

www.ajbrui.org

Afr. J. Biomed. Res. Vol. 26 (September 2023); 433-438

Research article

Prevalence, Types and Associated Factors of Liver Lesions in Slaughtered Sheep and Goats at The Suame Abattoir, Kumasi, Ghana

Appiah, J.¹, Ka-Chungu M.A.P.², Cobbinah D.E.¹, Asare D.A.¹, *Emikpe B.O.¹

¹*School of Veterinary Medicine, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana*

²*Pathology Department, Komfo Anokye Teaching Hospital, Kumasi, Ghana*

ABSTRACT

An active cross-sectional abattoir study was conducted to assess the prevalence, types and associated factors of liver lesions in sheep and goat at the Suame Abattoir in Kumasi- Ghana. A total prevalence rate of 13.2% liver lesions was recorded with a 7.3% and 5.9% prevalence rate in sheep and goats respectively. Liver abscess was recorded in 80.71% pathologic liver samples followed by liver fibrosis (5.71%), calcified cysts (2.86%), liver putrefaction (2.14%), liver cirrhosis (2.14%), melanosis (2.14%), hydatid cyst (1.42%) and fatty infiltration (1.42%), hepatitis (0.71%) and liver with urate deposits (gout) (0.71%). More liver lesions were found in the West African Dwarf Sheep (WADS) (54.5%) as compared to the Sahelian breed (45.5%) of sheep. The West African Dwarf Goat (WADG) had a higher occurrence (76.2%) of liver lesions than the Sahelian (23.8%). Female sheep and goats had higher occurrences of liver lesions as compared to the male. The adult (> 2 years) sheep and goats had more liver lesions compared to the young (< 2 years). Sheep and goats with good body condition score recorded higher liver pathologies with more recorded in the dry season. The differences in occurrence of liver lesions with respect to species of small ruminant was statistically significant ($p < 0.05$) whilst that of breed, sex, age and season of occurrence were not significantly different ($p > 0.05$). Good animal husbandry practices should be employed to lower the incidence of liver pathologies in small ruminants. Expert policies to trace back to towns of origin of small ruminants that present with liver diseases should be put in place by the abattoir.

Keywords: *Sheep, Goat, Liver, Abattoir, Pathology, Risk factors, Ghana*

*Author for correspondence: Email: banabis2001@yahoo.com; Tel: +233549410841

Received: September 2022; Accepted: May 2023

DOI: <https://doi.org/10.4314/ajbr.v26i3.19>

INTRODUCTION

Livestock production is known to be widely distributed across the various regions of the globe and it is of great importance and serves as a major source of livelihood to many. The livestock sector in Ghana, contributes on average an estimated 7% to Agricultural Gross Domestic Product (GDP), hence it makes a significant contribution to overall Agricultural development (SRID, 2001) of which the small ruminants contribution cannot be overemphasized. Small ruminants' population has been reported to be over 205 million sheep and 174 million goats in Africa (Emikpe *et al.*, 2019) with the population of sheep and goats estimated at 4,335,000 and 6,044,000 respectively in Ghana (Atawalna *et al.*, 2019).

In Ghana, the raising of small ruminants (sheep and goats) production is an economic way of providing animal protein in view of their short generation interval, higher prolificacy and lower production cost in comparison to bigger ruminants (cattle) (WAAP - Ghana, 2020). Sheep and goats also have an

advantage over monogastrics (pigs and poultry) since they do not compete with humans for grains. Research has shown that Ghanaian populace has increased preference for offal of ruminants including the kidneys, heart, intestines, rumen of which the liver cannot be exempted. This pattern of consumption, has become a deciding factor for the development of the livestock sector (Raju and Suryanarayana, 2005). According to research by Biesalski and Nohr, (2009), a daily intake of 100g of liver can supply up to 50% of the recommended daily allowance for iron, zinc, selenium, vitamins B1, B12, B6, B12 and 100% of vitamin A. In as much as the liver of sheep and goats is very nutritive and happens to be among the most consumed offal among Ghanaian populace, the public health significance of liver diseases such as fascioliasis cannot be underrated (Phiri, 2006, Frimpong *et al.*, 2011, Ayro *et al.*, 2016). It is worthy of mentioning that despite the contributions of small ruminants to the economy of Ghana as well as providing a good source of nutrition for the populace, the occurrence of disease conditions especially

diseases of vital organs like the liver which hampers their health and productivity cannot be overlooked.

