Study the Effect of Hypercholestrolemic Diet on the Histological Changes of the Kidneys in Local Male Rabbit *Oryctolagus cuniculus*

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Abstract

The presented work is conducted to examine the impact of hypercholestrolemic diet on male rabbits' kidneys. A total of 10 male and adult rabbits have been divided (randomly) into 2 groups (5/group) for three months, while the first group was allowed to ad labium supply and drinking tap water and was termed as the control group (G1). Second group rabbits have orally administrated 1,5% gm of the cholesterol with the diet throughout the 3 months (G2). This work indicated the occurrence related to tissue changes in the kidney tissue compared with the control group.

Conclusion: In conclusion, our study showed that the hypercholestrolemic diet at a dose of 1.5% gm caused pathological changes to the kidney tissue such as fatty changes in the tissue, the presence of fatty droplets within the capillary of the glomerulus, inflammatory infiltration of cells in the interstitial tissue of the kidney, cystic expansion of the renal tubules, and addition to the presence of hemorrhage compared to the control group.

Keywords: *hypercholestrolemic diet, kidneys, male rabbit, Oryctolagus cuniculus*

Introduction

Cholesterol can be defined as one of the main lipid components related to the mammalian cells' plasma membrane. It constitutes 45% mol in terms of other lipids hypercholesterolemic diet-induced hypercholesterolemia. High cholesterol (hypercholesterolemia) is specified as the existence of high cholesterol levels in the blood. [1] It is considered a form of hyperlipidemia, high blood lipid. Hypercholesterolemia is one of the clinical problems resulting in complications in the vital organs such as kidneys [4]. Besides, kidneys are the first organ experiencing damages from age as well as degenerative diseases. The renal aging was specified by the loss of the function and an increase in the glomerulosclerosis, interstitial fibrosis, and tubular atrophy [8]. The impact of aging in kidney damage pathology was related to a change in cholesterol metabolism.

Furthermore, previous experimental researches indicated that hypercholesterolemia is reducing the renal blood flow glomerular filtration and ultrafiltration, also glomerular excretion and damaging tubular [15,16]. The hypercholesterolemia might build up and become atherosclerosis, therefore narrowing the vessels of blood, particularly in the brain, heart, eyes, and kidneys [7] . societies and is one of the causes of concern for the healthcare professionals due to the fact that it constitutes a very high factor of risk for developing CVDs, like the atherosclerosis and its complications, the acute infarction of hypertension or myocardium [2,10]**.** There were close correlations between such diseases and lipid anomalies, particularly the high levels of plasma cholesterol, along with blood pressure (3). The majority of the previous researches was focused on the effect of chronically high concentration of the blood cholesterol on kidneys and indicated the developments of focal glomerulosclerosis as well as proteinuria, which quickly developed to renal failure [19]. However, there is minimum information provided in literature regarding early (sub-acute and acute) impacts of hypercholesterolemia on kidneys [18]. Therefore, this work aims at determining the impacts of a high cholesterol diet on kidneys.

Materials and Method

Animals and experimental design:

Ten adult male rabbits, eight months old and (1.5-2kg) mean body weight, are utilized. The work is carried out at the animal house of Pharmacy college throughout the summer of 2019. Ten adult male rabbits were divided (randomly) into 2 groups (5/group) for three months; the first group was allowed to ad labium supply and drinking tap water and served as the control group (G1). In the second group, rabbits have been orally administered 1,5% gm cholesterol with the diet (G2). The high cholesterol diet, which contains 1.5% of cholesterol per 100 gm of food, was prepared by mixing 98.5 gm of concentrated billet with 1.5% of the cholesterol powder produced by the company (BDH) of English origin in order to produce a high cholesterol food. Preparation has been conducted daily for avoiding cholesterol's oxidative modification. Animals have been euthanized, and samples were collected at the end of the experiment. The sample was initially saved after being removed from the animal in the formalin solution at a concentration of 10%. After four to five days, it was extracted from formalin and washed several times with tap water and then preserved at ethyl alcohol at 70% concentration. It was then conducted a series of preparations.

Histological section: were prepared on the basis of approaches indicated in (**Schreibman and Presnell, 1997).**

Result

The results of this study indicated that the group that was dosed with 1.5%gm of cholesterol resulted in histological changes in the kidney tissue.

Histological analysis using hematoxylin-eosin staining, which included the occurrence of fatty changes in the tissue, the presence of fatty droplets within the capillary of the glomerulus, inflammatory infiltration of cells in the interstitial tissue of the kidney, cystic expansion of the renal tubules, in addition to the presence of hemorrhage compared to the control group.

