

Bacteriological, Parasitological and Pathological Studies on Some Liver Affections of Buffaloes in Sharkia Governorate

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ABSTRACT

This work was planned to evaluate the possible effect of some liver affections (abscesses, cirrhosis and fasciola) on hematobiochemical and histological structure of liver to help reaching diagnosis naturally affected buffaloes (59 out 310 were affected with abscesses, cirrhosis and distomiasis,slaughtered in different slaughter house in Sharkia Governorate were investigated

The prevalence of various liver affections in buffaloes was 59 (19.03 %) [male 22 (7.10% and female 37 (11.93%)] and the hepatic affections were represented by abscesses 16 (5.17%), cirrhosis 12(3.87%) and distomiasis 31 (9.99%).The main isolated bacteria from the liver abscesses were single insulates [12 (75%) (*Staph. aureus* 3 (18.75%), *E.coli* 2 (12.5%), *Strept. Pyogenes* 3 (18.75%) and *Arcobacterium Pyogenes* 4 (25 %)] and mixed isolate [4 (25 %) (*Strept. Pyogenes* + *E. coli* 2 (12.5%), *Strept. Pyogenes* + *Staph. aureus* 1 (6.25 %) and *E. coli* + *Staph. aureus* 1 (6.25 %)]

Animals with liver abscess showed insignificant increase in total erythrocytic count, hemoglobin concentration, packed cell volume and significant increase in leukocytic count, neutrophil and significant decrease in lymphocytes associated with insignificant increase in eosinophils,basophils and monocytes.Buffaloes suffering cirrhosis and distomiasis showed significant decrease in total erythrocytic count, hemoglobin concentration, packed cell volume and significant increase in the total leukocytic count. Cirrhosis was associated with in significant increase in neutrophils and insignificant decrease in eosinophils, basophils and monocytes, meanwhile, distomiasis induced a significant increase in lymphocytes, eosinophils, monocytes and insignificant decrease in neutrophils and basophils

Liver affection (abscesses, cirrhosis and fascioliasis) induced significant increase in liver enzymes (AST-ALT-LDH, alkaline phosphatase and GGT) and bilirubin (total-direct and indirect).Total protein and globulin were significantly increased with decreased albumin level in buffaloes suffering hepatic abscesses. Buffaloes suffering cirrhosis and fascioliasis showed significant decrease in total protein and albumin, meanwhile globulin was significantly increased. Liver abscesses and cirrhosis induced an non significant increase in serum calcium, phosphorus and sodium but potassium and magnesium were insignificantaly decreased.Fascioliasis induced asignificant decrease in calcium, phosphorus, potassium, magnesium and significant increase in sodium.

The histopathological lesions of acute and chronic fascioliasis included multilobular cirrhosis and old abscesses.

It could be concluded that liver abscesses, cirrhosis and fascioliasis induced several adverse effects on blood picture, beside biochemical parameters in buffaloes.

INTRODUCTION

Liver is considered to be the most important organs for mammalian metabolism thus any disturbance in this organ would be reflected on the general health causing great economic losses in animal production (1).

Liver abscess can occur at all ages and in all breeds of cattle (2). Liver abscesses were caused by more than one bacterial species where *Arcobacterium pyogenes* and *Staph. aureus* are the most common causes (3). They have a major economic impact on the feedlot industry because

of liver condemnation and reduced animal performance (2). Liver fibrosis results from chronic injury leading to liver failure and death of many animals (4). Liver parasitic affections as fasciola are considered to be one of the most important problems, which induce decrease of animal production or leading to death (5). Fasciola infestation represents an important cause of liver damage (6) and caused adverse effects on growth and production (7). Fasciola hepatica and Fasciola gigantica are among the most important hepatic parasites affect liver of animal (8).

Histopathologically, liver abscesses composed of pyogranulomatous reactions with necrotic centers surrounded with fibrous connective tissue capsule (9). The earliest lesion is a microabscess, possibly induced by bacterial embolus in the hepatic sinusoid, the lesion then progresses to induce coagulative necrosis of the adjacent hepatocytes (10). Fascioliasis causes necrotic hepatic lesions due to the early parasitic migration through the hepatic parenchyma (11) such hepatic necrosis may predispose to other diseases (12).

MATERIALS AND METHODS

Animals

Natural hepatic affections (abscesses, cirrhosis, and fascioliasis) were detected in 59 out of 310 slaughtered buffaloes (males 2-3 years old and females 8-9 years old) in 5 slaughtered houses distributed in 5 different localities in Sharkia Provence (Zagazig, Belbis, Abo-Hamad, Deurp Nigm and Abo-Kabeer)

Bacteriological examination

The hepatic structure was seared with a hot spatula and swabs were prepared from liver abscesses of slaughtered buffaloes. The swabs were dipped in nutrient broth and incubated at 37°C for 24h., then subcultured into selective media (13). All bacterial isolates were identified (14).

Media

MacConkeys agar and broth, nutrient agar and broth (15) were used.

