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Bovine Hydatidosis: Occurrence, Economic and Public Health Importance in Gondar ELFORA Abattoir

Mamo Adane and Tadesse Guadu

Department of Veterinary Epidemiology and Public Health, Faculty of Veterinary Medicine, University of Gondar, P.O. Box: 196, Gondar, Ethiopia

Abstract: A cross sectional study was carried out on local zebu and cross breed cattle slaughtered at Gondar ELFORA abattoir from October 2013 to Aril 2014 to determine the prevalence, economic loss and public health significance of bovine hydatidosis. Postmortem examination of organs, hydatid cyst characterization, direct and indirect financial loss estimations and questionnaires regarding zoonotic importance were used. Out of the total of 350 animals examined, 100 (28.6%) were found harboring one or more hydatid cysts. The prevalence of disease was higher in cattle above five years old (31.0%) than five or bellow five years old (11.4%). Cattle with poor body condition score (45.6%) were highly affected than cattle with medium (26.7%) and fat body condition score (22.0%). Also, it was more prevalent in local breeds (32.2%) than cross breeds (3.3%). A total of 112 visceral organs were found harboring one or more hydatid cysts. The involvement of lung, liver, spleen, kidney and heart was found to be 53.6%, 34.8%, 6,3%, 3.6% and 1.8% respectively. From the total of 112 cysts counted, 41.1%, 22.3%, 14.3% and 22.3% were small, medium, large and calcified cysts respectively and 34.8% of them were fertile and 65.2% were non fertile. The total annual economic loss due to the direct and indirect losses was estimated to be 751,725.00 ETB. This revealed that hydatidosis is a major disease causing direct and indirect economic losses in the study area, where the people should be informed about the public health and economic significance of the disease and prevention of dogs access to condemned organs.

Key words: Abattoir · Bovine · Gondar · Economic Loss · Hydatidosis · Prevalence · Public Health

INTRODUCTION

Developing countries have nearly two third of the world's livestock population, but produces less than a third of the world's meat and a fifth of its milk. Similarly, Ethiopia has the largest livestock population in Africa, with an estimated 49.3 million heads of cattle, 46.9 million sheep and goats, 7.55 million equines and 2.3 million camels [1]. However, the contribution from these huge livestock resources to the national economy is disproportionately small, owing to several factors such as drought or malnutrition, management problems, poor genetic performance and livestock diseases [2]. Among the many prevalent livestock diseases, parasitism represents a major constraint to livestock development in the tropics in general and hydatidosis is among the major parasitic diseases contributing to low productivity of meat production due to carcass or organ condemnation, in particular [3].

Hydatidosis/Cystic echinococcosis is a severe cyclo-zoonotic parasitic infection caused by the closely related cestodes of the genus Echinococcus, namely *E. granulosus*, *E. multilocularis*, *E. oligrathrus* and *E. vogeli*. A wide variety of animal species, both domestic and wild, that act as intermediate hosts have made *E. granulosus* to be widely distributed across the globe and at least 10 genetically distinct populations exist within the complex *E. granulosus*. It involves two mammalian hosts, the definitive and intermediate hosts to complete its life cycle [3]. The definitive hosts are carnivores which harbor mature tapeworm in the intestine and excrete the parasite eggs along with their feces and plays a major role in the epidemiology of the disease, while livestock and humans are intermediate hosts for whom the outcome of infection is the development of hydatid cysts in lung, liver or other organs. The transmission of *Echinococcus species* from intermediate to definitive host is the result of

Corresponding Author: Tadesse Guadu, Department of Veterinary Epidemiology and Public Health, Faculty of Veterinary Medicine, University of Gondar, P.O. Box: 196, Gondar, Ethiopia.

predator-prey relationship existing between hosts; however, it can be modified by human behavioral factors for synathropic cycles and man is usually a dead end intermediate host [4]. The eggs are ingested by an intermediate host, in which the metacestode stages and protoscolices develop. The cycle is completed when an intermediate host or its infected organ is eaten by a suitable carnivore. Transmission is most intense in livestock rising regions where veterinary services are unsatisfactory and where condemned organs from slaughtered animals are accessible to dogs [5].

