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Prevalence of Foreign Bodies in Rumen and Reticulum of Cattle Slaughtered at Debremarkos Municipal Abattoir, North Western Ethiopia

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Abstract

A cross-sectional study was conducted from January 2025 to May 2025 at Debremarkos Municipal Abattoir, Northwest Ethiopia with the objectives of assessing the prevalence, location, and type of foreign bodies in the rumen and reticulum in cattle slaughtered at Debremarkos Municipal Abattoir. And to correlate the frequency of foreign bodies with factors such as cattle origin, farming system, sex, age, breed, and body condition of animals. Both ante-mortem and postmortem examinations were conducted to examine the live animal and for the recovery of foreign bodies from the rumen and reticulum after slaughter respectively. The study animals were selected by using a simple random sampling method from animals presented for slaughter. Totally 384 animals were examined and 97/384 (25.3%) of them were positive for the occurrence of foreign bodies in the rumen and reticulum. The prevalence of foreign bodies detected from the slaughtered animals was significantly associated with cattle origin, farming system, and cattle body condition (*p-value*<0.05). There was no significant association between male and female cattle in the occurrence of foreign bodies (*p-value*=0.05). Foreign body prevalence was not significantly associated with the breed and age of cattle (*p-value*>0.05). The prevalence of foreign bodies was found to be higher in the rumen (86.6%) than in the reticulum (9.3%), with the rest of the proportion occurring in both the rumen and reticulum (4.1%). The types of foreign bodies found were plastic, cloth, rope, and metal. Plastic was higher in proportion (52.6 %) and other foreign materials found in the rumen and reticulum were cloth (27.3%), rope (15.5%), and metal (4.1%). The results of this study showed that inappropriate disposal of solid waste in the environment has a higher risk for animals and causes environmental pollution. Therefore, responsible stakeholders the government, policymakers, livestock professionals, and communities should give attention to appropriate waste disposal methods to reduce environmental pollution, encourage societies to use biodegradable bags instead of plastics, and farmers should manage their herd properly by providing adequate nutrition, and reducing free grazing practices.

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Keywords

Abattoir, Cattle, Foreign bodies, Prevalence, Reticulum, Rumen

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% (CSA, 2017). The livestock sector has a significant role in the socioeconomic activities of the country and contributes much to the national economy (Abdella and Yune, 2017). Cattle, in particular, make a substantial contribution to the economy by providing meat, milk, income, and foreign exchange. However, their overall

potential impact is hindered by prevalent livestock diseases, suboptimal management systems, and poor genetic performance (Ame *et al*., 2022). Environmental pollution also poses a significant concern, leading to foreign body ingestion, which has become a global health problem for ruminants (Anwar *et al*., 2013). Ingestion of foreign bodies by ruminants is extremely common in developing countries like Ethiopia, where the standard of animal management is unsatisfactory, and the low nutritional status of ruminants has forced them to scavenge for food (Misk *et al.,* 2003).

Feed shortage usually occurs at a specific time of the year in most parts of Ethiopia. Moreover, most owners do not provide supplementary feed to animals. These in turn may predispose the animals to negative energy balance and force them to feed on unusual materials including plastics, clothes, ropes, and even metallic substances (Tesfaye *et al.,* 2012). This is due to the reason that cattle commonly ingest foreign objects, as they do not discriminate against metal materials in feed and do not completely masticate feed before swallowing. The disease is common when green chop, silage, and hay are made from fields that contain old rusting fences or baling wire, or when pastures are on areas or sites where buildings have recently been constructed, burned, or torn down. The condition tends to be more common during drought because animals graze closer to the ground or are fed harvested material that is contaminated with foreign objects (Hayder *et al*., 2006). Furthermore, industrialization and mechanization of agriculture have increased the incidence of foreign body ingestion (Semieka, 2010). Ingestion of indigestible foreign bodies in cattle is a pathological condition of both economic and health importance (Mushonga *et al*., 2015).

