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Pathological Characterization of Renal Lesions Developed in Some Ruminant Species in Egyptian Slaughter House.

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ABSTRACT

Kidneys of ruminant are considered as an edible organ in Egypt and renal condemnation resulting in economic losses. Survey on renal lesions in ruminant is essential as such lesions are subclinical and affect animal productivity. The present study was conducted on 59 cattle, 92 sheep and 18 goats from both sexes over a period of one year (2015-2016). Condemned kidneys were collected from El Bastin slaughter house, collected specimen were subjected for gross and routine histological processing. Results revealed great variation in incidence of renal pathological lesions among ruminant animals. The incidence of glomerular lesions developed were 17% in males and 15.38% in female cattle, 32.30% in males and 48.14% of females in sheep 50% and 33.33% in males and females respectively in goat. The total incidence of tubulointerstitial lesions was 84.78% in males and 84.61% in female cattle while the incidence in sheep was 67.69% in males and 51.85% in females. The total incidence of Tubulointerstitial in goat was 50% and 66.66% in males and females respectively. There were variable renal pathological lesions that were observed among ruminant animals in this study.

Keywords: kidney, pathology, glomerular lesions, tubulointerstitial lesions, Ruminants.

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INTRODUCTION

The slaughter houses and its regulations, represents a key control point of livestock production chain [1-2]. Kidney is one of the edible organs that commonly preferred by consumers. Numerous abattoir surveys of bovine pathological conditions have been conducted to investigate macroscopic and microscopic abnormalities [3-4]. Renal lesions that require total condemnation resulting in economic losses. Numerous abattoir surveys were conducted on bovine pathology in several countries including Egypt.

Glomerulonephritis constitutes an important category of renal diseases in animals and has been recognized with increasing frequency in the last decade. Glomerulonephritis is responsible for substantial morbidity and mortality in many species of animals. Although the cause is basically unknown, it is a disease generally thought to result from the interaction of immunologic and inflammatory reactants at a fixed tissue site (the glomeruli) with subsequent loss of structural and functional integrity of the injured tissues. Two major immunologic mechanisms of glomerular injury have been identified. In one, antibodies react with antigens in the glomerular basement membrane. In the other, antibodies react with non glomerular antigens in the circulation to form immune complexes that are deposited in the glomerulus [5]. AA amyloidosis is well known in cattle and are commonly involved, often causing the clinical appearance of the nephrotic syndrome with severe proteinuria [6].

The present study provides a base line data on the incidence of kidney pathological lesions among small and large ruminants in El-Basatin Abattoir as well as describing the gross and microscopic pictures of the condemned cases.

MATERIAL AND METHODS

Sample collection

The present work was performed in the Department of Pathology, Faculty of veterinary Medicine, Cairo University. A total of **163** kidney specimens, were collected from the kidneys of bothe male and female slaughtered cattle , sheep and goat. The specimens were collected from El-Basatin (Cairo) abattoir during a period from 2015-2016. the collected tissue samples from cattle were 46 male and 13 female with total number of 59 specimens, while the total number in sheep was 86 from which 58 males and 28 females. The total number of kidney samples from goat was 18; 12 males and 6 females.

Pathological evaluation

The collected kidney specimens were subjected to gross examination, then samples were fixed in 10% neutral buffered formalin. After fixation, the samples were dehydrated in several grades of ethyl alcohol, cleared in benzene and embedded in paraplast. After processing the paraffin embedded blocks were sectioned at 4-6 Um thick, and stained with hematoxyline and eosin. The sections were examined using light microscope for general histopathological examination. Selected tissue sections were further stained by Masson trichrome, Prussian blue ,Congo red and Gram`s stains for further microscopic identification [7] .

RESULTS

Glomerular lesions were recorded in cattle with an incidence of 17% in males and 15.38% in females, while the incidence in sheep was 32.30% in males and 48.14% in females .The total incidence of Glomerular lesions in goat was 50% and 33.33% in males and females respectively. The incidence of each type of glomerular lesions was shown in table (1).Tubulointerstitial lesions were recorded in cattle with an incidence of 84.78% in males and 84.61% in females, while the incidence in sheep was 67.69% in males and 51.85% in females .The total incidence of glomerular lesions in goat was 50% and 66.66% in males and females respectively. The incidence of each type of Tubulointerstitial lesions was shown in table (1).

Table (1): Incidence of different renal lesions in ruminants (%)

species lesion	Cattle		Sheep		Goat	
	Male (46)	Female (13)	Male (65)	Female (27)	Male (12)	Female (6)
Acute Glomerulonephritis	10.86	15.38	1.53	22.22	41.66	33.33
Proliferative Glomerulonephritis	2.17	-	13.84	29.62	-	-
Membranous Glomerulonephritis	4.34	-	1.53	-	-	-
Membranoproliferative Glomerulonephritis	-	-	1.53	-	8.33	16.66
Embolic nephritis	6.52	-	7.69	3.70	16.66	-
Acute pyelonephritis	4.34	7.69	6.15	7.40	16.66	-
chronic pyelonephritis	6.52	7.69	-	-	-	-
Acute non suppurative IST nephritis	8.69	7.69	4.61	3.70	-	16.66
Sub acute IST nephritis	4.34	7.69	3.07	-	-	-
Multifocal chronic non suppurative IST nephritis(white spotted kidney)	28.26	23.07	6.15	-	-	16.66
Diffuse non suppurative IST nephritis	6.52	-	1.53	-	-	-
Granulomatous nephritis	2.17	-	-	-	-	-
Nephrosis	10.86	30.76	33.84	37.03	33.33	-
Amyloidosis	6.52	-	4.61	-	-	-

