



Major Causes of Organ Condemnation and Estimated Financial Loss in Dromedary Camels Slaughtered at Jigjiga Municipal Abattoir, Somali Regional State, Ethiopia

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Author's contribution

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

A cross sectional study was conducted between November 2018 to June 2019 with the aim of determining the prevalence of causes of organ condemnation with associated potential risk factors and estimating the magnitude of the direct economic losses from rejected organs. A total of 432

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camels slaughtered at Jigjiga Municipal Abattoir abattoir were randomly selected; 180(59%) male, 103(81%) female, and in age 102(60.7%) young, 181(68.6%) adult, and in body condition score; poor 41(97.6%), medium 98(81.6%), and good 144(53.3%). Based on origin of the animal, 16(22.2%), 20(34.5%), 3(23.1%), 19(29.7%), 29(19.7%), 16(20.5%) from Jigjiga, Dahagbur, Kabridahar, Fik, Babile, Shinile were detected one or more pathological signs respectively. During antemortem examination 140(32.36%) camels showed various abnormalities. such as localized lesions 52(12.03%), local swelling 18(4.16%), lacrimation 17(3.93%), nasal discharge 15(3.47%), rough hair coat 13(3.00%), lameness 12(2.77%), depression 8(1.85%) and blindness 5(3.57%). Upon postmortem inspection, the overall prevalence was 504(29.1%); 254(58.7%) lungs, 203(46.9%) liver, 40(9.25%) heart, 7(1.6%) kidneys were condemned. Some of the major cause of lung condemned were due to 103(23.8%) hydatid cyst, 68(15.7%) emphysema, and 48(11.1%) pneumonia. Liver rejection were due to hydatid cyst, 25(5.8%) calcification, 82(19.0%) cirrhosis. Heart condemnation were due to 9(2.1%) calcified cyst, 4(0.9%) pericarditis, 13(3.0%) hydatid cyst. Kidney rejection rate were caused by 3(0.7%) hydatid cyst, 4(4.0%) hydronephritis. There was statistically significant between body condition score, and sex of the animal with the rate of organ condemnation ($P < 0.05$). While, age and origin of the animal were not statistically significant with the prevalence of organ condemnation ($P > 0.05$). Lung and liver were most commonly condemned organs followed by heart and kidney in camel slaughtered at Jigjiga Municipal Abattoir. The financial loss due to edible organs condemned in this study was estimated to 773,143,000 ETB / 16,734,696.97 USD. Therefore, appropriate strategies should be established for prevention, and control of this level of condemnation rate of organs and to sustain the massive monetary loss caused by the rate of organs condemned in the studied area.

Keywords: *Dromedary camels; Jigjiga; Ante-mortem; organ condemnation; financial loss; rejection rate.*

1. INTRODUCTION

World camel population number estimated to be 35 million heads [1], most of which are in Ethiopia, Somalia, Niger, Kenya, Chad, Mali, Mauritania and Pakistan. Five bordering countries-Somalia, Ethiopia, Kenya, Sudan, and Djibouti hold 84% of African and more than half of the world's camel population [2]. Ethiopia is an agrarian country with huge livestock population in Africa possessing over 4.5 million heads of *Camelus dromedarius*, [3].

"Meat is the main source of protein for man and it should be clean and free from diseases of particular importance to the public such as tuberculosis (TB), hydatidosis, cysticercosis and fasciolosis" [4]. "Meat is condemned at Municipal Abattoir to break the chain of some zoonoses such as hydatidosis and fasciolosis which are not directly transmitted to man through meat" [5,6].

"Meat inspection at the abattoir is a crucial need for food safety and disease control. It is one of the most widely implemented and longest-running systems of surveillance that involves the screening of animals and meat for wholesomeness for human consumption" [7]. Similarly, "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 a certain livestock diseases" [8].

"The results of meat inspection at Municipal Abattoirs with appropriate trends indicate possible risks due to unsafe meat obtained from camel carcasses at the Municipal Abattoirs. Such risks are eliminated by strict veterinary inspection of animals prior to slaughter as well as meat and parenchymatous organs after slaughter. Municipal Abattoirs provide an excellent opportunity for detecting pathological lesions of both economic and public health importance" [9].

"Animal diseases are considered as a major health problem and cause a significant economic loss in countries where livestock production is an important segment of the agricultural practice" [10]. For instance, diseases in camels cause considerable economic losses due to the condemnation of edible organs/decreased meat and milk production [11].

Most of the studies conducted in Jigjiga Municipal Abattoir have focused only on specific diseases such as fasciolosis and hydatidosis. As a result of this, there is no complete information about causes of organ condemnation at Jigjiga Municipal Abattoir. In line with this, it would be

essential to have comprehensive information on occurrence of various diseases and causes of organ rejection and their financial loss to establish appropriate strategy for prevention and controls. Therefore, the objectives of the study were to determine the overall prevalence and causes of organ condemnation with respect to associated factors and to estimate the annual financial loss of the condemned organs in camels slaughtered at Jigjiga Municipal Abattoir.

2. MATERIALS AND METHODS

2.1 Study Area and Period

The study was conducted on Jigjiga city. Jigjiga is the capital city of the Somali Regional State which is found on the Eastern part of Ethiopia (Fig. 1) about 630 km and 105 km away from Addis Ababa and Harar towns respectively. Human population size of Jigjiga is estimated about 763,509. Jigjiga is situated at an altitude ranging from 1,660 to 1,710 m above the sea level at geographic coordinates of approximately 9°20' N latitude and 45°56' E longitude. The climate of Jigjiga is semi-arid type which is characterized by high temperature and low rainfall. The mean annual temperature and mean annual rainfall is about 22°C and 543 mm respectively [12]. There is one sub-standard abattoir in Jigjiga city which is owned by Jigjiga municipality and environmental protection office, that aims to provide officially inspected and safe meat (beef, camel, goat and mutton) for consumers. The abattoir has separate compartment to slaughter animals for Christian and Muslim residents on average, 41 cattle for Christian and 20 for Muslims were slaughtered per day and average of 15 camels were slaughtered per day [13].



