

Research Article

Major Causes of Organ Condemnation in Camels Slaughtered at Akaki Abattoir, Addis Ababa, Ethiopia

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Abstract | A cross-sectional study was conducted from January to April 2014 to determine the major causes of carcass condemnation and rate of organs condemned in camels slaughtered at Akaki abattoir, Addis Ababa. For the study, meat inspection procedure involved both ante-mortem and post-mortem inspection was performed on a total of 385 camels and carcass. Upon ante-mortem inspection, disease conditions or abnormalities were found in 61 (72.62%) and 209 (69.44%) male and female camels, respectively. Out of total 385 camels slaughtered, 230 (59.74%) lungs, 34 (8.83%) livers, and 6 (1.55%) hearts were condemned. Among 84 male camels slaughtered, 52 (61.90%) lungs, 9 (10.71%) liver and 0 (0%) hearts were condemned; and out of 301 female camels slaughtered, 178 (59.13%) lungs, 25 (14.04%) livers and 6 (1.99%) hearts were condemned. Among disease conditions encountered during post mortem examination, hydatid cyst, emphysema and pneumonia were the major causes of lung condemnation whereas hydatid cyst was the major cause of liver condemnation. Result of the present work clearly revealed that considerable number of organs was condemned from camel slaughtered at Addis Ababa Akaki Abattoir mainly due to different pathological lesions on different organs. This warrants immediate need for the prevention of causes of organ condemnation and pathological abnormalities through development of animal health strategies, enforcement of slaughter policy and training of slaughterhouse personnel on standard slaughter operations.

Keywords | Abattoir, Addis Ababa, Camel, Condemnation, Inspection

Editor | Asghar Ali Kambh, Sindh Agriculture University, Tandojam, Pakistan.

Received | December 13, 2014; **Revised** | January 31, 2015; **Accepted** | February 02, 2015; **Published** | February 16, 2015

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Citation | Tenaw M, Feyera T, Abera B (2015). Major causes of organ condemnation in camels slaughtered at Akaki Abattoir, Addis Ababa, Ethiopia. *J. Anim. Health Prod.* 3(1): 14-20.

DOI | <http://dx.doi.org/10.14737/journal.jahp/2015/3.1.14.20>

ISSN | 2308-2801

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INTRODUCTION

The camel (*Camelus dromedaries*) is an important livestock species uniquely adapted to hot arid environments. It is most numerous in the arid areas of Africa, particularly in the arid lowlands of Eastern Africa namely, Somalia, Sudan, Ethiopia, Kenya and Djibouti. Approximately, 11.5 million animals in this region represent over 80% of the African and

two thirds of the world's camel population (Schwartz, 1992).

Ethiopia is one of the largest camel populated countries in the world; in Africa, it ranks third next to Somalia and Sudan (FAO-OIE-WHO, 1993). Diseases in camels cause considerable economic losses due to condemnation of edible organs and decreased meat/milk production (Romazanvoc, 2001). Meat of camel

is one of the components of diet for the pastoralist and residences of Somali ethnic groups in Addis Ababa, capital of Ethiopia (Muskin et al., 2011).

In developing countries, abattoir plays a major role in providing and serving as sources of information and reference centre for disease prevalence. Meat inspection is conducted in the abattoir for the purpose of screening animal products with abnormal pathological lesions that are unattractive and unsafe for human consumption (Nurit et al., 2012). Meat inspection assists to detect certain diseases of livestock and prevent the distribution of infected meat that could give rise to disease in animal and human being and to insure competitiveness of products in the local market (Hinton and Green, 1993). Abattoir meat inspection is essential to remove gross abnormalities from meat and its products, to prevent distribution of contaminated meat and to assist detecting and eradication of certain livestock diseases (Alemayehu et al., 2013).

Monitoring and other conditions at slaughterhouse have been recognized as one way of assessing the disease status of camel and abattoirs played an important role in screening animal products with various abnormalities and diseases that are not fit for human consumption (Alembrihan and Haylegebriel, 2013). The results of meat inspection at slaughterhouses with appropriate trends indicate possible risks due to unsafe meat obtained from camel carcasses at the slaughterhouses. Such risks are eliminated by strict veterinary inspection of animals prior to slaughter as well as of meat and parenchymatous organs after slaughter. Slaughterhouses provide an excellent opportunity for detecting pathological lesions of both economic and public health importance (Ahmed et al., 2013).

