Original Article

Effect of Green Lean Body Capsules on Body Weight, Lipid Profile, and Renal Physiology and Histology in Albino Rats

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Abstract:

Background: Many anti-obesity medicines have been increased in recent years to solve the problem of obesity; among these medicines are Green Lean Body Capsules (GLBCs) which contain green plants and fruits extract.

Objective: This study was designed to evaluate the effects of daily oral consumption of GLBCs on level of serum lipids, renal function tests, and the histological structure of the kidney in albino rats.

Materials and Methods: Twenty adult albino male rats weighing 240-260 g were divided into 2 equal groups: control group and GLBCs-treated group. During the 4-weeks treatment, each rat in the GLBCs-treated group was orally administered with 20 mg/kg B.W. of GLBCs, while the control rats were orally administered with 0.1 ml D.W. Body weights were monitored at the beginning and at the end of the experimental period. Lipid profile [total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (HDL-C), very low-density lipoprotein cholesterol (VLDL-C) and low-density lipoprotein cholesterol (LDL-C)], renal function tests (blood urea and serum creatinine) ; in addition to the histological examination of the kidney were evaluated in all the rats.

Results: The results revealed that body weight gain was significantly ($P<0.05$) less in the GLBCs-treated rats than in the control rats. Results of the lipid profile showed that the levels of TC, TG, LDL-C and VLDL-C were significantly ($P<0.05$) lower while the level of HDL-C was significantly ($P < 0.05$) higher in the GLBCs-treated rats than that in the control rats. Regarding the renal function tests, the results revealed that blood urea and serum creatinine levels in the GLBCs-treated rats were significantly ($P<0.05$) lower than that in the control rats. However, microscopic examination of the kidney revealed that both the control and the GLBCs-treated groups presented similar type of histological manifestations.

Conclusion: The data presented in this study suggested that the compounds found in GLBCs may act synergistically to suppress body weight gain, decrease the level of serum lipids, and decrease the level of renal function tests without any histological abnormalities effect in the kidney.

Key words: Green lean body capsules, body weight, lipid profile, rats.

J Fac Med Baghdad
2014; Vol.56, No .4
Received Apri.2014
Accepted Sept.2014

Introduction:

According to data from the World Health Organization (WHO), more than one billion adults worldwide are overweight and at least 300 million of them are clinically obese. On a global scale, obesity has reached epidemic proportions and is a major contributor to the global burden of chronic disease and disability (1). The increasing prevalence and incidence of obesity and its associated negative health impact have increased the need for effective treatments. Many herbal medicines are developed in the markets to solve the problem of obesity; one of these herbal medicines is Green Lean Body Capsules (GLBCs) which are the new generation products and green weight reduction with fast result. The main compositions of GLBCs are koncing nut, Garcinia cambogia, konjaku extracts, apple, kiwi fruit, mannanfibre, and sweet potato cellulose (2). The green plants and the fruits extract that are found in GLBCs have the efficiency of weight reduction. A previous study has established that an inverse association exists between nut consumption and risk of overweight in human (3). It has been reported that nuts may assist in controlling body weight, perhaps via increased satiety levels, increased resting energy expenditure, or energy malabsorption (4). On the other hand, Garcinia cambogia extract, containing hydroxycitric acid (HCA), has been used as a dietary complement for weight management because of its potential to safely reduce food intake, body weight, and oxidative stress levels, potentially by affecting neuroendocrine pathways related to satiety (5). Regarding konjac mannan, a viscous glucomannan, is thought to prolong gastric emptying time, which increases satiety, reduces body weight, suppresses hepatic cholesterol synthesis, and increases the fecal elimination of cholesterol containing bile acids (6). It is a known fact that any food which is rich in dietary fiber is good for weight loss. Apple and kiwi fruit are very good sources of fiber. Presence of these fruits with mannanfibre and sweet potato cellulose in GLBCs is thought to play a major role in its weight-loss capacity. Findings from several previous studies (7, 8) support a beneficial role for dietary fiber intake in promoting weight loss and preventing weight gain through its effects on suppress appetite by inducing satiation and satiety. Although some herbal medicines are

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usually recommended for the treatment of obesity, numerous natural products are used indiscriminately to prevent or reduce weight gain; there are no studies of its therapeutic efficacy and safety. In view of this, the present study was carried out to investigate the effects of daily oral consumption of GLBCs on serum lipids, renal function tests and the histological structure of the kidney in albino rats.

