

PREVALENCE OF LIVER LESIONS IN SMALL RUMINANTS (SHEEP AND GOATS) SLAUGHTERED AT THE KUMASI ABATTOIR, GHANA

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ABSTRACT

This study aimed to determine the occurrence of liver lesions in slaughtered sheep and goat with specific reference to the prevalence, breed, age, sex and month influence on liver lesion and also the pathological changes and its effect on the cost. This study involves a 3 months period (October and December 2015) weekly inspection of 2044 slaughtered sheep and goat, 824 were purposively examined, of which 75 were partially condemned and 36 samples out of the partially condemned were used for histopathological analysis. Lesions recorded were granuloma, necrosis, degeneration, cystic vacuole and some with no lesion. Age, sex and breeds had significant influence ($p > 0.05$) on the prevalence of liver lesions in sheep and goat. West African dwarf was the most susceptible breed. The ages in both species (sheep and goats) above 2 – 3 years were most susceptible to liver lesions. Goats were more susceptible than sheep and within the 3 months study the abattoir loss GH¢ 1125 due to liver lesion Economic loss due to liver condemnation estimated has showed there is much to be done to save loss incomes from liver condemnation. Good husbandry practices, proper feeding and good veterinary care should be given to small ruminants in order to minimize liver disease in small ruminants in Ghana.

Keywords: Liver lesion, Abattoir, Sheep, Goat, Prevalence

INTRODUCTION

Small ruminants (sheep and goat), remain popular among the rural populace and resource-poor people. Their importance is primarily associated with their small size, which is significant for the advantage of mankind as it favours low investments, small risk of loss and preference over large ruminants for food and reproductive efficiency and economic use of available land (Hooft *et al.*, 2008). In Ghana, meat from small ruminants such as goat and sheep form a major part of the diet of the populace and this serves as a source of animal protein which contains essential amino acids

needed for human growth (Adam *et al.*, 2010). This therefore justifies the essence of protecting these animals from diseases. Most of these animals in Ghana are kept on the free range or extensive system of rearing animals (Oppong-Anane, 2011); which subjects them to a wide range of diseases which include foot and mouth disease, caprine arthritis encephalitis complex, mastitis, brucellosis, tuberculosis, q-fever and some other disease conditions such as liver diseases (Turkson *et al.*, 2004). Liver lesion is a considered the most important disease condition of small ruminants (goats and sheep) (Dejene *et al.*, 2013). Liver is considered the most important organ for animal health production

and reproduction. Many of the metabolic activities of the body occurred in the liver. Liver infection is an important disease that affects all kinds of meat producing animals, this lead to great losses to livestock production and national income due to condemnation of great numbers of livers in the slaughter houses (Amene *et al.*, 2012; Tehrani *et al.*, 2012). The study attempts to explore the occurrence of liver lesion in slaughtered sheep and goat with specific reference to the prevalence, influence of breed, age, sex and month, pathological manifestation and how hepatic lesion influence the cost of liver in slaughtered sheep and goats.

MATERIALS AND METHODS

Study Area: The Kumasi Abattoir Company Limited (KACL) which is situated in the Kumasi Metropolis of Ghana served as the study area. KACL which was set up in 1997 with helps from Government of Ghana and the Canadian International Improvement Agency (CIDA) and initiated operations in 1998, is situated at Ahinsan/Kaase Modern Area on 6°39'36.6°N Latitude and 1°36'15.4°W Longitude in the Kumasi Metropolis of Ashanti Region, Ghana (Asare *et al.*, 2016). The abattoir is viewed as one of the busiest and biggest in the nation. Animal slaughtered at the abattoir includes steers, sheep, goats and pigs. There exists a ruminant (sheep and goats) market around 160 metres far from the slaughtering point, where the vast majority of the sheep and goats got from the different parts of the Kumasi Metropolis, and the encompassing regions including the Northern, Upper East, Upper West, Brong-Ahafo, as well as countries such as Burkina Faso, Mali, Niger, Cote d'Ivoire and Togo are amassed for acquiring by clients for slaughtering. The slaughtering of sheep and goats is done once a day, with daily slaughter of 120 – 150 sheep and goats. West African Dwarf Goat and the Sahelian breed constitute the transcendent types of sheep and goat slaughtered at the abattoir.