Ingested foreign bodies by cattle are divided into two main groups; the first category is foreign bodies of metallic origin and the second is foreign bodies of nonmetallic origin. Penetrating foreign bodies causes local traumatic reticulo-peritonitis in internal organs characterized by varying degrees of local abscesses and extensive fibrous adhesions between the organs, which leads to form complications (Berrie *et al*., 2015). Indigestible plastic foreign bodies that are accumulated in the rumen of ruminants cause ruminal impaction, recurrent tympany, and many other adverse health effects (Priyanka, and Dey, 2018). The types of foreign bodies that were found in the rumen and reticulum of cattle were plastics, clothes, ropes, needles, nails, and wires (Bassa and Tesfaye, 2017). Although the problems caused vary with the duration and location of the foreign body in the rumen or reticulum and also with the degree of obstruction; inappetence, vomiting, diarrhea, lethargy, and abdominal pains are clinical signs manifested by animals with foreign body (Makhdoomi *et al*., 2012).

The problem is serious usually in the urban and peri-urban areas where there are extensive building constructions are carried out and where there are improper plastic materials disposal. These materials are thrown on the roads and near the fences or anywhere and this is the way or the main cause of dying mainly due to the foreign bodies (Ramaswamy and Sharama, 2011). The fact that rumen impaction by those foreign bodies is mainly asymptomatic in nature and only diagnosed in live animals if the material is accumulated in large amounts and thus, it can be adequately studied during postmortem examinations in the abattoirs (Tesfaye and Chanie, 2012).

There were no studies carried out on the prevalence, location, and types of foreign bodies in cattle and associated risk factors in the study area. Therefore, the objectives of the present study were to determine the prevalence of foreign bodies and the risk factors associated and to identify the location and types of foreign bodies in the rumen and reticulum of cattle slaughtered at Debremarkos municipal abattoir.

Materials and Methods

Study design and Study area

A cross-sectional study was conducted from January 2025 to May 2025 in Debremarkos municipal abattoir to assess the prevalence of foreign bodies in the rumen and reticulum of cattle and associated risk factors, and to identify the location and types of foreign bodies. Debremarkos is found in Amhara Regional State, North West Ethiopia. It is located in the Northwest of Addis Ababa and on the way to Gondar road at an elevation of 2400 meters. The area is geographically located at latitude 10°19'N and longitude 37°43'E.

Study animals

The study was conducted on cattle slaughtered at Debremarkos Municipal Abattoir. Cattle slaughtered in the abattoir came from the Debremarkos town and localities around the town. Those cattle who came from local areas were considered as cattle that originated from rural areas and those bought from Debremarkos town were considered as those from urban areas. During the

study, the cattle were categorized into adult and old age groups. Since young animals are not slaughtered in the area. The age of the cattle was estimated based on dentition.

Sampling technique and sample size determination

The study cattle were selected using a simple random sampling method from cattle slaughtered on the day of sampling by assigning an identification number to every cattle. The required sample size was determined based on the procedure and formula described by Thrusfield (2005); using 50% expected prevalence of foreign bodies in cattle in the area, 5% desired absolute precision, and at 95% confidence level, and calculated as follows;

$n = (1.96)^2 P_{exp} * (1-P_{exp})/d^2$

(Where, n = required sample size, P_{exp} = Expected prevalence of population of indigestible Foreign bodies are 50%, d = Desired absolute precision (0.05)). Using this formula 384 cattle were sampled.

Study Methodology

Ante-mortem examination

During ante-mortem examination, selected cattle were assessed and recorded in terms of sex, age, origin, breed, and body condition. The age of cattle presented in the abattoir was classified as adult (4-8 years) and old age (above 8 years) based on dental eruption; body condition was classified as medium and good based on body appearance and spine process.

Post-mortem examination

The stomach of each cattle was removed from the abdominal cavity and all compartments were inspected for the existence of foreign bodies. Finally, the location and the types of foreign bodies were identified and recorded.

Data analysis

The data collected were recorded on formats prepared for this purpose and raw data were entered into a Microsoft Excel spreadsheet.

The prepared data was analyzed using Statistical Package for Social Science (SPSS 2007 version 20) software. The potential risk factors considered in the study were origin, farming system, breed, sex, age, and body condition of the cattle. Descriptive statistics, one-way ANOVA, and chi-square tests were employed for analysis. *P-value* < 0.05 was considered statistically significant.