The outcome of infection in humans and animals is the development of hydatid cysts in lung, liver or other organs. In domestic animals disease due to hydatid cyst is rare, but in human beings it is more dangerous. The significance of domestic animals as host of this parasite is therefore mainly that they act as the reservoir of the infection for man. As the cysts gradually increase in size, they may impair the health status of the host and causes dyspnea when they occur in the lung or digestive disturbance and possible ascites when the liver is affected [3].

Hydatidosis occurs throughout the world and causes considerable economical and public health problems in many countries. Its distribution is usually more prevalent in developing countries, especially in the rural communities where the dog lives in close quarters with man and domestic herbivores [6]. As previous cross studies have shown that cystic echinococcosis represented a considerable economic and public health significance in different countries including Ethiopia [7].

One of the major parasitic as well as zoonotic diseases prevailing in the area is hydatidosis occurring both in humans and in domestic animals causing huge organ loses due to condemnation [8]. Hence, knowledge on the extent of hydatidosis and associated economic loss in cattle would have paramount importance in justifying the need of an effective control scheme by considering the public health damages and economic loses [9]. However, there is no current information regarding the prevalence, economic and public heath significance of bovine hydatidosis in Gondar ELFORA abattoir, which is found in North Gondar Administrative Zone. Therefore, the objectives of this study were; to determine the prevalence of bovine hydatidosis, to estimate the direct and indirect financial losses associated with bovine hydatidosis and to assess the public heath significance of bovine hydatidosis in the study area.

MATERIALS AND METHODS

Study Area: The study was conducted from October 2013 to April 2014 in Gondar ELFORA abattoir, North Gondar zone, Amhara National Regional State. It is located at 748 Km far from Addis Ababa at an elevation of 2133 m.a.s.l. The city has a latitude and longitude of \12°36'N 37°28'E / 12.6°N 37.467°E. Rain fall varies from 880-1172 mm with the average annual temperature of 19.7°C. The area is characterized by two seasons, the wet season from June to September and dry season from October to May. The farming system in the area is mixed type (Crop-livestock production). Based on the 2008 national census conducted by the CSA of Ethiopia, Gondar has a total human and cattle population of 207,044 (Of whom 98,120 are men and 108,924 women) and 2,407,544 respectively [1, 10].

Sample Size Determination: The sample size was calculated according to Thrusfield [11] by considering 27.7% expected prevalence from previous study [8] and 5% desired absolute precision at 95 % confidence level using the following formula:

$$N = \frac{(1.96)^2 \ (Pexp) \ (1\text{-}Pexp)}{d^2}$$

where,

N = Total number of sample size
Pexp = Expected prevalence
d = Absolute precision

Therefore, the sample was about 308. But to increase the level of accuracy of determining the prevalence, the sample size was increased to 350.

Study Animals: The study animals were cross breed and indigenous zebu cattle brought from various localities to Gondar ELFORA abattoir for slaughtering purposes. It was difficult to precisely indicate the geographical origin of all animals slaughtered at Gondar ELFORA abattoir and relate the findings on hydatidosis to a particular locality. Nevertheless, attempts made in this regard revealed that majority of them were brought from nearby markets. Since, almost all the cattle presented for slaughtering in the study area were males; infection rate regarding sex variation was not included.

