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# Prevalence and Economic Importance of *Stilesia Hepatica* in Small Ruminants Slaughtered at Helmix Abattoir, Bishoftu, Ethiopia

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*Abstract-* Across sectional study was conducted at HELMEX abattoir, Debrezeit town, central highlands of Ethiopia from October 2010 to march 2011 on 800 young and adult sheep and goats (400 sheep and 400 goats) originated from different areas of Ethiopia. The objectives of the study were to determine the prevalence of *Stilesia hepatica* in young and adult sheep and goats brought to the slaughter house from different parts of Ethiopia and to assess the direct financial loss incurred due to rejection of *Stilesia hepatica* infected livers. Pearson's chi-Square (x2) test was calculated to determine the degree of association of *S.hepatica* infection with species (sheep and goats), origin and age (young and adult) of the animals. P-value less than 0.05 were considered to be statistically significant.The overall prevalence of *S.hepatica* in sheep and goats was 32.5% (130/400) and 21.3 %( 85/400), respectively. This difference in the prevalence of *S.hepatica* between sheep and goats showed statistically significant (P<0.05) values. The prevalence of S.hepatica in young and adult sheep and goats was 18.7 %( 88/471) and 38.6 %( 127/329), respectively. Statistical significant difference (P<0.05) was recorded between the respective adult and young age groups of sheep and goats. The prevalence of *S.hepatica* for sheep and goats originated from different areas of the country was Afar 21.3 %( 17/80), Arbaminch 32.2 %( 29/90), Awash 30.0 %( 48/160), Borena 20.0% (10/50), Jinka19.2 %( 25/130), Harar 36.7% (22/60), Ogaden 29.1% (32/130), Wolaita 26.7% (32/120). Statistically no significant difference (P>0.05) was recorded in the prevalence of *S.hepatica* in sheep and goats originated from different areas of Ethiopia. The total annual financial loss due to condemnation of stilesia affected livers was estimated to be 50,614.92 USD or 860,453.58 ETB. *S.hepatica* causes significant loss to farmers, butchers and consumers and it is also major cause of concern in the trade of small ruminants. Therefore, the disease should be investigated further on farms to determine the prevalence in animals of various ages, Species and breed and develop economic strategies for disease control at farm level.

*Keywords: goats, sheep prevalence, stilesia hepatica.*

## I. Introduction

Africa has a population of 209 million sheep and 174 million goats representing approximately 17% and 31% of the world total respectively (FAO, 1994). Within Africa the distribution of these small ruminants varies widely with a higher concentration found in dry areas than in humid. Small ruminants (sheep and goats) are important domestic animals in the tropical animal production system (Devendra and Meclorey, 1990). Within Africa society they comprise a great proportion of the total wealth of poor families because of low in put requirements such as small initial capital, fewer resources and maintenance cost and ability to produce milk and meat using marginal lands and poor pasture (Ibrahim, 1998). Furthermore, they need only short periods to reconstitute flocks after disaster and respond quickly to demand (Gatenby, 1991; Steele, 1996).

Ethiopia own huge numbers of small ruminants, about 23.62 million sheep and 23.33 million goats (CSA, 2004). The low land part constitutes 65% of the country area where 25% sheep and close to 100% goats' population exist (PACE-Ethiopia, 2003).

Sheep and goats cover more than 30% of all domestic meat consumption and generate cash income through export of meat and edible organs (Fletcher and Zelalem, 1991). Even though the livestock sub-sector contributes much to the national economy, its development is hampered by different constraints which include rampant animal diseases, poor nutrition, poor husbandry, poor infrastructure, shortage of trained man power, and lack of government policies (Gryseals, 1986).

Diseases cause extensive financial losses as a result of direct and indirect economic impacts; it is the major concern to small ruminant industry (Jibat, 2006). A significant economic loss incurred each year in the different abattoirs in Ethiopia is due to mortality, inferior weight gain and condemnation of edible organs at slaughter (Abebe, 1995; Jobre *et al.*, 1996). This production loss to the livestock industry is estimated to be more than 900 million USD annually (Jacob, 1979).

