

Biochemical Pathological and Bacteriological Studies on Salmonellosis in Pekin Duckling In Sharkia Governorate With Special Reference To Treatment

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ABSTRACT

The present study was performed with the aim to isolate and identify the bacterial causative agent of diarrhoea in pekin duckling and also to study its effects on some hematological and biochemical parameters and histopathological effects as well as the role of pefloxacin in treatment diarrhoea in white pekin duckling. A total of 160 white pekin ducklings one day old (80 healthy and 80 suffering from diarrhoea) from different hatchery in Sharkia Province were used in this investigation. Cloacal swab samples were collected from all duckling for isolation and identification bacterial causative agent of diarrhoea. Sixty duckling (20 healthy and 40 suffering from diarrhoea) out of 160 duckling were divided into three equal groups, 1st group was healthy duckling and kept as control group, 2nd group was diseased duckling non treated, 3rd group was diseased duckling treated with pefloxacin. Five ducklings from each group were weighted individually for calculation weight gain and record consumed diets for calculation feed conversion rate. At 1st, 7th and 15th days post treatment, Five ducklings were slaughtered from each group and two blood samples were collected for erythrogram and biochemical analysis. Specimens from internal organ were taken for pathological study.

Out of 160 samples 40 (25%) were found positive for *salmonella* isolation and this isolate were serotyped into single isolate (*Salmonella enteritidis* 12 , 30%) & *Salmonella typhimurium* 10, 25%) and mixed isolate (*Salmonella enteritidis* + *Salmonella typhimurium* together 18 ,45%) .

Antibiogram studies, showed that the pefloxacin was the highest effective than other tested drugs. Infected duckling with salmonellosis showed clinical signs, represented by depression, loss of appetite, and decreased body weight, beside diarrhea and mortality in diseased non treated duckling 25%. Pefloxacin induce reduction in clinical signs and mortality rate to 1% and *Salmonella Enteritidis* did not isolated post treatment.

Analyzed data revealed a significant decrease in body weight gain , erythrocytic count haemoglobin content, packed cell volume, total proteins, albumin and globulin beside significant increase in feed conversion rate, serum AST,ALT and alkaline phosphate in diseased duckling. This parameters were improved 7th day post treatment with pefloxacin.

Histopathological changes in ducklings infected non-treated, showed liver congestion of perivascular leukocytic infiltration, and focal area of coagulative necrosis. Kidney revealed degenerative changes and coagulative necrosis of some renal tubules with leukocytic aggregation. Lungs showed congestion of pulmonary blood vessels emphysema. Heart show perivascular edema with fibrin thread. Spleen revealed hyaline-zation and thickening of splenic blood vessels. Intestine revealed focal haemorrhages and desquamation of villus epithelium and leukocytic infiltration. histopathological changes were mild in treated duckling.

From this study we concluded that, *salmonellosis* in duckling resulted in adverse effect in body weight, erythrogram and biochemical parameters and histopathological picture. Pefloxacin treatment diseased duckling improved this parameters.

INTRODUCTION

Salmonella infections are important as both a cause of clinical disease in duck and as a source of food-borne transmission of disease to humans (1).

Duck salmonellosis is extremely acute and fatal (2). Heavy economic losses occur due to morbidity, mortality, reduced egg and meat production (3). Salmonellae are Gram negative, short plump shaped

rods, nonsporeforming, noncapsulated, aerobic and facultatively anaerobic organisms and classified under the family Enterobacteriaceae (4). Virulence factors of salmonella include three general toxins which have been reported to play role in their pathogenicity, endotoxins associated with cell wall lipopolysaccharides when liberated to circulation during bacterial deaths produce fever, liver and spleen lesions (5). Mortality may vary from 10% to 80% in severe outbreaks (6). Duck salmonellosis cause retardation in growth, reduction in egg production and hatchability. In addition to presence of catarrhal, hemorrhagic or necrotic enteritis, degeneration and necrosis of the hepatocytes, myocarditis and lubulonephritis (7).

Quinolones are widely used antimicrobial agents; the most commonly used fluoroquinolone is enrofloxacin and its metabolite Pefloxacin (8). fluoroquinolones interact with bacterial adherence and colonization of epithelial surface, alter the release of proinflammatory bacteria products, modulate phagocytic capacity and intraleukocytic killing (9). Pefloxacin is a broad-spectrum antibiotic commonly used against all of the Salmonella strains (10).

We carried out this study to isolate and identify Salmonella from duck and its effects on some hemato-biochemical parameters and histopathological effect as well as effect of pefloxacin against salmonella infection in white pekin duckling.

MATERIAL AND METHODS

Duckling

A total of 160 white pekin ducklings one day old (80 healthy and 80 suffering from diarrhoea) from different localities in Sharkia Province were used in this study. Duckling was floor reared under complete hygienic condition and fed on a balanced ration free from any medications and given water *ad-libitum*.

Drug

Pefloxacin (Peflodad 10%)[®] solution was obtained from Dar Al Dawa Veterinary and Agricultural Industrial Co. Ltd. Jordan. Each ml contains 100mg of pefloxacin base.

Bacteriological examination

A total of 160 cloacal swab samples from healthy and diarrhoeic duckling were collected. Samples

were under aseptic condition, inoculated into Selenite F broth (as enriched media) incubated at 37°C for 18 hrs. Then, reinoculated into MacConkey's (selective media), incubated at 37°C for 24-48 hrs. Positive cases give pale colonies (12). Bacterial colonies were selected for further morphological and biochemical, identification (12, 13).

Media: Selenite F broth and MacConkey agar (14).

Antibiotic sensitivity

The *in vitro* antibiotic sensitivity test of different isolated microorganism against antibacterial agents was carried out using disc method (15). The antibiotics used were Pefloxacin (5ug), gentamycin (10ug), flumequine, (30ug), neomycine (30ug) and enrofloxacin (10ug).

Experimental Design

Sixty (20 apparently healthy and 40 suffering from diarrhoea) out 160 duckling were divided into 3 equal groups. The 1st group was the apparently healthy duckling and kept as control group, 2nd group was diseased duckling non treated and 3rd group was diseased duckling treated with pefloxacin (5 mg/kgm b.wt. in drinking water for 5 successive days). At 1st, 7th and 14th days post treatment, 5 duckling were slaughtered from each group and two blood sample were collected. Specimens from internal organ for histopathological study. At 1st, 7th and 15th days post pefloxacin treatment cloacal swab samples from diseased duckling were collected for trail isolation salmonella post treatment.

