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Impact of Methanolic Extract of Pomegranate (*Punica granatum* L.) Seeds on Serum Biomarkers in Wistar Rats Fed High Cholesterol and Fructose Diet

Ayat Osman [1], Ahmed Omer Alameen[1,2]*, Walieldin Elsadig Elmgboul[1], Ibrahim Ibokhadaim[2], Sameer Alhojaily[2], Saad Shousha[2, 3] and Osama Hassan Ahmed Ali[1]

[1]*Department of Physiology, Faculty of Veterinary Medicine, University of Khartoum, 13314, Shambat, Sudan.*
[2]*Department of Biomedical Sciences, College of Veterinary Medicine, King Faisal University, 31982 Al-Ahsa, Saudi Arabia.*
[3] *Department of Physiology, Faculty of Veterinary Medicine, Benha University, Benha, 3736, Egypt.*

Abstract

POMEGRANATE HAS a potent antioxidant effect and anti-atherosclerotic activities. Also, it has a protective effect on different organs, such as the liver, heart, and skeletal muscle in obese rat models. This study aims to investigate the effect of pomegranate seed methanolic extract on lipid profile, renal function, and some blood parameters in high cholesterol / high fructose-fed rats. Four groups of ten male Wistar rats, A, B, C, and D, were created from the forty rats. As a negative control, Group A was fed a basal rat diet for six weeks. while groups B, C, and D were provided with 2% cholesterol added to the basal rat diet and +20% fructose in drinking water for four weeks (group B served as a positive control). After two weeks, groups C and D received 500 and 1000 mg of pomegranate methanolic extract/kg b.w/day, respectively; blood samples were collected at weeks 0, 2, 3, and 5. Compared to group B, groups C and D's serum levels of urea, triglycerides, and total cholesterol had significantly decreased by the end of the experiment. Groups C and D exhibited higher HDL-C levels than Group B. In comparison to the other experimental groups, group C's serum creatinine levels dramatically dropped. The blood glucose levels in group D were much lower than in group B. The pomegranate seed extract positively influenced serum lipid profile and blood glucose and protected creatinine and urea levels in Wistar rats.

Keywords: hypercholesterolemia, pomegranate, fructose, Kidney.

Introduction

Elevated levels of LDL and total cholesterol in the blood are indicative of hypercholesterolemia [1]. It is a risk factor for cardiovascular diseases (CVD), such as atherosclerosis and myocardial infarction [2]. Hypercholesterolemia is typically due to a combination of environmental and genetic factors, such as the case of familial hypercholesterolemia [3]. A diet that lowers cholesterol is the first line of treatment for hypercholesterolemia. However, lipid-lowering medications may be necessary, especially in patients with hypercholesterolemia and concurrent coronary risk factors, as diet alone is typically insufficient to achieve optimal control [4].

Fructose is a monosaccharide that is found in a variety of disaccharides. It is the sweetest of all simple sugars [5]. One of the main reasons that fructose might cause hypertriglyceridemia in the postprandial state is that it is more lipogenic than glucose [6]. Studies on short-term hypercaloric eating have shown that fructose causes greater increases in insulin resistance, hypertriglyceridemia, and visceral fat than does a comparable amount of glucose [7]. Animal studies have shown that a diet high in fructose (60%) can cause obesity, insulin resistance, hypertriglyceridemia, hypertension, hyperuricemia, and an increase in body weight [8].

A higher risk of cardiovascular events is linked to kidney impairment [9]. A high-fat, high-carbohydrate diet increases of renal failure and chronic kidney disease [10]. Besides hypertension, a variety of medical conditions can have an impact on the kidneys [11].