Data Collection

Abattoir Survey: To estimate the prevalence of bovine hydatidosis in Gondar ELFORA abattoir, ante mortem and post mortem examination were carried out to identify hydatidosis infected cattle. During ante mortem inspection, each of the study animals was given identification number by using ink. Age, breed and body condition scoring of the study animals were also recorded. Estimation of age was carried out by examination of the teeth eruption using the approach forwarded by De-Lahunta and Habel [12]. Two age groups were considered; less or equal to 5 years and above 5 years old. Since almost all the cattle presented to slaughtering in the study area were male, infection rate regarding sex variation was not included. The breed type (Local zebu and Holstein Friesian cross breed) was classified on the external traits that clearly separate zebu from European type. Local zebu cattle have hump, narrow body, sloping rump and long legs, whereas Holstein Friesian breeds are humpless breeds with large body size and black-and-white color (hence, sometimes called black-and-white breed [13]. The body condition scoring was also classified into three categories as lean (Score 1, 2 and 3), medium (Score 4-6) and fat (7-9) according to Nicholson and Butterworth [14]. Post mortem examination was carried out on different organs of each of slaughtered animals, particularly lungs, liver, spleen, kidney and heart. Each organ was assessed macroscopically either by visual inspection or palpation and where necessary one or more incision were made to detect small hydatid cysts. To do so, each organ hydatid cysts were carefully removed and separately collected (In organ basis) in clean containers for further cyst characterization to assess the status of the cysts.

The infected organs from each positive animal were collected and the total number of hydatid cysts were counted per organ and recorded. The size of the diameter of collected hydatid cysts was measured and classified as small (Diameter less than 4 cm), medium (Diameter between 4 cm and 8 cm) and large (Diameter greater than 8 cm) [15]. All collected hydatid cysts were subjected to cyst fertility and viability studies. The pressure of the cyst fluid was reduced by using a sterile hypodermic needle. Then, cyst was incised with a sterile scalpel blade and the content was poured into a glass petri dish and examined under microscope (x40) for the presence of protosclices. If protosclices were present, seen as white dotes on germinal epithelium or brood capsule or hydatid sands within the suspension, the cyst was categorized as fertile. Fertile cysts were subjected to viability test. A drop of fluid from cyst containing the protoscolices were placed on the microscope glass slide and covered with a cover slip and observed for amoeboid like peristaltic movements, with X40 objective. For clearer vision, a drop of 0.1% aqueous eosin solution was added to equal volume of protoscolices in hydatid fluid on microscope slide with the principle that viable protoscolices should completely or partially exclude the dye, while the non-viable protoscolices absorb the stain [16]. Furthermore, infertile cysts were further classified as sterile or calcified. Sterile hydatid cysts were characterized by their smooth inner lining usually with slightly turbid fluid in its content. Typical calcified cysts produce a gritty sound feeling up on incision [17].

Questionnaire and Hospital Survey: Systematic questionnaires querying the extent of awareness on the disease, control measures taken and other related factors of the respective individuals, such as householders, abattoir workers and health professionals working in Gondar University hospital were prepared. Some questionnaires forwarded for health professionals were enquiring whether there have been cases of human hydatidosis, diagnostic methods used, control measures taken and other related factors. In addition, a retrospective analysis on the Gondar University hospital case record books from 2008 to 2013 was used to find complementary information on the disease.

Economic Loss Estimation: Direct and indirect losses were the basis for the estimation of the annual economic losses due to hydatidosis. Direct loss was calculated on the basis of condemned organs, whereas indirect losses were estimated on the basis of live weight loss caused by hydatidosis. Accordingly, the economic values of the loss from organ condemnations were evaluated by considering the following parameters. These includes information on the mean retail market price of the organs (Lungs, liver, spleen, heart and kidney) at Gondar town obtained from butchers during the study period and the average annual slaughter rate of cattle at ELFORA abattoir estimated from the retrospective data of the last two years. And, the loss from organs condemned was calculated by using the formula described by Regassa *et al*. [18] as follows:

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 cattle slaughter annually
Ph = Prevalence of hydatidosis
Plu = Persent involvment of lung
Cplu = Current mean retail price of lung
Phr = Persen involvment of heart
Cphr = Current mean retail price of heart
Pli = Present involvement of liver
Cpli = Current mean retail price of liver
Psp = Present involvement of spleen
Cpsp = Current mean retail price of spleen
Pkid = Present involvement of kidney
Cpkid = Current mean retail price of kidney

Likewise, the following parameters were considered to estimate the economic loss due to carcass weight loss: Information on the mean retail market cost of 1kg beef at Gondar town obtained from butchers during the study period; the average annual slaughter rate of cattle at the Gondar ELFORA abattoir estimated from retrospective data of the last two years; and the average carcass weight loss of 5% due to hydatidosis. Thus, the economic loss due to denied carcass weight gain was determined as described by Regassa [18] using the following formula:

