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Rumen Impaction: Retrospective study on the prevalence, clinical findings, gross pathology and causes in sheep and goat reared in the tropical rain forest of Nigeria

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Abstract

In the present study, the prevalence, clinical manifestation, pathology and causes of rumen impaction in sheep and goats were determined from 6 years postmortem records, of the Department of Veterinary Pathology, College of Veterinary Medicine, Federal University of Agriculture, Abeokuta, for proper management of the condition. The prevalence was calculated as percentage of occurrence of rumen impaction among cases presented for postmortem examination; as overall, annual, age and sex-specific. The overall prevalence was 16.05%; and was higher in sheep (23.53%) than in goats (10.64%). Annual prevalence varied from 7.14 in 2014 to 25.00% in 2017. Higher prevalence was recorded in adult (23.81%) and female (21.43%) than in young (7.69%) and male (10.26%) animals. Clinical findings included distended abdomen, dullness, anorexia, fever; difficulty in breathing, recumbency and anaemia. Grossly the abdomens were distended; there were severe frothy exudates in the trachea and air ways. The visceral organs were severely congested. The rumens were markedly distended with foreign materials; as well as feed materials in some cases, thereby confusing the condition with pregnancy. The causes of rumen impaction include foreign materials such as nylon (40.00%), twines and ropes (25.00%), plastics and rubbers (10.00%), wire (2.00%) stones and sands (2.00%), bones and unidentified objects (1.00%). While impaction due to green and dry feeds constitute (15.00%) and cassava peels in 5% of the cases. When clinical sign of distended abdomen is observed in female small ruminants, proper examination should be carried out, bearing in mind the possibility of rumen impaction rather than considering only pregnancy. The high prevalence of rumen impaction recorded in this study call for proper environmental sanitation and proper management of small ruminants in the study area.

Keywords: Rumen impaction, prevalence, clinical signs, pathology, feed materials, foreign materials

Introduction

Sheep and goats have contributed to the economy of many farmers and countries, through the production of high quality protein (meat, milk and eggs) hides, skins, fertilizer, and power and traction for agricultural purposes and thereby increasing the productivity of small holdings (Torr *et al*., 2003). Small ruminants such as sheep and goats also serve as a financial reserve for periods of economic distress and crop failure and as primary source of cash income (International Livestock Research Institute, 1999).

However, the production of small ruminants is faced with various infectious and non-infectious disease conditions (Adeloye, 1998). Rumen impaction is a major threat to livestock production in Nigeria (Igbokwe *et al*., 2003). The condition can be asymptomatic and difficult to diagnose in live animal (Garba and Abdullahi, 1995; Abdelaal and Maghawry, 2014). It can only be adequately studied in abattoir when the animals are being dressed after slaughter or during postmortem examination (Igbokwe *et al*., 2003).

Rumen impaction can result as a primary condition or may be secondary to other conditions including impaction of other parts of the stomach, traumatic reticulo-peritonitis, metabolic disorders, viraemia, bacteriaemia or blood parasitism and ingestion of indigestible foreign bodies such as plastic, leather, nylon, clothes, rope and metal; dry feeds materials especially those that have high fiber content, sand as well as blockage of the omasal orifice by a foreign body and dehydration (Gyang, 1991; Pugh, 2002). Ingestion of indigestible foreign bodies is mainly associated with nutritional deficiencies, environmental pollution and poor feeding management, and causes various problems in the rumen and reticulum of ruminants (Jones *et al*., 1997). Ruminants reared in peri-urban and sub-urban (rural) areas are exposed to indigestible materials when reared on free range in environment that is polluted with such materials (Igbokwe *et al*., 2003; Remi-Adewumi *et al*., 2004). The effect of rumen impaction is interference of the flow of ingesta leading to rumen distension and absence of defaecation and death (Pugh, 2002; Igbokwe *et al*., 2003; Remi-Adewunmi *et al*., 2004), leading to serious economic loss (Hailat *et al*., 1996).

