The Prevalence and Socio-economic Importance of Major Metacestodes of Cattle at Debre-Tabour Municipal Abattoir, Northwest Ethiopia

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Abstract: A cross sectional study to determine the prevalence and socioeconomic importance of major metacestodes of cattle was carried out at Debre Tabour municipal abattoir. Random sampling was used to select 406 slaughtered cattle. Form the total slaughtered, 7.6% and 16.5% were infected with *Cysticercus bovis (C.bovis)* and *hydatid cysts,* respectively, with different organ distribution. The major risk factors for cysticercosis prevalence were origin of the animals (P = 0.012, OR = 2.9) and hydatid cysts prevalence was significantly varied with different age groups (*P* = 0.000, OR = 9.4). The viability of *C. bovis* was higher (38.3%) than that of hydatid cyst (23.5%). Of 79 interviewed respondents, 50.6% had acquired taeniasis and analysis of the risk factors showed association of religions (*P* = 0.003, OR = 24.4), occupation (*P*= 0.001, OR = 6.9), educational background (*P* = 0.035, OR = 2.7) and age (*P* < 0.001, OR = 3.9) of the respondents with taeniasis prevalence. Furthermore, the inventory of taeniasis drugs dose and treatment cost were estimated to be 308,490 adult doses and 20221.96 USD. In conclusion, the findings of the present study imply the zoonotic and socioeconomic importance of the diseases, which need intervention.

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1. Introduction

Livestock largely backs the agricultural sector of the country both as means of draught power for crop agronomy, food and income generation on its own right. Ethiopia 's livestock population is estimated to be 40.9 million head of cattle, 25.5 million head of sheep, 23.4 million head of goats, 2.7 million head of horses, 5 million head of donkeys and about 2.3 million head of camels (Ministry of Information, 2005). However, this huge potential of wealth is untapped to the livelihood of village farmers and the contribution to national economy at large is minimal. The reason being, preponderance of infections and parasitic diseases, age-old traditional management system, inferior genetic make up coupled with under nutrition and complicated by malnutrition and absence of well developed market infrastructure (Ministry of Agriculture and Rural Development, 1997). The life cycle of Cestode is indirect and requires the development of metacestodes hosts. The metacestode is passively transferred to the definitive host when the later ingests the infected intermediate host (Soulsby, 1982).

Bovine cysticercosis, refers to the infection of cattle with metacestodes of the human tape worm (Radositis, 1994). Bovine cysticercosis is a major problem for producers in Sub Saharan Africa (Grindle, 1978). The clinical effect of cysticercosis on infected animal is generally not significant, however, in addition to the effect on human health, economic losses may be high due to the condemnation of heavily infected carcasses and the necessity to freeze or boil the infected meat, restriction of exports and herd quarantine; thus it was significant economic impact on both affected producers and regulatory agency responsible for monitoring, control and compensation (Grindle, 1978). *T. saginata* occurs in the small intestine of human and the metacestode (*Cysticercus bovis*) is found in the skeletal muscle and organs of cattle and *Echinicoccus granulosus* is found in the small intestine of carnivores and the metacestode (Hydatid cyst) is found in wide range of ungulates and human (Soulsby, 1982).

Bovine cysticercosis is considered as an important public health and economic problem because of its consequences of human nutrition and economy of some countries. Cysticercosis was significantly more prevalent in feedlots and traditional farming systems than in dairy farms. It is suggested that the continuous human to animal contact and the use of causal workers in feedlots may be factors that are conducive to *T. saginata* transmition (Dorny *et al*., 2002). In Ethiopia the prevalence of *T. saginata* (*C. bovis*) has been reported by a number of individuals.

In some part of Ethiopia, due to the habit of eating raw beef dishes such as Kurt and kitffo that are served in raw or under cooked are source of *T. saginata* infection in man (Teka, 1997). Tembo (2001) reported prevalence of 89.4% in different agro- climatic zones of the country and she associated this high prevalence with the habit or culture of eating raw or under cooked beef. The prevalence of *C. bovis* in cattle reported by different individuals were 26.25% slaughtered at Hawassa municipality abattoir (Abunna *et al*., 2006), 2.2%-3.2% in Addis Ababa abattoir (Teka, 1997), 19.4% in BahirDar (Alemu, 1997), 21.17% in Nekemte (Ahmed, 1990), 13.85% in Debre Zeit (Belayneh, 1990), 9.67% in Gondar (Demissie, 1989) and 11.3% in Wollita Sodo (Regassa *et al,* 2009).