LCWL=NAS*Ph*Cpb*5%*126kg

where,

LCWL = Loss from carcass weight loss
5% = Estimated carcass weight loss due to hydatidosis
NAS = Average number of cattle slaughtered annually
Ph = Prevalence of hydatidosis
Cpb = Current average price of 1kg beef at Gondar town
126kg = Average carcass weight (Dressing percentage) of an adult zebu [18]

Finally, the total annual economic loss was calculated by considering the losses from both organ condemnation and carcass weight loss. Thus, total loss=LOC+LCWL.

Data Analysis: Data obtained from ante mortem and postmortem findings in the abattoir and further characterization of cysts in the laboratory was coded and uploaded into Microsoft Excel 2007 spreadsheet computer program. Then, it was analyzed by using SPSS version 16.0 for windows software and Chi-square (÷2) test is applied to compare the infection status with regard to the hypothesized risk factors like age, body condition scores and breed. But, comparison regarding sex was not made since all cattle brought to the abattoir were male. P-value<0.05 was accepted as statistically significant in all cases.

RESULTS

Abattoir Survey

Prevalence Study: Out of a total 350 cattle slaughtered and examined at Gondar ELFORA abattoir, 100 (28.6%) were found harboring one more hydatid cysts involving different visceral organs (Lung, liver, heart, spleen and kidney). Rate of infection of hydatidosis with respect to age group was statistically significant ($P < 0.05$) being higher in cattle above five years (31.0%) than in five or below five years old (11.4%) (Table1). With respect to body condition of cattle, highest prevalence (45.6%) was recorded in cattle with lean body condition followed by with medium (26.7%) and good body condition scores ($P < 0.05$) (Table 1). The infection rate was also assessed with regard to the breed of the cattle, which was found higher in local breed (32.2%) than cross breed (3.3%) ($P < 0.05$) (Table 1).

Cyst Characterization: Post mortem examination revealed that out of 350 cattle examined, 49 (14.0%) of them were harboring one more hydatid cysts in their lungs, 28 (8.0%) in livers, 6 (1.7%) in spleen, 4 (1.1%) in kidney, 2 (0.6%) in heart and 11 (3.2%) in multiple organ as mixed infection (Table 2). A total of 112 hydatid cysts were collected, of which 46 (42.0%) were small, 25(23.0%) medium, 16 (14.3%) large and 25 (23.0%) were calcified cysts (Table 3). Distribution of cysts based on size in different organs showed that higher numbers of medium and large sized cysts were found in lung, while highest numbers of calcified cysts was found in liver. In relation to fertility, highest number of fertile cysts (8.6%) was recovered from lungs and highest number of non-fertile cysts was found in liver (9.1%) (Table 4).

Estimation of economic loss: In the present study, a total of 60 lungs, 39 livers, 7 spleens, 4 kidneys and 2 hearts were condemned due to detection of hydatid cysts. The assessment of retail average market price of these organs in Gondar town was 30.00, 50.00, 10.00, 20.00 and 30.00 ETB respectively. The mean number of animals

Table 1: Prevalence of hydatidosis based on host related risk factors in cattle in Gondar ELFORA abattoir

Risk factor	No of examined	Number(%) of infected	$\chi 2$	p
Age				
>5 years	306	95(31.0%)	6.587	0.010
≤ 5 years	44	5(11.4%)		
Total	350	100(28.6)		
Body condition				
Lean	57	26(45.6%)	9.77	0.008
Medium	202	54(26.7%)		
Fat	91	20(22.0%)		
Total	100	100(28.6)		
Breed				
Local	289	93(32.2%)	10.58	0.001
Cross	61	7(3.3%)		
Total	350	100(28.6)		

Table 2: Prevalence of hydatidosis in different organs of cattle slaughtered in Gondar ELFORA abattoir

