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Research Article

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Comparative study on hydatidosis in slaughtered cattle and camels at Akaki municipal abattoir, its economic impacts and public awareness in Oromia Region, Ethiopia

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Abstract

Hydatidosis is a neglected cyclozoonotic disease affecting both humans and livestock populations. A cross-sectional study was carried out from November, 2019 to March, 2020 in the akaki Abattoir, in the Addis Ababa city of Ethiopia with the objective of to compare the prevalence of camel and cattle hydatidosisakaki municipal abattoir, to estimate the finical losses of hydatidosis due to organ condemnation and to assess the public awareness about hydatidosis. A total of 963 animals comprising 600 cattle and 363 camel examined for the presence of hydatid cysts an overall prevalence of 44.75% was recorded. From the total 600 cattle and 363 camels examined for hydatid cysts, 43.17% and 49.3% were found positive respectively. There was significant difference in the prevalence of hydatidosis in both cattle and camel at different age groups. More Hydatid infected cattle were found in Jima 56.4% where as 58.2 % of camel with Hydatid cyst was found in borena zone. Organ distribution hydatid cyst revealed that liver, lung, kidney, heart and GIT were found frequently infected. From a total 438 positive cysts: 35.2%, 30.1%, 17.1%, 11% and 6.6% in liver, lung, kidney, heat and GIT respectively. From a total 100 people responded to the questionnaires 53% of them, referred to as the high risk group' which means that this individuals have been practiced eating raw or meats denoted that they are engaging in a high risk behavior, whereas 47% of those who confirmed that they do not eat raw or undercooked meats are in turn referred to as the low risk group, Similarly from a total of 100 people only 16% knew that tapeworm could spread from animals to humans. The result of interview indicated that the evidence that the groups people differed in their behavioral experience of eating raw or undercooked meat except veterinarians and human health care workers. In the study, the total annual economic loss due to organ condemnationcaused by a cyst of hydatiosis at Akaki abattoir was estimated tobe 321,616.02 Ethiopian birr (10,613,328.66$). Study showed that a cyst of hydatiosis of cattle and camel causes significant economic loss. Further study to determine prevalence of hydatiosisin cattle and camels indifferent agro ecology of the country is should be conducted and community based control strategies should also be implemented.

Keywords: Camel, Cattle, comparative study, Economic loss, hydatiosis

Introduction

The world human population is growing at a rate much faster than food production and this increase is mainly in developing countries which are unable to assure adequate food for their people. Developing countries have nearly two third of the world's livestock population but produce less than a third of the world meat and a fifth of its milk (FAO, 1995).Thus, the contribution from these huge livestock resources to the national income is small, owing to several factors including draught, malnutrition, management problems, lack of veterinary services, poor genetic performance and the diversified topographic conditions with prevalent livestock diseases in Ethiopia (Kebede *et al.*, 2009).

Ethiopia is an agrarian country with huge livestock population in Africa. In the country, there were approximately 60.39 million cattle, 31.3 million sheep, 32.74 million goats, 0.46 million camels and 56.06 million poultry (CSA. 2018). Camel is a versatile animal; it can be milked, ridden, loaded, eaten (meat), harnessed to plow, traded for goods or, exhibited in zoos or turned into sandals. Despite the ecological, economic, environmental and social benefits of the camel it has remained the least studied domesticated animal. One reason is the main camel belt area is located in three poor countries, namely Ethiopia, Somalia, and Sudan accounting for 60% of the world camel population (Tezera and Belay, 2002).

Cestodes of the family Taeniidae which infect the dogs (definitive host) are transmitted to the range of intermediate host species where they cause Hydatidosis, Coenurosis, and Cysticercosis. Adult worms have been reported to be found in small intestines of dogs and wild carnivores like the wolf and fox (Ahmadi *et al.*, 2011). Among them hydatidosis a disease affecting camels and cattle is a diseases with substantial economic and public health importance occurring in many countries (Lahmar *et al*., 2004) and is becoming more endemic in many African countries including Ethiopia (Azlaf and Dakkak, 2006; Getaw *et al*., 2010).

Soil contaminated by dog feces and even dust containing eggs aspirated during rural activities can be major reasons for transmission of *E. granulosus*. In domestic animals Dogs are the obligate final host of the adult tapeworm and infected by ingesting infected offal's (lung, liver, kidney, spleen, etc). Human and wide varieties of other animals also serve as accident intermediate hosts for the parasite (Thompson and Mcmans, 2002).

