

Assessment of Sheep and Goat Foreign Bodies in Rumen and Reticulum in the Jigjiga Municipal Abattiar

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Rec date: August 26, 2015; Acc date: June 28, 2016; Pub date: July 5, 2016

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Abstract

The study was conducted from November 2014 to April 2015 at Jigjiga Municipal Abattoir, Somale Regional State, Eastern Ethiopia. The objective of the study was to assess the prevalence of rumen and reticulum foreign bodies, identifying types of foreign bodies and associated risk factors for the occurrences of foreign bodies in sheep and goats in the area. A total of 384 sheep and goats were selected using systematic random sampling method and 118 of them (30.73%) were found positive for foreign bodies in their rumen and/or reticulum. From each 192 sheep and goats examined, 34.4% (66) and 27% (52) were positive for various types of foreign bodies, respectively. There was no statistically significant ($p>0.05$) difference between the two species for the occurrence of rumen and reticulum foreign bodies. Prevalence of foreign body recorded in thin, medium and good sheep and goats was 40%, 35.9% and 28.52%, respectively. However, variation in the prevalence of foreign bodies among the body condition groups was significantly different ($p<0.05$). Prevalence of foreign body recorded in less than 2 years, 3-4 years and greater than 4 years old was observed to have no significant difference ($p>0.05$). From 118 animals positive for foreign bodies, rumen showed higher occurrence (78%) than reticulum (20.34%). The study showed high prevalence of foreign bodies in sheep and goats. Strict legislations regarding the proper disposal of wastes from households and factories should be applied to reduce pollution of the environment.

Keywords: Abattoir; Foreign body; Goat; Jigjiga; Prevalence; Rumen; Reticulum; Sheep

Introduction

Ethiopia is a home for many livestock species and suitable for livestock production. Ethiopia is believed to have the largest livestock population in Africa. 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 [1]. In most part of Ethiopia, extensive management system is practice for both sheep and goats production. The productivity of sheep and goats in developing countries is generally low, mainly because of under feeding, poor management system and various diseases [2].

Ethiopia has great potential for increased livestock production, both for local use and for export. However, expansion was constrained by inadequate nutrition, disease, lack of support services and inadequate information on how to improve animal breeding, marketing and processing. Thus, the country is not utilizing this huge potential livestock resource and an improvement in this sector. Therefore, has the potential to contribute significantly to national income and to the welfare of the majority of rural families. Sheep and goat play significant contribution in Ethiopian economy as source of meat, milk, and foreign exchange. However, as other livestock in the country their contribution is below their expected potential due to prevalent livestock diseases, poor management system and poor genetic performance [3].

Environmental pollution is one of the growing problems for grazing animals due to absence of recycling industries, cleaning of

environment cultures, improper disposal of plastic bags; free grazing animals eat plastic bags especially in towns and villages. These plastic bags are indigestible and their accumulation in the rumen of grazing animals may lead to adverse effect on health [4]; plastic bags resist to biodegradation and pollute for decades and centuries and pose great risk to human health and environment [5].

Ruminants are notorious for ingestion of foreign bodies related to nutritional deficiencies and feeding management of the animals. They are the root causes for various problems in different organs of the animals [6]. The entry and migration of foreign bodies through the body tissues lead to many complications based on nature of the foreign body entrance into the tissues [7].

In Ethiopia, sheep and goats are very likely to be exposed to various infectious diseases and to the ingestion of indigestible materials of various sources as they are mainly kept under an extensive type of management. 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 [8]. Sheep and goats are highly selective feeders and ingest significantly less amount of foreign bodies as compared to cattle [9]. However, the ingestion of indigestible materials may occur during period of feed scarcity [10].

Reports from cattle and sheep reared with in urban and sub-urban environments indicated that impaction of the rumen resulted from the accumulation of foreign bodies, such as plastic bags which cause interference with flow of ingesta leading to the distension of rumen and absence of defecation [10-12]. The presence of these foreign materials in the rumen and reticulum also hampers the absorption of volatile fatty acids and consequently reduces the rate of animals fattening [10]. In Jordan, an estimated loss of 25 million USD in

productivity and health associated with plastic impaction has been reported [9].