The liver is one of the vital organs in the animal's body with an array of functions. The liver performs many critical functions, including bilirubin metabolism, bile acid metabolism, protein synthesis, immune function as well as drug metabolism among many others (Zachary and McGavin, 2012). In view of this, any disease condition of the liver can impair its functions which will be detrimental to the survivability of the animal.

According to Okoli *et al.* (2002), majority of these small ruminants brought for slaughter may harbor chronic or subclinical infections which can rarely be detected during ante-mortem examination. In view of this challenge, monitoring disease and other conditions at slaughter has been recognized as one way of assessing the disease status of a herd (Herenda and Jackel, 1994). Several research works in different parts of the world including have shown that there exist liver pathologies in small ruminants (Johnson *et al.*, 2004; Schuppan & Afdhal, 2008, Ayroe *et al.*, 2016) and the associated effects include liver condemnation, reduction in revenue, among many others (Mekuria *et al.*, 2013, Ayele *et al.*, 2016, Ayroe *et al.*, 2016). Nevertheless, in Ghana, literature on the description of liver pathologies in small ruminants is scanty (Ayroe *et al.*, 2016). Therefore, there is the need to throw more light on the pathologies that affect the liver of small ruminants in Ghana. Owing to this background information, this study was conducted to determine the prevalence, type and associated factors of liver lesions in small ruminants slaughtered in Ghana.

MATERIALS AND METHODS

Research Design: This study was designed as a cross-sectional study which was conducted to determine the prevalence, types of liver pathologies and the associated factors in sheep and goat slaughtered at the Suame- Kotoko Municipal Abattoir.

Study Area: The study was conducted at the Suame-Kotoko Municipal abattoir in Ashanti Region of Ghana. Suame Kotoko is a suburb of the Kumasi Metropolitan Assembly of Ghana with a latitude of 6.7115913 and longitude -1.634209". The Sabtui Musah Abattoir (SMA) is considered as one of the very active small ruminant abattoirs in Kumasi and site for slaughtering few cattle, more sheep and goats (Emikpe *et al.*, 2019). The "Sabtui Musah Abattoir" (SMA) is owned by a private individual but supervisions are done by government employed workers, a meat inspector and an environmental sanitation worker. The abattoir It serves as a source of meat throughout the Kumasi metropolis and its adjoining districts such as Tafo, Sofoline, Aboabo and many others as meat is distributed to the market buyers.

Study Population, Sample Technique and Sample Size: The study population comprised all the sheep and goat slaughtered at the Suame Slaughter Slab. Sheep and goat livers were purposively sampled for the presence or absence of liver lesions in this study.

Data and Sample Collection: Daily sample collections and recordings on cases of liver pathologies in sheep and goats at the Suame Abattoir were performed through post mortem observation, palpation and examination of the liver. Livers which had lesions on them were recorded and tissues samples were taken. Information on the age, sex and breed of sheep and goats with liver lesions were recorded. Tissue samples of affected livers were collected and preserved in an air-tight plastic container containing 10% neutral buffer formalin. Collected samples were properly sealed and labeled and transported to the laboratory for histopathological examination.

Data Analysis: Data collected were analysed with Microsoft Office Excel Software (Version 2013) and Statistical Package for Social Sciences (SPSS) Version 20. Descriptive statistics and Chi-Square test were conducted to determine the distribution of liver pathologies with respect to age, breed, sex and season of slaughter of small ruminants. Statistical significance between the variables were tested at 95% confidence interval or 5% significance level

RESULTS

Number of animals slaughtered: A total of three thousand two hundred and twenty-nine (3,229) animals (sheep and goats) slaughtered were sampled. Out of the total animals slaughtered, one thousand four hundred and seventy-five (1,475) were sheep (45.6%) while one thousand seven hundred and fifty-four animals slaughtered were goats (54.3%) as shown in Figure 1 below.

Number of Livers sampled and Prevalence of Liver Pathologies: The total number of livers examined was one thousand and fifty-four (1,054). A total four hundred and sixty-five (465) livers were sampled 44.1% from the sheep slaughtered whilst five hundred and eighty-nine (589) livers 55.9% were from the slaughtered goats as shown in Table 1 below. Out of the one thousand and fifty-four (1,054) livers examined, 140 livers showed pathologies or lesions, 77 in sheep and 63 in goats. In terms of prevalence rate, it represent 13.2% of which 7.3% and 5.9% were in sheep and goats respectively as shown in Table 1 below.

