

## Causes of Beef Carcass and Organ Condemnations in Ethiopia

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### ABSTRACT

Carcass and organ condemnations cause big economic losses in the beef industry. The aim of this study was to determine the causes of condemnations of whole and partial carcasses and organs of cattle slaughtered at private abattoirs in Ethiopia. A total of 62,917 cattle slaughtered at Abergelle, Elfora Bishoftu and Elfora Kombolcha abattoirs from February 2010 to November 2013 were used for the study. The main causes of condemnations of whole carcasses were poor bleeding (0.11%), abscess (0.06%), adhesion (0.04%), TB (0.03%), pneumonia (0.01%), *Cysticercus bovis* (0.01%) and bruising (0.01%). Prevalence of abscesses, TB and *C. bovis* were significantly ( $p < 0.0001$ ) different between abattoirs. Main causes of partial condemnations of carcasses were bruising (34.11%), poor bleeding (25.59%), contamination (12.58%) and adhesion (9.37%). The prevalence of these problems were significantly ( $p < 0.0001$ ) different between years, abattoirs and season. The main causes of condemnations of liver was *faciola* (29.74%) while lungs were mainly condemned due to *H. cyst* (23.01%) and pneumonia (22.68). The main causes of condemnations of kidneys, hearts, tongue and spleens were nephritis (10.91%), poor bleeding (20.83%), abscess (4.71%) and splenitis (2.74%), respectively while heads were condemned mainly due to poor bleeding (18.77%) and bruising (17.05%). The causes of condemnations of organs were significantly ( $p < 0.0001$ ) different between abattoirs or years or both in some cases. From the study it was concluded that the prevalence of disease problems differ from abattoir to abattoir and across years. It is therefore recommended that different strategies should be developed to minimize these problems though the year and between regions based on the dynamic nature of the diseases.

**Key words:** Abattoir, cattle, diseases

### INTRODUCTION

Abattoirs and slaughterhouses are good sources of valuable information on the incidence of animal diseases and conditions. Prevalence of less acute, chronic and mild diseases with no clinical signs can be detected at slaughterhouses. An abattoir is a focal point to detect diseases of public health importance such as TB, cysticercosis, hydatidosis and *faciola* (Cadmus and Adesokan, 2009). As a result, if such information is well documented, it will aid in developing strategies to control disease of animal and human in a country. Meat inspectors assigned by Ministry of Agriculture routinely inspect the slaughtered animals and federal veterinary health officers supervise the inspection of the carcasses in Ethiopia. The inspection is done independently of livestock and abattoir owners. Prevalence of various diseases has been reported to the federal state from data collected at abattoirs.

Infectious diseases of livestock accounted for 30-50% of the total annual losses from livestock sector in Ethiopia (FAO., 1993). The level of condemnations of carcasses and organs affect the quality and monetary value of carcasses directly or indirectly. Studies done up to this day concentrated on condemnations of offal based on data collected at specific abattoirs (Asseged *et al.*, 2004; Megersa *et al.*, 2010; Abunna *et al.*, 2012; Aragaw *et al.*, 2012; Mesele *et al.*, 2012; Terefe *et al.*, 2012; Assefa and Tesfay, 2013; Mulatu *et al.*, 2013). Causes of partial and whole carcasses condemnations were not extensively studied in Ethiopia. The purpose of the present study was therefore to determine the causes of whole, partial carcasses and organs condemnations at private abattoirs and evaluate prevalence of the diseases across the years and abattoirs in Ethiopia.

## **MATERIALS AND METHODS**

**Study abattoirs:** The study was conducted at Abergelle, Elfora Bishoftu and Elfora Kombolcha abattoirs. These abattoirs are located in Oromiya, Amhara and Tigry regional states which constitute about 75% of cattle population in the country. Abergelle abattoir slaughters cattle for export purpose while Elfora Bishoftu abattoir slaughters cattle for local consumption. Elfora Kombolcha abattoir slaughters cattle for both export and local purposes. Abergele abattoir is located 783 km north of Addis Ababa, at 13°30'N 39°29'E and at an altitude of 2000-2200 m above sea level. The mean annual temperature and rainfall of the area ranges from 11.8 to 24.9°C and 579-650 mm, respectively. Elfora Bishoftu is located in Bishoftu 47 km east of Addis Ababa. The area lies at 8°45'N 38°59'E and at an altitude of 1880 m above sea level. The average temperature ranges from 9 to 23°C. This region has average annual rainfall of 1151.6 mm. Elfora Kombolcha is located at about 375 km north east of Addis Ababa at an altitude of 1500-1840 m above sea level. The average rainfall and temperature ranges from 750-900 mm and 25-30°C, respectively.

A retrospective abattoir survey was conducted based on a total numbers of 62,917 cattle slaughtered at these abattoirs from February 2010 to November 2013. The number of cattle slaughtered at Abergelle, Elfora Bishoftu and Elfora Kombolcha abattoirs were 39098, 9227 and 14592, respectively. The number of cattle slaughtered in 2010, 2011, 2012 and 2013 were 12708, 34674, 10363 and 5172, respectively. It was not possible to get information on the exact age, sex and breeds of cattle slaughtered in each abattoir. Almost all cattle slaughtered came from mixed crop livestock and agro-pastoral production systems.

**Data management:** Daily condemnation records for cattle slaughtered at Abergelle, Elfora Bishoftu and Elfora Kombolcha abattoirs were used as the sources of the data. Records on number of animals slaughtered and organs condemned were collected. Daily meat inspection was carried out by qualified federal veterinary inspectors who was trained on meat inspection and assigned by Ministry of Agriculture at each abattoir. These officers keep records of their finding and report to the federal bureau. Hence, individual differences between inspectors in major terms of findings of diseases can not be considered significant. This suggests that the differences in prevalence of disease conditions observed between abattoirs may arise due to differences in environmental conditions that are conducive to the perpetuation of the parasite, abundance of infected definitive host, livestock husbandry, stocking rate, nature of the pasture and grazing patterns of animals and abattoir management. Routine ante-mortem examinations were carried out for slaughtered cattle a day before or shortly prior to slaughter. This was followed by postmortem meat inspection involving visual examination, palpation and systematic incision of carcasses and visceral organs,

particularly lungs, livers, kidneys, hearts, spleens, tongues, heads and intestine according to procedures described Meat Inspection Guideline of Ethiopia, 2010. Organs were grossly diagnosed based on pathological changes such as color, size, morphology, consistence, presence of lesions or parasites. At the end of meat inspection, all partial and total condemned carcasses and organs were taken to the laboratory at each respective abattoir for further examination and identification of the lesions and parasites. In case causes of diseases were not confirmed in the respective laboratories, samples were submitted to the regional/ national animal health laboratory for further diagnosis.