Various investigations have been conducted through abattoir survey to determine the prevalence and economic importance of organs and carcass condemnation in Ethiopia (Jembere, 2001; Yilma, 2003). However, most of the surveys paid attention to parasitic causes; fasciolosis and hydatidosis especially in cattle. There is lack of information on the causes of organ and carcass condemnations and associated economic losses in small ruminants especially due to *Stilesia hepatica*. *Stilesia hepatica* is a cestode parasite living in the bile ducts of cattle, sheep, goats and occasionally

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camel. It is non-pathogenic but extremely prevalent (90-100%) in sheep in many parts of Africa including Ethiopia (Kaufmann, 1996). The condemnation of large proportion of sheep livers at meat inspection is the major loss due to this parasite for aesthetic reason (Gracey, 1999).

The objectives of this study were:

- To determine the prevalence of Stilesia hepatica in sheep and goats slaughtered at HELMEX abattoir, Debrezeit.
- To estimate the magnitude of direct financial loss due to condemnation of Stilesia hepatica infected livers

## II. Material and Method

### a) Study Area and Abattoir

The study was conducted at Hashim Nur's Ethiopian livestock and Meat Export (HELMEX) abattoir, Debrezeit, from October 2010 to March 2011. The abattoir is a privately owned export abattoir exporting beef, mutton, lamb, goat meat and edible organs like liver, kidney and brain of sheep and goats to Middle East countries. This abattoir is found in Debrezeit town, which is located at 90N and 400E with an altitude of 1880m a.s.l in the central highlands of Ethiopia at 47km South East of Addis Ababa. It has annual rain fall of 1151.6mm of which 84% falls during the long rainy season that extends from June to September; and the remaining during the short rainy season that extends from March to May. The mean annual minimum and maximum temperature are 8.50C and 30.70C, respectively and the mean relative humidity is 61.3% (NMSA, 2003).

The abattoir has a capacity of slaughtering up to 1500 animals per day, however the average current daily killing capacity was 700 animals due to lack of livestock availability and market infrastructure network. This abattoir has got few numbers of meat inspectors and had a problem to inspect all organs and carcass thoroughly.

### b) Study Animals and Sampling

The animals were all males originating from different areas of the country (Ogaden, Arbaminch, Wolaita, Afar, Jinka, Awash, Borena and Harar) representing different agro-ecological zones (highland, semi-arid and arid). Animals were transported to the abattoir using vehicles and on foot. The animals were systematically selected using regular interval during ante mortem inspection. For determination of the sample size, the expected prevalence was decided to be 50%. The desired precision was also decided to be 5% on the confidence interval of 95%. Thus, the formula described by Thrusfield (2005) was used to determine the sample size. Accordingly, the sample size was calculated to be 384 per species but to generate reliable data 400 sheep and 400 goats were taken. Hence, the total sample size for sheep and goats was 800.

To see the effect of age, animals were classified into two groups: young (goats less than 1year; sheep less than 1.25year) and adult (goats more than 1year; sheep more than 1.25 year), based on eruption of one or more incisor teeth.

### c) Study Methodology

The animals were identified (selected) systematically using regular interval (every 10th animal) then ropes which have different colors for age and origin of the animals were tied

After the removal of the head, the ropes were tied on the hind leg of the animals and after evisceration the ropes were tied on the liver of the identified animals. Livers which have rope were identified separately and inspected by visualization and making systematic (longitudinal) incision on the bile ducts to detect the presence of stilesia hepatica parasite.

### d) Data Analysis

The prevalence of S.hepatica was calculated by dividing the number of positive sheep and goats for S.hepatica by the total number of animals (sheep and goats) examined and multiplied by 100 to express in percentage.