Table 1: Liver samples and prevalence of liver pathologies in sheep and goat

Species of Animal	Number of Livers Sampled (%)	Number of Pathological Livers	Prevalence of Liver Pathologies (%)
Sheep	465 (44.1%)	77	7.3
Goat	589 (55.9%)	63	5.9
Total	1054 (100%)	140	13.2

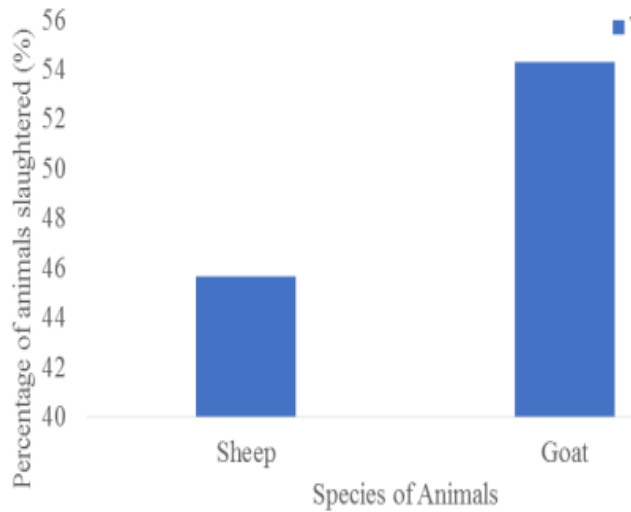


Figure 1: Percentage distribution of sheep and goats slaughtered.

Types of Liver Pathologies: Results on liver pathologies indicated that the most recorded liver lesion was abscessations in 113 (80.71%) of the pathologic liver samples with 26 (18.57%) of the abscessed liver being calcified abscesses and 87(62.14%) being in the form of other types of liver abscessations. Liver fibrosis was observed in 8(5.71%) and calcified cysts in 4 (2.86%). Liver putrefaction, liver cirrhosis and melanosis were observed in 3 samples (2.14%) each.

Hydatid cyst and fatty infiltration were seen in 2 (1.42%) each while hepatitis and liver with urate deposits (gout) were observed in 1 (0.71%) as shown in the Table 2 below.

Table 2: Distribution of the type of liver pathologies observed in sheep and goats

Liver Pathologies Observed	Frequency of Occurrence (n)	Percentage of Occurrence (%)
Liver Abscessations	113	80.71
Liver Fibrosis	8	5.71
Liver Calcifications	4	2.86
Liver Putrefaction	3	2.14
Liver Cirrhosis	3	2.14
Liver Melanosis	3	2.14
Hydatid Cysts	2	1.42
Fatty infiltration	2	1.42
Hepatitis	1	0.71
Ureate Liver	1	0.71

Macroscopic findings: Macroscopically, liver pathologies observed are as shown in Plate 1.

