



Some Histopathological and Biochemical Changes in Patients with Chronic Pyelonephritis

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Abstract

Introduction: Chronic pyelonephritis is a long-standing renal disorder characterized by tubulointerstitial inflammation with cortical scarring. Chronic pyelonephritis occurs in both adults and children but is more common in children. Xanthogranulomatous pyelonephritis is a severe type of chronic pyelonephritis and rare form of it .

The aim of study was to evaluate the levels of biochemical parameters and their correlation with histological in patients with chronic pyelonephritis to reach aspects of its pathogenesis and to study the types of chronic pyelonephritis and the percentage of each type in Iraq.

Materials and methods :the present study carried out on 59 serum sample of different persons,40 of persons were suffer from chronic pyelonephritis and 19 were taken as a control group.

The results :this study showed that the rate of this disease in female was 51% and in male was 49%. Also the result of this study showed that the rate of this disease in these 59 persons was 63% and the rate of xanthogranulomatous was 5% and 32% was as healthy individuals. Tests were used in this study are blood urea level , rondon blood sugar and serum creatinine level and the last was more high than the others two tests in pateints with chronic pyelonephritis. Histopathological features show there are areas of interstitial nephritis infiltration of lymphocytes and plasma cells giving rise to the tubular atrophy and fibrosis ,and examination of slides in xanthogranulomatous patientes show a granulomatous inflammatory infiltrate composed of neutrophils, lymphocytes, plasma cells, xanthomatous histiocytes, and multinucleated giant cells.

Key word: Chronic pyelonephritis, Xanthogranulomatous, Thyroidism , Blood urea, Creatinine level, Glomerulosclerosis

INTRODUCTION

Pyelonephritis – is the Greek word of "pyelo" (pelvis), "nephros" (kidney), and "itis" (inflammation) - refers to an inflammation of the kidney that can be acute, recurrent, or chronic where is chronic pyelonephritis is a complex renal disorder characterized by chronic tubulointerstitial inflammation and deep segmental cortical renal scarring^[1,2], and clubbing of the pelvic calyces as the papillae retract into the scars^[1] Chronic pyelonephritis has been an overdiagnosed condition since its first description over 70 years ago. By definition, it is a chronic process of parenchymal renal destruction by bacteria leading to small, shrunken kidneys and end stage renal failure.^[3] Clinicians, radiologists, pathologists, and bacteriologists have applied different criteria to the diagnosis, and variations within these specialties are sometimes as wide as those between them.^[4] Chronic pyelonephritis is a somewhat controversial disease from a pathogenetic standpoint^[5]. Xanthogranulomatous pyelonephritis, a severe, atypical, and relatively rare form of chronic pyelonephritis, accounts for 0.6% of surgically confirmed cases of chronic pyelonephritis^[6]. There is a history of acute inflammation (kidney infection – acute pyelonephritis) in 60% of cases of chronic pyelonephritis, which often becomes chronic if treated incorrectly^[7]. The Presence of other diseases of urinary system, which contribute to chronic process, first of all in violation of the outflow of urine^[8]. Nephrectomy is the treatment of chronic pyelonephritis especially with hypertension^[9].

MATERIALS AND METHODS

Study groups and sampling methods:

This study was carried out in Ghazi AL-Hariri Hospital in the Medical City in Baghdad, during the period from October 2016 up to the end of March 2017. They were divided into two groups. All members of the patients group; 22(37.3%) females and 18(30.5%) males, were referred to the radiology department in Ghazi Alhariri Hospital of medicine city in Baghdad had been clinically diagnosed as chronic pyelonephritis due to chronic pyelonephritis symptoms such as gradually progressive abdominal lump in lumbar region. They had complains of right flank pain, fullness and pus in urine for the same duration, they also had a fever with an age range of 5-60 years. Ninety healthy individuals were included as normal controls for the study 11(18.6%) males and 8(13.6%) females, range of ages (10-69)

years were selected randomly. Blood samples were collected from both groups (patients & control) and all the diagnoses were confirmed based on clinical, ultrasonography of the abdomen , histopathological examinations. Nephrectomy biopsy was collected by radical nephrectomy of kidney , without opens ureter with structure, pieces of tissue then fixed in 10% formalin.