Blood sample

1st sample was taken in tubes containing EDTA for estimation of erythrogram (16), 2nd sample was taken for obtaining clear serum for estimation of total proteins (17) albumin (18), globulin were calculated as difference between total proteins and albumin, AST-ALT (19) and alkaline phosphate (20).

Body weight

Five ducklings from each group were weighted individually at the beginning of the experiment, 1st day and 21 day post treatment for calculation weight gain and record consumed diets for calculation feed conversion rate.

Histopathological examination

Specimens from liver, spleen, kidney, heart, lung and intestine were collected from each sacrificed duckling and fixed in 10% neutral formalin buffer solution, paraffin sections of 4-5 microns thickness were performed and stained with hematoxylin and eosin (H & E) and examined microscopically (21).

Statistical analysis

The obtained data were tabulated and statistically analysed (22).

RESULT

During our study out of 160 samples 40 (25%) were found to be positive to *Salmonella spp.* Isolated *Salmonella* were single isolate (*Salmonella enteritidis* 12, 30%, & *Salmonella typhimurium* 10, 25%) and mixed isolate (*Salmonella enteritidis*+ *Salmonella typhimurium* 18, 45%) (Table 1 & 2).

Antibiogram studies revealed that the activity of pefloxacin and other antibiotic disc *in vitro* against previous isolated *Salmonella* from diarrhoeic duckling either single or mixed infection by disc diffusion test, showed that the pefloxacin was the highest effective than other tested drug followed by enrofloxacin, flumequin, gentamycin and Neomycin (Table 3).

Pekin duck naturally infected with *Salmonellosis* and non treated displayed clinical symptoms such as loss of appetite, depression, ruffled feathers, dropping of the wings with chalky white diarrhea around and covered vent. These symptoms disappeared post treatment with therapeutic dose of pefloxacin.

Salmonellosis induced 25% mortality in infected non treated duckling. Mortality rate was reduced to 5% and *Salmonella spp.* Didn't isolated from cloacal swabs collected from diseased duckling post treated with pefloxacin (Table 4).

Infected ducks with *Salmonellosis* and non treated evoked significant decrease in body weight, total proteins, albumin, globulin and significant increase in feed conversion rate, transaminases

(ALT, AST), alkaline phosphatase all over the experimental period. These parameters were improved towards the normal levels at 14th day post treatment with therapeutic dose of pefloxacin. (Tables 5-7).

Gross pathological lesions resulted from experimental infection with *Salmonellosis* were enlarged highly congested liver highly distended gall bladders with bronze discoloration with Patches of haemorrhage were observed. Intestine was inflamed and hemorrhagic. Kidneys was highly congested and the ureter filled with urates Septicemic signs were observed in the form of congestion in heart, lung and severe congestion in blood vessels and capillaries of the pectoral muscle

Microscopically, the liver showed congestion of central vein and sinusoids beside perivascular leukocytic infiltration (Fig1) moreover focal area of coagulative necrosis of some hepatocytes were recorded in duckling infected non treated (Fig. 2). The liver of infected duckling treated with pefloxacin showed periportal leukocytic infiltration (Fig. 3). The kidney of duckling infected with salmonellosis non treated revealed focal interstitial leukocytic aggregation mainly lymphocytes and heterophils (Fig. 4). Degenerative changes and focal area of coagulative necrosis of some renal tubules were recorded (Fig. 5), Moreover, kidney of treated duckling showed mild lesion represented by mild swelling of glomerular tubules (Fig. 6). The lungs of infected non treated duckling showed congestion of pulmonary blood vessels thickening in the intra alveolar septa, alveolar emphysema and airsacculitis (Figs. 7,8). The heart of infected non treated showed perivascular edema with some fibrin threads (Fig. 9). The spleen of infected non treated birds showed thickening and hyalinization of the wall of the splenic blood vessels (Fig.10). The intestine of infected non treated ducklings showed severe hemorrhages in intestinal mucosa and desquamation of villus epithelium and leukocytic infiltration (Figs.11,12). on the other hand the mild lesions in all organs were recorded in duckling infected and treated with pefloxacin.

Table 1. Isolation of Salmonella from cloacal swab samples collected from diarrhoeic ducks

Total	No. of samples(n)		Cultural examination		Biochemical examination		Total +ve Salmonella	
	healthy	diseased	+ve	-ve	+ve	-ve	No.	%
160	80	80	40	120	40	120	40	25

Table 2. Prevalence rate of different types of Salmonella isolated from duckling.

Isolated microorganisms	Single species		Mixed species	Total
	<i>S. enteritidis</i>	<i>S. typhimurium</i>	<i>S. enteritidis</i> + <i>S. typhimurium</i>	
Number	12	10	18	40
%	30	25	45	100

Table 3. In vitro susceptibility Sal. Spp. of duck origin to some commonly used antibiotics

Antibiotic disc	Disc-potency (ug)	<i>S. enteritidis</i>		<i>S. typhimurium</i>	
		inhibitory zone	sensitive	inhibitory zone	sensitive
Pefloxacin	5	2.00	+++	2.00	+++
Gentamycin	10	1.5	+	1.5	+
Flumequin	30	1.8	++	1.8	++
Neomycin	30	1.7	+	1.7	+
Enrofloxacin	10	1.9	+++	1.9	+++

Table 4. Effect of salmonellosis, on mortality rate and reisolated salmonella of duckling

Groups	Parameters	Total No	Mortality rate		Reisolated Salmonella post treatment(f(day)		
			No	%	1	7	14
Healthy duckling		20	00	00	0.00	0.00	0.00
Diseased duckling non treated		20	5	25	3.83×10^6	4.9×10^6	4.8×10^5
Diseased duckling pefloxacin treated		20	1	5	0.00	0.00	0.00

Table 5. Effect of salmonella on body weight feed conversion rate in pekin duckling (n=5)