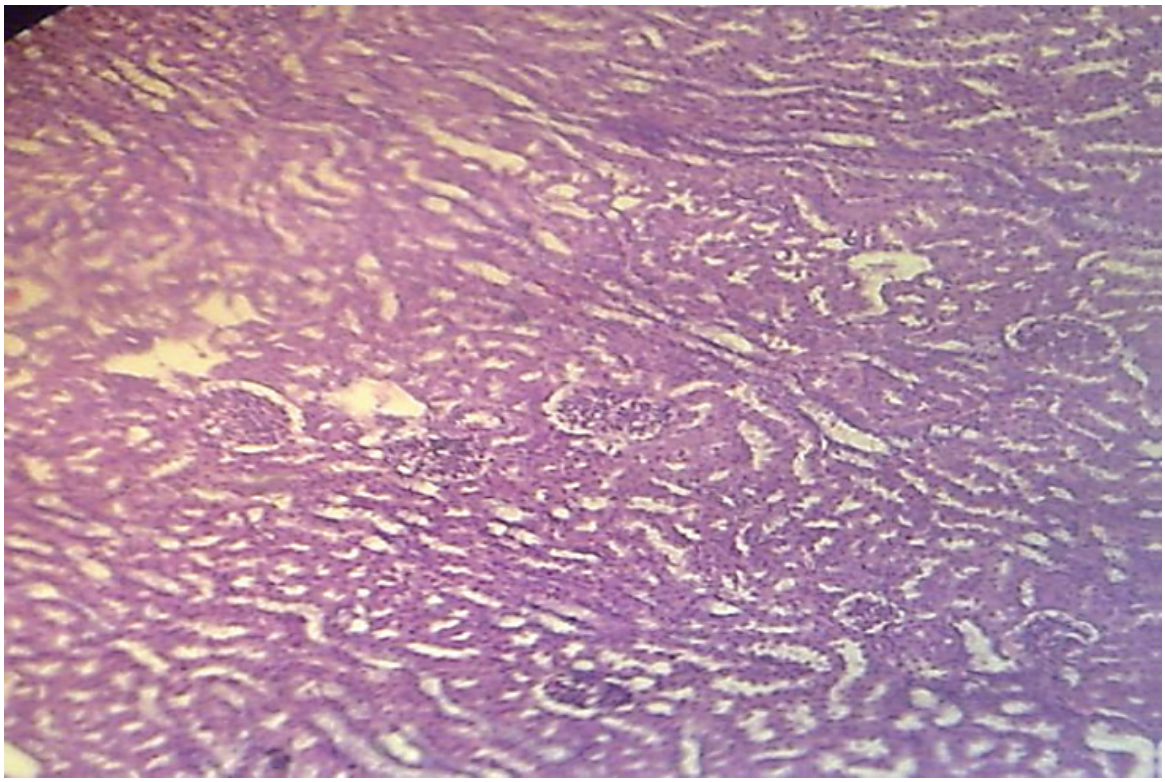

Figure (1) shows the normal histological structure of kidney tissue in control group for local male rabbit *Oryctolagus cuniculus*

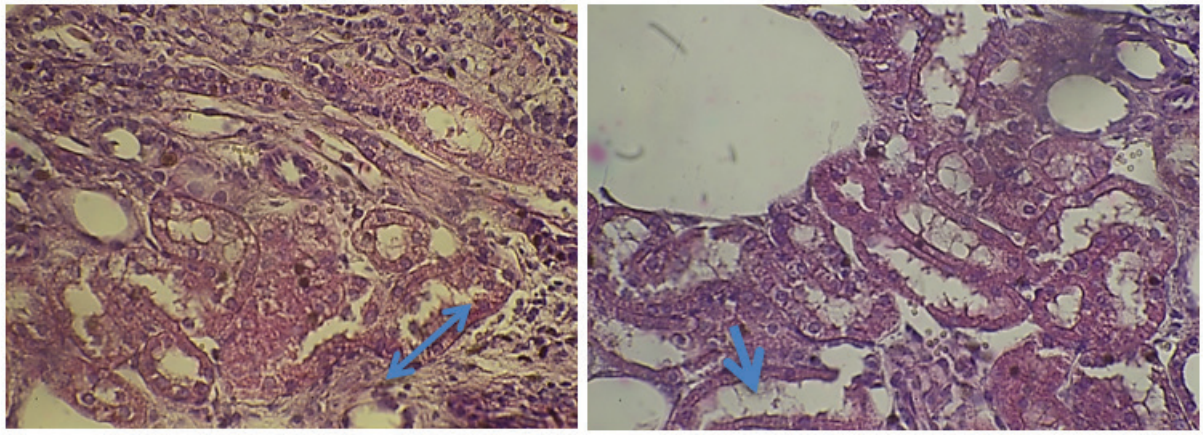

Figure (2) A histological section of the kidney in the cholesterol treatment group showing the fetty change (40X H`&E).

