Parasitic, Bacterial Diseases and Other Abnormalities in Abattoirs of Tigray Region, Northern Ethiopia

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Abstract

Parasitic, bacterial diseases and other abnormalities are serious impediments to livestock production. A cross sectional active abattoir survey was conducted to identify the parasitic, bacterial diseases and other abnormalities in cattle slaughtered in abattoirs of Tigray region, northern Ethiopia from May, 2014 to January, 2015. A total of 479 cattle were examined through ante mortem and postmortem examinations. Eye discharge (5.43%), localized swelling (3.97%), rough hair (3.34%) and salivation (2.71%) were the major abnormalities encountered during ante mortem inspection. Postmortem examinations revealed that out of the total examined cattle, 228 (47.6%) were found to be infected with different parasitic, bacterial diseases and other abnormalities. Cysticercosis (15.66%) was the most frequently encountered parasitic disease followed by hydatidosis (11.1%) and fasciolosis (6.3%), respectively. Bovine tuberculosis (0.4%) was identified among the bacterial diseases. Emphysema (4.4%), calcification (2.9%), hydronephrosis (2.5%), pneumonia (2.5%), abscess (1.3%) and cirrhosis (0.6%), respectively were the major abnormalities. The prevalence of cysticercosis, hydatidosis and hydronephrosis showed a significance difference between the body condition score of the cattle ($p < 0.05$) and higher infection was recorded in cattle with poor body condition. Similarly, there was significant difference in prevalence of cystesercosis between sex of cattle ($\chi2 = 57.5$, $p = 0.014$) and male animals were more infected. The current study revealed that parasitic, bacterial diseases and other abnormalities were the main animal health problems in Tigray region. Therefore, the zoonotic importance of the diseases and abnormalities needs intervention.

Keywords: Abattoir, Abnormality, Cattle, Disease, Prevalence, Tigray

1. Introduction

Animal production has been considered as the main component of agricultural development in most parts of Sub-Saharan Africa. Like in many developing countries, domestic animals play a crucial role in Ethiopia. They provide food in the form of meat and milk and non-food items such as draft power, manure and transport services as inputs into food crop production and fuel for cooking (EASE, 2003). Livestock are also a source of cash income through sales of the above items, animal hides and skins. Ethiopia is known by its high livestock population, being the first in Africa and tenth in the world (CSA, 2008). The recent livestock population estimates that the country has about 52.1 million heads of cattle, 24.2 million sheep, 22.6 million goats and 44.9 million poultry (CSA, 2008).

Despite the large number of livestock in Ethiopia the sector is characterized by low productivity and, hence, income derived from this sector of agriculture could not impart significant role in the development of the country's economy (Elsa *et al.*, 2012). The low productivity is attributed by low genetic potential of indigenous breeds, inadequate management, poor nutrition, poor reproductive performance, high disease incidence and parasite burden (Elsa *et al.*, 2012). Among these factors animal diseases have numerous influences on productivity and fertility of cattle i.e. losses due to mortality and morbidity, loss of weight, slow down growth, poor fertility performance and decrease physical power and thus they are considered to be the major once causing a significant economic loss in the agricultural sector (Elsa *et al.*, 2012).

Studies conducted in different abattoirs of Ethiopia revealed parasitic diseases such as fasciolosis, hydatidosis and cysticercosis are the major causes of organ condemnation (Yifat *et al.*, 2011; Amene *et al.*, 2012; Alembrhan and Haylegebriel, 2013; Miheret *et al.*, 2013). In addition to the parasitic diseases, bacterial diseases and other abnormalities also cause for organ condemnation (Adamu *et al.*, 2011; Genet *et al.*, 2012). In Tigray region there seems little work identifying different causes of organ condemnation such as parasitic and bacterial diseases and other abnormalities extensively. Therefore, this study was conducted to identify the parasitic,

bacterial diseases and other causes of organ condemnation of cattle slaughtered in abattoirs of Tigray region in a holistic manner.