The sheep and the goats fore stomach are affected highly due to ingested foreign bodies which are the subject of attention almost all over the world and also major economic importance due to severe loss of production and production ability and sometimes death of the animal [13]. The ingestion and lodgment of foreign bodies are common in the *ovine* than *caprine* primarily due to indiscriminate feeding habits. In addition, industrialization and mechanization of agriculture have further increased the incidence of foreign bodies in these animals [14]. Ingestion of foreign bodies in sheep and goats are common especially in developing countries where the standard of animal management is unsatisfactory [15].

Animals with nutritional deficiencies may also ingest various types of foreign bodies deliberately. The indiscriminate feeding habits and mineral deficiency makes them susceptible to inadvertent ingestion of foreign materials. Rumen impaction due to plastics, ropes and leather in the rumen leads to anorexia, decreased production and progressive loss of body condition [16].

In Ethiopia small ruminants are left to roam and seek their own feed as the raising system is mainly extensive type. The areas available for grazing particularly 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. The fact that rumen impaction by these foreign bodies is mostly 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 are:

- To estimate the current prevalence of foreign body in sheep and goats rumen-reticulum slaughtered at Jigjiga municipal abattoir.
- To identify the type and nature of rumen and reticulum foreign bodies.
- To study the risk factors associated with the ingestion of those foreign bodies in sheep and goats.

Materials and Methods

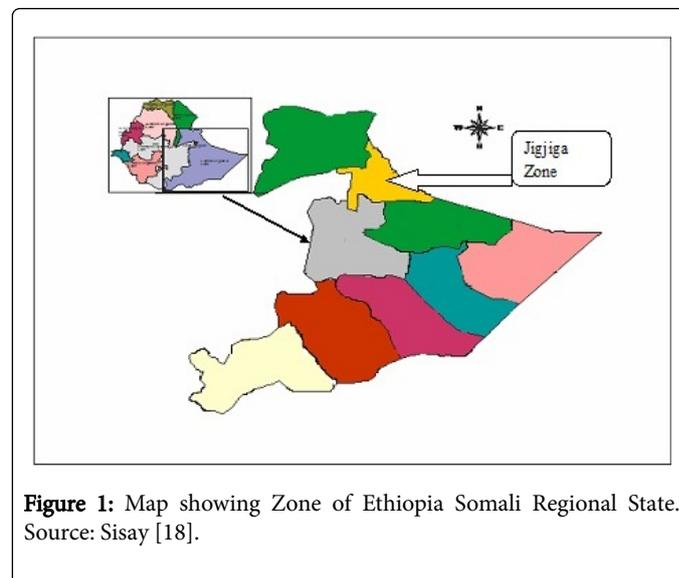
Study area description

The study was conducted in Jigjiga Municipal Abattoir from November, 2014 to June, 2015. Jigjiga is the capital town of Ethiopian Somali Regional State. The town is located at about 628 km away from Addis Ababa in Eastern part of Ethiopia. Geographically the town is located at 9° 20' north latitude and 42° 47' east longitude and at elevation ranging 1803 meters above sea level. Ecologically the area lies dry land ecosystem and area receives a mean annual rain fall of about 500 mm³ which comes from short rainy season. The annual minimum and maximum temperature is about 20°C and 30°C respectively [17] (Figure 1).

Study population

The study was conducted on sheep and goats that were brought from the market. Since the animals were come to the market from different places, the origin of animals were difficult to identify. Most of

these animals are managed under an extensive type of management by farmers. During the study different risk factors like species, age, sex and body condition of animals were considered.



Study design

A cross sectional study was conducted to assess the prevalence of the rumen and reticulum foreign bodies, to identify the types of foreign bodies and their associated risk factors for the occurrence of the foreign bodies. Species, age, body for occurrence of foreign bodies. During the study time the animals was categorized into three as young, adult and old and age of studied animals was estimated based on dentition pattern.