Parameters	Body weight 10days	1 days				21 days			
		B.W. gm/duck	B.W.G. gm/duck	F.C. gm/duck	F.C. R	B.W. gm/duck	B.W.G. gm/duck	F.C. gm/duck	F.C. R
G1	275.38± 1.52	415.10± 1.27	139.72± 1.20	272.93	1.95	703.04± 1.31	287.94± 1.09	1232.09	4.28
G3	280.17± 1.72	378.18± 1.59**	98.01± 1.25**	230.17	2.35	553.62± 1.87**	175.44± 1.42**	990.94	5.65
G4	283.31± 1.37	400.14± 1.22	116.83± 1.18	255.21	2.18	681.04± 1.10	281.90± 1.27	1225.25	4.35

** P < 0.01

Table 6.: Effect salmonellosis and pefloxacin on erythrogram in pekin duckling (n=5)

Parameter	Healthy duckling (Control)	Disease duckling (salmenlosis)			
		Non Treated	Treated duckling (day)		
			1st	7th	14th
RBCs (106/UL)	3.94±0.31	2.07±0.37**	2.71±0.52*	3.05±0.51	3.82±0.62
H.b. (gm/dl)	14.89± 0.47	9.13± 0.51**	12.16±0.27*	13.37± 0.93	14.17± 0.83
PCV (gm/dl)	37.52±0.98	30.14±1.24**	33.08±0.89*	35.18±1.21	37.06±1.27

* P < 0.05

** P < 0.01

Table 7. Effect salmonellosis and pefloxacin on some biochemical parameters in pekin duckling (n=5)

Parameter	Healthy duckling (Control)	Disease duckling (salmenlosis)			
		Non Treated	Day post treatment		
			1	7	14
T.protein (gm/dl)	4.16±0.10	2.13±0.14***	3.08±0.15**	3.93±0.11	3.99±0.17
Albumin (gm/dl)	2.31±0.14	1.07±0.09***	1.40±0.10**	2.10±0.12	2.25±0.17
Globulin (gm/dl)	1.91±0.10	1.06±0.08***	1.68±0.11**	1.83±0.12	1.74±0.14
AST(U/L)	40.93±2.96	52.03±2.78***	47.25±2.89**	44.01±2	41.37±2.68
ALT(U/L)	21.85±0.94	29.14±0.93***	25.13±0.78**	23.12±0.9	20.25±0.64
Alk.ph.(U/L)	15.31±1.06	23.17±0.87***	21.53±0.88**	18.34±0.7	15.17±0.38

** P < 0.01

*** P < 0.001

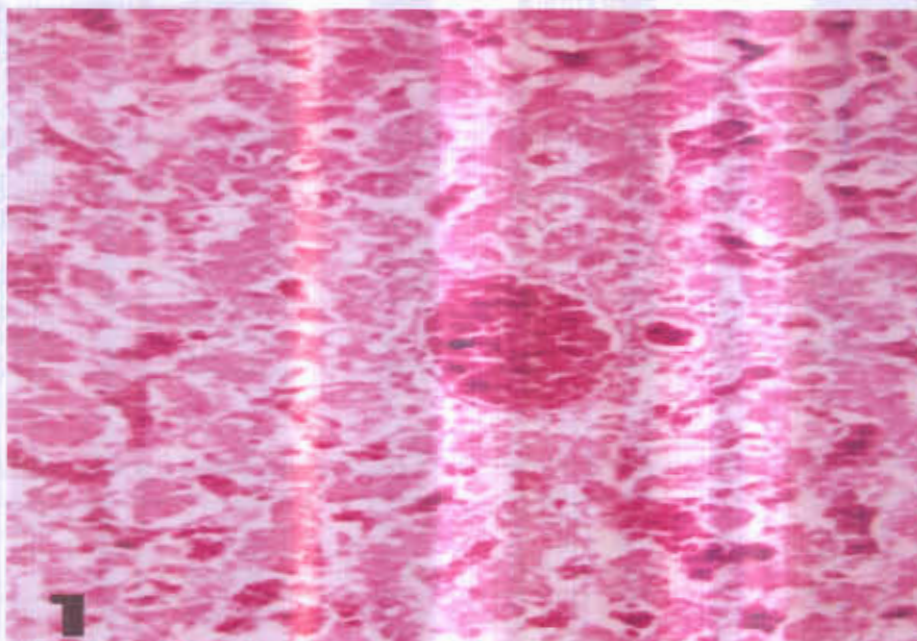


Fig. 1. Section in the liver of infected duckling with salmonellae non treated showing congestion of central vein and sinusoids beside perivascular leukocytic infeltration. H&E X 100.

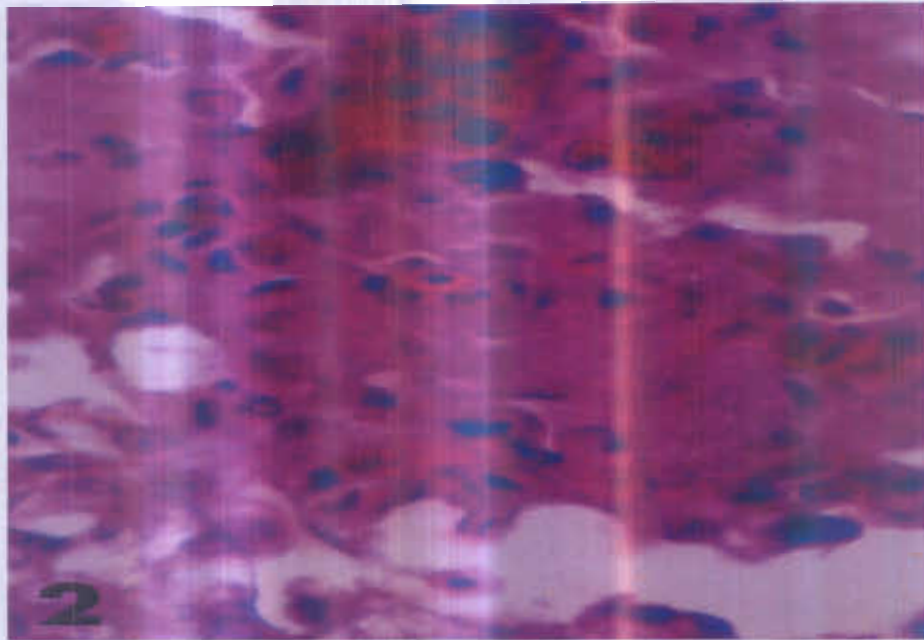


Fig. 2. Section in the liver of infected duckling with salmonellae non treated showing periportal leukocytic infiltrations. H&E X400 .