Study Animals and Sample Collection: Sheep and goats brought from Mali, Burkina-Faso, Northern parts of Ghana and the Ashanti

region to the abattoir between October and December 2015 for slaughtering; comprising of the Sahelian and West African Dwarf goats, constituted the animals for the study. Purposeful sampling of the liver of animals was used throughout the postmortem examination and livers that had lesion were sampled.

Data Collection: Daily test accumulations and recordings of liver lesion in small ruminant done at the Sheep and Goat Section of the abattoir through postmortem examination of the liver. Antemortem examination of animal to be slaughtered was performed but the majority of the animal did not hint at clinical signs but rather postmortem investigation uncovered the liver lesions in the sheep and goats. Information on age, sex and breed of animal were gathered accordingly.

Age, Breed and Sex Determination: Dentition of the animals was used to determine the age after slaughter. Analyses of the number of permanent teeth present both in the lower jaw of the goat with the aid of the formula below was used to determine the age of the goat. Age of animal = (Number of permanent teeth in the upper jaw) (Wilson and Durkin, 1984). Breeds of animals was determined by analyzing the distinctions in the length of the fore and hind legs of both the West African Dwarf and Sahelian sheep and goats, West African Dwarf having shorter fore and hind legs and the Sahelian having longer fore and hind legs (Sumberg and Cassaday, 1984). The sex of animals was determined by examinations of the perineal area and the udder of the animal body after butcher, to decide the sex organ of the animals (Terra and Reynolds, 2020).

Post Mortem Examination: Post mortem examination of 2044 slaughtered sheep and goat was done through visual observation of liver lesion in the animals. A sizeable amount of the liver lesion was trimmed and placed in a formalin solution. The liver lesions were put in well-labelled bottles containing 10% buffered formalin which were utilized for histopathology study using the method of Madhan and Raju (2014).

Economic Loss Determination: The extent of financial loss due to liver condemnation was analyzed based on the average annual average market price of each normal liver and the price for each diseased liver. The market prices were determined based on the interview made with the abattoir personnel and the butchers.

Data Analysis: Descriptive statistics was used to describe the age, sex, and breed influences on the occurrence of liver lesion, using Microsoft Excel version 2013 and Statistical Package for Social Sciences (SPSS) Version 20. Chi-square test was used to check for the difference in occurrence of liver lesions in small ruminants. Significant differences were tested at 95% confidence interval or 5% significance level.

RESULTS

Prevalence of Liver Lesion: Out of a total of 2044 small ruminants (942 sheep and 1102 goats) of different breed, age and sex, slaughtered at the Kumasi abattoir, 842 livers were examined of which 75 sheep and goat had liver lesions, giving a prevalence rate of 9.0 % with 3.9 and 5.1 % sheep and goats respectively (Table 1). These differences were significantly different at $p < 0.05$.

Breed Influence on Liver Lesion: The West African breeds of both sheep (5.41 %) and goat (6.84 %) had a higher susceptibility to liver lesion in comparison to the Sahelian breeds sheep and goats with 2.84 and 2.07 % prevalence respectively (Table 2). This differences were found to be statistically significant ($p < 0.05$) among the breeds.

Age Influence on Liver Lesion: The age influences on the occurrence of liver lesion in small ruminants indicated that sheep and goats between 1 – 2 years of age recorded low prevalence of liver lesions of 0.52 and 0.88 % respectively, whilst sheep and goat with the age ranges of above 2 – 3 years had the highest record of lesion of 7.22 and 7.28 % respectively (Table 3). It could be said that small ruminants within the age range of above 2 – 3 years were more susceptible to liver lesions as compared to

the other age groups. These differences however were statistically significantly different ($p < 0.05$).

