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Study on prevalence of indigestible foreign bodies in rumen and reticulum of cattle slaughtered at Bedeno Woreda Municipal Abattoir, Eastern Ethiopia

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Abstract

From October 2020 to April 2021, a cross-sectional study was undertaken at Bedeno Woreda Municipal Abattoir in Eastern Ethiopia with the goal of identifying and characterizing the prevalence of cattle indigestible rumen and reticulum foreign body, as well as its risk variables. This study included 384 cattle that were chosen at random. Prior to postmortem examination, an ante mortem examination was used to characterize a specific animal. A total of 154 (40.1%) of the 384 cattle evaluated were found to have indigestible foreign materials in their rumen and reticulum. Female cattle (54.4 percent) had a substantially greater prevalence of foreign bodies (2 = 25.817, p 0.05) than male cattle (29.0 percent). In terms of breed, the prevalence of foreign bodies was higher in cross breed (56.2 percent) animals than in local breed animals (38.6 percent). Poor (71.2 percent) had substantially more foreign bodies collected (2 = 69.138, p 0.05) than medium (52.9) and good (52.9). Score for bodily condition (18). The results showed that age has a significant connection (2 = 40.626, p 0.05) among different age groups of animals for foreign bodies (21.4 percent in young, 40.8 percent in adults, and 70.3 percent in old). The rumen was shown to have a higher percentage of foreign bodies (78.0%) than the reticulum (10.1%), with the remaining percent present in both the rumen and the reticulum. Plastic (53.4%) was the most commonly found foreign material in the rumen, while metallic material (35.3%) was found in the reticulum. The findings of this study revealed that improper solid waste garbage disposal in habitats poses a considerable danger of animal and environmental damage. As a result, the responsible government and community should focus their efforts on preventing the problem from worsening.

Keywords: Cattle, indigestible foreign bodies, rumen, reticulum, prevalence, abattoir

1. Introduction

Ethiopia is thought to have Africa's greatest livestock population. The country's overall cattle population is estimated to be around 59.5 million. Females account for 55.5% of this total, while males account for 44.5%, with a total of 60 million goats and sheep (CSA, 2017) ^[1].

This Livestock provides high-quality food for human consumption and contributes to the country's economic development by producing hides, skins, manure as fertilizer, income, and foreign exchange, as well as drought power in working agriculture to help smallholder farmers increase their output (CSA, 2015) ^[2]. However, due to frequent livestock diseases, poor management systems and poor genetic performance, appropriate veterinary services, lack of government attention, and recurring drought, livestock contributions to the country's economic development are below their predicted potential (Desiye and Mersha. 2012; Abdela and Jilo, 2016) ^[3, 4].

Due to pollution, one of the growing concerns for free-grazing animals is environmental pollution. In cities and villages, there are no recycling companies, environmental cultures are being cleaned up, and plastic, leather, and metal are being disposed of improperly. These compounds are indigestible and build up in the rumen and reticulum of grazing animals, potentially causing health problems (Baumont, 1996; Ghurashi *et al.*, 2009) ^[5, 4]. Solid waste contamination from residential and commercial sources is a prevalent issue in developing

countries (Bwatota *et al.* 2018) [7] Foreign body ingestion is a non-infectious illness of the forestomach in animals that have been shown to block the digestive activities of the gastro intestinal tract (Remi-Adewunmi *et al.*, 2004) [8]. Disease pathogenesis frequently begins with the consumption of indigestible material, which results in a slow loss of weight, reproduction, feed absorption and productivity, as well as mortality (Mushonga *et al.* 2015) [9]. Ingestion is linked to nutritional deficits, grazing area contamination, and inadequate feeding management (Negash *et al.* 2015) [10].

Foreign bodies in rumen and reticulum disorders have a high economic impact due to severe productivity losses and animal death (Radositis *et al.*, 2007; Berrie *et al.*, 2015) [11, 12]. When a foreign body penetrates an organ, it causes local traumatic reticulo-peritonitis. Localized abscesses and severe fibrous adhesions between the organs may major complications (Berrie *et al.*, 2015) [12].

In addition to plastics, nails, rubber, wire, wood, and ropes, livestock, particularly cattle, have been known to eat indigestible material such as plastics, nails, rubber, wire, wood, and ropes, particularly during periods of drought and feed scarcity (Shiferaw *et al.* 2013) [13]. Cattle with a lack of extremely sensitive prehensile organs such as the lips and tongue consume foreign materials with or without food (Singh and Nigam 1981; Mekuanint *et al.* 2017) [14, 15]. Metallic and nonmetallic foreign bodies are classed as indigestible foreign substances (Misk *et al.*, 2001) [17]. In Ethiopia, there is relatively little information about the quantity and prevalence of indigestible foreign materials in cattle's foreguts; yet, many animals are managed in contaminated areas.