Sample size determination and sampling method

Sheep and goats slaughtered during each visit day were systematic random sampling and all the necessary data were recorded. Systematic random sampling technique was used and the sample size was determined by using the formula given by Thrusfield [19]. To calculate the sample size 50% prevalence, 95% confidence level and 5% desired absolute precision (d=0.05) was used. According to the above formula, a minimum of 384 should sampled.

$$N = \frac{1.92^2 \times P \exp(1 - P \exp)}{D^2} = 384$$

Where N = sample size

Where D = absolute precession

Where P = expected prevalence

Data collection

Ante mortem examination: Ante mortem examination on individual animals was done for assessment of age, species, sex and body condition of the animals. Age was categorized into young (<2 years), adult (3-4) years) and old (>4 years) based on dentition eruption according to Gatenby [20]. Body condition of sheep and goats were recorded as thin, medium and good based on the appearance of the animal and manual palpation of the spinus and transverse

processes of the lumbar vertebrae according to ESGPIP [21]. During Ante mortem examination each animals was marked for the identification by marking on its skin by using color.

Postmortem examination: In the postmortem examination rumen and reticulum was examined. Immediately after slaughter in the evisceration stage, the stomach was carefully removed from the abdominal cavity open and was explored for the presence of any foreign non-dietary material by visualization and palpation. Any foreign bodies obtained during inspection was washed with water to removing adhering feed material and identified. When the finding positive, the location and type of the foreign bodies was recorded otherwise recorded as negative in postmortem recorded sheet.

Data management and analysis

The data collected was entered and scored in Microsoft excel before subjected to statistical analysis, the data was thoroughly screened for errors and properly coded. For analysis, SPSS Microsoft software Version 20 was used. The prevalence of rumen and reticulum foreign bodies was calculated as percentage by Pearson chi square (χ^2) test was employed to assess the existence of association between prevalence of the foreign bodies and different potential risk factors considered. In all the statistics, parameters having a p-value<0.05 were considered to have significant differences.

Results

Prevalence of foreign body in sheep and goats

Prevalence of foreign body in sheep and goats from a total of 384 small ruminants examined for the presence of foreign body, 118 (30.7%) of them were having foreign body in their rumen or/ and

reticulum. From each 192 sheep and goats examined, 34.4% and 27% were found to contain foreign body in their rumen or/ and reticulum respectively (Table 1).

Frequency and prevalence of foreign body occurrence in rumen and reticulum of sheep and goats

The type of foreign body found were plastics, pieces of cloth, rope, wire and leather. Plastic materials were the most common foreign body encountered which accounted for 12.5% of all cases (Table 2). There was no significant association between species variation and foreign body ingestion (p>0.05). The type of foreign bodies encountered their frequency of occurrence and prevalence with regards to species is presented in Table 2.

Occurrence of foreign bodies in different age groups

From 138 animals examined, higher foreign body prevalence was observed in the older animals (33.3%) and lower prevalence was encountered in young groups (30.4%). However, this variation in the foreign body prevalence was not significantly different (p>0.05) among the age groups. Table 3 shows the occurrence of foreign bodies in each age category.

Species	№ of examined animals	№ of positive animals	Prevalence	p-value
Ovine	192	66	34.40%	0.179
Caprine	192	52	27%	
Total	384	118	30.73%	

Table 1: Prevalence of foreign body in sheep and goats.