2. Materials and Methods

2.1. Study Area

The study was conducted in Tigray regional state, Northern Ethiopia. Tigray region located farther than 700 km north of Addis Ababa, the capital city of Ethiopia. It is bordered with Eritrea in North, with Afar region in northeast, with Amhara region in east and south and with Sudan in west. Four zones of the region namely, southern, eastern, central and north western zones were selected for the study. These zones were intentionally selected based on their climatic- ecological conditions, degree of livestock production practices and cattle slaughter capacity. The study areas have altitude ranging from 1400 to 2500 meter above sea level. Their minimum and maximum annual rainfalls are 500 mm and 1200 mm, respectively. Their annual temperature ranges from 20 °C – 40 °C.

2.2. Study animals and Study design

The study animals were cattle brought to the abattoirs for slaughter. A cross sectional active abattoir survey was conducted from May, 2014 to January, 2015 to identify the parasitic, bacterial diseases and other abnormalities in cattle slaughtered in abattoirs of Tigray region.

2.3. Sample Size and Sampling technique

Sample size was estimated using the formula given by Thrusfield (2005) as follows

$$N = Z^2 P (1-P)/D^2$$ Where,

N   = minimum number of sample size,

Z = standard value,

P = the expected prevalence of the diseases and abnormalities in the study area

D = marginal error. At 95% confidence interval Z =1.96 and marginal error is 5%. Expected prevalence of 50% was considered as there was no previous data for the areas.

$$N = 1.96^2 \times 0.5 (1- 0.5) / 0.05^2 = 384$$

To minimize sampling error during sample collection, about **95** cattle were added to the estimated sample size. Accordingly, a total of **479** cattle were taken as minimum sample size and examined by ante mortem and postmortem examinations using standard examination procedures.

2.4. Active abattoir survey

2.4.1. Ante mortem examination

The cattle were transported from different areas to the abattoirs lairage and stay for 24 hours then each of the study cattle was identified by marking numbers on their body with a color marker and their age, sex, breed and body condition score were recorded. The age of the animals was determined on the basis of the dentitions as described by Kelly (1975) and two age groups were considered; below and above five years. Body condition scoring was also done according to Nicholson and Butter Worth (1986) and classified in to three categories as poor, medium and good. General behavior, signs of disease, cleanliness and any type of abnormalities were also recorded (Gracey, 1986).

2.4.2. Postmortem examination

Postmortem examination was conducted through visual inspection, palpation and systematic incision of each visceral organ particularly the liver, lung, heart and kidney for the presence of various parasites, bacteria and lesions of abnormalities (Getaw *et al*., 2010). Diseases and abnormalities were grossly diagnosed based on pathological changes of organ color, size, consistency, presence of lesions and parasites (Mellau *et al*., 2010).

2.5. Data Analysis

The collected data were entered and stored into Microsoft excel and analyzed using SPSS version 20. Descriptive statistics such as percentage was used to determine organs condemnation rate. The prevalence of diseases and abnormalities with relation to the host related risk factors such as sex, age, body condition and breed was evaluated by chi-square test (χ2) and p value less than 0.05 was considered as statistically significant.

3. Result and Discussion

A total of 479 cattle were slaughtered and examined through ante-mortem and postmortem examinations. On ante-mortem examination, different abnormalities were detected in 108 (22.55%) cattle. The most encountered abnormality was eye discharge 26 (5.43%) followed by local swelling 19 (3.97%) and rough hair 16 (3.34%), respectively (Table 1).

The eye discharge was most probably due to beating during transport of cattle and in the lairages by the shepherds/attendant, wind, overcrowding in the holding pens of the abattoir and truck. Localized swelling might be due to trauma while being driven to market places and during transportation to the abattoir by inappropriate vehicles.