Organs	No of examined	No of infected	%
Lungs only	350	49	14.0%
Liver only	350	28	8.0%
Spleen only	350	6	1.7%
Kidney only	350	4	1.1%
Heart only	350	2	0.6%
Lungs and liver only	350	10	2.9%
Lungs, liver and spleen only	350	1	0.3%
Total	350	100	28.6

slaughtered annually at abattoir was determined from the records of the last two years as 4,089 and the average number of positive for hydatidosis as extrapolated from the prevalence findings at the study area was 1,170. The total annual loss from offal condemnation (LOC) and loss from carcass weight loss (LCWL) in cattle slaughtered at Gondar ELFORA abattoir was estimated to be 751,725.00 ETB.

Questionnaire survey and hospital data assessments: A total of 105 householders (97 Christians and 8 Muslims) who owned an average of 4 livestock per household from different kebeles were interviewed. 86.7% of them (91 Christians and 3 Muslims) had one dog per household. The animals were kept for draught power and as a source of cash income. The animals grazed communally where livestock and humans have frequent contact with dogs and their excreta. During holidays, ceremonies and feasts, the community mostly practiced homestead (backyard) slaughtering. It is a common practice that during slaughter meat inspection was not practiced and the offal was often given to the pets. No treatment of dogs with traditional or modern taenicidal drugs was practiced in the study area. Of the total 11 abattoir workers at Gondar ELFORA abattoir, 2 (0.5%) of them were able to recognize hydatid cysts and frequently affected organs.

About 10 health professionals working in public health institution (Gondar University hospital) were interviewed and all of them were aware of the disease (Its transmission, diagnostic methods, control measures and related issues). No human cases were encountered in the area and ultrasound was the most frequently used diagnostic method. Professionals had never tried to

Table 3: Distribution of cysts based on size in different organs of cattle in Gondar ELFORA abattoir

Organs	No (%) of Small cysts	No (%) of medium cysts	No (%) of large cysts	No (%) of calcified cysts	Total (%) cysts
Lungs	25(23.0%)	18(16.5%)	13(11.6%)	4(3.7%)	60(53.6%)
Liver	17(15.5%)	7(6.4%)	3(2.7%)	12(11.0%)	39(34.8%)
Spleen	2(1.8%)	0(0%)	0(0%)	5(4.6%)	7(6.3%)
Kidney	1(0.8%)	0(0%)	0(0%)	3(2.7%)	4(3.6%)
Heart	1(0.9%)	0(0%)	0(0%)	1(0.9%)	2(1.8%)
Total	46 (41.1%)	25 (22.3%)	16 (14.3%)	25 (22.3%)	112 (100.0%)

Table 4: Cysts size distribution related to body condition of cattle slaughtered in Gondar ELFORA abattoir

	Fertile cysts		Non fertile cysts		
Organs	Non-viable (%)	Viable (%)	Sterile (%)	Calcified (%)	Total (%)
Lungs	21(18.8%)	10(8.9%)	25(22.3%)	4(3.6%)	60(53.6%)
Liver	6(5.4%)	1(0.9%)	14(12.5%)	18(16.1%)	39(34.8%)
Spleen	0(0%)	0(0%)	2(1.8%)	5(4.5%)	7(6.3%)
Kidney	0(0%)	0(0%)	1(0.9%)	3(2.7%)	4(3.6%)
Heart	1(0.9%)	0(0%)	0(0%)	1(0.9%)	2(1.8%)
Total	28(25.0%)	11(9.8%)	42(37.5	31(27.7%)	112(100%)

educate people, risk individuals and created awareness about the disease. In addition, a five years retrospective data analysis of case record books from Gondar university hospital was made and no suspected or confirmed human cases were noticed.