Fig. 1. Map of study area Jigjiga, Eastern Ethiopia [14]

2.2 Study Population

The study population was *Camel dromedary* slaughtered at Jigjiga Municipal Abattoir

received from different sources included Jigjiga, Degahbur, Kabridahar, Fik, Babile, and Shinile. Slaughtered animals were both male and female. Simple random sampling method was used as a sampling technique. All camels presented for slaughter during the investigation period were sampled for this epidemiological study. Mostly, extensive management care was practiced to camels slaughtered but sometimes special care was given for fattening purpose.

2.3 Study Design

A cross-sectional study was conducted from November 2018 to June 2019 to determine the prevalence of major causes of organ condemnation and economic significance in camels slaughtered at Jigjiga Municipal Abattoir. During the period of study, four visits per week were made purposively out of 7 slaughter days in a week. Camels were selected by simple random sampling per visit 9 animals were recorded in a day. The first animals were selected randomly and the rest with equal intervals and were subjected for both antemortem and detailed postmortem inspections.

2.4 Sampling Method and Sample Size Determination

By using simple random sampling methods and 95% confidence interval with required 5% precision, the sample size was determined by the formula of Thrusfield and Christley [15].

$$n = \frac{1.96^2 P_{exp}(1 - P_{exp})}{d^2}$$

Where; n= required sample size P_{exp}=expected prevalence d= required precision

The expected prevalence is 50% with the required precision (d) of 5% (0.05). By substituting the value in the above formula, we get the sample size:

$$n = \frac{1.96^2 \times 0.5(1 - 0.5)}{(0.05)^2}$$

Therefore, the calculated sample size was 384 camels, but 48 samples were added with the intention of maximizing the accuracy, and increasing precision level and the calculated sample size was 432 camels.

2.5 Study Methodology

2.5.1 Ante-mortem examination

Pre slaughter examinations of camel were conducted in the lairage by grouping the animals based on their age, body condition score and place of origin. Ante-mortem inspections were conducted on individual animals while the animals entering into the lairage and after they entered into the lairage s. Both sides of the animals were inspected at rest and in motion. The body condition scoring for camels was conducted based on the guidelines given by Faye [16]. The scoring was conducted by looking at the back and flank and then classified as poor (0 and 1), medium (2 and 3) and good (4 and 5). Moreover, the general behavior of the animals, nutritional status, cleanliness and sign of diseases or abnormalities were recorded according to the procedures by Gracey [17].

2.5.2 Post-mortem examination

Postmortem Examination was conducted based on the guidelines set on manual on meat inspection for developing countries [18]. Accordingly, the liver, lung, heart, and kidney were examined through visualization, palpation and systematic incision for any pathological lesion(s).

2.6 Financial Loss Analysis

To analyze financial loss due to organ condemnation, the average annual slaughter capacity of the abattoir, the average market price of each organ in Jigjiga city and the rejection rate of each organ were used. The average market price was also determined by interviewing different butchers. The financial loss due to the condemnation of organs was estimated by the formula given by Ogunrinade [19] as follows;

$$EL = \sum sr_x * Coy * Roz$$

Where

EL = Annual economic loss estimated due to organ condemnation.

$\sum sr_x$ = Annual camel slaughter rate of the abattoir.

Coy = Average cost of each camel liver/lung/heart/kidney.

Roz = Condemnation rate of each camel liver/lung/heart/kidney.

2.7 Data Management and Analysis

The data collected were entered into the Microsoft excel 2010 spreadsheet and analysed by using the SPSS version 20. The data were summarized as a table and Chi-square (X^2) test were used to compare prevalence among sex, age, and body condition, and origin. In all cases, 95% confidence intervals and ($P < 0.05$) were to be considered as statistically significance.

3. RESULTS

Out of the 432 camels inspected at ante-mortem 140(32.4%) camels were found to have abnormalities (Table 1). Age wise the selected animals were divided into young (168) of less than 7 years and adult (264) of 7 or above years. Slaughtered animals were male (305) and Female (127). Based on the body condition score animals were classified into poor (42), Medium (120) and Good (270). All slaughtered animals were marked for identification purpose and code was given. Following were the abnormalities encountered during ante-mortem examination; localized lesions 52(12.03%), local swelling 18(4.16%), lacrimation 17(3.93%), nasal discharge 15(3.47%), rough hair coat 13(3.00%), lameness 12(2.77%), depression 8(1.85%) and blindness 5(3.57%). All these abnormalities were considered mild and approved for slaughter purpose (Table 1).

Table 1. Abnormal conditions encountered during ante-mortem inspection

| Abnormal conditions | No. animals affected | Camels affected in percent |
|---------------------|----------------------|----------------------------|
| Localized lesions | 52 | 12.03 |
| Localized swelling | 18 | 4.16 |
| Lacrimation | 17 | 3.93 |
| Nasal discharge | 15 | 3.47 |
| Rough hair coat | 13 | 3.00 |
| Lameness | 12 | 2.77 |
| Depression | 8 | 1.85 |
| Blindness | 5 | 1.15 |
| Total | 140 | 32.4% |

3.1 Overall Prevalence

The postmortem examination was performed for all slaughtered camels (n=432). Out of the 432 inspected lungs (254) were rejected for having gross abnormalities; hydatid cyst (23.84%), emphysema (15.74%), pneumonia (11.11%), calcified cyst (5.32%), and abscess (2.77%). Similarly, a total number of (203) livers were condemned for having different abnormalities;

cirrhosis (18.98%), Hydatid cyst (17.82%), calcification (5.78%), and discoloration (4.39%). From the total camels slaughtered (40) hearts were rejected for various abnormal conditions; hydatid cyst (3.00%), calcified cyst (2.08%), and pericarditis (0.92%). In addition, kidneys [7] were not approved for finding gross pathological changes; (0.92%), and hydatid cyst (0.69%) (Table 2).