Blood samples

Two blood samples were collected from animals (healthy and affected) just before slaughtering. The 1st sample was collected in tubes containing EDTA for erythrogram and leukogram (16). The 2nd sample was collected to obtain clear serum for determination of AST and ALT (17), alkaline phosphatase (18), lactic dehydrogenase (19), gamma glutamyl transferase (20), total protein (21), albumin (22) & globulin calculated as difference between total proteins and albumin beside total bilirubin (23). Calcium (24) phosphorus (25), sodium, potassium and magnesium were measured using flame photometer, (26).

Histopathological studies

Specimens were collected from infected liver and fixed in 10% neutral buffer formalin solution. Collected samples were dehydrated, cleared. Five micron thick paraffin sections were prepared stained by Harris hematoxylin and eosin and examined microscopically (27).

Statistical analysis

Statistical analysis of data was performed (28).

RESULTS

Fifty-nine (19.03%) out of 310 examined buffaloes showed various liver affections. Twenty two (7.10%) were males and 37 (11.93%) were females. such affections were represented by liver abscesses (16) 5.17%, liver cirrhosis (12) 3.87% and fascioliasis (31) 9.99% (Table 1).

Bacteriological isolation

Single bacterial isolates were obtained from abscesses in 12 (75%) *Staph. aureus* was isolated from 3 (18.75%), *E. coli* 2 (12.5%), *Strept. Pyogenes* 3 (18.75%) and *Arcobacterium Pyogenes* 4 (25 %) and mixed isolate [4 (25 %) (*Strept. Pyogenes* + *E. coli* 2 (12.5%), *Strept. Pyogenes* + *Staph. aureus* 1 (6.25 %) and *E. coli* + *Staph. aureus* 1 (6.25 %)] (Table 1).

Table 1. Prevalence of liver affections in buffaloes

Affections & Animals City	Total No.	Healthy	Total affected		Liver affections in buffaloes					
			male	female	abscesses		cirrhosis		fascioliasis	
					male	female	male	female	male	female
Zagazig	95	79	6	10	2	3	1	3	3	4
Belbis	66	56	4	6	1	1	1	1	2	4
AboHamad	48	38	4	6	1	2	1	1	2	3
DeurpNigm	49	37	5	7	1	2	1	1	3	4
AboKabeer	52	41	3	8	1	2	1	1	1	5
Total	No	310	22	37	6	10	5	7	11	20
	%	100	80.97	7.10	11.93	1.94	3.23	1.61	2.26	3.55

Table 2. Prevalence of bacterial isolant from liver abscesses of buffaloes

Isolated microorganisms		Number	%
Single isolate	Staph. aureus	3	18.75
	E. coli	2	12.5
	Strept. pyogens	3	18.75
	Arcanobacterium pyogeness	4	25
Mixed isolate	Strept. pyogens + E. coli	2	12.5
	Strept. pyogens + Staph. aureus	1	6.25
	E. coli + Staph. aureus	1	6.25
Total		16	100

% was calculated according to the number of examined samples (16).

Hematological values

Table 3 reveals that, buffaloes infected with liver abscesses showed insignificant elevation in total erythrocytic count, hemoglobin concentration, packed cell volume and significant elevation in leukocytic count, neutrophil and significant decrease in lymphocyt associated with insignificant increase in eosinophils, basophils and monocytes. Cirrhosis and fascioliasis were associated with significant decrease in total erythrocytic count, hemoglobin concentration, packed cell volume and a significant increase in the total leukocytic count, lymphocyte. Cirrhosis induced insignificant increase in neutrophils and insignificant decrease in eosinophils, basophils and monocytes, Fascioliasis induced a significant increase lymphocytes, eosinophils, monocytes and insignificant decrease in neutrophils and basophils

Biochemical parameters

Liver affections (abscesses, cirrhosis and fascioliasis) in buffaloes induced a significant increase in liver enzymes (AST-ALT-LDH, alkaline phosphatase and GGT, beside bilirubin total-direct and indirect). Total protein and globulin were significantly increased but albumin decreased in buffaloes suffering liver abscesses. Buffaloes suffering liver cirrhosis and fascioliasis showed a significant decrease in total protein and albumin, meanwhile globulin was significantly increased. Liver abscesses and cirrhosis induced insignificant increase in serum calcium, inorganic phosphorus and sodium but potassium and magnesium were insignificantly decreased, Meanwhile, fascioliasis induced significant decrease in serum calcium, organic phosphorus, potassium, magnesium and significant increase in sodium.

Table 3. Erythrogram and leukogram in diseased buffaloes (n=5)

Parameters Group	Erythrogram			leukogram					
	RBCs 10 ⁶ /ul	Hb Gm%	PCV %	TLC 110 ³ /ul	Absolute differential count (10 ³ / ul)				
					N	L	E	B	M
Control	7.68± 0.92	11.17± 0.89	33.03± 1.28	10.41± 0.55	4.10± 0.21	4.01± 0.58	1.05± 0.26	0.23± 0.16	1.12± 0.14
Liver abscesses	7.47± 0.87	10.03± 0.82	32.21± 1.71	14.51± 0.69**	8.04± 0.72*	3.28± 0.26**	1.85± 0.15	0.38± 0.25	1.26± 0.16
Cirrhosis	5.31± 0.42**	9.09± 0.15*	27.01± 1.02*	12.03± 0.09*	4.92± 0.63	7.14± 0.20*	0.19± 0.04	0.18± 0.04	0.35± 0.08
fascioliasis	4.22± 0.53**	8.27± 0.71**	26.3± 1.26*	15.21± 0.52**	3.92± 0.54	6.47± 0.30*	1.85± 0.29**	0.20± 0.04	1.90± 0.41*