Cystic echinococcosis is a zoonotic disease caused by the larval stage of the tape worm *Echinococcosus granulosus*. Domestic animals are the intermediate host of the parasite, which is the major reservoirs for the diseases in humans and dogs (Soulsby, 1982). Dogs are the obligate final host of the parasite and become infected by ingesting infected offal's (lung, liver, spleen. etc.); likewise to cysticercosis the clinical effect of Cystic echinococcosis in the intermediate host is not significant.

However, in addition to the effect in human health and economic losses may be high (Kebede *et al*., 2009). *Cystic echinococcosis*, the parasitic zoonoses, causes considerable public health and economic importance in areas where it occurs. Jobre *et al*. (1996) found prevalence of 46.5%, 25.7% and 24.3% of hydatid cyst in cattle slaughtered in Debre Zeit and South Omo respectively.

Although there was some research works carried out in certain part of the country, the status of metacestodes in livestock and the economic and public health impact of these parasites were not so far studied in the study area. Therefore, this study is targeted to fill the information gap in the area with the following specific objectives: To determine the prevalence of metacestodes in cattle and to assess the public health and economic impact of the disease.

2. Materials and Methods

2.1. Study area

The study was conducted in Debre Tabour, Northern part of Ethiopia, 669 km away from Addis Ababa, located at latitude of $11^0 51'$N and longitude of $38^0 1'$E. The altitude ranges from 2440-2880 m.a.s.l. The area has an annual rain fall ranging from 1250-1559 mm^3. The mean annual temperature of the area is about 15^0C. Agriculture is the livelihood for more than 90% of the population in the surrounding rural farming community. Livestock production is complementary to crop production. The total livestock population of the woreda is 14243 bovine, 12400 ovine, 2865 caprine, 2823 equine and 16161 poultry. The human population of the town is 23449 males and 33864 females (Debre Tabour Town district information and communication Bureau, 2009).

Study Population

The study animals were cattle brought from different parts of the surrounding areas of Debre Tabour for slaughtering purpose to Debre Tabour municipal abattoir.

Study Design

It is a cross-sectional type of study in which case active abattoir survey, questionnaire and drug shop inventories were conducted.

Sample size and sampling technique

The total number of cattle required for this study was calculated based on the formula given by Thrusfield (1995) for simple random sampling method. By rule of thumb where there is no information for an area it is possible to take 20% or 50% prevalence. In this study, 50% prevalence was used to calculate the sample size using the following formula.

$$n = \frac{1.96^2(P)(1-P)}{d^2}$$

where
n = sample size
P = expected prevalence
d = desired level of precision

Therefore, using 50% expected prevalence and 5% absolute precision at 95% confidence level; the number of animals needed in this study was calculated to be 384. However 406 animals were included in this study, with the intention of maximizing the number of sample size.

Study methodology

Active abattoir survey

The cross-sectional study was conducted on randomly selected 406 cattle slaughtered at Debre Tabour municipal abattoir. Accordingly, study animals were selected during ante mortem and the related risk factors such as age, origin, breed and body condition were recorded before slaughtering on specially designed sheet.

The tags of study animals were properly recorded during ante mortem and after slaughtering

each predilection sites (organs) for the metacestodes were also carefully followed and inspected for the presences of the respective larvae. Visual inspections followed by routine incision of organs were made to examine for the metacestodes. Regarding to the inspection for C*ysticercus bovis,* each predilection sites were inspected according to the guideline by ministry of agriculture (1972) as follows; for masseter muscle deep linear incision were made parallel to mandible; the tongue was examined from base to tip the hearts were incised from base to apex to open pericardium and incision was also made in the cardiac muscle for detail examination.

Deep, adjacent and parallel incision was made above the point of elbow in the shoulder muscle. Examination of the kidney, liver and lung were also conducted accordingly. All the positive samples were transported to the Parasitology laboratory of the district clinic of Debre Tabour for conformation of cyst fertility and viability. The cysts were incubated at 37^0C for 1-2 hrs using 40% ox bile solution diluted in normal saline solution. After this the scolex was examined under microscope by pressing between two glass slides.

The cysts were regarded as viable if the scolex evaginate during the incubation period at same time the scolex was checked whether it is *T. saginata* or other based on the size of *cysticercus*, absence of hook on the rostellium of the evaginated cyst (WHO, 1983).

