

## Study on Prevalence of Indigestible Foreign Bodies in the Rumen and Reticulum of Cattle Slaughtered at Gimbi Municipal Abattoir, West Wollega, Ethiopia

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**Abstract:** A cross sectional study was conducted on 384 cattle slaughtered from November, 2022 to April, 2023 at Gimbi municipal abattoir, western Wallaga, Ethiopia. The main objective of this study was to estimate prevalence and to distinguish the type of indigestible foreign bodies in rumen and reticulum of slaughtered cattle with their associated risk factors. Each compartments of fore stomach were carefully opened through incision followed visualization for identification indigestible foreign bodies to categorize into appropriate foreign bodies type. Indigestible foreign bodies identified based on physical appearance categorized as plastic bags, cloth, wire, rope, and nails. The study revealed the overall prevalence of 15.3% animals with 10/59 (16.94%), 9/59 (15.25%), 9/59 (15.25%), 7/59 (11.86%), 6/59 (10.16%), 5/59 (8.47%), 4/59 (6.77%), 4/59 (6.77%), 3/59 (5.08%) and 2/59 (3.38%) indigestible foreign bodies which had ropes, clothes, plastic bags, leather; plastic and leather; plastic, leather and clothes; nails, plastic and clothes; wires; plastic, nails and wires were detected respectively with ascending prevalence order. Out of 384 sample cattle examined foreign bodies observed in rumen and reticulum were 41(69.49%), 18(30.5%) were positive for foreign bodies in rumen and reticulum of slaughtered animals in Gimbi municipal abattoir respectively. From three age groups examined the prevalence was higher in old and lower in young animals. Among risk factor, body condition score 25(29.06%) poor followed by medium 21(14.78%) and finally 13(8.33%) good body conditions were positive for foreign bodies based on frequency of occurrence. It is concluded that apart from the factor considered additional study needs to identify important risk factor that contributes for abnormal feeding .

**Key words:** Cattle • Ethiopia • Foreign Body • Gimbi • Indigestible • Prevalence • Reticulum • Rumen

### INTRODUCTION

The occurrence of foreign bodies in the rumen and reticulum of cattle is commonly seen in developing countries primarily due to indiscriminate feeding habits, improper waste disposal in the environment, nutritional deficiency and poor management system around home [1]. Industrialization and mechanization further increased the incidence of foreign bodies in animals in urban and semi urban areas [2]. Cattle kept in farm yards, stables close to human mechanical activities are disposed to swallow metallic, plastic and non-plastic objects such as nails and pieces of wires that have been carelessly left in their feeding areas. They are exposed to indigestible materials resulting in high economic losses [3, 4].

Most of these foreign bodies were found mainly in the fore-stomachs and they are responsible for most pathological conditions [5]. This may lead to various complications including ruminitis, rumen impaction, traumatic pericarditis and traumatic reticulo-peritonitis, even penetrate pleural cavity causing Pleuritis and pneumonia, and into the pericardial sac causing pericarditis [6]. It may ultimately lead to rumen distension, absence of defecation, reduced feed intake, failure of the absorption of volatile fatty acids, reduced rate of weight gain, internal injury, the perforation of the wall of the reticulum which allows leakage of ingesta and rumen micro flora which contaminates the peritoneal cavity, resulting in inflammation of the peritoneum and consequently death [7, 8].

In Ethiopia, the occurrence of rumen and reticulum indigestible foreign bodies in cattle had been reported in different regions. Occurrence rate of 23%, 13.2%, 8.6%, 14.8%, 43.4%, 18.3%, and 35.7% were recorded by Tefaye *et al.*, Tefaye and Chanie, Nugusu *et al.*, Berrie *et al.*, Negash *et al.*, Ushula and Nana and Mekuanint *et al.* respectively [9-15]. However, there is no published data on rumen foreign body of cattle in Gimbi area.

Therefore, the objectives of this study were to estimate the prevalence, identify type of foreign bodies and associated risk factors for indigestible foreign bodies in rumen and reticulum of cattle in Gimbi town.

