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Study on Assessment of Foreign Body in Rumen and Reticulum of Cattle Come from Different Market Slaughtered at Holeta Municipal Abattoir

Sena Terecha Gurara*
West shoa chombi woreda animal health clinic

Temesgen Kassa Getahun
Ethiopian Institute of Agricultural research

Misgana Duguma
Wollege University

Abstract
Ingestion of indigestible foreign bodies by ruminants is becoming a common worldwide problem which is the associated with a shortage of feed as well as increased pollution of grazing lands with indigestible materials. Cross-sectional study was conducted from November 2016 to April 2017 on 384 ruminants slaughtered at Holeta municipal abattoir and Elfora export abattoir with the objective to determine the prevalence and type of indigestible foreign body in rumen and reticulum of ruminants in association with hypothetical risk factors. Simple random sampling technique was used for selecting the study animals which were ruminants brought from various localities to Holeta municipal abattoir and Elfora export abattoir. Out of 384 ruminants (cattle 128, goat 128, sheep 128) examined for the presence of indigestible foreign bodies, 81 (21.1%) animals were found positive for one or more indigestible foreign bodies in their rumen or reticulum or both**.** The prevalence of foreign bodies was insignificant between species ($p>0.05$). Significantly highest prevalence was observed in adult and thin body condition of ruminants than young and medium and good body condition. Plastic material was the most commonly encountered (38.3%) foreign material in all study animals, followed by hair and hide, mixed, rope, clothes, wood strip and metals. In all species the proportion of indigestible foreign body in rumen (70.4%) were significantly higher than reticulum (18.52%) and both rumen and reticulum (11.11%). This study revealed ingestion of different types of indigestible foreign bodies by ruminants in the study area which may pose serious health problem for free grazing ruminant and negatively affect their overall productivity and production. This strongly calls for concerned stakeholders to design and implement appropriate waste disposal practice and thereby reduces the chance of ingesting foreign bodies.
Keywords: Export Abattoir, Foreign Bodies, Municipal Abattoir, Reticulum, Rumen, Ruminants,
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1. INTRODUCTION

Livestock are a source of high-quality protein (meat, milk and eggs) and also contribute to the economic welfare of people by providing hides, skins, fertilizer, power and traction for agricultural purposes and increasing the productivity of smallholdings.They are also a 'living savings bank', serving as a financial reserve for periods of economic distress and crop failure and as a primary source of cash income [1].

Ethiopia is a home for many livestock species and suitable for livestock production. An estimate indicates that the country is a home for about 54 million cattle, 25.5 million sheep and 24.06 million goats. From the total cattle population 98.95% are local breeds and the remaining are hybrid and exotic breeds. 99.8% of the sheep and nearly all goat population of the country are local breeds [2]. However, development this sector is hampered by different constraints and has not been fully exploited the benefit of indigenous livestock compared to its tremendous potential. Significant losses result each year from the death of animals as a result of lack of appropriate veterinary services, lack of attention from government, wide spread endemic disease and recurrent drought [3, 4]

Indigestible rumen foreign bodies are reported to be a common cause of surgical emergency in veterinary medicine [5, 6]. Ingestion of foreign body in cattle was reported to be a condition of great economic importance and causes severe loss of production and high mortality rates. Sheep and goats are highly selective feeders and ingest significantly less amount of foreign bodies as compared to cattle [7]. Ingestion of large quantities of indigestible materials occurs in sheep and goats during periods of drought, food scarcity, nutritional deficiency, pica and massive environmental pollution [8, 9]. Previous reports on impaction with indigestible foreign bodies indicate that, sheep and goats reared in urban and peri-urban areas are more prone to this condition than those reared in rural areas [10]. In developed countries, industrialization and agriculture mechanization have further increased the occurrence of foreign bodies in ruminants, while in developing countries the high rate of occurrence

is associated with poor farming management [11, 12].

