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## Bovine Hydatidosis at Central Abattoir of Dhamar City, Yemen

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### ABSTRACT

A cross-sectional study was conducted from January to June 2013 to determine the prevalence of cystic hydatidosis in cattle slaughtered at central abattoir of Dhamar city. The results revealed that, out of the total 323 cattle examined visually and manually, 49 (15.2%) were found harboring hydatid cysts. The distribution of different cysts in different organ was 52.79%, 42.49%, 2.15%, 1.75% and 0.86% in lung, liver, spleen, kidney and heart respectively. Significant differences ( $P < 0.05$ ) were observed in distribution of hydatid cysts in different organs. Out of 233 cysts tested for fertility and viability, 75(32.2%) were fertile, 126 (54.08%) sterile, and 32(13.73%) calcified cysts. There was a significant difference in fertility of cysts of different organs ( $P < 0.05$ ). The cysts of lung origin were highly fertile. The higher infection rate of hydatidosis was recorded in the month of June (22.7%); whereas, the lower rate in the month March (5.4%). Significant difference ( $P < 0.05$ ) was observed in prevalence of hydatidosis and month variation (season). The higher rate of hydatidosis was recorded in elder animals ( $P < 0.05$ ) compared to younger animals group. The results of this study could be useful for providing a basis for developing epidemiological control strategies for hydatidosis in cattle at Dhamar areas.

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### INTRODUCTION

Livestock play multiple roles in the livelihoods of people in developing and developed countries, particularly for the poor communities. They provide food of high biological values, drought power, and raw fertilizer to keep soil fertility, the

economic and social status, and ensure environmental sustainability (Otte et al., 2004; Mark and Grange, 2008). Hydatidosis is widespread in the world and is one of important zoonotic disease causing morbidity and mortality in humans and animals ( Brundu et al., 2012).

Cystic echinococcosis or hydatidosis, caused by the metacestode of *Echinococcus granulosus* worm (Romig et al. 2011). Dog and carnivores, harbor the adult cestode in their small intestine, are the definitive hosts for the parasite, while a wide range of mammalian species including domestic ungulates and man act as intermediate hosts (Azami et al., 2013; Khan et al., 2013).

The major economic impacts caused by cystic echinococcosis in food-producing animals are losses in productivity such as reductions in carcass weight, milk production, fleece and wool value, fertility, hide value, birth rate and fecundity, delayed performance and growth, condemnation of organs especially liver and lungs, costs for destruction of infected viscera, and dead animals (Ibrahim, 2010; Romig et al. 2011; Azami et al., 2013).

Preventive measures that have been used to control *Echinococcus* infections include avoidance of contact with dog faeces, hand washing, improved sanitation, reducing dog populations, treatment of infected dogs with anthelmintics, incineration of infected organs, and health education (McManus et al., 2003; Moro and Schantz, 2009).

Despite the economic impact of hydatidosis in livestock, few studies have been carried out on hydatidosis of cattle in some geographical zones of Yemen (Muqbil et al., 2012); whereas, none or scarce studies and/or not published data available on bovine hydatidosis in Dhamar. Therefore, this study was designed to investigate the current status of hydatidosis and associated risk factors in cattle at Dhamar city.

## MATERIALS AND METHODS

### 1. Study area

The study was conducted at central abattoir of Dhamar governorate from January to June 2013 with main objective to determine the prevalence of hydatidosis in cattle. Geographically, Dhamar is located approximately 100 km south to Sana'a, the capital of Yemen. Its lies between 14.58'N latitude, 44.43'E longitude at an altitude of 2425 meter above sea level.

The area receives average rainfall ranging from 64.2 to 68.8 mm. The mean of temperature and relative humidity recorded from January to June 2013 are 24.3°C and 59.7% respectively. Dhamar is one of important governorate in raising livestock and crops production in the country and majority of people working in Agriculture.

### 2. Study animals

The study animals were indigenous and exotic zebu cattle bought from various areas of Dhamar governorate to central abattoir of Dhamar for slaughtering purposes.

### 3. Size of sample

A total of 323 cattle were selected by systematic random sampling method. The sample size was calculated according to method given by Thrusfield (2007), considering 30% expected prevalence and 95% confidence interval with 5% desired absolute precision.

### 4. Study design

A cross-sectional study was conducted to investigate current status of bovine hydatidosis at central

abattoir/slaughterhouse of Dhamar. Regular visits were carried out to central abattoir of Dhamar city from January to June 2013. Each animal selected was subjected to ante-mortem and post-mortem examination according to the techniques described by Regassa et. al. (2010), infected organ was kept in aseptic and clean container labeled properly with necessary information for analysis and brought to department of veterinary parasitology laboratory, Faculty of Agriculture and Veterinary Medicine for further processing and examination.