**Data analysis:** Data was analyzed using JMP version 8 statistical software. Prevalence of disease was calculated as a ratio of number of carcass/organs condemned for specific disease problem to the total number of cattle slaughtered during the day. Chi-square test at critical probability value of  $p < 0.05$  was used to test the significant difference between abattoirs, years and season. Presence (value = 1) and absence (value = 2) of diseases condition were used to analyze statistical difference. Season was classified in to dry (October to February) and wet (March to September).

## RESULTS

**Causes of whole carcass condemnations:** Out of 62,917 cattle slaughtered during the study period, a total of 170 whole carcasses were condemned (Table 1). The main causes of whole carcass condemnations were poor bleeding (0.11%), abscess (0.06%), adhesion (0.04%), TB (0.03%), pneumonia (0.01%), *Cysticercus bovis* (0.01%) and bruising (0.01%). The prevalence of abscess was significantly different ( $p < 0.0001$ ) between years and abattoirs (Table 2). A higher prevalence of abscess was observed in 2010 which was 0.20%. The prevalence of TB and *C. bovis* significantly differed ( $p < 0.0001$ ) between abattoirs. TB and *C. bovis* were higher in Elfora Kombolcha (Table 3).

**Causes of partial carcass condemnations:** About 52,437 carcasses were partially condemned during the study period. Main causes of partial condemnations were bruising (34.11%), poor bleeding (25.59%), contamination (12.58%), adhesion (9.37%), abscess (1.55%) and calcification of cysts (0.11%). The prevalence of bruising, poor bleeding, contamination, adhesion, abscess and calcified cyst were significantly different ( $p < 0.0001$ ) between years, abattoirs and season. The prevalence of *C. bovis*, *H. cyst* and edema was significantly different ( $p < 0.0001$ ) between abattoirs (Table 2). Bruising and contamination were higher ( $p < 0.0001$ ) in 2010 (53.93%, 17.06%) while poor bleeding and adhesion were higher ( $p < 0.0001$ ) in 2011 (36.70%, 14.71%). The prevalence of all disease conditions were the lower in 2013 compared to other years of study (Table 1). Most partial condemnation was observed at Abergelle abattoir. The prevalence of bruising and poor bleeding were relatively higher in dry season while the prevalence of adhesion, abscess, contaminations and calcified cysts were relatively higher in wet season (Table 3).

**Causes of condemnations of livers:** The main causes of condemnations of livers were fasciola (29.74%), *H. cyst* (15.44%), Calcified cyst (10.56%), contamination (7.36%), *C. bovis* (5.44%), poor bleeding (5.01%) and abscess (1.5%; Table 1). The prevalence of these problems was significantly different ( $p < 0.0001$ ) between years and abattoirs (Table 2). All these problems except fasciola, contamination and *C. bovis* were significantly different ( $p < 0.05$ ) between seasons (Table 2). Condemnations of livers due to fasciola and *H. cyst* were relatively lower in 2010 (17.36, 9.91%) compared the prevalence of these problems in 2011 (32.02, 14.61%), 2012 (32.58, 23.05%) and 2013 (39.21, 19.33%; Table 1). Fasciola was the common causes of condemnations of livers at Abergelle

Table 1: Causes of condemnation of whole, partial carcass and organs of cattle slaughtered from 2010-2013