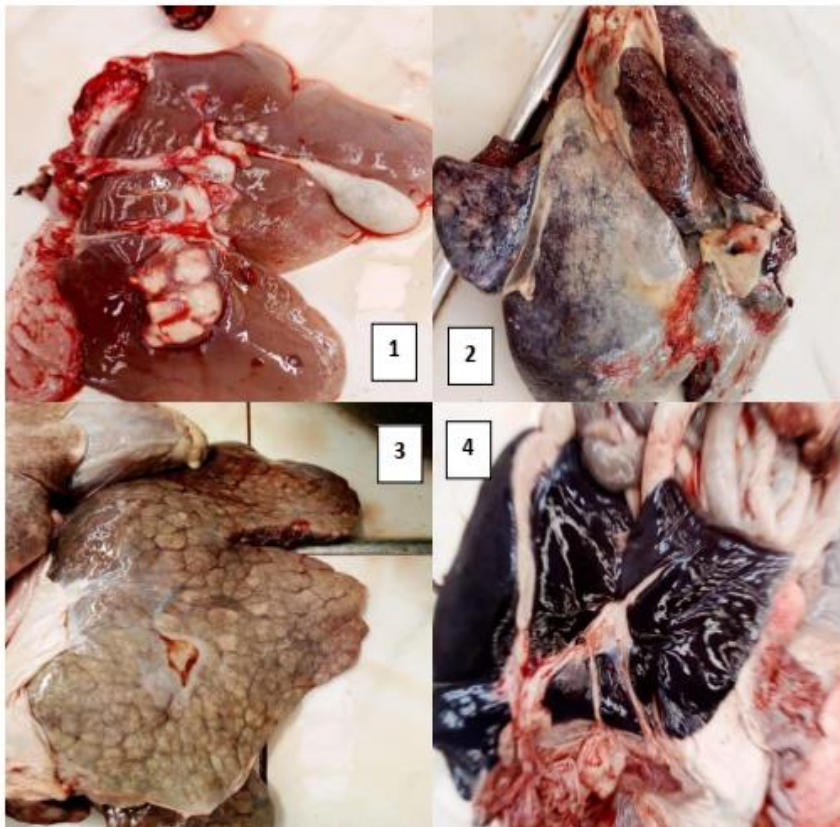


Plate 1: 1-Pyogenic abscessation of the liver, 2-Generalized urates deposition of the liver (Gout), 3-Generalized cirrhotic liver (nodule-like),4-Excessive melanin pigmentation of the liver

Distribution of liver lesions in sheep and goats: More of the liver pathologies were recorded in sheep 77 (55%) whilst 63 cases (45%) of the liver pathologies were recorded in goats slaughtered as shown in Table 3 below. The percentages of the different liver lesions recorded in both species (sheep and goats) were shown to be statistically significant ($p < 0.05$).

Effect of breed on the occurrence of liver pathologies: In sheep, more liver lesions were found in the West African Dwarf Sheep (WADS) as compared to the Sahelian breed type with 42 cases (54.5%) and 35 cases (45.5%) of liver lesions respectively. The differences in occurrence of liver lesions among breed of sheep was not statistically significant ($p > 0.05$) as shown in Table 4 below. In goats, the West African Dwarf Goat (WADG) had a higher occurrence of liver lesions than the Sahelian with 48 cases (76.2%) and 15 cases (23.8%) respectively. These differences were found not be statistically significant ($p > 0.05$). (Table 4).

Effect of sex on the occurrence of liver pathologies: The prevalence of occurrence of liver pathologies/ lesions based on sex showed that 5 cases (6.5%) were recorded in rams and 72 cases (93.5%) were recorded in ewes. The findings in goats was similar to sheep. A total of 3 cases (4.76%) of liver lesions occurred in the bucks as compared to the does which recorded 60 (95.24%). Nevertheless, the differences in occurrences of liver lesions were not statistically significant ($p > 0.05$) (Table 5).

Effect of Age on the occurrence of liver pathologies: The prevalence of occurrence of liver pathologies based on age showed that 7 cases representing 9.1% were recorded in young sheep and 70 cases representing 90.9% were recorded in adult sheep. Though the prevalence of lesions in sheep above 2 years was more than the young animals, there was no statistical significance ($p > 0.05$). The adult goats had more liver lesions than the young goats with 47 cases representing 74.6% and 16 cases representing 25.4% respectively ($p > 0.05$). (Table 6).

Effect of body condition on the occurrence of liver pathologies: Results on the body score condition effect on occurrence of liver pathologies in sheep showed a statistically significant difference ($p < 0.05$) in sheep as 65 cases representing 84.4% occurred in sheep with good body condition whilst 12 cases representing 15.6% of the liver lesions occurred in sheep with poor body condition. In goats, the group of goats with good body condition score recorded 53 cases of liver pathologies representing 84.13% whilst that of poor body condition score recorded 10 cases of liver lesions representing 15.87%. Despite the differences in the occurrence in liver lesions, these differences were not statistically significant ($p > 0.05$). (Table 7).

Effect of season on the occurrence of liver pathologies: The results on the relationship between prevalence of occurrence of liver lesions and seasonality were not statistically significant ($p > 0.05$). Less number of 29 cases (37.7%) of liver lesions in were recorded in the rainy season as compared to the dry season (48 cases (62.3%)) in sheep. In goats, lesser

numbers of 15 cases (23.8%) of liver lesions in goats were recorded as compared to the dry season (48 cases (76.2%)). Nevertheless, differences did not show any statistical significance ($p > 0.05$); which is also the case of the overall effect of the season on the occurrence of liver pathologies in small ruminants (Table 8).