In laboratory, the number of hydatid cysts on each positive organ were counted and recorded. The diameters of collected hydatid cysts were measured and classified as small (diameter less than 3 cm), medium (diameter between 3 and 8 cm), and large (diameter greater than 8 cm) as described by Kumsa and Mohammedzein (2010).

For fertility and aviability of cysts, the techniques as described by Kebede et al. (2009); Regassa et al. (2010) and Melaku et al. (2012), were followed, in brief, 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. The presence of protoscolices in the cyst fluid was considered as fertile cyst.

The Fertile cysts were further subjected to viability bioassay. A drop of fluid from cyst containing the protoscolices were placed on the microscope glass slide and covered with cover slip and observed for amoeboid like peristaltic movements with  $\times 40$  objective. For clear 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 dead ones take it up.

### **5. Statistical analysis**

Data were analyzed using SPSS 17.1 software and to determine the different between distribution of infection rate and season, sex, site of cyst, and fertility rate of cyst, data were tested using Chi-square.

## **RESULTS**

The meteorological data were obtained from meteorological station of Agriculture and Extension Authority, Dhamar. Monthly mean of temperature, relative humidity and rainfall at the study area from January to June 2013 are presented in Table 1.

An investigation study on hydatidosis was conducted among the cattle slaughtered at abattoir of Dhamar. Out of the total 323 heads cattle slaughtered and examined, 49 (15.2%) were harbor hydatid cysts either in single or in multiple number.

**Table 1.** Mean of Temperature, Relative humidity and Rainfall during the study period in Dhamar

Month	Temperature °C (%)	Relative humidity (%)	Rainfall ( mm)
January	13.1	55.0	0
February	13.7	47.0	0
March	15.1	58.0	44.7
April	16.2	63.0	155.6
May	18.5	57.0	52.5
June	18.7	50.0	2.0

Overall distribution of hydatid cysts in different organs of cattle slaughtered at central abattoir of Dhamar governorate is presented in Table 2.

As shown, the higher rate of infection was recorded in lung (52.8%); whereas, lower rate (0.86%) in heart. There were significant differences ( $P<0.05$ ) on distribution of hydatid cysts in different organs.

**Table 2.** Distribution, size and counts of hydatid cysts in relation to organ of cattle

Organ	Small cysts	Medium cysts	Large cysts	Calcified cysts	Total	P value
<b>Lung</b>	58(47.2%)	35(28.5%)	19(15.4%)	11(8.9 %)	123(52.79%)	0.000
<b>Liver</b>	36(36.4%)	29(29.3%)	15(15.15%)	19(19.19%)	99(42.49%)	
<b>Spleen</b>	3(60%)	1(20%)	00	1(20%)	5(2.15%)	
<b>Kidney</b>	2(50%)	1(25%)	00	1(25%)	4(1.72%)	
<b>Heart</b>	1(50%)	1(50%)	00	00	2(0.86%)	
<b>Total</b>	<b>100</b>	<b>67</b>	<b>34</b>	<b>32</b>	<b>233</b>	

The systematic size measurement of the cysts revealed that majority of large, medium and small sized and calcified cysts were found in lungs followed by liver; while, the low number of small and medium sized cyst were found in hearts Table 2. Variation in size of cysts of different organs was significant ( $P<0.05$ ).

The fertility and sterility rates of hydatid are presented in Table 3. As shown, Out of 233 cysts tested for fertility and sterility, the results reveals, in general,

32.2%, 54.08% and 13.73% were fertile, sterile and calcified respectively.

Furthermore, on the organ basis, the results displays that, 43 (34.95%) cysts collected from lung, 31(31.31%) cysts of liver, and one (20%) cysts of spleen were fertile. The rest of cysts were either sterile or calcified (Table 3). Fertility of cysts from different organs have shown a significant differences ( $P<0.05$ ). The cysts of lung origin were predominant and highly fertile.

**Table 3.** Fertility and sterility of hydatid cysts found in infected organs of cattle slaughtered at abattoir/slaughterhouse of Dhamar

Organ	Fertile cyst	Sterile cyst	Calcified cyst	P value
Lung	43 (34.95%)	69 (56.09%)	11(8.94%)	0.000
Liver	31 (31.31%)	49 (49.49%)	19 (19.19%)	
Spleen	1(20%)	3 (60%)	1(20%)	
Kidney	00	3 (75%)	1(25%)	
Heart	00	2 (100%)	00	
<b>Total</b>	<b>75 (32.2%)</b>	<b>126 (54.08%)</b>	<b>32 (13.73%)</b>	

The effect of month variation (season) in distribution of hydatidosis in cattle slaughtered at abattoir of Dhamar during different months of study is presented in Table 4. The higher infection rate was

recorded in the month of June (22.7%); whereas, the lower rate was in the month March (5.4%). No significant differences ( $P < 0.05$ ) were observed in prevalence of Hydatidosis and month variation.