*Corresponding authors: Ahmed O. Alameen, E-mail: aomer@kfu.edu.sa, Tel.: 00966549373708
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The Punicaceae family includes the pomegranate *(Punica granatum* L.), whom's name comes from the Latin words "Pomus" and "granum," which mean "apple with grains". It offers numerous nutritional and medicinal advantages [12-14]. The seeds, fruit, juice, and peel of the pomegranate are rich in bioactive compounds like ellagic acid, ellagitannins, punicalagin, punicic acid, flavonoids, anthocyanidins, anthocyanins, estrogenic flavonols, various fatty acids, and flavones, all of which have therapeutic properties [15]. Pomegranate seed oil is particularly valued for its high linoleic acid content, which is beneficial to health [12]. Recent research indicates that pomegranate may help treat various diseases when applied with different concentrations [16].

Therefore, this study aims to investigate how *Punica granatum L.* affects renal function and lipid profiles in relation to a diet high in fructose and cholesterol.

Material and Methods

Punica granatum

The fresh fruits were purchased from a local market, then washed and the seed dried. The seeds were extracted with methanol in the Soxhlet apparatus.

Methanolic Extract Preparation

The extraction process was done using the guidelines provided in reference [17]. 260 g of plant material was coarsely ground into powder using a mortar and pestle. 80% methanol was used to extract a coarse sample using a soxhlet extractor equipment. Extraction was done for almost five hours until the solvents' colour returned to being colourless at the final siphoning period. A rotating evaporator device was used to evaporate solvents at lower pressure. After allowing the extract to air dry in a Petri dish until it was scorched, the yield % was computed (Table 1).

Induction of hypercholesterolemia/ and metabolic syndrome

In groups B, C, and D, hypercholesterolemia and metabolic syndrome were induced by providing fructose in drinking water at a concentration of 20% [18]. The diet was also high cholesterol, prepared by adding egg yolk replaced (w/w) from the rat diet, calculated to supply cholesterol as 2% of the diet [19].

Making fructose-based drinking water

Fructose 20% of drinking water was freshly prepared every other day; 20 g of fructose was diluted in 100 ml of tap water [18].

Experimental design

Forty adult male Wistar albino rats were purchased from the Experimental Animal Unit, Faculty of Veterinary Medicine, University of Khartoum, Shambat, Sudan. 14 days of acclimation, rats were placed into four groups, each with 10 rats. In Group A, distilled water and a conventional rat meal were provided as a negative control. A high-cholesterol diet and 20% fructose in their drinking water were given to Group B (positive control). Group C was given an oral dose of 500 mg of pomegranate methanolic extract in addition to a high-cholesterol diet and 20% fructose in their drinking water. Group D received an oral dose of 1000 mg of pomegranate methanolic extract in addition to a high-cholesterol diet and 20% fructose in their drinking water. The experiment lasted for six weeks. Each group was housed in two cages. Group A continued the standard diet for six weeks, while Groups B, C, and D were on the high cholesterol and fructose diet for four weeks. Groups C and D were administered low and high doses of pomegranate methanolic extract, respectively, for the final two weeks.

Samples Collection

The rats were comfortable and restrained, and the collection area was scrubbed with disinfectant (70% ethanol). Before sampling, a topical local anaesthetic, Lidocaine 1%, was applied to the eye. Blood samples were collected four times during the experimental period from all groups at weeks 0, 2, 3, and 5 using the capillary tube from the orbital plexus.

The 40 blood samples were allowed to clot in each collection, then centrifuged at 3000 rpm for 10 minutes. The serum was separated and used to determine the biochemical parameters.

Blood Metabolites

According to Allain [20], the enzymatic approach was used to determine the serum cholesterol levels using a commercial kit (Biosystem, Spain). Serum triglycerides concentration was estimated by the enzymatic method using a commercial kit (Biosystem, Spain) according to the method described by Fassati and Prencipe [21]. Serum HDL concentration was determined by the enzymatic Spectrophotometric method described by Burstein [22]. The concentration of LDL was determined using enzymatic spectrophotometric methods, as described by Assmann [23]. Glucose concentration was determined by enzymatic method using a kit (Spinreact, S. A., Spain) according to the method described by Trinder [24]. Serum urea was determined by the colourimetric method, as Evan [25] described using commercial kits (SPINREACT, SPAIN). The serum creatinine concentration was determined by commercial kits (SPINREACT, SPAIN).