As a result, the primary goal of this research was to-

- The purpose of this study was to determine the prevalence of indigestible foreign bodies in cattle slaughtered at the Bedeno Woreda Municipal Abattoir in Eastern Ethiopia.
- To identify different sorts of indigestible foreign items non cattle's foregut.
- To discover the risk factors that are linked to the explanatory variables

2. Materials and Methods

2.1 Study Area

The research was carried out in the Bedeno Woreda Municipal Abattoirs from October 2020 to April 2021. Bedeno Woreda is 547 kilometers east of Addis Abeba and 47 kilometers west of Harar. The woreda is divided into three climate zones, with a total area of 97410 hectares. Temperate wet, tropical rainy, and tropical dry agro-climatic zones cover approximately 32%, 48%, and 21% of the entire land, respectively. The area's latitude and longitude are 8° 52' 30" N, 90° 13' 30" E and 41° 30' 0" E, 41° 50' 0" E, respectively. The woreda's altitude spans from 1200 to 3381 meters above sea level, with an average annual temperature of 22 degrees Celsius and an average annual rainfall of 400 to 1200 millimeters.

2.2 Study Population

The research animals are cattle that were brought in for slaughter from Bedeno and the neighboring districts. These animals were raised in traditional extensive and semi-intensive management techniques, resulting in local breeds.

2.3 Research Methodology

In order to determine the prevalence and types of indigestible foreign bodies swallowed by cattle in the research region, a

cross-sectional study was done, with risk factors such as sex, age, physical condition, and breed taken into account. The research took place between October 2020 and April 2021.

2.4 Research Methodologies

An ante mortem inspection was performed on selected animals prior to post mortem examination to document the animals' sex, age, breed, and bodily condition. According to (CABSESP, 2013) [17], the cattle's age was classified as young, adult, and old, and their body condition score was classified as bad, medium, and good, with some modifications, according to (Nicholson and Butterworth, 1986) [18]. Those animals who passed the anti-mortem inspection were subjected to a post-mortem examination. Their rumen and reticulum were incised and visually examined before being documented.

2.5 Determination of Sample Size

Because there has been no extensive study on the incidence of indigestible foreign bodies in this specific area, the sample size for the study was calculated using Thursfield's formula (2005) [19], with an expected prevalence of 50%, an accepted error of 5%, and a confidence level of 95%. As a result, 384 cattle were included in the study.

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

Where, n is the required sample size, d is the desired absolute precision, and P_{exp} is the predicted prevalence, a total of 384 animals will be chosen at random for the study.

2.6 Data Analysis and Management

For data management, the collected data were saved in a Microsoft Excel database system and analyzed using SPSS software. To analyze the variations in the occurrence of foreign bodies among categorical variables, frequency distribution, Chi-square, or Fisher's exact tests were used. Statistical significance is defined as a P-value of less than 0.05.

3. Results

3.1. Frequency of foreign bodies in the rumen and reticulum

As a whole 384 cattle were evaluated for the presence of indigestible rumen and reticulum foreign bodies during the investigation. 154 (40.1%) of the animals tested positive for foreign bodies in their rumen and reticulum. There was a statistically significant difference in the prevalence of foreign bodies in the rumen and reticulum (p 0.05). Various types of foreign bodies were identified.

Table 1: 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
Total	168		100.00

3.3. Foreign Body Prevalence in Relation to Gender, Age, Body Condition Score, and Breed

Foreign bodies in conjunction with sex were discovered positive in 54.4% (92/169) of females and 29.0% (62/215) of males, respectively (Table 3). The occurrence of foreign

bodies is substantially related with male and female ($p < 0.05$) according to statistical research. The prevalence of young, adult, and elderly cattle was 21.4%, 40.8%, and 70.3%, respectively, in young, adult, and old cattle (Table 3). This was a statistically significant change ($p < 0.05$). Total foreign body prevalence was 71.2%, 52.9%, and 18%, respectively, in

the poor, medium, and well-body conditioned groups of animals (Table 3).

There were 32 cross breeds and 352 native breeds among the 384 animals tested. Foreign bodies were found in both breeds, albeit in varying amounts. The prevalence of foregut foreign bodies was higher in cross breeds (56.2%) than in purebreds.