**Table 4.** Distribution of hydatidosis in cattle at abattoir of Dhamar according to month variation(season)

Month	No. of animals xamined	No. of animals infected	Prevalence %	P value
January	60	12	20.00%	0.850
February	22	2	9.10%	
March	55	3	5.40%	
April	71	14	19.70%	
May	71	8	11.30%	
June	44	10	22.70%	
<b>Total</b>	<b>323</b>	<b>49</b>	<b>15.17%</b>	

An infection rate of hydatidosis in different animal age groups is depicted in Table 5. As shown, the higher rate (41.81%) of infection was recorded in animal group above 5 years old; whereas,

the lower rate (3.33%) was recorded in animal groups of 3-4 years old group. Significant differences ( $P < 0.05$ ) were observed between hydatidosis prevalence and animal age groups.

**Table 5.** Distribution of hydatidosis in cattle at abattoir of Dhamar according to age

Age group	No. of animal examined	No. of animals infected	Prevalence %	P value
< 1 year	58	None	00	<b>0.000</b>
1-2 years	65	None	00	
3-4 years	90	3	3.33%	
5 and above	110	46	41.81%	

**Table 6.** Distribution of hydatidosis in cattle at abattoir of Dhamar according to sex

Sex	No. of animals examined	No. of animals infected	Prevalence %	P value
Male	213	37	75.51	<b>0.819</b>
Female	110	12	24.49	
Total	323	49	100%	

Sex-wise data indicated that the higher of infection was recorded in male (75.51%) compared to females (24.49%). No significant difference ( $P < 0.5$ ) was observed in prevalence of the hydatidosis and sex of animals (Table 6).

## DISCUSSION

The current study reveals that the prevalence rate of bovine hydatidosis in abattoir of Dhamar was 15.2%. Few previous studies reported that hydatidosis is exist in livestock in Yemen. It is documented that the prevalence of 3.21% and 2.13% in sheep and goats respectively was recorded in Hadhramout (Baswaid, 2007) and 2.6 % in cattle in Aden (Muqbil et al., 2012). The current findings are indicative of a high prevalence and comparable to some of these studies from different parts of the country. The occurrence of such a high prevalence in the current study might be due to inflow of cattle from different areas of Dhamar governorate to central abattoir and animals management practices. Similar studies have also carried out on bovine hydatidosis in different countries of world and reported different prevalence rate of hydatidosis for example; in Turkey, Umur (2003); in Morocco, Azlaf and Dakkak (2006); in Turkey, Esatagil and Tuzer

(2007), in Ethiopia, Regassa et al. (2010); in S. Arabia, Ibrahim (2010); in Sudan, Moamadin and Abdelgadir ( 2011); in Ethiopia, Fikire et al. (2012); in Iran, Azami et al. (2013); in Libya, Kassem et al. (2013), the prevalence rates reported by the above workers were ranged from 2.5- 52.69 %. The higher rates of infection reported by some above workers may be attributed to size of samples, difference in strains of *E. granulosus* that exist in different geographical regions, difference in culture, social activity, and availability of dog in study area (Kebede et al., 2009; Regassa et al., 2010).

In this study, the prevalence rate of hydatid cysts was higher in lung and liver, while lower in other organs. The results of this study are in agreement with findings of Magaji et al. (2011); koudiri et al. (2012); Azami et al. (2012); Melaku et al. (2013) who evaluated the prevalence rate of hydatid cysts in lung and liver of cattle and reported lung and liver are more infected with hydatid cysts compared to other organs examined in their studies. This could be due to the fact that lungs and liver possesses the first capillaries sites encountered by the migrating *Echinococcus onchosphere* which adopt the portal vein route and primarily hepatic and pulmonary filtering system

sequentially before any other peripheral organ is involved (Urquhart et al., 2003; Kebede et al., 2009; Getaw et al., 2010). Lungs were more infected than liver and other organs, probably due to the presence of greater capillary beds in the lung than liver (Getaw et al., 2010).

In the current study, the cysts count was the highest in lung and liver, while the lower in heart. In addition, lung and liver harbored a higher frequency of large and medium and calcified cysts; whereas heart found to harbor low number of small sized cysts. This fact can be explained in view of Getaw et al. (2010) who suggested that the relative softer consistency of lung and liver allowed easier development of the pressure of cyst. However, the presence of higher number of calcified cysts also in same organs; this could be attributed to relatively higher reticuloendothelial cells and abundant connective tissue reaction of the lung and liver.