The two major species of medical and public health importance in Ethiopia are *Echinococcus granulosus* and *Echinococcus multilocularis*, which cause cystic *echinococcosis* (CE) and alveolar *echinococcosis (*AE), respectively. They are found in a large number of hosts also throughout the world. The distribution of hydatidoses is worldwide with its prevalence varies among regions due to climate difference, agro-ecology, level of education, and development condition (Ahmadi *et al.*, 2011). It is regarded as an emerging zoonotic disease occurring with the highest prevalence in parts of Eurasia, north and East Africa, Australia, and South America (Seimeni, 2003).

It's transmission is high in livestock raising regions where veterinary service is unsatisfactory and offal from slaughtered animals is accessible to dogs. The tapeworm spends most of its adult life in the intestine of its definitive host, namely canids particularly the dogs. The tapeworm eggs become voided in the canids' faeces and as a result of ingesting the eggs, infection passes to the intermediate host, commonly herbivores while grazing. However, humans can become accidentally infected and hydatid cysts may develop throughout the body (Gottstein *et al.*, 2017).

The adult form of the parasite is a minute white tapeworm, few millimeters long (3-7 mm) with three to five proglottids. Like all tapeworms, Echinococcus has no gut and all metabolic

interchange takes place across the syncytial outer covering tegument. The adult Echinococcus possesses an attachment organ, the scolex, which has four muscular suckers and two rows of hooks. The eggs are ovoid (30µm-40µm diameter), consisting of a hexacanth embryo (oncosphere or first larval stage) surrounded by several envelopes, the most noticeable one being the highly resistant keratinized embryo phore, which gives the egg a dark striated appearance, host specificity and pathogenicity (Nakao *et al.,* 2013). *Echinococcus granulosus* was initially regarded as the causative agent of hydatidosis and it has different taxa with differences in adult morphology, host specificity and pathogenicity (Nakao*et al.,* 2013). Domestic animals such as camels, cattle, goats, and sheep which live in close contact with dogs are implicated as one of the important contributors of zoonotic diseases to humans (Gesses *et al.,* 2015)

Currently ten (G1-G10) and lion strain (E. felids) genetically, biologically and morphologically distinct strains of *E.granulosu*s have been identified from different parts of the world. Strain of *E. granulosus i*s sheep strain (G1), cattle strain (G5), camel strain (G6) genotype distributed worldwide and occurring particularly in areas of extensive farming. It is the predominant strain infecting humans but the other genotypes are also known to be infective. The presence of other *Echinococcus strains* in humans has been confirmed in Argentina (G1), Kenya (G2), Egypt (G5,) Poland, Ukraine, the Slovak Republic, Turkey, Austria, South Africa (G7), Russia, and Mongolia (G10) (Aito *et al.,* 2014).

The different strains of the parasite were reported to have different epidemiological, socio-economical significances and geographical ranges. Among the ten different strains of *E. granulosus* so far characterized, seven of them (G1, G2, G3, G5, G6, G7, and G9) were reported to have public health importance. In Africa, six strains of *E. granulosus*, the common sheep strain (G1), Tazanian sheep strain (G2), horse strain (G4), cattle strain (G5), camel strain (G6), and lion strains *(E. felids*) were reported. From these, four of them (G1, G2, G5 and G6) were reported to infect humans in different parts of the world (Lymbery *et al*., 2015)**.**The molecular characterization of human and animal. *E.granulosus* isolates demonstrated that the 'camel' strain (G6) is also equally important source of infection to humans (Magambo *et al.*, 2006; Ahmadi *et al.,* 2011).

Human acquire this infection by accidental ingestion of *E. granulosus* eggs with food, water or contaminated soil. Initiative to assess the global burden of food borne diseases, the cysts in humans develop mainly in the liver (70%), lungs (20%), and other organs like the brain, heart, and bones (Pawlowsk *et al*., 2008). Hydatidosis, caused by the larval stage of *E.granulosus*, is characterized by the formation of variably sized cysts in the visceral organs of the intermediate hosts and adult tape worm in the intestine of dogs. The cysts usually may develop asymptomatically for years and clinical symptoms occur when the cysts press on the surrounding tissues or organs. Hydatidosis can be life-threatening when the cysts rupture into the peritoneal cavity causing anaphylaxis. In domestic animals the hydatid cyst in the liver or lungs is usually tolerated without any clinical signs, and the majority of infections are revealed only at post mortem inspection (Urquhart *et al*., 2013).

In Ethiopian situation, hydatidosis is a serious public health problem of includes cost of hospitalization, medical, surgical, losses of income and productivity due to temporal incapacity to work, social consequences, due to disability and mortality. In livestock it causes considerable economic losses due to condemnation of affected animal organs at the slaughter house .In food animals, it has adverse effect on production causing decreased in production of meat, milk, wool, reduction in growth rate and predisposition to other diseases (Melaku *et al*., 2012).