DISCUSSION

Out of a total of 350 cattle slaughtered at Gondar ELFORA abattoir, the overall prevalence of 28.6% was recorded. This value was in agreement with the prevalence of cattle slaughtered in South Omo (24.3%) [19], Gondar (27.7%) [8], Tigray region (22.1%) [20], Central Sudan (30%) [21] and Morocco (22.98%) [22]. However, it was lower than the findings from different places of Ethiopia like 52.69% in Hawassa [18], 48.9% in Debre zeit [19] and 34.05% in Bahidar [20]. Likewise, it was greater than some of the previous findings by Kebede *et al*. [20] (15.2%) in Birre Sheleko and Dangila abattoirs and Dhote *et al*. [23] (14.7%) in India. This variation in prevalence between different countries and regions might be attributed mainly to strain difference in *E.granulosus* that exists in different geographical situations [5, 24]. In addition, other factors like difference in culture, social activity and attitude to dog in different regions might have contributed to this variation [16].

With regards to rate of infection of hydatidosis in different age groups of cattle, significant difference ($P < 0.05$) was observed. Animals with more than 5 years of age (31.0%) were highly affected than five or bellow five years old (11.4%). The difference in infection rate could mainly be attributed to the fact that aged animals are exposed over a long period of time to *E. granulosus* eggs [25]. The present study also disclosed that there was statistically significant variation ($P < 0.05$) between different body condition scores with highest infection rate was in cattle with lean body condition score (45.6%) followed by medium (26.7%) and fat body condition score (22.0%). This was the reflection of the fact that parasitic infections causes retarded performance, live weight loss and reduced quality of meat [26]. The highest infection rate in cattle with lean body condition might probably indicate the effect of high cyst burden. The infection rate was also statistically different ($P < 0.05$) in both breed types, with higher prevalence (32.2%) in local breeds than in cross breeds (3.3%). This is because local breeds are usually kept in pasture, whereas cross breeds are kept in door.

The result obtained from this study indicated that lungs and liver were found to be the most predominantly affected organs. This finding is in agreement with literature that reveals hydatid cyst is commonly found in liver and lungs of ungulates [27]. This could be justified by the fact that lungs and liver possess the first great capillary sites encountered by the migrating Echinococcus onchosphere (Hexacanth), which adopt the portal vein route and primarily negotiate hepatic and pulmonary filtering system sequentially before any other peripheral organ is involved [6, 23]. Furthermore, lungs were the most frequently infected organs than any other organ. This is justified by the fact that cattle are slaughtered at older age, during which period the liver capillaries are dilated and most cysts directly pass to the lungs. Also during this period, it is possible for the hexacanth embryo to enter the lymphatic circulation and be carried via the thoracic duct to the heart and lungs in such a way that the lungs may be infected before the liver and / or instead of the liver [24].

Higher number of large cysts was found in the lungs than in the liver and other organs, while the liver was found harboring large number of calcified cysts. The high number of large sized cysts in lung may be due to relatively softer consistency [28]; and the higher number of calcified cysts in the liver could be attributed to the relatively higher number of reticulo-endothelial and connective tissue reactions of the organ [29]. The high number of small cysts may be due to immunological response of the host which might preclude expansion the cyst [30].

The overall percentage of fertile cysts in present study was 10.9 %. This finding was comparable to the fertility rate of 9.85% in Nekemt [31]. But, it was quite lower compared to the finding of 70% in Great Britain, 96.9% in South Africa and 95% in Belgium [24]. Yet, lower fertility rates of 1.76% around Wolayita Soddo [32], 6.2% in Bahir Dar [33] were reported. The variation in fertility rates among different in different geographical zone could be due to difference in strain of *Echinococcus granulosus* [5]. In comparison of the fertility rate of different organs, it was higher for lung than liver while other organs were almost non fertile. The fertility rate of lungs (8.6%) was higher than that of liver (2.0%). This might be due to relatively softer consistency of lungs that allow earlier development of cyst; and fertility of hydatid cysts may show a tendency to increase in advanced age of the host [27]. The variation between tissue resistances might also influence the fertility rate of cysts with respect to organ type; for example, host reaction that limit fertility rate of hydatid cysts in liver is more than in that of the lungs [20].