In Ethiopia, there is gap of information on causes of carcass condemnation and the status of camel diseases that put the public at risk of acquiring zoonotic food borne diseases. In this regards, as Ethiopian dromedaries are primarily reared by pastoralists, abnormalities of carcass and edible organs could have significant economic and public health consequences in the regions. However, abattoir based epidemiological studies are needed to show the real picture of abnormalities and lesions resulting in carcass and organ condemnation in camels so that this would suggest impact on economy and public health. Therefore, the objective of the present study was to identify the different causes of organ condemnation in camel slaugh-

tered at Addis Ababa Akaki Abattoir and to gather information on the spectrum of diseases.

MATERIALS AND METHODS

STUDY AREA

The study was conducted from January to April 2014 at Akaki abattoir, which is located in Addis Ababa, the capital city of Ethiopia, with a mean annual minimum and maximum temperature of about 21 to 27°C, respectively (NMSAE, 2012). Although the camel meat is not popular in Addis Ababa, the only Somali community and some other Muslim communities who live in the city are the main consumers of camel meat from this abattoir. As a result the Akaki abattoir usually slaughters an average of seven camels per day. In addition, this abattoir also gives service to the hotels and restaurants of the Akaki town by slaughtering cattle, sheep and goats every day.

STUDY POPULATION AND SAMPLING METHOD

The study animals were local camels (*Camelus dromedaries*) slaughtered at the Addis Ababa Akaki abattoir. The camels slaughtered at the abattoir were both male and female that originated from pastoral areas of the country mainly from Borena and Bale zones, Fentale district of East Shoa zone and Meiso district of West Hararghe zone, Ethiopia.

Table 1: Abnormalities encountered during ante-mortem examination

Abnormality	No. of animals with disease condition	Proportion (%)
Lameness	5	11.11%
Localized swelling	9	20.20%
Dirty wool	3	6.66%
Blindness	2	4.44%
Emaciation	14	31.11%
Rough hair coat	12	26.66%
Total	45	100%

The purposive sampling method was used for sampling. All camels presented for slaughter during the investigation period were sampled for this epidemiological study. Accordingly, during the period of investigation averagely seven camels were slaughtered each day and a total of 385 camels were examined.

Table 2: Distribution of number and sex of camel slaughtered and organ rejection rates

Sex	Total number (%) of organ condemned			
	Camel Slaughtered	Lung	Liver	Heart
Male	84 (21.81%)	52 (61.90%)	9 (10.71%)	0 (0%)
Female	301 (78.18%)	178 (59.13%)	25 (14.04%)	6 (1.99%)
Total	385	230 (59.74%)	34 (8.83%)	6 (1.55%)

STUDY METHODOLOGY

Thorough meat inspection procedure involving both ante-mortem and post-mortem inspection was performed.

ANTE-MORTEM EXAMINATION

Ante-mortem examination was conducted on individual animals, while the animals were entering into the lairage and in mass after they entered into the lairage. Both sides of the animals were inspected at rest and in motion. Moreover, the general behaviour of the animals, cleanness, and sign of diseases and abnormality of any type were recorded according to the standard ante-mortem inspection procedures (FAO, 1994).

POST-MORTEM EXAMINATION

Post mortem examination was carried out by visual inspection, palpation and systematic incision on visceral organs, i.e., lung, liver, heart, kidney and spleen; according to procedures recommended by Food and Agricultural Organization (FAO, 1994).

DATA ANALYSIS

Data collected during the study were entered into Excel spread sheet (Microsoft Excel 2007) and analyzed by statistical methods using SPSS version 16. Descriptive statistics such as percentage was used to determine the level of organs condemnation rate. The association of prevalence of lesions on different organs with sex and body condition of the animals was assessed by Pearson chi-square (X^2) and the p -value < 0.05 was considered significant.

RESULTS

ANTE-MORTEM EXAMINATION

Out of the 385 camels examined at ante-mortem, 45 (11.69%) camels were found to have the abnormalities (Table 1). The most common abnormalities encountered during ante-mortem inspection were lameness (11.11%), localized swelling (20.20%), blindness

(4.44%), emaciation (31.11%), dirty wool (6.66%) and rough hair coat (26.66%).