Regarding to the hydatid cyst, individual cysts were grossly examined for any evidence of degeneration and calcification. Cysts were taken to laboratory for fertility and viability test. The content were transferred into a sterile container and examined microscopically (40x) for the presences of protoscolex. The viability of the protoscolex was assessed by the motility of flam cells together with a staining 0.1%aqueous solution of eosin (Smyth and Barrest, 1980).

Live protoscolex did not take up the stain, unlike the dead one.

Questionnaire survey

To each of randomly selected 79 households in the various kebeles of Debre Tabour, a risk assessment questionnaire was administered. Accordingly, questionnaire was administered to individual interviews of the household heads. The purpose of this interview was to estimate the risk factors associated with cysticercosis/taeniasis, relative frequency of taeniasis and to indentify the risk factors associated with the transmission of infection.

The question to be asked were subsequently uses in the establishment of relative taeniasis cases among respondent households. In the questionnaire survey, the number of cattle owned, general management of cattle with particular emphasis on feeding practices and husbandry were included. In addition to these, the aim of keeping cattle, presence and usage of sanitary facilities especially toilet, knowledge of *T. saginata* life cycle, specific questions regarding medical history related to traditional and modern taenicidal drugs impact of taeniasis and possible options were included. By doing so risk factor associated for the occurrence of the disease in human and public impact of the disease was assessed.

Inventory of pharmaceutical shops

Different human drug stores located at Debre Tabour town were used for the amount of drugs and cost of drugs they sold the treatment of the adult stage of human metacestode. So that the economic impact of the disease was assessed. An inventory of pharmaceutical shops, hospital, rural drug vendors, and clinics in the study area were conducted by recording five years of data by yearly taenicidal drug sales and adult doses were gathered and analyzed to estimate the economic impact of taeniasis in and around the town.

Data Management and Analysis

Abattoir data was collected and data cleaning was done properly in the Microsoft excel sheet (V. 2016). The outcome variables for the abattoir study were cases of C*ysticercus bovis* and hydatid cyst detected during routine post mortem inspection at Debre Tabour municipal abattoir. The statistical analysis was with STATA statistical software. Logistic regression was employed to analyses the association of the occurrence of the two diseases with the potential risk factors like origin, breed, body condition score and age using. Multivariate analysis for the risk factors during the study period was used in which the degree of risk factors association between the diseases occurrence and the risk factors were analyzed using odd ratios. Pharmaceutical inventory data were also coded and analyzed.

Results

Abattoir survey

Prevalence

Of 406 animals inspected, 31 (7.6%) and 67 (16.5%) animals were positive for *C. bovis* and Hydatid cysts, respectively. The association between the prevalence of *C. bovis* in cattle and different risk factors (Table 1).

Risk factors

Cysticercus bovis

Association between the prevalence of *C. bovis* and the risk factors in cattle were depicted in table 1.

Table 1: Risk factors associated with the occurrence of B. cysticercosis in carcass/organs inspected at the Debre Tabour Municipal abattoir, Ethiopia, 2017/2018.

Risk factors		**Total No**	**No positive**	**OR & CI**	***P*-value**
Body Condition	Medium	347	26 (7.5%)	1	
	≤6 years	59	5 (8.5%)	1.14 (0.42, 3.9)	0.793
	7-10years	64	4 (6.3%)	1	
Age	>10years	196	13 (6.6%)	1.09 (0.34, 3.47)	0.885
	≤6 years	146	14 (9.6%)	1.61 (0.51, 5.12)	0.413
Breed	Local	306	19 (6.2%)	1	
	Cross	100	12 (12%)	2.06 (0.96, 4.4)	0.063
Origin	High land	213	10 (4.7%)	1	
	Mid land	101	13 (12.9%)	2.99 (1.27, 7.09)	0.012
	Lowland	92	8 (8.7%)	1.93 (0.74, 5.06)	0.180

Accordingly, statistical analysis revealed that there is no significant difference in prevalence of Bovine cysticercosis between age, breed and body condition, but there is significant difference in the prevalence of bovine cysticercosis in animals originated from mid land ($P = 0.012$).

Table 2: Risk factors associated with the occurrence of Hydatid cyst in carcass inspected at the Debre Tabour Municipal abattoir during 2017/2018.

