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Prevalence of Indigestible Foreign Bodies in Rumen and Reticulum of Cattle Slaughtered at Dire Dawa Municipal Abattoir, Eastern Ethiopia

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Abstract
A cross-sectional study was conducted with the aim of identifying and assessing the prevalence of indigestible rumen and reticulum foreign body in cattle with respect to its risk factors from October 2017 to April 2018 at Dire Dawa Municipal Abattoir, Eastern Ethiopia. A total of 384 cattle were considered in this study by randomly selected. Before postmortem examination employed ante mortem examination performed for characterization of selected animal. Out of total 384 cattle examined 154(40.1%) were found positive for presence of indigestible foreign bodies in their rumen and reticulum. The prevalence of foreign bodies was significantly ($\chi 2 = 25.817$, $p < 0.05$) higher in female (54.4%) than male cattle (29.0%). The prevalence of foreign bodies in relation to breed was higher in cross breed (56.2%) animals than that of local breed (38.6%). More of the foreign body collected was significantly higher ($\chi 2 = 69.138$, $p< 0.05$) in poor (71.2%) than medium (52.9) and good body condition score (18). The result evidenced (21.4% in young, 40.8% in adult and 70.3% in old) that age has also significant association ($\chi 2 = 40.626$, $p< 0.05$) within different age group of animals for foreign bodies. This study revealed a higher percentage of foreign bodies occurred in the rumen (78.0%) than in the reticulum (10.1%), with the remaining percent present in both rumen and reticulum. A Plastic (53.4%) was the most harbored foreign material from rumen while metallic material (35.3%) was more detected in reticulum. Results of this study showed that may be inappropriate disposal of solid waste garbage on the environments that have high risk for animal and environmental pollution. Therefore, responsible government like environmental activists, Policy makers, Livestock professionals, and community should give attentions to reduce further problem by educating the society on the risk of improper disposal of plastic and other materials.
Keywords: Cattle, Indigestible foreign bodies, Rumen, Reticulum, Prevalence, Dire Dawa, Abattoir.
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1. Introduction

Ethiopia is believed to have the largest population of livestock in Africa. The total cattle populations of the country are estimated to be about 59.5 million. Out of this number female constitute 55.5% and male 44.5% whereas the number of goat and sheep are estimated to exceed 60 million (CAS, 2017). This Livestock are a source of high-quality food for human consumption and contribute to the economic development of country by production of hides, skins, manure as fertilizer, income, and foreign exchange and drought power in working agriculture for increasing the productivity of smallholding farmers (SCA, 2015). However, the contribution of livestock in the economic development of country is below their expected potential due to prevalent livestock diseases, poor management system and poor genetic performance, shortage of veterinary services, lack of attention from government, and recurrent drought (Desiye and Mersha, 2012; Abdela and Jilo, 2016).

Environmental pollution is one of the growing problems for free grazing animals due to absence of recycling industries, cleaning of environmental cultures, improper disposal of plastic material, leather and metal in towns and villages. These materials are indigestible and accumulate in the rumen and reticulum of grazing animals may lead to adverse effect on health (Baumont, 1996; Ghurashi *et al*., 2009). The contaminations by solid wastes from domestic and commercial sources are common problem of developing countries (Bwatota *et al*., 2018).

Ingestion of foreign body is one of the non-infectious diseases of the fore-stomach of livestock and known to obstruct the digestive functions of gastero intestinal tract (Remi *et al*., 2004). The pathogenesis of diseases often begins with ingestion of indigestible material causing gradual reduction in weight, reproduction, feed absorption and productivity, and death (Mushonga *et al*., 2015). Ingestion is mainly associated with nutritional deficiencies, pollution of grazing area and poor feeding management (Negash *et al*., 2015).

Foreign body in diseases of rumen and reticulum are great economic importance because of severe losses from productivity to the death of the animals (Radostits *et al*., 2007; Berrie *et al*., 2015). Penetrating foreign body causes local traumatic reticulo-peritonitis in organ characterized by varying degrees of locally abscesses and extensive fibrous adhesions between the organs, which lead to form complication (Berrie *et al*., 2015).

