

OCCURRENCE AND FINANCIAL EFFECT OF OVINE AND BOVINE LIVER CONDEMNATIONS DUE TO ABSCESSSES AND NECROSIS IN THE SUDAN

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ABSTRACT

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Livers are known to be of high nutritional value. They are eaten raw as a food habit in the Sudan. Surveys regarding liver abscesses and necrosis in ovine and bovine livers were carried out to reflect their magnitude as liver affections and their economic effect. Retrospective studies of liver condemnation of slaughtered animals in Omdurman Central Abattoir were carried out at different periods during 1994 and 1995 and for the whole seven years from 1996 to 2002 in Elsabalouga Abattoir. Monthly records in the latter years were used to study the effect of season on liver condemnation. Liver condemnations due to different affections in slaughtered sheep and cattle during the period 1994-1995 were found to be 26.2% and 5.4% respectively. Out of those condemnations 57.6 % and 22% respectively were found to be due to abscesses and necrosis. The surveillance of the liver condemnation in Elsabalouga Abattoir, during the period 1996-2002, revealed 77.43% condemned livers due to abscesses and necrosis out of the total condemned livers that in turn constituted 15.45% of the examined ovine livers. Out of 10.69% of the bovine condemned livers due to different affections, 11.96% were condemned due to abscesses and necrosis. There was strong to moderate correlation between the total condemned ovine and bovine livers and the condemnation due to abscesses and necrosis. Seasons were found to be of no significant effect on the ovine and bovine liver condemnations.

Key words: *Ovine, Bovine, Liver condemnations, Abscesses.*

INTRODUCTION

Liver condemnations constitute a high economic loss. Liver of small ruminants was reported to be the most condemned organ in a survey made in Ethiopia (Regassa, 2013). While in Tanzania liver was reported to be one of the two most frequently condemned organs in food animals including sheep and cattle (Mellau *et al.* 2011). In previous studies, condemnation due to abscesses and necrosis was shown to be of statistical significance (Jensen *et al.*, 1954.) The percentage of these liver affections was studied in several countries (Anon 1960, 1961, 1962; Hussien, 1973; Jensen, 1974, Kanoe *et al.*, 1979; Khatzmnol and Koskoal, 1991); it was shown to be steadily increasing in some of them (Newson, 1938; Kanoe *et al.*, 1976). The percentage of bovine liver condemnation in a study made in Ethiopia, in 2011-2012, was found to be 66.06% with 4.09% condemned livers due to abscesses (Hailemariam, 2012). Ovine liver condemnation was surveyed in an Ethiopian abattoir and found to constitute 87.72% of which 3% was due to abscessation (Getachew, 2007).

OBJECTIVES

The livers of slaughtered cattle and sheep in Omdurman Central Abattoir and Elsabalouga Abattoir were surveyed during 1994-2002, for presence of lesions in general and for abscesses and necrosis in specific, to study these affections and to estimate their economic impact in Sudan.

Methods

To attend the meat inspection of sheep and cattle slaughtered for exportation and for the three towns-Khartoum, Khartoum North, and Omdurman, regular visits for Omdurman Central Abattoir and Elsabalouga Abattoir were carried out. The animals slaughtered have originated from several localities in the Sudan. Liver condemnation in 3522 slaughtered lambs and 2376 slaughtered heavy bulls was actively surveyed in Omdurman Central Abattoir over a period of six months during 1994 and 1995. A second survey was carried out over a period of three months from January to March in 2002 in Elsabalouga Abattoir, liver

condemnation in 14717 slaughtered lambs and 795 slaughtered heavy bulls was actively surveyed.

Livers were examined grossly and the ones contained abscesses and necrosis were sorted out, collected in plastic bags and taken to the laboratories of Faculty of veterinary medicine, University of Khartoum or of Faculty of veterinary medicine Sudan University of Science and Technology. Samples of 1x1 cm were fixed in 10% formal saline and processed as described by Drury and Walungtone (1980). Microscopic examination for the histologically processed tissue sections was carried out to confirm the type of lesion.

Retrospective studies of liver condemnation were carried out at different periods during 1994 and 1995 depending on the availability of the records in Omdurman Central Abattoir; and for the whole seven years from 1996 to 2002 in Elsabalouga Abattoir. Monthly records in the latter years were used to study the effect of season on liver condemnation.