Acute proliferative glomerulonephritis. The lesion characterized grossly by the appearance of very fine dots on the subcapsular space and renal cortex with congestion of the corticomedullary junction and medulla. Microscopically, the lesion characterized by expansion of glomerular tuft fill the bowman’s space with leucocytic infiltration in glomerular capillary (Fig.1a), focal necrosis of capillary endothelium, Mesangial cells and parietal epithelium were observed. Occasionally fibrin thrombi with exudation of eosinophilic exudates filling the glomerular space were also seen in some cases. The interstitium showed massive granular degeneration and necrosis of tubular epithelium with expansion of the interstitial tissue by edema and leucocytes. Bacterial colonies were detected in the interstitial tissue which was confirmed by gram’s stain (Fig.1b&c). The arterial vasculature showed variable changes, thrombosis with deposition of bacterial colonies in the arterial lumen, and fragmentation of the tunica media were also detected. Fibrinoid necrosis of interlobular arteries and arterioles was observed, characterized by the presence of eosinophilic circumferential band in the tunica media associated with microthrombi and leucocytic infiltration (Figs.1d). In Subacute type glomerulonephritis ;the lesion characterized microscopically by hypercellularity of the glomerulus with hyperplasia of mesangial and endothelial cells, with active vesicular nuclei and leucocytic cells infiltration in glomerular tuft associated with periglomerular leucocytic cells aggregations (Fig.1e), and leucocytic cells infiltrating the tuft, in addition to focal hyperplasia and hypertrophy of the parietal epithelial lining the Bowman’s capsule. The changes in the interstitium showed mild edema and proliferating fibroblast with few neutrophilic cells infiltration, in addition to formation of hyperplastic regenerative renal tubules, vacuolization and necrosis of the renal tubular epithelium with accumulation of granular castand fragmented desquamated cells were also observed. In chronic progressive proliferative cases, the kidneys grossly showed pale cortical areas with focal adhered capsule, the microscopic changes included glomerular hypercellularity with hyperplasia and hypertrophy of the parietal epithelial lining the Bowman’s capsule resulting in glomerular synchiae, marked interstitial fibrosis with mono nuclear cells infiltration, atrophied renal tubules with formation of hyperplastic and dysplastic renal tubules(Figs.1f).

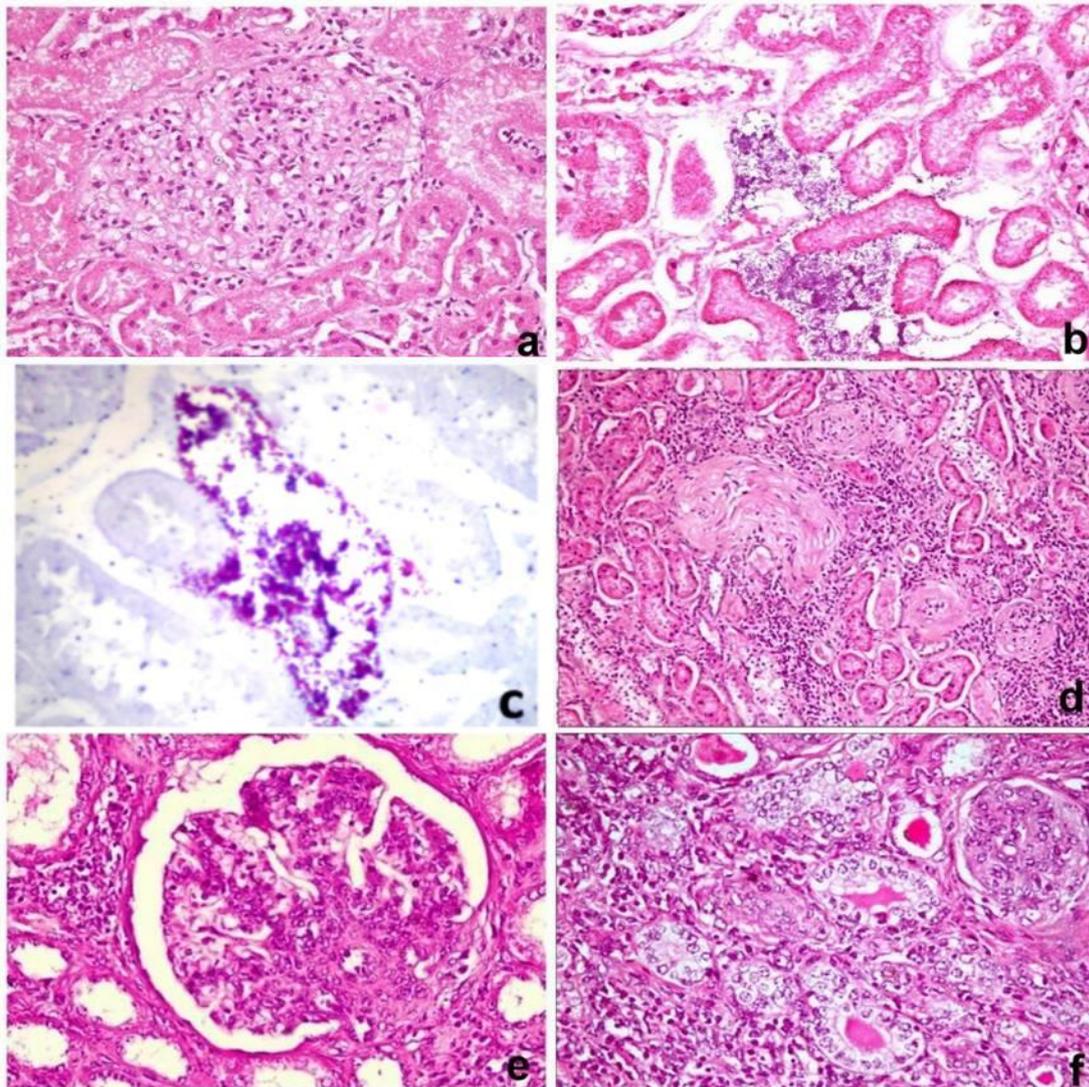


Fig.1a; kidney of male Cattle showing swelling of glomerular tuft filling the Bowman`s space with leucocytes infiltrating the glomerular tuft (H&E, X400).