Livestock, especially cattle, have been known to ingest indigestible material such as plastics, nails, rubber, wire, wood, ropes, especially during periods of drought in feed scarcity (Sheferaw*et al*.,2014). Lack of highly

sensitive prehensile organs of cattle like lips and tongue make them ingest foreign bodies with or without feed (Singh and Nigam, 1981; Mekuanint *et al*., 2017) These indigestible foreign bodies are classified into two categories: metallic and nonmetallic origin (Misk *et al*., 2001). In Ethiopian, information regarding to the magnitude and prevalence of indigestible foreign bodies in fore stomach of cattle is very limited; despite the fact that, many animals are managed in contaminated area.

Therefore, the main aim of this study was-

- To estimate the prevalence of indigestible foreign body in cattle slaughtered at Dire Dawa Municipal Abattoir, Eastern Ethiopia.
- To identify types of indigestible foreign bodies in fore stomach of cattle.
- To assess the associated risk factors with the explanatory variables (sex, age, body condition score and breed).

2. Materials and Methods

2.1. Study Area

This study was conducted from November 2017 to April 2018 at Dire Dawa Municipal Abattoirs, in Dire Dawa Administration council. The town is located in the eastern part of Ethiopia at about 515km from capital, Addis Ababa and it lies approximately between 9°27' and 9°49' N latitude and 41°38' and 42°19' E longitude. The altitude of DDA ranges from 960 mean above sea level in the northeast to 2450 mean above sea level in the southwest and characterized by only two broad agro-ecological zones (AEZs): the *Kola* AEZ (below 1500m) and *Woina Dega* (above 1500m It shares boundary to the South, South-East and South-West with Eastern Hararghe zone of the Oromia regional state and the North, North-East and West with Shinile zone of Somali regional state (Abduljawad *et al*., 2011).

2.2. Study Population

The study animal was cattle, which came from Dire Dawa and their surrounding areas for slaughter. These animals had been kept under the traditional extensive and semi-intensive management systems, which constituted cross and local breeds.

2.3. Study Design

A cross-sectional study was conducted to estimate the prevalence and types of indigestible foreign bodies ingested by cattle in the study area and associated risk factors like sex, age, body condition and breed were considered. The study was done from November 2017 to April 2018.

2.4. Study Methodology

Before post mortem examination of selected animals, ante mortem inspection were performed for recording of animals' sex, age, breed and body condition. The age of the cattle were categorized as young, adult and old according to CABSESP, (2013) and body condition score were also grouped into poor, medium and good according to Nicholson and Butterworth, (1986) after some modification. The post mortem inspection was performed for those animals that passed the anti-mortem inspection. Their rumen and reticulum was incised and examined by visual inspection and recorded it.

2.5. Sample Size Determination

As there is no comprehensive study on the prevalence of indigestible foreign bodies in this specified area, the sample size for the study was estimated by taking expected prevalence of 50%, accepted error 5% and confidence level of 95%, according to the formula given by Thrusfield (2005)

$n = (1.962 * P_{exp} (1—P_{exp}))/d^2$

Where n = required sample sizeP_{exp}=Expected prevalenced^2 = Desired absolute precision (5%) Based on this formula, the total numbers of respondents to be included in the questionnaire survey were 384.

2.6. Data Management and Analysis

Collected data were stored in Microsoft Excel database system for data management and analyzed by SPSS software. Analyze was done using frequency distribution, Chi-square or Fisher's exact tests performed to evaluate the differences in the occurrence of foreign bodies among categorical variables. A P-value < 0.05 was considered as statistically significant.