Other harmful effects of rumen impaction include reduced feed intake, failure to absorb volatile fatty acids, reduced rate of weight gain, internal injury and death (Igbokwe *et al*., 2003; Radostits *et al*., 2007). There has been recurrent rumen tympany in large ruminants that has nonmetallic indigestible foreign bodies in the reticulo-rumen, especially in dairy cow (Vanitha *et al*., 2010).

Alterations in the microbial populations of the digestive chambers is a common finding in ruminants that have large amounts of indigestible foreign bodies in the reticulo-rumen, thereby facilitating the pathogenesis of rumen impaction (Ismail *et al*., 2007).

Management practices such as provision of good feeds and clean environment is the most preferred option of reducing the rate of rumen impaction in a herd. Treatment can be done by employing surgical technique

The present study was carried out to determine the extent of rumen impaction and the associated clinical signs, gross pathology and aetiology in sheep and goats reared in the tropical rain forest, for accurate diagnosis, proper management and prevention.

Materials and methods

The prevalence, clinical findings, postmortem findings and aetiology of rumen impaction were determined in this study. The date, total number of postmortem cases in sheep and goats and the number of cases of rumen impaction with the associated clinical history and postmortem findings were retrieved from 6 year postmortem records (2012-2017) of the Department of Veterinary Pathology, College of Veterinary Medicine, Federal University of Agriculture, Abeokuta. The prevalence of rumen impaction was calculated by taking the percentage of occurrence as overall,

animal type, annual, age and sex-specific. Information on blood parameters and faecal examinations were obtained from the clinical records of the Veterinary Teaching Hospital, Federal University of Agriculture, Abeokuta.

Results

Prevalence

The overall prevalence of rumen impaction in both sheep and goats was 16.05%. The prevalence was higher in sheep (23.53%) than in goats (10.64%) (Table 1) while annual prevalence varied from 7.14 in 2015 to 25.00% in 2017 (Table 2).

Table 1: Animal type-specific prevalence of rumen impaction in sheep and goat from 6 years (2012-2017) postmortem records

Animal type	Number of postmortem cases	Number of cases of rumen impaction	Prevalence (%)
Sheep	34	8	23.53
Goat	47	5	10.64
Overall	81	13	16.05

Table 2: Annual prevalence of rumen impaction in sheep and goat from 6 years (2012-2017) postmortem records

Year	Number of postmortem cases	Number of cases of rumen impaction	Prevalence (%)
2012	16	3	18.75
2013	13	2	15.38
2014	17	3	17.65
2015	14	1	7.14
2016	13	2	15.38
2017	8	2	25.00
Overall	81	13	16.05

Age-specific prevalence was highest in adult (23.81%) than in young animals (7.69%) (Table 3), While Sex-specific prevalence was highest among females (21.43%) when compared to that in the males (10.26%) (Table 4).

Table 3: Prevalence of rumen impaction in adult and young sheep and goats from 6 years (2012-2017) postmortem records

Age	Number of postmortem cases	Number of cas es of rumen impaction	Prevalence (%)
Adult	42	10	23.81
Young	39	3	7.69
Overall	81	13	16.05

Table 4: Sex-specific prevalence of rumen impaction in sheep and goat from 6 years (2012-2017) postmortem records

Animal type	Number of postmortem cases	Number of cases of rumen impaction	Prevalence (%)
Female	42	9	21.43
Male	39	4	10.26
Overall	81	13	16.05

Clinical Findings

Clinical histories and signs

Majority of the animals diagnosed with rumen impaction were on free range (90%). Clinical signs associated with rumen impaction in both sheep and goats were distended abdomen, dullness, anorexia, fever, difficulty in breathing, recumbence, reluctance to stand, pasty stool, pale mucous membranes, lateral deviation of the neck, teeth grinding and death. There were cases in which rumen impactions were confused with pregnancy.

Haematological parameters

Most of the animals had low packed cell volumes ranging from 18% to 27%. There were neutrophilia in 60% of the cases (Table 5).