Table 3. Species effect on the occurrence of liver pathologies in sheep and goats

Species of Animal	Frequency of occurrence	Percentage of occurrence (%)	Chi-Square value	P-value
Sheep	77	55%	22.89	0.01*
Goat	63	45%		
Total	140	100		

* = *p-value is significant ($P \leq 0.05$) at 95% confidence interval or 5% significant level.*

Table 4: Breed effect on the occurrence of liver pathologies in sheep and goats

Type of Animal	Breed Type	Frequency and Percentage of occurrence (%)	Chi-Square value	P-value
Sheep	Sahelian	35 (54.5%)	5.89	0.551
	WADS	42 (45.5%)		
Goat	Sahelian	15 (23.8%)	10.75	0.474
	WADG	48 (76.2%)		
Overall		140 (100%)	8.63	0.623

Table 5: Sex effect on the occurrence of liver pathologies in sheep and goats

Type of Animal	Sex Categories	Frequency and Percentage of occurrence (%)	Chi-Square value	P-value
Sheep	Male	5 (6.5%)	9.64	0.260
	Female	72 (93.5%)		
Goat	Male	3 (4.76%)	9.71	0.451
	Female	60 (95.24%)		
Overall		140 (100%)		

Table 6: Age effect on the occurrence of liver pathologies in sheep and goats

Type of Animal	Age Categories (yrs)	Frequency and Percentage of occurrence (%)	Chi-Square value	P-value
Sheep	Young (< 2)	7 (9.1%)	3.34	0.638
	Adult (>2)	70 (90.9%)		
Goat	Young (< 2)	16 (25.4%)	15.61	0.063
	Adult (>2)	47 (74.6%)		
Overall		140 (100%)	19.75	0.067

Table 7.

Body condition score effect on the occurrence of liver pathologies in sheep and goats

Type of Animal	Body condition score	Frequency and Percentage of occurrence (%)	Chi-Square value	P-value
Sheep	Good	65 (84.4%)	18.64	0.032*
	Poor	12 (15.6%)		
Goat	Good	53 (84.13%)	8.71	0.299
	Poor	10 (15.87%)		
Overall		140 (100%)	16.73	0.093

* = *p*-value is significant ($P \leq 0.05$) at 95% confidence interval or 5% significant level

Table 8.

Seasonal effect on the occurrence of liver pathologies in sheep and goats

Type of Animal	Season Type	Frequency and Percentage of occurrence (%)	Chi-Square value	P-value
Sheep	Dry	48 (62.3%)	7.74	0.356
	Rainy	29 (37.7%)		
Goat	Dry	48 (76.2%)	9.71	0.314
	Rainy	15 (23.8%)		
Overall		140 (100%)	9.43	0.387

Prevalence of Liver Lesions with respect to Seasons

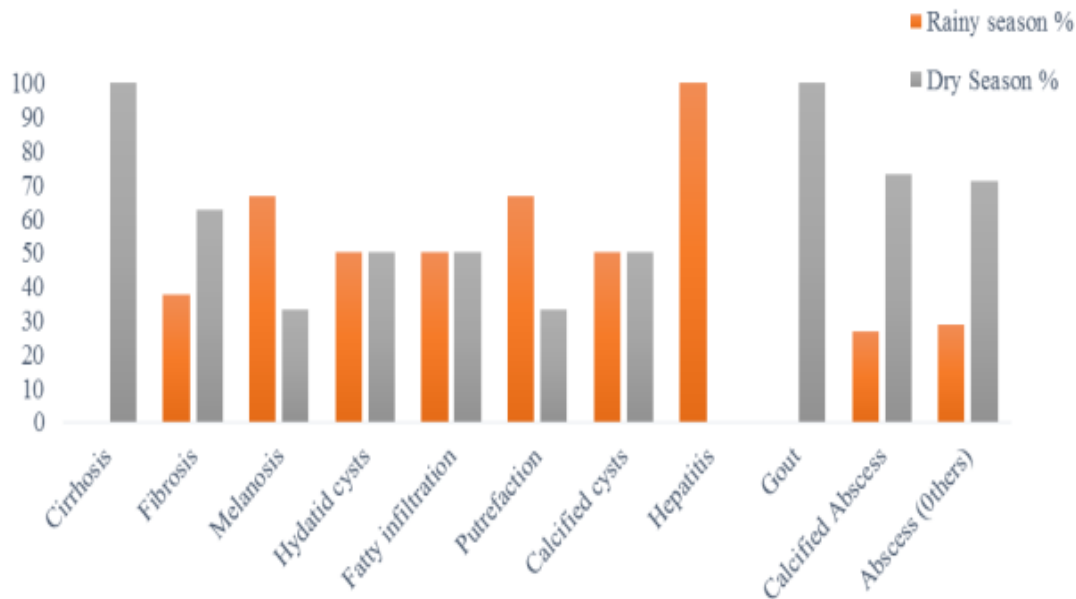


Figure 3.