*P < 0.05

** P < 0.01

Table 4. Liver enzymes bilirubin and protein profile in diseased buffaloes (n=5)

Parameters Groups	Liver enzymes					protein profile		
	AST (U/L)	ALT (U/L)	Al.ph. (U/L)	LDH (U/L)	GGT (U/L)	T.Protein (gm/dl)	Albumin (gm/dl)	Globulin (gm/dl)
Control	45.21± 1.21	39.36± 2.13	72.34± 2.26	242.40± 7.95	17.66± 1.43	8.02± 0.24	4.39± 0.45	3.73± 0.20
Liver abscesses	53.22± 2.05**	41.24± 1.95	84.07± 1.34*	258.6± 8.12*	22.08± 1.17*	10.05± 0.31**	2.08± 0.27**	7.97± 0.21**
Liver cirrhosis	58.3± 1.82***	45.17± 1.07**	78.05± 1.19	274.4 ± 10.31**	25.34± 1.91**	6.93± 0.15**	2.15± 0.14*	4.78± 0.22**
fascioliasis	55.41 ± 1.52**	49.08± 1.21**	89.14± 1.49**	271.9± 9.25**	26.06± 1.86**	5.99± 0.35**	1.96± 0.18**	4.03± 0.23**

*P < 0.05

** P < 0.01

Table 5. Some serum minerals and bilirubin in diseased buffaloes (n=5)

Parameters Group	Bilirubin(mg/dl)			Macro minerals				
	Total	Direct	Indirect	Calcium mg/dl	Inorganic Ph.(mg/dl)	Sodium mEq/L	Potassium mEq/l	Magnesium mg/dl
Control	5.3± 0.56	2.48± 0.32	2.83± 0.61	9.14± 0.93	5.35± 0.29	139.17± 4.3	5.28± 0.27	7.69± 0.69
Liver abscesses	9.57± 1.43**	6.50± 1.25**	3.07± 0.11*	9.92± 0.84	5.49± 0.34	140.37± 6.78	4.87± 0.49	6.98± 0.32
Liver cirrhosis	8.49± 1.09**	5.03± 0.26*	3.46± 0.13*	9.56± 0.79	5.61± 0.28	141.22± 4.04	4.99± 0.29	7.25± 0.88
fascioliasis	9.18± 1.37**	4.52± 0.37**	4.66± 0.87*	5.82± 0.68*	3.27± 0.61*	169.15± 8.2*	3.55± 0.40*	5.05± 0.30*

*P < 0.05

** P < 0.01

Histopathological finding

Macroscopically, distomiasis led to formation of dark, red, raised tracks on the hepatic cut surfaces. The contents of these

tracks were clotted blood and fragile grayish materials. Microscopically tracks of lamellate fibrin intermingled with erythrocytes, plasma cells and other inflammatory cells replaced the hepatic parenchyma (Fig. 1) these hemorrhagic

tracks usually contained hemosiderin, eosinophils and necrotic debris (Fig. 2). Macroscopically chronic fascioliasis was associated with thickened wall of bile ducts which contain the fluke. Microscopically the walls of the bile duct was thickened by adenomatous hyperplasia of its epithelial lining surrounded by fibrous tissue proliferation infiltrated with round cells and necrotic surrounding hepatic cells (Figs.3,4). Macroscopically the cirrhotic liver was pale, hard firm and lobulated. Microscopically,

lobules were of fibrous tissues infiltrated with mononuclears, mainly lymphocytes and macrophages, with hepatocytes among them (Figs. 5, .6). Macroscopically the liver with abscesses showed discrete pale foci that were sharply demarcated from the adjacent parenchyma. Microscopically, focal necrosis with pale eosinophilic inspissated material was surrounded by leukocytic infiltration, mainly neutrophils and mononuclear were encapsulated with thick fibrous capsule a (Figs 7,8).