## MATERIALS AND METHODS

**Study Area:** The study was conducted in Western Ethiopia, Oromia Regional state, West Wallaga Zone, at Gimbi district. Gimbi is located at about 427 km from west of Addis Ababa and bounded by Benishangul region in the North, Haru woreda in the South, East wallaga zone in the East and Lalo Asabi woreda in the West direction. The district is located between latitude 9°10' N and longitude 35°50' E with altitude of the area ranges from 1845-1930 meters above the sea level. The mean annual rain fall of the area ranges from 1400-1500 millimeter and the mean annual minimum and maximum temperatures are 12°C and 34°C respectively. The major agricultural production seasonally harvested includes chickpea, wheat, teff, maize and other legume crops [15].

The main farming system in the area is mixed farming and cattle are the most abundant animal species kept in the area. The cattle in the area are indigenous East African zebu breeds and are kept under traditional husbandry system. According to the reports on November 16, 2023, from Gimbi livestock office, there were about 117,758 of cattle population [16].

**Study Design:** A cross-sectional study was carried out from November, 2022 to April, 2023 at Gimbi slaughter municipal abattoir in the study area. The study was carried out on 384 cattle which originated from different agro-ecological zones and kept under different management system. The study animals originated from Arjo, Enango, and Jitu local markets. Animals were selected from the study population by using simple random sampling technique. During sampling the age, body condition, and origin of animals were recorded. Classification of the body condition of animal was made

according to a method previously described by Nicholson and Butterworth, with scale ranging from poor, medium and good [17]. The age of the animals was grouped as ( $\leq$  5years), (5-10years) and ( $\geq$  10 years).

**Sample Size Determination:** The required sample size was determined based on the procedure described by Thrusfield [18] using 50% expected prevalence of cattle foreign bodies in cattle in the area, and 5% desired absolute precision and at 95% confidence level. Accordingly, the total sample was determined by below formula [18].

$$N = (1.96)^2 P_{\text{exp}}(1 - P_{\text{exp}})/d^2$$

Where: n = required sample size,  $P_{\text{exp}}$  = Expected prevalence and d = desired absolute precision. The sample size for this work was determined using 50% expected prevalence and 5% absolute precision at 95% confidence level using the above formula, the minimum of 384 cattle were intended to be sampled.

**Ante Mortem Inspection:** Animals presented for slaughter were subjected to ante-mortem inspection upon arrival at the slaughter house. Ante-mortem inspection was conducted by applying a specific range of procedures that consider the behavior and appearance, as well as signs of disease in animals [19]. Ante-mortem inspection of cattle took place in pens on the premises and each animal was observed at rest and in motion for the general status. Only animals that were judged to be sufficiently rested were proceeding to slaughter. Each animal selected for the study was further identified by providing a unique identification number that was used for the preceding postmortem examination.

**Postmortem Examination:** After slaughter and before flaying, slaughtered animals were identified by recording the code given at antemortem. Animals were visually inspected and their rumen and reticulum were palpated immediately post slaughter. Then, the stomach was gently removed from the abdominal cavity and all the contents were examined carefully for the presence or absence of any foreign material. The location and types of foreign bodies that were found in the stomach were properly recorded. When foreign bodies were found, they were carefully removed, washed, with pure water and the type of foreign bodies would identified.

**Data Analysis:** Data was entered into a Microsoft Excel spreadsheet and summarized using descriptive statistics. For analysis, SPSS Microsoft software Version 17.0 was used. Descriptive analysis and Pearson chi-square ( $\chi^2$ ) test were employed to assess the existence of association between prevalence of the foreign bodies and different potential risk factors considered. P-values less than 0.05 were considered significant.

## RESULTS

**Occurrence:** From the total of 384 cattle sample examined for the presence of indigestible foreign bodies in their rumen and reticulum, 59(15.3%) were found positive. The types of indigestible foreign bodies were Leather, clothes, plastic bags, ropes; nails; plastic and wire; plastic and clothes; plastic, leather and clothes; wires; plastic, nails and wires were found with the frequency of 9/59 (15.25%), 9/59 (15.25%), 7/59 (11.86%), 7/59 (11.86%), 7/59 (11.86%), 5/59 (8.47%), 5/59 (8.47%), 4/59 (6.77%), 4/59 (6.77%), and 2/59 (3.38%) with ascending order respectively.