The present study was emphasized to carry out an assessment on the annual economic loss due to bovine hydatidosis at Gondar ELFORA abattoir. Losses from organ condemnation (Direct loss) and carcass weight loss (Indirect loss) in infected cattle were assessed and estimated to be 751,725.00 ETB, which corresponds to a loss of 183.80 ETB per head of any slaughtered cattle and 642.80 ETB per head of each positive animal. The current estimation of annual economic losses is much higher than the report of Kebede *et al*. [34] who reported annual economic loss of 25, 608 ETB in their study area in Tigray region of Northern Ethiopia. However, it was lower than 1,761,625.98 ETB that was estimated by Regessa *et al*. [18] in Hawassa municipal abattoir. The difference in economic loss estimation in various regions/abattoirs may be due to the variation in the prevalence of the disease, mean annual number of cattle slaughtered in different abattoirs and variation in the retail markets price of organs in different regions. In addition to losses incurred in the abattoir, hydatidosis could have economic impact due to invisible losses like impaired productivity; for example, reduced traction power of oxen that results in reduced crop production. Moreover, cost of control, loss of life, productivity and treatment cost in humans magnifies the economic losses [35].

Based on the data obtained from questionnaire survey, the relevant findings of hydatidosis in the study area could be ascribed to the following realities prevalent in the area. To begin with, backyard slaughtering is a common practice in the study area and infected organs are thrown to dogs since these dogs are present in the vicinity. This leads to perpetuation of various dangerous parasites like *E. granulosus* [36]. Almost all livestock owners and urban dwellers keep one dog for the purpose of safeguarding their properties from wild carnivores and thieves. Dog owners and other people in area are not totally aware of the public health significance of the disease. Because of these and other economic importance, dogs have a close contact with humans and livestock that enhance the disease transmission to animals and humans. With regard to abattoir workers, inadequate ability of meat inspectors resulted in improper meat inspection and improper disposal of the hydatid cyst infected organs, which were the leading factors for the recorded prevalence of bovine hydatidosis in the area [8]. In general, the widespread practice of offering dogs with uncooked infected offal, the absence of habit of slaughtering animals in the abattoir and leaving of the dead animals unburied were important factors that favor the maintenance and widespread existence of the disease in the study area.

The absence of reported human hydatid cases from Gondar University hospital might not suggest that the study area was free of the disease. The lack of modern diagnostic facilities, clinical similarities with other disease and its asymptomatic appearance and extended incubation period added to the inability to afford medical treatment by the most vulnerable section of the society could have contributed to the obtained result.

CONCLUSIONS AND RECOMMENDATIONS

The findings reported herein show that cystic echinococcosis is widespread disease in cattle in Gondar and its surroundings. The overall prevalence of the disease in this study was 28.6%, which is slightly higher than the previous prevalence (27.7%) reported in the area. Among different organs, the lungs were the most commonly affected organ, whereas heart and kidney were the least. Furthermore, prevalence of fertile cysts in examined organs was high suggesting that cattle play an important role in the life cycle of this serious zoonosis and the presence of potential risks of transmission to other intermediate hosts and human population. Also, hydatidosis caused substantial visible economic losses due to condemnation of the organs and carcass weight loss in the study area, which was estimated to be 751, 725.00 ETB.

In line with above conclusion and in view of the result obtained from this study, it is important to forward some general and specific recommendations to the realities of the study area as follows:

- The people should be informed about the public health and economic significance of the disease by mass education through Radio, schooling and other mass media, with special attention being given to school children, butcher men and dog owners.
- To break the life cycle, the people should also be informed not to feed condemned organs to dogs and prevent them access to condemned organs from abattoirs.
- Policy on dog keeping and handling including registration, treatment and elimination of stray dogs should be established by taking social, cultural and the economic condition of the people into consideration.
- The concern government body should design and reinforce policy to put an end to the wide spread backyard slaughtering of animals, thereby promoting the contraction of abattoirs having proper meat inspection services (Especially in the rural areas).

- Dogs and wild cannids proof fences and disposal pits must be contracted for the existing slaughterhouses.
- Upgrading skills of veterinarians and para-veterinarians, construction of clinic with adequate drugs and facilities have to take concern and be implemented.

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