Prevalence of liver lesions and their respective seasonal percentages

DISCUSSION

The findings of this study show the prevalence of liver lesions in sheep and goats slaughtered at the Suame Sabtui Musah Abattoir, Kumasi, Ghana. From the results given above, goats had the highest number of slaughter compared to that of sheep which possibly would be due to the high demand and preference for goat meat by chop bars and citizens especially, with the southern people of Ghana having an inordinate taste for that compared to sheep. Also, the prices for sheep in comparison to that of the goats are higher which makes a lot of people go for the goat, except during important functions like Muslim religious festivities where sheep are the preferred. Although the number of inspected goat liver exceeded that of the sheep by 11.76%, thus, (55.88%-44.12%), there were more liver lesions encountered in the sheep (7.3%) than that of the goat liver (5.98%). A similar survey conducted in Tanzania, Mellau *et al.*, (2010) reported a prevalence of (18.5%) and (17.1%) for goats and sheep respectively which is higher than this present results though Johnson *et al.*, (1999), reported

similar prevalence in caprine liver lesions at Oman, 9.3%. The prevalence of liver lesions in sheep being more than that of the goat could be due to the high susceptibility of sheep to liver diseases than in goats as observed by Ayele *et al.*, (2016).

Liver pathology due to abscess was the highest among the other lesions (80.71%) with sheep (43.57%) and goat (37.14%). The abscesses observed were pyogenic, granulomatous, pinpoint, multifocal, mixed lesions and calcified resulting in partial condemnations by trimming and sometimes total condemnation. The prevalence of liver abscess in the sheep (15.72%) was twice reported by Ghadrddan-Mashhadi, (2006) and similar to that of Al-Qudah and Al-Majali, (2002) which had 16.4%. The high prevalence of liver abscesses in ruminants could be due to grain overload which causes a high reduction in the rumen pH leading to rumen wall damage. This will result in lodgement of ruminal bacteria in the liver through the portal vein (Al-Qudah & Al-Majali, 2003).

In this study, the second cause of liver pathology was calcification 18.57% which had almost similar results to that

of Ayele *et al.*, (2016) who had 24.87%. This can be attributed to liver tissue healing and repair. Comparing the prevalence of calcified cysts 2.85%, Mellau *et al.*, (2010), reported a similar prevalence of 2.9% in both sheep and goats. Cirrhosis, putrefaction, melanosis, hydatid cyst, fatty degeneration, gout and hepatitis individually had less than 2.5%, which would suggest that they are likely to be of little concern and may have occurred sporadically during this study.

This study also showed that the male small ruminants were least affected with liver diseases compared to the females. The reason could be as a result of the higher number of females slaughtered and observed. Results from this study indicated that associated factors established in this study include species of small ruminant in Ghana of which sheep is the most affected. The sex of animals, body condition score, breed of sheep and goat, as well as the seasons had no significant ($p>0.05$) effect on occurrence of liver lesions.

In conclusion, 13.2% liver pathology prevalence was recorded in small ruminants of which more sheep were affected than goats. Liver abscessation was the prevalent liver pathology prevalence recorded. This however warrants stringent and thorough examination of livers at the abattoirs to enhance the safety of human consumption. It is recommended that good animal husbandry practices should be employed to lower the incidence of liver pathologies in small ruminants. There should also be reduction in the grain-feed given to the animals by supplementing with fiber or roughages. Expert policies should be put in place by abattoirs to trace back to towns of origin of small ruminants that present with liver diseases