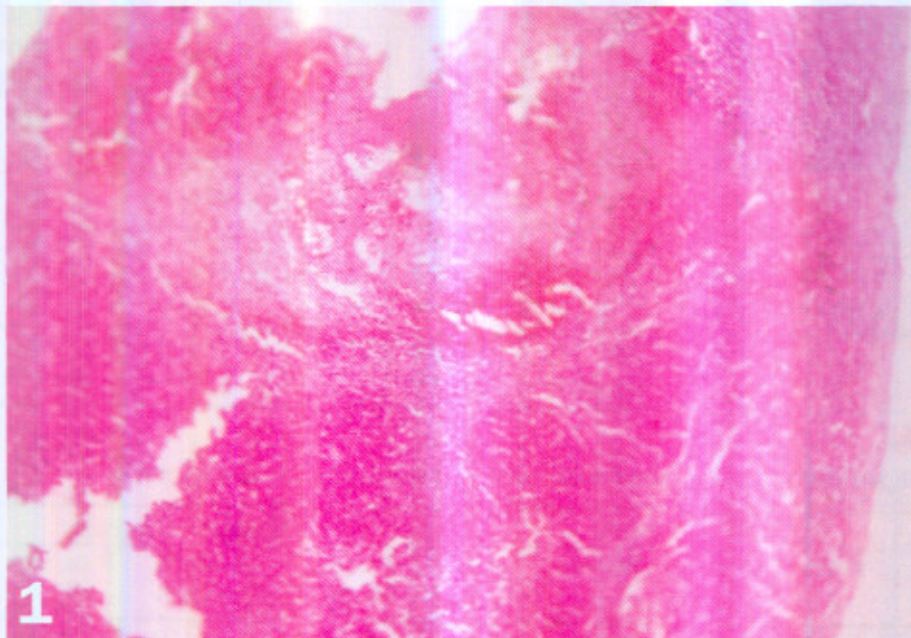


Fig. 1. Liver distomiasis showing migratory track. H&E X 120.

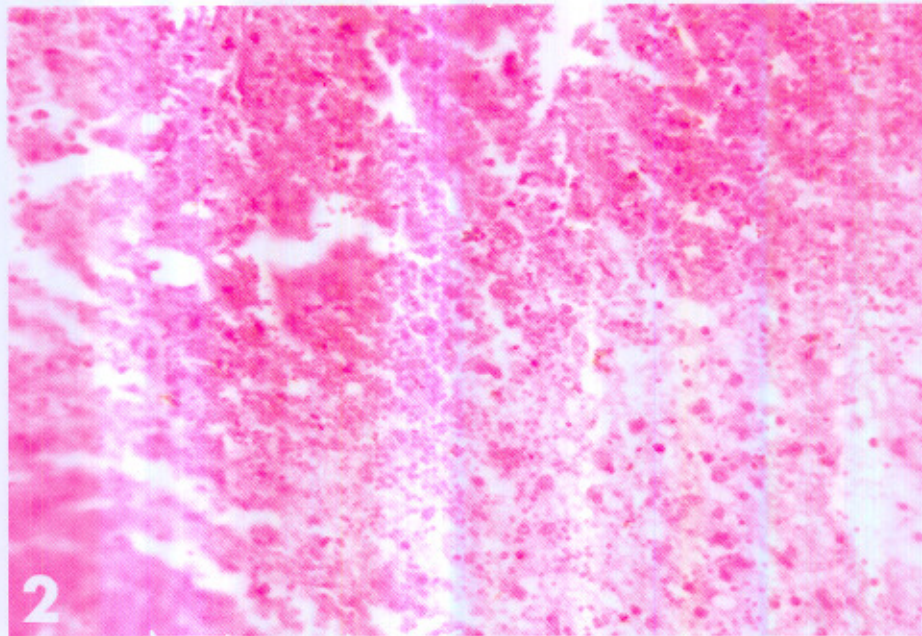


Fig.2. High power of previous figure to show erythrocytes, fibrin threads, plasma cells and hemosiderin in the migratory track. H&E X 300.

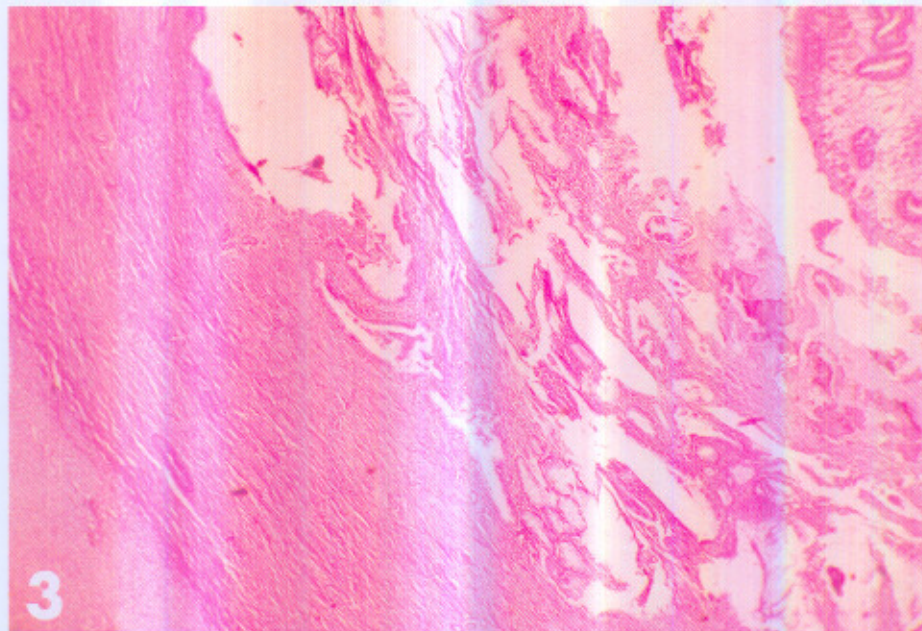


Fig. 3. Liver chronic fascioliasis showing the parasite inside the inflamed bile ducts. H&E X 120.