Serological Laboratory Analysis

Antecubital venous blood (3 ml) were drawn from each subject of the two groups and were put in plain tubes. Sera were separated by centrifugations at 3000 rpms for 10 minutes. The amount of sera was stored in three separated plain tubes at -20°C before further testing. All sera tubes were allowed to thaw once (repeated thawing is avoided).

Determination of serum creatinine kinase using kit provided from Biosystem S.A Barcelona (Spain).Serum creatinine is measured by preincubate working reagent, samples and standard to reaction in temperature (37c). Pipette and mix well 1 ml of working reagent and 100MLof sample into a cuvette. Record absorbance at 500 nm

Determination of blood urea nitrogen using kit provided from Biosystem S.A Barcelona (Spain).Blood urea nitrogen is measured by bring reagents and samples to room temperature and pipette 1ml of working reagent and 10MI of sample and incubate for 10 minute. Read the absorbance of the samples at 600 nm against the reagent blank.

Determination of blood sugar using kit provided from L.S.A Milano(Italy).Blood sugar is measured by pipette and mix 1ml of working reagents and 10MI of samples incubate for 10minutes at room temperature and read at505 nm.

Histological Laboratory Analysis

The Biopsy specimens were fixed in 10% neutral buffer formalin for at least 72 hrs. The fixed specimens were then submitted to grade of concentration alcohol 70%, 80%, 90% and 100%,followed by immersed in twice in xylenes and embedded in paraffins .Sections of 4µm-thickness were obtained and stained with hematoxylin-eosins stain (H & E).

Photography

Photography was done using digital camera Sony with effective 18.2 mega pixels, high sensitivity 10 X optical zoom in college of Dental Medicine of Baghdad University.

Statistical Analysis:

Chi-square was used to detect the significances among the variables of our study by using SPSS ver.18.0.

RESULTS AND DISCUSSION

The Demographical Picture of Studied Groups:

Distribution of study groups according to their Age:

This study demonstrated that 22(37.3%) at age between (5-30) and 18(30.5%) at the age upper than(31)years old in total of 40(67.8%) in patients with chronic pyelonephritis in comparison with 9(15.3%) are at age(5-30) and 10(16.9%) upper than 31 years apparently healthy individuals. No significant difference (P value=0.5 > 0.05 NS) among different groups was noticed table(1). The findings of the current study are similar to previous studies in other countries that showed that the chronic pyelonephritis occurs more often in infants and young children (younger than 2 y) than it does in older children and adults. Another study also found that chronic pyelonephritis occurs in both adults and children but is more common in children, because the children are more exposed to pollution and thus bacteria can enter their bodies easily and cause urinary tract infection which is play important role in kidney disease(acute and chronic pyelonephritis)^[10].

Table (1) : Distribution of study groups according to their Age:

Study Groups	Age Groups		Total
	(5 - 30)	≥ 31	
Case	22	18	40
	37.3%	30.5%	67.8%
Control	9	10	19
	15.3%	16.9%	32.2%
Total	31	28	59
	52.5%	47.5%	100.0%

p. value = 0.5 > 0.05 NS

Distribution of study groups according to their gender:

This study found that there are 22(37.3%) of patients with chronic pyelonephritis are female in comparison with 18(30.5%) male in the total of 40 (67.8%) of patients in comparison while 8 (13.6%) are female and 11(18.6%) male apparently healthy individuals. No significant difference (p .value = 0.3 > 0.05 NS) among different groups was noticed in table(2).

The current study has match with the other study that found that female sex were risk factors for the presence of renal scars, mainly in the dilated vesicoureteral reflux than male sex ^[8].