Organ and conditions	No. of carcasses condemned (%)				
	2010 (n = 12708)	2011 (n = 34674)	2012 (n = 10363)	2013 (n = 5172)	Total (n = 62917)
<b>Whole carcass condemnation</b>					
Poor bleeding	0 (0.00)	69 (0.20)	0 (0.00)	0 (0.00)	69 (0.11)
Abscess	25 (0.20)	7 (0.02)	3 (0.03)	5 (0.10)	40 (0.06)
Adhesion	0 (0.00)	28 (0.08)	0 (0.00)	0 (0.00)	28 (0.04)
TB	3 (0.02)	6 (0.02)	5 (0.05)	5 (0.10)	19 (0.03)
Pneumonia	0 (0.00)	0 (0.00)	0 (0.00)	5 (0.10)	5 (0.01)
Cysticercus bovis	0 (0.00)	1 (0.00)	2 (0.02)	1 (0.02)	4 (0.01)
Bruising	0 (0.00)	0 (0.00)	1 (0.01)	3 (0.06)	4 (0.01)
Hydatid cyst	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.02)	1 (0.00)
<b>Partial carcasses condemnation</b>					
Bruising	6854 (53.93)	13626 (39.30)	977 (9.43)	1 (0.02)	21458 (34.11)
Poor bleeding	2275 (17.90)	12727 (36.70)	1101 (10.62)	0 (0.00)	16103 (25.59)
Contamination	2168 (17.06)	5271 (15.20)	479 (4.62)	0 (0.00)	7918 (12.58)
Adhesion	395 (3.11)	5100 (14.71)	402 (3.88)	0 (0.00)	5897 (9.37)
Abscess	112 (0.88)	792 (2.28)	71 (0.69)	1 (0.02)	976 (1.55)
Calcified cyst	72 (0.57)	0 (0.00)	0 (0.00)	0 (0.00)	72 (0.11)
Cysticercus bovis	0 (0.00)	6 (0.02)	1 (0.01)	1 (0.02)	8 (0.01)
Hydatid cyst	0 (0.00)	3 (0.01)	0 (0.00)	0 (0.00)	3 (0.00)
Edema	2 (0.02)	0 (0.00)	0 (0.00)	0 (0.00)	2 (0.00)
<b>Liver</b>					
Faciola	2207 (17.36)	11102(32.02)	3376 (32.58)	2028 (39.21)	18713 (29.74)
Hydatid cyst	1259 (9.91)	5065 (14.61)	2389 (23.05)	1000 (19.33)	9713 (15.44)
Calcified cyst	1555 (12.24)	4651 (13.41)	424 (4.09)	14 (0.27)	6644 (10.56)
Contamination	1993 (15.68)	2305 (6.65)	244 (2.35)	87 (1.68)	4629 (7.36)
Cysticercus bovis	598 (4.71)	2466 (7.11)	286 (2.76)	75 (1.45)	3425 (5.44)
Poor bleeding	319 (2.51)	2548 (7.35)	283 (2.73)	0 (0.00)	3150 (5.01)
Abscess	184 (1.45)	525 (1.51)	123 (1.19)	112 (2.17)	944 (1.50)
Other*	327 (2.57)	1023 (2.95)	359 (3.46)	348 (6.73)	2057 (3.27)
<b>Lung</b>					
Hydatid cyst	2815 (22.15)	7267 (20.96)	3213 (31.00)	1182 (22.85)	14477 (23.01)
Pneumonia	2169 (17.07)	9428 (27.19)	1897 (18.31)	775 (14.98)	14269 (22.68)
Emphysema	2269 (17.85)	7978 (23.01)	1358 (13.10)	305 (5.90)	11910 (18.93)
Poor bleeding	2158 (16.98)	8434 (24.32)	662 (6.39)	4 (0.08)	11258 (17.89)
Contamination	869 (6.84)	1816 (5.24)	244 (2.35)	98 (1.89)	3027 (4.81)
Calcified cyst	233 (1.83)	1553 (4.48)	168 (1.62)	1 (0.02)	1955 (3.11)
Abscess	162 (1.27)	318 (0.92)	42 (0.41)	24 (0.46)	546 (0.87)
Other*	4 (0.03)	42 (0.12)	12 (0.12)	7 (0.14)	65 (0.10)
<b>Kidney</b>					
Nephritis	859 (6.76)	2470 (7.12)	2513 (24.25)	1021 (19.74)	6863 (10.91)
Edema	201 (1.58)	667 (1.92)	166 (1.60)	134 (2.59)	1168 (1.86)
Hydronephrosis	49 (0.39)	344 (0.99)	470 (4.54)	257 (4.97)	1120 (1.78)
Hemorrhage	211 (1.66)	592 (1.71)	160 (1.54)	140 (2.71)	1103 (1.75)
Contamination	446 (3.51)	368 (1.06)	6 (0.06)	4 (0.08)	824 (1.31)
Congenital cyst	121 (0.95)	351 (1.01)	190 (1.83)	140 (2.71)	802 (1.27)
Infracts	62 (0.49)	193 (0.56)	96 (0.93)	49 (0.95)	400 (0.64)
Calcified cyst	32 (0.25)	157 (0.45)	84 (0.81)	80 (1.55)	353 (0.56)
Poor bleeding	259 (2.04)	38 (0.11)	0 (0.00)	0 (0.00)	297 (0.47)
Hydatid cyst	10 (0.08)	125 (0.36)	67 (0.65)	45 (0.87)	247 (0.39)
Other*	6 (0.05)	97 (0.28)	20 (0.19)	15 (0.29)	138 (0.22)
<b>Heart</b>					
Poor bleeding	2698 (21.23)	9330 (26.91)	1075 (10.37)	2 (0.04)	13105 (20.83)
Pericarditis	666 (5.24)	1473 (4.25)	500 (4.82)	249 (4.81)	2888 (4.59)
Cysticercus bovis	33 (0.26)	554 (1.60)	299 (2.89)	88 (1.70)	974 (1.55)
Contamination	204 (1.61)	553 (1.59)	132 (1.27)	77 (1.49)	966 (1.54)
Oedema	109 (0.86)	409 (1.18)	147 (1.42)	93 (1.80)	758 (1.20)
Other*	253 (1.99)	834 (2.41)	169 (1.63)	90 (1.74)	1346 (2.14)
<b>Tongue</b>					
Abscess	689 (5.42)	1902 (5.49)	232 (2.24)	142 (2.75)	2965 (4.71)
Cysticercus bovis	36 (0.28)	188 (0.54)	194 (1.87)	77 (1.49)	495 (0.79)

Table 1: Continue

Organ and conditions	No. of carcasses condemned (%)				
	2010 (n = 12708)	2011 (n = 34674)	2012 (n = 10363)	2013 (n = 5172)	Total (n = 62917)
Contamination	59 (0.46)	361 (1.04)	22 (0.21)	14 (0.27)	456 (0.72)
Edema	44 (0.35)	83 (0.24)	10 (0.10)	28 (0.54)	165 (0.26)
Others*	65 (0.51)	58 (0.17)	10 (0.10)	29 (0.56)	162 (0.26)
<b>Spleen</b>					
Splenitis	198 (1.56)	730 (2.11)	409 (3.95)	389 (7.52)	1726 (2.74)
Hematoma	105 (0.83)	395 (1.14)	258 (2.49)	281 (5.43)	1039 (1.65)
Contamination	79 (0.62)	182 (0.52)	111 (1.07)	78 (1.51)	450 (0.72)
Splenomegaly	58 (0.46)	158 (0.46)	57 (0.55)	71 (1.37)	344 (0.55)
Hydatid cyst	32 (0.25)	89 (0.26)	73 (0.70)	81 (1.57)	275 (0.44)
Abscess	5 (0.04)	74 (0.21)	13 (0.13)	7 (0.14)	99 (0.16)
Other*	5 (0.04)	12 (0.03)	2 (0.02)	11 (0.21)	30 (0.05)
<b>Head</b>					
Poor bleeding	1811 (14.25)	9336 (26.93)	665 (6.42)	0 (0.00)	11812 (18.77)
Bruising	2009 (15.81)	8043 (23.20)	593 (5.72)	81 (1.57)	10726 (17.05)
Abscess	608 (4.78)	1266 (3.65)	201 (1.94)	105 (2.03)	2180 (3.46)
Contamination	77 (0.61)	1091 (3.15)	307 (2.96)	37 (0.72)	1512 (2.40)
C. bovis	2 (0.02)	37 (0.11)	20 (0.19)	4 (0.08)	63 (0.10)
Other*	28 (0.22)	68 (0.20)	2 (0.02)	5 (0.10)	103 (0.16)
<b>Intestine</b>					
Abscess	0 (0.00)	13 (0.04)	39 (0.38)	0 (0.00)	52 (0.08)
C. bovis	0 (0.00)	7 (0.02)	1 (0.01)	1 (0.02)	9 (0.01)
H. cyst	0 (0.00)	10 (0.03)	0 (0.00)	0 (0.00)	10 (0.02)