Table 1: Abnormalities encountered in cattle during ante mortem examination

Abnormalities	No. of infected animal	Percentage (%)
Eye discharge	26	5.43
Local swelling	19	3.97
Rough hair	16	3.34
Salivation	13	2.71
Blindness	10	2.09
Branding	9	1.88
Wound	7	1.46
Nasal discharge	6	1.25
Emaciation	2	0.42
Total	108	22.55

The postmortem examination showed that a total of 228 (47.6%) cattle were found to be infected by different parasitic, bacterial diseases and other abnormalities. Distribution of the parasitic, bacterial diseases and other abnormalities in relation to the study abattoirs indicated that the highest prevalence was recorded from Shire followed by Adwa and Allamata municipal abattoirs, respectively (Table 2 and 3).

Table 2. Prevalence and distribution of parasitic and bacterial diseases in Tigray abattoirs

Abattoirs	Total examined	No. of cattle infected by parasitic & bacterial diseases (%)				
		Cysticercosis	Hydatidosis	Fasciolosis	Tuberclosis	Total
Shire	234	59(25.2)	39(16.7)	24(10.3)	2(0.85)	124(53)
Adwa	27	3(11.1)	6(22.2)	2(7.4)	-	11(40.7)
Wukro	13	-	2(15.4)	-	-	2(15.4)
Machew	190	13(6.8)	4(2.1)	3(1.6)	-	20(10.5)
Alamata	15	-	2(13.3)	1(6.67)	-	3(20)
Total	479	75(15.66)	53(11.1)	30(6.3)	2(0.4)	160(33.4)

Table 3 . Prevalence and distribution of different abnormalities in Tigray abattoirs

Abattoirs	No. of cattle examined	No. of cattle infected by different abnormalities (%)						Total
		Emphysema	Pneumonia	Calcification	Hdronephrosis	Abscess	Cirrhosis	
Shire	234	15(6.4)	11(4.7)	7(3)	10(4.3)	4(1.7)	2(0.85)	49(20.9)
Adwa	27	2(7.4)	1(3.7)	1(3.7)	1(3.7)	1(3.7)	0	6(22.2)
Wukro	13	0	0	2(15.4)	0	0	0	2(15.4)
Machew	190	3(1.6)	0	3(1.6)	1(0.5)	2(1.1)	1(0.5)	10(5.3)
Alamata	15	1(6.67)	0	1(6.67)	0	0	0	1(6.67)
Total	479	21(4.4)	12(2.5)	14(2.9)	12(2.5)	6(1.3)	3(0.6)	68(14.2)

Table 4 shows the association between the prevalence of different diseases and other abnormalities in cattle and host related factors. Cysticercosis (15.66%) was identified as the most prevalent parasitic disease followed by hydatidosis (11.1%) and fasciolosis (6.3%), respectively. The prevalence of cysticercosis in this study was higher than reports from different parts of Ethiopia (Bekelle *et al*., 2010; Jemal and Haileluel, 2011; Hussien *et al*., 2011; Nurraddis and Frew, 2012; Haylegebriel and Alembrhan, 2014) and from Egypt and Nigeria by Basem *et al.* (2009) and Rabi and Jegede (2010), respectively. On the contrary this prevalence was lower as compared with the prevalence reported by Fufa *et al*. (2008) and Genet *et al*. (2012) with an infection rate of 26.3 and 42.85% from Hawassa, and Gondar abattoirs, respectively. The high distribution of cysticercosis in this study could be due to lack of personal awareness and environmental hygiene through proper use of latrine which may contribute high contamination of grazing land by human excreta containing *T. saginata* eggs that may lead to increase the chance of infecting the intermediate host.

Statistical analysis indicated that there was a significant variation in prevalence of cysticercosis between sex of animals ($\chi2 = 57.5$, $p = 0.014$) and it was higher in male animals. This could be small number of female cattle were slaughtered and examined in the abattoirs because most female are productive. Significant difference ($\chi2 = 47.3$, $p = 0.043$) was also recorded between body conditions of the animals. Cattle with poor body condition had higher infection of cysticercosis than well fed and good body conditioned animals and this could be due to the fact that animals with poor body condition are usually less resistant and are consequently susceptible to infectious diseases. However, there was no association between the prevalence of cysticercosis and age and breed of the animals ($p > 0.05$).