REFERENCES

- Al-Qudah, K., & Al-Majali, A. (2003).** Bacteriologic studies of liver abscesses of Awassi sheep in Jordan. *Small Ruminant Research*, 47(3), 249-253. [https://doi.org/10.1016/S0921-4488\(02\)00260-2](https://doi.org/10.1016/S0921-4488(02)00260-2).
- Atawalna J., Yeboah DA and Ovoru MR, (2019).** Causes of Carcass Condemnation and its Associated Financial Losses in Slaughtered Pigs at the Kumasi Abattoir Company Limited. *Journal of Dairy & Veterinary Sciences*, 13, 1-3. DOI: 10.19080/JDVS.2019.13.555859
- Ayele, M., Abdella, A., & Ayele, B. (2016).** Prevalence of Gross Pathologies Causing Organs and Carcass Condemnation at Hashim Nur's Ethiopian Livestock and Meat Export Abattoir, Debre Zeit Ethiopia.
- Ayroe F, Emikpe B.O, Asiamah E, Dankqua K.O (2016).** Consumer preference and associated pathology observed in cattle and goat offals in Kumasi, Ghana *African Journal of Infectious Diseases* 10 (2) 127-133
- Biesalski, H. K. and Nohr, D. (2009).** The nutritional quality of meat. In: J.P. Kerry and D. Ledward (eds). *Improving the sensory and nutritional quality of fresh meat*, 1st edn. Cambridge: Woodhead Publishing Ltd, England
- Emikpe, B.O., Jarikre, T.A., Akpavie, S.O. Opoku-Agyemang, T., Asare D.A & Folitse, R.D. (2019)** Histological and immunohistochemical assessments of pneumonia in sheep slaughtered at Ibadan, Nigeria and Kumasi, Ghana, *Journal of Immunoassay and Immunochemistry*, 40:3, 300-313, DOI: 10.1080/15321819.2019.1589495
- Ghadrdan-Mashhadi, M. Gorban-Poor and M. Soleimani , 2006.** Bacteriological Study of Liver Abscesses in Sheep in Ahvaz (Iran). *Pakistan Journal of Biological Sciences*, 9: 2162- 2164.
- Johnson, E. H., Al-Habsi, K., Kaplan, E., Srikandakumar, A., Kadim, I. T., Annamalai, K., Al-Busaidy, R., & Mahgoub, O. (2004).** Caprine hepatic lipidosis induced through the intake of low levels of dietary cobalt. *Veterinary Journal* (London, England: 1997), 168(2), 174– 179. <https://doi.org/10.1016/j.tvjl.2003.10.012>.
- Mekuria, E., Shimelis, S., Bekele, J., & Sheferaw, D. (n.d.).** Sheep and goats Cysticercus tenuicollis prevalence and associated risk factors. 5.Black, H., Hutton, J. B., Sutherland, R. J., & James, M. P. (1988). White liver disease in goats. *New Zealand Veterinary Journal*, 36(1), 15–17. <https://doi.org/10.1080/00480169.1988.35465>
- Nagaraja TG, Laudert SB, Parrott JC. 1996.** Liver abscesses in feedlot cattle. Part 1. Causes, pathogenesis, pathology and diagnosis. *Comp Cont Edu Pract Vet* 18: 230-256.
- Navarre, C.B. and D.G. Pugh, 2002.** Disease of the Liver. In *Sheep and Goat Medicine*. Pug, D.G., (Ed.), 1st Edn., W.B. Saunders, Philadelphia, pp: 97-104.
- Okoli, I.C., Nwokeocha, J.R., Okoli, C.G. and Ogundu U.E. 2002.** Prevalence of fascioliasis and oesophagostomosis among slaughtered animals in Imo State, Nigeria and their correlation with emaciation diagnosis at antemortem. *Tropical Veterinarian* 20(3): 139 – 148.
- Phiri, A.M. (2006).** Common conditions leading to cattle carcass and offal condemnation at three abattoirs in western province of Zambia and their zoonotic implication to consumers. *J. South Afr. Vet. Assoc.* 77:28-32.
- Raju, D.T., and Suryanarayana, M.V.A.N. (2005).** Meat consumption in Prakasam district of Andhra Pradesh: an analysis. *Livestock Research for Rural Development* 17:1-8
- Schuppan, D., & Afdhal, N. H. (2008).** Liver cirrhosis. *Lancet* (London, England), 371(9615), 838–851. [https://doi.org/10.1016/S0140-6736\(08\)60383-9](https://doi.org/10.1016/S0140-6736(08)60383-9).
- Sonawane, G.G., Kumar, J. and Sisodia, S.L. (2016).** Etiopathological study of multiple hepatic abscesses in a goat. *Indian J. Vet. Pathol.*, 40(3): 257-260