To study the economic impact of ovine and bovine liver condemnation, fifty ovine and fifty bovine carcasses and livers were weighed; and survey was carried out for the prices of the carcass and liver of the two food animals in the three towns.

RESULTS

The results have shown that abscesses in bovine and ovine livers varied in sizes from 0.5 to 7 cm in diameter. They were pallor in color than the surrounding apparently normal liver tissue, elevated from the surface, mostly well circumscribed and occasionally superficially covered by obvious fibrous tissue.

The necrotic foci were pale yellow to grayish white of 0.1 to 0.5 cm in diameter. The lesions were firm and vary greatly in shape.

In Omdurman Abattoir, 922 (26.2 %) out of 3522 inspected sheep livers, were condemned due to different affections. Necrosis and abscesses were observed in 531 (57.6 %) of the condemned livers. In 2476 inspected cattle livers, 129 (5.4%) liver were condemned due to different affections. 29 (22 %) of the total condemned livers were condemned due to abscesses and necrosis (table. 1).

The surveillance of the liver condemnation in Elsabalouga Abattoir revealed that 2273 (15.45%) out of 14717 inspected ovine livers were condemned due to different affections. Necrosis and abscesses were observed in 1760 (77.43%) of the condemned livers. Out of 795 inspected bovine livers in the same

abattoir, 85(10.69%) liver were condemned due to different affections. Necrosis and abscesses were observed in 10 (11.96%) of the condemned livers (table. 1).

Ovine and bovine liver condemnation that have appeared in the earlier annual reports of Omdurman Central Abattoir during different periods in 1994-1995 are shown in Figure (1) and Figure (2) respectively. Frequencies and percentages of ovine and bovine liver condemnations in Elsabalouga Abattoir from 1996 to 2002 are shown in Table (2) and Table (3) respectively.

The correlation between slaughtered animals and liver condemnation in ovine and bovine is shown in table (4) and table (5), respectively. There was strong positive and moderate correlation between the total condemned ovine livers and the condemnation due to necrosis and abscesses, respectively and a strong positive correlation between the total condemned bovine livers and condemnation due to necrosis and abscesses each.

Liver was found to constitute 2.43% of the bovine carcass weight and 3.13% of the ovine carcass weight. The price of ovine liver was found to be 25 Sudanese Pounds and the price of the bovine liver was found to be about 60 Sudanese Pound/ Kg. The price is approximately the same in the three towns: Khartoum, Khartoum North and Omdurman. The average annual losses due to liver condemnation during 1994-1995 in ovine 2.063.700 Sudanese Pounds and the losses due to liver abscess and necrosis constitutes about 1038078.5 Sudanese Pounds In bovine the total condemned livers costs about 12603600 Sudanese Pounds and that due to abscessed and necrotic liver condemnation is 359691.78 Sudanese Pounds. The average annual losses due to total ovine liver condemnations in 1996-2002 was found to be 1681785.8 Sudanese Pounds and the losses due to liver abscess and necrosis constituted about 88967.75 Sudanese Pounds.

In bovine the average annual losses due to total ovine liver condemnations in 1996-2002 was found to be 1405895.7 Sudanese Pounds and the losses due to liver abscess and necrosis constituted about 387090 Sudanese Pounds.

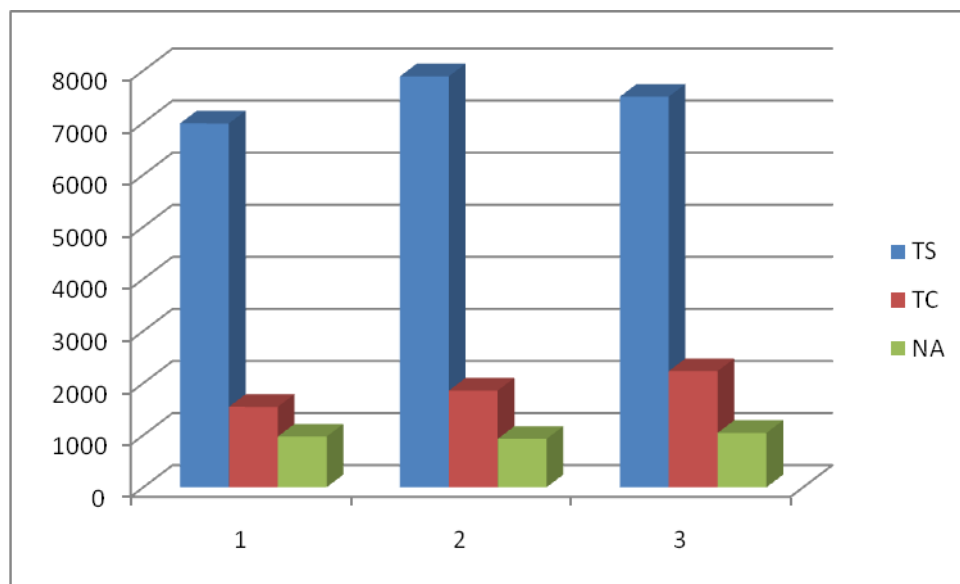
The effect of season on the liver condemnation was studied in the three seasons: dry summer, wet summer and winter over seven years from 1996 to 2002. It revealed no significant effect on both ovine and bovine liver condemnations. The number of slaughtered animals and liver condemnation was found to be the least in the dry summer.