Table 2. Causes of organ condemnation and their percentage %

| Organ | Causes | Number condemned | Percent (%) |
|--------------|----------------|------------------|--------------|
| Lung | Hydatid cyst | 103 | 23.8 |
| | Emphysema | 68 | 15.7 |
| | Pneumonia | 48 | 11.1 |
| | Abscess | 12 | 2.8 |
| | Calcified cyst | 23 | 5.3 |
| Liver | Hydatid cyst | 77 | 17.8 |
| | Calcification | 25 | 5.8 |
| | Discoloration | 19 | 4.4 |
| | Cirrhosis | 82 | 19.0 |
| Heart | Calcified cyst | 9 | 2.1 |
| | Pericarditis | 4 | 0.9 |
| | Hydatid cyst | 13 | 3.0 |
| | Adhesion | 14 | 3.2 |
| Kidney | Hydatid cyst | 3 | 0.7 |
| | Hydronephritis | 4 | 0.9 |
| Total | | 504 | 116.6 |

Table 3. Distribution of all risk factors with the rejection rate of each variable

| Variable | Category | No. inspected | Rejection rate n(%) | X ² | P- value |
|----------------------|------------|---------------|---------------------|----------------|----------|
| Sex | Male | 305 | 180(59) | 19.36 | 0.000* |
| | Female | 127 | 103(81) | | |
| Total | | 432 | 283(65.5) | | |
| Age | Young | 168 | 102(60.7%) | 2.79 | 0.094 |
| | Adult | 264 | 181(68.6%) | | |
| Total | | 432 | 283(65.5) | | |
| Origin | Jiggiga | 72 | 16(22.2) | 6.77 | 0.238 |
| | D/hbur | 58 | 20(34.5) | | |
| | Kebridaher | 13 | 3(23.1) | | |
| | Fik | 64 | 19(29.7) | | |
| | Babile | 147 | 29(19.7) | | |
| Total | | 432 | 103(23.8) | | |
| Body Condition Score | Poor | 42 | 41(97.6) | 50.75 | 0.000* |
| | Medium | 120 | 98(81.6) | | |
| | Good | 270 | 144(53.3) | | |
| Total | | 432 | 283(65.5) | | |

Table 4. Estimated direct annual financial loss

| Organs condemned | Toral No. of Organs condemned | Rejection rate % | Annual slaughter rate of camels in the abattoir | Average Price in ETB | Financial loss in ETB |
|------------------|-------------------------------|------------------|-------------------------------------------------|----------------------|-----------------------|
| Lungs | 254 | 58.7% | 9,125 | 140 | 74,989,250 |
| Liver | 203 | 46.9% | | 1,500 | 641,943,750 |
| Heart | 40 | 9.25% | | 150 | 54,750,000 |
| Kidney | 7 | 1.6% | | 100 | 1,460,000 |
| Total | 540 | 116.6% | | | 773,143,000 |

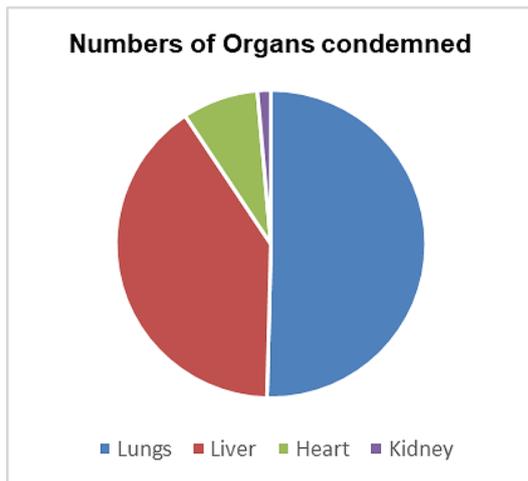


Fig. 2. Total Number of organs condemned During study period in Jigjiga Slaughter ETB House (n=432)

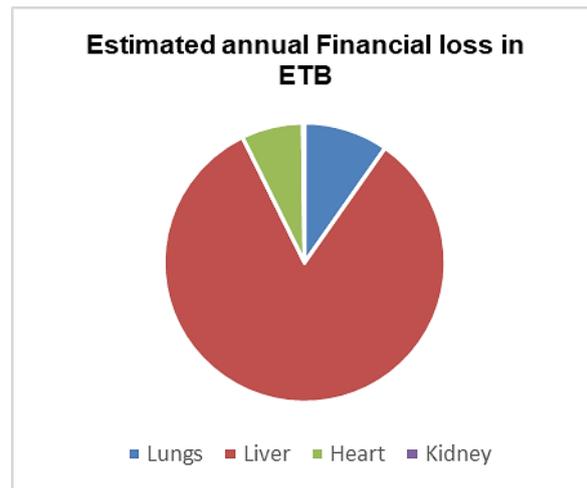


Fig. 3. Estimated annual loss in Jigjiga Municipal Abattoir with 773,143,000 ETB annual slaughter capacity

3.2 Risk Factors and Rate of Prevalence of Organ Condemnation in Camels

The Cause of organ condemnation with respect to sex revealed that higher prevalence in females 103(81%) than in males 180(59%) camels and it showed there is statistical significance ($P < 0.05$). Regarding the age of animals, a higher prevalence was recorded in adults 181(68.6%) than in young 102(60.7%) animals but there were no statistically significant between age and cause of organ condemnation rate ($P > 0.05$). Related to body condition the highest prevalence was in poor with the percentage 41(97.6%) followed by medium 98(81.6%) and good 144(53.3%) body condition scores. There was a statistically significant between the rejection rate and the body condition score of animals. ($P < 0.05$). Based on the origin of the animal the highest prevalence is under 20(34.5%) Dagahbur, followed by 19(29.7%) Fik, 3(23.1%) Kabridaher, 16(22.2%) Jigjiga, 16(20.5%) Shinile, then 29(19.7%) Babile. There was no statistically significant ($P > 0.05$) (Table 3).