\*Other on liver (oedema, adhesion, pleuritis, hemorrhage, hematoma, tumor, peritonitis, TB, Bruise, Jaundice), on lung (hemorrhage, tumor, adhesion, C. bovis, TB), on kidney (tumor, abscess, C. bovis, bruising), on heart (hemorrhage, calcified cyst, abscess, Hydatid cyst, tumor), on tongue (hemorrhage, tumor, ulcer), on spleen (oedema, calcified cyst, hemorrhage, c. bovis, tumor), on head (Hydatid cyst, edema, adhesion)

Table 2: Chi-square test for causes of condemnations of carcasses and organs

Condemnations and causes	Year		Abattoir		Season	
	$\chi^2$	p-value	$\chi^2$	p-value	$\chi^2$	p-value
<b>Whole carcasses</b>						
Poor bleeding	1.91	0.59	2.09	0.352	1.76	0.184
Abscess	46.80	<0.0001*	73.87	<0.0001*	1.88	0.170
Adhesion	1.91	0.59	2.09	0.352	1.76	0.184
TB	0.49	0.921	86.89	<0.0001*	0.28	0.600
Pneumonia	3.18	0.365	2.09	0.352	1.07	0.301
C. bovis	1.87	0.599	20.33	<0.0001*	0.48	0.490
Bruise	5.10	0.165	5.90	0.052	0.78	0.378
H. cyst	3.18	0.365	2.09	0.352	1.07	0.301
<b>Partial carcasses</b>						
Bruise	356.07	<0.0001*	1218.18	<0.0001*	4.81	0.0284*
Poor bleeding	281.28	<0.0001*	1030.83	<0.0001*	14.07	0.0002*
Contamination	310.83	<0.0001*	1115.55	<0.0001*	6.17	0.0130*
Adhesion	264.29	<0.0001*	825.26	<0.0001*	5.31	0.0212*
Abscess	234.53	<0.0001*	842.26	<0.0001*	5.15	0.0232*
C. calcification	16.32	0.0010*	11.22	0.0037*	4.07	0.0437*
C. bovis	5.62	0.132	11.13	0.0038*	2.93	0.087
H. cyst	3.92	0.271	5.6	0.061	2.03	0.154
Edema	8.14	0.0432*	5.6	0.061	2.03	0.154
<b>Liver</b>						
Faciola	16.97	0.0007*	10.33	0.0057*	1.45	0.229
H. cyst	7.68	0.053	279.15	<0.0001*	3.77	0.052
Calcified cyst	273.23	<0.0001*	982.41	<0.0001*	6.57	0.0104*
Contamination	280.33	<0.0001*	1082.55	<0.0001*	0.37	0.545
C. bovis	239.54	<0.0001*	795.07	<0.0001*	3.54	0.06
Poor bleeding	191.14	<0.0001*	707.38	<0.0001*	17.86	<0.0001*
Abscess	83.31	<0.0001*	573.41	<0.0001*	0.32	0.575

Table 2: Continue

Condemnations and causes	Year		Abattoir		Season	
	$\chi^2$	p-value	$\chi^2$	p-value	$\chi^2$	p-value
<b>Lung</b>						
H. cyst	2.32	0.5090	99.67	<0.0001*	0.87	0.3520
Pneumonia	45.04	<0.0001*	99.56	<0.0001*	0.09	0.7600
Emphysema	123.33	<0.0001*	589.90	<0.0001*	0.30	0.5830
Poor bleeding	276.87	<0.0001*	1023.48	<0.0001*	16.11	<0.0001*
Contamination	152.81	<0.0001*	815.39	<0.0001*	1.29	0.2560
Calcified cyst	242.88	<0.0001*	753.00	<0.0001*	1.18	0.2770
Abscess	72.34	<0.0001*	327.58	<0.0001*	1.70	0.1920
<b>Kidney</b>						
Nephritis	59.00	<.0001*	207.42	<0.0001*	0.63	0.4280
Edema	5.96	0.114	542.63	<0.0001*	6.18	0.0129*
Hydronephrosis	40.24	<0.0001*	277.05	<0.0001*	0.90	0.3430
Hemorrhage	8.66	0.0341*	634.21	<0.0001*	6.58	0.0103*
Contamination	156.64	<0.0001*	219.19	<0.0001*	2.55	0.1110
Congen cyst	7.43	0.06	660.92	<0.0001*	9.00	0.0027*
Infracts	6.12	0.106	400.63	<0.0001*	0.77	0.3810
Calcified cyst	1.51	0.68	331.69	<0.0001*	0.20	0.6550
Poor bleeding	212.36	<0.0001*	153.20	<0.0001*	30.63	<0.0001*
H. cyst	11.51	0.0093*	72.96	<0.0001*	4.40	0.0360*
<b>Heart</b>						
Poor bleeding	309.33	<0.0001*	1045.31	<0.0001*	10.47	0.0012*
Pericarditis	104.13	<0.0001*	207.74	<0.0001*	0.03	0.8720
C. bovis	112.14	<0.0001*	94.78	<0.0001*	1.97	0.1610
Contamination	82.40	<0.0001*	505.09	<0.0001*	0.00	0.9500
Edema	3.90	0.2730	621.02	<0.0001*	4.18	0.0409*
<b>Tongue</b>						
Abscess	178.69	<0.0001*	555.99	<0.0001*	0.41	0.5220
C. bovis	23.47	<0.0001*	133.60	<0.0001*	27.82	<0.0001*
Contamination	102.87	<0.0001*	206.13	<0.0001*	1.67	0.1970
Edema	33.39	<0.0001*	259.56	<0.0001*	18.71	<0.0001*
<b>Spleen</b>						
Splenitis	5.72	0.126	802.97	<0.0001*	5.68	0.0172*
Hematoma	6.69	0.082	634.39	<0.0001*	7.31	0.0068*
Contamination	2.00	0.572	431.26	<0.0001*	2.45	0.1180
Splnomegaly	5.08	0.166	363.24	<0.0001*	3.17	0.0750
H. cyst	3.29	0.348	312.00	<0.0001*	1.02	0.3140
Abscess	2.35	0.504	30.70	<0.0001*	1.41	0.2350
<b>Head0</b>						
Poor bleeding	260.84	<0.0001*	930.82	<0.0001*	13.09	0.0003*
Bruise	104.38	<0.0001*	725.62	<0.0001*	2.22	0.1370
Abscess	134.01	<0.0001*	727.23	<0.0001*	0.00	0.9560
Contamination	20.73	0.0001*	257.09	<0.0001*	0.24	0.6280
C. bovis	15.58	0.0014*	8.97	0.0113*	0.02	0.8960
<b>Intestine</b>						
Abscess	28.83	<.0001*	0	-	6.81	0.0091*
C. bovis	2.65	0.265	0	-	1.21	0.2710
H. cyst	1.44	0.486	0	-	1.58	0.2080

(25.17%), Bishoftu (30.46%) and Kombolcha (41.54%) abattoirs. Hydatid cyst was the cause of condemnations of livers at Abergelle (14.30, 12.52%) and Bishoftu (36.76, 14.70%) abattoirs. Calcification of cyst, contamination, poor bleeding and C. bovis were prevalent at Abergell compared to the other studied abattoirs. Calcified cyst and poor bleeding were relatively more prevalent (p<0.0001) in the dry than the wet season while the prevalence of H. cyst was more prevalent (p<0.0001) in the wet than the dry season (Table 3).