Species	No of examined	Frequency and prevalence of occurrence				Overall prevalence
		Plastic	Plastic and wire	Plastic and leather	Cloth, plastic and rope	
Ovine	192	24(12.5%)	15(7.8%)	14(7.3%)	13(6.77%)	66(34.4%)
Caprine	192	24(12.5%)	10(5.2%)	8(4.16%)	10(5.2%)	52(27%)
Total	384	48(12.5%)	25(6.5%)	22(5.73%)	23(6%)	118(30.73%)

Table 2: Frequency and prevalence of foreign body occurrence in rumen and reticulum of sheep and goats

Age group	Animal examined	Frequency and prevalence of occurrence					p-value
		Plastic	Plastic and wire	Plastic leather and	Cloth, plastic and rope	Overall	
<2 yrs	138	23(16.7%)	6(4.35%)	7(5%)	6(4.35%)	42(30.4%)	0.751
3-4 yrs	213	22(10.8%)	14(6.6%)	13(5.6%)	16(7.5%)	65(30.52%)	
>4 yrs	33	3(9%)	2(6%)	3(9%)	3(9%)	11(33.3%)	
Total	384	48(12.5%)	22(5.73%)	23(6%)	25(6.5%)	118(30.73%)	

Table 3: Prevalence and types of foreign bodies among the age groups at jigjiga municipal abattoir

Prevalence of foreign bodies in body condition of sheep and goats

The overall foreign body prevalence in the thin, medium and good body conditioned group of animals was 40%, 35.9% and 28.52%

Body condition	Animal examined	Frequency and prevalence of occurrence				
		Plastic	Plastic and wire	Plastic and leather	Cloth, plastic and rope	Total
Thin	15	2(33.3%)	2(33.3%)	-	2(33.3%)	6(40%)
Medium	92	7(7.6%)	11(12%)	6(6.5%)	9(9.8%)	33(35.9%)
Good	277	39(14%)	12(4.3%)	16(5.8%)	12(4.3%)	79(28.52%)
Total	384	48(12.5%)	25(6.5%)	22(5.73%)	23(6%)	118(30.73%)

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

Foreign body occurrence in the rumen and reticulum

Of the total 118 foreign bodies encountered, 92 (78%) of them was found in rumen and 24(20.34%) in reticulum, while both in rumen and reticulum accounted for 2(1.7%) of occurrence (Table 5). Occurrence of foreign bodies was not significantly different ($p>0.05$) in rumen and reticulum where higher prevalence was observed in the rumen.

Organs	No of positives out of 384 animals examined	P-value	Odds ratio
Rumen	92	0.253	0.252
Reticulum	24		
Total	118		

Table 5: Proportion of foreign body occurrence in the rumen and reticulum.

Discussion

This study revealed an overall foreign body prevalence of 30.73% in sheep and goats slaughtered at Jigjiga municipal abattoir. This agrees with Rahel (2011) reported a closely similar overall prevalence of 30.5% in Hawassa from urban area [22]. Hiwot [23] has reported a more or less consistent overall prevalence of 23.4% in small ruminants slaughtered at Addis Ababa municipality abattoir. This study is disagrees with Nuru (2009) has reported extremely low overall foreign body prevalence of 6.1% in small ruminants slaughtered at Lunna export abattoir [24]. This difference in prevalence may be due to the differences in origin of the animals slaughtered and the type of waste management system between the study areas. This means, if there is shortage of feed in the area this may predispose the animals to negative energy balance and force them to feed on unusual materials including plastics, clothes, ropes and even metallic substances. On other hand, if there is no or less waste management system in the area the chance of animals to ingest foreign bodies is high.

This study is disagree with Igbokwe et al. [10] reported low overall prevalence of 19.3% in sheep in Nigeria and Hailat et al. [9] recorded extremely low overall prevalence of 8.9% in Jordan. On the contrary, Remi-Adewunmi et al. [12] was reported extremely high overall

respectively (Table 4). There was significant association difference ($p<0.05$) in the occurrence of foreign body in the three classes of body conditions. Plastics were the most frequently encountered foreign body type which had 12.5% overall prevalence.

prevalence of 97% in Nigeria in sheep and goats brought from urban areas for slaughter [23]. The difference in the prevalence might be due to differences in the origin of animals presented for slaughter and type of waste management system between the countries. In this study rumen impaction with foreign bodies was found to occur more frequently in thin animals. This agrees with reported by [5,12]. Thin body condition by itself might be due to the contribution of the foreign body that is the animal loss weight after it has been exposed or it might be due to the interference of foreign body with the absorption of volatile fatty acid (VFA) and thus causes reduced weight gain.