3.3 Estimation of Direct annual Economic Losses

The average means annual camel slaughtered at Jigjiga Municipal Abattoir was estimated to be 9,125 heads; rate of condemnation of the current study were 254(58.7%), 203(46.9%), 40(9.25%), 7(1.6%) lung, liver, kidney and heart respectively. The total annual loss was calculated 773,143,000 ETB / 16,734,696.97

USD (1USD= 46.20 ETB at the moment of study) (Table 4).

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4. DISCUSSION

In the present study, the most commonly encountered abnormalities during ante-mortem inspection were Localized lesions 52(12.03%), local swelling 18(4.16%), lacrimation 17(3.93%), nasal discharge 15(3.47%), rough hair coat 13(3.00%), lameness 12(2.77%), depression 8(1.85%) and blindness 5(3.57%). With an overall prevalence of 140(32.4%). Localized lesion was the highest in prevalence than the others and blindness was the least variable during assessment of ante-mortem examination. In this study, out of 432 inspected camels 504 organs were condemned with the overall prevalence 504(29.1%). This finding is relatively very closer to the findings of 28.6%, 28.3% [20,21] in Dire dawa municipal abattoir, and Hawassa municipal abattoir respectively. This result is much lower than 55.21% as reported by Teddy [22] from Arba Minch municipal abattoir.

However, this finding is considered relatively higher than the findings of 23.3%, 24.9%, 20.7%, [23,24,25] in Akaki Abattoir Addis Ababa, Assella municipal abattoir, Jimma municipal abattoir respectively. Moreover this output had much higher than the findings of 17%, 17.5%, 14.7%, 14.%, 13.85%, 13.5%, 12.3%, 4.7%, [21], [26,27,28,29,30,31,32] in Addis Ababa municipal abattoir, Hawassa municipal abattoir, Wolaita Soddo municipal abattoir, Gondar municipal abattoir, Dessie municipal abattoir, Adama municipal abattoir, Wolaita Soddo municipal abattoir, Adigrat municipal abattoir respectively. This variation may be due to the variety of origins that animals were brought from and also to the differences among sanitation standards in abattoirs.

Sex-related distribution of organ condemnation and rejection rate in this study stated that higher prevalence in female 103(81%) than male 180(59%) camels. This finding in agreement with reports showed female has higher prevalence (63.95%) than male (41.05%) Male 84 (21.81%) female 301 (78.18%) [20,23], from Dire dawa municipal abattoir, and Akaki abattoir respectively. On contrary, this result was in disagreement with the findings of Shitahun [26] those reported Male 249(57.3%) animals had higher prevalence than the Female 9(2.1%) in Addis Ababa abattoir.

Enterprise. Similarly, report from Teddy [22] stated there is slightly higher prevalence in males 206 (55.5%) than in female cattle 6 (46.1%). Sex was statistically significant different with prevalence of organ condemnation rate ($P < 0.05$) This variation in prevalence rate might be due to physiological and hormonal effect among animals [33].

In context of age this current study revealed that low prevalence was recorded in young 102(60.7%) than in adult 181(68.6%) animals. This result agreed with the findings of Assefa [34] who reported young 51(4.9%) animals had lower prevalence than adults 211(19.6%) from Addis Ababa abattoir Enterprise. Similarly, a report of Teddy [22] was stated slightly higher prevalence in males 206(55.5%) than in female 6(46.1%) from Jimma Municipal Abattoir. There was no statistically significant different ($P > 0.05$). The highest infection rate in adult animals than younger ones might be due to the decreased immunity in older animals than younger ones [35].

In this study the prevalence of organ condemnation with aspect of body condition score of the animal higher prevalence was recorded in poor 41(97.6%), followed by medium 98(81.6%), and good 144(53.3%). This finding is in line with the report of Asmare [36] which was expressed that higher prevalence in poor 47(29.7%), Medium 67(38.3%), and good 15(29.4%) from Bahir dar municipal abattoir. This result is similar also to the report of Wondemagegnehu [31] Poor 48(39.34), medium 50(24.87), good 16(18.82) from Wolaita Soddo municipal abattoir. However, this disagreed with the observations of Shitahun [26] who referred higher prevalence in good 247(56.9), than medium 8(1.8), than poor 3(0.69) from Addis Ababa municipal abattoir. Body condition score was statistically significant with rate of organ condemnation ($P < 0.05$). This variation may be due to when animals suffer shortage or scarcity of nutrition, their immunity compromised. Hence, possibly this can be accounted for the higher prevalence in poor body conditioned animals [37].

In the current study prevalence of organ rejection rate with respect of animal origin was relatively higher from Dagahbur 20(34.5%) followed by Fik 19(29.7%), Kabridaheh 3(23.1%), Jigjiga 16(22.2%), Shinile 16(20.5%), then Babile 29(19.7%). This finding is in disagreement with the report of Nejash and Walkite [20].