Statistical Analysis

SAS version 9.12 was used to conduct analysis of variance (ANOVA) tests on the data for the Complete Randomised Block Design (CRBD)

experiment. Means were separated according to Duncan's multiple range test. Significance was accepted at $p \leq 0.05$.

Results

Total cholesterol (mg/dl)

The data showed no substantial difference in cholesterol concentrations after two weeks of feeding high cholesterol and high fructose. Serum total cholesterol levels were numerically higher at week 2 compared to week zero in all groups, especially the treated one. At week four, serum TC was considerably ($P \leq 0.001$) lower in group D (high dose) compared to other experimental groups. In group C, the level of serum TC was non-significantly different compared to group A but significantly lower compared to group B, as shown in Figure 1.

Triglycerides (mg/dl)

Serum TG was remarkably ($P \leq 0.001$) increased in groups B, C, and D compared to control group A (after feeding high cholesterol and high fructose diet). At week four, the serum TG was notably ($P \leq 0.05$) higher in group B compared to other experimental groups. Notably, Figure 2 displays no discernible variations between groups A, C, and D.

Low-density lipoproteins (mg/dl)

At week two, the serum LDL was significantly ($P \leq 0.01$) increased in groups B, C, and D compared to low-density lipoproteins in the control group (A). At week four, the serum LDL was substantially ($P \leq 0.05$) lower in groups C and D (received the treatment) compared to group B. However, as Figure 3 illustrates, there were no appreciable variations between the pomegranate-treated and control groups.

High-density lipoproteins (mg/dl)

The serum HDL level did not show any significant differences between all experimental groups (after feeding high cholesterol and high fructose diet). At week four, after receiving pomegranate, the serum HDL was considerably ($P \leq 0.05$) decreased in group B compared to other experimental groups. Group C had the highest serum HDL, as seen by Figure 4, despite the fact that there were no discernible variations in HDL between groups A, C, and D.

Creatinine (mg/dl)

After two weeks of feeding high cholesterol and high fructose diet, all experimental groups had no significant differences in serum creatinine levels. However, the serum creatinine was increased numerically in groups B, C, and D compared to the control group (A). At the end of the experiment, the serum creatinine was substantially ($P \leq 0.05$) decreased in group C (received a low dose of pomegranate) compared to other experimental groups shown in Table 2.

Urea (mg/dl)

In week two (after two weeks of feeding high cholesterol and high fructose diet), all experimental groups showed no significant differences in serum urea levels. At week four, after receiving pomegranate, the serum urea was remarkably ($P \leq 0.05$) lower in groups C and D compared to group B. No considerable differences were noticed between the pomegranate-treated groups and the control one. Even though the treated groups showed numerically lower values than the control groups (Table 3).

Blood glucose (mg/dl)

In comparison to the control group (A), groups B, C, and D had significantly ($P < 0.001$) higher blood glucose levels at week two (after feeding a high-cholesterol and high-fructose diet). Figure 5 illustrates how group D's blood glucose levels at the end of the trial were considerably ($P < 0.001$) lower than group B's.

Discussion

Dyslipidemia is a disorder of lipoprotein metabolism characterized by increased levels of total cholesterol, triglycerides, and low-density lipoprotein cholesterol and decreased levels of high-density lipoprotein cholesterol [26]. Hyperlipidemia is known as the greatest risk factor contributing to the prevalence and severity of coronary heart disease [27].