**Occurrence of Foreign Bodies with Regard to Age:** The study animals were grouped to three as young (< 5 years), adult (5-10 years), old (>10 years). From the total of 25, 343, 16 these age groups cattle sample examined with respect to their age in this groups 1(4%), 46(13.41%), 12(75%) were found positive. Foreign bodies were more frequently encountered in old animal than the other first two age groups. The statistical analysis showed that there was highly significant difference among age group (Table 1).

**Occurrence of Foreign Bodies with Regard Body Condition:** Prevalence of foreign bodies in relation to body condition from the total of 86, 142 and 156 poor, medium and good scoring animals 25(29.06%), 21(14.78%) and 13(8.33%) were positive for foreign body in their rumen and reticulum respectively. There was statistically significant difference among body condition score of cattle in relation to the occurrences of foreign bodies in rumen and reticulum (P<0.05).

**Occurrence with Regard to Animal Origin:** Animals slaughtered in the abattoir from three different origins (Arjo, Jitu, and Enango). From the total of 100, 152, 132 cattle examined from Enango, Jitu and Arjo, the highest frequency of rumen and reticulum of foreign bodies observed in cattle originated from Arjo followed by Jitu while lowest from Enango (Table 3).

**Prevalence of Foreign Bodies with Regard Lodgments Site:** From the 59(15.3%) positive cases for rumen and reticulum indigestible foreign bodies, 41/59 (69.49%) had foreign bodies in the rumen while 18/59(30.51) from reticulum of slaughtered cattle (Table 4).

## DISCUSSION

Available literatures indicated that indigestible foreign body in rumen and reticulum is one of the most important diseases of cattle requiring surgical remedy in the developing countries. The current study revealed an overall prevalence of 15.3% of rumen and reticulum indigestible foreign body in cattle slaughtered at Gimbi municipal abattoir. The current finding agree with the

Table 1: Age distribution of rumen and reticulum foreign bodies in cattle at Gimbi municipal abattoir.

Types foreign bodies	Age			Total	X2	p-value
	<5 years (%)	5-10 years (%)	>10 years (%)			
Foreign bodies negative	24(96)	297(86.58)	4(25)	325		
Plastic	-	4(8.69)	3(25)	7		
Leather	-	9(19.56)	-	9		
Clothes	1(100)	6(13.04)	2(16.67)	9		
Rope	-	6(13.04)	1(8.33)	7	65.34	0.000
Nail	-	5(10.86)	2(16.67)	7		
Wire	-	4(8.69)	-	4		
Plastic and wire	-	3(6.52)	2(16.67)	5		
Plastic and clothes	-	3(6.52)	2(16.67)	5		
Plastic leather and clothes	-	4(8.69)	-	4		
Nail plastic and wire	-	2(4.34)	-	2		
Total	25	343	16	384		

Table 2: Association of body condition score rumen and reticulum foreign bodies in cattle at Gimbi municipal abattoir.

Types foreign bodies	Body condition			Total	X2	p-value
	Poor (%)	Medium (%)	Good (%)			
Foreign bodies negative	61(70.93)	121(85.21)	143(91.67)	325		
Plastic	5(20)	2(9.52)	-	7		
Leather	5(20)	2(9.52)	2(15.38)	9		
Clothes	3(12)	4(19.04)	2(15.38)	9		
Rope	3(12)	2(9.52)	2(15.38)	7	34.281	0.024
Nail	3(12)	3(14.28)	1(7.69)	7		
Wire	-	1(4.76)	3(23.07)	4		
Plastic and wire	1(4)	3(14.28)	1(7.69)	5		
Plastic and clothes	3(12)	1(4.76)	1(7.69)	5		
Plastic leather and clothes	1(4)	2(9.52)	1(7.69)	4		
Nail plastic and wire	1(4)	1(4.76)	-	2		
Total	86	142	156	384		

Table 3: Frequency of occurrence of rumen and reticulum foreign bodies based on origin of cattle at Gimbi municipal abattoir.