This finding agreed with the report of lowland has higher prevalence than midland and highland [8] in Luna Export abattoir. While, this result disagreed with the report of Yalew [29] high prevalence rate for highland than midland and lowland from Dessie municipal abattoir. For origin there was no statistically significant different ($P > 0.05$). The difference in the prevalence of different places in this study may be due to the difference in management practice, environment factors and climate variation and husbandry action.

In the present study disease encountered during postmortem examination were hydatid cyst, emphysema, pneumonia, abscess, and calcified cyst in lungs with prevalence rate (58.7%). hydatid cyst, calcification, discoloration, and cirrhosis in liver with the rate of (46.9%). Calcified cyst, pericarditis, hydatid cyst, and adhesion in heart (9.25%). Hydatid cyst, and hydronephritis in kidneys (1.6%) among all these the most pathological findings in slaughtered

camels at the abattoir were lung lesions with total number of (254) lungs followed by (203) liver, (40) heart, and (7) kidneys.

The overall prevalence of this study of hydatid cyst in lungs (23.8%) and in liver (17.8%). This finding is relatively closed with reports of (18.7%), (16.62%), (18.86%) of Dawit [38] [23,38] respectively. This result was lower than the report of (28.6%) lung (28.2%) that followed by liver (21.2%) by Mersha [39,40] in Dire Dawa, and Assella municipal abattoir respectively. This results much lower than with the report of Haimanot [41] (73.75%) liver, (14.34%) lungs. Similarly, lower than the report (35.25%) by Ahmadi [42] in Iran and (32.85%) by Mohamed [43] in Saudi Arabia in lung on other hand, this finding had higher prevalence of camel hydatidosis reported (4.5%) by Woubet [44] in Harar municipal abattoir, Ethiopia. And. Hydatid cyst was most frequently reported abnormalities with present in this study due to its size, blood supply and availability of oxygen supply [45].

On this study the prevalence rate of pneumonia and emphysema were 48(11.11%), 68(15.7%) respectively. This finding agreed with the report of (16.88%) Pneumonia and in it was disagreed (5.63%) for the Emphysema by Haimanot [41] from Dire dawa municipal abattoir. Similarly, the result was disagreed with the report of (6.77%) Emphysema by Amene [10] from Jimma municipal abattoir. However, this outcome much lower than the report of (43.75%) Emphysema by Seboka from Addis Ababa Abattoir. [46]

This result higher than (3.33%), (6.0%) pneumonia by Jemalo [24,47] from Asselle municipal abattoir, and from Nigeria. The variations of the infection rates could be due to the variations in the temperature, environmental conditions and the nature of the pasture and the way of rising and grazing of these animals. The prevalence may however vary from country to country or even within a country. Generally, the variation in prevalence rate among different geographical locations could be ascribed to the strain differences of *Echinococcus granulosus* that exists in different geographical locations and different species of livestock [48].

For liver condemnation rate of this study revealed 203(46.9%); 77(17.8%) hydatid cyst, 25(5.8%) calcification, 19(4.4%) discoloration, 82(19.0%) this study is indicated that hydatid

cyst was the most pathological lesion cause of liver condemnation whereas the whole frequency of liver condemnation is similar to the report of 46.2% Asmare [36] in Jimma municipal abattoir and its closely related to the report 43.95% by Nigatu [49] in Addis Ababa abattoir. This finding also higher than the reports of (29.7%) report of Asmare [36] in Bahir dar municipal abattoir and (8.83%) by Tenaw [23] in Akaki Abattoir, (31.1%) [50] in Gondar ELFORA abattoir (31.1%) [51] in Gondar ELFORA abattoir and (17.58%) [32] in Adigrat abattoir. And also (40.9%) [24] in Assella Municipal Abattoir. And [27,52] in which they reported 39.68% 20.28% in Nigeria and Wolaita Soddo municipal abattoir respectively. These findings are much lower than the reports of (66.55%) [53] from Kombolcha Municipal Abattoir and 61.1% [54] from Gondar municipal abattoir. 59.37%, of Bedaso [55] in Adama municipal abattoir. These differences within the country are attributed mainly to variations in the ecological and climatic conditions such as altitude, rainfall, and temperature, although differences in livestock management system and the ability of the inspector to detect the infection may play a part [28].

The rate of heart condemnation of this findings were 40(9.25%); 14(3.2%) Adhesion, 13(3.0%) hydatid cyst, 9(2.1%) calcified cyst, 4(0.7%) pericarditis. This result is similar with the report of 8%, 7.86% by Ahmed [9], % by Nigusu [49] in Ismailia Abattoir, and Addis Ababa abattoir respectively. This finding is higher than reports of 1.55%, 4.43%, 3.71% 1.0%, 0.44%, [56,29,57,51,10] from Addis ababa Akaki abattoir, Dessie municipal abattoir, Mekelle municipal abattoir, Gondar municipal abattoir, Jimma municipal abattoir respectively. This finding is closely related to the report of 3.1% on hydatid cyst However on other hand is higher than 4.9% on pericarditis [25] in Jimma municipal abattoir. And also, This result in line with the report of 2.3% hydatid cyst and in higher than in 2.2% pericarditis by Jemalo [24] from Assella municipal abattoir. On contrary, higher prevalence were reported 11% by Amene [10] in Jimma Municipal Abattoir. This result disagreed with the report of 10.67%, hydatid cyst 4.2% pericarditis [40] from Dire dawa municipal abattoir. This finding much higher reports were recorded 36% in pericarditis by Kambarage [58] from Gondar ELFORA Abattoir. Differences in the rejection rate of organs with different causes may also be due to differences in the prevalence of the diseases and variations in animal management systems [30].

