Hossain MM, Paul S, Rahman MM, Hossain FMA, Hossain MT, et al. (2011) Prevalence and economic significance of caprine fasciolosis at sylhet district of Bangladesh. Pak Vet J 3(12): 113-116.
14. Thienpont D, Rochette F, Vanparijs OFJ (1979) Diagnosing helminthiasis through coprological examination. Janssen Research Foundation, Beeres Belgium, pp. 112.
15. Schantic PM (1990) Parasitic zoonoses in perspective. International Journal for Parasitology, 21: 165-166.
16. Azami M, Anvarinejad M, Ezatpour B, Alirezaei M (2013) Prevalence of hydatidosis in slaughtered animals in Iran. Turk J Parasitol 37:102-106.
17. Kassa SA (2012) Cystic Hydatidosis in Ethiopia: a review. Scientific Journal of crop science 1: 1-8.
18. Jibat T, Ejeta G, Asefaw Y, Nusie A (2006) Causes of abattoir condemnation in apparently healthy slaughtered sheep and goats. Debre Zeit: HELMEX Abattoir.
19. Budka H, Buncic S, Colin P, Collins, J (2004) Opinion of the Scientific Panel on Biological Hazards on a request from the Commission related on Revision of Meat Inspection Procedures for Lambs and Goats. EFSA J 54: 1-49.
20. Rostami S, Salavati R, Beech RN, Babaei Z, Sharbatkhori M, Baneshi MR, et al. (2013) Molecular and morphological characterization of the tapeworm Taenia hydatigena (Pallas, 1766) in sheep from Iran. Journal of Helminthology. Cambridge University Press 8: 1-8.
21. Ne Dwight, Bowman D, Carl R, Eberhard L, Alcaraz A (2003) Economic importance of small ruminant's echinococcosis, Parasitol Vet 139(8): 38-45.
22. Woinshet S, Girma G (2010) Prevalence, risk factors and distribution of Cysticercus tenuicollis in visceral organs of slaughtered sheep and goats in central Ethiopia. Science and Business Media 4: 14-19.
23. Acha PN, Szyfres B (2003) Zoonoses and communicable diseases common to man and animal.Volume Parasitoses. 3rd Washington DC: PAHO; 2003. Scientific and Technical Publication No. 580. Cysticercosis p. 75.
24. Biffa D, Jobre Y, Chakka H (2006) Ovine helminthosis, a major health constraint to productivity of sheep in Ethiopia. Animal Health Research Reviews 7: 107-118.
25. Singh KS (2003) Veterinary helminthological. Indian Council of Agricultural Research.
26. Kaufmann J (1996) Parasitic infections of domestic animal a diagnostic manual. Birk Hauser ver lag, Basel Boston, Berlin, pp. 280-283
27. Swai I, Schoonmann K (2012) A survey of zoonotic diseases in trade cattle slaughtered at Tanga city abattoir: a cause of public health.
28. CSA (2013) Agricultural sample survey report on livestock and livestock characteristics (Private peasant holdings). Statistical Bulletin 570. Central Statistical Agency federal democratic republic Ethiopia Addis Ababa, Ethiopia.
29. Thrusfield M (2007) Veterinary Epidemiology, (3rd edn), Black well Science, Singapore, pp. 233.
30. FAO/UNEP/WHO (1994) Guidelines for echinococcosis/ hydatidosis surveillance, prevention and control. Rome: Food and Agriculture Organization of the United Nations pp. 147.
31. Chen MG, Mott KE (1990) "Progress in assessment of

morbidity due to Fasciola hepatica Infection: a review of recent literature". Tropi.

32. Mirzaei M, Rezaei H, Nematollahi A (2015) Role of ruminants in the epidemiology of *Echinococcusgranulosus*in Tabriz area, Northwest of Iran. Trop Biomed 32(2): 269-275.

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