Fig. 1b; kidney of male cattle showing presence of bacterial colonies (bacilli) in the interstitial tissue associated with edema and extensive necrosis of renal tubular epithelium (H&E, X400

Fig.1c; kidney of male cattle showing presence of Gram positive bacterial colonies (cocobacilli) in the interstitial tissue . (Gram's stain, X400)

Fig.1d; kidney of male cattle showing fibrinoid necrosis and microthrombi in the small intrerlobular blood vessels with marked interstitial leucocytic cells infiltration (H&E, X200).

Fig.1e; Kidney male sheep showing proliferation of mesangial and endothelial cells with characteristic active vesicular nuclei and leucocytic cells infiltration in glomerular tuft associated with periglomerular leucocytic cells aggregations (H&E, X400).

Fig.1f;Kidney of male cattle showing hyperplasia and dysplasia of the renal tubules distended with protein casts. Interstitial tissue infiltrated eith mononuclear cells (H&E,X400).

Membranous glomerulonephritis showed thickening of glomerular basement membrane and parietal later of bowman`s capsule (Figs.2a&b) which was confirmed and stained positive by using the Periodic Acid Schiff (PAS)(Fig.2c). The interstitial tissue revealed infiltration of periglomeular and perivascular areas by mononuclear cells mainly macrophages and lymphocytes (Fig.2d). The small arteries and arterioles showed vasculitis that characterized by infiltration of their wall by inflammatory cells with hyalinization of media. The renal tubular cells showed degenerative and necrotic changes with the appearance of various nuclear changes. Membranoproliferative glomerulonephritis, the gross lesion was similar to the previously described lesion of membranous glomerulonephritis, while the microscopic examination revealed glomerular hypercellularity and

thickening of glomerular capillary basement membrane with the characteristic lobulated appearance. Interstitial tissue was infiltrated by mononuclear cells.

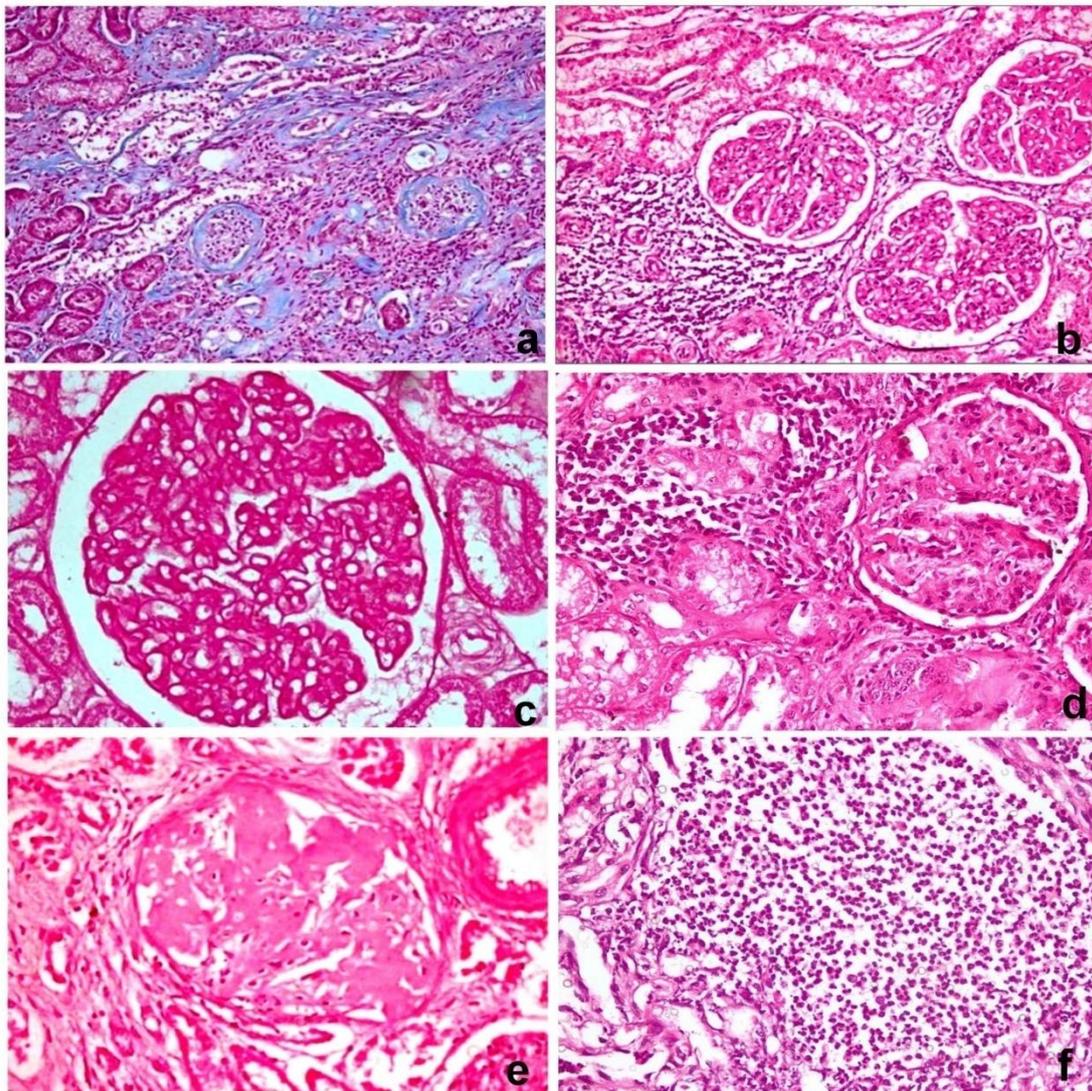


Fig. 2a: Kidney of male cattle showing peritubular fibrosis and mononuclear cell infiltration with interstitial fibrosis (MTC, X400).