Sex Influence on Liver Lesion: Findings on the liver lesion with respect to sex of animals showed that males were less susceptible to liver lesions than female in both sheep and goats. The females were more susceptible to liver lesion with prevalence of 6.70 and 7.48 % in sheep and goat respectively, while males recorded 1.55 and 2.03 % prevalence of liver lesion in sheep and goat respectively (Table 4). These differences were statistically significantly different ($p < 0.05$).

Monthly Influence on Liver Lesion: Findings on the monthly distribution of liver lesions in small ruminants are displayed in Figure 1. There was variation in the monthly occurrence of liver lesion from October to December. October had the highest score to liver lesions, followed by November and December respectively.

Gross Morphological and Histopathological Findings: There were variations in the colour of the liver (markedly pale, reddish, whitish and brownish), in sizes (moderate to markedly enlarge) and distribution of hepatic necrosis (focal, multifocal, extensive and diffuse) (Figure 2). Findings on histopathology are displayed in Table 5. The outcome of 36 samples of liver lesion that were used for histopathology analysis indicated that liver granulomas was found in 25 % of the livers, necrosis was found in 25 % of the livers, degeneration and cystic vacuole were found in 13.9 and 8.3% respectively of the liver samples (Figure 3). Additionally, 27.8 % of the livers did not show any observable lesion after histological examination.

Economic Loss: The average price of unaffected liver was GH¢ 30, the price reduces when the liver was affected with lesion. The affected liver was sold for half the normal price (GH¢ 15), within the 3 months study (October – December) the estimated abattoir loss due to liver damaged was GH¢ 1125.

Table 1: Prevalence of liver lesions in small ruminants slaughtered at the Kumasi abattoir, Ghana between October and December 2015

Species	Total examined	Total with liver lesions	Prevalence (%)	X ² value	P-value
Sheep	388	32	8.25	6.32	0.33
Goat	454	43	9.47		
Total	842	75	8.91		

Table 2: Prevalence of liver lesions in small ruminants slaughtered at the Kumasi abattoir, Ghana between October and December 2015 with respect to breed

Species	Breed	Total with liver lesions	Prevalence (%)	X ² value	P-value
Sheep	WADS	21	5.41	1.24	0.03*
	Sahelian	11	2.84		
Goat	WADG	33	6.84	2.30	0.03*
	Sahelian	10	2.07		
Total		75	8.91		

Table 3: Prevalence of liver lesions in small ruminants slaughtered at the Kumasi abattoir, Ghana between October and December 2015 with respect to age

Species	Age (years)	Total with liver lesions	Prevalence (%)	X ² value	P-value
Sheep	1 – 2 years	2	0.52	2.76	0.04*
	Above 2 – 3 years	28	7.22		
	Above 3 years	2	0.52		
Goat	1 – 2 years	4	0.88	3.56	0.01*
	Above 2 – 3 years	33	7.28		
	Above 3 years	6	1.32		
Total	842	75	8.91		

Table 4: Prevalence of liver lesions in small ruminants slaughtered at the Kumasi abattoir, Ghana between October and December 2015 with respect to sex of animal

Species	Sex	Total with liver lesions	Prevalence (%)	X ² value	P-value
Sheep	Male	6	1.55	6.55	0.01*
	Female	26	6.70		
Goat	Male	9	2.03	9.34	0.03*
	Female	34	7.48		
Total		75	8.91		

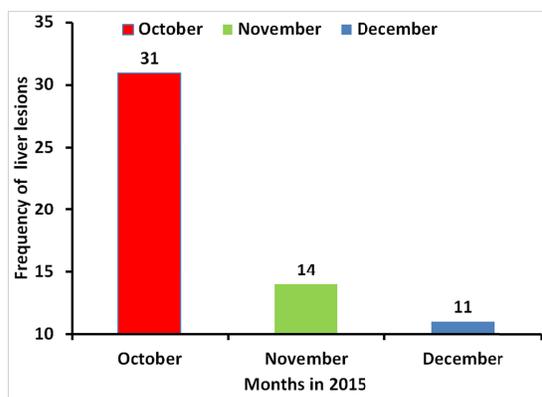


Figure 1: Distribution of liver lesions in small ruminants slaughtered at the Kumasi abattoir, Ghana between October and December 2015 with respect to months

This was considered as a huge loss with 75 liver lesion recorded on a purposeful sampling basis.

