



Original article

Prevalence of indigestible substances in the rumen and reticulum of small ruminants slaughtered at Katsina central abattoir, Katsina state, northwestern Nigeria

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ABSTRACT

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An abattoir based cross sectional study was conducted on 753 slaughtered small ruminants (406 ovine and 349 caprine) at Katsina Central abattoir, Katsina state, Northwestern Nigeria to determine the prevalence of indigestible substances in the rumen and reticulum of small ruminants. The study animals were selected using simple random sampling technique from the study population. 11.02% (83) were found to be positive for the presence of indigestible substances in the rumen and reticulum of the animals examined. A prevalence of 59.0% and 41.0% of indigestible substances were observed in sheep (406) and goat (347) examined respectively and there was no significant association ($p > 0.05$) between each of the species examined and the indigestible substances. A prevalence of 12.0%, 28.9%, 39.8% and 19.3% were also observed in <1 year, 2 years, 3 years and >3 years of the study population respectively. 86.7% and 13.3% prevalences were recorded in both rumen and reticulum of the examined animals respectively and the occurrence of indigestible substances was significantly different ($p < 0.05$) in rumen and reticulum. Therefore, adopting intensive system of management in small ruminant production and proper managerial practices will

reduce the incidence of ingestion of indigestible substances in sheep and goat within the study area.

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1. Introduction

Small ruminants contribute significantly to the total meat supply in the tropics. The importance of small ruminants in general is well recognized (Hailatet *al.*, 1997). Small ruminant are reared mainly for four functions, namely meat, milk, skin and wool, according to order of importance. In addition, they also provide other products of great nutritional and economical values, which include milk, skin, hair wool and manure and as such they vary in different parts of the world. Sheep is characterized as defenseless, vigilant, tight flocking, visually alert, wool-covered ruminant that evolved with a mountain grassland habitat (Abdullahi *et al.*, 1984). Goat on the other hand is essentially mountain dwellers and associate in herds of visually five to twenty.

Small ruminant are highly selective feeders and ingest significantly more amount of indigestible substances as compared to cattle (Hailatet *al.*, 1997). However, the ingestion of indigestible substances may occur during drought or food scarcity (Igbokweet *al.*, 2003). Due to the absence of recycling industries and lack of good environmental sanitation cultures, the indiscriminate disposal of polythene bags, nylon sheets, and other indigestible materials in both urban and rural areas, ingestion of these materials by free grazing small ruminant is easy (Ghurashiet *al.*, 2009). As confirmed by the present study, despite the abundance of the pre disposing factors in the study area, yet the prevalence of these indigestible substances was very low.

The fact that impaction of the rumen cause by accumulation of indigestible substances is mostly asymptomatic in nature and can only be diagnosed in live animals if accumulated in larger amount thus, it can be adequately studied in abattoirs (Raminet *al.*, 2008). In the drier region of Nigeria, Katsina to be precise, there are abundant feed stuffs during the rainy season and a decline in feed supply during the dry season. During this period, the scavenging small ruminants suffer a serious scarcity of nutrients, hence they eat anything at their disposal including polythene bags and nylon sheets in garbage and on the streets resulting in the subsequent impaction of the rumen (Remi-Adewunmiet *al.*, 2004).

In Nigeria, small ruminants are kept under an extensive system of management and are very likely to be exposed to the ingestion of indigestible substances of various sources due to the wide spread environmental contamination with polythene bags, absence of policy to protect the environment from such insults and the frequent occurrence of drought that predispose animals to nutritional deficiency and pica. Despite the presence of the predisposing factors, the study so far conducted in Nigeria on the prevalence of indigestible substances ingestion by small ruminants is scarce.

