Morphmetrical and Histological Changes in Domestic Chicken Kidneys in Response to Salinated Water

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Background: The high ratio of salt in the water of my country (Iraq) had bad effect on the products of the poultry industry, therefor were focusing in this study on the effect of salt on the kidney of birds

Material and Method: were carried on Twenty domesticate chicken*(Gallus gallus*) and divided into two groups (control and stressed) ten birds for each, used for determinate the morphological and histological differences in the kidneys .For histological study, kidney samples were taken to prepared slid to check the structure tissue of kidney in both groups.

Result: The mean weight of kidney in stressed was (5.31 ± 0.55) g. It was heavier than the kidney of control group which weighted (4.08±0.47) g. The same difference was recorded about the size of kidney; the length (5.38 ± 0.49 cm) and width (2.40±0.32 cm) of kidney in stressed group was higher than that of control group (length 4.33±0.41 cm) and width (2.00±0.31 cm). Also some histological changes in stressed group was differed than control.

Conclusion: The moderate salt level in food or drinking water was a toxic for chickens. The structure and function of chickens' kidney were less efficiently to eliminate (NaCl), therefore severe histological changes in kidney and others vital organs.

Key Word: *Kidneys; Morphology; Histology; Domestic Chicken, Salinated Water.*

Introduction

The urinary system of birds consist of paired kidneys and the ureters, which transport urine to the urodeum of the cloacae, The renal pelvis and urinary bladder were absent [(1)] The avian kidneys were extended from the caudal margin of lungs to the caudal end of the synsacrum and embedded in it fossa[(2)]. The avian kidney consists of three incompletely separated lobes [(3)] each lobe is composed of numbers of lobules that drain into many ureter branches [(4-5)]. The kidneys regulates the body fluids and minerals composition thus they necessary to maintain the homeostasis and expelled the metabolic waste, as well as excess water and electrolytes [(6-7)] urine produced in the kidneys were refluxed into cloacae-rectum, where it is finally modified before elimination, due to the fact that the end product of nitrogen metabolism was uric acid, avian urine was less concentrated than mammals urine [(8-10)]. The fowl Gallus Gallus Domesticated or the chicken is domesticated fowl live in terrestrial (nonaquatic birds) [(11)]. The kidney lobe of birds was divided to many lobules which enclosed central vein, each was divided to two regions cortex and small medulla. The cortical region contained renal corpuscles (reptilian and mammalian type), proximal convoluted tubules, distal convoluted tubules and collecting ducts .The medulla region contained thin and thick segments of Henle loop. The cortex was largest than medulla [(12)]. The mammalian corpuscles characterized by presence of loop Henle's and large corpuscle, The reptilian type has small corpuscle without

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loop of Henle [5]. The sodium chloride (NaCl) salt was toxic for chickens concentration level that were safe for mammals and, the moderate increased salinity of water or food causes ascites with pathological changes in some birds organs[13]. The Toxic effect increase salt (NaCl) in water intake on the renal tissue were, necrosis in effected renal glomeruli and renal tubules lining epithelia. The healthy glomeruli and renal tubules show hypertrophy as compensatory response [14]. The present study was to investigate the morph metrical and histological response of domesticate chicken kidneys to high concentration of salt in drinking water for long period.

Materials and Methods

Twenty adult's healthy local domestic fowl (with no respect to sex) were pouch from the local markets of Basra provinces. The birds were grouped into two groups (control and stress). The control group late to drink fresh water, the salt stressed group watered on salt water contained (NaCl) 3% or (9000 mg/liter) (1.7mmol/ Liter) for 10 days (The water was given in plastic pools and replenished fourth time daily). All birds were sacrificed by decapitation for short period (8-10) days, because effect increase salt (NaCl) in water intake on the renal tissue and causes ascites with histological changes in some birds organs, also lost body mass and mortality birds .and then Both left and right kidneys were quickly removed from each bird in two groups (control and stress).The kidneys sizes and weight were measured. Then immersed in 10% neutral buffered formalin for 72 hours. Paraffin sections at (5-7) µm, thick were prepared and stained with Hematoxylin and Eosin stain [15-16]. Means were compared using unpaired t test.$P<0.05$ is considered significant.

Results and Discussion

The current study showed that, the general morphological characters of kidneys in control group was, red to brown red in color, flattened dorso-ventrally organs which extended from the ventral aspect of the lungs to the end of the synsacrum bone, and the ventral half of the kidneys were embedded deep in the synsacral fosse. Each kidney consisted of three parts(lobes) which were not completely separated (cranial, middle and caudal) (Figure 1).This facts proved what was reported by many others in different birds species, Like what was mentioned by in common coot bird,[17] in Emu, in dove and owl, and[18] in dove, racing pigeon. The result in control group was characterized by (small rounded cranial, round middle and large oval caudal) parts with red brown in color, While in salt stress group, characterized by swollen and congestion in blood vessels (Figure 2).

Figure (1) Macro graphic of chicken kidney(control) shows; cr-cranial lobe; m-middle lobe; ca-caudal lobe.

Figure (2) Macro graphic of stressed fowl kidney shows:-increase in size of kidneys. Congestion of blood vascular.