Materials and Methods:

Twenty adult albino male rats (Rattus novergicus) weighing 240-260 g were obtained from animal's house of the Department of Biology, College of Science, Baghdad University. The animals were maintained at a constant temperature (25°C) and a 12:12-h light-dark cycle in plastic cages with free access to water and food. After 1 week of acclimation to the laboratory, rats were weighed, matched and divided into 2 groups: control group (n = 10) and GLBCs-treated group (n = 10). During the 4-week treatment, each rat of the GLBCs-treated group was daily and orally administered 20 mg/kg B.W. of GLBCs by use of intragastric tube, while the control rats were orally administered with 0.1 ml D.W. Body weights were monitored for all the rats at the beginning and at the ending of the experimental period. At the end of 28 days, rats were deprived of food overnight and then anesthetized. Blood samples were taken from the rats by heart puncture into plastic tubes. After centrifugation (3000 rpm, 10 minutes), sera were separated for biochemical assays. The rats were thereafter dissected and the kidney was taken for histological evaluation. Serum lipids concentrations were spectrophotometrically estimated using commercial kits (Biolabo SA, France). Total cholesterol (TC) and triglycerides (TG) were measured enzymatically (9), whereas the high-density lipoprotein cholesterol (HDL-C) was estimated by precipitation technique (10). According to Friedewald equation (11), very low-density lipoprotein cholesterol (VLDL-C) and low-density lipoprotein cholesterol (LDL-C) were calculated as: VLDL-C = TG/5 and LDL-C = TC - (VLDL-C + HDL-C). Determination of serum urea concentration was carried out using the colorimetric method (12) as described by the kit manufacturers (Biolabo SA, France). Serum creatinine was estimated using Jaffe reaction (13) and Human kit (Human Gasellschaft fur Biochemica und Diagnostica mbH, Germany) was used in this colorimetric method .For conventional microscopy, kidney sample were fixed by 10% neutral formalin and dehydrated in an ascending grade of alcohol (ethanol), and then embedded in paraffin wax. Serial sections of 5 microns thick were obtained using a rotatory microtome and then stained with hematoxylin and eosin (H&E). After that the sections were examined with a light compound microscope. Results are given as the mean ± SD. All analyses were made using the SPSS version 12. The statistical analysis included Student's t-test to examine the differences between the control group and the GLBCs-treated group. The differences were considered significant at $P < 0.05$.

Results:

The present study revealed that body weight did not differ between the control rats and the GLBCs-treated rats at the beginning of the experiment and increased gradually throughout the experimental period. However, body weight gain was significantly ($P < 0.05$) less in the GLBCs-treated rats than in the control rats (Table 1).

Table 1: Body weight changes in the rats of the control group and the green lean body capsules-treated group.

Body weight (g)	Control group (Mean ± SD)	Treated group (Mean ± SD)	P value
Initial body weight	250±6	255±7	NS
Final body weight	295±9	275±8	P<0.05
Body weight gain	45±7	20±5	P<0.05

Results of the serum lipids concentrations (Table 2) shows that the levels of TC, TG, LDL-C and VLDL-C in the GLBCs-treated rats were significantly ($P < 0.05$) lower than that in the control rats; while the level of HDL-C in the GLBCs-treated rats was significantly ($P < 0.05$) higher than that in the control rats.

Table 2: Serum lipids concentration in the rats of the control group and the green lean capsules-treated group.