**Causes of condemnations of lungs:** Main causes of condemnations of lungs were H. cyst (23.01%), pneumonia (22.68), emphysema (18.93%), poor bleeding (17.89%), contamination (4.81%) and Calcified cyst (3.11%; Table 1). The prevalence of H. cyst was significantly different (p<0.0001)

Table 3: Condemnations of whole, partial carcasses and organs in Abergelle, Bishoftu and Kombolcha abattoirs in dry and wet seasons

Condemnations and conditions	No. of carcasses condemned (%)				
	Abergelle (n = 39098)	Bishoftu (n = 9227)	Kombolcha (n = 14592)	Dry (n = 26977)	Wet (n = 35940)
<b>Whole carcasses</b>					
Poor bleeding	69 (0.18)	0 (0.00)	0 (0.00)	69 (0.26)	0 (0.00)
Abscess	33 (0.08)	0 (0.00)	7 (0.05)	21 (0.08)	19 (0.05)
Adhesion	28 (0.07)	0 (0.00)	0 (0.00)	28 (0.1)	0 (0.00)
Pneumonia	5 (0.01)	0 (0.00)	0 (0.00)	0 (0.00)	5 (0.01)
C. bovis	0 (0.00)	1 (0.01)	3 (0.02)	1 (0.00)	3 (0.01)
TB	0 (0.00)	5 (0.05)	12 (0.08)	6 (0.02)	11 (0.03)
Bruising	0 (0.00)	2 (0.02)	2 (0.01)	2 (0.01)	2 (0.01)
Hydatid cyst	1 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (0.00)
<b>Partial carcasses</b>					
Bruising	21456 (54.88)	2 (0.02)	0 (0.00)	10773 (39.93)	10685 (29.73)
Poor bleeding	16103 (41.19)	0 (0.00)	0 (0.00)	7270 (26.95)	8833 (24.58)
Contamination	7918 (20.25)	0 (0.00)	0 (0.00)	2428 (09.00)	4323 (12.03)
Adhesion	5897 (15.08)	0 (0.00)	0 (0.00)	2256 (8.36)	3641 (10.13)
Abscess	974 (2.49)	2 (0.02)	0 (0.00)	385 (1.43)	591 (1.64)
Calcified cyst	72 (0.18)	0 (0.00)	0 (0.00)	0 (0.00)	72 (0.2)
C. bovis	6 (0.02)	2 (0.02)	0 (0.00)	1 (0.00)	7 (0.02)
Hydatid cyst	3 (0.01)	0 (0.00)	0 (0.00)	0 (0.00)	3 (0.01)
Oedema	2 (0.01)	0 (0.00)	0 (0.00)	0 (0.00)	2 (0.01)
<b>Liver</b>					
Faciola	9842(25.17)	2810 (30.46)	6061 (41.54)	6816 (25.27)	11897 (33.10)
Hydatid cyst	5592 (14.30)	3392 (36.76)	729 (5.00)	4094 (15.18)	5619 (15.63)
Calcified cyst	6550 (16.75)	91 (0.99)	3 (0.02)	3437 (12.74)	3207 (8.92)
Contamination	4149 (10.61)	0 (0.00)	480 (3.29)	2206 (8.18)	2423 (6.74)
C. bovis	3008 (7.69)	5 (0.05)	412 (2.82)	1589 (5.89)	1836 (5.11)
Poor bleeding	3150 (8.06)	0 (0.00)	0 (0.00)	1374 (5.09)	1776 (4.94)
Abscess	513 (1.31)	0 (0.00)	431 (2.95)	361 (1.34)	583 (1.62)
Other*	184 (0.47)	34 (0.37)	1839 (12.60)	666 (2.47)	1391 (3.87)
<b>Lung</b>					
Hydatid cyst	8928 (22.83)	4088 (44.30)	1461 (10.01)	6433 (23.85)	8044 (22.38)
Pneumonia	10251 (26.21)	1673 (18.13)	2345 (16.07)	5719 (21.20)	8550 (23.79)
Emphysema	10075 (25.77)	327 (3.54)	1508 (10.33)	5204 (19.29)	6706 (18.66)
Calcified cyst	1927 (4.93)	28 (0.30)	0 (0.00)	941 (3.49)	1014 (2.82)
Abscess	464 (1.19)	3 (0.03)	79 (0.54)	276 (1.02)	270 (0.75)
Contamination	2518 (6.44)	0 (0.00)	509 (3.49)	1547 (5.73)	1480 (4.12)
Poor bleeding	11258 (28.79)	0 (0.00)	0 (0.00)	5867 (21.75)	5391 (15.00)
Other*	31 (0.08)	8 (0.09)	8 (0.05)	26 (0.10)	21 (0.06)
<b>Kidneys</b>					
Nephritis	1451 (3.71)	4060 (44.00)	1352 (9.27)	2626 (9.73)	4237 (11.79)
Edema	6 (0.02)	0 (0.00)	1162 (7.96)	233 (0.86)	935 (2.60)
Hydronephrosis	0 (0.00)	772 (8.37)	348 (2.38)	447 (1.66)	673 (1.87)
Hemorrhage	0 (0.00)	0 (0.00)	1103 (7.56)	271 (1.00)	832 (2.31)
Contamination	763 (1.95)	0 (0.00)	61 (0.42)	402 (1.49)	422 (1.17)
Co. cyst	0 (0.00)	0 (0.00)	802 (5.50)	249 (0.92)	553 (1.54)
Infracts	0 (0.00)	0 (0.00)	400 (2.74)	127 (0.47)	273 (0.76)
Calcified cyst	16 (0.04)	51(0.55)	286 (1.96)	109 (0.40)	244 (0.68)
Poor bleeding	297 (0.76)	0 (0.00)	0 (0.00)	245 (0.91)	52 (0.14)
Hydatid cyst	0 (0.00)	140 (1.52)	107 (0.73)	73 (0.27)	174 (0.48)
Other*	87 (0.22)	12 (0.13)	39 (0.27)	100 (0.37)	38 (0.11)
<b>Heart</b>					
Poor bleeding	13105 (33.52)	0 (0.00)	0 (0.00)	7048 (26.13)	6057 (16.85)
Pericarditis	1530 (3.91)	559 (6.06)	799 (5.48)	1207 (4.47)	1681 (4.68)
C. bovis	385 (0.98)	486 (5.27)	103 (0.71)	330 (1.22)	644 (1.79)
Contamination	520 (1.33)	0 (0.00)	446 (3.06)	403 (1.49)	563 (1.57)
Oedema	0 (0.00)	0 (0.00)	758 (5.19)	182 (0.67)	576 (1.60)
Other*	766 (1.96)	56 (0.61)	600 (4.11)	562 (2.08)	784 (2.18)
<b>Tongue</b>					
Abscess	2583 (6.61)	51 (0.55)	244 (1.67)	1407 (5.22)	1471 (4.09)
C. bovis	54 (0.14)	378 (4.10)	63 (0.43)	138 (0.51)	357 (0.99)