Table 4:- Prevalence of diseases & abnormalities with sex and age of cattle in Tigray

Causes	Sex			Age		
	Male (n =396)	Female (n = 83)	Total	≤ 5 (n =79)	> 5 (n =400)	Total
Cysticercosis	71(17.93)	4 (4.82)	75(15.66)	12(15.2)	63(15.75)	75(15.66)
Fasciolosis	26(6.56)	4(4.82)	30(6.3)	5(6.3)	25(6.2)	30(6.3)
Hydatidosis	50(12.63)	3(3.6)	53(11.1)	4(5.1)	49(12.2)	53(11.1)
Tuberclosis	2(0.5)	0	2(0.4)	0	2(0.5)	2(0.4)
Emphysema	20(5.1)	1 (1.2)	21(4.4)	5(6.3)	16(4)	21(4.4)
Pneumonia	10(2.5)	2 (2.41)	12(2.5)	2(2.5)	10(2.5)	12(2.5)
Cirrhosis	2(0.5)	1(1.2)	3(0.6)	0	3(0.75)	3(0.6)
Calcification	13(3.4)	1(1.2)	14(2.9)	3(3.8)	11(2.75)	14(2.9)
Abscess	6(1.5)	0	6(1.3)	0	6(1.5)	6(1.3)
Hydronephrosis	10(2.5)	2 (2.41)	12(2.5)	3(3.8)	9(2.25)	12(2.5)
Total	210(53)	18(21.7)	228(47.6)	34(43)	194(48.5)	228(47.6)

The overall prevalence of hydatidosis (11.1%) in this study was in consistent with the findings of Melaku *et al.* (2011), Jemere *et al.* (2013) Alembrhan and Haylegebriel (2013) at Dessie, Mizan Teferi and Teppi and Adigrat municipal abattoirs, respectively. However, it was lower than the studies conducted by Endria *et al.* (2010) who reported 29.69% from Ambo, Dechassa *et al.* (2012**a**) 40.5% from Addis Ababa, Dawit *et al.* (2013) 28.09% from Mekelle and Endalew and Nuraddis (2013) 28% from Gondar municipal abattoirs. This could be due to the prevalence of hydatidosis in a given locality may be associated with prevailing specific social, cultural, religious, environmental and epidemiological situations of the study areas. The prevalence of hydatidosis showed a significant variation between body conduction scores of animals ($\chi2 = 51.8$, $p = 0.037$) and animals with poor body condition were more infected than those animals with medium and good body condition scores.

Table 5:- Prevalence of diseases & abnormalities with body condition & breed in Tigray

Causes	Body condition				Breed		
	Poor (n = 40)	Medium (n = 386)	Good (n = 53)	Total	Local (n =384)	Cross (n = 95)	Total
Cysticercosis	8(20)	60(15.5)	7(13.2)	75(15.66)	58(15.1)	17(17.9)	75(15.66)
Fasciolosis	5(12.6)	21(5.4)	4(7.5)	30(6.3)	18(4.7)	12(12.6)	30(6.3)
Hydatidosis	7(17.5)	42(10.9)	4(7.5)	53(11.1)	45(11.7)	8(8.4)	53(11.1)
Tuberclosis	1(2.5)	1(0.26)	0	2(0.4)	2(0.5)	0	2(0.4)
Emphysema	2(5)	17(4.4)	2(3.8)	21(4.4)	17(4.4)	4(4.2)	21(4.4)
Pneumonia	0	10(2.5)	2(3.8)	12(2.6)	10(2.6)	2(2.1)	12(2.5)
Cirrhosis	0	2(0.5)	1(1.9)	3(0.6)	3(0.8)	0	3(0.6)
Calcification	4(10)	7(1.8)	3(5.7)	14(2.9)	13(3.4)	1(1)	14(2.9)
Abscess	2(5)	4(1)	0	6(1.3)	5(1.3)	1(1)	6(1.3)
Hydronephrosis	5(12.6)	4(1)	3(5.7)	12(2.5)	9(2.4)	3(3)	12(2.5)
Total	34(85)	168(43.5)	26(49)	228(47.6)	180(46.9)	48(50.5)	228(47.6)