Fig. 2b: Kidney of male sheep showing glomerular swelling with thickening of glomerular capillary wall by mesangial matrix together with interstitial mononuclear cells infiltration. Note, the lobular appearance of the glomerular tuft. (H&E, X200).

Fig. 2c: Kidney of male sheep showing deposition of PAS positive material in glomerular basement membrane and Bowman's capsule (PAS, X400).

Fig. 2d: Kidney of female goat showing glomerular hypercellularity and thickening of glomerular basement membrane with interstitial mononuclear cell infiltration (H&E, X400).

Fig. 2e: Kidney of male sheep showing obliteration of glomerular tuft by deposition of homogenous eosinophilic structureless material (amyloid) with necrosis of mesangial cells and periglomerular fibrosis (H&E, X400)

Fig. 2f: Higher magnification of the previous figure. Note the focal aggregation of neutrophils (H&E, X400).

Amyloidosis was recorded in cattle and sheep, grossly; kidney was enlarged with tense capsule and appearance of whitish yellow dots in the cortex. Microscopically, obliteration of glomerular tuft by deposition of retractile homogenous eosinophilic material (amyloid) (Fig. 2e) with hypocellular glomerular tuft. The renal tubules showed deposition of amyloid material at the circumference of tubular basement membrane and the

perivascular area of the intertubular small blood vessels and capillaries. The interstitium showed mononuclear cell infiltration.

There was various types of tubulointerstitial lesions, Embolic suppurative interstitial nephritis, The lesion characterized by the presence of abscesses of various size which ranged from tiny small yellowish abscesses distributed randomly on the subcapsular space of the renal cortex with congestion of parenchyma to variable sized multifocal yellow patches of pyogranulomes in the renal cortex . The tiny abscess characterized microscopically by focal aggregation of neutrophils in the cortical part of the interstitium, the lesion associated with degenerative and necrotic changes of renal tubules (Fig.2f).

Acute pyelonephritis, the kidney grossly appeared enlarged with stretched capsule, the cut section revealed congested cortex and medulla with the appearance of yellow strips and ulceration of calyces .The microscopic examination revealed diffuse infiltration of the interstitial tissue by neutrophils with hyperemia of renal vasculature associated with interstitial edema (Fig.3a). The renal tubules in the cortex showed degenerative and necrotic changes with distension of some tubular lumina by eosinophilic protein cast mixed with fragmented desquamated epithelial cells and neutrophils in the disrupted tubules, and some tubules impacted with large number of neutrophils. The glomeruli appeared normal except for hyperemia of glomerular tuft. The renal pelvic showed destruction and denuded epithelial surface with intense neutrophilic infiltration admixed with edema in the subepithelial tissue. Appearance of fragmented neutrophils mixed with desquamated cells filling the lumen of the renal pelvic and renal calyces (Figs.3b).

Chronic pyelonephritis was detected among ruminants, the kidney appeared grossly as small shrunken and distorted surface with adhered capsule and dilated calyces The microscopic examination revealed that the fibroblastic reaction more prominent in medulla and pelvic than in the cortex. the renal showed proliferation of fibrovascular organized tissue replacing the pelvic tissue with mononuclear cells infiltrating the area, while the collecting tubules were atrophied and impacted with protein cast (pseudo-thyroid appearance) and mononuclear cells infiltration in the interstitial tissue (Fig.3c). The cortex showed fibrous tissue proliferation in the interstitial tissue, periglomerular fibrosis with shrunken glomerular tuft and distension of renal tubules with homogenous eosinophilic hyaline casts resembling the thyroid gland acini (thyroidization).

Focal non suppurative interstitial nephritis was detected and varies in severity and distribution, in acute onethe lesion ranged from small foci randomly distributed on renal parenchymal surface to large distributed irregular white patches on renal subcapsular surface, but in general the kidney was enlarged with congestion of corticomedullary areas. The microscopic examination revealed small aggregation of leucocytes consisted of neutrophils mixed with macrophages associated with interstitial edema and congestion of blood vessels, the renal tubules showed degenerative and necrotic changes.in chronic multifocal non suppurative interstitial nephritis (white spotted kidney),the kidney grossly contained variable sized white patches distributed randomly on subcapsular surface . Microscopically the lesion characterized by multinodular aggregation of lymphoplasmocytic inflammatory reaction that distributed in the interstitium (Fig.3d).the interstitial fibrosis ranged from mild fibroblasts proliferation with dilated renal tubules to massive interstitial fibrosis that stained positively by Masson`s Trichrome (MTC) (Fig.3e). Atrophied renal tubules with hyalinized basement membrane and formation of regenerative renal tubules containing karyomegalic vesicular nuclei .The collecting tubules contained cellular and hyaline casts (Fig.3f).in chronic diffuse non suppurative interstitial nephritis, Grossly the kidneys were diffusely shrunken with granular pitted capsular surface and adhered capsule. The microscopic picture included diffuse interstitial fibrosis throughout the kidney parenchyma and renal pelvic associated with periglomerular and peritubular fibrosis that were suffered from atrophied glomerular tuft and tubules, there was diffuse chronic inflammatory cell infiltration mainly macrophages ,lymphocytes and plasma cells with hyalinization of vascular wall (Fig.4a) , the fibrosis was positively stained with MTC (Fig.4b). There were regenerative renal tubuleswith active vesicular nuclei in the renal parenchyma .The medullary tubules showed focal mineralization with extensive inter-tubular fibrosis. The renal artery showed hypertrophy of media and narrowing of its lumen and separation of the internal elastic lamina, also there was intimal fibrosis of some hypertrophied arterioles that stained positive by MTC . The renal pelvic showed extensive fibrosis.