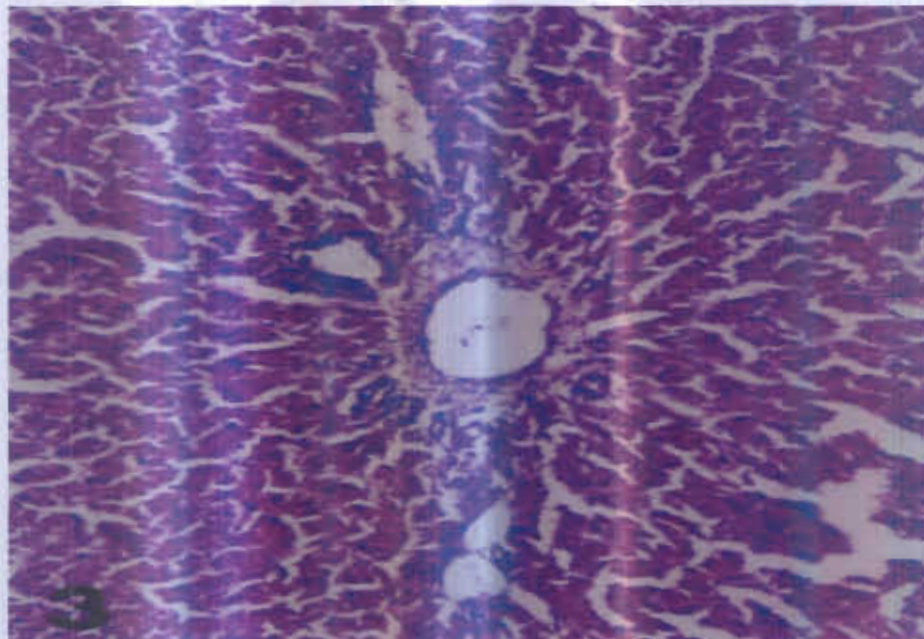


Fig. 3. Section in the liver of infected duckling with salmonellae after treatment with pefloxacin showing focal area of coagulative necrosis of hepatocyt. H&E X 400.

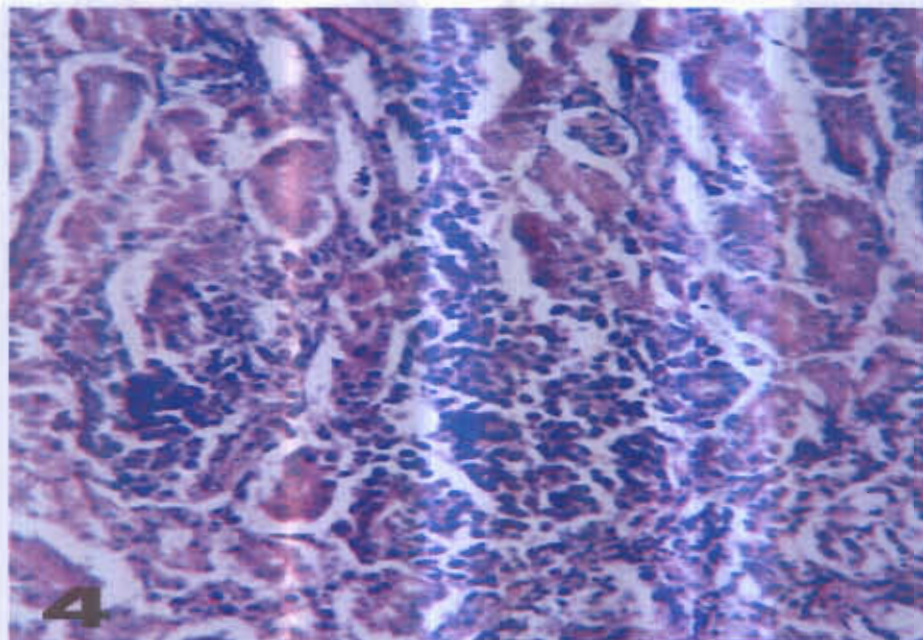


Fig. 4. Section in the kidney of infected duckling with salmonellae NON treated showing sever focal areas of interstitial leukocytic aggregations.H&EX160.

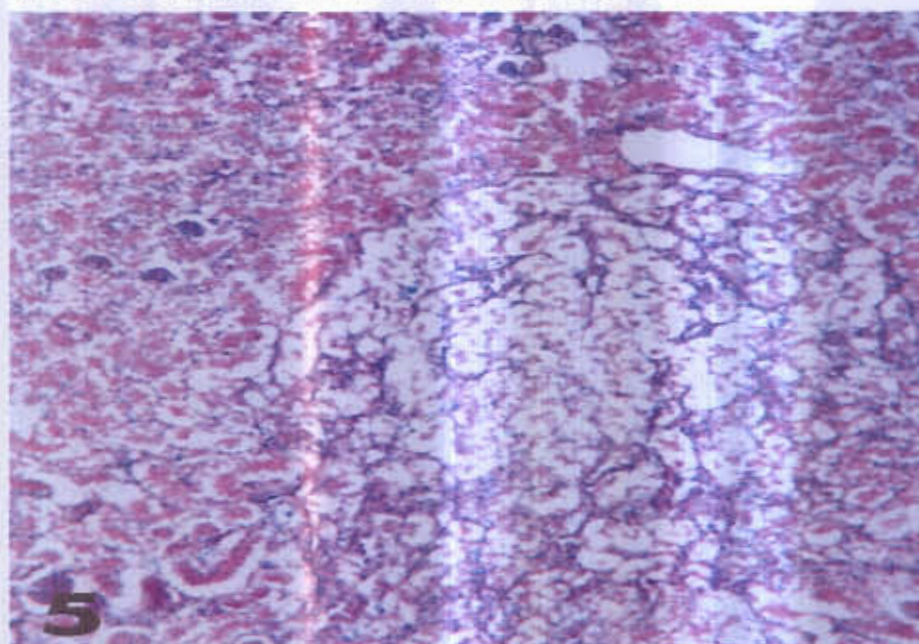


Fig. 5. Section in the kidney of infected duckling with salmonellae non treated showing coagulative necrosis of some renal tubules and degenerative changes in others.H&E X 160.