Studies have shown that the non-penetrating foreign bodies commonly recovered in ruminant stomachs are plastic bags, sack thread, ropes, leather, rubber, bed linen, pieces of lead pipe, straw baskets, hair and plant fibres (bezoars) [13]. The major penetrating foreign bodies include metallic pieces of wire, needles, nails and stones [14, 15, 16]. Most of these foreign bodies were found mainly in the fore stomach and they are responsible for most pathological conditions affecting this area [17].

The frequently encountered clinical signs caused by foreign body ingestion are inappetence, vomiting, diarrhea, lethargy and abdominal pains [18]. The presences of foreign bodies in the rumen and reticulum also hamper the absorption of volatile fatty acids (VFA) and consequently reduction in the rate of animal fattening. The perforation of the wall of the reticulum allows leakage of ingesta and bacteria which contaminates the peritoneal cavity, resulting in local or diffuse peritonitis is the swallowed objects can also penetrate pleural cavity causing pleuritis and pneumonitis and into the pericardial sac causing pericarditis [19]. They also obstruct the orifice between reticulum and omasum and if not removed through surgery, may become fatal [20].

The condition is serious in our country usually in urban and peri-urban areas where extensive building are carried out and proper plastic material disposal is no conditioned and so thrown on roads and near the fence or anywhere and that is way our ruminants are dying mainly associated with foreign bodies [16]. In Jordan, an estimated loss of 25 million USD in productivity and health associated with plastic impaction has been reported [7].

In Ethiopian formation regarding the magnitude and occurrence of forestomach foreign bodies is very limited. The areas available for grazing particularly in rural area while, in the case for animals reared in the urban and sub-urban areas are polluted with plastics, ropes, hair, wool and metals. This pollution may be predicated as a growing problem for grazing animals because of the poor waste management system and inadequate availability of feed during the long dry season [21]. The fact that rumen impaction by these foreign bodies is mainly asymptomatic in nature and only diagnosed in live animals if the material is accumulated in large amount and thus, it can be adequately studied in abattoirs. Therefore, the objectives of this study were to estimate the prevalence of foreign bodies in rumen and reticulum of ruminants slaughtered at Holeta municipal and Elfora export abattoirs and to identify the types of foreign bodies and the risk factors associated with the ingestion of those foreign bodies in ruminants.

2. MATERIALS AND METHODS

2.1. Study Area

The study was conducted from November 2016 to April 2017 at Holeta municipal abattoir and at Bishoftu Elfora export abattoir. Holeta is 28 km West of Addis Ababa, at 09°02’ N latitude and 38°34’ E longitudinal and latitude ranges 2060 to 3380m.a.s.l. with high altitude (41%), mid altitude (59%) climatic zone having average temperature of 21°C and 900 to 1100 mm annual rainfall with bimodal pattern as short rain season from March-April and long rain season from July-October [22].

Elfora export abattoir is found in Bishoftu town, which is located at 90^0N and 40^0E with an altitude of 1880m.a.s.l in the central highlands of Ethiopia 47 Km South East of Addis Ababa. It has annual rainfall of 1151.6mm of which 84% falls down during the long rainy season that extends from June to September and the remaining during the short rainy season that extends from March to May. The mean annual minimum and maximum temperatures is 8.5 ^{0}C and 30^0C, respectively, and the mean humidity is 61.3% [23]. The study animals were small ruminants slaughtered at Elfora export abattoir and large ruminants at Holeta municipal abattoir. The animals slaughtered in Elfora export abattoir were all males originated from different parts of the country including Arsi, Bale, Afar, Shewa, Wollo, Omo, Borena and Jenka and the animals slaughtered in Holeta municipal abattoir were also male originated from Ginchi, Inchini, Addisalem, Adama, Addis Ababa and around Holeta town. They were transported to the abattoir using vehicles.

2.2. Study Population and Study Design

A cross-sectional study was conducted on ruminants slaughtered at Holeta municipal and Elfora export abattoirs with the objective to estimate the prevalence, to identify the type of foreign bodies and risk factors at the mentioned abattoirs.