Serum lipids concentration (mg/dl)	Control group (Mean ± SD)	Treated group (Mean ± SD)	P value
Total cholesterol	95±3	78±4	P < 0.05
Triglycerides	120±6	90±3	P < 0.05
HDL- cholesterol	35±3	44±3	P < 0.05
LDL- cholesterol	36±3	16±2	P < 0.05
VLDL- cholesterol	24±2	18±1	P < 0.05

Significant ($P < 0.05$) differences were found between the two experimental groups with regard to the renal function tests (Table 3). Blood urea and serum creatinine levels in the GLBCs-treated rats were lower than that in the control rats.

Table 3: Renal function tests in the rats of the control group and the green lean body capsules-treated group.

Renal function tests (mg/dl)	Control group (Mean ± SD)	Treated group (Mean ± SD)	P value
Blood urea	28±3	16±1	P < 0.05
Serum creatinine	0.8±0.3	0.4±0.2	P < 0.05

Light microscopic examinations revealed that the control rats had a normal morphology of the kidney (Figure 1). Also, there were no remarkable histological abnormalities observed in the kidney of the GLBCs-treated rats when compared with the control rats (Figure 2).

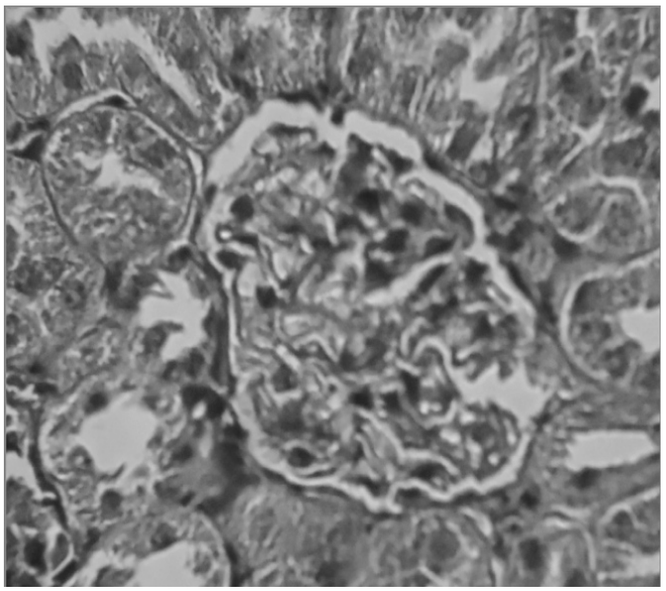

Figure1: Section of control rat kidney showing normal histology of the kidney (H&E 400x).

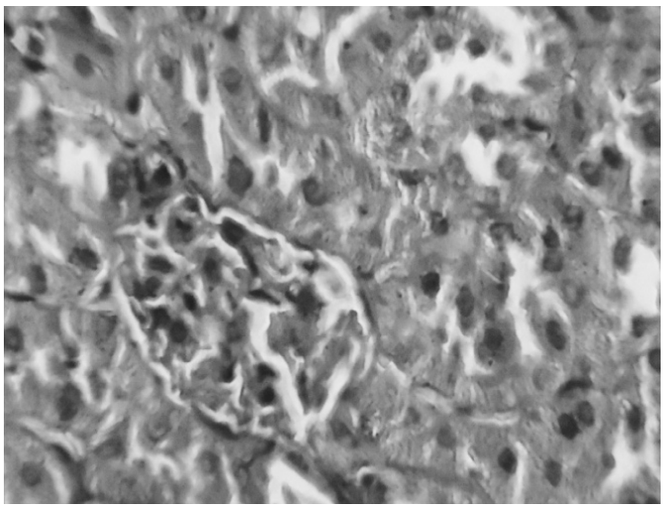

Figure 2: Section of rat kidney treated with green lean body capsules showing no obvious histological changes (H&E 400x).