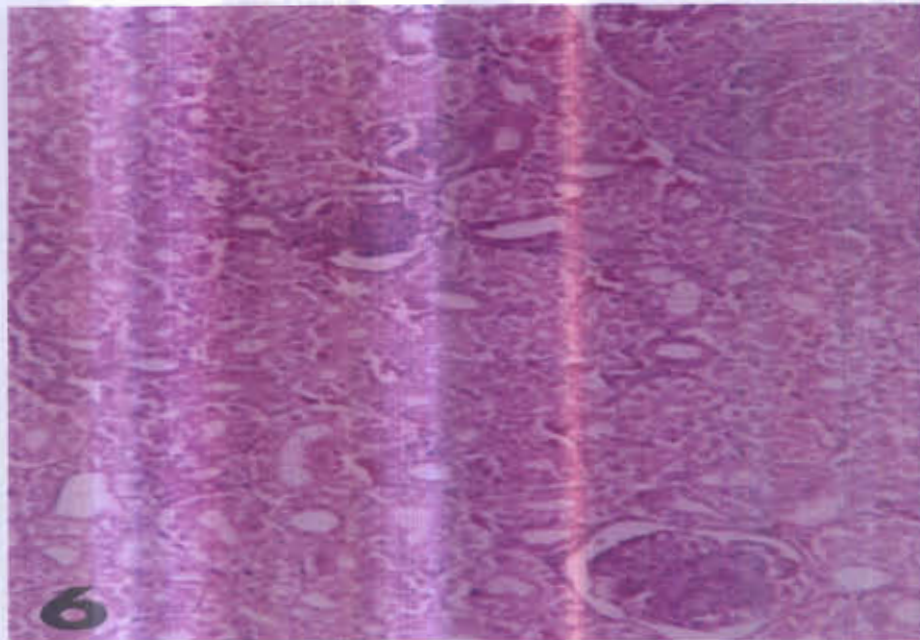


Fig. 6. Section in the kidney of infected duckling and treated with pefloxacin showing mild lesions represented by mild swelling of some glomerular tubules H&E X 160.

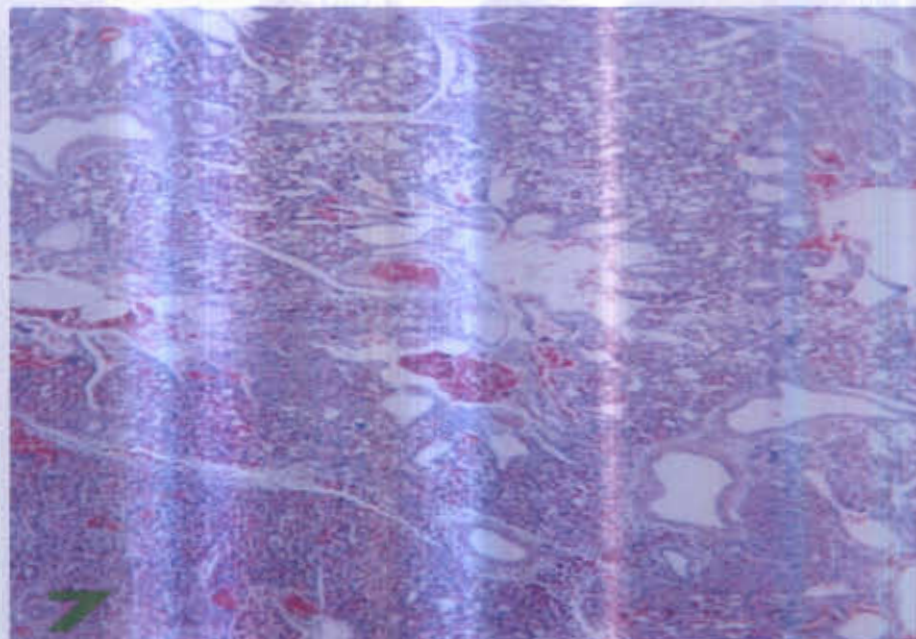


Fig. 7. Section in the lung of infected duckling with salmonellae non treated showing congestion of pulmonary blood vessels, thickening in the intralveolar septa and air sacculitis H&E X 160.

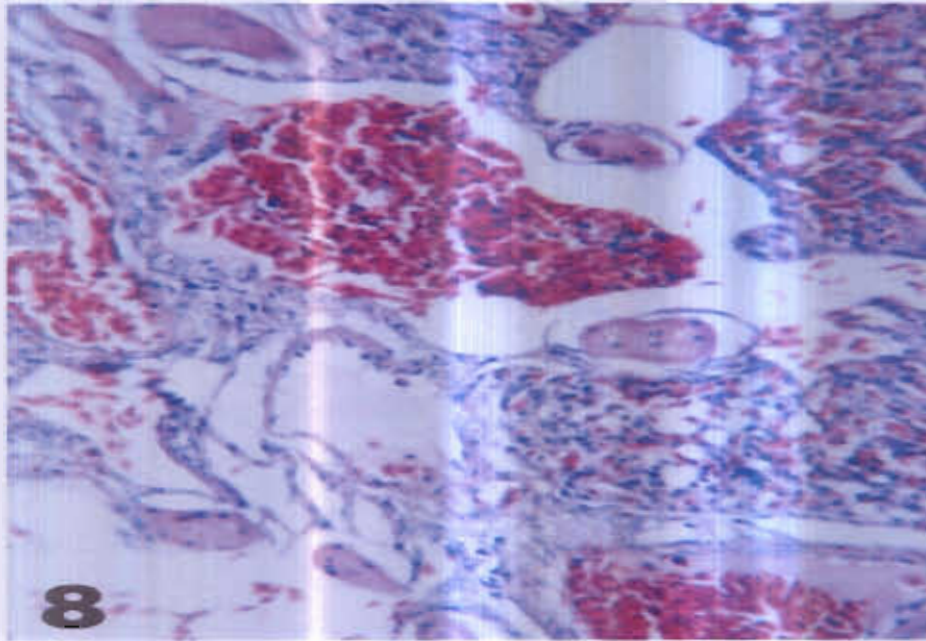


Fig. 8. High power of previous figure showing congestion of pulmonary blood vessels, alveolar emphysema and airsacculitis H&E X 400.