Table (2) : Distribution of study groups according to their gender:

Study Groups	Genders		Total
	female	male	
Case	22	18	40
	37.3%	30.5%	67.8%
Control	8	11	19
	13.6%	18.6%	32.2%
Total	30	29	59
	50.8%	49.2%	100.0%

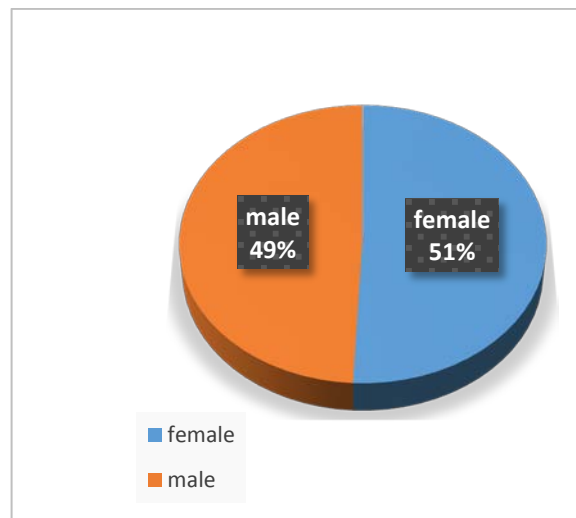
p. value = 0.3 > 0.05 NS

Distribution of study groups according to the Xanthogranulomatous pyelonephritis:

The figure (2) showed that there is 5% of total number of individuals in this study has xanthogranulomatous and 63% are patients with chronic pyelonephritis and 32% are healthy control. In this study we found three cases are females with Xanthogranulomatous as in table(3).

This study was match with other previous study that found that the xanthogranulomatous pyelonephritis, a severe, atypical, and relatively rare form of chronic pyelonephritis, accounts for 0.6% of surgically confirmed cases of chronic pyelonephritis^[6].

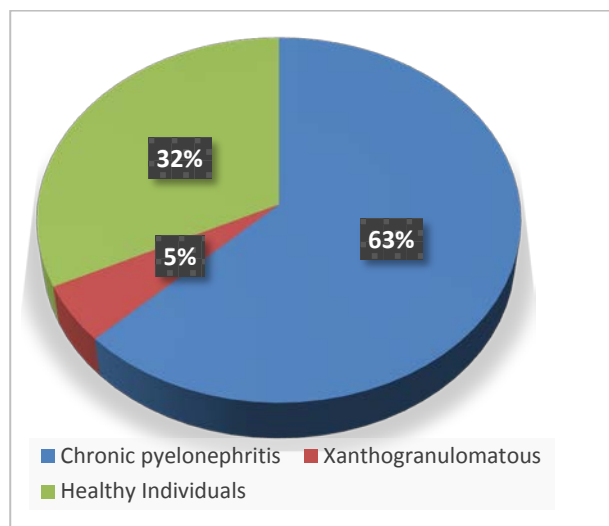
From our study we found that all the patients with xanthogranulomatous are females, this result was match with other previous study that found from 87patients 73 are females^[11] The laboratory data showed almost normal findings female, with the exception of slight CRP elevation (1.04mg/dL)with age of 76years..^[12]. A case report of female 59year with xanthogranulomatous and type 2 diabetis milltus^[13].



Figure(1) :The Demographical distribution according to their gender.

Table (3) : Distribution of study groups according to the Xanthogranulomatous pyelonephritis :

Patients	Age	RBS	Creatinine	B. Urea
Pt.1 (Female)	55	140 mg/dl	2	28
Pt.2 (Female)	35	83 mg/dl	1.9	23
Pt.3 (Female)	60	213 mg/dl	2.1	60



Figure(2) The Demographical Picture of Studied Groups

Estimation of biochemical parameters levels in sera of studied groups:

Distribution of study groups according to the random blood sugar:

The data demonstrate that 24(40.7%) are normal and 16(27.1%) are abnormal in the total of 40 (67.8%) of patients with chronic pyelonephritis in comparison with 19(32.2%) are normal and no

abnormal in apparently healthy individuals. High significant difference (p. value = 0.000 < 0.001 HS) among different groups was noticed in table(4),figure(3).
 These results are not match with previous study that found Urinary tract infections are more common, more severe, and carry worse outcomes in patients with type 2 diabetes mellitus [14].