Risk factors		Total No	No Positive	OR and CI	*P*-value
Body Condition	Medium	347	62 (17.86%)	1	
	Good	59	5 (8.5%)	0.43 (0.16, 1.10)	0.080
	≤ 6 years	64	3 (4.68%)	1	
Age	7-10years	196	18 (9.18%)	2.05 (0.59, 7.22)	0.261
	> 10years	146	46 (31.5%)	9.35 (2.79, 31.38)	0.000
Breed	Local	306	33 (10.78%)	1	
	Cross	100	34 (34%)	2.05 (0.96, 4.41)	0.063
	High land	213	37 (17.37%)	1	
Origin	Mid land	101	15 (14.85%)	0.83 (0.43, 1.59)	0.575
	Low land	92	15 (16.30%)	0.93 (0.48, 1.79)	0.820

Hydatid cyst

Accordingly, statistical analysis revealed that there was a significant difference in the prevalence of hydatid cyst between animals with in different age groups ($P = 0.000$) while there is no variation between animals with in different breed, body condition and origin.

Anatomical distribution of cysts

Analysis of the active abattoir survey showed that there was a significant variation in the anatomical distribution of cysticerci and hydatid cyst in organs inspected. Of the organs examined, the highest proportion of *C. bovis* were observed in the tongue (3.2%) followed by masseter (2.7%) and heart (1.7%) where as the highest proportion of hydatid cysts were recorded in the lung (11.8%) followed by liver (8.6%).

Table 3. Proportions of carcasses inspected with C. bois and hydatid cyst in Debre Tabour, Ethiopia, 2017/2018.

Organ inspected	*C. bovis*		Hydatid cyst	
	No. of Positive	%	No. of positive	%
Heart	7	1.70%	0	0.00%
Masseter	11	2.70%	0	0.00%
Tongue	13	3.20%	0	0.00%
Lung	0	0.00%	48	11.80%
Liver	0	0.00%	35	8.60%
Total	31	-	83	-

Out of the total cysts collected from each organ, which were not used to estimate the cyst burden, are used for rough calculation of cyst viability test for each organ of animals at the abattoir. Of the total 47 *C. bovis* cysts collected from whole organs at the abattoir during the study period, 18(38.29%) were

found to be live while others 29(61.7%) were degenerated cyst (Table 4).

Table 4: Proportion of Viable Cysticerci in different Organs Inspected, Debretabor, Ethiopia

Organ inspected	Cyst counted	Viable cysts
Heart	11	4 (36.36%)
Masseter	20	8 (40%)
Tongue	16	6 (37.5%)
Total	47	18 (38.29%)

Accordingly, of the total 98 recorded hydatid cyst 47 (47.95%) were fertile and contained protoscolex whereas the remaining 51 (52%) were sterile cyst. Viability test indicated that 23 (23.46%) of cysts were found viable indicating the higher proportion of viable cysts of *C. bovis* compared to that of viable hydatid cyst.

Table 5: Anatomical distribution of hydatid cyst, fertility and viability test of cysts.

Organs	Positive organs	Total cyst	Fertility		Viability	
			Fertile	Sterile	Viable	Dead
Liver	35 (8.6%)	40	15 (37.5%)	25 (62.5%)	5 (12.5%)	10 (25%)
Lung	48 (11.8%)	58	32 (55.1%)	26 (44.8%)	18 (31%)	14 (24.14%)
Total	83 (20.4%)	98	47 (47.95%)	51 (52%)	23 (23.46%)	24 (24.48%)

Questionnaire survey

Prevalence: - from the total 79 interviewed volunteer respondents in Debre Tabour town who were participated on different working environment (50.6%) positive for *T. saginata.* Association of risk factors with the prevalence of taeniasis: The majority of the respondents had an experience of raw meat consumption as a result of traditional and cultural practices.

The logistic regression analysis of these risk factors shows statistically significant difference in the prevalence of taeniasis between religion ($P < 0.05$), occupation ($P = 0.001$), educational background ($P <0.05$) and age ($P = 0.001$). Accordingly, Christian communities, informal and elementary educational level, old age and high risk groups had higher chance to acquire taeniasis than Muslim communities, higher educational level, younger one and low risk groups, respectively (table 6). From this analysis there was no statistically significant difference in the prevalence of taeniasis between sex ($P > 0.05$, Cl= 0.64-4.43). In the present study of the 79 respondents 40 were raw meat consumers while 39 of them had the habit of consuming properly cooked meat. All the 39 respondents had no history of contracting tapeworm infection.