Table 1: Condemned ovine livers in relation to slaughtered animals actively surveyed in Elsabalouga Abattoir

and Omdurman Central Abattoir.

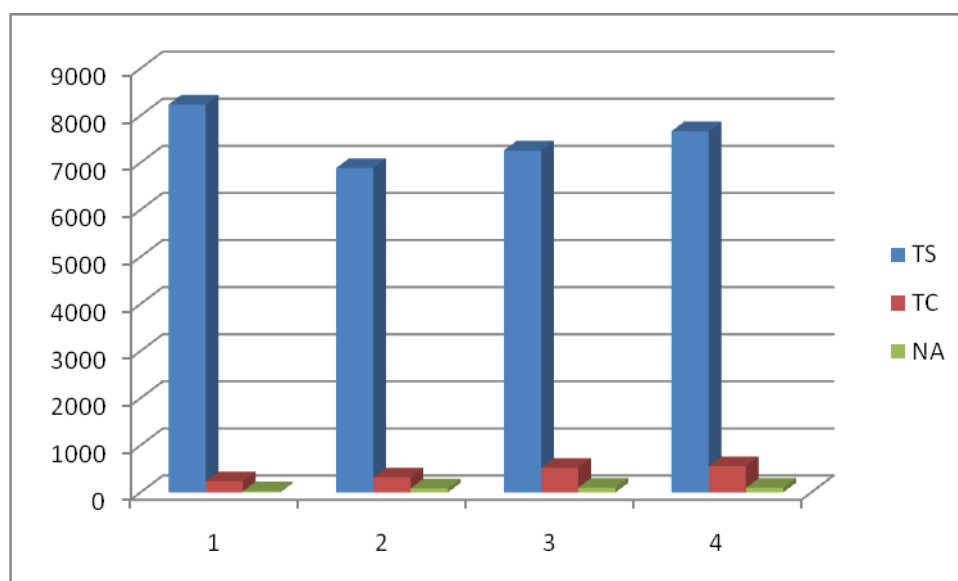
Slaughtered animals	Abattoir	TSA	TC	AN
Ovine	Elsabalouga	14717	2273 (15.45%)	1760 (77.43%)
	Omdurman	3522	922 (26.2 %)	531 (57.6 %)
Bovine	Elsabalouga	795	85 (10.69%)	10 (11.96%)
	Omdurman	2476	129 (5.4%)	29 (22 %)

TSA = Total slaughtered animals; TC = Total liver condemnations; AN = Liver condemnation due to abscesses and necrosis.



TS= Total slaughtered animals; TC= Total condemned livers; NA= condemned livers due to abscesses and necrosis.

Fig. 1 Condemned ovine livers in relation to slaughtered animals in Omdurman Central Abattoir during three different periods in 1994-1995.



TS= Total slaughtered animals; TC= Total condemned livers; NA= condemned livers due to abscesses and necrosis.

Fig. 2: Condemned bovine livers in relation to slaughtered animals in Omdurman Central Abattoir during four different periods in 1994-1995.

Table 2: Frequencies and percentages of total ovine liver condemnation and of condemnation due to abscesses and necrosis in relation to slaughtered animals recorded in Elsabalouga Abattoir.