Results and Discussion

Prevalence of foreign bodies in relation to cattle origin

Among 384 of cattle examined, 202 (52.6%) cattle were originated from urban, and 182 (47.4%) cattle were from rural areas. From these cattle examined, 75 (37.1%) and 22 (12.1%) urban and rural origin cattle were found with foreign bodies respectively. Overall, 97 (25.3%) cattle were found with foreign bodies. There was significant association between origin and foreign body prevalence (*p-value*=0.00) as shown in the Table 1.

Prevalence of foreign bodies in relation to farming systems

From a total of 384 cattle examined, 190 (49.5%) cattle were from intensive farming, and 194 (50.5%) cattle were from extensive farming systems. About 17 (8.9%), and 80 (41.2%) of cattle were found with foreign bodies from the intensive, and extensive farming systems respectively. There was a significant association between a farming system and foreign body prevalence (*p-value* =0.00).

Prevalence of foreign bodies in relation to breed and sex of cattle

From a total of 384 cattle examined, 351 (91.4%) of them were local and 33 (8.6%) were cross-breed. From these cattle, 86 (24.5%) of local breed cattle were found with foreign bodies, and 11 (33.3%) of cross-breed cattle were found with foreign bodies.

This result shows that cross-breed cattle were more affected by foreign bodies. But, there was no significant association between cattle breed and foreign body prevalence (*p-value* =0.26). From a total of 384 cattle examined, 363 (94.5%) were males and the remaining 21 (5.5%) were females.

From these cattle, 95 (26.2%) of males were found with foreign bodies, and 2 (9.5%) of females were found with foreign bodies. However, there was no significant difference between male and female in the prevalence of foreign bodies (*p-value*=0.05).

Prevalence of foreign bodies in relation to age of cattle

From 384 cattle, 300 (78.1%) cattle were in the age range 4-8 years (adult) and 84 (21.9%) cattle were greater than 8 years (old). Among these cattle 73(24.3%) adult cattle were found with foreign body and 24 (28.6%) older cattle were found with foreign body.

The data analysis showed that there was no significant relation between the prevalence of foreign bodies and age of cattle (*p-value* =0.43), but older cattle (>8 years) had higher prevalence (28.6%) of foreign bodies compared to adult animals (4-8 years) (24.3%).

Prevalence of foreign bodies in relation to body conditions

All sampled cattle presented in the abattoir were in the medium and good body condition score. The overall foreign body prevalence in the medium and good body-conditioned cattle were 67 (50%) and 30 (12%) respectively. The result showed that there was significant association between presence of foreign bodies and body condition of cattle (*p-value* =0.00). Cattle with medium body conditions had higher prevalence of foreign bodies compared to cattle with good body conditions as presented in table 6.

Location of foreign bodies in cattle stomach

From 384 cattle examined, 97 (25.3%) were found with foreign bodies. From a total of 97 cattle with foreign bodies, 84 (86.6%) cattle were with foreign bodies in the rumen, 9 (9.3%) cattle were with foreign bodies in reticulum, and 4 (4.1%) cattle were with foreign bodies in both rumen and reticulum.

Types of foreign bodies

The types of foreign bodies found were plastics, piece of cloth, rope, and needle. Plastics were the most common foreign bodies encountered which accounted for 52.6% of overall prevalence and as shown in table 8 below.

Table.1 Prevalence of foreign bodies in cattle originated from urban and rural areas.