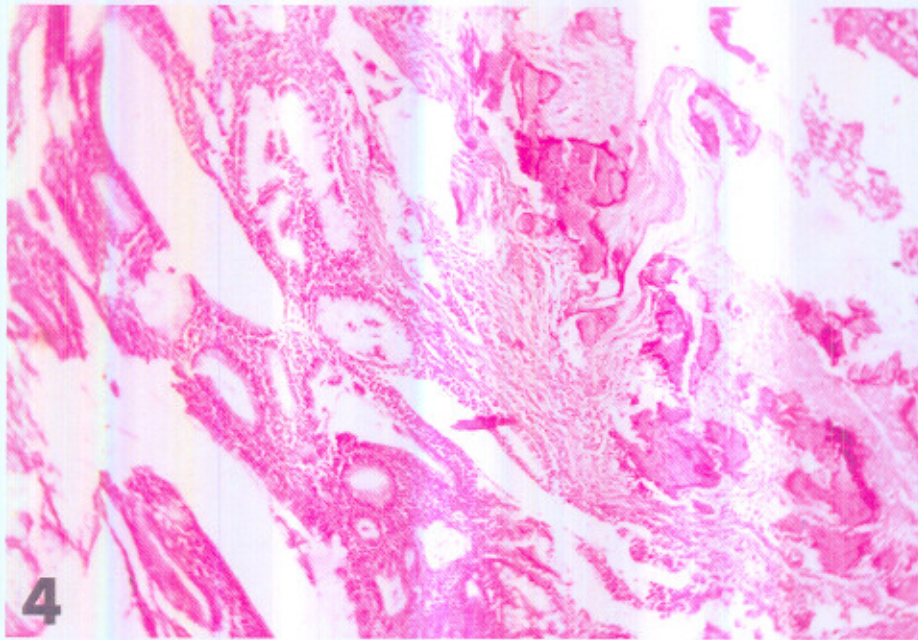


Fig. 4. High power of previous figure to show the hyperplasia of the epithelial lining of the bile duct and adenomatous, necrosis with calcification of bile ductules. .H&E X 300.

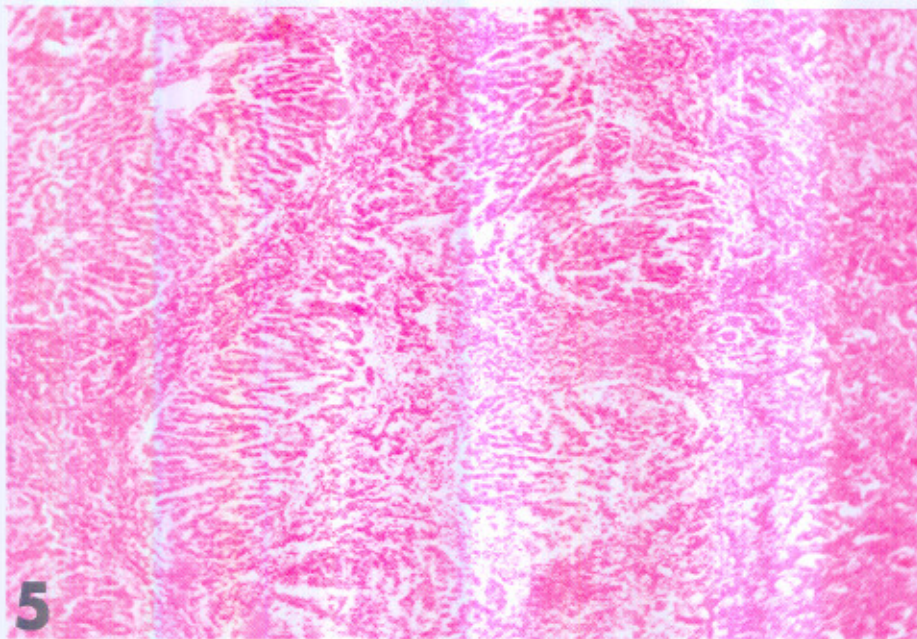


Fig.5. Liver multilobular cirrhosis. H&E X 120.