3. Results

3.1. Overall occurrence of foreign bodies in rumen and reticulum

During the study, 384 cattle were examined for presence of indigestible rumen and reticulum foreign bodies. Out of these cattle, 154 (40.1%) were found positive for different kinds of foreign bodies in their rumen and

reticulum. This difference in prevalence of foreign bodies in rumen and reticulum was statistically significant ($p< 0.05$). Types of foreign bodies were metallic and non-metallic materials like plastic, pieces of cloth, rope and stone.

3.2. Foreign body types and distribution in the rumen and reticulum

The types of foreign bodies observed were non-metallic (plastics, cloths, rope, stone and their mixed) and metallic materials. From 168 total foreign bodies counted, 131(78.0%) of them was occurred in rumen while 17(10.1%) in reticulum and the rest of percentage was observed in both of rumen and reticulum (Table 1). Plastic materials was the most common foreign bodies observed in rumen 53.4% followed by 20.6% cloths and 16.7% ropes while 35.5% of metal was the most common foreign bodies observed in reticulum (Table 2).

Table1. Frequency of foreign bodies in rumen and reticulum

Types of organ	No of organ examined	Frequency	Percentage
Rumen	384	131	78.0
Reticulum	384	17	10.1
Rumen and Reticulum	384	20	12.0

3.3. Prevalence of Foreign Body in relation to sex, age, body condition score and breed

With regard to foreign bodies in association with sex, 54.4% (92/169) and 29.0% (62/215) of females and males were found positive, respectively (Table 3). Statistical analysis showed that the prevalence of foreign bodies was significantly associated between both sex ($p < 0.05$).

The prevalence in relation to age of examined cattle was 21.4%, 40.8% and 70.3% in young, adult and old, respectively (Table 3). This difference was statically significant ($p<0.05$).The total foreign body prevalence in the poor, medium and good body conditioned group of animals was 71.2%, 52.9% and 18%, respectively (Table 3).From the total 384 animals examined, 32 were cross breeds and 352 were local breeds. Foreign bodies were detected in both breeds in different distribution. The prevalence of fore stomachs foreign bodies were higher in the cross breeds 56.2% than that of local breeds' cattle 38.6%. The occurrence of foreign body was statically slightly significant difference ($p=0.05$) between local and cross breed cattle (Table 3).

Table 2. Frequency occurrence of foreign bodies according to their nature and location

	Rumen		Reticulum		Rumen & Reticulum		
IFB*	No	%	No	%	No	%	Total
Plastics	70	53.4	2	11.7	7	35	79
Cloths	27	20.6	4	23.5	5	25	36
Rope	22	16.7	1	5.8	4	20	27
Plastics, cloths	7	5.3	--	--	1	5	8
Plastic, cloths & rope	5	3.8	--	--	--	-	5
Stone	--	--	4	23.5	1	5	5
Metal	--	--	6	35.3	2	10	8
Total	131	100.0	17	100.0	20		168

*IFB= Indigestible foreign body; n= number foreign bodies

Table 1: Occurrence of foreign bodies according to sex, age, body condition score and breed.

Risk factors		Animal examined	Positive animals	Prevalence (%)	X^2	*(P-value)*
Sex	Female	169	92	54.4	25.817	0.000
	Male	215	62	29.0		
Age	Young	112	24	21.4	40.626	0.000
	Adult	208	85	40.8		
	Old	64	45	70.3		
Body	poor	59	42	71.2	69.139	0.000
Condition	Medium	153	81	52.9		
	Good	172	31	18		
Breed	Local	352	136	38.6	3.789	0.050
	Cross	32	18	56.2		

4. Discussion

The current study showed that the overall foreign body prevalence was 40.1% (154/384) in rumen and reticulum of cattle slaughtered at Dire Dawa Municipal Abattoir. This finding is in agreement with the reports of Negash *et al.* (2015) who reported 43.4% (144/332) foreign body in cattle slaughtered at Haramaya University and