Some expensive equipment can be used to explore the presence of some penetrating objects by eliciting and detecting pain behind the xiphoid process of the sternum but in countries like Nigeria, abattoir survey is the best option available. The presence of indigestible substances in the rumen and reticulum slow the absorption of volatile fatty acids and consequently reduction in the rate of animal fattening (Igbokweet *al.*, 2003). Therefore, the aim and objectives of this study is to find the prevalence of indigestible substances in the rumen and reticulum of small ruminants slaughtered at Katsina Central abattoir, Katsina state, Northwestern Nigeria. Hence, there is a need to assess the magnitude of ingestion of indigestible substances in the study area.

2. Materials and methods

2.1. Study area

This study was conducted at Katsina Central abattoir, Katsina state, Nigeria. The state is located at Northwestern part of Nigeria on latitude 13⁰00'N and longitude 07⁰36'E with altitude of 182.82 to 457 meters above the sea level. It falls into the ecological zone of Sudan Savannah, characterized by a short rainy season with annual rainfall of about 50 to 80mm in the month of April to October. It is an area that has temperature variation. It is bordered by Niger Republic to the North, Kano and Jigawa state to the South and Zamfara state by the West (NPC, 2006).

2.2. Sample collection

753 slaughtered animals were sampled comprising of 406 sheep and 347 goats, each specie was determined as described by Pfeiffer (2002) and the animals were selected via simple random sampling technique. The animals were identified at post-mortem inspection and a unique identification number was used in sampling them and recorded. The age of the animals were estimated using dentition as described for African indigenous livestock (Pasquinet *al.*, 2003) and recorded. After slaughter, the stomach was carefully removed from the abdominal cavity and placed in a container. Rumen and reticulum were incised and thoroughly examined by visual inspection and palpation. All the contents were examined thoroughly for the presence of foreign bodies. Magnets were used for the detection of metallic objects, and then the foreign bodies were washed, dried, identified and labeled.

2.3. Statistical analyses

The specie of each animal and the value of its age were recorded along with the post-mortem findings. The data collected were summarized and analyzed using computer based data management system employing Microsoft Excel and SPSS software and the results are presented in tables.

3. Results

83 (11.02%) out of 753 animals examined were found to be positive for different types of indigestible substances during post-mortem examination. The prevalence of indigestible substances observed in <1 year, 2 years, 3 years and >3 years old were 12.0%, 28.9%, 39.8% and 19.3% respectively (Table 1). There was a significant difference ($p < 0.05$) between old and young animals in the presence of indigestible substances.

Table 2 shows the frequency of different types of indigestible substances found in both sheep and goat and they include; Polythene bags (77.1%), hairball (13.3%), nylon (6.02%) and metals (3.6%) in descending order of occurrence. There was no significant association ($p > 0.05$) between any of the indigestible substance found.

The prevalence of 59.0% and 41.0% were observed in both slaughtered sheep and goat respectively (Table 3) and there was no significant association ($p > 0.05$) between each of the species examined and the indigestible substance.

Table 4 shows that from the 83 positive cases of indigestible substance, 72 (86.7%) were found in the rumen and 11 (13.3%) in the reticulum (Table 4) and the occurrence of indigestible substances was significantly different ($p < 0.05$) in rumen and reticulum.

Table 1

Prevalence of indigestible substances at different age groups of small ruminant slaughtered at Katsina Central abattoir, Katsina state, Nigeria.

| Age group | No. examined | Positive animals | Prevalence (%) |
|----------------|--------------|------------------|----------------|
| <1 year old | 138 | 10 | 12.0 |
| 1 -2 years old | 204 | 24 | 28.9 |
| 3 years old | 188 | 33 | 39.8 |
| >3 years old | 223 | 16 | 19.3 |
| Total | 753 | 83 | 100 |

$p < 0.05$

Table 2

Frequency of different types of indigestible substances in small ruminant slaughtered at Katsina Central abattoir, Katsina state, Nigeria.

| Species | Positive animals | Nylon | Hairball | Polythenebags | Metals |
|-----------|------------------|---------|----------|---------------|--------|
| Caprine | 49 | 4 | 5 | 40 | 1 |
| Ovine | 34 | 1 | 6 | 24 | 2 |
| Total (%) | 83 (11.02) | 5(6.02) | 11(13.3) | 64(77.1) | 3(3.6) |