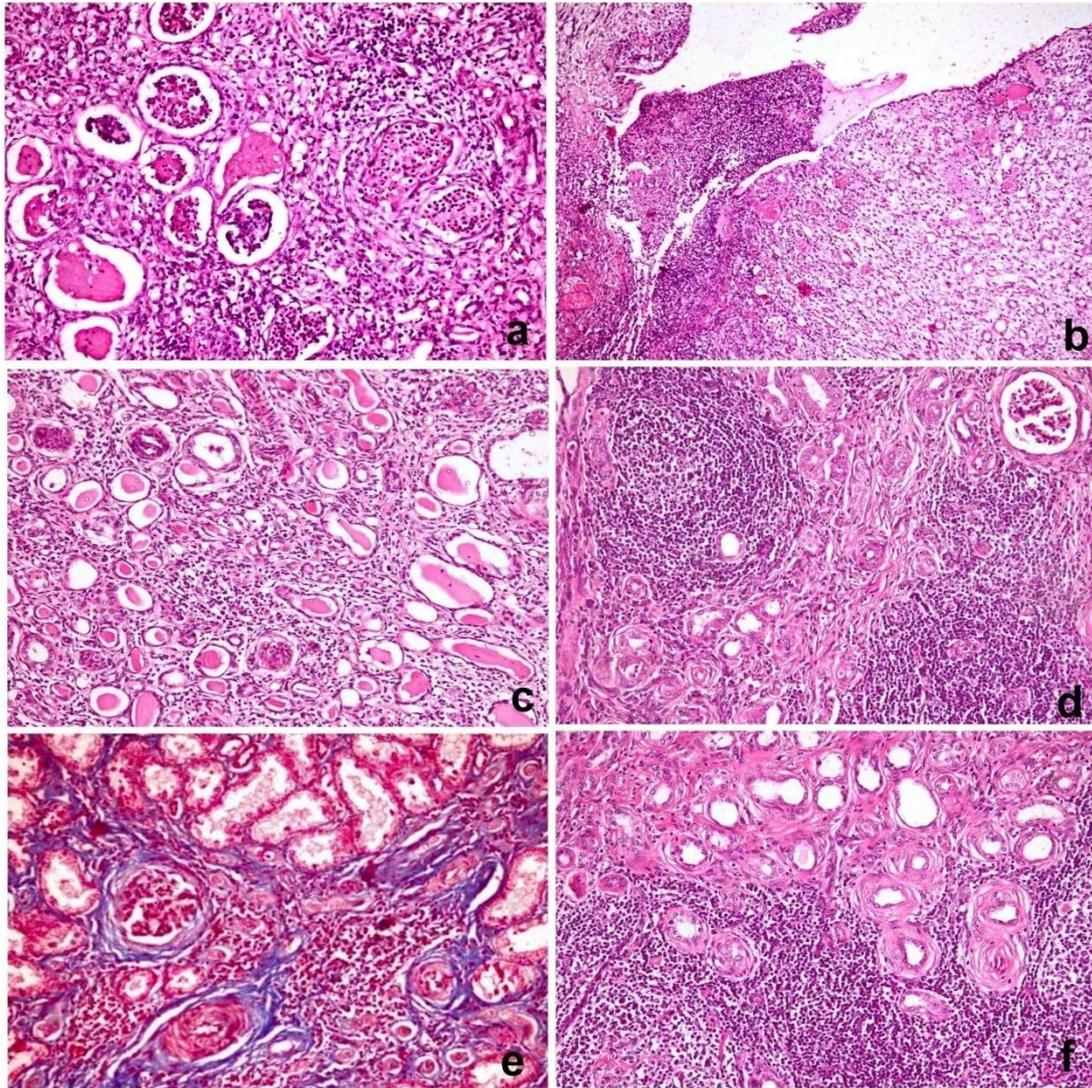


Fig.3a;Kidney of male cattle showing distension of renal tubules by cellular casts and some with neutrophils ,the interstitium showing edema and infiltrated by neutrophils and mononuclear cells (H&E,X200).

Fig.3b;Kidney of male cattle showing distension of renal pelvise and calyces with degenerated neutrophiles mixed with eosinophilic exudate together with sever hyperemia of the renal vasculatures and ulceration of the lining epithelium of renal calyces (H&E,X200).-

Fig.3c;Kidney of male cattle showing difuse infiltration of renal interstitium by mononuclear cells with IST fibrosis assocaited with dilatation of renal tubular lumina that distnded by eosinophilic protein cast. note the shrinkage of glomerular tuft (H&E,X200).

Fig.3d;kidney of male cattle showing lymphoplasmocytic aggregation with peritubular and periglomerular fibrosis (H&E,X200).