The important control method of the disease are to prevent dogs from ingestion of uncooked offal, keeping the dog health service, prevent backyard slaughtering and disposal of infected organs, community education about spread and causes of

disease and to giving recommendation on the epidemiology of the disease (Loomu, 2010).

Hydatodiosis is one of the major causes of organ condemnation in most export abattoirs and municipal slaughter houses which leads to huge economic losses in Ethiopia. Various studies have been conducted on hydatosis in Ethiopia especially on the bovine (Getaw *et al*., 2010; Kebede, *et al.*, 2009; Melaku *et al*., 2012). Knowledge on the epidemiology and extent of zoonosis both in human, domestic and wild animal population by the different species of echinococcus would be of prime importance in targeting an effective control scheme in the country as well as knowing about the prevalence of the diseases together with associated risk factors helps for the prevention and control of the diseases. However, published reports on bovine a hydatosis in Ethiopia are more than in camels. In study area meat processing plant there is a significant amount of organs loss through condemnation due to hydatidosis. So that this study was planned depending on the above points and taking into account that previously little research work has been done in the area particularly on hydatidosis.

Therefore the objectives of the current study was:[1]To determine the current prevalence of hydatidosis in slaughtered camel and cattle atAkaki municipal abattoir [2] estimate the finical losses due to condemnation of organs with cysts [3] To assess major risk factors associated with the occurrence of the diseases [4] To evaluate the public awareness about hydatidosis and related risks

Materials and Methods

Description of the Study Area

The study was conducted at Akaki manicipal abattoir, which is located at Akakikality Sub-city,Woreda-03,located 25 km south east of Addis Ababa from December 2019 to May 2020. The abattoir is fully equipped with semi-modern technology for slaughtering process. As a result, the Akaki abattoir usually slaughters an average of 200 cattle, 30 goat/ sheep and 5camels per day.

Study animals

The study animals were indigenous Zebu cattle, cross breed cattle and dromedary camels presented for slaughter in Akaki Abattoir. The animals were brought from different part of Ethiopia. Cattle were presented from; Central Ethiopia, East Shoa, West shoa, Wollega and Jimma while camels were brought from various camels rearing pastoral areas namely Babile (Somali region), Metahara (East Shoa zone) and Borena (Borenazone of Oromia regions).

Study Design and Sample Size Determination

A cross-sectional study type was carried out from December, 2019 to May, 2020to the study prevalence, risk factors, public and finical losses of bovine and camel Hydatidoses in Akaki Abattoir by using systematic random sampling technique from bovine and camel which was presented for slaughter on the days of abattoir visit. The sample size required for the study was from Expected prevalence reported by (Bulto*et al*., 2014) for camel and (Hailu and Tegene, 2013) for cattle, respectively were used. The 5% desired absolute precision and 95% CI were used according to thru field (2005).

Table 1: calculated sample size for the study

Expected prevalence (%)		**Calculated sample size**			**Maximized sample size to increase precision**			**Formula (Thrusfield, 2005)**
Cattle	Camel	Cattle	Camel	Total	Cattle	Camel	Total	$n= 1.96^2P_{exp}(1-P_{exp}) / d^2$
40	62	369	363	730	600	363	963	

Study methodology

Abattoir Survey

Each week abattoir visit was made for five days for ante mortem and post mortem inspection of slaughtered animals. The ante mortem and post mortem inspection was carried out in accordance with the procedures of Ethiopian Ministry of Agriculture Meat Inspection Regulation 1972.During the ante mortem inspection the animals were placed in adequate lairage for 24h for visual observation. Information concerning the age, sex, origin, body condition score of all animals were assessed and recorded (Gracey *et al*., 1999).In the case of camel the age was determined by dental eruption according to (Khan *et al*.,2003).The body condition scoring for camels was carried out based on the guidelines given by Faye *et al*.(2001).The scoring was conducted by looking at the back and flank then classified as poor(0 and 1),medium(2and 3),and good(4 and5).In the case of cattle age estimation done based one eruption of one or more incisor teeth according to De lahunta and Habel(1986). Body condition score of cattle was made by the scoring system into poor, medium and good as described by (Tennant *et a*l.,2002). Animals were identified based on the enumerated marks on its body surface before slaughter using ink and before conducting the post mortem examination the identification markings done in the ant mortem examination were transferred to all organs that will going to be examined by post mortem examination .During post mortem examination organs especially liver, lung, spleen kidney, heart and gastro intestinal tract (GIT)as awhole were systematically inspected for the presence of hydatid cyst by applying the routine meat inspection procedure of primary examination followed by secondary examination. The primary examination involves visualization of the organs, were as secondary examination involves further incision of each organs in to pieces whenever evidence of hydatidcyst (Alula, 2010).