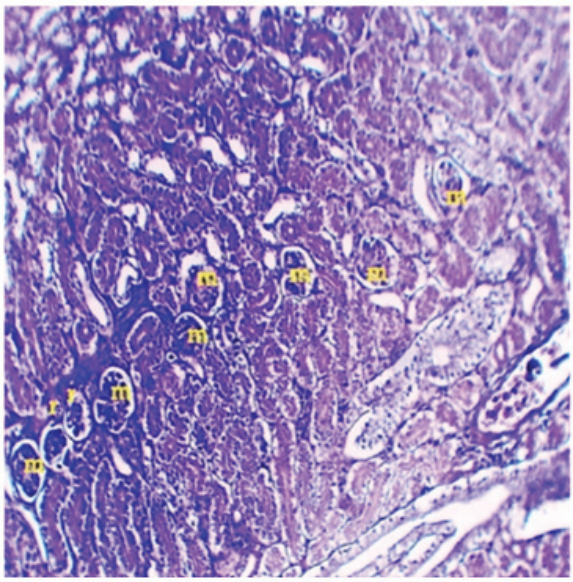

Figure (3) Histological section of kidney chicken (control) shows; c-cortex; rc-renal corpiscul; d-distal tubule; p-proximal tubule (H&E X200)

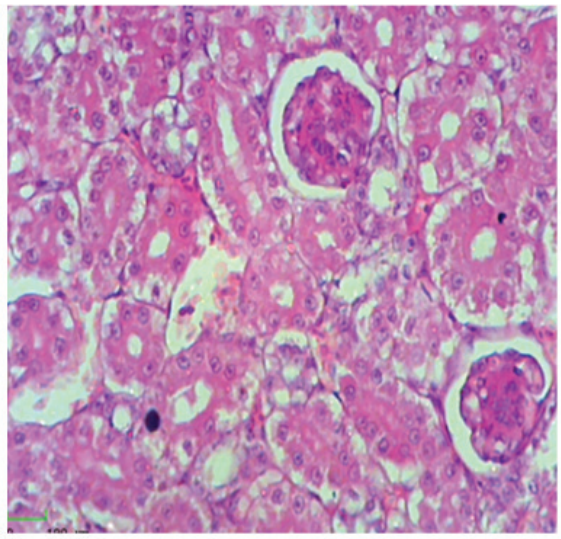

Figure (4) Histological section of kidney chicken (control) shows; c-cortex; rc-renal corpiscul; d-distal tubule; p-proximal tubule (H&E X200)

Morphometric Results

The current study recorded clear increase in the size and weight of kidneys in stress group, compression with the same parameters of control group. The mean weight of kidney in stress chickens was (5.31 ± 0.55) g. It was heavier than control group which weighted (4.08±0.47) g. The same difference was recorded about the length (5.38±0.49) cm and width (2.40±0.32) cm of kidney as compared with the corresponding means of control (4.33±0.41 cm length and 2.00±0.31 cm width).

Histological results:

Histological investigation of kidneys in both groups (control and stressed) revealed, each kidney lobe consisted of many renal lobules, each lobules had small medulla centrally located surrounded by wide zone of cortex, which was made of renal corpsicals (Figure 3, 7). This results was in agreement with the results of[18-19] In dove, racing pigeon and gold eagle and the results of in Harrier, Mallard and chicken, In all this birds species the lobes of kidney consisted of many lobules which formed of large cortex and small medulla .The renal nephrons were in two types according to size of renal corpuscles the present of loop of Henle.

In this study the arrangement and distribution of renal nephrons segment in both group of birds were the

same, In the cortex zone the renal corpuscles of the both types, the mammalian and reptilian renal corpuscles (MC,RC), were present in different levels(Figure 3), also the (proximal and distal) tubules and cortical collecting duct could be noticed in cortex (Figure 4). Thin and thick segment of Henley's loop in addition collecting duct were present in medulla. This histological feature was mention in previous studies in other birds species in common coot [17] in emu bird[19-20] in great flamingos , the (proximal and distal) tubules and cortical collecting duct were present in cortex, the medulla occupied by the thin and thick segment of Henley's loop in addition collecting duct .

The histological changes of kidneys belong to chickens which drink salt water; The Salt (sodium chloride) is one of the major components of feed for the normal maintenance of biological processes. But the chickens were more sensitive for sodium chloride (NaCl). Therefore the excess in doses of salt can cause toxic effects in chickens, and causes mortality birds. The increased salinity of water 3% sodium chloride causes histological changes in kidneys. The kidneys were response to over load salty water was enlargement and increased in the size. Some renal corpuscle hypertrophied, and another degenerated, congestion of capillary tufts with condensation of central glomerulus mesangial cells, which had large rounded Heterochromic nuclei, increase or dilatation of bowman space and thickening of bowman capsule with renal tubules necrosis(Figure 5, 6). Degeneration in collecting tubules and mucus secretion was found. Histological changes of kidneys were mentioned in previous studies in other birds species [21], in chicken birds [22] in White leghorn chick[23] in Mallard duck. The kidneys were response to over load salty water was enlargement and increased in the size and causes histological changes such as congestion in cortical and medullary in renal lobule, congestion of capillary tufts and condensation of glomerulus mesangial cells and Renal tubule necrosis.

Conclusion

The moderate salt level in food or drinking water was a toxic for chickens. The structure and function of chickens' kidney were less efficiently to eliminate (NaCl) therefore severe histological changes in kidney and others vital organs.

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Ethical Clearance: Obtained from Institutional ethical committee

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