Table 3: Continue

Condemnations and conditions	No. of carcasses condemned (%)				
	Abergelle (n = 39098)	Bishoftu (n = 9227)	Kombolcha (n = 14592)	Dry (n = 26977)	Wet (n = 35940)
Contamination	305 (0.78)	0 (0.00)	151 (1.03)	242 (0.90)	214 (0.60)
Oedema	0 (0.00)	0 (0.00)	165 (1.13)	28 (0.10)	137 (0.38)
Other*	0 (0.00)	0 (0.00)	162 (1.11)	21 (0.08)	141 (0.39)
<b>Spleen</b>					
Splenitis	0 (0.00)	0 (0.00)	1726 (11.83)	561 (2.08)	1165 (3.24)
Hematoma	0 (0.00)	0 (0.00)	1039 (7.12)	345 (1.28)	694 (1.93)
Contamination	1 (0.00)	0 (0.00)	449 (3.08)	149 (0.55)	301 (0.84)
SplinoMegaly	0 (0.00)	0 (0.00)	344 (2.36)	99 (0.37)	245 (0.68)
Hydatid cyst	0 (0.00)	13 (0.14)	262 (1.80)	92 (0.34)	183 (0.51)
Abscess	71 (0.18)	0 (0.00)	28 (0.19)	79 (0.29)	20 (0.06)
Other*	0 (0.00)	1 (0.01)	29 (0.20)	12 (0.04)	18 (0.05)
<b>Head</b>					
Poor bleeding	11812 (30.21)	0 (0.00)	0 (0.00)	5637 (20.90)	6175 (17.18)
Bruising	10469 (26.78)	0 (0.00)	257 (1.76)	5139 (19.05)	5587 (15.55)
Abscess	1835 (4.69)	33 (0.36)	312 (2.14)	1179 (4.37)	1001 (2.79)
Contamination	1302 (3.33)	0 (0.00)	210 (1.44)	747 (2.77)	765 (2.13)
C. bovis	29 (0.07)	24 (0.26)	10 (0.07)	21 (0.08)	42 (0.12)
Other*	65 (0.17)	0 (0.00)	38 (0.26)	68 (0.25)	35 (0.10)
<b>Intestine</b>					
Abscess	0 (0.00)	52 (0.56)	0 (0.00)	8 (0.03)	44 (0.12)
C. bovis	0 (0.00)	9 (0.10)	0 (0.00)	9 (0.03)	1 (0.00)
Hydatid cyst	0 (0.00)	10 (0.11)	0 (0.00)	10 (0.04)	0 (0.00)

\*Other on liver (oedema, adhesion, pleuritis, hemorrhage, hematoma, tumor, peritonitis, TB, Bruise, Jaundice), on lung (hemorrhage, tumor, adhesion, C. bovis, TB), On kidney (tumor, abscess, C. bovis, bruising,), on heart (hemorrhage, calcified cyst, abscess, Hydatid cyst, tumor), on tongue (hemorrhage, tumor, ulcer), on spleen (oedema, calcified cyst, hemorrhage, C. bovis, tumor), on head (Hydatid cyst, edema, adhesion)

between abattoirs (Table 2). H. cyst was relatively higher in Bishoftu (44.30%) compared to Abergelle (22.83%) and Kombolcha (10.01%) abattoirs (Table 3). Pneumonia, emphysema, poor bleeding, contamination and calcified cyst were significantly different ( $p < 0.0001$ ) between years and abattoirs (Table 2). The prevalence of pneumonia was relatively higher in 2012 (Table 1). The problem of pneumonia, emphysema and poor bleeding were higher at Abergelle abattoir compared to the other abattoirs studied. Poor bleeding was relatively higher in the dry season compared to the wet season (Table 3).

**Causes of condemnations of kidneys:** The main causes of condemnations of kidneys were nephritis (10.91%). The prevalence of H. cyst, poor bleeding, calcified cyst, infracts, congenital cyst, hemorrhage, hydronephrosis and edema were in the range between 0.39 and 1.86% (Table 1). The prevalence of these problems were significantly ( $p < 0.0001$ ) different between abattoirs (Table 2). Nephritis, hydronephrosis and H. cyst were the major problems of Bishoftu abattoir. Contamination and poor bleeding were prevalent at Abergelle while Calcified cyst, edema, hemorrhage, congenital cyst and infracts were prevalent at Kombolcha abattoir (Table 3). All causes of condemnations except edema, infract and Calcified cyst were significantly ( $p < 0.0001$ ) different between years of study. Prevalence of nephritis was relatively higher in 2012 (24.25%) and 2013 (19.74%) compared to other studied years (Table 1). Moreover, prevalence of edema, hemorrhages, congenital cyst, poor bleeding and H. cyst were significantly ( $p < 0.0001$ ) different between seasons (Table 2). Except poor bleeding, all the problems were more prevalent in the wet season compared to the dry season (Table 3).