Assessment of direct economic loss

The economic losses from organ condemnations were evaluated by considering the following parameters. These include; information on the mean retail market price of the organs (lung, liver, gastrointestinal track, kidney, spleenand heart).The loss from organs condemned will calculated by using the formula described by (Regassa e*t al*., 2010). LOC= (NAS × Ph × Plu× Cplu) + (NAS × Ph × Phr ×Cphr) + (NAS × Ph × Pli × Cpli) + (NAS × Ph × Psp ×Cpsp) + (NAS × Ph × Pkid × Cpkid). Where: LOC- loss due to organ condemnation, NAS -Mean number of camel and cattle slaughtered annually, Ph-Prevalence of hydatidosis, Plu-Percent involvement of lung, Cplu -Current mean retail price of lung Phr -Percent involvement of heart, Cphr -Current mean retail price of heart ,Pli--Percent involvement of liver, Cpli- Current mean retail price of liver, Cpgit -Current mean retail price of GIT,P kid-Percent involvement of kidney, Cpkid –Current mean retail price of kidney.

Questionnaire survey

To awareness public knowledge on the hydatiosis closed ended questionnaire were administered. The sample size required for the questionnaire survey was 100. The sample size for the questionnaire survey was calculated by using the formula given by Arsham (2002). $N=0.25/SE^{2;}$ Where, N= sample size and SE (Standard Error) =5%

A total 100 volunteer respondents from different sex, age, level of education, occupation and religion were selected using random sampling based on willingness to participate in the questionnaire survey.

Data management and analysis

The data generated were stored in Microsoft excel spreadsheet and analyzed using STATA version 11.0. Percentages, chi square test, univariable logistic regression were performed, to quantify

the association between risk factors and hydatiosis and odds ratios and CI were used to quantify the degree of association between risk factors and the disease and multivariable logistic regression analysis were used. Only the independent variables showing co linearity <50% and P<0.25 were included to final model analysis. These variables were categorized during data analysis. The categories of the variables were as follows: species of animals, age sex, breed, body condition and origin of animals.

Ethical Considerations

To make this study ethically sound all the important topics in public health ethics such as consents of the participants for the study were asked and acknowledged first. All the moral, cultural, religious values of the community were respected. The confidentiality of information and privacy of participants during sample collection and interview was protected. Access to confidential records and computer files was limited by keep in records under lock and key**.**

Results

Prevalence of camel and cattle hydatidosis

In the current study total of 963 animals comprising 600 cattle and 363 camels slaughtered at akaki municipal abattoir were examined for the presence of hydatidosis. Out of the total 963 animals examined for the presence of hydaticysts an overall prevalence was 44.75%. Out of 600 bovine examined for hydaticyst 259(43.17%) were positive. Similarly, out of the 363 camels examined 179 (49.31%) to be positive for hydaticysts.

Table 1: Overall prevalence of hydatiosis in cattle and camel slaughtered at Akaki municipal abattoir

Species of animals	No of examined	No of positive	Prevalence (%)
cattle	600	259	43.17%
Camel	363	179	49.31%
Total	**963**	**431**	**44.75%**

Association of risk factors with occurrence of hydatidosis

The results of the association of different risk factors with the prevalence ofhydatosisusing chi square(X^2) test.Prevalence of camel hydatidosis infection was significantly associated risk factors: sex, age, bcs, origin and similarly prevalence cattle hydatidosis significantly associated risk factors: age, bcs, origin ($p<0.05$), but breed of bovine was not significantly associated ($p>0.05$) Table 2.

Table 2: The association between hydatidosis prevalence and the risk factors in camesl and cattle slaughtered at Akaki municipal abattoir

Risk factors	No of animals	no of positive	prevalence (%)	X^2	P- value
Camels					
Sex					
Male	110	45	41	4.45	0.03
Female	253	134	53		
Age					
young	50	8	16	25.7	0.000*
adult	313	171	55		
BCS					
Good	74	28	37	18.9	0.000*
Medium	264	129	48		
Poor	25	22	88		
Origin					
Babile	77	33	43	6.8	0.03
Metahar	152	68	45		
Borena	134	78	58		
Cattle					
Breed					
Cross	98	36	367	1.97	0.16
Local	502	223	44		
Age					
Young	215	81	36	4.11	0.04
Adult	385	178	36		
BCS					
Good	329	130	40	18.5	0.00*
Medium	226	96	42		
Poor	45	33	73		
Origin					
East Shoa	120	44	37	12.8	0.01
C. Ethiopia	250	96	38		
Wollega	61	28	46		
West Shoa	91	47	52		
Jimma	78	44	56		