Table 6: The risk factors associated with the prevalence of Taeniasis, Debretabor, Ethiopia,1017/2018

Risk factor		No.	No. (%)	Adjusted OR (95% CI)	*P* -Value
Sex	Male	55	30 (54.5%)	1	
	Female	24	10 (41.7%)	1.68 (0.64,4.43)	0.294
Age	<15	5	0 (0.00%)	1	
	15-26	12	5 (41.7%)	1.75 (0.86,5.94)	0.056
	27-40	49	23 (46.9%)	1.05 (0.13,3.12)	0.065
	>40	13	12 (92.3%)	6.81 (2.82,5.62)	0.000
Religion	Muslim	16	1 (6.3%)	1	
	Christian	63	39 (61.9%)	24.38 (3.02,196.51)	0.003
Literacy	Non educated	43	26 (60.4%)	1	
	Educated	36	14 (38.9%)	2.67 (1.07,6.64)	0.035
Occupation	Low risk groups	49	18 (36.7%)	1	
	High risk groups	30	22 (73.3%)	6.68 (2.44,19.28)	0.000

Inventory of pharmaceutical shops

The modern taenicidal drugs sold in those shops and health centre were inland product and imported from foreign countries. The estimate of annual adult taenicidal drugs dose and its worth collected from; recorded data, stock cards, personal interview with pharmacist, druggist or shop owner from 2008-2012 revealed a total adult taenicidal drug dose of 308490 and a total worth of 363995.3 Ethiopian Birr. A relative dose of praziquante (31.2%) was used

followed by Albendazole (20.2%), Niclosamide (18.7%), Mebendazole (bolus) (18.3%) and Mebendazole (syrup) (11.7%).

Table 7: Inventory of annual prescribed adult taenicidal drugs dose and their worth (2000-2004).

Taenicidal Drug	Years											
	2000		2001		2002		2003		2004		Total	
	Dose	Worth	Dose	Worth	Dose	Worth	Dose	Worth	Dose	Worth	Dose	Worth
Niclosamide	9720	3268.8	12240	4428	14400	6152.4	15480	7560	5760	140	57600	22813.2
Praziquantel	18000	23058	21600	31356	21600	34164	19800	34530	15120	29232	96120	152340
Albendazole	9330	2908.5	14760	5832	14760	6246	13320	6786	10080	5706	62250	27478.5
Mebendazole	12960	12510	11880	12510	12240	14133.6	11520	13562	7920	12708	56520	65423.6
Mebendazole	6120	15318	7920	22626	7560	21420	6120	18504	8280	18072	36000	95940
Total	56130	57063.3	56160	76752	70560	82116	66240	80942	47160	67122	308490	363995.3

Discussion

Most adult and larval tapeworm infection causes little or no clinical disease. However, cysticercosis causes economic loss through condemnation of infected meat and offal (OIE, 2008). *Bovine cysticercosis* usually does not cause much morbidity or mortality among cattle, but it does cause serious economic problems in the endemic areas due to the condemnation of meat or downgrading of carcasses in light infection (Oyango-Abuje *et al*., 1996) contributing to constraint in food security and safety. The economic losses as a result of the condemned and downgrading of carcasses due to treatment or processing of carcasses for human consumption are substantial (Fan, 1997). In East Africa, *T. saginata* cysticercosis has been reported as a widespread and extremely common (Urquhart *et al*., 1996). The results of the present study also reflect both the economic and zoonotic importance of this disease, which is in agreement with the prevalence of *C. bovis* among the carcass inspected at Debre Tabour municipal abattoir was 7.6% which is higher than the finding of Dawit (2004), (4.9%) at Gondar and Tembo (2001) (3.11%) in the central Ethiopia. above statements.

The higher prevalence of B*ovine cysticercosis* in this study might be attributed to the variation in the personal and environmental hygiene, culture and feeding habit of the population, method and quality of meat inspection. In Debre Taour, the communities do have a habit of raw meat consumption in different public holydays and wedding ceremony. However, the prevalence of the present study was slightly in agreement with the finding of Abunna *et al*. (2007) in Hawassa (26.25%), Hailu (2005) in East Shoa (17.5%) and Getachew (1990) at Debre Zeit (13.8%).