Types foreign bodies	Enango (%)	Jitu (%)	Arjo (%)	Total	X2	p-value
Foreign bodies negative	87(87)	128(84.21)	110(83.3)	325		
Plastic	2(15.38)	2(8.33)	3(13.63)	7		
Leather	2(15.38)	4(16.66)	3(13.63)	9		
Clothes	1(7.69)	5(20.83)	3(13.63)	9		
Rope	2(15.38)	2(8.33)	3(13.63)	7		
Nail	1(7.69)	5(20.83)	1(4.54)	7		
Wire	-	1(4.16)	3(13.63)	4	15.413	0.752
Plastic and wire	2(15.38)	2(8.33)	1(4.54)	5		
Plastic and clothes	2(15.38)	-	3(13.63)	5		
Plastic leather and clothes	-	2(8.33)	2(9.09)	4		
Nail plastic and wire	1(7.69)	1(4.16)	-	2		
Total	100	152	132	384		

Table 4: Origin of animal was found determining the frequency of occurrence rumen and reticulum foreign bodies in cattle at Gimbi municipal abattoir.

Types foreign bodies	No positive	Rumen (%)	Reticulum (%)	Prevalence (%)	X2	p-value
Foreign bodies negative	325	-	-	-		
Plastic	7	7(17.07)	-	11.86		
Leather	9	9(21.9)	-	15.25		
Clothes	9	9(21.9)	-	15.25		
Rope	7	7(17.07)	-	11.86		
Nail	7	-	7(38.8)	11.86	18.716	0.001
Wire	4	-	4(22.2)	6.77		
Plastic and wire	5	-	5(27.7)	8.47		
Plastic and clothes	5	5(12.1)	-	8.47		
Plastic leather and clothes	4	4(9.7)	-	6.77		
Nail plastic and wire	2	-	2(11.1)	3.39		
Total	59	41	18	15.36		

report from Gondar Elfora abattoir which was 14.8% [11]. This level of prevalence had major economic importance which causes production losses and even serious cause fatality of animals. However, the result obtained from this study was relatively lower than the reports from Bassa and Tesfaye which was 17.5% [20]. Similarly, similar results were reported from the rumen and reticulum of cattle in Rwanda [21]. On the other hand, the result obtained from this study area was higher than the report

made by Tesfaye and Chanie from Jimma municipal abattoir which was 13.22% [4]. On the contrary, reports made from Haramaya Municipal Abattoirs, the Amhara region, and Bodingi Municipal Abattoirs showed a higher prevalence rate of 43.4%, 41.8%, and 20.8% than current study respectively [12,22,23]. Moreover, report with much higher prevalence rate was also reported from Addis Ababa municipal abattoirs [14] and higher prevalence rate of 59.14% was reported from Pakistan [24].

These variations in the prevalence rate in the different regions might be due to the level of environmental pollution by non-degradable plastic foreign materials as the use of plastic bags for carrying goods is less practiced in some of the localities. Grazing lands are contaminated with indigestible materials mainly by plastic foreign bodies in peri-urban and urban areas. Hence those cattle raised in rural areas are less affected than those reared in semi-urban and urban areas. Shortage of forage and absence of supplementary feed especially during the long dry season predispose the animals to a negative energy balance that in turn force them to eat unusual materials including plastics, cloth, rope and even metallic objects [4,6].

The highest frequency of occurrence of rumen and reticulum foreign bodies were detected in animals greater than 10 years (75%) followed by 5-10 years (14.78 %) and less than 5 years (4 %). This finding is lower than with Hailat *et al.* who reported prevalence rate of 59.14% [25]. Foreign bodies in rumen and reticulum in older dairy cattle are the most commonly affected group [26]. Similarly, highest prevalence (81.25%) of foreign bodies was detected in cattle greater than 10-year age [24]. This finding was also in agreement with the work of Fromsa and Mohammed who recovered plastics, leather, clothes and ropes at higher prevalence from the rumen and reticulum of old sheep and goats [27]. Indigestible rumen foreign body detection was higher in adult ruminants (46.7%) than young ruminants (12.9%) [14]. This variation might be associated with level of environmental foreign bodies pollution and age risk factors were due to gradual exposure through life and many were found to accumulate and lead animals to harbor large sized foreign bodies.