RATE OF ORGAN CONDEMNATION

The post-mortem examination was performed for all the slaughtered camels (n=385). From the total organs examined 230 (59.74%) lung, 34 (8.83%) liver and 6 (1.55%) hearts were condemned or rejected as unfit for human consumption based on gross pathological findings (Table 2).

Table 3: Causes of Lung condemnation and their percentage (%)

Causes	Number condemned	Percent (%)
Hydatid cyst	64	16.62%
Calcified cyst	29	7.53%
Emphysema	64	16.62%
Pneumonia	43	11.17%
Calcification	25	6.49%
Abscess	3	0.78%
Discoloration	2	0.52%
Total	230	59.74%

Table 4: Causes of Liver and heart condemnation and their percentage (%)

Organ	Causes	Number condemned	Percent (%)
Liver	Hydatid cyst	15	3.90%
	Calcified cyst	2	0.52%
	Calcification	6	1.56%
	Abscess	2	0.52%
	Hepatitis	5	1.30%
	Discoloration	4	1.04%
	Total	34	8.83%
Heart	Calcified cyst	4	1.04%
	Pericarditis	2	0.52%
	Total	6	1.55%

Table 5: Prevalence of hydatid cyst on lung of camels slaughtered at Addis Ababa Akaki Abattoir in relation to sex and body condition score

Variable	Observation	Number of positive	Chi-square value	P-value	Total
Sex	Male	84	16(19.05%)	0.456	64 (16.62%)
	Female	301	48(15.95%)		
Body condition score	Good	306	32(10.46%)	44.758	64 (16.62%)
	Medium	57	26(45.64%)		
	Poor	22	6(16.62%)		

*= p<0.005

Table 6: Prevalence of hydatid cyst on liver of camels slaughtered at Addis Ababa Akaki Abattoir in relation to sex and body condition score

Variable	Observation	Number of positive	Chi-square value	P-value	Total
Sex	Male	84	3(3.57%)	0.030	15 (3.90%)
	Female	301	12(3.99%)		
Body condition score	Good	306	9(2.94%)	4.389	15 (3.90%)
	Medium	57	5(8.77%)		
	Poor	22	1(4.55%)		

Table 7: Prevalence of emphysema on lung of camels slaughtered at Addis Ababa Akaki Abattoir in relation to sex and body condition score

Variable	Observation	Number of positive	Chi-square value	P-value	Total
Sex	Male	84	18(21.43%)	1.789	64 (16.62%)
	Female	301	46(15.28%)		
Body condition score	Good	306	52(16.99%)	0.344	64 (16.62%)
	Medium	57	8(14.04%)		
	Poor	22	4(18.18%)		

Table 8: Prevalence of pneumonia on lung of camels slaughtered at Addis Ababa Akaki Abattoir in relation to sex and body condition score

Variable	Observation	Number of positive	Chi-square value	P-value	Total
Sex	Male	84	9(10.71%)	0.022	43 (11.17%)
	Female	301	34(11.30%)		
Body condition score	Good	306	28(9.15%)	6.554	43 (11.17%)
	Medium	57	10(17.54%)		
	Poor	22	5(22.73%)		

*= p<0.005

CAUSES OF LUNG REJECTION

A total of 230 (59.74%) camel lungs were rejected for gross abnormalities (Table 3). Hydatid cyst (16.62%), emphysema (16.62%) and pneumonia (11.17%) were the major causes resulting in lung rejection.

CAUSES OF LIVER AND HEART REJECTION

From the total number of camel slaughtered 34

(8.83%) liver were rejected due to different pathological lesions. Hydatid cyst was the major cause resulting in liver rejection. A total of 6 (1.55%) camel heart were rejected for gross abnormalities (Table 4).

PREVALENCE OF PATHOLOGICAL LESIONS ON DIFFERENT ORGANS

The result also showed that distribution of lesions

such as hydatid cyst (lung and liver), emphysema (lung) and pneumonia (lung) were differentially distributed in relation to body condition and sex of animals. Higher rate of hydatid cyst in lung was detected in male (19.05%) than female (15.95%); and camels with good (78.18%) body condition score were found to bear considerably higher ($p < 0.05$) cysts in their lung as against those having poor (14.81%) and medium (5.71%) body condition score (Table 5). Whereas for the liver, both male (3.57%) and female (3.99%) were infested more or less with a similar rate, and medium body condition camels (8.77%) had higher rate of hydatid cyst infestation in their liver than poor (4.55%) and good body condition camels (0.94%) (Table 6).