Origin	Cattle examined	Positive	Prevalence (%)	*p-value*
Urban	202	75	37.1	0.00
Rural	182	22	12.1	
Total	384	97	25.3	

Table.2 Prevalence of foreign bodies in relation to farming system

Farming sys.	Cattle examined	Positive	Prevalence (%)	*p-value*
Intensive	190	17	8.9	0.00
Extensive	194	80	41.2	
Total	384	97	25.3	

Table.3 Prevalence of foreign bodies in relation to breed

Breed	Cattle examined	Positive	Prevalence (%)	*p-value*
Local	351	86	24.5	0.26
cross	33	11	33.3	
Total	384	97	25.3	

Table.4 Prevalence of foreign bodies in relation to sex of cattle

Sex	Cattle examined	Positive	Prevalence (%)	*p-value*
Male	363	95	26.2	0.05
Female	21	2	9.5	
Total	384	97	25.3	

Table.5 Prevalence of foreign bodies in relation to age of cattle

Factor	Category	Cattle examined	Positive	Prevalence (%)	*p-value*
Age	**Adult**	300	73	24.3	0.43
	Old	84	24	28.6	
	Total	384	97	25.3	

Table.6 Prevalence of foreign bodies in relation to body condition

Factor	Category	Cattle examined	Positive	Prevalence (%)	*p-value*
BCS	**Medium**	134	67	50	0.00
	Good	250	30	12	
	Total	384	97	25.3	

Table.7 Location of foreign bodies in cattle stomach

Foreign body location	Cattle examined	Positive cattle	Percent (%)
Rumen	-	84	86.6
Reticulum	-	9	9.3
Rumen& Reticulum	-	4	4.1
Total	384	97	25.3

Table.8 Types and frequency of foreign bodies in rumen of cattle slaughtered in Debremarkos municipal abattoir (n = 384).

Forign bodies	Cattle examined	Positive cattle	Percentage (%)
Plastics	-	51	52.6
Clothes	-	27	27.8
Ropes	-	15	15.5
Metals	-	4	4.1
Total	384	97	25.3

This study revealed that the overall prevalence of foreign bodies in the rumen and reticulum in cattle slaughtered in the Debremarkos municipal abattoir was 25.3%. This result was consistent with the report of Bwatota *et al*. (2018) from Tanzania, 24.02% of foreign bodies in the rumen and reticulum at Morogoro Municipal Slaughter-house and also Tesfaye *et al*. (2012) from Eastern Ethiopia had reported that 23.9% prevalence of foreign body in cattle slaughtered at Hirna municipal abattoir. The prevalence of foreign bodies in the present study was higher than report of Mushonga *et al*. (2015) from Rwanda revealing 17.4% prevalence of foreign bodies in the fore-stomach of cattle. And Bassa and Tesfaye (2017) had reported that 17.16% prevalence of foreign body in rumen and reticulum of cattle slaughtered at Wolaita Sodo Municipal abattoir. Rahel (2011) from Hawasa also reported that 17.07% prevalence of foreign bodies in fore stomach of cattle in Hawasa Municipal Abattoir, Ethiopia. In contrast to this study result, Ismael, *et al*. (2007) had reported higher overall prevalence of foreign body (77.41%) from Jordan. These variations could be due to differences in farming system and waste management system practices in different study areas. And associated risk factors like origin, age, breed, body condition, and sex of animals may be involved for those variations.

There was significant association between cattle origin and foreign body prevalence (*p-value*=0.00). The present study revealed that the higher prevalence was recorded in cattle originated from urban areas than those originated from rural areas. This finding was in agreement with the study of Remi-Adewunmi (2004) from Nigeria, an overall foreign body prevalence of 97% was detected from animals brought from urban areas for slaughter. In Nigeria, prevalence of foreign body was observed to be

higher in animals originating from urban setting than from rural areas. The result of the present study was in contrast to the report of Daba (2024) there was no significant association between cattle origin and ruminal foreign body prevalence.

In this study, there was significant association between prevalence of foreign body and farming system (*p-value*=0.00). Cattle came from extensive farming systems were more exposed to foreign bodies than those from intensive farming systems. They cover 82.5% from positive animals and the remaining only 17.5% was cattle from extensive farming system. This difference may be due to cattle kept in extensive farming system left for grazing and exposed to foreign bodies. In the present study, there was no significant association between prevalence of foreign body and breed of cattle (*p-value*=0.26). Though statistically not significant, mathematically the prevalence of foreign bodies was shown to be higher in cross breed cattle (33.3%) than in local breed cattle (24.5%). This result was in line with the study of Desiye and Mersha (2012) who found that 70%, and 10.77% prevalence in cross breed, and local breed cattle respectively. And Rahel (2011) reported that forestomach foreign bodies with the high prevalence of 58.82% in crossbreeds. The higher prevalence of foreign bodies in crossbred animals might be due to the high energy demand of crossbred animals and feed scarcity which makes them to ingest all materials they encounter without selection that increases the chance of exposure to foreign bodies.