Table 5: Haematological parameters associated with rumen impaction in sheep and goats

Parameter	Value	Normal range	Percentage (%)
PCV	18-20%	27-45%	60
Total WBC	3.6-4.8 x 10^3	4-12 x $10^3/\mu l$	55
Neutrophils	60-70%	20-50%	70%
Lymphocytes	40-60%	40-75%	90%
Monocytes	0%	0-6%	100%
Basophils	0%	0-3%	100%
Eosinophils	5-10%	0-10%	80%
Haemoparasites	Nil	Nil	100%

Faecal examinations

Faecal examination revealed few number of Eimeria species (++) in 40% of the cases

Gross pathology

Gross pathological findings associated with rumen impaction in sheep and goats were distended abdomen (Figure 1-3), mucoid nasal discharges, pale ocular and oral mucous membranes, marked hydrothorax, severe frothy exudates in the trachea and air ways, the lungs were severely congested and oedematous and have not collapsed in 100% of the cases, and the coronary blood vessels were engorged. The liver, spleen and kidneys were severely congested. The rumens were markedly distended with variable digestible (Figure 4 and 5) (20) and indigestible foreign materials (80%) (Figure 6). There were few number of haemonchus species in the abomasums in 30% of the cases in both sheep and goats. The intestines contained scanty watery faecal materials.

Aetiology

The digestible materials causing rumen impaction in sheep and goats were green or dry feeds (15%) (Figure 4) and cassava peels (Figure 5) (5%). The foreign bodies identified in the rumens were mainly nylons, which occurred in 40% of the cases examined. There were twines and ropes in 25% of the cases. Other materials observed were plastics and rubbers (10%), wires (2%), stones and sands (2%); while bones and unidentified objects were observed in only 1% of the cases (Figure 6). There was a case in which the different types of foreign bodies inter-twined and measuring 110cm and weighed 2.5 kg was observed (Figure 7).

Figure 1: Photograph of a sheep with rumen impaction showing distended abdomen (arrow)

Figure 2: Photograph of a goat with rumen impaction showing distended abdomen (arrow)

Figure 3: Photograph of the rumen of a sheep showing distention (arrow)

Figure 4: Photograph of the rumen of a sheep distended with greenish feed materials (arrow)

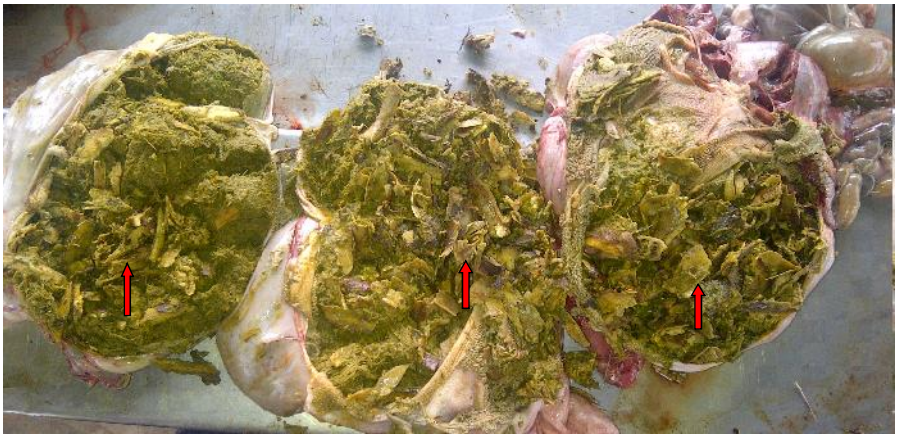

Figure 5: Photograph of rumens distended with cassava peels and geenish feed materials, from goats with rumen impaction (arrows)

Figure 6: Photograph of indigestible foreign materials comprising of ropes, nylons, plastics, metals, stone and sand from the rumen of a sheep with rumen impaction

Figure 7: Photograph of nylons, wires, plastics and ropes inter -twined, from a sheep with rumen impaction