There was no significant difference in the prevalence of both emphysema and pneumonia on the lung between sexes (Tables 7 and 8). However, lung of camels having poor body condition score was found to be highly affected ($p < 0.05$) by pneumonia as compared to those with medium and good body condition score (Table 8).

DISCUSSION

MEAT INSPECTION

An important function of meat inspection is to assist in monitoring diseases in the national herd and flock by providing feedback information to the veterinary service to control or eradicate disease and to produce wholesome products and to protect the public from zoonotic hazards (Gracey et al., 1999).

The most commonly encountered abnormalities during ante-mortem inspection, in the present study, were lameness, localized swelling, blindness, emaciation, dirty wool and rough hair coat, 11.11%, 20.20%, 4.445, 31.11%, 6.66% and 26.66% respectively. The present study revealed that the most commonly encountered abnormalities during post-mortem inspection were hydatid cyst and emphysema.

MAJOR CAUSES OF ORGAN CONDEMNATION

Among the disease conditions encountered during the post mortem examination, hydatid cyst, emphysema and pneumonia were the major causes of lung condemnation, while hydatid cyst was the major cause of liver condemnation. However, the disease condition or abnormalities detected in the heart have approximately less contribution for the condemnation of the

organs. From the total number of camels slaughtered, 64 (16.62%), 64 (16.62%) and 43 (11.17%) lungs were condemned due to hydatid cyst, emphysema and pneumonia respectively. Hydatid cyst condemned 15 (3.90%) camel liver during the study period.

The overall prevalence of hydatidosis at Addis Ababa Akaki abattoir was 16.62% and it has been observed that it occurred predominantly in the lung. This finding is closer to that reported by Regassa et al. (2009) from Wolaita Sodo abattoir (15.4%). However, this finding lower than that of Yifat et al. (2011), Jobre et al. (1996) and Kebede et al. (2009) from Gondar (24.2%), South Omo (25.7%) and Tigray (22.1%) regions respectively. This report is higher than the report of Alembrhan and Haylegebriel (2013) who reported 5.1% from Adigrat.

Factors like differences in culture, social activity, systems of animal husbandry, lack of proper removal of infected carcass and approach to dogs in various regions might have accounted for variation of the prevalence in different areas of a country (Yifat et al., 2011). The lung is the most frequently having hydatidosis due to its size, blood supply and availability of oxygen supply (Amene et al., 2012).

RATE OF ORGAN CONDEMNATION

The prevalence of emphysema and pneumonia were 16.625 and 11.17% respectively. This finding is higher than the rejection rate of 1.5% for emphysema and 1.8% for pneumonia as reported by Yifat et al. (2011) and Marta (2010) at Gondar and Sebeta abattoirs, respectively. Emphysema and pneumonia could be due to exposure of animal to bacterial or viral origin infections, stress factors including exposure to dust and starvation. Moreover, penetration of lung by foreign body, adverse weather condition or accidental inhalation of liquid may cause pneumonia (Amene et al., 2012). The prevalence of emphysema in the present study was lower than reported by Kambarage et al. (2000) with 22% in Tanzania and Seboka (2008) with 43.75% in Addis Ababa Municipal Abattoir. But, this finding is closer to the figure (16.53%) reported by Abayneh (1999) in Assela Municipal Abattoir.

Pneumonia which was another pathological condition attributed to 11.17% of rejection rate. A lower rejection rate of 31.02% was reported by Cadamus and Adesokan (2010) from Nigeria. Whereas, a high-

er rejection rate of 3.33%, 1.8%, 1.07% and 11.11% were reported by [Kambarage et al. \(2000\)](#), [Yifat et al. \(2011\)](#), [Alebrhan and Haylegebriel \(2013\)](#) and [Amene et al. \(2012\)](#) in Tanzania, Gondar, Adigrat and Jimma abattoir, respectively.