	TSA	TC	AN
1996	272740(100%)	92602 (34.00%)	60749 (66.00%)
1997	3728388(100%)	121705 (3.26%)	69035 (57.00%)
1998	672342 (100%)	151960(22.6%)	69404 (45.67%)
1999	5062726 (100%)	63133 (1.25%)	28925 (45.82%)
2000	1055708 (100%)	30618 (2.9%)	19180 (62.64%)
2001	87155 (100%)	4233 (4.86%)	1738 (41.06%)
2002	230695 (100%)	6649 (2.88%)	41 (.062%)

TSA = Total slaughtered lambs; TC = Total ovine liver condemnations; AN = Condemnation of ovine livers due to abscesses and necrosis;

Table 3: Frequencies and percentages of total bovine liver condemnation and of condemnation due to abscesses and necrosis in relation to slaughtered animals recorded in Elsabalouga Abattoir.

	TSA	TC	AN
1996	80215 (100%)	5580 (6.96%)	1872 (33.55%)
1997	77846 (100%)	7354 (9.45%)	2178 (29.62%)
1998	109369 (100%)	7149 (6.54%)	1841 (25.75%)
1999	53890 (100%)	3946 (7.32%)	1251 (31.7%)
2000	45055 (100%)	3049 (6.77%)	777 (25.48%)
2001	29488(100%)	2211(7.50%)	278 (12.57%)
2002	13786 (100%)	533 (3.87%)	14 (2.63%)

TSA = Total slaughtered bulls; TC = Total bovine liver condemnations; AN = Condemnation of bovine livers due to abscesses and necrosis;

Table 4: Correlation between slaughtered sheep and condemned livers in Elsabalouga Abattoir from 1996 to 2002.

		Correlations			
		TC	AN	N	A
TSA	Pearson Correlation	0.275	0.253	0.214	0.392
	Sig. (2-tailed)	0.551	0.584	0.645	0.384
	N	7	7	7	7
TC	Pearson Correlation		.971**	.951**	.798*
	Sig. (2-tailed)		0	0.001	0.031
	N		7	7	7

TSA = Total slaughtered lambs; TC = Total ovine liver condemnations; AN = Condemnation of ovine livers due to abscesses and necrosis; N = Condemnation of ovine livers due to necrosis; A = Condemnation of ovine livers due to abscesses

** . Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 5: Correlation between slaughtered cattle and condemned livers in Elsabalouga Abattoir from 1996 to 2002.

		Correlations			
		TC	AN	A	N
TS	Pearson Correlation	.950**	.912**	.884**	.894**
	Sig. (2-tailed)	0.001	0.004	0.008	0.007
	N	7	7	7	7
TC	Pearson Correlation		.972**	.932**	.954**
	Sig. (2-tailed)		0	0.002	0.001
	N		7	7	7

TSA = Total slaughtered bulls; TC = Total bovine liver condemnations; AN = Condemnation of bovine livers due to abscesses and necrosis; N = Condemnation of bovine livers due to necrosis; A = Condemnation of bovine livers due to abscesses

** . Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

DISCUSSION

A prerequisite to a proper meat industry is the recognition of the disease conditions that affect the quality and safety of meat. This is usually met by strict meat hygiene in the process of meat inspection of parts, organs and entire carcasses.

Liver inspection and condemnation has a socio-economic impact in the Sudan. Consumption of raw liver is a food habit in the whole country that increases the risk at consumption of the diseased ones.

The total ovine liver condemnation were studied before by Hussein (1973) who gave a range of 7.3 to 9.3 % over a period of three consecutive years. The average of these percentages decreased from 8.6 % to 7.3 % in the first two years and increased during third year to 9.3%. Comparing the findings observed in the current study with those in Hussein (1973), the percentage of liver condemnation during 1994 to end of 1995 was increased about three folds to be 20 to 27%. In the last seven years, 1996-2002 the percentage of total ovine liver condemnation ranges from 34% to 1.25% with a decreasing tendency

towards 2002. The results of the current study and the previous one show a considerable fluctuation in the number of the condemned ovine livers from 1973 to 2003. But the percentage of condemnation due to abscesses and necrosis shows an increment in 1994-1995 study which was 57.6% and in 1996-2002 which was 77.43%. This may be due to the improvement in sheep fattening program in those years as reflection of the improved veterinary extension. The relationship between animal fattening and these liver affections was stated before by Jensen and Donald (1965).