Data generated from post-mortem inspection of the livers was entered to Microsoft excel 2002. Descriptive statistics, such as percentage and chi-Square test were calculated with SPSS software for windows version 15. Pearson's chi-Square (x2) test was used to determine the degree of association of S.hepatica infection with species (sheep and goats), origin and age (young and adult) of the animals. P-value less than 0.05 were considered to be statistically significant.

### e) Assessment of Direct financial loss

In assessing the economic losses, only the direct financial loss due to rejection of liver was considered. The analysis was based on annual slaughter capacity of the abattoir considering market demand, average market price on international market and in the town of Debrezeit and the rejection rate of liver. The annual slaughter rates were estimated from retrospective data recorded in the past four years. Average market price of liver was determined from interviews made with personnel of the abattoir and marketing department. Financial loss was then computed mathematically by using the formula of Ogurinade and Ogurinade (1980) for liver rejection as follows:

$$EL = \sum Srx.Coy.Roz$$

Where: -

EL- estimated annual economic loss due to organ and carcass condemnation from international or domestic market.

Srx- annual sheep/goat slaughter rate of the abattoir
Coy- average cost of each sheep/goats liver /lung/heart/kidney/brain/carcass.
Roz- condemnation rates of sheep/goats liver/lung /heart /kidney/brain/carcass.

## III. Results

Totally 800 sheep and goats (400 sheep and 400 goats) were inspected at post-mortem by categorizing them according to species, origin and age of sheep and goats.

The prevalence of *S.hepatica* in sheep and goats was found to be 32.5 %( 400) and 21.3% (400), respectively (Table1).

*Table 1 :* prevalence of *S.hepatica* in slaughtered sheep and goats

| Species | No of animals examined | Prevalence N (%) |
|---|---|---|
| Ovine | 400 | 130(32.5%) |
| Caprine | 400 | 85(21.3%) |
| Total | 800 | 215(26.9%) |

X2= 12.880; P=0.000

Statistically significance difference (P<0.05) in the prevalence of *S.hepatica* between sheep and goats was observed.

Among the 800 sheep and goats examined at post-mortem, 329 of them were adult and 471 of them were young. The prevalence of *S.hepatica* was found to be 38.6% (127) and 18.7 %( 88) in adult and young respectively (Table 2).

*Table 2 :* prevalence of *S.hepatica* in slaughtered adult and young sheep and goats

| Age category | No of animals examined | Prevalence N (%) |
|---|---|---|
| Adult | 329 | 127(38.6%) |
| Young | 471 | 88(18.7%) |
| Total | 800 | 215(26.9%) |

$X^2$=39.103; P=0.000

Statistically significant difference (P<0.05) in the prevalence of *S.hepatica* between adult and young age groups was observed.

The animals (Sheep and goats) which were slaughtered during study period had different origin.

Among 800 sheep and goats examined at post-mortem, 80 of them were from Afar, 90 from Arbaminch, 160 from Awash, 50 from Borena, 130 form Jinka, 60 form Harar, 110 from Ogaden and 120 from Wolaita. The prevalence was found to be 21.3% (17), 32.2%(29), 30.0%(48), 20.0%(10), 19.2%(25), 36.7%(22), 29.1%(32) and 26.7% (32), respectively (Table 3).

*Table 3 :* prevalence of *S.hepatica* in sheep and goats originated from different areas of Ethiopia

| Origin of animals | No of animals examined | Prevalence N (%) |
|---|---|---|
| Afar | 80 | 17(21.3%) |
| Arbaminch | 90 | 29(32.2%) |
| Awash | 160 | 48(30.0%) |
| Borena | 50 | 10(20.0%) |
| Jinka | 130 | 25(19.2%) |
| Harar | 60 | 22(36.7%) |
| Ogaden | 110 | 32(29.1%) |
| Wolaita | 120 | 32(26.7%) |
| Total | 800 | 215(26.9%) |

$X^2$= 11.665; P=0.112

The prevalence of *S.hepatica* in shoats slaughtered at HELMEX abattoir showed no statistically significant difference (P>0.05) among the different places of origin.