The rate of liver condemnation in this study was 8.83% which is lower than the report of [Denberga et al. \(2011\)](#) in Gondar ELFORA abattoir (31.1%), [Yifat et al. \(2011\)](#) in Gondar ELFORA abattoir (31.1%) and [Alebrhan and Haylegebriel \(2013\)](#) in Adigrat abattoir (17.58%). Liver condemnation due to hydatid cyst (3.90%) in the present study was lower than studies conducted by [Gebretsadik \(2009\)](#) who reported 12.56% from Tigray, by [Miheret et al. \(2013\)](#) 33.33% from Dire Dawa, by [Zelalem et al. \(2012\)](#) 31.7 % from Addis Ababa and [Asmare et al. \(2012\)](#) 10.2% from Bahir Dar municipal abattoirs. Prevalence of hydatid cyst on liver was higher than studies conducted by [Yifat et al. \(2011\)](#) in Gondar ELFORA abattoir which was 1.2% and although the present study was closer to the figure reported by [Alebrhan and Haylegebriel \(2013\)](#) in Adigrat abattoir (3.62%).

The rate of heart condemnation in this study was 1.55% which is closer to [Yifat et al. \(2011\)](#) in Gondar ELFORA abattoir (1.0%) and higher than studies conducted by [Amene et al. \(2012\)](#) in Jimma abattoir (0.44%). However, a lower rejection rate of Pericarditis (36.0%) was reported by [Kambarage et al. \(2000\)](#) from cattle slaughtered in Tanzania.

CONCLUSIONS

A considerable number of organs were condemned from camels slaughtered at Akaki Abattoir, Addis Ababa mainly due to different pathological lesions on different organs such as hydatid cyst, emphysema and pneumonia during the present study. Affected meat were condemned and rendered unfit for human consumption. Some of the limitations, however, encountered in this study including the use of only gross pathology in the diagnosis of the diseases, thus only those diseases with gross pathological lesions that are pathognomonic were likely to be diagnosed. Taken as a whole, the public health implication of the quality of infected organs condemned at this abattoir on the customers and the role which post-mortem inspection plays in safeguarding the health of the public cannot be overemphasized. In conclusion, therefore, there is a

need for adequate meat inspection in the abattoirs in order to identify diseases and thereby minimize associated public health risks.

ACKNOWLEDGEMENTS

The authors would like to acknowledge Addis Ababa Akaki Abattoir center office for their critical support during data and sample collection.

REFERENCES

- Abayneh L (1999). Pulmonary lesions of cattle slaughtered at Assela Abattoir. Faculty of eterinary Medicine, Addis Ababa University, Debre Zeit, Ethiopia, DVM Thesis.
- Ahmed AM, Ismail SAS, Dessouki AA (2013). Pathological lesions survey and economic loss for male cattle slaughtered at Ismailia abattoir. *Int. Food Res. J.* 20(2): 857-863.
- Alemayehu R, Nebyou M, Bekele M, Desta B, Dessie S, Etana D, Fufa A, Eystein S (2013). Major causes of organs and carcass condemnation in small ruminants slaughtered at Luna Export Abattoir, Oromia Regional State, Ethiopia. *Prevent.Vet. Med.* 110(2): 139– 148. <http://dx.doi.org/10.1016/j.prevetmed.2012.11.020>
- Alebrhan A, Haylegebriel T (2013). Major causes of organ condemnation and economic loss in cattle slaughtered at Adigrat municipal abattoir, northern Ethiopia. *Vet. World.* 6(12): 2231-0916.
- Amene F, Eskindir L, Dawit T (2012). Cause, Rate and Economic Implication of Organ Condemnation of Cattle Slaughtered at Jimma Municipal Abattoir, Southwestern Ethiopia. *Glob. Vet.* 9(4): 396-400.
- Asmare A, Biniyam A, Mersha C (2012). Major Causes of Lung and Liver Condemnation and Financial Impact in Cattle Slaughter at Bahir Dar Municipal Abattoir. *African J. Basic Appl. Sci.* 4(5): 165-171.
- Cadamus SIB, Adesokan A (2010). Causes and implication of bovine organ /offal condemnation in some Abattoirs in Western Nigeria. *Trop. Anim. Health Prod.* DOI, 10.1007/s 11250-009- 9334-7.
- Denbarga Y, Demewez G, Sheferaw D (2011). Major Causes of Organ Condemnation and Financial Significance of Cattle Slaughtered at Gondar Elfora Abattoir, Northern, Ethiopia. *Glob. Vet.* 7(5): 487-490.
- FAO-OIE-WHO (1993). Animal health year book. Food and agricultural organization of UN's Rome. Pp. 121-123.
- Food and Agricultural Originations (FAO) (1994).