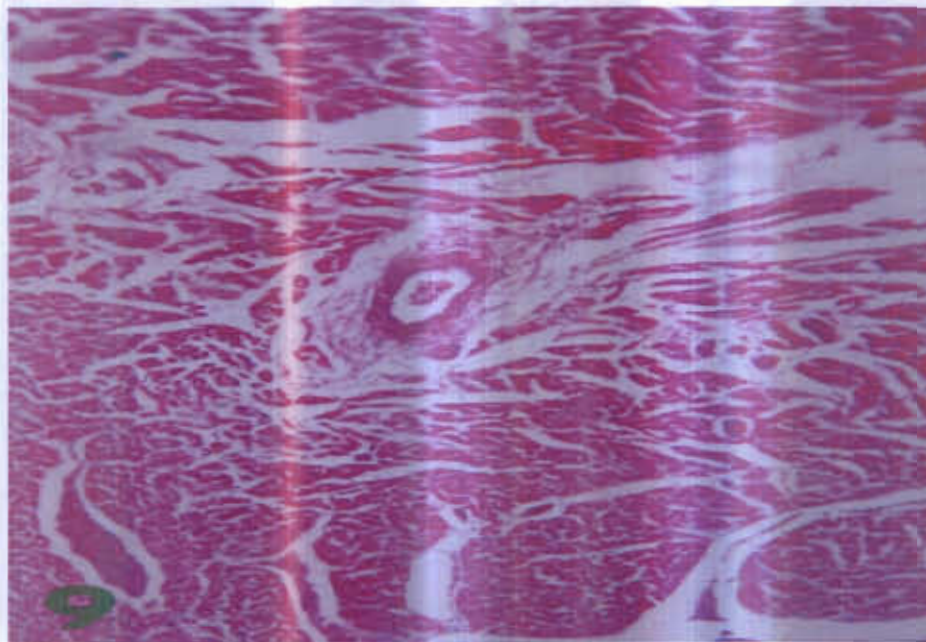


Fig. 9. Section in the: heart of infected duckling with salmonellae non treated showing perivascular edema with some fibrin threads H&E X300.

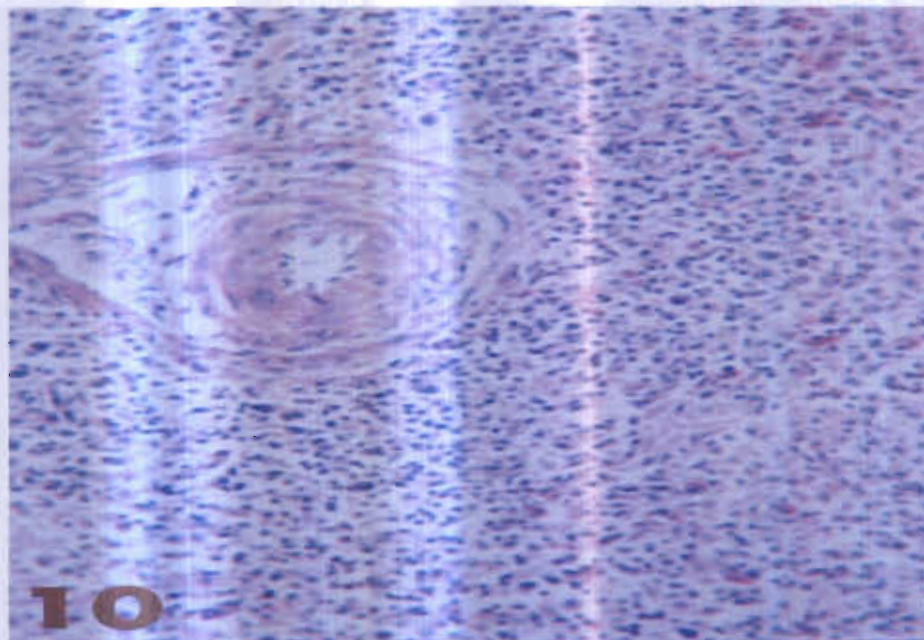


Fig.10. Section in the spleen of infected duckling with salmonellae and non treated showing thickening and hyalinization of the wall of the splenic blood vessels. H&E X 160.

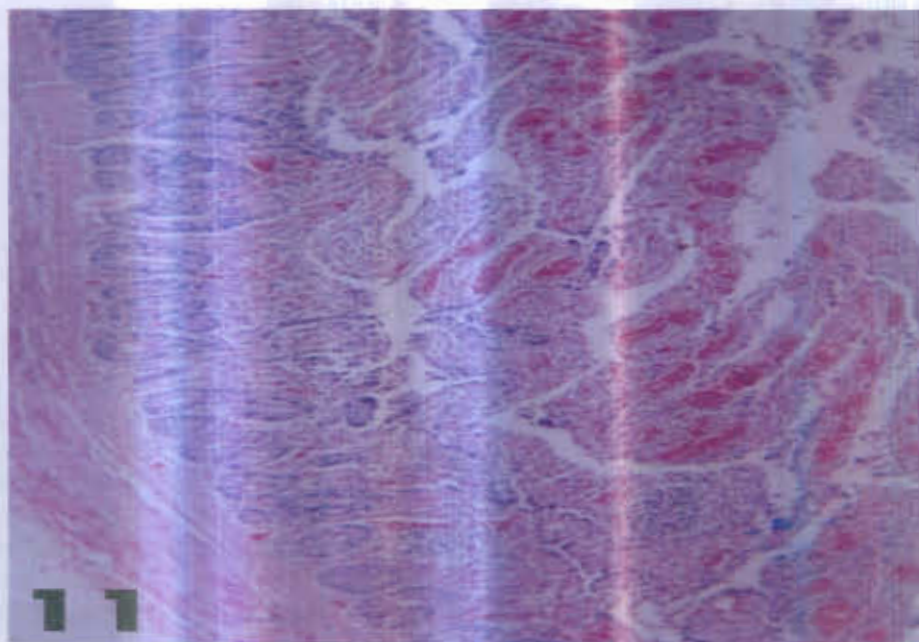


Fig.11. Section in the intestine of infected duckling with salmonellae non treated showing severe haemorrhages in the intestinal mucosa and desquamation of villus epithelium. H&E X160.