Fig.3e;kidney of male cattle showing interstitial, periglomerualr and peritubular fibrosis (MTC,X200).

Fig.3f;kidney showing lymphoplasmocytic inflammatory aggregation andatrophied renal tubules with hyalinized basement membrane(H&E,X200)

Granulomatous interstitial nephritis was recorded incidentally and associated with pyelonephritis. The lesion appeared as large single caseated granulome replacing a focal area of renal parenchyma with ulceration. The granulome associated with pyeolephritis. The granulome consisted of central eosinophilic granular area of caseouse necrosis with calcification surrounded by langhan's giant cells mixed with lymphocytes, macrophages and plasma cells with few neutrophiles. There was brown pigment that was observed in the cytoplasm of mononuclear cells (Fig.4c) .

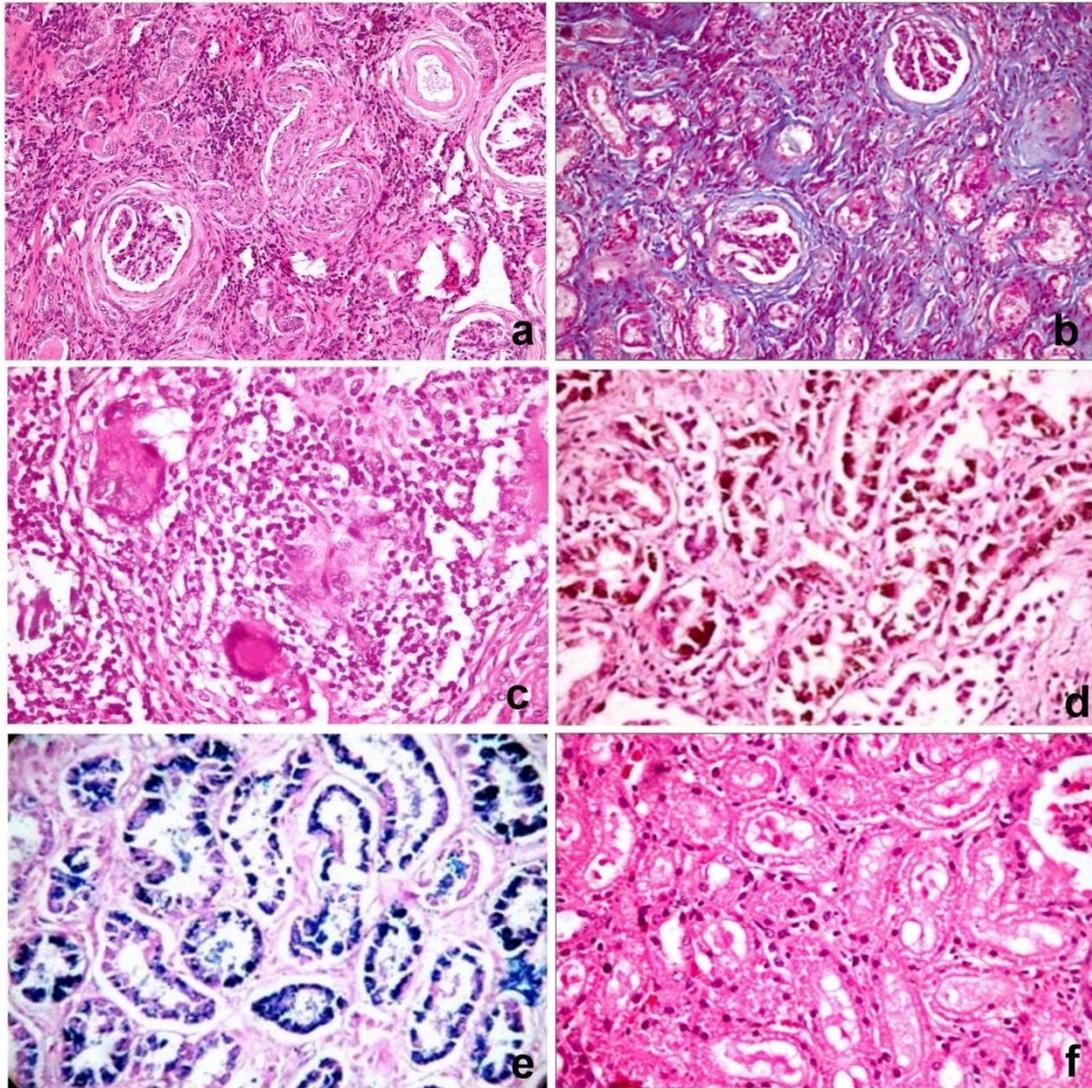


Fig.4a;kidney of female cattle showing regenerative renal tubules with active vesicular nuclei associated with hyalinized vascular arterioles with interstitial mononuclear cell infiltration and periglomerular fibrosis (H&E,X200).

Fig.4b; kidney of female cattle showing interstitial, periglomerular and peritubular fibrosis with glomerular tuft atrophy of some glomeruli (MTC,X200).

Fig.4c;higher magnification of the previous lesion note the presence of langhan`s giant cells mixed with mononuclear cells and few neutrophils (H&E,X400).

Fig.4d;kidney of male cattle showing deposition of brown pigment in the tubular cortical epithelium(H&E,X200).

Fig.4e;High power of the previous picture, showing deposition of deep blue pigment in the tubular epithelium(H&E,X200).

Fig.4f;kidney of male sheep showing necrosis of renal tubular epithelium with nuclear pyknosis and lysis associated with interstitial neutrophilic infiltration (H&E,X400).