2.3. Sample Size Determination and Sampling Technique

The sample size was determined based on the formula given by [24] with 50% expected prevalence, 5% desired level of precision and 95% of confidence interval. Accordingly the required samples for this study were 384 animals. The data for this study was collected by visiting abattoir twice a week. The study animals were selected from cattle, sheep and goats slaughtered during each visit day by using simple random sampling technique.

$$n= \frac{1.96^2 \times p_{exp}\,(1-p_{exp})}{d^2} = 384 \text{ animals}$$

Where n = sample size
Where d = absolute precession
Where p = expected prevalence

2.5. Data Collection Methods

2.5.1. Ante mortem and Post Mortem Examination

During ante mortem examination each selected animal was identified by providing a unique temporary identification number that could be used for post mortem examinations. Furthermore, the animals' species, sex, age and body conditions were recorded on special format prepared for this purpose. Age and body condition of the animals was determined based on standard given by [25, 26, and 27]. The body condition of study animals were classified in to three, namely thin, medium, and good. Similarly, the age was also classified in to three which comprise < 2, 2-3, >3 for small ruminants and <4, 4-7, and > 7 for cattle and those can be described as young, adult and old respectively. During postmortem examination, the stomach was removed from the abdominal cavity and rumen and reticulum were examined by visual inspection and palpation which were followed by incision and examination of the whole contents for the presence of foreign bodies. When foreign bodies are encountered, they were removed, washed and the location and type of the foreign bodies was recorded otherwise recorded as negative in postmortem record sheet.

2.6. Data Management and Analysis

The data obtained was coded in Microsoft excel and edited for errors and the data was transformed to SPSS version 20.0 software. Then the data was analyzed by using descriptive statistics like frequency distribution and cross tabulation. Pearson chi square (x^2) test was employed to assess the existence of association between prevalence of the foreign bodies and different potential risk factors considered. For (x^2) test, p- value < 0.05 were considered significant whereas p-value > 0.05 considered non-significant. Descriptive statistical analysis such as table was used to summarize and present the data collected. The total prevalence of rumen and reticulum foreign bodies was calculated as percentage by dividing total number of positive animals for foreign bodies to the total number of animal examined.

3. RESULT

3.1. Prevalence of Foreign Body in Relation to Animal Species

From 384 ruminants (128 bovine, 128 caprine and 128 ovine) were examined for the presence of indigestible foreign bodies, 81/384(21.1%) animals were found positive for one or more indigestible foreign bodies in their rumen or reticulum or both. When compare bovine, caprine and ovine there was insignificant difference (p=0.720) between species (Table 1).

Table 1:Frequency and prevalence of foreign body occurrence in rumen and reticulum of bovine, caprine and ovine

Types of Foreign bodies	No Examined, Frequency and Prevalence				X^2	P-value
	Bovine=128	Caprine=128	Ovine=128	Total=384		
Clothes	4(3.1%)	2(1.5%)	0	6(1.5%)	0.66	0.72
Hair and Hide	4(3.1%)	8(6.25%)	4(3.1%)	16(4.2%)		
Wood strip	3(2.3%)	0	0	3(0.78%)		
Plastic Materials	8(6.25%)	10(7.81%)	12(9.4%)	30(7.81)		
Metals	2(1.5%)	0	0	2(0.52%)		
Rope	2(1.5%)	5(3.9%)	4(3.1%)	11(2.86%)		
Mixed foreign bodies	2(1.5%)	5(3.9%)	6(4.68%)	13(3.38%)		
Overall Prevalence	25(19.5%)	30(23.4%)	26(20.3%)	81(21.1%)		

NB: X^2 =chi square, No=number

3.2. Prevalence of Foreign Body Occurrence in Rumen and Reticulum or Both

The type of foreign body found were clothes, hair and hide, wood strip, plastic material, metals, rope and mixed of two or more than two of those foreign bodies. Plastic materials were the most common foreign body encountered followed by hair and hide, mixed foreign material, rope clothes, wood strip and metals respectively (Table 2).