Haramaya municipal abattoirs, Sheferaw *et al*. (2014) reported 41.8% (167/400) from free grazing ruminants in Amhara Region, and Mekuanint *et al.* (2017) also reported 35.7% (137/384) from cattle in ruminants slaughtered at Addis Ababa Abattoir Enterprise. However, the prevalence of foreign body in the current study is greater than some reports of other region of Ethiopia and abroad, for instance Tesfaye *et al*. (2012) reported 23.9% (92/384) from cattle slaughtered at Hirna municipal abattoirs, Bassa and Tesfaye, (2017) reported 17.16% (103/600) prevalence of foreign body from cattle slaughtered at Wolaita Sodo municipal Abattoir, Ethoipia. Rahel, (2011) and Ushula and Nana, (2017) reported 17.07% and 18.3% (55/300) prevalence respectively from cattle slaughtered at Hawasa Municipal Abattoir. Similar lower prevalence was reported 17.4% (219/1261) by Mushonga *et al*. (2015) from Rwanda and 24.02% by Bwatota *et al*. (2018) from Tanzania. In contrast, much higher prevalence of foreign bodies was reported by Khurshaid *et al*. (2013) 59.14% (207/350) from cattle slaughtered in regions of khyber pakhtunkhwa, Pakistan and 77.41% reported by Ismael *et al*. (2007) from adult dairy cattle cases suffering due to recurrent rumen tympani having indigestible foreign bodies in Jordan. These variations in the prevalence of foreign bodies between different study areas may be associated with in improper disposal of indigestible material on grazing environment and improper animal management in the rural, urban and pre-urban. Roman and Hiwot, (20l0) reported that this difference is due to origin of animals presented for slaughter and type of waste management system between the countries.

The higher occurrence of foreign bodies in the current study area is probably related to widespread use and improper disposal of plastics bags and other indigestible material. The other intensified problem of this study area is scarcity of grazing land due to small rural agricultural land is almost occupied by chat (“Jimaa” in local name) and area is repeatly affected by drought which causes shortage of animal feed. These factors increased the chance of animals to ingest indigestible foreign material scattered on the field. The nutritional deficiencies specifically, calcium, phosphorus and other micronutrients causes indiscriminate feeding habit of animal to ingest indigestible foreign material (Hailat *et al*., 1996).

This study revealed that more indigestible foreign bodies was higher only in rumen 78.0% than reticulum 10.1% and the rest of percentage was occurred in the both of them. This result is agreed with the reports of Tesfaye *et al*. (2012) who found 67.3% in rumen and 32.7% in reticulum, Negash *et al*. (2015) reported 87.9% in rumen and 5.0% in reticulum from all ruminants and Sheferaw *et al.* (2013) gets 88% in rumen and 14.4% in reticulum. The finding of more foreign bodies in the rumen than reticulum is due to rumen is larger volume and first room for accumulation of ingesta (Hailat *et al*., 1996).The ingested feed that have high density with small in size are settle down toward reticulum and bottom of the rumen while that have low density floating in the rumen. This actually may be due to gravity (Hailat *et al*., 1996; Bwatota *et al*., 2018).

Plastic 53.4% was the most common indigestible foreign materials encountered from rumen followed by 20.6% cloths, 16.7%% rope while metal is the most prevalent in reticulum 35.5%.This finding is agreed with most of reporter. Mekuanint *et al*. (2017) reported 46.1% of plastics bags, Hailat *et al*.(1996) reported 74% from the rumen of sheep in Jordan, Remi-Adewnmi *et al*. (2004) recorded 85% of plastics from rumen impaction of cattle, sheep and goats slaughtered at Addis Ababa Abattoir Enterprise, Berrie *et al.* (2015)recorded 42.3% from cattle slaughtered at Gondar Elfora Abattoir. Bwatota *etal*. (2018) observed the 50.5% Plastic bags from cattle slaughtered at Morogoro Municipal Slaughterhouse, Tanzania. The most of reporter revealed that plastics bags is high prevalent than other rumen and reticulum ingestible foreign body. The reason for high prevalence of plastics bags and other non- metabolic foreign bodies in different country is due to rapid industrialization, garbage disposal, more urbanization (Reddy *et al*., 2014) absence of recycling industries in most of developing country, overcrowding of herd with insufficient feeding, plastics is easily move from one place to other by wind. The reason for high metallic prevalence in reticulum is due to gravity.