Acute tubular necrosis was detected and was of two types ischemic and toxic acute tubular necrosis. In ischemic type the kidney grossly showed diffuse congestion of renal parenchyma ,the microscopic picture included sever congestion of intertubular blood capillaries associated with degeneration and necrosis of tubular epithelium Another case of ischemic nephrosis was heamoglobin nephrosis the lesion was characterized microscopically by massive deposition of brown pigment in renal tubular epithelium in both cortex and medulla (Fig.4d),the pigments give positive results by using the Prussian blue stain (Fig.4e). in addition to formation of heam casts in the renal and collecting tubules associated with interstitial edema.

In case of toxic nephrosis the kidneys were enlarged, pale, with tense stretched capsule and congestion of the corticomedullary junction and sever congestion of medulla. Microscopically; the interstitium showed edema, congestion of intertubular blood capillaries and few polymorphnuclear cells infiltration (Fig.4f) the glomeruli exhibited dilatation and distension of Bowman's space by faint esinophilic material and focal necrosis of parietal epithelium of Bowman's capsule and glomerular capillary endothelial and mesangial cells.

DISCUSSION

Renal lesions in ruminant animals were subclinical in most cases and affected the animal production. Kidneys were considered as an edible organs in Egypt and their condemnation due to renal pathology resulted in economic losses. In the present work, recording and characterization of kidney lesions developed in cattle, sheep and goat were performed in a slaughter house in EL-Basatin. The incidence of glomerular lesions developed were 17% in males and 15.38% in female cattle, 32.30% in males and 48.14% of females in sheep 50% and 33.33% in males and females respectively in goat. [8], recorded the incidence of golmerular lesions in cattle and they found to be 5.7%. [9] Previous study recorded the incidence of glomerulonephritis developed in cattle with total incidence of 6.2%, another study stated that glomerulonephritis was relatively prevalent in domestic animals and represented a common form of renal disease and reported to be a sequel to chronic infectious disease[10]. Higher incidence of glomerular lesions in sheep and goat was agreed with [11], who stated that spontaneous proliferative glomerulonephritis in small ruminants seems to fairly frequent as they conducted a survey on 25 oxen and 4 goat and glomerulonephritis affected 23 oxen and all goats. Development of glomerulonephritis was associated with pregnancy toxemia in ewes, focus of infection such as metritis, mastitis, arthritis [12] and caseous lymphadenitis [13]. There was an association between parasitic infestation and glomerulonephritis as they found that sheep suffered from hydatidosis developed glomerulonephritis [14]. On other hand [10], stated that Glomeruli of sheep and goats were often hyper cellular and have membranous changes, but the changes appeared to have little clinical significance.in the present study the glomerular changes was associated with interstitial inflammatory and degenerative reaction .In the present study the glomerular lesions were of various types, proliferative, membranous and membrano proliferative types. In proliferative type, the lesion characterized by glomerular hypercellularity, influx of inflammatory cells in interstitial tissue and degenerative changes of renal tubules. While the membranous glomerulonephritis was characterized by thickening of glomerular basement membrane .membrano proliferative type collected both histological picture of proliferative and membranous glomerulonephritis.in addition there was fibrin thrombi was observed in glomerular capillary tuft .Glomerulonephritis developed through an immune - mediated mechanism which was either by development of antibodies to glomerular basement membrane or deposition of soluble immune complexes within the glomeruli. Second type of glomerulonephritis occurred with prolonged antigenemia that associated with persistent infections [10] several diseases were encountered in the development of glomeruolonephritis ,in cattle bovine viral diarrhea induced glomerulonephritis in cattle with deposition of fibrin thrombi in glomerular tuft [10] .The doepsition of immune complex induced glomerular injury due to activation of Hagman factor resulting in fibrin thrombi formation and subsequent glomerular ischemia [15] Amyloidosis was recorded in cattle and sheep with total incidence of 6.52% and 4.61% respectively. and was recorded only in males. [16] recorded the incidence of amyoidosis developed in cattle in among 300 cases slaughtered in Ziaran slaughter-house to be 0.33%.while [8] recorded the amyloidosis incidence to be 2.8% in cattle. the lesion was characterized grossly by paleness of kidney and microscopically by obliteration of glomerular tuft by translucent eosinophilic amyloid material that was stained positively by congo red. The amyloidosis was glomerular and medullary amyloid deposits. Previous researches confirmed that the type of amyloidosis that occurred in demostic animals was of reactive secondary type and renal amyloidosis was recorded in cattle suffered from chronic inflammatory reaction as pododermatitis ,mastitis and metritis with increased serum level of amyloid (SAA)[17-18].reactive amyloidosis derived from serum protein AA apo SAA ,serum ammyloid associated) which is an acute phase reactant apoprotein .this protein was produced as result of chronic antigenic stimulation , persistent infection and neoplasia .Glomerular and medullary amyoidosis were recorded in cattle , sheep and goats with chronic suppurative and tissue destructive process [10] In the present study all cases of amyloidosis that was recorded in sheep was associated with suppurative reaction in renal pelvic or renal abscess. The amyloid stained positively with amyloid indicated that the amyloid was of AA type as indicated by [10].