Table 2: Prevalence of different foreign bodies in rumen and reticulum or both

Foreign body	Prevalence (%)
Clothes	7.4
Hair and Hide	18.5
Wood strip	3.7
Plastic Materials	38.3
Metals	2.5
Rope	13.6
Mixed foreign bodies	16
Total	100

3.3. Occurrence of Foreign Bodies in Different Age Groups

From animals examined in different species higher foreign body prevalence was observed in adult animals (25.45%) and lowered encountered in young groups (15.1%). The variation in the foreign body prevalence was significancantly difference (*p<0.05)* among the age group (Table 3).

Table 3: Prevalence and types of foreign bodies among the age groups

Types of Foreign bodies	Numbers of Animals Examined in different age group, Frequency and Prevalence of Occurrence of Foreign Bodies			
	Young=159	Adult=220	Old=5	Total=384
Clothes	1(0.63%)	5(2.27%)	0	6(1.56%)
Hair and Hide	6(3.8%)	10(4.55%)	0	16(4.2%)
Wood strip	0	3(1.4%)	0	3(0.78%)
Plastic Materials	10(6.3%)	20(9.1%)	0	30(7.81%)
Metals	0	2(0.91%)	0	2(0.52%)
Rope	5(3.14%)	6(2.73%)	0	11(2.86%)
Mixed foreign bodies	3(1.9%)	10(4.55%)	0	13(3.4%)
Overall Prevalence	25(15.7%)	56(25.45%)	0	81(21.1%)
X^2= 7.840		P-value=0.020		

3.4. Occurrence of Foreign Bodies in Different Body Condition

The foreign body prevalence in the thin, medium, and good body condition group of ruminant was 52.5%, 17.45% and 2.1% respectively. The variation in the foreign body prevalence was significancantly difference (*p<0.05)* among the body condition group of animals (Table 4).

Table 4: Occurrence of various foreign bodies in different body condition categories

Types of Foreign bodies	No of Animals Examined in different body condition, Frequency and Prevalence of Occurrence of Foreign Bodies			
	Thin=61	Medium=275	Good=48	Total=384
Clothes	2(3.3%)	4(1.45%)	0	6(1.6%)
Hair and Hide	6(9.84%)	10(3.64%)	0	16(4.2%)
Wood strip	1(1.64%)	1(0.4%)	1(2.1)	3(0.78%)
Plastic Materials	13(21.31%)	17(6.2%)	0	30(7.81%)
Metals	1(1.64%)	1(0.4%)	0	2(0.52%)
Rope	1(1.64%)	10(3.64%)	0	11(2.86%)
Mixed foreign bodies	8(13.1%)	5(1.82%)	0	13(3.4%)
Overall Prevalence	32(52.5%)	48(17.45%)	1(2.1%)	81(21.1%)
X^2= 63.951		P-value=0.000		

NB X^2 =Chi-square, No =number

3.5. Occurrence of Foreign Body in Rumen and Reticulum

From the total 81 foreign bodies encountered 57(70.4%), 15(18.52%) and 9(11.11%) of them found in rumen, reticulum and both rumen and reticulum respectively. Occurrence of foreign bodies was significantly different ($p<0.05$) where higher prevalence was observed in the rumen (Table 5).

Table 5: prevalence of foreign body occurrence in the rumen, reticulum and both rumen and reticulum**.**

Organs	No of foreign bodies	%	X^2	P- Value
Rumen	57	70.4	418.512	0.000
Reticulum	15	18.52		
Both	9	11.11		
Total	81	100		