In this present study the prevalence rate of condemnation in kidneys 7(1.66%); hydatid cyst 3(0.7) and hydronephritis 4(0.9%). This finding is closer than the report of 1.8% [20] from Dire dawa municipal abattoir. This finding higher than the report of 0% [56] in Addis Ababa Akaki. However, this result, lower than the report of 6.5%, by Shitaye [21] from Hawassa municipal abattoir. This result was seemed to be close than the report of 0.1% hydatid cyst by Jatenie [30] from Adama municipal abattoir. This finding much lower than with the report of 21.43% hydronephritis by Haimanot [41] from Dire dawa municipal abattoir. Variation in the proportion of organs condemned due to gross pathological changes may be due to differences in agro-ecological condition of the animal environment that could be favorable to the causative agent, livestock management system and improper disposal of condemned organs [21].

The financial losses incurred this study estimated as result of organ rejection was 773,143,000 ETB / 16,734,696.97 USD. This result is higher with the reports of 3,535,937.50 ETB/ 153,736.41 USD [54] from Adama municipal abattoir. This finding of the current study was also higher than the reports of 1,839,760.00 ETB/99,446.49USD, 182,448.9 ETB/ 8365.38 USD by Biressaw and Deneke [59,24], Dire dawa municipal abattoir, and Assella municipal abattoir respectively. Moreover, the result was higher than the reports of 122,617.70 ETB/6,288.08 USD, 80,470.37 ETB/3,688.988 USD, [29,20] from Dire dawa municipal abattoir, and from Dissie municipal abattoir. Variations in the amount of economic lost in different abattoirs probably due to the differences in the prevalence of diseases, rejection rate of organs, slaughtering capacity of the abattoirs, local market price of organs and management, of animals [32].

5. CONCLUSION AND RECOMMENDATIONS

The current study deals with diseases caused by organ condemnation and their extensive financial impact. This study revealed an overall prevalence 29.1%. Lung was the mostly condemned organ in this study with the reason of hydatid cyst, emphysema, pneumonia, abscess and calcified cyst. The second organ was liver by cirrhosis hydatid cyst, calcification, and discoloration. In heart it was rejected by hydatid cyst, adhesion, calcified cyst, and pericarditis. In kidney it was condemned by hydatid cyst and hydronephritis. Thus, proper

meat inspections are essential to remove gross abnormalities from meat and its products in order to prevent the distribution of contaminated meat to the public and Affected meat were condemned and rendered as unfit for human consumption. Lack of knowledge about the diseases caused by organs to condemn and economic impact. Inappropriate disposal of abattoir materials were sustained the occurrence of the disease in the study area. Only pathognomic lesion were used as diagnose. Lack of well-trained inspectors at abattoir and community awareness for the meat borne diseases. Pets were not restricted for the entrance of abattoir and there was no direct estimation on economic loss caused by rejection rate of organs in this slaughterhouse. Therefore its recommended that Proper meat inspection for detection and public safety, public awareness raising about raw meat consumption, law prohibits contaminated offal sales for pet feed and effective farm animal health management that can potentially decrease financial losses and boost the sectors economic return.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. FAO. Camel population and <http://www.fao.org/corp/statistics/en/> FAO (2019). R. Italy. FAOSTAT; 2019
2. Mwinyikione M, Mekonnen H. Preview of Camel (*Camelus dromedarius*) hides marketing and challenges in Eastern Africa. Journal of Africa Leather and Leather Products Advances 2016;3(1): 2410-0838.
3. Shapiro B, Getachew G, Solomon D, Asfaw N, Kidus N, Gezahegn A, Henok M Ethiopia livestock sector analysis, ILRI Project Report, Nairobi, Kenya: International Livestock Research Institute (ILRI). 2017;8.
4. Sirak A. Causes of organ condemnation in Bahir Dar abattoir proceeding of the 4th national live stock improvement conference. Addis Ababa: Institute of Agricultural Research; 1991.
5. Arbabi M, Hooshyr H. Survey of Regions might have accounted for variation of the Echinococcosis and Hydatidosis in Kashan Region, Prevalence in different areas of a