The present study revealed that 54.4% and 29.0% prevalence of foreign bodies in fore stomach of female and male cattle, respectively. This result agreed with work of most reporter like Berrie *et al.* (2015) who observed 87% in dairy cattle affected by foreign body. Vikhaya *et al.* (2017) also reported 66.2% in female and 33.8% in male at Queenstown abattoir and 56.1% in female and 43.9% in male at East London Abattoir, South Africa, Mushonga *et al.* (2015) is another reporter who reports 20.0% in female and 15.7%.in male from Rwanda and Bwatota *et al*. (2018) indicated 61.5% of female crossbred than 23.0% male cross breed cattle, Tanzania. The reasons for this difference may be associated with the level of milk yield, which requires high demand of nutrition during pregnancies and lactation period of female animal (Berrie *et al*., 2015). Another reason may be reduced stomach capacity of female animal to take enough amount of feed during their advanced pregnancy.

Ushula and Nana, (2017) 63.6%, Desiye and Mersha, (2012) 80% and other were reported a higher prevalence in aged cattle than other age group. In this study, the same findings 70.3% were investigated. This is due to accumulation of different types of foreign bodies in fore stomach of cattle throught their lifetime.

In this study, most of the indigestible foreign bodies were found in cattle of poor body condition as we compared with other body condition. The result of this study indicated that 71.2% prevalence of poor body condition which is significantly higher ($\chi 2 = 69.138$, $p < 0.05$) than in those with medium 52.9% and good body condition 18.0%. This finding is in agreement with the reports of Mushonga *et al*. (2015), Negash *et al.* (2015),

Ushula and Nana, (2017), Bassa.K and Tesfaye, (2017), Bwatota *et al.* (2018) and other related reports. The losses of body condition is due to indigestible material lodged and compress ruminal space which interfere with normal physiology of rumen and reticulum function (Remi-Adewunmi *et al*., 2004) and reduce absorption of volatile fatty acids and minerals. Accumulation of ingested foreign bodies prevents animals from attain good and healthy body condition.

In the present study, the prevalence of foreign bodies is higher in crossbred 56.2% cattle than local breed 38.6% cattle. This difference might be associated with the high productivity of cross breed animal than local breed. Cross breed animal have more feeding ability and high desired appetite than local breed due to their high productive than local breed. The recorded result is agreed with report of Desiye and Mersha, (2012) 70% in cross breed and 10.77% in local breed, Bwatota *et al.* (2018) 42.3% in cross breed and 22.7% in local breed and Rahel (2011) 58.82% prevalence of foreign bodies in cross breed were reported.

5. Conclusion and Recommendations

This study showed that there was high prevalence of rumen and reticulum foreign bodies of cattle in study area. This result indicated that may be associated with widespread distribution of solid waste foreign bodies' material in environment, especially plastics or improper animal managements by owners. The higher prevalence of indigestible foreign materials was encountered from female, cross breed, old and poor body conditioned animals than other with higher frequency in rumen than reticulum. The rumen has more harbored plastics while reticulum harbored metallic materials due to its gravitational force. Accumulation of these indigested material in fore stomach of animal might reduce economy of producer due to loss of production and prevent animal from attain good body condition even cause death of animal. Based on the above conclusions the following recommendations were forwarded:

- To reduce plastics and other indigestible environmental contamination, community should encourage using biodegradable paper bags.
- The responsible government and community should give attentions to reduce further problem.
- Government should provide legislations regarding the proper disposal of wastes from households and factories and enforce factory to replace non-biodegradable with degradable plastics paper to reduce pollution of the environment.
- The farmers should manage their herd properly by providing nutrition and controlling animals from access to indigestible materials.

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