**Causes of condemnations of hearts:** The main causes of condemnations of hearts were poor bleeding (20.83%) and pericarditis (4.59%). The prevalence of C. bovis, contamination and edema



were in the range between 1.20% and 1.55% (Table 1). Poor bleeding, pericarditis, *C. bovis*, contamination and edema were significantly ( $p < 0.0001$ ) different between years and abattoirs (Table 2). The prevalence of poor bleeding and contamination were higher in 2010 and 2011. Pericarditis, *C. bovis* and edema were more prevalent in 2010, 2012 and 2013, respectively (Table 1). Poor bleeding was the major causes of condemnations of heart at Abergelle abattoir while pericarditis and *C. bovis* were more prevalent at Bishoftu abattoir. The prevalence of contamination and edema were higher ( $p < 0.0001$ ) at Kombolcha abattoir compared to other studied abattoirs. Poor bleeding was relatively higher ( $p < 0.0001$ ) in the dry season compared to the wet season (Table 3).

**Causes of condemnations of tongues:** Main cause of condemnations of tongues was abscess (4.71%). Condemnations due to *C. bovis*, contamination and edema were in the range between 0.26 and 0.79% (Table 1). The causes of condemnations of tongues were significantly different ( $p < 0.0001$ ) between years and abattoirs (Table 2). Abscess was relatively higher in 2010 and 2011 while *C. bovis* was higher in 2012 and 2013. Contaminations of tongues were higher in 2011 while edema was higher in 2013 (Table 1). Abscess and *C. bovis* were higher ( $p < 0.0001$ ) at Abergelle and Bishoftu abattoirs, respectively while contamination and edema were higher ( $p < 0.0001$ ) at Kombolcha abattoir. *C. bovis* and edema were relatively higher ( $p < 0.0001$ ) in the wet season compared to the dry season (Table 3).

**Causes of condemnations of spleens:** The main causes of condemnations of spleen were splenitis (2.74%) and hematoma (1.65%). Condemnations due to contamination, splenomegaly, *H. cyst* and abscess were in the range between 0.16 and 0.72% (Table 1). These problems were significantly ( $p < 0.0001$ ) different between abattoirs. The prevalence of splenitis and hematoma were significantly ( $p < 0.0001$ ) affected by season (Table 2). These problems were mainly problems of Kombolcha abattoir particularly in the wet season (Table 3).

**Causes of condemnations of heads:** The main causes of condemnations of the heads were poor bleeding (18.77%) and bruising (17.05%). The prevalence of abscess, contamination and *C. bovis* were in the range between 0.10 and 3.46% (Table 1). These problems were significantly ( $p < 0.0001$ ) different between years and abattoirs (Table 2). Poor bleeding, bruising and contamination were higher in 2011 while abscess and *C. bovis* were higher in 2010 and 2012, respectively. Poor bleeding, bruising, abscess and contamination were the main causes of condemnations of head at Abergelle abattoir while *C. bovis* was relatively higher Bishoftu abattoir. Poor bleeding was relatively higher ( $p < 0.0001$ ) in the dry season compared to the wet season (Table 3).

**Causes of condemnations of intestine:** Intestine was condemned due to abscess (0.08%), *C. bovis* (0.01%) and *H. cyst* (0.02%); Table 1). These problems were exclusively observed at Bishoftu abattoir (Table 3). The prevalence of abscess was relatively higher ( $p < 0.0001$ ) in 2012 and in the wet season (Table 1 and 3).

## DISCUSSION

**Whole carcass condemnations:** The results of the present study revealed that there were several disease conditions associated with the condemnations of carcasses and organs at local and export abattoirs in Ethiopia. The causes of condemnations of whole carcasses in the present study were similar to that reported in Ontario, Zambia and Tanzania (Phiri, 2006; Alton *et al.*, 2010; Mellau *et al.*, 2011). The prevalence of *C. bovis*, TB and *H. cyst* in the present study were

comparable to the report in Ethiopia, Cameron and Tanzania (Asseged *et al.*, 2004; Awah-Ndukum *et al.*, 2007; Mellau *et al.*, 2011). The lower prevalence of *C. bovis*, TB and H. cyst in the current study should not be underestimated as these diseases are zoonotic in their nature. Bovine tuberculosis is an important infectious disease of Ethiopian cattle whose existence has been documented in almost all parts of the country (Biffa *et al.*, 2010). This suggests the need to implement an annual monitoring program to minimize the incidence in the future.

**Partial carcass condemnations:** Partial condemnations of carcasses due to bruising in the present study was lower than the 40% reported in USA and 41.1-63.1% reported at a municipal abattoir in South Africa (Boleman *et al.*, 1998; McKenna *et al.*, 2002; Vimiso and Muchenje, 2013). However, it was comparable to the 34% reported in Canada in 2011 (Beef Cattle Research Council, 2011). In the present study bruising has shown a decreasing pattern over the year. This suggests the possibility of intervention either by the abattoirs or farmers supplying cattle to the abattoirs to minimize the prevalence of bruising. The higher prevalence of bruising at Abergelle abattoir indicates the need to create awareness on handling and transporting cattle for people involved in supplying cattle to the abattoir in this region. Higher prevalence of bruising in the dry season compared to the wet season in the present study might be due to an increase in physical stress due to long distance traveled by cattle in search of feed and high temperatures. Bruising does not only minimize carcass yield but can also be a cause of DFD carcasses. Bruised cattle are stressed and are expected to produce an abnormally high pH in the muscle because of glycogen depletion and the subsequent lower production of lactic acid in the muscles (Kannan *et al.*, 2002). Hence, it is important to minimize the prevalence of bruising as it affect on meat quality is double folded. Poor bleeding was the other important problem during the study period. Poor bleeding can be caused by stress, ineffective stunning techniques and ineffective sticking techniques (MOA., 2010). This problem can make blood vessels filled with blood causing the carcass to have an overall darker red color. The change in the appearance affects the visual acceptability of a carcass (Gregory, 2004). Meat from such a carcass will have poor lasting qualities. Because of these associated effects, the fate of incomplete bleeding of carcasses is condemnation (MOA., 2010). The exclusive observation of this problem at Abergelle abattoir indicate the need to investigate the cause of this problem whether emanated from stress of animals prior to slaughter, ineffective stunning or sticking techniques and take appropriate measure to minimize the prevalence. Similar to poor bleeding, the condemnations of partial carcass due to contamination have shown a decreasing trend across the year and were exclusively observed at Abergelle abattoir. The soiling, contamination by visceral content, blood splash and abscess were the main causes of contamination. Tag (manure and mud) on the hide of the cattle is the major cause of contamination of carcasses in the beef industry. The audit conducted in Canada in 2010/2011 indicated that 85.3% of fed and 20.6% of non-fed cattle contained tag on their hides (Beef Cattle Research Council, 2011). The higher prevalence of condemnation of partial carcasses due to contamination in the wet season compared to the dry season, strengthen the speculation that the hide of cattle might be the causes of contamination of carcasses as the wet weather favors soiling of hides due to wet ground. The problem of contamination and adhesion of carcasses are due to operation management defects (Goetzinger, 2006). As these problems were observed at the Abergelle abattoir, measures should be taken to minimize these problems by implementing good management program at this abattoir. In the present study, the significant difference in the prevalence of abscess, calcified cyst, *C. bovis*, H. cyst and edema between abattoirs studied suggest the need to develop different strategy for regions these abattoirs are located to minimize the prevalence of these problems.