Univariable logistic regression for risk factors with camels and cattle hydatiosis

During the Univariable logistic regression analysis, for all the risk factors, the first level of each independent variable (the category of a risk factor with lowest prevalence) was used as a reference Category for measuring the degree of association between the disease and risk factors. Univariable logistic regression analysis showed that the risk of hydatidosis infection slightly high in female 52.9% (OR1.6, CI: 1.017-2.52) than male in camel. hydatidosis infection in adult was 36.2% times greater than in young(16%) in camel and hydatidosis infection in adult was 37.6% slightly higher in young (36.2%) in cattle. Similarly, the Odd of hydatidosis infection based origin jima was 2.23 times than west shoa, wollega, central Ethiopia, east shoa and west shoa was 1.84 times than wollega, central Ethiopia,

east shoa and wollega was 1.4 times than central Ethiopia and east shoa and centeral Ethiopia was 1.07 times than East shoa in bovine. Uni-variable logistic regression analysis also showed that there was a strong association (OR>1) between positivity and sex, age, BCS, breed and origin of animals (Table 3).

Table 3: Univariable logistic regression analysis on risk factors of Hydatidosis at Akaki municipal abattoir

Risk factors	No of examined	no of positive	prevalence(%)	OD Ratio(95% CL)	P- value
Camel					
Sex					
Male	110	45	41	1.00	
Female	253	134	53	1.6(1.017-2.52)	0.042
Age					
young	50	8	16	1.00	
Adult	385	178	36	6.2(2.84-13.74)	0.000*
BCS					
Good	74	28	38	1.00	
Medium	264	129	48	1.54(0.91-2.62)	0.1
Poor	25	2288	12	(3.3-43.9)	0.00*
Origin					
Babile	77	33	43	1.00	
Metahar	152	68	45	1.07(0.62-1.87)	0.7
Borena	134	78	58	1.8(1.02-3.1)	0.04
Cattle					
Breed					
Cross	98	36	37	1.00	
Local	502	223	44	1.3(0.8,2.1)	0.1
Age					
Young	215	81	36	1.00	
Adult	385	178	36	1.4(1.01.2)	0.04
BCS					
Good	329	130	40	1.00	
Medium	226	96	42	1.13(0.8,1.5)	0.4
poor	45	33	73	4.2(2.0,8.4)	0.00
Origin					
East shoa	120	44	37	1.00	
CenteralEthio	250	96	38	1.07(0.6,1.6)	0.7
Wollega	61	28	46	1.4(0.7,2.7)	0.2
West shoa	91	47	55	1.84(1.06,3.2)	0.03
Jimma	78	44	56	2.23(1.24,3.9)	0.07

Multivariable logistic regression analysis of risk factors

For multivariate analysis all variable entered into the multivariate model because the independent variables were showing co linearity <50% and P<0.25 to final model analysis. Multivariate logistic analysis showing all independent variables were statistically significant except sex and breed Table5.

Table 4: Multivariable logistic regression analysis of risk factors

Risk factors	No of animal's	No of positive	Prevalence (%)	OD	CL	P- value
Camel						
Sex						
Male	110	45	41	1.00		
Female	253	134	53	1.54	0.9-2.52	0.079
Age						
young	50	8	16	1.00		
Adult	385	178	36	6.9	3-15.4	0.000*
BCS						
Good	74	28	38	1.00		
Medium	264	129	48	-		
Poor	25	22	88	2.41.5-3.79		0.00*
Origin						
Babile	77	33	431.00			
Metahar	152	68	45 -			
Borena	134	78	58	1.5	1-2	0.011*
Cattle						
Breed						
Cross	98	36	37	1.00		
Local	502	223	44	1.2	0.74-1.95.45	
Age						
Young	215	81	361.00			
Adult	385	178	36	1.58	1.1-2.28	0.012
BCS						
Good	329	130	401.00			
Medium	226	96	42			
poor	45	33	731.56	1.18-2.06		0.002
Origin						
East shoa	120	44	371.00			
CenteralEthio	250	96	38	-		
Wollega	61	28	46-			
West shoa	91	47	52-			
Jimma	78	44	56	1.3	1.14-1.48	0.00*

Organ distribution of cysts

Organs distribution of cystic hydatiosis revealed liver, lung, kidney, heart and GIT to be the most frequently infected visceral organs in both species. Accordingly, 32.4 of cysts were found in liver, 27.4% in lung, 20.4% in kidney, 13.2 in heart lungs and 6.6% in GIT. Out of 179 positive cysts in camel 39.1% in liver, 34.1% in lung, 12.3% in kidney, 7.8% in heart and 6.7% in GIT harbored hydatid cysts (Table 7).