In the present study, pomegranate treatment significantly decreased total serum cholesterol levels (TC), particularly in group D, compared to the other groups. Pomegranate seed extract has been suggested to lower total cholesterol (TC). This might be achieved by reducing intestinal absorption of cholesterol or encouraging the liver's breakdown of cholesterol into bile. Tannins found in pomegranate seeds have been shown to significantly decrease pancreatic lipase activity and the intestinal absorption of fat [28]. This result was consistent with another study that found that rats fed a high-cholesterol diet and treated for 60 days with either ellagic acid or the juice or seed extract of either Saudi or Egyptian pomegranates had a significant reduction in their cholesterol levels [1]. Additionally, it demonstrated that rats given 500 mg/kg of pomegranate seed extract orally for eighteen days had a significant drop in serum total cholesterol [29]. Nevertheless, these results and the current one disagree with the finding that the serum cholesterol level is not significantly affected in healthy humans who consumed 500 ml of pomegranate juice daily for two weeks [30]. Noteworthy, some studies concluded showed that pomegranate might reduce TC [31] [32].

In the current investigation, pomegranate seed extract treatment resulted in a substantial drop in blood triglyceride levels (TG) compared to the positive control. Rich in polyunsaturated fatty acids,

pomegranate seed oil contains punicic acid, which is known to cause hypolipidemia by inhibiting fatty acid synthase and so reducing TG synthesis in the liver [30]. These results were in line with those obtained which showed that the level of triglycerides decreases significantly in response to pomegranate juice administration (5ml/Kg B.wt) for 8 weeks in hyperlipidemia rats [33]. The present results aligned with the research that shown a significant reduction in total cholesterol (TG) in rats fed a high-cholesterol diet and treated with ellagic acid or juice or seed extract of either Saudi or Egyptian pomegranates for a duration of 60 days [1]. However, it also demonstrated that patients with Type 2 Diabetes who took 5 mg of pomegranate seed powder twice a day for eight weeks did not exhibit significantly different triglyceride levels [34].

In the current study, serum low-density lipoproteins level (LDL) was not significantly affected by the two concentrations of pomegranate. This result is consistent with the finding that serum LDL was affected considerably in healthy humans who consumed 500 ml of pomegranate juice daily for two weeks [30]. Also, this finding agrees which showed that LDL in hyperlipidemia subjects who received 400 mg of pomegranate seed oil twice daily for 4 weeks dose not significantly affected [35]. Furthermore, the current finding disagrees which showed that the level of LDL significantly decreased in hypercholesterolemia rats who received a diet supplemented with 5% pomegranate seed oil for 28 days [36]. In the current investigation, pomegranate treatment considerably raised high-density lipoproteins (HDL) serum levels, particularly in group C. This increase may be because pomegranate possesses antioxidants that enhance the expression of genes related to HDL-C metabolism and function. According to a recent study, mice with a diet rich in cholesterol and ellagic acid or the juice or seed extract of either Saudi or Egyptian pomegranates for 60 days had a considerably higher amount of high-den lipoproteins [1]. However, it disagrees with the finding, which showed that the level of HDL does not significantly increase with 400 mg of pomegranate seed oil twice daily for 4 hyperlipidaemiclipidamic subjects [35]. Gallic and linoleic acids, which are found in pomegranate seeds, are known to reduce LDL-c, triglycerides, and total cholesterol in obese rats [37]. Several studies showed that pomegranates have potent hypolipidemic effects. Despite this, some studies showed controversial findings. This might be due to different intervention durations, samples and dissimilar doses of pomegranate. Also, different pomegranate products from various countries might not have the same effective phytochemical constituents for lipid profiles.

The findings showed that blood glucose levels were abolished in response to the pomegranate treatment, particularly in group D. This decrease in blood glucose level suggested that bioactive pomegranate could act on peripheral tissues by improving glucose uptake via the glucose transporter GLUT4. Noteworthy, pomegranate seeds have increased insulin secretion and upregulate and activate the glucose transporter type 4 expressions [37]. These outcomes are consistent with research that showed pomegranate seed powder (5 g twice a day) treatment for eight weeks dramatically lowers blood glucose levels in type 2 diabetes patients [37]. These findings contradict those that claimed that when diabetic rats were administered 5 mg/kg B. wt or 100 mg of pomegranate seed powder in 1 mL of distilled water every day for 21 days, there was no discernible change in blood glucose levels [38]. The findings are described due to the doses used in the current study and the previous ones. This could be evidenced in the current study since the low dose (500 mg/kg B. wt) did not affect the blood glucose concentration.