- country Central Iran. *Iran Journal Public Health*. 2006;35:75-81.
6. Fufa A, Loma A, Bekele M, Alemayehu R. Bovine fasciolosis: Coprological, abattoir survey and its economic impact due to liver condemnation at SodoMunicipal abattoir, Southern Ethiopia. *Journal of Veterinary Medicine and Animal Health*. 2010;42:289-292
 7. Stärk K, Alonso S, Dadios N, Dupuy C, Ellerbroek L, Georgiev M, Hardstaff J, Huneau Salaün A, Laugier C, Mateus A Strengths and weaknesses of meat inspection as a contribution to animal health and welfare surveillance. *Food Control*. 2014;39:154–62.
 8. Alemayehu R, Nebyou M, Bekele M, Desta B, Dessie S, Etana D, Fufa A, Eystein S. Major causes of organs and carcass condemnation in small ruminants slaughtered at Luna Export Abattoir, Oromia Regional State, Ethiopia. *Preventive Veterinaey Medicine*. 2013; 110(2):139– 148.
 9. Ahmed A, Ismail S, Dessouki A. Pathological lesions survey and economic loss for male cattle slaughtered at Ismailia abattoir. *International Food Research Journal*. 2013;20(2):857-863.
 10. Amene F, Eskindir L Dawit T. Cause, of Organ Condemnation of Cattle Slaughtered at Jimma Municipal Abattoir, Southwestern Ethiopia. *Global Veterinarian*. 2012;9(4):396-400.
 11. Romazanvoc F. Cestode zoonosis: Echnococcosis and Cysticercosis an emergent and global problem. IOS Press, Netherlands. 2001;34-57.
 12. Central Statistical Agency (CSA): Federal democratic republic of ethiopia. agricultural sample survey report on livestock and livestock characteristics, Addis Ababa, Ethiopia; 2012.
 13. Somali regional State pastoral development bureau (SRSPDB): Annual report on Livestock production at jijjiga city, Ethiopia; 2015.
 14. Theme Grill. Where is jijjiga located? What Country is Jijiga in? Jijiga Map; 2021.
 15. Thrusfield M, Christley R. *Veterinary epidemiology*, 4th ed., John Wiley & Sons Ltd., Oxford, UK. 2018;275-276.
 16. Faye B, Benoumi M, Cleradin A, Tabaruni A, Chilliard Y. Body condition score in dromedary camel: A tool for management of reproduction. *Emergence. Journal of Agricultural Science*. 2001;13:1-6.
 17. Gracey J, Collins D, Huey R. Kenya. *Meat Hygiene*, 3 editions. W.B. Saunders Company Ltd. 1999;669-678.
 18. FAO. Diseases of domestic animals caused by flukes, Epidemiology, diagnosis and control of Fasciola, Paramphistome Dicrocoelium, Eurytrema and Schistosome infections of ruminants developing countries, FAO/UN, Viale delle Terme di 18. Caracalla, Rome, Italy. 1994;49.
 19. Ogunrinade A. Economic importance of bovine fasiolosis in Nigeria. *Tropical Animal Health Production*. 1980;12:155-160.
 20. Nejash A, Walkite F. Major Causes of Organ Condemnation and Their Economic Loss in Camels Slaughtered at Dire Dawa Municipal Abattoir. *Academia Arena*. 2018;10(4):44-52.
 21. Shitaye M, Tilaye Sh, Fanos T. Major causes of organ condemnation and associated financial loss in cattle slaughtered at Hawassa Municipal Abattoir, Ethiopia, *Journal of Veterinary Medicine and Animal Health*. 2016;8(10): 150-156.
 22. Teddy D, Berhe M, Habtom K, Beyenech G. Major causes of condemnation of diseased organs and its economic importance in Cattle Slaughtered at Arba Minch Municipal Abattoir, Southern Ethiopia, *Ethiopian Journal of Veterinary Science and Animal Production (EJVSAP)*. 2018;2(1):1-11.
 23. Tenaw M, Feyera T, Abera B. Major causes of organ condemnation in camels slaughtered at Akaki Abattoir, Addis Ababa, Ethiopia. *Journal. Animal Health Production*. 2015;3(1):14-20.
 24. Jemalo A, Haile G, Furgasa W. Major Causes of Organ Condemnation and Their Economic Loss in Beef Cattle Slaughtered at Assella Municipal Abattoir. *Journal of Veterinary Science & Animal Husbandry*. 2018;6(2):208.
 25. Wale T, Tirfayehu M, Asefa A. Major causes of organ condemnation and financial significance in cattle slaughtered at Jimma Municipal Abattoir, Southwestern Ethiopia. *International Journal of Advanced Research in Biological Sciences*. 2017;4(2):32-39.
 26. Shitahun A, Tesfu K, Yomiyu M. Major causes of organs condemnation of cattle slaughtered at Addis Ababa Abattoir

- Enterprise and their Economic Importance European Journal of Biological Sciences. 2018;10(3):72-79.
27. Fufa A, Debele H. Major Causes of Organ Condemnation for Cattle and its Financial Impact at Wolaita Soddo Municipality Abattoir, Southern Ethiopia, Global Veterinarian. 2013;11(6):730-734.
 28. Amare A, Yosef D, Nuraddis I. Major causes of organ condemnation and its financial loss in cattle in Gondar ELFORA abattoir, Ethiopia. Researcher. 2017;9(10): 31- 38.
 29. Yalew T, Zewdu M, Wedajo M. Major causes and abnormalities of organ condemnation and financial loss in cattle slaughtered at Dessie municipal abattoir North Eastern Ethiopia, Journal of Veterinary Medicine and Animal Health. 2015;8(7):56-63.
 30. Jatenie J, Mahendra P, Tanvir R. Investigation into major causes of organs condemnation in bovine slaughtered At Adama Municipal Abattoir And Their Economic Importance, Haryana Veterinary. 2014;53(2):139-143
 31. Wondemagegnehu S, Shimelis A, Teferi M. A Study on the Major Causes of Organ and Carcass Condemnation in Cattle Slaughtered at Wolaita Sodo Municipality Abattoir, Food Science and Quality Management; 2017.
 32. Alembrhan A, Haylegebriel T. Major causes of organ condemnation and economic loss in cattle slaughtered at Adigrat municipal abattoir, northern Ethiopia, Veterinary World. 2013;6(10): 734-738.
 33. Mokhtaria K, Fadela S, Ammar M, Becacem T, Ammar A, Ameer S, Abdelkader B. Cysticercus tenuicollis in small ruminants of Algeria: abattoir survey, biochemical and morphological characterization. Bulgarian Journal of Agricultural Science. 2018;24(4):698-703.
 34. Assefa D, Gezaheng E, Abera B, Eticha E. Major Cause of Organ and Carcass Condemnation in Apparently Healthy Small Ruminant Slaughtered at Addis Ababa Abattoir Enterprise, Ethiopia. Journal of Veterinary Science & Technology. 2017;8:419.
 35. Bhaskararao T, Varaprasad V, Hafeez D. Prevalence of Cysticercus tenuicollis infection in slaughtered sheep and goats at Kakinada, Andhra Pradesh. Assiut Veterinary Medical Journal 2003;27(2): 126-127.
 36. Asmare A, Biniyam A, Mersha C. Major causes of lung and liver condemnation and financial impact in Cattle Slaughter at Bahir Dar Municipal Abattoir. African Journal of Basic & Applied Sciences. 2012;4(5):165-171.
 37. Mekuria E, Shimelis S, Bekele J, Sheferaw D. Sheep and Goat *Cysticercus tenuicollis* Prevalence and associated risk factors. African Journal of Agricultural Research. 2013;8(24): 3121-3125.
 38. Dawit G, Aklilu F, Getachew T, Matios L. Infection rates, risk factors and cyst fertility of hydatid cyst disease in camels in Ayssaita district, Northeastern Ethiopia. Global Veterinarian. 2013;11: 465-471.
 39. Moges W, Issa A, Mersic A, Potgieter L. Investigation of parasitic disease of one-humped camel (*Camelus dromedarius*) in eastern Ethiopia. Journal of Camel Practice and Research. 2001; 8:77-81.
 40. Mersha Ch, Abdiselam M, Ismail W. University of Gondar, Faculty of Veterinary Medicine, Department of Paraclinical Studies,, Gondar, Ethiopia Dire Dawa Animal Health Investigations and Diagnosis Laboratory, Dire Dawa, Ethiopia; 2014.
 41. Haimanot D, Munera A, Hawi J, Tilahun Z, Girma K. Major Causes of Organ Condemnation and Its Financial Losses in Cattle Slaughtered at Dire Dawa Municipal Abattoir, Eastern Ethiopia, Academic Journal of Animal Diseases. 2015;4(3): 118-123.
 42. Ahmadi NA. Hydatidosis in camels (*Camelus dromedarius*) and their potential role in the epidemiology of *E. granulosus* in Iran. Journal of Helminthology. 2005; 79:119-125.
 43. Mohamed M. Study of cystic echinococcosis in slaughtered animals in Al Baha region. Saudi Arabia: Interaction between some biotic factors. Acta Tropica. 2010;113:26–33.
 44. Woubet M. A preliminary study of echinococcosis/hydatidosis in Hararge region and the efficacy of Glinhslotoidus seeds against *Echinococcus granulosus* in pups infected experimentally with hydatid material. DVM thesis, Addis Ababa University, Faculty of Veterinary Medicine, Debrezeit, Ethiopia; 1987