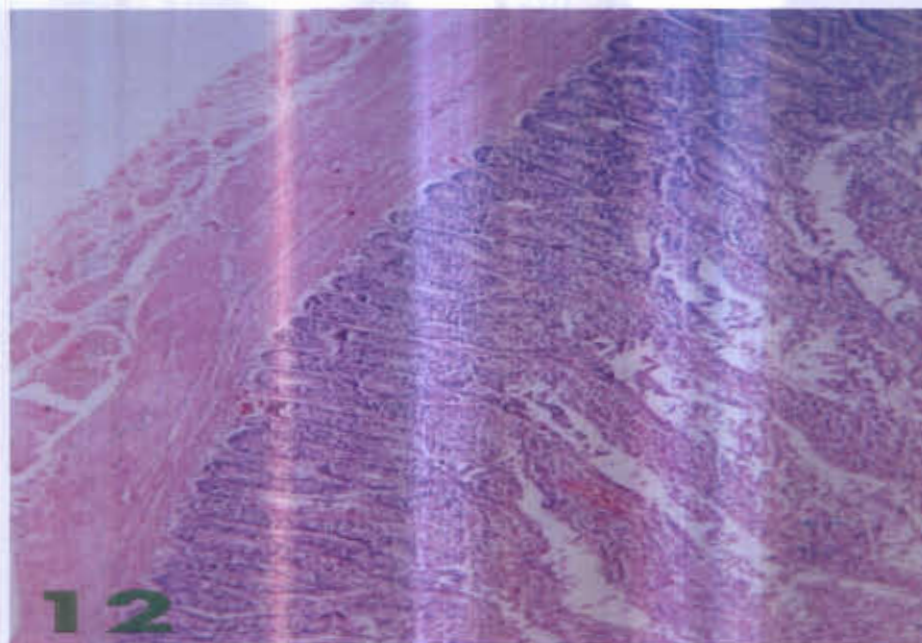


Fig.12. Section in the intestine of infected duckling with salmonellae and non treated showing desquamation of the villus epithelium and leukocytic infiltration in the intestinal mucosa .H&E X 160.

DISCUSSION

Infection with *salmonella* involve three stages:1st,intestinal colonization where the shedding occur (23),2nd:invasion beyond gastrointestinal tract can lead to multiplication of the organisms in macrophage-phagocyte system of liver, spleen and other organs (24),3rd extensive bacteremia which may cause high mortality specially in young birds.

During our study out of 160 samples 40 were found to be positive to *Salmonella*. The percentage of positive samples of *salmonella* in duckling was 25%. In this study, the rates of isolates were high in Sharkia Province. This agrees with most studies, (25) and (26) isolated *Salmonella enteritidis* from cloacal swabs. Moreover, *Salmonella typhimurium* from (27), was isolated dead Moscowy ducks *Salmonella enteritidis* was isolated from the feces of infected hens (28,29). High level of isolate *Salmonella* from duckling in Kalubia Province was 41.77% (30).

Disc diffusion test is widely used for antimicrobial sensitivity test for reasons of

time, simplicity and cost (31). In present study by using the disc- diffusion test showed that the Pefloxacin was the highest effective on all isolated *salmonella* (*S.enteritidis* and *S. typhimurium*) than other tested drug followed by enrofloxacin, flumoquin, gentamycin and Neomycin . Fluorinated quinolones have excellent activity against *Salmonella* Strains. The new generations were very active against all salmonella strains (33).

Infected duckling showed clinical sign represented by depression, loss of appetite, decreased body weight, beside diarrhea and mortality rate were 25%. Similar clinical signs were recorded (33,30). Pefloxacin induce reduction in clinical signs, mortality rate to 1%and *salmonella* (*Enteritidis* & *typhimurium*) did not isolated from collected faecal swabs post-treatment. Fluoroquinolone treatment showed no salmonella in feces or cloacal swabs and organ (34).

The duckling showed variations in erythrogram including a significant decrease in total erythrocytic count haemoglobin content,

packed cell volume in ducklings infected with *salmonella*. These variations in erythrogram remained till the 5th day post treatment by pefloxacin and improvement was seen on the 10th day post treatment. The observed anemia in the infected duckling may be attributed to the bacterial endotoxins. Similar results were previously recorded in fowl (35) cause. Our results were supported by several previous study which recorded that bacterial endotoxins cause intravascular destruction of erythrocytic cells in the body and consequently lead to haemolysis with break-down of haemoglobin (36).

The analysis of serum proteins, of the infected duckling with salmonella non treated indicated a significant decrease in total proteins, albumin and globulin. albumin is selectively lost in renal diseases (37). Moreover, the liver is the sole site of albumin synthesis and hypoalbuminaemia is an important feature of liver diseases (35). Decreased serum total protein and albumin could be attributed to a disturbed protein synthesis and / or deprivation of diet-protein resulting from anorexia which accompanied salmonella infection (38). Bacterial toxin has destructive effect on the liver cells which is the main sources of albumin and protein synthesis in the body (39). Treatment diseased duckling with pefloxacin improved total proteins, albumin and globulin at 14th day post treatment, this may be due to overcome infection. Fluoroquinolone has bactericidal activity against major pathogenic bacteria found in diseased animal and improved total proteins, albumin and globulin (40).

Measurement of serum transaminases (AST and ALT) activities are standard tests for hepatocellular damage. It's well known that the enzymes are intracellular being located in the mitochondria, the cytoplasm or both, consequently, circulating levels increase following liver cell damage (41). Serum transaminases (AST- ALT) and alkaline phosphatase activities were significantly increased duckling infected with *salmenlosis* (42,43).

In this work histopathological changes in ducklings infected with *salmonellosis* and non treated, the postmortem changes were recorded, Moreover microscopically, the liver revealed congestion of hepatic blood vessels, leukocytic infiltration and focal area of coagulative necrosis of some hepatocytes. The kidney showed leukocytic aggregation and coagulative necrosis of some renal tubules, lungs revealed congestion of pulmonary blood vessels air sacculitis and emphysema, Heart showed perivascular edema. The spleen revealed hyalinization and thickening of splenic blood vessels. Intestine showed hemorrhages and desquamation of villus epithelium and leukocytic infiltrated. on the other hand the mild lesion were recorded in duckling infected and treated with pefloxacin. These aforementioned results were in chickens (44,45). Duck *salmonellosis* causes severe microscopical lesions in many of internal organs such as coagulative necrosis in liver (7). Avian salmonellosis causes necrotic enteritis, zenker's necrosis, and fibrinous pericarditis in the heart (46), bronchopneumonia and peritonitis (47,48). Salmenlosis in duck induce hepatic lesion represented by different degenerative changes of hepatocytes, focal coagulative necrosis of hepatic cells, multiple focal leukocytic aggregation which replaced the hepatic parenchyma (27).

