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Prevalence of Hydatid Cysts in Bulle District Gedeo Zone, South Ethiopia.

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Abstract

A cross-sectional study was conducted from March to June, 2022 on bovine hydatidosis in cattle slaughtered at Bulle town municipality abattoir in Gedeo zone, Ethiopia with objective of determining the prevalence of hydatid cyst and estimating the economic loss from organ contamination due to hydatid cyst in the study area. Accordingly, a total of 398 randomly selected slaughtered cattle were examined both during ante mortem and postmortem inspection and then a prevalence of 10.55% (42/398) was observed. The chi-square test of potential risk factors revealed that there was statistically significant difference in the prevalence of hydatidosis between animals from different origin ($p < 0.05$). However, breed, age, sex and body condition showed no significant effect ($p < 0.05$) on the prevalence of the disease. Regarding the distribution of hydatid cyst; liver (49.21%), lung (28.57%), heart (19.05%) and spleen (3.17%). The estimated annual financial loss due to organ condemnation was 5,684,684 ETB (120,951 USD) based on the local market price in the study period. This study assured that bovine hydatidosis was the problem of cattle in this study area. Therefore, it needs due attention to safeguard the public health and the economy.

Keywords

Abattoir;
Bovine;
Bulle;
Hydatidosis;
Prevalence.

Introduction

Hydatidosis is the globally recognized helminthes Zoonotic disease affecting both humans and animals that causes considerable financial losses, in many countries of the world including North and East Africa, West and Central Asia, China, South America, North America and Australia [1, 2, 3]. In Ethiopia, the disease has been known and documented as early as 1970`s [4, 5]. The country has largest number of livestock more than any other country in Africa, with nearly 63 million cattle, over 31 million sheep and 33 million goats, and 61 million chickens [6]. However, the contribution from these huge livestock resources to the national income is disproportional due to several factors. Studies conducted recently in abattoirs of various locations indicate that

Echinococcus granulosus which is a causative agent of hydatidosis is wide spread in Ethiopia with great economic and public health significance [7].

The causative agent of hydatid disease is the metacestode stage (larvae) of tape worm of genus Echinococcus [8, 9]. This parasite is characterized by cyst containing numerous tiny protoscolices that most often develop in the liver, lungs and also develop in the kidneys, spleen, nervous tissue, bone and other organs [10]. However, some studies shows the percentage of affection was more in lung followed by liver, kidney, spleen and heart at Mekele, Arbaminch, Arsi-negele, Adama, Harar and Hawassa [5, 11, 12].
It is one of the most important parasitic diseases of ruminants responsible for huge economic losses due to reduction in carcass, weight gain and condemnation of organs [13]. Research findings from abattoir surveys conducted in Ethiopia have been revealed the prevalence of cystic bovine Hydatidosis, ranging from 6.51% (Debre-brhan) to 62.38% (Assela) and annual economic loss ranging from 8,798.50 (Arsi) to 19,847,704.00 (Addis Ababa Abattoir Enterprise) Ethiopian Birr [14]. The total annual economic loss incurred due to hydatidosis in ruminants slaughtered at Adama municipal abattoir was estimated to be to 52,828 ETB (5869.8 USD) [15].

The clinical manifestations of hydatids cyst can vary from asymptomatic infection to death [16]. Epidemiology of echinococcosis zoonosis is complex and dynamic, being influenced by varying parameters that can roughly be categorized as human-related,

pathogen-related, and climate/environment-related [17, 18]. The creation of a normative and the global vision of echinococcosis as a public health problem might help improve the control of this disease. In general, now it is considered that there is a risk of getting echinococcosis infection, as well other cestodiasis, while traveling to endemic zones [19].

Echinococcosis has been neglected worldwide and especially in Ethiopia. There is no subsequent interest in the occurrence of this disease and all its implications. Due to the impact of echinococcosis, the burden it creates, and the consequences in the economy, it becomes important to create strategies in order to improve and have a better control on this disease in our country [5, 16]. However, every step gone to improve the impact should be well organized depending on different findings gathered from literatures. Nevertheless, there is a scarcity of information upon this in the Kambata Tambaro zone. Therefore, this study was conducted to determine the prevalence and financial losses significance of Hydatidosis in cattle slaughtered at Bulle town municipal abattoir.

Statement of the problem

Statement of the problem Echinococcosis in cattle is a parasitic infection of worldwide distribution, which, despite causing significant loss of health and money. In cattle's, losses are due to lost productivity, losses in quality of meat, and decreased milk production and fertility. Furthermore, the loss in humans is due to costs of hospitalization, treatment, disability, etc. Therefore, the impact of the disease on the country's economy and its effect on the health of cattle and human beings were considered on the current study. Due to the impact, the burden it creates, and the consequences in the patients, the disease becomes important to create strategies in order to improve and have a better control in our country on the bases of following basic question.

Objective of study

General objective

General objective of this study will to determine the prevalence of Hydatidosis in cattle slaughtered at Bulle town municipal abattoir and to determine financial losses due to condemnations of organs and to establish the recommendations.
Specific objectives of the study

- To estimate the prevalence of Hydatidosis in the study area.