Discussion

The present study revealed the occurrences of severe rumen impaction in sheep and goat reared in the tropical rain forest. The prevalence of 47% recorded in this study was lower than the 58.2% reported in sheep and goats but higher than the 43.4% recorded in cattle by Negash *et al*. (2015), on mere presence of foreign bodies in the rumen instead of rumen impaction; and may account for the difference in the prevalence. This suggests that small ruminants are more prone to rumen impaction than large ruminants. The reason the prevalence of the indigestible foreign materials was higher in adult sheep and goats may be due to the fact that rumen impaction results from accumulation of materials over a period of time. The high prevalence recorded in females agreed with the report of Igbokwe *et al*. (2003), who asserted that ingestion of foreign bodies by ruminants is associated with increased appetite of female animals due to the nutritional demands during pregnancy and lactation. In addition, female animals are kept longer for breeding than the males. Ingestion of foreign bodies by animals is associated with a shortage of forage (Hailat *et al*., 1996) as well as increased pollution of grazing lands with indigestible materials (Tesfaye *et al*., 2012). According to Remi-Adewunmi *et al*. (2004) the occurrence of foreign bodies in sheep and goats was higher within and at the outskirts of urban areas due lack of enough grazing lands, leading to malnutrition, and thus affected animals are observed to be frequently emaciated and thin. Weight loss is associated with rumen impaction because of interference of the foreign bodies with absorption of volatile fatty acids, causing reduced weight gain and consequently economic loss (Igbokwe *et al*., 2003; Remi-Adewunmi *et al*., 2003).

Most of the cases of rumen impaction in small ruminants in the present study were recorded in animals reared on free range. This may be due to unrestricted movement and feeding by the animals as well as lack of feed supplement, resulting to energy balance that will force them to ingest unusual materials. The clinical signs such as distended abdomen; and recumbency observed in rumen impacted animals in the present study can confuse the condition with pregnancy (Garba and Abdullahi, 1995). This may be the reason one of the cases was diagnosed by ballotment as pregnancy, prior to the death of the animal.

The Clinical signs observed in the present study have been reported by other workers (Mozaffari *et al*., 2009; Hussain *et al*., 2013). However, clinical signs in rumen impaction have been reported to vary widely and are nonspecific (Hussain *et al*., 2013). Haematological findings of low packed cells

volume (PCV) and neutrophilia observed in the present study have been reported in sheep and goat as well as bovine species with rumen impaction (Elsa and Onyeyili, 2002; Akinrinmade and Akinrinde, 2012; Hussain *et al*., 2013). Elsa and Onyeyili (2002) reported a significant decrease in Haematocrit haemoglobin and red blood cell count of Red Sokoto goat with rumen impaction. The decrease in PCV in the present cases can also be attributed to the presence of Eimeria and Haemonchus species that were recorded.

The pathological lesions observed in visceral organs might have resulted from haematological and biochemical changes associated with rumen impaction (Akinrinmade and Akinrinde, 2012; Hussain *et al*., 2013). Information is scanty on the pathological changes in visceral organs of animals with rumen impaction. However, Hailat *et al*. (1998) has described distended and firm rumen in goats with rumen impaction caused by plastics.

The aetiological causes of the rumen impaction such as the digestible green and dry feeds have been reported in rumen impaction. Rumen impaction caused by a species of grass (Ficus esquiroliana levl.) has been reported in Boer goats (Shao-lun *et al*., 2013). However, rumen impaction due to cassava peels is rare, and can predispose animals to cyanide poisoning (Cereda and Mattos, 1996). On the other hand, rumen impaction due to polythene, twines, ropes and plastics seen in the present study are consistent with those reported by various workers (Sanni *et al*., 1998; Hayder *et al*., 2002; Igbokwe *et al*., 2003; Abdelaal and El-Maghawry, 2014). The prevalence of rumen impaction due to foreign bodies in goat's rumen was lower than the one reported in Omdurman Province of Khartoum State, Sudan (Hayder *et al*., 2002), which may be attributed to the less availability of forage in the desert zone of Sudan. Although the presence of foreign materials in the rumen of sheep and goats is a common finding, the massive nature of those materials seen in one of the cases was unusual.

In conclusion, the prevalence of rumen impaction recorded in the present study calls for proper environmental sanitation and management of small ruminants. The condition can be confused with pregnancy. Therefore, when clinical signs such as distended abdomen were observed in female sheep and goats during pregnancy examination by ballotment, proper examination should be done, bearing in mind the possibility of rumen impaction.

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