In the present study, serum urea levels decreased substantially ($P<0.05$) after administering pomegranate seed extract compared to the control. This decrease may be because pomegranate possesses potent antioxidant properties, which inhibit lipid peroxidation and reactive oxygen species production. Reactive oxygen species are involved in many organs' toxicity. Reactive oxygen species (ROS) inhibited Na+ /K+ pump activity in various tissues including the brain, kidney, and myocardium pomegranate polyphenols act as protection against reactive oxygen species [39]. These results were in line with the findings reported that serum urea significantly decreased in rats, who suffered from nephrotoxicity induced by hexachlorobutadiene, then treated with pomegranate seed oil using 3 doses (0.16, 0.32, and 0.64 mg/k Bwt) [40]. Furthermore, pomegranate seed oil using two concentrations (0. 4 and 0.8 mL/kg Bwt) for 3 days has been found to cure nephrotoxicity induced by mercuric chloride as indicated by decreasing serum urea significantly [41]. Nevertheless, the current finding and the supporting ones in the literature disagree with that report, which found that serum urea significantly increased in rats that received oral administration of 3 ml/day of pomegranate juice for 21 days [42].

In the current study, serum creatinine levels significantly decreased, the decrease in group C received a low dose of pomegranate extract (500mg) compared to other groups. Suggested the preventing effect of pomegranate extract could be related to the antioxidant properties of their active components. This result was in line with the findings reported that serum creatinine significantly decreased in rats who received oral administration of 3 ml/kg pomegranate juice for 21 days [42]. In the same contrast, the high level of serum creatinine due to nephrotoxicity induced by mercuric chloride in rats was

significantly decreased by pomegranate seed oil using two concentrations (0. 4 and 0.8 mL/kg Bwt) for 3 days [41]. The mechanism of the effect of pomegranate seed on kidney function is unknown. Because pomegranate seeds have the highest antioxidant activity and shield our cells from free radical damage, it is suggested that they prevent kidney function. Free radicals are created when exposed to harmful environmental contaminants and sunlight.

Conclusion

The results of this study indicate that Punica granatum seed extract is a hypocholesterolemic agent, as evidenced by the reduction of serum total cholesterol, LDL-C, and triglycerides and the elevation of HDL-C. The effects of pomegranate are most pronounced when a high dose of 1000 mg is administered. The results showed a good picture of renal function, as reduction of serum urea levels and serum creatinine, low dose (500mg) of pomegranate was the better dose decreased level of serum urea. The results showed a reduction in blood glucose level when administering a high dose (1000mg) of pomegranate.

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Declaration of Conflict of Interest

The authors declare that there is no conflict of interest.

Author's contribution

This work was carried out in collaboration among all authors. Authors Ayat and Osama Hassan designed the experiment. Authors Ayat and Walli Eldin performed the experiment, Osama Hassan and Ahmed Omer performed the statistical data analysis and wrote the first version of the manuscript. Authors Ibrahim, Samir and Saad commented on the previous version of the article and revised it. All authors read and confirm the final version of the manuscript.

Ethical of approval

The experiment was ethically approved by the Faculty of Veterinary Medicine, University of Khartoum research committee, according to the National Research Council guide for the care and use of laboratory animals (NRC, 2011).