Table 5: Distribution of cysts in different organs of infected cattle (n=259) and Camel (n=179) at AkakiAbattoir

Liver	lung	kidney	Heart	GIT		
Cattle	positive	84	71	53	34	17
	%	(32.4%)	(27.4%)	(20.4%)	(13.2%)	(6.6%)
Camel	positive	70	61	22	14	12
	%	(39.1%)	(34.1%)	(12.3%)	(7.8%)	(6.7%)
Grand total		**154**	**132**	**75**	**48**	**29**
		(35.2%)	**(30.1%)**	**(17.1%)**	**(11%)**	**(6.6%)**

Figure 4: Distribution of hydatid cysts on visceral organs of slaughtered cattle and camels

Questionnaire survey results

From a total 100 people responded to the questionnaires in study area for awareness of community about the zoonotic hydatiosis. In this study 53% of them, referred to as the high risk group' which means that this individuals have been practiced eating raw or undercooked meats denoted that they are engaging in a high risk behavior, whereas 47% of those who confirmed that they do not eat raw or undercooked meats are in turn referred to as the low risk group. The result of interview indicated that the evidence that the groups people differed in their behavioral experience of eating raw or undercooked meat except veterinarians and human health care workers. Based on the gender almost half of the men and women experienced eating raw or undercooked meat. Education status all individuals have under risk based levels of education. Although in terms of religion varied, there was high risk group where large number of Christians experienced consumption of raw meat (Table 5).

Table 6: Results of questionnaire survey based on risk factor assessments

Risk factors	No of respondents	Do you eat raw meats yes	no
Age			
<3041	23	18	
31-40	33	19	17
>40	26	11	12
Gender			
male	63	37	26
Female	37	16	21
Religion			
Christian	55	31	26
Muslim	45	22	23
Education			
Elementary	43	23	20
High school	37	17	20
Diploma and above	20	13	7
Place of work			
Health center	10	-	10
Veterinary center	6	-	6
Other sector	84	53	31

From a total of 100 people 47% have pet animals in their house. More than 81% was no information about zoonotic parasite; however only 19% respondents knew the zonotic parasite. In this study less number of people knew about fatality of tapeworm and majority of these people were recognized for the presence of its treatment, prevention and well-endowed about its high cost treatment (Table 6).

Table 7: Questionnaire results on assessment of public awareness about hydatidosis

Risk factors	No of respondents	percent of response Yes	No
Awareness about zoonotic Hydatidosis			
Have u information about zoonotic parasites	100	16%	84%
Do you agree zoonotic parasite from cattle or camel?	100	10%	90%
Have you ever suffered from hydatidcyts in the past one year	100	17%	83%
Do you have latrine (Toilet) facility at home?	100	100%	-
Knowledge about causes of hydatidosis			
Do you know that hydatidosis is caused by parasite?	100	16%	84%
Dou you know that pets can be affected by eating raw uncooked offal?	100	16%	84%
I can get hydatidosis from eating raw meat	100	-	100%
Knowledge of fatality, effectiveness of treatments and control of hydatidosis			
If I get hydatidcyct, I will get sick and the illness would be very bad	100	66%	34%

There is effective treatment for a person/animal who affected hydatidcyct parasite	100	57%	43%
I know the disease has costly treatment	100	28%	72%
Is there any control measures against the disease both in human and animals	100	16%	84%
Do you agree that hydatidosiscan be prevented by Cooking meat?	100	38%	62%
If everyone eats cooked meat, hydatidosis would not be around	100	41%	59%
Veterinarian can decrease the risk of zoonotic parasites?	100	47%	53%
Meat eating behavior of individuals			
intend to eat raw or undercooked meat	100	53%	43%
I know where to buy inspected meat?	100	61%	39%
I always eat well cooked meat.	100	38%	62%
The chance of eating raw uninspected meat is high during holiday	100	82%	18%
My families/neighbours/others will force me to eat raw meat	100	47%	53%

Finical loss estimation

Total Finical loss due to hydatiosis was estimated based on data from abattoir Survey at akaki abattoir. During study period facilitated examination of 600 cattle and 363 camels, of these, 44.75% were found infected with hydatidcysts. Observation during this study revealed that 259(43.17 %%) cattle and 179(49.31%) camel were condemned out of the total infected animals. The average retail market price of both species was 10ETB/kg livers, 5ETB/KG lung, 15ETB/kg kidney, 15ETB/kg heart and 20ETB/kg GIT from market. The losses from organs condemned were calculated by using the formula described by (Regassa*et al.*, 2010). LOC= (NAS × Ph × Plu × Cplu) + (NAS × Ph × Phr ×Cphr) + (NAS × Ph × Pli × Cpli) + (NAS × Ph × Psp ×Cpsp) + (NAS × Ph × Pkid × Cpkid). Based on these data, direct annual finical loss was determined by considering mean of annual slaughter rate of cattle and camel to be 321,616.02 ETB annually (Table 8).