J To assess the financial significans of the Hydatidosis in the study area.

Materials and Methods

Study area

The study was conducted in Bule municipality abattoir. Bule town is found in SNNP Regional state of South Ethiopia Gedeo zone; Gedeo zone Buleworeda387kms South of Addis Ababa. It lies between 6^0 07' – 6^0 37' latitude North and $38^0$27' - $38^0$44'longitude East in the SNNPR State. Its temperature has two Climates zone are Daga and wondaga. From the total Area daga account 69.8% and the rest 30.2% is woyndaga. The altitude of the study area is 2800-3000 meter above sea level. It has an annual rain fall and temperature ranging from 1400-1800 mm and 12.6^0c - 20^0c respectively with daga and woynadaga climatic zone [20].

Study Animals

During the study period a total of 398 cattle slaughtered at Bule municipality abattoir were included in the study. The abattoir slaughtered bovine and ovine species for human consumption. More of the cattle were above 5 years age. The majority of cattle were originating from Danaba, Haro, Dama, O/majo, Bore, Elalcha, Herede and sokicha. Estimation of age was done by the examination of teeth eruption [21].

Study Design and Sampling Method

The cross sectional abattoir survey was conducted on slaughtered cattle to study the prevalence of bovine hydatidosis at Bule municipality abattoir on June 2022. A simple random sampling method was employed, and the study animals were selected randomly and recorded on data collection format. Since there was no previous study conducted at Bule municipality abattoir to determine the prevalence of bovine hydatidosis , the sample size was determined by taking an estimated prevalence of 50% using the method designed by Thrustfield ((1995) [22], the sample size was determined to be 398 cattle at 95% confidence interval and 5% expected error.

$$N= \frac{1.995^2 \, Pexp \, (1- Pexp)}{d^2}$$

Where n: required sample size
Pexp: expected prevalence
D: the desired absolute precision

Hence, d= 0.05 and p= 0.5/50%/

Where n = require sample pexp = expected prevalence d = desire absolute precision
Therefore, by substituting the value in the given formula n = 398 which are used as represent tative animal for study of the prevalence of bovine hydatidosis in study area.

Study Design and Methodology

Study Design

A cross sectional study will perform to assess the prevalence of hydatid cyst in Bulle municipality abattoir through meat inspection conduct on 384 cattle's during the study period.

Study Methodology

Anti-mortem inspection: Anti-mortem inspection will do on individual animals for assessment of animal origin, body condition, breed and age determination. During anti-mortem inspection each of the study animal will give an identification number based on enumerates mark on its body tagg before slaughter.

Post mortem inspection: Post mortem inspection procedure will conduct on organs namely lung, liver, heart, kidney and spleen involving visualization and palpation to detect the presence of hydatid cysts. Number of hydatid cysts that were found per organ and per animal will registered.

Assessment of financial loss

To assess the financial loss due to hydatidosis, only direct loss will consider and the calculation will based on condemned organs (liver, lungs, heart and spleen). In calculating cost of condemned edible organs, 5 different meat sellers; 2 meat inspector and 5 meat consumers will interview randomly to establish the unit price per organ and the average organ price will determine and this price index will used to calculate the loss [23]. The economic effect of the parasite will determine by the following formula (Ogunrinade and ogunrinade, 1980) [24].

LOC= NAS [(Plu×Cplu) + (phr×Cphr) + (pli×Cpli) + (psp×Cpsp)]

Where: LOC = Loss due to organ condemnation,
NAS = Mean number of cattle slaughter annually,
Plu = Percent involvement of lung cases,
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,
Psp = Percent involvement of spleen,
Cpsp = Cur-rent mean retail price of spleen.

Data analysis

Data collecting from anti-mortem and post-mortem findings will enter in to Ms-Excel program (Microsoft Corporation, USA) and the data will analyzed using SPSS (Statistical Package for Social Science) 25 version. Chi-square test will use to determine the association between the prevalence of cysts and risk factors. Statistical significance will consider when P-values will below the threshold value (0.05).

Results

The total number of infected animals with hydatid cyst are 42 (fourty two) out of 398 animals examined with overall prevalence of 10.55%. Among the study animals, 362 (90.95%) cattle were local breeds whereas 36 (9.05%) were cross breeds. Three hundred fifty four (88.94%) of the animals were males while the remaining 44 (11.06%) were females. In addition, 291 (73.12%) were under or equal to five years of age and the remaining 107 (26.88%) were above five years of age and 246 (61.81%) and 152 (38.19%) good and medium body conditioned, respectively (Table 1)

Table 1 Prevalence of hydatids cyst in relation to different risk factors

Risk factors		No of examined	No of infected	Prevalence %	x- value	p- value
Breed	Cross	362	39	10.77	0.207	0.649
	Local	36	3	8.33		
	Total	398	42	10.55		
Sex	Male	354	39	11.02	0.731	0.393
	Female	44	3	6.82		
	Total	398	42	10.55		
Age	<5 Years	291	31	10.65	0.012	0.915
	>5years	107	11	10.28		
	Total	398	42	10.55		
Body Condition	Good	246	21	8.54	2.774	0.096
	Medium	152	21	13.82		
	Total	398	42	10.55		