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

IFB*	Rumen		Reticulum		Rumen & Reticulum	Total	
	n	%	n	%	Frequency	%	
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 and textiles	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
%	78.0		10.1		12.0		

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

Table 3: Occurrence of foreign bodies according to sex, age, and body condition score and breed.

Factors that are at risk	Examining the animal		Animals that are Prevalence (%) positive	X2 (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 Condition	poor	59	42	71.2	69.138 (0.000)
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 prevalence of foreign bodies in the rumen and reticulum of cattle slaughtered at the Bedeno Woreda Municipal Abattoir was found to be 40.1% (154/384) in the current study. This data is consistent with Negash *et al.* (2015) [10], who found that 43.4% (144/332) of calves slaughtered at Haramaya University and Haramaya Municipal Abattoirs had foreign bodies. Shiferaw *et al.* (2013) [13], found 41.8% (167/400) of cattle in ruminants murdered at Addis Ababa Abattoir Enterprise, and Mekuanint *et al.* (2017) [15] found 35.7% (137/384) of cattle in ruminants slaughtered at Addis Ababa Abattoir Enterprise. However, the prevalence of foreign bodies in the current study is higher than some reports from other regions of Ethiopia and abroad. Such as Tesfaye *et al.* (2012a) [20] who reported 23.9% (92/384) prevalence of foreign body from cattle slaughtered at Hirna municipal abattoirs, Bassa and Tesfaye (2017) [21], who reported 17.16% (103/600), prevalence of foreign body from cattle slaughtered at Wolaita Sodo municipal Rahel (2011) [22], as well as Ushula and Nana (2017) [23], found 17.07% (55/300), and 18.3% (55/300) prevalence in cattle slaughtered in Hawasa Municipal Abattoir, respectively. Mushonga *et al.* (2015) [9], from Rwanda found 17.4% (219/1261) prevalence, whereas Bwatota *et al.* (2018) [7], from Tanzania, recorded 24.02% prevalence. Khurshaid *et al.*, (2013) [24], on the other hand, found a substantially greater prevalence of foreign bodies 59.14% (207/350) of cattle slain in Khyber Pakhtunkhwa, Pakistan, and 77.41% recorded by Ismael *et al.* (2007) [25] of adult dairy cattle cases in Jordan suffering from recurrent rumen tympani with indigestible foreign materials. These differences in the occurrence of foreign bodies between research regions could be linked to inefficient grazing

environment disposal of indigestible waste and poor animal management in rural, urban, and pre-urban settings. The discrepancy, according to Roman and Hiwot (2010) [26], is attributable to the provenance of the animals given for slaughter and the waste management methods utilized by the two groups of countries.

The increased frequency of foreign bodies in the current study region is most likely due to the extensive usage and incorrect disposal of plastic bags and other indigestible materials. The scarcity of grazing pasture in this research area is exacerbated by the fact that tiny rural agricultural land is nearly entirely filled by chat (known locally as "Jimaa"), and the area is frequently hit by drought, resulting in a shortage of animal feed. Because of these conditions, animals were more likely to consume indigestible foreign stuff that was strewn over the area. Specifically, nutritional deficits calcium, phosphorus, and other micronutrients cause animals to eat indigestible foreign material indiscriminately (Hailat *et al.*, 1996) [27].

The number of indigestible foreign bodies was found to be higher none the rumen (78.0%) than the reticulum (10.1%), with the rest of the proportion occurring in both. Tesfaye *et al.* (2012a) [20] discovered 67.3% in the rumen and 32.7% in the reticulum, Negash *et al.* (2015) [10], found 87.9% in the rumen and 5.0 percent in the reticulum from all ruminants, and Shiferaw *et al.* (2013) [13], found 88% in the rumen and 14.4% in the reticulum. The presence of more foreign bodies in the rumen than in the reticulum is attributable to the rumen's higher volume and position as the primary site of ingesta accumulation (Hailat *et al.*, 1996) [27]. Ingested feed with a high density and tiny size settles toward the rumen's reticulum and bottom, while feed with a low density floats in

the rumen. It's possible that gravity is at blame (Hailat *et al.*, 1996; Bwatota *et al.* 2018)^[27, 7].