Table 8: Number of organ examined, condemned, percentage involvement and their current average price

Organ condemned	No of organ examined	No of organ condemned	percentage involvement	Average price ETB
Liver	963	154	35.2%	10
Lung	963	132	30.1%	5
Kidney	963	75	17.1%	15
Heart	963	48	11%	15
GIT	963	29	6.6%	20

Discussion

Hyadatidosis is an important knows disease in both livestock and human population in different parts of the world. Its prevalence and economic significance has been reported by different researches in different country. The prevalence of hydatidosis varies from country to country even within the country and has been reported by various researchers from developing country under extensive production system (Gracey *et al*., 1999).

The aim of the present study was to investigate th e Comparative prevalence, associated risk factors, to assess the finical losses and the public awarene ss about hydatidosis in cattle and camel slaughtere d at Akaki abattoir. In the present study the overall prevalence of cattle and camel in Hyadatidosis at Akaki municipal abattoir were found 44.75%.However the present study relatively higher prevalence of hydatidosis in camels (49.31%) than cattle (43.17%) was recorded. This results disagreed the reported by Fromsa and Jobre, 2011 who found that cattle were identified to have the highest prevalence of hydatidosis than camel. The variation might be due to different srain of *E. granulosus* that exist in different geographical location, different culture of the society, social activity, animal husbandry system and attitude to dogs in different regions may contribute to variations (Kebede *et al*., 2009). But many reports from the different corners of the world indicated relatively higher prevalence of hydatidosis in camel (80%) than cattle in Morocco (Pandey*etal*., 1986).This may be due to in many camel breeding areas, offals are not consumed by the community rather given to dogs that may increase the chance of environmental contamination, where by dogs can easily acquire the infection and then continuously discharge eggs of the parasite. More over dogs are not kept in door for religious and traditional matters resulting in increased number of stray dog's favours further dissemination of the diseases.

The current study the prevalence of the camel's hydatiosis (49.31%) which is higher than the previous reports of 4.5% in eastern Ethiopia by Mulate and Nazir (2015).Similarly the study reported in different country of the world showed the prevalence of camel hydatiosis was less than the current study: 39.65% in Kuwait by Abdul and Farah, (1988), 18.8% in Saudi Arabia by Ibrahim and Craig, (1998), and 32.85% in Saudi Arabia by Mohamed, (2010). However, the current prevalence is lower than in the same study area that reported by Bulto *et al*., (2014), 61.6% by Hailu and Tegene (2013) in Ethiopia and 61.4 % by Njorogeet al (2006) in Kenya. These variations might be due to the variations in the temperature, environmental conditions, livestock health practice and number of stray dogs as well as other animal contact. The present study showed the female camels higher prevalence was than males. Comparable findings have been reported byMulate and Nazir (2015) in Ethiopia and by Abdul-salam and Farah, 1988 in Kuwait. This might be related to the practice in management of male and female camels that males are moved too far for grazing and watering whereas females are usually managed around homesteads at the backyard for milk purpose which commonly expose female animals to come in contact with infected dog, Females remain longer than males for reproductive purpose in the area so that the probability of getting more infection will be higher than the males. The statically significance of the study result showed the prevalence was higher in adult than young. This showed the age dependent increase in infection rate among examined animals is in accordance with the findings of Azlaf and Dakkak (2006). Also Ibrahim(2010) reported the age variation can be associated with differences in exposure to infection because older livestock may have been exposed to more infective stages.

The study showed based on body condition score of camel 37.8%, 48.4% and 88% good, medium and poor were positive respectively. This finding is agreed with the study reported by Bulto et *al* (2014) and Endriase t al (2010). The variation Might be due to Poor body conditions of cattle were found high prevalence than good and

medium body condition. This is due to lower immunity to compact infection, retarded growth, weight loss and moderate to severe infection. In this study there was statistical variation in the prevalence between the origins of the examined animals were as high prevalence recorded in Borana (58.2%) than Matahar and Babile. The variation might be due to different environmental situation. In the present study also the prevalence of cattle hydatidosis in the study area were 43.17% which is comparable with the results of Torgerson et al (2008) who reported prevalence of 54.84%. The present study was higher compared to the prevalence reported 28 % by Deba and Ibram(2013) at Gonder ELFORA abattoir. But lower prevalence was also 7.5% reported by Kebede (2009) in Shire. The variation may be due to difference in the ecology, animal production system that affect the life cycle of the parasite, different strain of *E.granulosus* that exist in different geographical situations, difference in culture, social activity and attitude of dog in different regions.