In this study there was no significant difference between sex of cattle in the prevalence of foreign body (*p-value*=0.05). The present study, the prevalence of foreign bodies were 26.2% and 9.5% in male and female cattle respectively. This result disagreed with the study of Berrie *et al*. (2015) who observed that 87% dairy cattle affected by foreign body. Bwatota *et al*. (2018) from Queenstown abattoir reported that 66.2% in female and 33.8% in male. Moreover, Vikhaya *et al*. (2017) indicated that 61.5% of female crossbred than 23.0% male cross breed cattle from Tanzania. Although there was no significant association between age of cattle and foreign body prevalence (*p-value*=0.43), foreign bodies were more frequently encountered in old animals than adults. About 28.6% and 24.3% of foreign body prevalence were detected in old and adult cattle respectively. This finding was in line with the studies of Reddy *et al.* (2014) and Fromsa and Mohammed (2011) who reported that 93% and 81.25% of foreign bodies were detected in old cattle respectively. The higher prevalence in old cattle might be associated with increased exposure through life and gradual accumulation of foreign bodies in the rumen and reticulum. There was significant association between prevalence of foreign body and body condition of cattle (*p-value*=0.00). The prevalence of foreign bodies in medium body conditioned cattle was 67 (50%) and good body conditioned cattle was 30 (12%). This finding was in agreement with the reports of Fromsa and Mohammed (2011) and Hailat *et al*. (1996). The reason for animals to be poor in body condition might be associated with the foreign body in the rumen and reticulum. The animal losses weight after it has been exposed to foreign bodies. It may interfere with the absorption of volatile fatty acid and thus causes reduced weight gain (Rahel, 2011).

The number of foreign bodies was found to be higher in the rumen (86.6%) than reticulum (9.3%), with the rest of the proportion occurring in both rumen and reticulum (4.1%). This result was in line with the work of Negash *et al*. (2015) who revealed that 87.9% in the rumen and 5.0% in the reticulum from all ruminants. And also with Sheferaw *et al*. (2014) who had reported 88% in the rumen and 14.4% in the reticulum. The presence of more foreign bodies in the rumen than reticulum is attributable to the rumen's higher volume and position as the primary site of ingesta accumulation. 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). The types of foreign bodies detected in this study were plastic, cloth, rope, and metal. The higher proportion of foreign bodies were plastic 52.6 % and the remaining cloth (27.8%), rope (15.5%), and metal (4.1%). Because of the wide spread use, improper disposal of plastic bags and lack of awareness among livestock owners on the risk of ingestion of these materials on the health of their animals also contributed to the high prevalence of rumen impaction in this species. Shortage of feed during the long dry season increase the likelihood of ingestion of plastic foreign bodies which is also associated with a shortage of feed specifically of minerals and vitamins.

Recommendations

In conclusion, the study showed that there was a 25.3% overall prevalence of rumen and reticulum foreign bodies of cattle in the study area. This might be associated with wide-spread distribution of solid waste materials in the environment especially plastics. Improper animal management practices by owners might also contribute

to the occurrence of foreign bodies in cattle. The prevalence of foreign materials was higher in the cattle who were from rural areas, extensive farming systems, and medium body-conditioned animals than others. Accumulation of these foreign materials in the rumen and reticulum of cattle might affect producers economically due to loss of production and prevent cattle from attaining good body condition. Based on these conclusions the following recommendations were forwarded; appropriate waste disposal methods should be implemented to reduce environmental pollution, encourage societies to use biodegradable bags instead of plastics, and the government should provide legislations regarding the proper disposal of wastes from households and factories. Furthermore, farmers should manage their herds properly by providing adequate nutrition, and reducing free grazing.

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Competing interests

The author declares that she has no competing interests.

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