Plastic the most common indigestible foreign elements encountered none the rumen were 53.4%, followed by 20.6% textiles, 16.7% rope, and 35.5% metal. The majority of the reporters agree with this conclusion. Mekuanint *et al.*, (2017)^[15], found 46.1% of plastic bags in the rumen of sheep in Jordan, Hailat *et al.* (1996)^[27], found 74% in the rumen of sheep in Jordan, and Remi-Adewnmi *et al.*, (2004)^[8], Berrie *et al.* (2015)^[12] observed 42.3% of plastics from cattle slaughtered in Gondar Elfora Abattoir, whereas documented 85% of plastics from rumen impaction of cattle, sheep, and goats slaughtered at Addis Ababa Abattoir Enterprise. Bwatota *et al.* (2018)^[7] found 50.5% plastic bags in cattle butchered at Morogoro Municipal Slaughterhouse in Tanzania. Plastic bags are more common than other rumen and reticulum ingestible foreign bodies, according to the majority of reporters. The growing incidence of plastic bags and other non-metabolic foreign entities in various countries is attributable to fast globalization industrialization, waste disposal, increased urbanization (Reddy *et al.*, 2014)^[28]. Lack of recycling industry in most developing countries, overcrowding of herds due to insufficient food, and the easy movement of plastics from one location to another by wind Gravity is to blame for the high metallic predominance in the reticulum.

Foreign bodies were found in the fore stomachs of 54.4% of female cattle and 29.0% of male cattle, respectively, in the current investigation. This conclusion was consistent with the findings of most reports, such as Berrie *et al.* (2015)^[12], who found that 87% of dairy cattle were impacted by foreign bodies. Vikhaya *et al.*, (2017)^[29] also reported 66.2% female and 33.8% male at Queens Town Abattoir in South Africa, and 56.1% female and 43.9% male at East London Abattoir in South Africa. Mushonga *et al.*, (2017)^[9] and colleagues reports 20.0% female and 15.7% male crossbred cattle from Rwanda, while Bwatota *et al.*, (2018)^[7] reported 61.5% female crossbred cattle and 23.0% male crossbred cattle from Tanzania. The causes for this disparity could be linked to the degree of milk yield, which necessitates a significant demand for nourishment throughout female animal pregnancies and lactation periods (Berrie *et al.* 2015)^[12]. Another factor could be the female animal's smaller stomach capacity a sufficient supply of food during their advanced pregnancy Aged cattle had a larger incidence than other age groups, according to Ushula and Nana (2017)^[23] 63.6%, Desiye and Mersha (2012)^[3] 80%, and others. The same 70.3% of findings were evaluated in this study. This is due to the buildup of various foreign bodies in the foregut of cattle throughout the course of their lives.

When comparing cattle with different body conditions, the majority of indigestible foreign bodies were detected in cattle with low body conditions. The findings of this study revealed a 71.2 percent prevalence of poor body condition, which is substantially greater ($2 = 69.138$, $p 0.05$) than the 52.9% prevalence of medium body condition and the 18.0% prevalence of good body condition. This conclusion is in agreement with the reports of Mushonga *et al.* (2015)^[9], Negash *et al.* (2015)^[10], Ushula and Nana (2017)^[23], Bassa and Tesfaye, (2017)^[20], Bwatota *et al.* (2018)^[7] and other comparable reports. Indigestible debris stuck in the ruminal area, interfering with normal rumen and reticulum function (Remi-Adewnmi *et al.*, 2004)^[8], and reducing the absorption of volatile fatty acids and minerals, causes body condition

loss. The accumulation of ingested foreign substances makes it difficult for animals to maintain a healthy body condition.

In this study, the prevalence of foreign bodies was shown to be higher in crossbred cattle (56.2%) than in native breed cattle (38.6%). This disparity could be explained by the higher output of crossbred animals compared to local breeds. Due to their higher productivity than local breeds, cross breed animals have more feeding ability and a higher desired hunger. The reported result agrees with Desiye and Mersha's report, (2012)^[3]. Bwatota *et al.* (2018)^[7] found 70% in crossbred and 10.77% in local breed, while Rahel (2010)^[22] found 42.3 percent in crossbred and 22.7% in local breed. Foreign bodies were found to be present in 58.82% of cross breeds.

5. Conclusions and recommendations

The frequency of rumen and reticulum foreign bodies in cattle was found to be high in the research area. This study suggested that solid waste foreign bodies material, particularly plastics, was widely distributed in the environment. Accumulation of indigested material none the fore stomach of an animal reduces the producer's economy owing to lost production, prevents the animal from achieving healthy physical condition, and may even result in the animal's death. The following recommendation should be forwarded based on the preceding conclusions:

- To eliminate plastics and other indigestible environmental contaminants, the community should promote the use of biodegradable paper bags, and the responsible government and community should focus on preventing the situation from getting worse.
- To prevent pollution of the environment, the government should enact rules regarding proper trash disposal from families and factories, as well as require factories to replace non-biodegradable plastics with biodegradable plastic paper.
- Farmers must correctly manage their herds by providing nutrients and maintaining control.

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