DISCUSSION

Out of a total of 2044 sheep and goats of different breed, age and sex slaughtered at the Kumasi abattoir, 842 livers was examined of which 75 livers had liver lesions, giving a prevalence rate of liver lesion of 9.0 %. The overall prevalence of liver lesions in this study was lower than 34 % recorded by Bekele and Szonyi (2014) in a study in Ethiopia. The differences recorded could be attributed to differences in the geographical locations as well as the differences in the density of slaughter at the different abattoirs.

Species differences showed no significant liver lesion occurrence in goats (9.47 %) as compared to sheep (8.25 %).

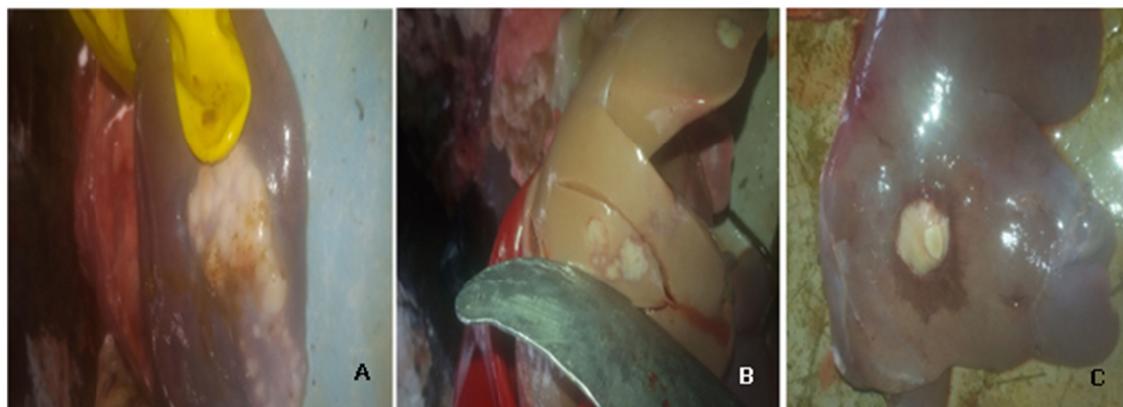


Figure 2: Histomorphology of liver lesion in small ruminants slaughtered at the Kumasi abattoir, Ghana between October and December 2015 showing extensive liver necrosis (A), multifocal liver necrosis (B) and focal liver necrosis (C)

Table 5: Prevalence of types of histopathological liver lesions in small ruminants slaughtered at the Kumasi abattoir, Ghana between October and December 2015

Liver Lesion	Frequency	Percentage (%)
Granuloma	9	25.00
Necrosis	9	25.00
Degeneration	5	13.90
Cystic vacuole	3	8.30
Number of observable Lesions	10	27.80
Total	36	100.00

These differences may be attributed to the sampling units obtained since at the abattoir more goats were slaughtered than sheep. This pattern of species of small ruminants slaughtered is influenced by consumer preferences as goats are more consumed and preferred to sheep in the region of study. However, this finding was in agreement with the findings reported that there were no species based statistical significant differences of liver contaminations due to liver lesion at Elfora Export Abattoir, Bishoftu, Ethiopia (Nasir and Abebe, 2016).

Breed influence on the occurrence of liver lesions in goat showed a significant influence such that the West African breed of both sheep and goat had a higher susceptibility to liver lesion in comparison to the Sahelian breed. This finding could be possibly explained by the combination of the behaviour characteristics and the management system which predisposes them to liver damage.

The West African dwarf breed of sheep and goats can adapt to humid zone and often roam about; feeding on kitchen wastes, unfit grains, unwholesome and moldy crop leftovers as well as bush grazing with little to no veterinary care, this type of unsupervised feeding often predisposed them to aflatoxin in such unwholesome feeds which has severe consequences on the liver. This agreed with the position of FAO (2008) on how animals get exposed to aflatoxins.