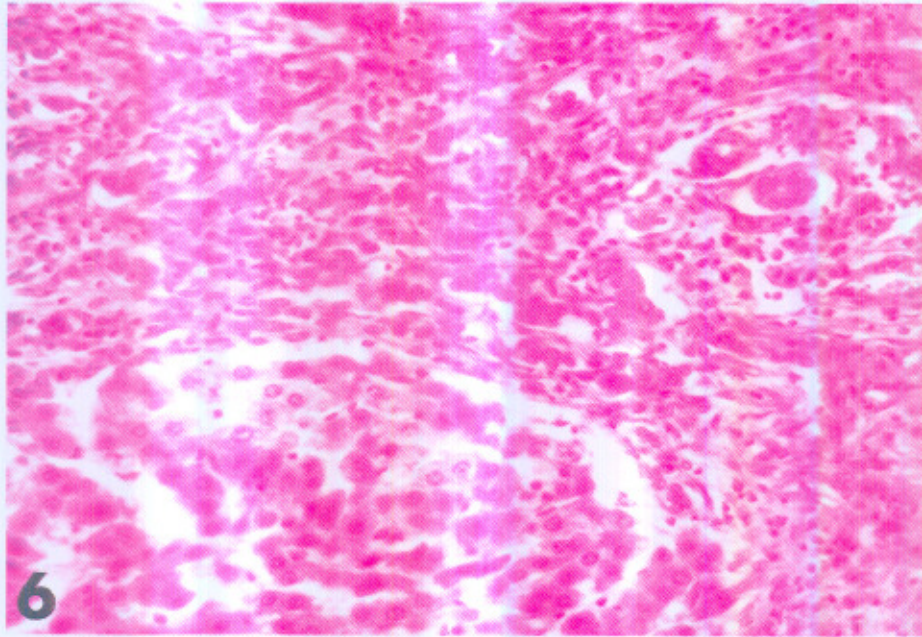


Fig.6. High power of previous figure to show fibrous tissue infiltrated by mononuclears in the interlobular tissue.H&E X 300.



Fig.7. Liver with abscesses. H&E X 120.

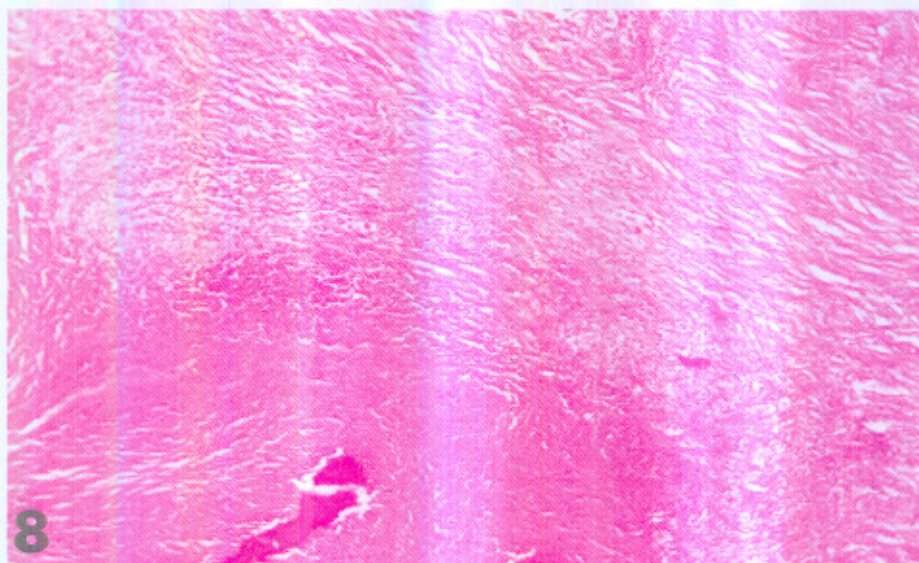


Fig.8. High power of previous figure to show fibrous tissue around the necrotic area.H&E X 300.

DISCUSSION

Liver abscesses, cirrhosis and fascioliasis in animals lead to decreased milk production and weight gain (29).

The prevalence of various liver affections in buffaloes in our study was 19.03 %. The prevalence of liver abscesses in cattle can range from 2.84 or 6.92% (30) and were common in heavily fattened cattle (31). The prevalence of fasciola infection in cattle was 15.5% (32) and 13.9%-14% in Friesian cattle (33). The prevalence of distomiasis was higher in adult cows than calves (34). Such high rate may be due to the type of ration in which calves mainly feed on milk and dry food, while older cows are fed mainly on green forage (main source of infection).

Bacteriological examination of the cultured swabs from liver abscesses revealed that the main causative organism isolated bacterial pathogens were single isolate (75%) and mixed isolate 4 (25 %) *Corynebacterium pyogenes* was the most predominant isolates from liver abscesses of cattle, followed by *Staph.* and *Strept. spp.*(9), and *Staph. aureus*, *E. coli*, *Strept. Spp.* and *Proteus* were isolated from liver abscesses of cattle (35).

Corynebacterium spp. was isolated from liver abscesses of cattle (36).

The present investigation declared insignificant decrease in the erythrocytic count, hemoglobin, packed cell volume, leukocytosis, neutrophilia and lymphoenmia associated with insignificant increase in monocytes, basophils and eosinophils in buffaloes suffering liver abscess, meanwhile buffaloes suffering cirrhosis and fascioliasis showed significant decrease in erythrocytic count, hemoglobin concentration, packed cell volume and leukocytosis lymphocytosis, eosinophilia and monocytosis in fasciolia only. These results Sheep affected with liver abscesses showed insignificant reduction in erythrocytic count hemoglobin concentration, packed cell volume and significant elevation of the total leukocytic count and neutrophils with significant decrease in lymphocytes (37). Liver abscesses induced significant decrease in total erythrocytic count, hemoglobin concentration, packed cell volume (38). Hepatic abscesses in cattle induce leukocytosis with neutrophilia (39). Liver abscesses induced leukocytosis, neutrophilia and significant decrease in lymphocytes coupled with insignificant increase in monocytes, basophils and eosinophils. This is expected especially in pyogenic infections during which the animals become subjected to

bacterial sensitization for relatively long period (40). Calves suffering cirrhosis showed mild anemia associated with decreased erythrocytic count, hemoglobin concentration, packed cell volume besides leukocytosis (41). Marked peripheral eosinophilia was reported in buffaloes infested with *Fasciola gigantica*. Also leukocytosis was reported in sheep infested with *Fasciola gigantica* (43). Cattle infested with fascioliasis displayed a significant decrease in total erythrocytic count, hemoglobin, packed cell volume % besides leukocytosis (44).