- Manual for meat inspection for developing countries, FAO, Rome Italy.
- Gebretsadik B (2009). Abattoir survey on cattle hydatidosis in Tigray Region of Ethiopia. *Trop. Anim. Health Prod.* 41(7): 1347-1352. <http://dx.doi.org/10.1007/s11250-009-9320-0>
 - Gracey TF, Collins DJ, Huncy RJ (1999). *Meat hygiene*, 3rd editions. W. B. Saunders Company Ltd. Pp. 669-678.
 - Hinton M, Green L (1993). Meat inspection which goes through university of Bristol, Langford Uk. *Vet. J.* 152(2): 91-92.
 - Jobre Y, Lobago F, Tirunch R, Abebe G, Dorchie PH (1996). Hydatidosis in three selected regions of Ethiopia: An assessment trial on the prevalence, economic and public health importance. *Revue de medicine Veterinaire.* 147: 797-804.
 - Kambarage DM, Kimera SI, Kazwala RR, Mafwere BM (2000). Disease conditions responsible for condemnation of carcass and organs in short horn Zebu Cattle slaughtered in Tanzania. *Prevent. Vet. Med.* 22(2): 249-255. [http://dx.doi.org/10.1016/0167-5877\(94\)00421-E](http://dx.doi.org/10.1016/0167-5877(94)00421-E)
 - Kebede W, Hagos A, Girma Z, Lobago F (2009). Echinococcosis/ hydatidosis: its prevalence, economic and public health significance in Tigray region, North Ethiopia. *Trop. Anim. Health Prod.* 41(6): 865-871. <http://dx.doi.org/10.1007/s11250-008-9264-9>
 - Marta T (2010). Major cause of organ and carcass condemnation in cattle slaughtered at Sebeta municipal abattoir. DVM thesis, Faculty of Veterinary Medicine, University of Gondar, Gondar.
 - Miheret M, Biruk M, Habtamu T, Ashwani K (2013). Bovine Hydatidosis in Eastern Part of Ethiopia. *MEJS.* 5(1): 107-114.
 - Muskin S, Hailu D, Moti Y (2011). Infection Rates, Cyst Fertility and Larval Viability of Hydatid Disease in Camels (*Camelus dromedarius*) from Borena, Kereyu and Harare Areas of Ethiopia. *Glob. Vet.* 7(6): 518-522.
 - National Meteorology Service Agency of Ethiopia (NMSAE) (2012). Annual metrological analysis and report.
 - Nurit M, Zerihun H, Serkalem M (2012). Major Cause of Liver Condemnation and Associated Financial Loss at Kombolcha Elfora Abattoir, South Wollo, Ethiopia, *European J. Appl. Sci.* 4(4): 140-145.
 - Regassa A, Abunna F, Mulugeta A, Megersa B (2009). Major metacestodes in cattle slaughtered at Wolaita Sodo municipal abattoir, Southern Ethiopia: Prevalence, Cyst viability, Organ distribution and Socio-economic implications. *Trop. Anim. Health Prod.* 41: 1495-1502. <http://dx.doi.org/10.1007/s11250-009-9338-3>
 - Romazanvoc F (2001). Cestode zoonosis: Echinococcosis and Cysticercosis an emergent and global problem. IOS Press, Netherlands. Pp. 34-57.
 - Schwartz HJ (1992). *Camel production in Eastern Africa. A pictorial guide to disease, health care and management.* Verlag, Josef, Margraf, Germany. Pp. 155.
 - Seboka F (2008). A study on common Lung gross abnormalities at Addis Ababa abattoir. Faculty of Veterinary Medicine, Jimma University, DVM thesis.
 - Yifat D, Gedefaw D, Desie S (2011). Major Causes of Organ Condemnation and Financial Significance of Cattle Slaughtered at Gondar Elfora Abattoir, Northern Ethiopia. *Glob. Vet.* 7(5): 487-490.
 - Zelalem F, Tadele T, Zelalem N, Chanda M, Nigatu Kebede (2012). Prevalence and characterization of hydatidosis in animals slaughtered at Addis Ababa abattoir, Ethiopia. *J. Parasitol. Vector Biol.* 4(1): 1-6.