Tubulointerstitial lesions were more frequent than glomerular lesions in the present study the total incidence of tubulointerstitial lesions that was recorded in cattle was 84.78% in males and 84.61% in females while the incidence in sheep was 67.69% in males and 51.85% in females .The total incidence of

Tubulointerstitial in goat was 50% and 66.66% in males and females respectively. Similar findings were recorded by [10] who found the incidence of Interstitial nephritis to be 85.7% in female and male cattle in slaughtered at the Ghaem (Shahriar) and Ziaran (Ghazvin) abattoirs in addition [16] found that The most common reason for rejection of kidney was focal interstitial nephritis with an incidence of 60.1%. While recording lower incidence of interstitial nephritis among 450 male and female sheep at Tiaret abattoir, (Algeria) with an incidence of 8.6% was recorded by [9] also [19] recorded similar lower incidence of interstitial renal lesion in 310 condemned kidney of cattle. [20] a conducted survey on 50 kidney of cattle from Mosul abattoir were performed and the most common lesions were white spotted kidney with the total incidence of 20% [20]. Suppurative reaction of interstitial tissue was either embolic or pyelonephritis. Embolic nephritis was recorded in the present study with higher incidence in goat followed by sheep than cattle also the lesion was higher in males than females. The lesion characterized by presence of focal abscess in renal cortex composed of neutrophils with liquefactive necrosis of renal parenchyma. Renal infection occurs via the hematogenous route and several pathogen were encountered in the development of lesions as *Salmonella* species, *arcanobacterium pyogenes* in cattle and *Corynebacterium pseudotuberculosis* in small ruminants [21-22-23] while pyelonephritis was relatively higher in female cattle than sheep and goat compared with male ones. [24] recorded the incidence of pyelonephritis in Shahrekord abattoir among 404 kidneys of slaughtered cattle (207 female and 197 male) and they observed pyelonephritis in 3 cases (0.74%), one of which occurred in a 7-year-old cow and the others in bulls less than 2-year-old and the microbiological examination revealed infection by *E. coli* and *Staphylococcus aureus* that were isolated from renal tissue. It seems that some stresses such as pregnancy, parturition, dystocia, post parturient uterine diseases and high milk production may act as important predisposing factors for entrance of organisms into urinary tract and producing the disease [25]. [10] clarified the pathogenesis of pyelonephritis in animals, the infection occurred via ascending route through the lower urinary tract, pathogens as *Escherichia coli*, staphylococci, streptococci, *Enterobacter*, *Proteus*, and *Pseudomonas*, and more specific urinary pathogens, such as *Coryne bacterium renale*, *C. cystitidis*, and *C. pilosum*. Acute non suppurative interstitial nephritis was recorded with an incidence of 8.69% in male and 7.69% in female cattle, 4.61% and 3.70% in male and female sheep respectively while higher incidence was recorded in female goat. [21-9], clarified that Acute interstitial nephritis in domestic animals resulted frequently from an allergic reaction and bad reactions to drugs. Antibiotics and NSAIDs (non steroidal anti-inflammatory drugs). these drugs induced permanent kidney damage in cattle sheep, pigs, goats and horses. Chronic Non suppurative interstitial nephritis of multi focal type (white spotted kidney) was characterized grossly by the presence of multiple white foci on renal surface. The lesion was characterized microscopically by presence of multifocal lymphoplasmocytic nodules. The lesion was more obvious in cattle than other ruminant. White spotted kidney was the most common finding in cattle after slaughter and could be induced by several pathogens as Leptospirosis. Infection, *Escherichia coli* septicemia, malignant catarrhal fever, theileriosis, lumpy-skin disease, *Salmonella* and *Brucella* and as a fatal autosomal recessive disorder in Japanese Black cattle while in sheep, the lesion developed with infection by sheep-pox [10-27-15]. Granulomatous nephritis was recorded only in male cattle in the present study. the lesion was consisted of focal caseous necrosis with calcification with infiltration of neutrophils, macrophages, lymphocytes, plasma cell and multinucleated giant cells. the reaction assumed to be resulted from presence of urinary calculi in renal pelvic and medulla as the reaction was restricted to these area and associated with chronic pyelonephritis, similar findings were observed by [28], who found Calcium deposits with eosinophilic material in the medullary tubules and pelvis renalis lumens with giant cell formations around the stone reactions were rarely observed and there were pyelonephritis and tubular hyperplasia in the kidney tissue. Nephrosis was recorded in the present study in all ruminant species with relatively higher incidence in female cattle, male and female sheep and males goat compared with male cattle. the nephrosis of two types ischemic and toxic. Ischemic type there was massive necrotic reaction of renal tubular epithelium affecting both cortex and medulla with disruption of tubular basement membrane occasionally there was hema cast deposition in tubular lumen as part of hemoglobin nephrosis. [10], stated that renal cortical necrosis and acute tubular necrosis occurred in cattle due to various endotoxemic conditions, such as mastitis or metritis, and in gastrointestinal diseases, such as severe enteritis and grain overload, they added that another mechanism by which renal cortical necrosis occurred was through the generalized Schwartzman reaction, an example of *disseminated intravascular coagulation*, which is often due to gram-negative endotoxemia. Endothelial injury in glomerular and peritubular capillaries leads to microthrombosis and hemorrhagic renal cortical necrosis. [29] recorded that acute Leptospirosis could infect the calves in utero and subsequently developed the acute hemolytic form of disease that was characterized by hemoglobin nephrosis. in the toxic nephrosis, the necrotic reaction primarily affect the proximal tubules and characterized by degenerative and necrotic reaction of tubular epithelium with intact basement membrane. Hemosiderosis of renal tubular epithelium was detected

in incidental cases of cattle and sheep that characterized by deposition of brown pigment in tubular epithelium of renal cortex similar findings was recorded by [10] who stated that presence of hemosiderin pigment in the epithelial cells of renal tubules and glomeruli, resulted from degradation of resorbed hemoglobin due to hemolytic crisis of chronic copper poisoning in sheep. There was deposition of golden yellow brown pigment in renal epithelium that was negatively stained by prussian blue thus it was not hemosiderine we assumed to be porphyrine pigment as result of ictrus as a part of cholemicnephrosis .

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