The current study showed the absence of significant association between species differences and indigestible substances ingestion ($p>0.05$). However, Roman and Hiwot and Hailat et al. [9,23] 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 will have excess feed for both species while others may lack feed for either 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. This study also shows that animals aged greater than 4 years are more frequently affected with indigestible materials than the animals aged less than 2 years groups. This is in agreement with Abebe and Nuru and Roman and Hiwot [3,23], the findings may be due to gradual ingestion of indigestible substances over a prolonged period of time [24].

In present study plastics have higher frequency of occurrence followed plastics and ropes, wire, clothes and ropes. This may be attributed to improper disposal of plastics and other ingestible foreign materials in urban and peri urban areas. This agrees with Hiwot [23] has reported that plastic bags were the most common cause of rumen impaction that were found in all of the animals examined at Addis Ababa municipal abattoir Similar study in Jordan by Hailat et al. [9], revealed 74% plastic foreign body prevalence whereas Igbokwe et al. and Remi-Adewunmi et al. [10,12] in Nigeria showed an overall prevalence of 81.6% and 85% plastic foreign bodies respectively [25].

The present study indicated that larger number of foreign bodies occurred in the rumen (78%) than reticulum (20.34%) of sheep and goats; this may be due to that the larger size of rumen and many ingested feed goes to the rumen as compared to that of reticulum. This agrees with Nuru and Hiwot have reported higher frequency of foreign

bodies in the rumen than in the reticulum [24]. Wide spread use and improper disposal of plastics that are used for packing of goods could also contribute for the occurrence of foreign bodies in the rumen and reticulum. Lack of awareness among livestock owners on the risk of ingestion of these foreign materials by small ruminants may also contributed for the occurrence of foreign bodies in the rumen and reticulum [26]. Feed shortage usually occurs at specific time of the year in most part of Ethiopia. Moreover, most owners do not provide supplementary feed to animals particularly to sheep and goats.

Conclusion and Recommendations

The present study revealed that rumen and reticulum foreign bodies have great economic significance associated with reduced production and productivity of animals suffering from them. Ingestion of metallic and non-metallic foreign bodies by sheep and goats are the most important not only because of their mortality and morbidity but also it contributes a lot for animals output. Hence, sex, age groups, body condition score and species of animals are the considered risk factors for the occurrence of foreign bodies. Therefore, degree of association is not statistically significant ($p>0.05$) for sex, age groups and species while, there was significant association for body condition score for the occurrence of foreign body in sheep and goats. Most of the non-metallic foreign bodies lodged in rumen while metallic foreign bodies lodged in reticulum. So, it is a problem for individual in particular and the country in general. The study also showed that littering the environment with plastic bags and other indigestible materials could pose serious health problem for free grazing ruminants unless appropriate measure is taken.

Based on the above conclusion, the following recommendations are forwarded:

- Creating awareness for animal owners how to keeping their animals away from the site of new construction and unclear grazing sites.
- Animal owners should be advised to keep their sheep and goats in intensified manner so that the owners could easily control their accessibility to foreign bodies.
- Created awareness how to manage disposal of plastic bags, rope and leather and as well as the periodical cleaning of these wastes in the grazing area.
- All the concerned authority should be formulate strategies how to manage waste solid disposal in the environment.

There is no previous study about foreign bodies in this area, so further research should be made to emphasize the importance of the problem and address the prevention and control measures.

Acknowledgements

I wish to express my thanks to my advisor Dr. Nugusu Fasil for his intellectual advice, encouragement and support. My thanks also extended to my family for this incalculable aid and moral support throughout my life.

I would like to thanks Jigjiga Municipal Abattoir workers for provision of materials during this research work. Especially I appreciate *woizero* Meseret Kidane the Jigjiga Municipal Abattoir meat inspector for her advising and sharing experience. Finally, I would extended my gratitude to all those who were contributing directly or indirectly to finalize this piece of paper.

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