From this study we could be concluded that, salmenlosis infection in white pekin duckling resulted in decrease in mortality, body weight and induce change in erythrogram and biochemical parameters which could be lead to economic losses in peckin duckling Pefloxacin treatment helped in controlling the infection.

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الملخص العربي

دراسات بكتريولوجية وبيوكيميائية وباثولوجية على السالمونيلا في البط البيكني الأبيض في محافظة الشرقية الأبيض مع الاشارة إلى العلاج

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تم عمل مسح في بعض مفرخات البط البيكني الابيض بمحافظة الشرقية وكان عمر البط يوم واحد وكانت بعض الحالات سليمة ظاهريا وبعضها تعاني من الإسهال بصوره المختلفة ، وتم أخذ مسحات من فتحه المجمع لعدد160 بطه (80 بصحة جيدة و80 تعاني من وجود اسهال) للفحص البكتريولوجي وبعد الفحص البكتريولوجي اتضح اصابه 40 بطه بالسالمونيلا فقط.

في هذه الدراسة تم استخدام عدد 60 بطه (40 مصابة بالسالمونيلا -20 بصحة جيدة) تم تقسيمهم الى ثلاث مجموعات متساوية كلا منها يضم 20 بطه .المجموعة الأولى بط بصحة جيدة (مجموعة ضابطة).المجموعة الثانية مصابة بالاسهال ولم يتم علاجها.المجموعة الثالثة مصابة بالاسهال وتم علاجها باستخدام الجرعة العلاجية من البيفلوكساسين (5 مجم/كجم من وزن الطائر) لمدة 5 يوم .يتم تسجيل الأعراض التي تظهر على البط المصاب وعدد الوفيات في كل مجموعته,معدل الوفيات ويتم وزن البط في بداية التجربة وعند فترات مختلفة بعد نهاية العلاج , حساب كمية العلف المستخدمة لكل مجموعة لدراسة التأثيرات على وزن الجسم ومعدل التحويل الغذائي.كذلك يتم ذبح عدد5 بطه من كل مجموعة عند اليوم الأول والسابع والخامس عشر بعد نهاية العلاج ويتم اخذ 2 عينة دم من كل طائر عند نفس المدد السابقه, الأولى لدراسة تاثير الإصابة بميكروب السالمونيلا والعلاج على صورة الدم والعينة الثانية لفصل المصل عند نفس المدد السابقة وذلك لدراسة التأثيرات على بعض الوظائف الحيوية,وكذلك يتم اخذ عينات من بعض الأعضاء الداخلية لعمل شرائح باثولوجية وذلك لدراسة تاثير الإصابة بالاسهال والعلاج على البط باثولوجيا .

وتبين من الفحص البكتريولوجي أن هناك 40 عينة من 160 التي تم فحصها بها ميكروب السالمونيلا فقط وكانت نسبة الاصابة بالسالمونيلا بمحافظة الشرقية 25% .وعند التعرف علي نوع السالمونيلا المعزوله وذلك بالشكل الظاهري للمزارع البكتيرييه وبعض الاختبارات البيوكيميائية وجد انها كانت عدوى منفردة بنسبة (22)55% (سالمونيلا انتريديس (12) 30%, سالمونيلا تيفميوريم(10) 25%) وعدوى مشتركة بنسبة (18)45% (سالمونيلا انتريديس مع سالمونيلا تيفميوريم).والاصابه بالسالمونيلا في البط البيكني ادت إلى ظهور أعراض مرضية وأدت إلى زيادة نسبة الوفيات الى (25% في المجموعة المصابه والتي لم يتم علاجها) وبعمل اختبار الحساسية لهذه المعزولات وجد أن البيفلوكساسين أكثر المضادات الحيوية تأثيرا علي هذه المعزولات.

تشير النتائج أن الإصابة بميكروب السالمونيلا أدى إلى حدوث نقص معنوي في وزن الجسم, الوزن المكتسب عدد كرات الدم الحمراء, تركيز الهيموجلوبين، حجم خلايا الدم المرصوصة، البروتين الكلي،الزلال، الجلوبيولين وزيادة معنوية في معدل التحويل الغذائي, إنزيمات الكبد (ALT -AST) الفوسفاتيز القاعدي. واستنادا إلى التحسن الملحوظ على الأعراض الإكلينيكية ونسبة النفوق ومعدل استهلاك العلف ومعدل التحويل الغذائي بالإضافة إلى الوزن المكتسب وصورة الدم والوظائف البيوكيميائية يمكن

القول بكفاءة البيفلوكساسين فى التغلب على الإصابة بالسالمونيليا فى البط البيكينى الابيض وعند اعاده عزل الميكروب من البط المعالج لم يتم عزله..

وبالفحص الباثولوجى للاعضاء الداخلىة للبطن المصاب بالسالمونيليا وغير المعالج وجد ان الكبد به احتقان بالاوعية الدموية وانتشار للخلايا اللالتهابية مع بؤر نخر تجلدى بالخلايا الكبدية اما الكلى فوجد تنكس استسقاى مع بؤر نخر تجلدى بالانابيب الكلوية وانتشار للخلايا اللالتهابية والرئتين وجد بها احتقان بالاوعية الدموية مع زيادة سمك الاسفاج الرئوية وانتفاخ فى البعض الاخر. وبالقلب وجد بعض الارتشاحات الاودمية وخيوط فبرينية. والطحال وجد به تنكس انحلالى مع زيادة فى سمك الاوعية الدموية. اما الامعاء فوجد بها بؤر نزفية بالانسجة المعوية ونخر وانفصال للخلايا المبطننة للخملات مع انتشار للخلايا اللالتهابية. اما المجموعة المصابة اصابة صناعية وتم علاجها باستخدام الجرعة العلاجية من البيفلوكساسين سجلت تغيرات باثولوجية طفيفة مما انعكس على الحالة الصحية للبطن المعالج ونسبة النفوق

من كل ما سبق نلاحظ أن استخدام البيفلوكساسين بالجرعة العلاجية لة تأثير فعال فى علاج الإصابة بالسالمونيليا وأدى إلى اختفاء الأعراض الظاهرية وأدى إلى عودة هذه الوظائف إلى المستوى الطبيعى بعد العلاج ب 14 يوم