Origin	O/majo	56	11	21.57	12.436	0.029
	E/Haro	62	5	8.06		
	H/Chabi	85	5	5.88		
	Elalcha	51	4	7.84		
	Herede	58	3	5.17		
	Dama	86	14	16.28		
	Total	398	42	10.55		

Organ distribution of cysts

The total number of hydatid cyst found is 63 (sixty-three) out of which 31 (49.21%), 18 (28.57%), 12 (19.05%) and 2 (3.17%) cysts are investigated in organs liver, lung, heart and spleen, respectively, with descending order of proportion. (Table 2)

Table 2 Organ distribution of the cysts

Organ	No of cyst	Proportion %
Lung	18	28.58
Liver	31	49.21
Heart	12	19.05
Spleen	2	3.17
Total	63	

Table 3 Total Number of Organ Condemned During the Study Period in Bulle Town Municipal Abattoir,

Organ	No of organ condemned	Local price per organ in ETB	Total Price per organ in ETB
Lung	42	25	1050
Liver	11	35	385
Heart	5	25	125
Spleen	23	20	460
Total	81	105	2020.00

Discussion

The overall prevalence of Hydatidosis in cattle slaughtered in Bulle Town municipal abattoir during the study period was 10.55%. The current finding is in close agreement with that reported 11.26% in Mizan Teppi by Jemere *et al*., (2013) [25], 11.6% in Mekelle Abergelle export abattoir by Yitbarek and Mulugeta, (2012) [26], 10.56% in Libya by Elmajdoub and Rahman, (2015) [27], and 10.6% in Morocco by Azlaf and Dakkak, (2006) [28]. The present finding was higher than the previous works reported like 2.1% from Zambia by Banda et al., (2013) [29], 6.99% from Iran by Ahmadi and Meshkehkar, (2011) [30], 2.8% from Sudan by (Conway *et al*., 2004) [31]. However, the current finding is lower than prevalence study in other areas like 57.6% in Assela (Gadisa and Addis, 2016) [32], and 52.69% Hawassa (Regassa *et al*., 2010) [33]. These discrepancies in disease prevalence among the various studies in different areas might be due to the difference in availability and frequency of exposure of the final hosts among the infected intermediate hosts and vice-versa.

Association of origin of animals and prevalence was statistically significant ($p < 0.05$) which agree with findings of (Dawit, 2018) [34] in Wolayita zone Kindo koysha woreda. Whereas the variables breed was in agreement with Berhe, (2009) [35], Assefa *et al*., (2014) [36], age (in

agreement with Bekele *et al*., (2013) [37]. Sex and body condition were insignificant ($p< 0.05$). All contradicts with the findings of (Mandefro *et al*., 2019) [38].

In the present study, the livers were found to be most commonly infected with hydatid cysts of the lungs and other organs. That is, 31 (49.21%), 18 (28.57%), 12 (19.05%) and 2 (3.17%) cysts were investigated in organs liver, lung, heart and spleen, respectively, with descending order of proportion. These findings were supported by studies in Ethiopia (Yitbarek *et al*., 2012; Mulatu *et al*., 2013) [26] and other studies conducted in Libya (Khan *et al*., 2001; Tashani *et al*., 2002; Elmajdoub and Rahman, 2015) [27, 39, 40]. The reason why the liver most commonly infected is because the bile duct in the liver receives the blood with the oncospheres after the blood has passed the duodenum [41].

The annual financial loss incurred due to organ condemnation, because of hydatidosis was estimated to be 5,684,694 ETB (120,951 USD). This finding is much higher than the reports of Adem and Addis, (2015) [42] which was 1,160,932.40 ETB (56,647.70 USD) in Bishoftu and Gadisa and Addis, (2016) [32] which was 3,479,679.13 ETB (173983.96 USD) in their study in Asella, Ethiopia. This difference may be due economic inflations through time.

Conclusion and Recommendations

The current study revealed the occurrence and economic impact of bovine hydatidosis in cattle slaughtered in Bulle Town municipality abattoir. The vital organs like liver, lung and heart were affected in the study area. These organs are most consumable for the public, hence, serious public health issue and major cause of economic loss due to organ condemnation.Therefore, based on this study and other facts about the public health and socio –economic impact of the disease, the following recommendations are forwarded:

- There should be strict routine meat inspection so that infected organs can be condemned accordingly and also backyard slaughtering of animals should be prohibited through designing and reinforcing of legislation, construction of slaughter houses which full fills the necessary facilities and implementation of proper meat inspection services.
- All condemned organs should be properly disposed in order to break the life cycle of some metacestodes like Echinococcus granulosus and stray dogs and cats must be prohibited from abattoirs and their number should also be systematically reduced.
- There should be public education to create awareness so that all consumers avoid consumption of raw meat.
- Further investigation on public health significance of the disease should be done on the area

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