Table (4) : Distribution of study groups according to the random blood sugar:

Study Groups	RBS		Total
	Normal	Abnormal	
Case	24	16	40
	40.7%	27.1%	67.8%
Control	19	0	19
	32.2%	.0%	32.2%
Total	43	16	59
	72.9%	27.1%	100.0%

P .value = 0.000 < 0.001 HS

Distribution of study groups according to the Creatinine level.

This study demonstrate that the majority of patients 38(64.4%) are with high level of creatinine in comparison with 2(3.4%) are normal creatinine in the total of 40 (67.8%) of patients with chronic pyeloniphritis in comparison with 19(32.2%) are normal and no abnormal in apparently healthy individuals. High significant difference (p. value = 0.000 < 0.001 HS) among different groups was noticed in table(5),figure(3).
 This study was agreement with other study that found the serum creatinine and blood urine nitrogen levels are elevated in patients with chronic kidney disease [15]. Also another study found that elevated creatinine [16]. Other study found that Blood creatinine may be raised in renal failure [17] and another study found that creatinine level raised in nephrotic syndrum [18 ,19].

Table (5) : Distribution of study groups according to the Creatinine level:

Study Groups	Creatinine Levels		Total
	Normal	Abnormal	
Case	2	38	40
	3.4%	64.4%	67.8%
Control	19	0	19
	32.2%	0.0%	32.2%
Total	21	38	59
	35.6%	64.4%	100.0%

p. value = 0.000 < 0.001 HS

Table (6) : Distribution of study groups according to the Blood urea level :

Study Groups	Blood Urea		Total
	Normal	Abnormal	
Case	28	12	40
	47.5%	20.3%	67.8%
Control	19	0	19
	32.2%	0.0%	32.2%
Total	28	31	59
	47.5%	52.5%	100.0%

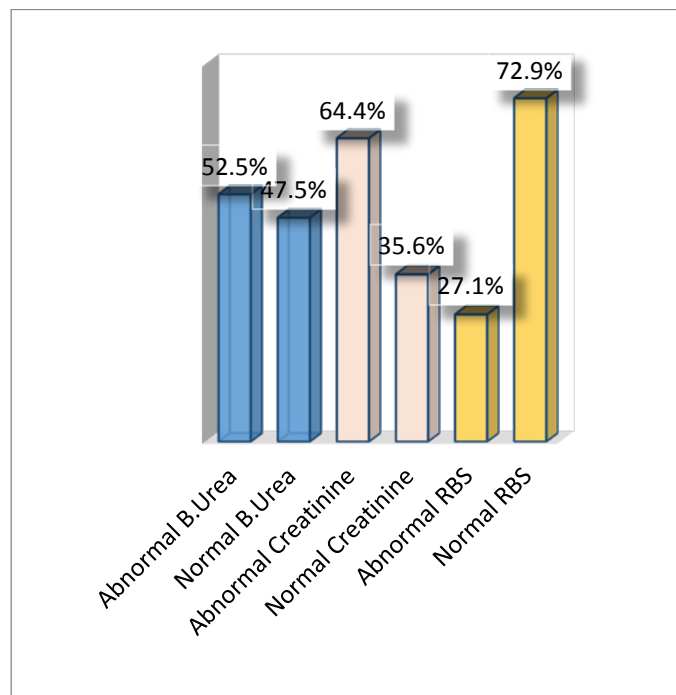
P .value = 0.000 < 0.001 HS

Distribution of study groups according to the Blood urea level

The data demonstrate that 28(47.5%) are normal and 12(20.3%) are abnormal in the total of 40 (67.8%) of patients with chronic pyeloniphritis in comparison with 19(32.2%) are normal and no abnormal in apparently healthy individuals. High significant

difference (p. value = 0.000 < 0.001 HS) among different groups was noticed in table(6),figure(3).

The findings of the current study are similar to previous studies that found that the serum blood urine nitrogen and creatinine levels are elevated in patients with chronic kidney disease. [19]. Another previous study found that the laboratory testing may reveal decreased kidney functioning, with increased blood urea nitrogen (BUN) and creatinine [18].



Figure(3) :Distribution of study groups according to the biochemical parameters levels in sera.