The age of an animal played an importance role in the occurrence and incidence in a particular kind of diseases or liver infections. In this study, small ruminants within the ages of above 2 – 3 years were most susceptible to liver lesions. This was in agreement with the findings of Nagaraja and Lechtenberg (2007) who reported similar findings of liver abscesses in feedlot cattle. Again, Arafat *et al.* (2015) reported similar findings in liver diseases of sheep in Myemensingh Municipality Area in Bangladesh. This happening could be attributed to small ruminants being fattened for sale and slaughter and hence are exposed to several feeds of which some can contain aflatoxins, microorganisms and stressors which can induce liver pathologies. Again, the increase and longer exposure of animals to both infectious and non-infectious causes more of liver diseases in adult as compared to the young (Talukder *et al.* 2010) could be an attributing factor to the finding in this study.

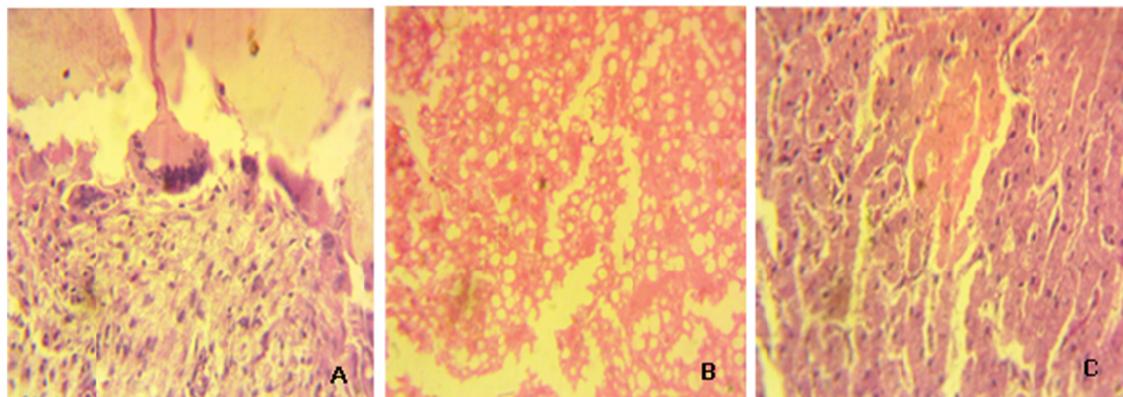


Figure 3: Histopathology of liver lesion in small ruminants slaughtered at the Kumasi abattoir, Ghana between October and December 2015 showing granulomatous hepatitis (A), diffuse vacuolar degeneration of hepatocytes (B) and centrilobular necrosis of hepatocytes (C), H&E x400

The sex of small ruminants had significant influence on the occurrence of liver lesions. More female had liver lesions than male in both sheep and goats. This finding agreed with previous study in Bangladesh conducted by Arafat *et al.* (2015). This finding could be attributed to possible hormonal changes and pregnancy stressors which has an effect on liver functioning. In addition, the increase in the slaughter of female animals at older ages at the abattoir could be a contributing factor to the occurrence of more liver lesions when compared to males (Maqbool *et al.*, 2000).

Monthly occurrence showed that more lesions were recorded in October as compared to November and December. In Ghana, these months mark the beginning of the dry harmattan season, when there is shortage of grasses, and forages which could predispose animals to possibly nutritional stresses as well as feeding on unwholesome feeds which could contain infectious agents, fungi among others. This happening coupled with physiological stress, easily predisposes animals to hepatitis. This finding was similar to reports of Mellau *et al.* (2010) who conducted similar study from March to June, in Tanzania.

Conclusion: In conclusion, a prevalence of 9.0 % of liver lesion was found in sheep and goats. Breed, age, sex and monthly occurrence had major influence on the susceptibility in sheep and goat. Economic loss due to liver condemnation estimated has showed that there is much work needed to be done to save loss of incomes from liver condemnation. Good husbandry

practices, proper nutrition and good veterinary care should be given to small ruminants to minimize the prevalence of liver diseases in Ghana.

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