Although higher prevalence recorded, the present study revealed light infection among the inspected animals and this could be due to the practical limitation to the number of incisions allowed and many infestations undetected (Wanzala *et al*., 2003). As gross mutilation lowers the marketability of carcasses and introduces contamination, owners do not allow multi incisions for the detail investigation. In the analysis of the risk factors, significant differences in the prevalence of Bovine cysticercosis between origins of animals were recorded indicating the higher occurrence of *C. bovis* in the midland. There is a difference in geographical isolates of the parasite as possible factors affecting the distribution and prevalence of *C. bovis* (Pawlowiski *et al*., 2001). The other thing is that the management of animals that coming from midland were poor compared to from the other areas.

Regarding the anatomical distribution of the cyst, the organ affected in order of the higher proportion of the cysts, were tongue, masseter and heart. The most frequently affected organs with the highest number of cyst was the tongue, whereas viability test of the cyst leveled that it was masseter, which harbored the highest number of viable cysts (40%), followed by tongue (37.5%) and heart (36.4%). This finding was in agreement with the report of Dawit (2004) at Gondar abattoir. Generally, the method of meat inspection, the ability of meat inspector to identify the cases, difference in the managements of animals, sample size and sampling method, the number of cuts and other factors can contribute for the variation of the prevalence of *Bovine cycticercosis*.

In addition to the abattoir based study; questionnaire survey was also conducted in this study. The quality of questionnaire is an important tool in individual cases and in mass investigation for the detection of *T. saginata* in the carrier population (Fralova, 1985). This is based on OIE (2004) and WHO (1983) guidelines, which stated that *T.saginata* is known by its more frequent expulsion through anus

than *T.solium*. The supporting evidence for the occurrence of *T.saginata* rather than *T. solium* among the respondents were that almost all of the residents of the town do not eat pork due to religious cult which confirms the current finding to *T. saginata*. The prevalence of *T. saginata* in this study based on the questionnaire is 50.6% in the population of Debre Tabour town and it is very close to the finding of Abunna *et al* (2007) (64.2%), Hailu (2005) (79.5%) and Dawit (2004) (69.2%) in Ethiopia. On the other hand, Woldemikael *et al* (1990) reported relatively lower prevalence (13.5%) in Ethiopia. However, the present finding was lower than the report of Arundel (1980) in native stock men in Africa (80%).

The observed strong association ($p< 0.05$, OR=24.38) between the prevalence of taeniasis and religion indicating the higher proportion of infection in the Christian community and this study was in line with the finding of Abunna *et al* (2007), Hailu (2005), Dawit (2004) and Tembo (2001) in Ethiopia. This could be justified by the fact that raw meat is more favorite dish among Christian communities than Muslim of the country. In addition to this Christian's celebrate several annual festivals with the tradition of raw meat consumption on these occasions which is certainly increasing the likelihood of contracting taeniasis.

The prevalence also significantly differed ($p<0.001$) among the residents from different occupational background with the high risk groups found to be more prone to infection than low risk groups. Abunna *et al* (2007), Hailu (2005), Dawit (2004) and Tembo (2001) in Ethiopia and the majority of researchers in the world also reported the higher taeniasis prevalence in the higher risk groups due to more access they have to come in contact with meat and meat products as a result of which there could be a higher possibility of getting infection of taeniasis. The transmission of *T. saginata* infection from animals to human depends on the habit of eating raw or semi raw meat dishes like "kitifo" in Ethiopia and pieces of meat simply roasted over an open fire in central and East Africa (Carmichael, 1952). There is a strong association ($p<0.05$, OR=6.81) between age of the respondents. The possible suggestion for this could be that older people had the habit of eating raw meat than the younger as younger's are not allowed to consume raw meat.

In the present study there was no observed statistically significant difference in the prevalence of the disease between sex, which is in agreement the finding of Abunna *et al* (2007) in and around Hawassa, but the present study disagreement with the finding of Hailu (2005) and Dawit (2004) in Ethiopia, Dada (1980) in Nigeria and Fan (1997) in East Asia reported higher prevalence of taeniasis in males than females. In the study area there was no discrimination between males and females to consume meat in restaurant and butchers. There was a significant variations in the occurrence of taeniasis among the people with different educational backgrounds ($p<0.05$, OR=2.67) and this could be due to the fact that educated people may prefer to consume properly cooked products than raw meat.

Inventory of pharmaceutical shops: - despite the fact that the pathogenic significance of *C. bovis is* considered to be very low and human taeniasis has importance both in socio-economic and public health aspects (Soulsby, 1982). However, an evaluation of the economic aspect is very difficult in developing countries like Ethiopia, where infected people are used to treat themselves with traditional herbal drugs. One of the possible sources of information to evaluate the economic feature is to carry out inventory of pharmaceutical shops, which still can not reflect the actual economic impact of the disease.