Histopathological Features of chronic pyelonephritis:

Microscopic investigation of Haematoxylin and Eosin stained slides showed tubular atrophy, interstitial fibrosis, and a mononuclear infiltrate (figure 4) and also inflammation and lymphoid follicls formation with germinal centers (figure 5) and (figure6).

These results are match with others reasercher ,they are found that during chronic pyelonephritis there are focal infiltration areas in interstitium [20] interstitial inflammation, fibrosis [21]also other reaserchs are found that There is patchy tubulointerstitial scarring in a so-called jigsaw or geographic pattern with well-delineated, irregular areas of scarring due to the patchy initial infection from the ascending route [22,23].

The most severe damage was accompanied by hyaline cast formation within tubules which gave rise to the typical thyroid like appearance of chronic pyelonephritis (figure7)and (figure8).

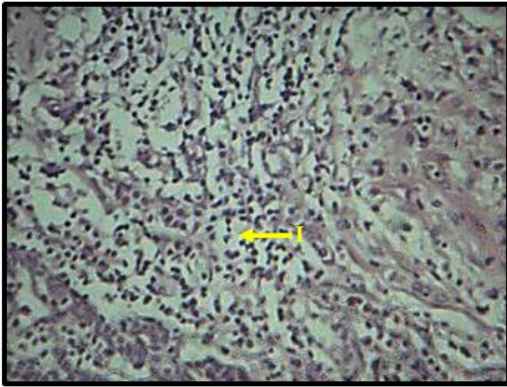
The results are match with others reaserchs that found that the atrophy or cystic dilatation of the collecting tubules. Many of the dilated tubules contain pink to blue glassy-appearing casts called "colloid casts" giving them a thyroid-like appearance and hence the descriptive term "thyroidization" [22,23].

The microscope examination of slide show a thickness in the blood vessels wall as the hyalinization (figure 9) ,also the examination of study group slides shows the glomerulosclerosis (figure 10)and hyalinization of glomeruli (figure 11).

Hyaline thickening of the wall of the arterioles (due to hypertension) and periglomerular fibrosis and secondary segmental glomerulosclerosis [21,23].

In study group there are about 5 % of rare chronic pyelonephritis ,it is xanthogranulomatous . Histological examination of these

slides show a granulomatous inflammatory infiltrate composed of neutrophils, lymphocytes, plasma cells, xanthomatous histiocytes, and multinucleated giant cells (figure 12), (figure 13) and (figure 14).



Figure(4): Microscopic appearance of cortical in kidney in patient with chronic pyelonephritis, showed: interstitial fibrosis (I) (H&E200X).

XPN is a rare cause of chronic pyelonephritis resulting in non-functioning kidneys and poses a preoperative diagnostic dilemma which may mimic other diseases but whenever encountered it should be treated with surgical removal [25].



Figure (7): Microscopic feature of cortical in kidney in patient with chronic pyelonephritis showed infiltration of inflammatory cells (I) and thyroidism (T) (H&E200X).

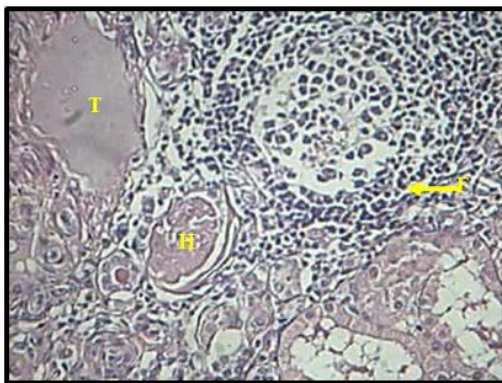
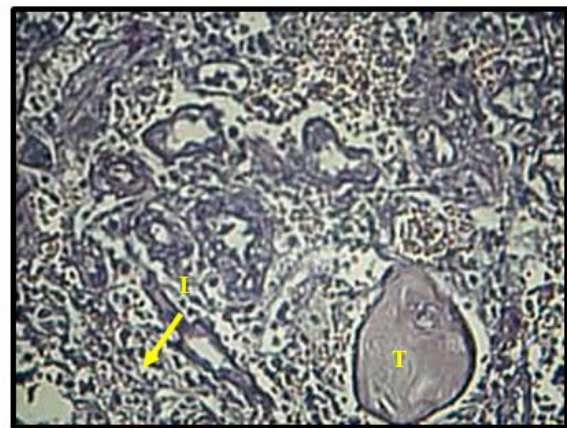


Figure (5): Microscopic appearance of cortical in kidney in patient with chronic pyelonephritis showed inflammation and lymphoid follicles formation with germinal centers (F), thyroidism (T) and hyalinization of glomerulus (H) (H&E200X).