Liver function tests may be used to establish a diagnosis in an individual animal or to detect subclinical liver damage following bacterial infection and its circulating toxins (45). The current work revealed a significant increase in liver enzymes (AST, ALT, Alk.ph., LDH and GGT) in buffaloes suffering from liver abscesses, liver cirrhosis and fascioliasis buffaloes infected with liver abscesses revealed a significant increase in serum AST and ALT (46) and the activities of liver enzymes are sensitive indicators of liver damage in sheep and cattle (47). Dogs suffering liver abscesses showed significant elevation in alkaline phosphatase, (AST and ALT) activities (39). Liver abscesses in cattle induced significant increase in GGT (48). The increase in enzyme activity may indicate hepatobiliary obstruction (49). The liver abscesses elevated GGT activity (50). Cirrhosis in calves induced significant increase in liver enzymes (41). The increase of AST and LDH (51), may be related to the inflammatory state of the liver and tissue destruction through the parenchymal migration of immature flukes. Increase in GGT has been described as coinciding with the penetration of fluke into the bile ducts, causing a hyperplastic cholangitis (52).

The present investigation revealed that hyperprotenemia and hyperglobulinemia in all cases in buffaloes suffering liver abscesses but liver cirrhosis and fascioliasis induced hypoproteneemia and hyperglobulinemia in addition to hypoalbuminemia in all cases. Holstein dairy cattle suffering liver abscess showed similar effect. High serum globulin levels were characteristic of chronic

inflammation (38). Liver abscesses in dog induced hypo-albuminemia (39). Significant decrease in serum albumin in buffaloes suffering liver abscesses may be referred to the state of inability of the liver to synthesize albumin. The reduction of the albumin is attributed to the stress factors and the general unthriftiness which may affect worsely the hepatic parenchyma resulting in failure of albumin synthesis (53). The significant increase in the serum globulin in the buffaloes suffering liver abscesses may be due to the stimulation of immune system by the infectious agents to produce great amounts of immunoglobulin (54). Hypoalbuminemia, detected in liver flukes infected animals may be due to decreased albumin synthesis or higher catabolic rate due to the damage to liver parenchyma (55). High level of globulin is an indication of an immune response by the host (51).

Buffaloes liver affections (abscesses, cirrhosis and fascioliasis) induced significant increase in bilirubin (total-direct and indirect). Liver abscesses and cirrhosis induced insignificant increase in serum calcium, inorganic phosphorus and sodium meanwhile potassium and magnesium were insignificantly decreased, but fascioliasis induced significant decrease in serum calcium, organic phosphorus, potassium, magnesium and significant increase in sodium. Bilirubin was increased in Holstein dairy cattle suffering liver abscesses (29). Liver abscesses in dog induced significant increase in bilirubin concentration (39). Calcium, inorganic phosphorus and magnesium were significantly decreased in sera of sheep infested with fasciola (56). The decreased calcium, inorganic phosphorus and magnesium could be due to presence of adult fasciola in the bile duct this may interfere with the passage of bile into the intestine causing disturbance in the absorption and utilization of dietary calcium, phosphorus and magnesium (57). Disturbed bile secretion could be induced by death of hepatic parenchyma associated with liver affection (58).

Our data revealed liver abscesses represented by focal necrotic areas containing pale eosinophilic inspissated material

surrounded by leukocytic infiltration mainly neutrophils, lymphocytes and plasma cells, followed by a thick fibrous capsule which separated it from the hepatic parenchyma. The latter showed coagulative necrosis, which due to toxins. Necrotic centers of degenerating hepatocytes and leukocytes surrounded capsule of fibrocytes, collagen and elastic fibers were recorded previously (9). Coagulative necrosis involving hepatocytes adjacent to abscesses were filled with pus (10). *Fasciola* infected livers showed fibrin with erythrocytes, plasma cells and other inflammatory cells forming tracks replacing the hepatic parenchyma. The tracks usually contained haemosiderin, eosinophils and necrotic debris. Similar lesions were recorded in cattle (59) and buffaloes (60). Fascioliasis caused necrotic lesions in the liver due to the parasitic migration through parenchyma. The multilobular cirrhosis in the hepatic parenchyma (11) was manifested by fibrous tissue proliferation and chronic inflammatory cells with mild hyperplasia of bile ducts. Similar findings were reported (61).

It could be concluded that liver abscesses, cirrhosis and fascioliasis induced several adverse effects on blood picture, besides liver and kidney functions in buffaloes.