### **Condemnations of organs**

**Liver:** The prevalence of fascioliasis of liver in the present study was comparable to the report in Zambia and higher than the report in Tanzania (Phiri, 2006; Mellau *et al.*, 2011). Because of an increase in the prevalence of this disease across the year, it is important to monitor its development and develop appropriate strategies to reduce the problem (Mungube *et al.*, 2006). Significant differences in the prevalence of the disease among abattoirs may be due to the agro-ecological and climatic differences between the regions in which abattoirs are located. Differences in cattle management systems in different region may also contributed to variation in the prevalence of diseases. Abergelle abattoir is located in a region which received relatively lower annual rainfall. Most of cattle supplied to this abattoir came from a mixed crop-livestock production system while most of those supplied to Beshoftu and Kombolcha abattoir came from agro-pastoral production system. The prevalence of fascioliasis throughout the year might be due to the chronic nature of the disease in the study areas as chronic fascioliasis is able to exist in all seasons (Kahn and Line, 2005).

The lower prevalence of the cyst at Kombolcha abattoir compared to the other abattoirs might be due to the religious prohibition of keeping dogs practiced by those communities supplying cattle to the abattoir as the life cycle of the parasite involves dogs as definitive host. Similar to the present study prevalence rate of 5.92% was reported at Kombolcha abattoir between 2003 and 2007 (Abunna *et al.*, 2012). The prevalence of calcified cyst on liver in the present study was higher than the 1.9% reported in Tanzania (Mellau *et al.*, 2010). The actual cause of the calcification in the present study was not established but problems like cirrhosis, hydatidosis, *C. bovis* and tumor might have been the cause. The prevalence of *C. bovis* in the present study was higher than the 2.55% reported in Northern Ethiopia (Assefa and Tesfay, 2013). In Ethiopia, there is a practice of eating raw meat and liver. In such circumstance, it is important to eliminate the incidence of this parasite from the livestock sector to safe guard the health of the society. In long term, changing the attitude of the society to abstain from eating raw meat will help to break the life cycle of the parasite. As this problem was higher at Abergelle abattoir, a strategy should be developed to minimize the exposure of cattle to infective eggs from human faeces/sewage in the region supplying cattle to this abattoir. Condemnations due to poor bleeding of liver in the present study was comparable to the report in Tanzania (1.1%) and lower than the report in Nigeria (2.9%), Brazil (2.5%) and Bangladesh (3.8%) (Rosa *et al.*, 1989; Cadmus and Adesokan, 2009; Mellau *et al.*, 2010). The causative agent of abscess of the liver needs to be identified so that appropriate measures can be taken in the future.

**Lung:** The causes of condemnations of lungs reported in Northern Tanzania, Northern Ethiopia and Zambia (Phiri, 2006; Mellau *et al.*, 2011; Assefa and Tesfay, 2013) were similar to the present study. The prevalence of H. cyst was higher in lungs compared to other organs in the present study. The prevalence of pneumonia was higher compared to the 4% report in Tanzania and 1% report in North Ethiopia (Mellau *et al.*, 2011; Amuamuta *et al.*, 2012). The problem of emphysema was higher than the 1.73% reported in Tanzania and 4.4% reported in Northern Ethiopia (Mellau *et al.*, 2011; Amuamuta *et al.*, 2012).

**Kidney:** The causes of condemnations of kidneys in the present study were similar to that reported in other studies (Mesele *et al.*, 2012; Mellau *et al.*, 2011; Phiri, 2006). However, the prevalence of nephritis in the present study was relatively higher than the report in these studies. The causes of this problem should be identified and a strategy should be developed to minimize the problem

in the future. The prevalence of hydronephrosis in the present study was comparable to the report in Zambia and Tanzania (Phiri, 2006; Mellau *et al.*, 2011). The causes of urethral obstruction which was the cause for hydronephrosis should be identified and preventive action need to be planed in the future.

**Heart:** The prevalence rate of pericarditis in the present study was higher than the 0.8 and 1.04% reported in Zambia and Tanzania (Phiri, 2006; Mellau *et al.*, 2011). The prevalence of *C. bovis* in the present study was relatively higher than the prevalence of this problem in Adigrat and Jimma abattoirs in Ethiopia which were 0.27 and 0.8%, respectively (Megersa *et al.*, 2010; Assefa and Tesfay, 2013).

**Tongue:** The prevalence of abscess and *C. bovis* were higher than 0.2 and 0.02%, respectively, reported in Zambia (Phiri, 2006). These problems have shown a decreasing pattern across the year.

**Spleen:** The prevalence of Splenitis, hematoma, contamination and splenomegaly problems were relatively higher than the report in Tanzania (Mellau *et al.*, 2011). The causes of these problems in the present study need to be investigated to develop preventive measure in the future.

**Head:** The prevalence of abscess and *C. bovis* in the present study was higher than the report in Tanzania and Zambia (Phiri, 2006; Mellau *et al.*, 2011). The problem had shown a decreasing pattern across the year.

## CONCLUSION

From the present study it was concluded that several disease problems were associated with the condemnations of carcasses and organs in Ethiopia. Most of these problems differed significantly between years and abattoirs. The problems of fasciola, nephritis and hydronephrosis have shown an increasing pattern across the year. Bruising, contamination, poor bleeding and pneumonia were the major problems at Abergelle abattoir while renal and intestinal problems were the main problems at Bishoftu abattoir. Condemnations of spleen due to different diseases were the major problems at Kombolcha abattoir. It is therefore recommended that different strategies should be developed to minimize these problems over the year and different regions due to the dynamic nature of the diseases.

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