Figure(8): Microscopic feature of cortical in kidney in patient with chronic pyelonephritis showed infiltration of inflammatory cells interstitial inflammation (I) and thyroidism (T) (H&E200X).

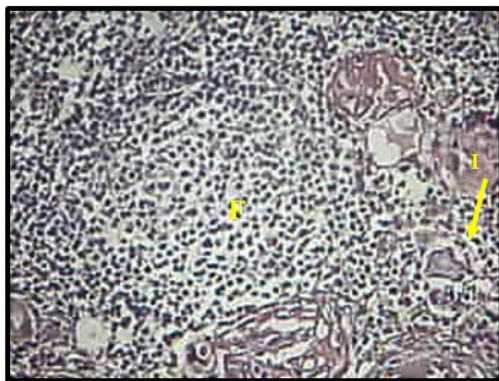


Figure (6): Microscopic appearance of cortical in kidney in patient with chronic pyelonephritis showed interstitial inflammation (I) and lymphoid follicles formation with germinal center (F) (H&E200X).

This study was match with other previous study that found xanthogranulomatous pyelonephritis presents a granulomatous inflammatory infiltrate composed of lymphocytes, neutrophils, plasma cells, xanthomatous histiocytes, and multinucleated giant cells [24].

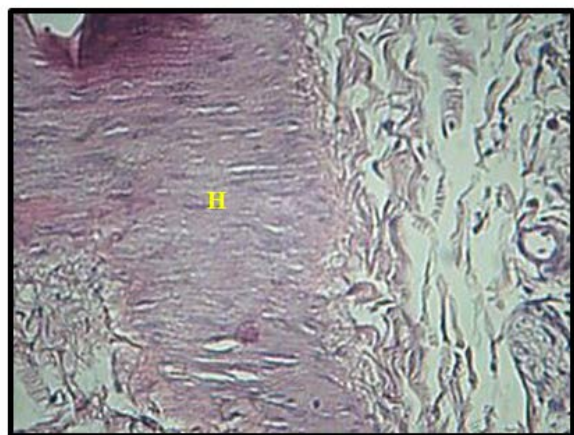


Figure (9): Microscopic feature of cortical in kidney in patient with chronic pyelonephritis showed thickness in the blood vessels wall as the hyalinization (H) (H&E200X).

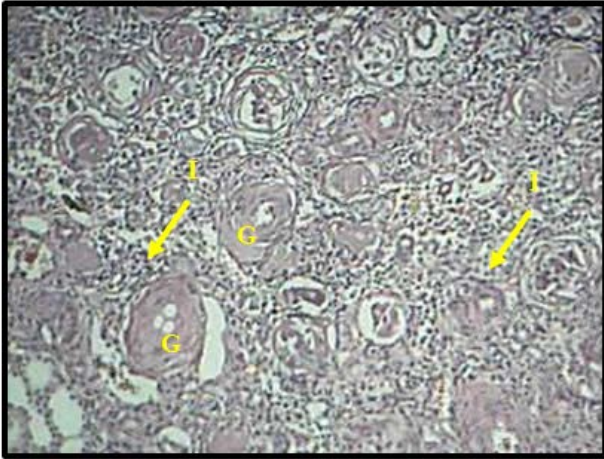


Figure (10): Microscopic feature of cortical in kidney in patient with chronic pyelonephritis showed infiltration of inflammatory cells (I) glomerulosclerosis (G) (H&E100X).