$p > 0.05$

Table 3

Prevalence of indigestible substances in small ruminants slaughtered at Katsina Central abattoir, Katsina state, Nigeria.

| Species | Animals examined | Positive animals | Prevalence (%) |
|---------|------------------|------------------|----------------|
| Caprine | 406 | 49 | 59.0 |
| Ovine | 347 | 34 | 41.0 |
| Total | 753 | 83 | 100 |

p>0.05

Table 4

Prevalence of indigestible substances in rumen and reticulum of small ruminants slaughtered at Katsina Central abattoir, Katsina state, Nigeria.

| Stomach compartment | No. of positive animals | Prevalence (%) |
|---------------------|-------------------------|----------------|
| Rumen | 72 | 86.7 |
| Reticulum | 11 | 13.3 |
| Total | 83 | 100 |

p<0.05

4. Discussion

Ingestion of indigestible substances by small ruminants is common and a worldwide problem previously reported from Nigeria (Igbokweet *et al.*, 2003; Remi-Adewunmiet *et al.*, 2004), Jordan (Hailat *et al.*, 1997) and Sudan (Ghurashiet *et al.*, 2009). This study revealed an overall prevalence of 11.02% (n=83) of indigestible substances found in small ruminants slaughtered at Katsina Central abattoir, Katsina state, Nigeria. This agrees with Igbokweet *et al.* (2003) who reported a slightly higher prevalence of 19.3% of indigestible substances in small ruminants in Nigeria and also Abebe and Nuru (2011) reported a prevalence of 12.23% of indigestible foreign bodies in a study conducted on small ruminants at Luna Export Abattoir, East Shoa, Ethiopia. While on the contrary, a much higher prevalence of 97% was reported in Nigeria in small ruminants brought from urban for slaughter (Remi-Adewunmiet *et al.*, 2004). 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. It may also be due to the difference in the sex composition of the animals or drought nature of the study year. It has been reported that ingestion of foreign bodies is associated with shortage of forage and increased pollution of the grazing land with the indigestible materials (Hailat *et al.*, 1998). Similarly, in Nigeria, feed shortage is prevailing particularly during the long dry season and most owners of small ruminants do not supply supplementary feed to the animals.

In this study, nylon occurs less frequent in sheep than in goats, while on the contrary rumen indigestible substances occurred less frequently in goats than in sheep due to the selective nature of goats while grazing (Remi-Adewunmiet *et al.*, 2004). Most of the animals slaughtered at Katsina Central abattoir are males, higher prevalence rate of indigestible materials in the female animals was reported (Roman and Hiwot, 2010).

This study showed the absence of significant association between species differences and indigestible substances ingestion (p>0.05). However, Roman and Hiwot (2010) and Hailat *et al.* (1997) found the presence of significant association between species differences and indigestible substances. This may be attributed to the variation in the origin of the animals studied. So also this study shows that older animals are more frequently affected with indigestible materials than the younger ones. This is in agreement with Abebe and Nuru (2011) and Roman and Hiwot (2010), the findings may be due to gradual ingestion of indigestible substances over a prolonged period of time. The types of indigestible substances found in this study were nylon, hairball, polythene bag and metals which are also similar to the findings of Abebe and Nuru (2011). The result shows that polythene bag was found to be of higher frequency than others and is the cause of rumen impaction in most cases. This is in accordance with the reports of Abebe and Nuru (2011), Roman and Hiwot (2010) and Hailat *et al.* (1997) and this may be attributed to improper disposal of polythene bags in urban and peri-urban areas.

5. Conclusion

The findings of this study showed that littering the environment with polythene bags and other indigestible substances could pose a serious health problem for free grazing small ruminants and the findings could help environmental activists, veterinarians, policy makers and livestock owners to recognize the impact of indigestible substances in small ruminant health and productivity in this country and also there is a need to further carry out a similar research in other different species.

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