As indicated by Hussein (1973) liver condemnation in bovine was fluctuating from one year to another with an average of 14.55 %. In 1994-1995 the percentage of the liver condemnation was less than the half of that percentage in Hussein study (1973) whereas the percentages of bovine liver condemnation over the period from 1996 to 2002 were higher than that of 1994-1995 percentage and less than that of Hussein (1973). When actively surveyed, bovine liver condemnation due to abscesses and necrosis ranged from 3.4 to 3.5 % in 1973 study (Hussein, 1973), 1.2 % in 1994-1995 and 0.013 in 2003. That decrease could be attributed to the improved animal husbandry and veterinary care.

The percentage of bovine liver condemnation due to abscesses and necrosis was found to range from 33.55% to 2.63%. Higher rates of liver condemnation due to abscesses and necrosis in the retrospective studies may indicate error in reporting the causes of condemnation or reflects the difference in the periods of collected data which is short in the active survey compared to the retrospective study using the records.

Compared to neighboring countries, the percentages of ovine liver condemnation in Sudan show lower rates; in Ethiopia it constituted 87.72% (Getachew, 2007). The difference in bovine liver condemnation between Sudan and Ethiopia is much pronounced than that of sheep, however, it also shows a lower rate compared to that in Ethiopia which was found to be 66.06%.

In spite of the variation in the numbers of slaughtered animals and the ovine and bovine liver condemnations in the three seasons: dry summer, wet summer and winter, the effect of season on total liver condemnations and liver condemnations due to abscesses and necrosis was found to be insignificant. The increases of numbers of slaughtered animals and condemned livers in winter and wet summer may be due to the effect of the feeding system in the Sudan. Effect of the year months on bovine liver abscessation was also reported by Harman *et al.* (1989).

It is worth mentioning that liver is known to be an important preferred edible type of meat in the Sudan. The monetary value of each of the condemned livers of sheep was 25 Sudanese pounds. It constituted

about 3.5 % of the total value of the animal in 1995 (Hind *et al.*, 2002). Recently this percentage have been decreased greatly this may be due to the increased cost of food animals in general and/or decreased price of the preferred types of meat as a matter of supply and demand. The same percentage applies to the losses of the bovine livers whereas the effect is less on their price. This may be due to the fact that sheep livers are more preferred so they have much higher prices in 1995. The annual ovine liver condemnations in the Sudan costs a value of about 800 lamb besides, there is loss of a highly nutritious type of food.

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التواجد والأثر الإقتصادي لإعدامات أكباد الضأن والأبقار نتيجة للإصابة بالنخر والخراج في السودان

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عرفت الاكباد بقيمتها الغذائية العالية. وكعادة غذائية في السودان فهي تؤكل نيئة. تم اجراء مسح للنخر والخراج في أكباد الضأن والأبقار لمعرفة مقدار تفشيها واثرها الاقتصادي. درست اعدامات اكباد الضأن والأبقار المذبوحة في سلخانة أم درمان المركزية في فترات مختلفة خلال عامي 1994-1995 ولمدة سبعة أعوام كاملة من 1996 حتى 2002 في سلخانة السبلوقة. تمت دراسة أثر فصول السنة في السنوات سابقة الذكر على اعدامات الأكباد باستعمال التقارير الشهرية. في عامي 1994-1995 اعدمت من أكباد الضان والأبقار 26,2% و 5,4% على التوالي. و 57,6% و 22% من الاعدامات اعلاه على التوالي كانت بسبب النخر والخراج. نتج عن المسح الذي اجري لاعدامات الأكباد في سلخانة السبلوقة ان الاعدامات في الضأن نتيجة للإصابة بالنخر والخراج تشكل 77,43% من جملة اعدامات الأكباد التي شكلت بدورها 15,45% من جملة أكباد الضأن المذبوحة. من مجموع اكباد الأبقار المعدمة نتيجة للإصابات المختلفة والتي شكلت 10,69% اعدمت 11,96% من الأكباد نتيجة للإصابة بالنخر والخراج. وجد ان هناك علاقة تتراوح بين القوية والمتوسطة بين الاعدامات في اكباد الضان والأبقار بسبب النخر والخراج وجملة الاعدامات. في حين ان الفصل السنوي ليس ذو أثر ملحوظ على هذه الاعدامات.