Discussion:

Anti-obesity drugs are all pharmacological agents that reduce or control weight; these drugs operate through suppression of the appetite, increase of the body's metabolism, and interference with the body's ability to absorb specific nutrients in food (14). Animal models have proven useful in the study of obesity and the identification of novel anti-obesity drug targets. Drug-induced weight loss in such models commonly reflects effects in humans. However, their ability to predict potential side effects remains in question (15). Numerous natural products have been tested to aid in the difficult task of eating less than desired, by reducing hunger and/or increasing satiety (16). It is assumed that self-medication with "natural products" has increased considerably in recent years because the population in general believes that these drugs will not bring harm to health (17). Green Lean Body Capsules contain the fruits extract that have the efficiency of weight reduction. In this study, GLBCs were evaluated for their effects on weight loss, serum lipids, renal function tests and the histological structure of the kidney in albino rats. In comparison with the rats of the control group, the reduction in body weight gain in the rats of the GLBCs-treated group correlated with the decreased food intake observed in these rats during the experimental period. Low food intakes observed in the rats of the GLBCs-treated group may be explained by the swelling of fibers, as one component of this product, in the stomach and the small intestine achieving early satiety signals in these rats. This is attributed to the water-holding capacity and induced viscosity of soluble fibers. Dietary fibers, in particular viscous dietary fibers, have been shown to increase postprandial satiety and to decrease subsequent hunger (18); this may lead to decreases in energy intake and thereby in body weight. In the long term, dietary fibers may play a role in obesity prevention. Also, the weight reducing effect of GLBCs may be due to inhibition of lipogenesis in the treated rats which could be partially attributed to the presence of Garcinia cambogia extract which containing HCA; this acid has been shown to suppress de novo fatty acid synthesis and food intake, and decrease body weight gain (19). Levels of serum TC, TG, LDL-C and VLDL-C were found to be significantly reduced while the level of HDL-C was found to be significantly increased in the GLBCs-treated rats when compared with the control rats. The underlying mechanisms by which GLBCs exerts its cholesterol lowering effect may be due to a decrease in cholesterol absorption from the intestine by binding with bile acids and increasing bile acids excretion and/or decreasing the cholesterol biosynthesis especially by reducing the NADPH required for fatty acids and cholesterol synthesis (20).The hypolipidemic effect of GLBCs, which was noticed in this study, could be attributed to their components. According to a previous study, nuts are good sources of unsaturated fatty acids known for their favorable effects on blood lipids; evidence suggested that nuts reduce TC and LDL-C concentrations (21). Also; Konjac mannan, a viscous glucomannan, has demonstrated hypocholesterolemic effects which could be mediated by its viscosity, fermentability or both (22). In a previous study, Sood et al. (23) concluded that glucomannan appears to beneficially affect lipid profile and body weight. On the other hand, most of the investigations on

the health effects of apples have focused on their lipid-lowering effects. Aprikian et al. (24) found that when cholesterol fed rats were supplemented with lyophilized apples, there was a significant drop in TC and an increase in HDL-C; the authors suggested that the fiber in apples is thought to play a major role in its lipid-lowering capacities. The ability of soluble fibers to lower serum cholesterol has been stated due to different mechanisms: interfering with bile acid reabsorption, with cholesterol absorption/ reabsorption, and production of cholesterol-lowering fermentation by-products such as short-chain fatty acids (25). According to potential mechanisms of fiber action in the intestine, the hypotriglyceridemic effect may be related to an alteration in the rate of fat and glucose absorption, resulting in a reduced postprandial TG and VLDL-C levels (26). On the other hand, the HDL-C increasing effect of GLBCs may be attributed to its effect on the reverse cholesterol transport, a process whereby excess cell cholesterol is taken up and processed by HDL-C particles for further delivery to the liver for metabolism (27).The significant low concentrations of blood urea and serum creatinine in the GLBCs-treated rats indicated incidence of nutritional adequacy in these rats due to reduced feed intake especially lower protein intake. However, microscopic examination of the kidney revealed that both the control and the GLBCs-treated groups presented similar type of histological manifestations. In conclusion, the results of this study may suggest that the main components of GLBCs may act synergistically to suppress body weight gain, and decrease the obesity-related biochemical parameters.

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