45. Urquhart G, Armמוש J, Dunn A, Jennings F. Veterinary parasitology, 2nd ed. UK Oxford Longman scientific and technical press. 1996;100-109.
46. Seboka F. A study on common Lung gross abnormalities at Addis Abeba abattoir; 2008.
47. Casdamus and adeskan A. Cause of implication of Bovine organ/offal condemnation in some abattoird in western Nigeria Tropical Animal Health Production. 2009;41:1455–63.
48. McManus D. Molecular epidemiology of cystic echinococcosis. Parasitology, 127 Supplement. 2006;S37-51.
49. Nigusu B, Melaku T, Berhanu S, Nigatu K. Pathological Causes and Financial Lossof Camel Organ and Carcass Condemnationat Addis Ababa Abattoirs Enterprise, Ethiopia European Journal of Biological Sciences. 2015;7(2): 78-84.
50. Denbarga Y, Demewez G, Sheferaw D. Major causes of organ condemnation and financial significance of cattle slaughtered at Gondar Elfora Abattoir, Northern, Ethiopia. Global Veterinarian. 2011;7(5):487- 490.
51. Yifat D, Gedefaw D, Desie S. Major Causes of Organ Condemnation and Financial Significance of Cattle Slaughtered at Gondar Elfora Abattoir, Northern Ethiopia. Global Veterinarian. 2011;7(5):487-490.
52. Ojo A. A survey of pathological conditions in slaughtered goats a Zaria Municipal Abattoirs:In: Lebble, S.H.B Kagwini, E. (eds), Small Ruminant Research and Development in Africa. Proceeding of the 3 Biennial Coference of the Africa Small Ruminant Research Network, UICC, Kampala, Uganda, 5-9 International Livestock Research Nairobi, Kenya; 1996.
53. Nurit M, Zerihun H, Serkalem M. Major cause of liver condemnation and associated financial loss at Kombolcha Elmore Abattoir, South Wollo, Ethiopia. European Journal of Applied Sciences. 2012;4(4):140-145.
54. Genet M, Guadu T, Basaznew C, Mersha B. Pathological Conditions Causing Organ and Carcass Condemnation and Their Financial Losses in Cattle Slaughtered in Gondar, Northwest Ethiopia. 2012;4(6): 200-208.
55. Bedaso K, Mekdes A, Teshome G. Major causes of organs and carcass condemnation and financial losses in Cattle Slaughtered at Adama Municipal Abattoir, Adama, Ethiopia. International Journal of Economic Behavior and Organization; 2020.
56. Bosenu A, Mekuanenttena, Teka F. College of veterinary medicine; College of dryland agriculture, Jigjiga University, Ethiopia; 2015.
57. Shegaw S, Ashwani K, Kassaw A. Organ condemnation and economic loss at Mekelle municipital abattoir, Ethiopia. Global Veterinarian. 2009;48:17-22.
58. Kambarage D, Kimera S, Kazwala R, Mafwere B. Disease conditions responsiblefor condemnation of carcass and organ in shorthorn Zebu Cattle slaughtered in Tanzania Journal of Health Research. 2000;22:249-255.
59. Biressaw S, Deneke T. Major Causes of Organs and Carcass Condemnation and Financial Loss in Animals Slaughtered at Dire Dawa Municipal Abattoir, Eastern Ethiopia: Retrospective Data from 2010-2015, European Journal of Applied Sciences. 2017;9(6):s296-301.

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