The prevalence of fasciolosis in this study was 6.3% and it was relatively in agreement with the previous studies conducted by Dechassa *et al*. (2012) and Alembrhan and Haylegebriel, (2013) in Jimma and Adigrat municipal abattoirs, respectively as well as from other countries like Nigeria and Kenya by Okoli *et al*. (2000) and Kithuka *et al*. (2002) with a prevalence of 8 and 8.2 %, respectively. However, it was lower than the studies conducted by Tadelle and Worku (2007) in Jimma, Mihreteab *et al*. (2010) in Adwa, Genet *et al*. (2012) in Gondar, Amene et al. (2012) in Jimma and Nurit *et al*. (2012) in South Wollo, who reported 46.58, 32.3, 48.5, 47.6 and 36.06%, respectively. The prevalence difference in fascioloisis might be due to variation livestock management system and in the climatic and ecological conditions such as altitude, rainfall and temperature, suitability of the environment for survival and distribution of the parasite as well as the intermediate host (Urquhart *et al.,* 1996).

The present study was identified bovine tuberculosis (0.4%) as the most bacterial disease and its prevalence was relatively in agreement with the study conducted by Shegaw *et al*. (2009) in Mekelle and Nurit *et al*. (2012) in South Wollo. Emphysema (4.4%) was recorded as the most prevalent abnormality followed by calcification (2.9%), pneumonia (2.6%) and hydronephrosis (2.5%) respectively (Table 5). The prevalence of emphysema (4.4%) in this study was in agreement with the studies conducted in Mekelle, Gondar and Bahri Dar municipal abattoirs (Shegaw *et al*., 2009; Yifat *et al*., 2011; Asmare *et al*., 2012). But, it was lower than the rate reported by Genet *et al*. (2012) 10.5% from Gondar abattoir. The occurrence of emphysema could be due to exposure of cattle to bacterial or viral infections, stress factors such as exposure to dust from the environment or exhaustion during long treks of pastoral livestock in search of pasture and water and when animals are taken to markets (Benard *et al*., 2011).

The prevalence of hydronephrosis in this study was 2.5% and it was lower than the reports from Gondar 79.1 and 17.65 % by Yifat *et al*. (2011) and Genet *et al*. (2012), respectively. However, it was higher than the studies conducted in Jimma by Amene *et al*. (2012), Adigrat municipal abattoirs by Alembrhan and Haylegebriel (2013). The prevalence variation could be attributed to the differences in the virulence and variation in animal management systems. Significant difference ($\chi 2 = 61$, p = 0.008) was recorded between the prevalence of hydronephrosis and body conditions of the animals and it was higher in cattle with poor body condition score.

4. Conclusion and Recommendation

The results of the present study revealed that parasitic and bacterial diseases such as cysticercosis*,* fasciolosis, hydatidosis and tuberculosis and other abnormalities like emphysema, pneumonia, calcification, hydronephrosis, abscess and cirrhosis were the most animal health problem in Tigray region. The current study may be valuable for the country by providing data for monitoring disease conditions and management practices of animals that have public health and aesthetic value. Therefore, to reduce the prevalence and transmission of the diseases the responsible bodies necessary provides public education concern: use of latrines and improved personal hygiene, avoid eating of raw meat and vegetation, promoting construction of abattoir with their appropriate disposal pits and proper disposal of condemned organs, improved grazing management system, regular deworming of cattle with anti-helminthes drugs at the end of dry and rainy season, establish policy on dog keeping and elimination of stray dogs as well as proper and detail meat inspection at the abattoirs. Furthermore, the detail economic impact of the diseases and abnormalities of cattle should be investigated.

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