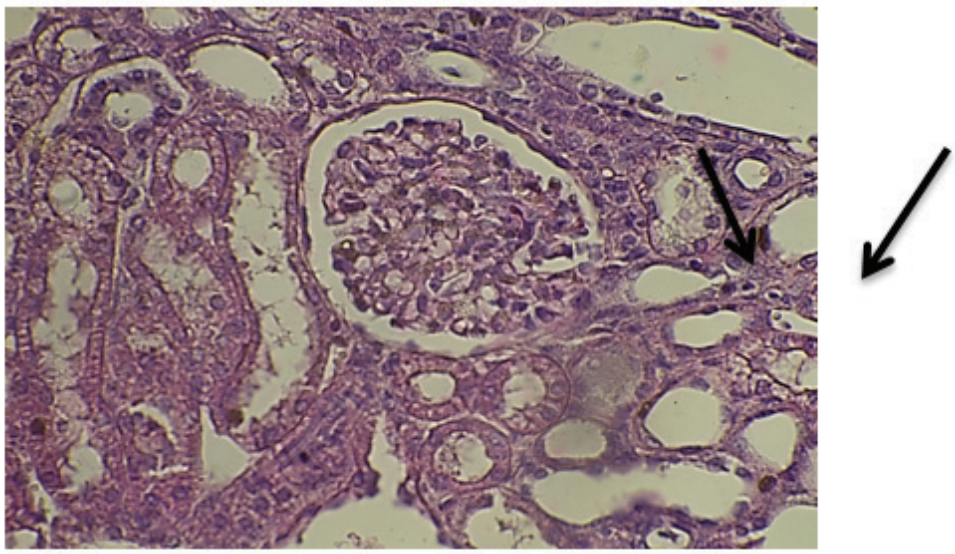

Figure (3) A histological section of the kidney in the cholesterol treatment group showing the presence of fatty droplets in the glomerulus capillary (40X H &E stain).

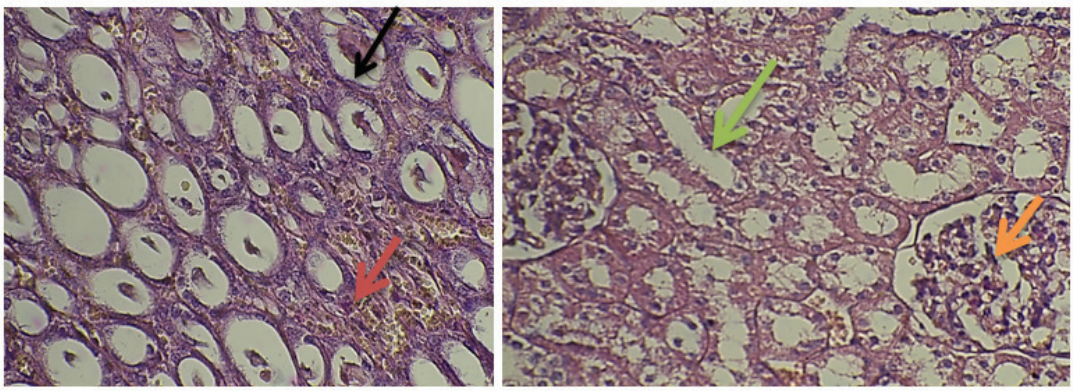

Figure (4) A histological section of the kidney in the cholesterol treatment group showing the presence of inflammatory infiltration of cells in the interstitial tissue of the kidney and cystic expansion of the renal tubules in addition to the presence of hemorrhage (40X H &E stain).

Dissection

High cholesterol diet caused kidney damage through fatty changes in the tissue, the presence of fatty droplets within the capillary of the glomerulus, inflammatory infiltration of cells in the interstitial tissue of the kidney, cystic expansion of the renal tubules, in addition to the presence of hemorrhage, compared to the control group This study was in agreement with (HOTIMAH2018), along with previous researchers showing that the hypercholesterolemia induction results in tubular damage which caused an accumulation of fat droplets in the tubular cells (Ab alhamid, 2014) that impacted the cell metabolism and induced the lipid peroxidase and oxidative stress (Balarini 2011) carried out a study that indicated that accumulation of fat in renal tubules might develop lipotoxicity, as fatty acids are acting as detergents that might weaken the structure of the membrane and increases the cell.

A diet that is high in cholesterol leads to an increase in fatty acids. Also, the increase in cholesterol and protein lipids with low density may be due to disturbances that occur in the metabolic processes as a result of a defect in the lipid homeostasis process, which leads to a change in the activity of the enzyme Hydroxyle -3-methylglutary-Coenzyme A (HMG-CoA) that leads to disorders of cholesterol esters and a decrease in the activity of the enzyme Lipoprotein Lipase, and increases the level of free fatty acids. In addition to the importance of what was mentioned (Dabbaghet al, 1997) about the sensitivity of LDL-receptors located in the walls of blood vessels to the collection of lipoproteins in the plasma, Approximately 22% of the cardiac outputs pass through kidneys, which makes them prone to the endothelial capillary damages apoptosis [17]**. T**his work indicated that the hypercholestrolemic diet increases the inflammation cells in the histological analysis of the kidney. The increase in the inflammation cells might be associated with lipid accumulations in the kidney tissue.

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Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved under the College of Education for pure sciences, Iraq and all experiments were carried out in accordance with approved guidelines.

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