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الملخص العربي

دراسات بكتيرية وطفيلية وباثولوجية على بعض الإصابات الكبدية في الجاموس بمحافظة الشرقية

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الإصابات الكبدية مثل الخراييج والتليف والديدان الكبدية في الجاموس تشكل أهمية كبيرة وخطيرة حيث أنها قد تؤدي إلى نفوق الحيوان في الحالات الحادة أو الإصابة بالهزال في الحالات المزمنة مما يؤثر على إنتاجيته. في هذه الدراسة تم عمل مسح ببعض المجازر (الزقازيق- بلبيس- ابو حماد- ديرب نجم- ابو كبي) بمحافظة الشرقية على عدد 310 حيوان من الجنسين عمر (ذكور 2-3 سنة والاینات 8-9 سنة) لدراسة الأعراض التي تظهر على الحيوانات قبل الذبح وربطها بصورة الدم وبعض التحليلات البيوكيميائية والصورة الهستوباثولوجية للإصابات الكبد (الخراييج والتليف والديدان الكبدية) وذلك لمحاولة التشخيص والتفريق بين تلك الأمراض في الحيوانات المصابة. تم تقسيم الجاموس بعد فحصها بالمجازر قبل وبعد الذبح إلى أربع مجموعات. حيوانات ذات اكباد سليمة وتتمتع بصحة جيدة قبل الذبح ظاهريا ولا تظهر عليها اي أعراض مرضية، والباقي حيوانات تعاني من الهزال والضعف العام لوجود (خراييج، تليف وديدان الكبدية)

تشير النتائج أن نسبة الإصابات الكبدية (الخراييج، التليف والديدان الكبدية) كانت 59 بنسبة 19,04 % الاصابة في الذكور (22) بنسبة 7.10% بينما كانت الاصابة في الاناث (37) بنسبة 11,94% وكانت الإصابات الكبدية تشمل الخراييج (16) 5.16%، تليف الكبد (12) 3.87% الاصابة بالديدان الكبدية (31) 9.99% وبالفحص الميكروبيولوجي تم تحديد المسببات البكتيرية لخراييج الكبد وكانت عدوى منفردة بنسبة 75% (ميكروب العقنود الذهبي (3) 18.75%، ميكروب القولون العصوي (2) 12.50%، ميكروب السبحي الصديدي (3) 18.75%، ميكروب الكوريني بكتريم الصديدي (4) 25%. وعدوى مشتركة (4) بنسبة 25% وكانت كالاتي ميكروب السبحي الصديدي مع ميكروب القولون العصوي (2) 12.50 ميكروب السبحي الصديدي مع ميكروب العقنود الذهبي (1) 6.25% وميكروب القولون العصوي مع ميكروب العقنود الذهبي (1) 6.25% .

خراييج الكبد ادت الى حدوث نقص غير معنوي في عدد كرات الدم الحمراء، تركيز الهيموجلوبين، حجم خلايا الدم المرصوصة مصحوبة بزيادة معنوية في العدد الكلى لكرات الدم البيضاء والخلايا متعادلة الصبغه ونقص معنوي في الخلايا الليمفاوية مصحوبا بزيادة غير معنوية في الخلايا الحمضية والقلوية الصبغه كما ان الاصابة بالديدان الكبدية وتليف الكبد ادبا الى حدوث نقص معنوي في العدد الكلى لكرات الدم الحمراء، تركيز الهيموجلوبين، حجم خلايا الدم المرصوصة وزيادة معنوية في العدد الكلى لكرات الدم البيضاء والخلايا الليمفاوية مصحوبة بزيادة غير معنوية في الخلايا المتعادلة ونقص غير معنوي في الخلايا الحمضية، قاعدية الصبغه والملتهمة في حالة تليف الكبد الاصابة بالديدان الكبدية ادت الى حدوث زيادة معنوية في الخلايا الحامضية الصبغه والملتهمة الكبير ونقص غير معنوي في الخلايا المتعادلة والقاعدية الصبغه.

التحليلات البيوكيميائية لمصل الحيوانات المصابة بخراييج الكبد وتليف وديدان الكبدية ادت الى حدوث زيادة معنوية في انزيمات الكبد ALT,AST, الفوسفاتيز القاعدي، لاكتك ديهيدروجينيز، الجاما جلوتاميل انسفيراز البيلروبين. كذلك خراييج الكبد ادت الى حدوث زيادة معنوية في البروتين الكلى و الجلوبيولين ونقص معنوي في الزلال بينما الاصابة بالديدان الكبدية وتليف الكبد ادت الى حدوث نقص معنوي في البروتين الكلى و الزلال وزيادة معنوية في الجلوبيولين. لم تحدث خراييج الكبد وتليف تغير معنوية في الكالسيوم، الفوسفور، الصوديوم والبوتاسيوم والماغنسيوم في مصل الدم و الاصابة بالديدان الكبدية ادت الى حدوث نقص معنوي في تركيز الكالسيوم، الفوسفور، البوتاسيوم والماغنسيوم وزيادة معنوية في مستوى الصوديوم .

تم وصف الافات النسيجية المرضية للالتهاب الحاد والمزمن لداء الفاشيولا بالكبد مع وجود تليف متعدد الفصوص كما وجد خراييج بؤرية قديمة تحتوى على قيح .

الخلاصة ان خراييج الكبد والفاشيولا والتليف تسبب في وجود تأثيرات عكسية على صورة الدم وكذلك الوظائف البيوكيميائية بالجاموس.