Regarding to the fertility and sterility of cysts collected and tested from various infected organs in present study. In general, the fertility and sterility rates recorded 32.2% and 54.08% respectively. These rates are less than rates reported by Muqbil et al. (2012) and Kouidri et al. (2012) and higher than rates reported by Melaku et al. (2013). The contrary between the results of this study and above workers may be due to strains of *E. granulosus*. Furthermore, pulmonary and hepatic cysts presented the majority of fertile cysts found in current study; whereas, none or neglected number in the rest of organs subjected to fertility and

viability tests. These results are in accordance with previous reports of Regassa et al. (2010) and Fikire (2012). The proportions of viable protoscoleces from fertile cysts may be related to immunological response of the host and genetic factors.

The results of this study shows that hydatidosis was prevalent throughout the study period. However, higher rate of infection was recorded in June and lower rate in March. These results are in contrast with findings of Mohamadin and Adelqadir, (2011) who studied the relationship between hydatidosis prevalence and month variation (season) in cattle. The higher rate of infection recorded in month of June could be attributed to environmental factors which are suitable for life cycle, development, and survival of causative agent.

In the current study, the higher rate of infection was recorded in animals above 5 years old; whereas, lower rate in young animals group. The results of this study are in line with findings of Kassem et al. (2013) in Libya and kumsa and Mohammedzein (2012) in Ethiopia, who observed that elder animals are more infected with hydatidosis compared to younger animals. The higher infection rate recorded in elder animals group may be due to aged animals have longer exposure time to eggs of *E. granulosus* compared to younger animals.

Sex wise observations revealed that the prevalence of hydatidosis in cattle was more in males compared to females. The results of this study are in consistent with findings of Muqbil et al. (2012) and

Kassem et al.(2013) who studied the effect of sex on the prevalence rate of hydatidosis in animals. The higher rate of infection in male animals slaughtered at abattoir of Dhamar may be attributed to more male animals are bought to abattoir and slaughtered compared to females during study period.

In conclusion, hydatidosis is prevalent in cattle at abattoir of Dhamar. The risk factor such as age, influence significantly in the prevalence of hydatidosis in cattle. Therefore, preventive measures should be adapted to avoid great economic losses in cattle. Furthermore, more studies are suggested on hydatid cysts of different animal species. The information obtained from this study could be provided baseline for developing control strategies for controlling *Echinococcus granulosus* parasite in cattle at Dhamar governorate.

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## الأكياس المائية ( المشوكة الحبيبية ) في الأبقار في مسلخ ذمار المركزي ،اليمن

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### الملخص

أجريت هذه الدراسة العرضية القطاع للتعرف على مرض الأكياس المائية (داء المشوكة الحبيبية) ومعدل انتشاره في الأبقار في مسلخ منطقة ذمار في الفترة من يناير 2013 إلى يونيو 2013. تم اختيار 323 رأس عشوائيا من الأبقار التي تذبح في مسلخ ذمار المركزي من كلا الجنسين وبأعمار متفاوتة. خضع كل حيوان للفحص العياني قبل وبعد الذبح بحثا عن أي علامات مرضية، في المختبر تم عدد الأكياس المائية وقياس إجماعها وتحديد درجة خصوبتها. كشفت الدراسة إن معدل انتشار مرض الأكياس المائية في الأبقار كانت (15,2%)، ونسبة الانتشار بحسب العضو المصاب كانت النسبة 52,79%، 42,49%، 2,15%، 1,75%، 0,86% في الرئة، الكبد، الطحال، الكلية و القلب على التوالي. لوحظت فروق معنوية ( $P < 0.05$ ) بين نسبة الإصابة بين العضو المصاب. بينت الدراسة أن نسب الخصوبة و العقم و التكلس في الأكياس المائية التي تم فحصها كانت 32,2%، 54,08% و 13,73% على التوالي، لوحظت فروق معنوية ( $P < 0.05$ ) بين نسبة الانتشار و أنواع الأكياس المائية المختلفة. كشفت الدراسة أن أعلى نسبة إصابة بالأكياس المائية كانت في شهر يونيو (22,7%) و أقل نسبة في شهر مارس (5,40%)، كما كشفت أيضا أن نسبة الإصابة في الفئات العمرية الكبيرة للأبقار كانت أعلى ( $P < 0.05$ ) عن ما هو في الفئات العمرية الصغيرة. يمكن الاستفادة من نتائج هذه الدراسة في تصميم برنامج لمكافحة الأكياس المائية في منطقة ذمار و الحد من انتشاره.

كلمات مفتاحية: الأكياس المائية، الأبقار، ذمار، اليمن