The Statically significant difference of the study showed the prevalence of adult cattle was high prevalence 36.2% than young. It is known that adult animals might be more exposed to the parasite and thus increased possibility of acquiring the infections as in the case similar to above the camel. Similarly, previous studies strongly suggested that prevalence is heavily influenced by age (WHO/OIE, 2001). Poor body conditions of cattle were found high prevalence than good and medium body condition. This is due to lower immunity to compact infection, retarded growth, weight loss and moderate to severe infection in such animals as described by Azlaf and Dakka (2006).

The present study showed lowest prevalence 36.6% was observed from East shoa and the highest prevalence 56.4% was detected in cattle originated from Jimma zone which is characterized by high humidity and plenty of rain fall. Another important factor is the difference in the livestock production system. The studies have shown that temperature has a significant effect on the survival of echinococcus eggs in which eggs survive longer under coler temperature than semi-arid condition (Azlaf and Dakkak, 2006, Kumssa and Mohammedzein, 2012). Regarding organ distribution, the current study showed that liver (35.2%), lung(30.1%), kidney(17.1%), heart(11%) and GIT (6.6%). were the most preferred predilection site for hydatid cysts followed by liver (35.2 %) which is in agreement with other study in cattle in Ethiopia such as Tezera and Belay (2012). This is due to the presence of large capillaries to provide nutrients for the blood borne onchospheres and provide spaces for the developments of the cyst. Similar suggestions were given (Bizuwork *et al*., 2013). So that liver and lung are found to be the major organs infected with hydatidosis and condemned offal's.

Based on questionnaire survey public awareness about hydatiosis not practice that means majority of community was under risk due to consummation of row/uncooked meat. This is facilitated by the very limited knowledge on the cause and transmission of hydatidosis in study area. The present study showed that there was gap of knowledge between ages of the respondents that means greater age group of respondent's relatively more consuming raw meat than others. The observation from respondents shows improper disposal of infective organs or throwing into the bush and/or direct feeding by dogs. Dog management like feeding left over, dog keeping style which is most dogs free all the time and sometime these are shepherd dog that increases the chance of pasture contamination by their faeces (Getaw *et al*., 2010).

Frequently, decision of farmers during animals sick (sale to the market, home slaughtering) was observed as an important factor which contributes to public awareness of the disease. The annual estimated financial loss in the present study need to be cautiously interpreted as it would be affected by factors which are dynamic and change over time due to market price of cattle and camel as condemnation of the organs, prevalence of disease and number of animals slaughtered every year which can change the amount of financial

loss from year to year. Financial loss analysis due to hydatidosis in cattle and camel slaughtered, retail price of organ at market and prevalence of the disease at study time in the study, the total annual economic loss due to organ condemnation caused by a cyst of hydatiosis at Akaki abattoir was estimated tobe 321,616.02 Ethiopian birr (10,613,328.66$). Study showed that a cyst of hydatiosis of cattle and camel causes significant economic loss.

Conclusion and Recommendations

Hydatidosis is an important zoonosic disease that causes serious public health as well as economic problem throughout the world. The current study clearly indicated that Hydatidosis affected slaughtered cattle and camel resulted in significant finical losses due to organ condemnation. Higher prevalence of the disease was recorded in animals from in Jima zone for slaughtered cattle and borena zone for camel. Similarly the prevalence of Hydatidosis was also higher in adult than young animals. Backyard slaughtering being practiced in the country and those sites of origin of the slaughtered animals can enhance the continuation of the life cycle between the intermediate and final host. The result of questionnaire survey showed that major factor that plays a great role in the persistence of the disease is mainly human factor due to low of public awareness about the disease and routes of transmission.

Based on the above conclusion the following recommendations are forwarded

- Public education is required on the importance of proper disposal of condemned offal's and prohibition backyard slaughter that might contribute for the control of the diseases
- In endemic areas of hydatidosis immuno-logical screening of animals should be carried for early detection of infected animals
- Close collaboration and coordination between veterinary and medical authorities at all level is required.
- The construction of municipal abattoir with fencing and disposal system of infected organs particularly in rural areas.

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