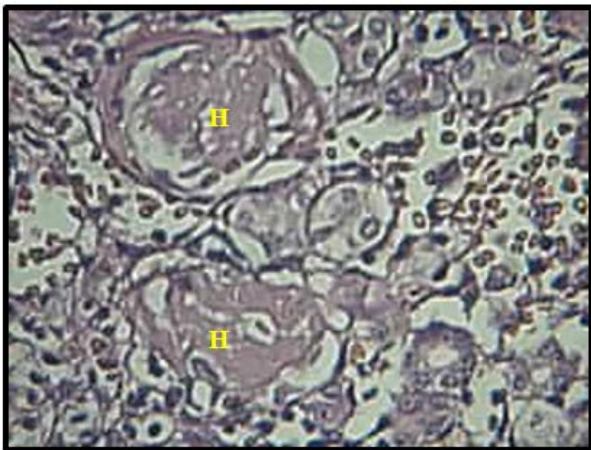
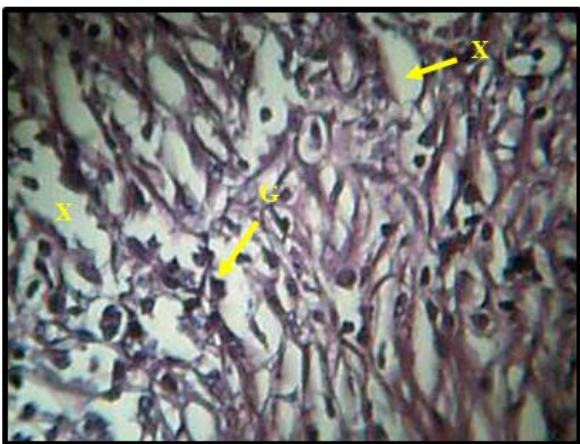
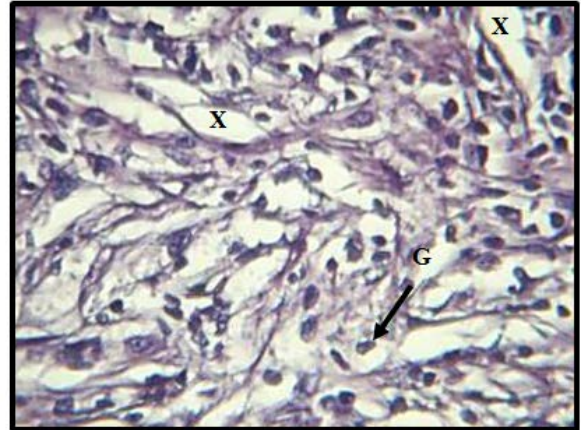


Figure (11): Microscopic feature of cortical in kidney in patient with chronic pyelonephritis hyalinization of glomeruli (H) (H&E400X).



Figure(12):Microscopic appearance of cortical in kidney in patient with chronic pyelonephritis showed a granulomatous inflammatory infiltrate composed of neutrophils, lymphocytes, plasma cells (G), xanthomatous histiocytes (X) (H&E400X)



Figure(13):Microscopic appearance of cortical in kidney in patient with chronic pyelonephritis showed a granulomatous inflammatory infiltrate (G) xanthomatous histiocytes, xanthoma cells (X) (H&E400X).

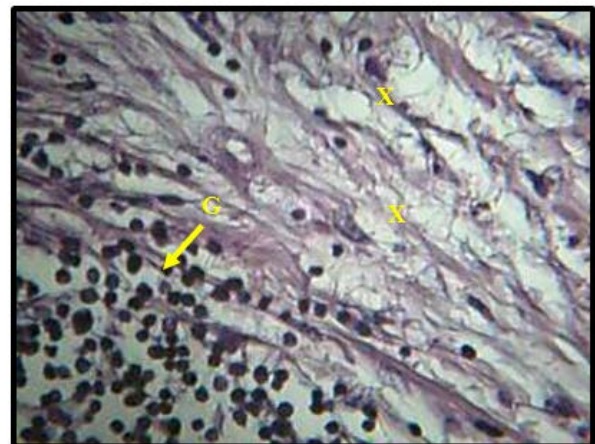


Figure (14):Microscopic appearance of cortical in kidney in patient with chronic pyelonephritis showed a granulomatous inflammatory infiltrate (G), xanthoma cells (X) (H&E 400X).

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