Regarding body condition score, the highest frequencies of occurrence of rumen and reticulum foreign bodies were detected in poor 25(29.06%) followed by medium 21(14.78%) and good 13(8.33%) body conditioned cattle, and the difference were statistically significant ( $P < 0.05$ ). This result was in agreement with the finding of Tesfaye and Chanie who reported higher, medium and lower prevalence rate in poor, medium and good body condition score, respectively at Gondar Elfora abattoir [4]. This study reveals higher frequency of foreign body occurrence in animals having poor body condition than in good body condition animals and which was also reported in other studies [4, 6, 27]. Accumulation of indigestible foreign bodies in the rumen interfere with the flow of ingesta and decrease absorption of volatile fatty acid and thus cause reduced weight gain [7, 8, 28].

These effects contributed to poor body condition, and in long period of time, these materials form large tight balls inside the rumen leading to decreased production and loss of weight gain [29].

In this study, the prevalence foreign bodies in rumen (69.49%) and in reticulum (30.51%) were recorded. This finding also agrees with the work of Tesfaye and Chanie, who reported the higher number of foreign bodies occurrence in the rumen (79.2%) than in the reticulum (20.8%) [4]. This finding also relatively agreed with the findings of Ushula and Nana also reported high prevalence which was (87%) occurred in the rumen and (13%) occurred in reticulum at Hawassa municipal abattoir [13]. Furthermore, Khurshaid *et al.* also reported that most foreign bodies were encountered in the rumen (58.45%) than the reticulum (19.32%) of Achai cattle at different regions in Pakistan [24]. In contrast, Bassa and Tesfaye reported lower prevalence than present findings which was 10.83% in Wolaita Sodo municipal Abattoir [20]. This is attributed to the larger rumen volume, the cumulative size and material composition of the foreign bodies, and the types of materials, with metals and sharp objects tending to localize preferentially in reticulum. However, metallic and nonmetallic foreign bodies most frequently encountered from rumen and reticulum respectively [26]. Rope was the most commonly encountered (2.6%) foreign material, followed by plastic and cloth (2.34%) and the least encountered were nail, plastic and wire materials comprising together (0.52%). This finding in general agreed with various reports from different areas of Ethiopia, from Nigeria and from Jordan also reported similar findings [4, 6-8, 22, 27, 30]. This showed that the wide spread use of plastic bags in these areas, improper disposal, and also lack of proper disposal of used and trimmed cloths elsewhere in the environment.

The highest prevalence of foreign body was observed in animals originated from Arjo (16.67%), followed by Jitu which was 15.78% and the least prevalence was recorded in those originated from Enango town which was 13 %. Accordingly, the difference in the prevalence rate in locality could be due to difference in the origin of animals and awareness of community about waste management system [28]. Arjo is small town so that the animals have a chance to get access to pieces of metal and plastics around construction sites. Moreover, improper disposal of plastic bags from shops, market places, and by the public could have contributed for the higher occurrence of the problem in those animals originated from Jitu. Lack of feed supplement cause the

cattle search for foreign bodies. Extensive free grazing area, forced the animals to look for feed, to go to nearby town, market place and road side that are polluted with those indigestible materials. In this study origin had no statistical significance ( $P>0.05$ ).

### CONCLUSION AND RECOMMENDATIONS

This study revealed presence of improper use and rejection of plastic bags, leather, rope, clothes, wires and nails anywhere increase exposure probability of peri-urban and urban cattle to harbor indigestible foreign bodies in their forestomach. Improper disposal of materials made up of plastics and metals ameliorate the risks of ingestion of indigestible material that is major problem in extensive system of management. During dry seasonal, Lack of feed also widens the chance to intake foreign bodies. In addition to this, shortage of provision of balanced diet increases the desire of animals toward pica to satisfy their needs of nutrition. As the country proceed to industrialization and mechanization indigestible foreign bodies would be increased. Problem in early detection of susceptible animal make the foreign bodies to be accumulated.

Based on above conclusion the following recommendation was forwarded:

- To minimize the problem, creating awareness for concerned owner of animal on the impact of foreign bodies' consequences on health of animals and production as well.
- Correction of animal nutrition and by satisfy their need to interfere foreign bodies' uptake.
- To minimize the risk of foreign body through adoption of reusable strategy of foreign bodies in order to collect them for reuse.
- Keeping animals away from construction areas.
- Further study should be conducted to assess the production and economic effects of foreign body accumulation in environment.

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