The average annual slaughter rate of the abattoir was estimated to be 177,509 shoats. The average liver condemnation rate of the current study was 26.9% (215/800). The average cost of a kilogram of liver was 4.25USD and on average 4 pieces of liver could weigh 1kg. Thus, the average cost of one liver is 1.06USD or 18.02ETB. Therefore, by substituting these values in the formula of Ogurindae, the annual financial loss due to liver condemnation was estimated to be 50,614.92 USD or 860, 453.58 ETB (Table, 4)

*Table 4 :* Direct financial loss incurred annually due to rejection of stilesia affected livers

| Examined organ | Slaughter capacity of abattoir | Rejection rate | Average price per kg | Annual loss |
|---|---|---|---|---|
| Liver | 177509 | 26.9%(215/800) | 1.06USD or 18.02ETB | 50,614.92USD or 860,453.58ETB |

## IV. Discussion

Abattoirs provide information on the epidemiology of diseases on livestock to know what extent the public is exposed to certain zoonotic diseases and estimate the financial losses incurred through condemnation of affected organs and carcasses (Nfi and Alonge, 1987; Vanlongtesijin, 1993).

The over all prevalence of *S.hepatica* in sheep and goats slaughtered at HELMEX abattoir in the present study was found to be 32.5% (130/400) and 21.3% (85/400), respectively. This prevalence was in agreement with the prevalence reported by Ashenafi (2010) who recorded a prevalence of 31.04% and 27.02% in sheep and goats respectively; Sisay et al., (2008) who reported prevalences of 39% and 36% in sheep and goats, respectively and Mungube et al. (2006) recorded also a prevalence of 28% and 22% in sheep and goats, respectively in Kenya.

The prevalence reported by Sisay et al. (2008) was higher than the prevalence recorded in the current study, where as the prevalence recorded Mungube et al. (2006) in Kenya was lower than the current study. This may be related to differences in the agro-ecology of countries.

The prevalence of S.hepatica in adult and young sheep and goats in the current study was found to be 38.6% (127/329) and 18.7 %( 88/471), respectively. This prevalence was in agreement with Ashenafi (2010) who reported a prevalence of 27.5% and 24.5% in adult and young, respectively. The higher prevalence of S. hepatica in adult than young shoats may be attributed to the greater exposure of adult shoats than young ones during life time.

The prevalence of *S.hepatica* in slaughtered sheep and goats at HELMEX abattoir which were brought from different areas of the country was found to be 21.3%(17/80) from Afar, 32.2%(29/90) Arbaminch, 30.0%(48/160) Awash, 20.0%(10/50) Borena,

There was no significant difference in the prevalence of *S. hepatica* among shoats from different sites of origin. This may be due to the similarity in the distribution of intermediate hosts and reservoirs among the different places from which the animals were recruited.

The frequency of occurrence has not been quoted, since little work has been conducted on this parasite. However, S. hepatica prevalence is high (60%) especially considering post-mortem liver inspection (Mungube *et al.* 2006). This estimate is higher than the present study. Losses due to *S.hepatica* liver condemnation were mainly observed in small ruminants rather than in bovines. Out of 5124 and 20226 livers inspected in caprine and ovines 61% and 85% were condemned due to *S.hepatica* in caprine and ovines respectively (Mungube *et al.* 2006).

The direct annual loss in HELMEX abattoir due to rejection of affected livers due to S. hepatica infection was estimated to be 50,614.92 USD or 860,453.58 ETB from international and domestic market. This estimate was higher than the estimate of Seid (2007) and Shiferaw(2002), who recorded annual loss of 57,939.84 and 130,718.49 ETB, respectively due to organ /carcass condemnation in cattle. This may be due to inadequate diagnosis or lack of control of *Stilesia hepatica* at farm level.

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