However, inventories of seven pharmaceutical shops which comprises a fife years record in Debre Tabour during the study period indicated that 308490 adult doses of taenicidal drugs and 20221.96 USD annual estimated costs that resulted from taeniasis treatment was recorded (table 7). This indicated that taeniasis diminishes the household financial resources, which could be easily avoided by eating properly cooked meat and using toilets. The prevalence of *T. saginata* varies from country to country and even differs with in the same country from area to area. This could be due to many factors; such as variation in the habit of raw meat consumption, awareness of the patients about the clinical picture of the disease, variation in personal and environmental hygiene and other factors related to the variation in the prevalence of taeniasis among countries.

Cystic echinococcosis, the parasitic zoonosis caused by *E. granulosus*, is a considerable public health and economic importance in area where it occurs (Jobre *et al.,* 1996). The prevalence of hydatid cyst in the current study at Debre Tabour municipal abattoir was 16.5% which is in agreement with the finding of Kebede *et al* (2009) 16% in Wolita Sodo, Mersie (1993) 20.5% in eastern Ethiopia, Kipkorir (1998) 19.9% at Mekale, Dada and Belion (1978) 14.7% in Nigeria and Nioroge *et al* (2002) 19.4% in north Turkana in Kenya. However, the prevalence of this study was lower than the finding of Kipkorir (1998) 60.8% in Assela, Jobre *et al* (1996) 46.5%, 25.7% and 24.3% in cattle slaughtered at Debre Zeit, South Omo and Gondar, respectively. The lower prevalence of hydatid cyst in cattle in this study might be due to low number of stray dogs around abattoir, absence of close contact between cattle and dogs and proper disposal of organs infected with hydatid cyst.

In this study statistical analysis revealed significant difference in the prevalence of hydatid cyst between animal of different age groups ($p<0.05$, OR=9.35). The most affected animals in the study area were older animals. This might be the exposure of animals to the disease (parasitic ova) over a long period of time with an increase possibility of acquiring the infections. There was no significant difference between breed, body condition and origin of animals.

In the present study, it has been established that hydatid cyst occur predominantly in the lung with the prevalence rate of 11.8% followed by liver with the prevalence of 8.6%. This is explained by the fact that lung and liver possess the first great capillaries sites encountered by the migrating *Echinococus* oncosphere (hexacanth embryo) which adopt the portal vein route and primarily negotiate hepatic and pulmonary filtering system sequentially before any other peripheral organ is involved (Kebede *et al*., 2009).

In examining the condition of cyst fertility and viability; the finding of 47.9% fertile cysts and 40.4% sterile cysts and among the fertile cysts 23.5% viable and 24.5% were dead cysts. The fertility of hydatid cyst may show a tendency to increase with advancing age of the host. In compassion of the fertility rate among the organs, it was higher in lung than liver. It has been stated that the relatively softer consistency of lung tissue allows the easier development of the cyst this may be attributed probably due to reduced immunological compatibility of animals at their older age of infection. The variation between tissue resistances of the infected organs may also influence the fertility rate of hydatid cyst (Kebede *et al.,* 2009).

Conclusion and Recommendation

Bovine cysticercosis and *Cystic echinococcosis* are zoonotic disease. They have also great economic importance resulting in losses due to condemnation of infected organs, down graded carcasses and further more, there can also be huge amount of economic losses due to treatment of human taeniasis. The recorded prevalence of the metacestodees, the drug shop inventory and questionnaire survey result of this study are indicating the importance of these diseases in the study area. The finding of this work demonstrates the importance of *T, saginata* taeniasis and *C. bovis* in humans and animals, respectively and cystic echinococcosis in animals. In conclusion, the finding of the present study reflects the zoonotic and economic impact of these diseases which deserves serious attention by the various stockholders in order to safe guard the public health.

Based on this study and other facts about the prevalence and socio-economic impact of these diseases, the following recommendations are forwarded: There should be strict routine meat inspection so that infected organs and carcasses can be condemned accordingly. Proper disposal of infected organ is mandatory in order to break the life cycle of some metacestodes like *E. granulosus*. There should be public education to create awareness so that all consumers avoid consumption of raw meat and also able to use toilet.

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