NB No =number, X^2 =chi square

4. DISCUSSION

The result of the current study showed an overall foreign body prevalence of 21.1% (81/384) in ruminants slaughtered at Holeta municipal abattoir and Elfora export abattoir. This study revealed relatively higher foreign body prevalence in small ruminants (Goat 30/128 (23.4%) and Sheep 26/128 (20.3%) than in cattle 25/128(19.5%). This finding was in line with [28] who reported higher prevalence in small ruminants (58.2%) than in cattle (43.4%). Higher prevalence rates reported in small ruminants have due to the fact that in desert countries, farmers live closely with their animals. As a result, the animals frequently eat household waste and graze very close to the homestead and are thus exposed to a higher risk of ingesting indigestible materials [29]. It also similar to the findings of higher prevalence of indigestible foreign bodies in goats than sheep reported in Sudan [30]. The differences in the prevalence of indigestible foreign bodies observed between sheep and goats may be attributed to the variations in the origin of the animals, husbandry practices, feeding behavior and the waste management system or the level of environmental pollution at the source rather than the species of the animal being the cause [8, 9 and 31].

The current study showed non-significant association between species regarding indigestible substances ingestion ($p>0.05$). However [7 and 31] found the presence of significant association between species differences and indigestible substances. This may be due to the variation in the origin of animals studied as some areas have excess feed for all species while others may lack feed for those of the species. In the case of the present study, the relatively lower feed sources for goats probably forced them to graze on the pasture making them equally exposed for foreign bodies.

According to this study adult ruminants are frequently affected with indigestible materials (25.45%) than young ruminants (15.1%). The current finding was similar to report of Otsyina HR *et al*., (2015) who encountered plastic bags most frequently in sheep and goats in the 2-3 years old age group (37.5%) followed by those in the 1-2 year old age group (24.1%) and absence of foreign material in animals older than 4 years. and also, this finding is in agreement with [6, 7, 8, 10, 31, 32 and 33]. This may happen because of ingestion of indigestible substances over a prolonged period.

The prevalence of foreign bodies in small ruminant with thin body condition of (52.5%) was significantly higher ($p=0.000$) than in those with medium (17.45%) and good body condition (2.1%). This finding is in agreement with the reports of [6, 7, 8, 10, 31, 32 and 33]. This may be because of thin body condition animals consuming without selection to compensate there energy balance. As a result thin body condition of animals with indigestible foreign bodies was attributed to reduction in volatile fatty acids absorption from rumen and this result in inappetence, abdominal distention, reduced weight gain, lack of defecation with consequent emaciation and recumbence [8].

Accumulations of indigestible foreign bodies were significantly higher in rumen ($p=0.000$) of all study animal than in the reticulum and both. This finding was in agreement with the findings of [6, 28, 31and 32]. This may be because of the larger rumen volume, the cumulative size/s and material composition of the foreign bodies, and the types of materials, with metals and sharp objects tending to localized preferentially in reticulum. Plastic was the most commonly encountered (38.3%) foreign material in all study animals, followed by hair and hide mixed, rope, clothes, wood strip, and metals. This finding is in general agreement with various reports from different areas of Ethiopia [34], Nigeria [8] and Jordan [7]. This indicates the widespread use of plastic in these areas and environmental pollution due to their improper disposal.

The frequency of occurrences of foreign bodies in the ruminant stomach was higher in adult animals than young. The occurrence is likely due to differences in feeding practices between adult and young stock and increased exposure occurring over time and also [8 and 31] have recovered those plastics, ropes, leather and papers from the rumen of older goats and sheep slaughtered at abattoir.

5. CONCLUSION AND RECOMMENDATION

The finding of 21.1% prevalence of indigestible rumen and reticulum foreign bodies in ruminants indicates ingestion of foreign bodies, particularly plastic materials by these animals due to environmental contamination. Those foreign bodies have great economic significance associated with reduced production and productivity of animals. Species, age and body condition of animals are considered as a risk factors for the occurrence of foreign bodies. But, the degree of association is non-significant between species while, there were significant association

for age and body condition score for the occurrence of foreign bodies.

Based on the above conclusion, the following recommendations are forwarded: Creating awareness for animal owners how to keep their animals away from the site of new construction and unclear grazing sites, awareness should be created how to manage and dispose those materials that can cause a problem to animals when ingested with feed. And veterinarians and animal health workers should consider foreign bodies as one of the animal health problem affecting production and productivity

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