TABLE 1. Weight of extract obtained / weight of plant sample X 100

Sample name	Weight of plant (g)	Weight of extract (g)	Yield (%)
***Punica granatum* seeds**	260	174.56	67.14

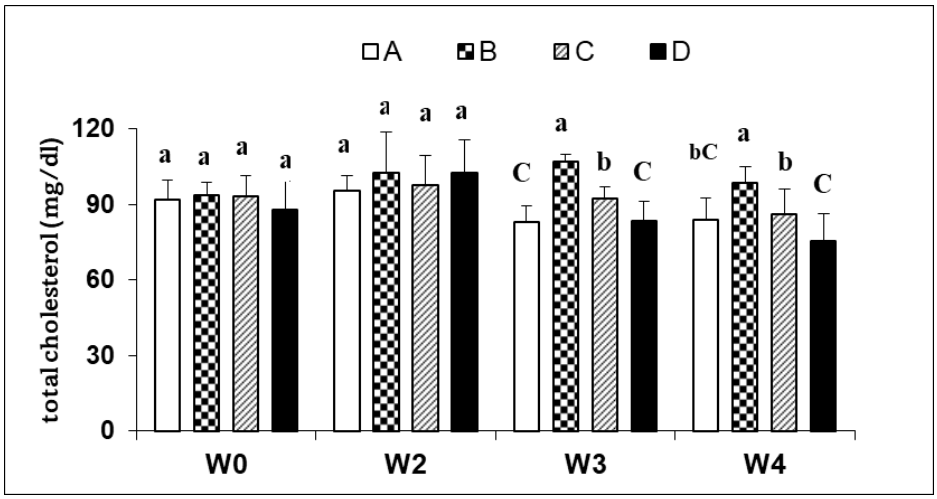

Fig. 1. Effect of *Punica granatum* seed methanolic extract on serum total cholesterol levels (mg/dl) in Wistar Albino rats fed high cholesterol/fructose diet. A ≡ Rats fed basal diet (Negative control group), B ≡ Rats fed high cholesterol (2%) diet and high fructose (20%) (Positive control group), C ≡ Rats fed high cholesterol (2%) and fructose (20%) diet and administered with low dose (500 mg/kg Bwt/day) of pomegranate, and D ≡ Rats fed high cholesterol and fructose diet and administered with high dose (1000mg/kg Bwt/day) of pomegranate. The mean ± S.E. is used to express values. Superscript differences between columns indicate a remarkable difference (P ≤ 0.05).

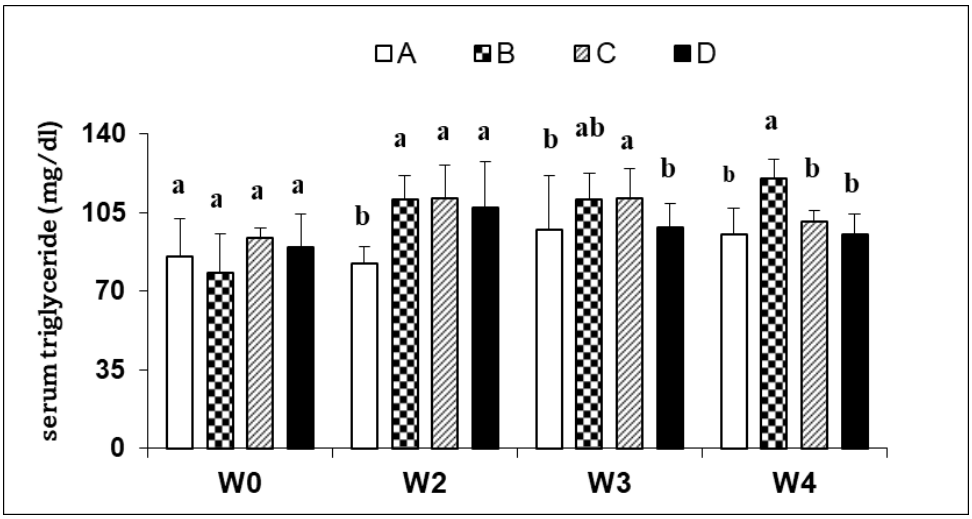

Fig. 2. Effects of Punica granatum seed methanolic extract on serum triglycerides levels (mg/dl) in Wistar Albino rats fed high cholesterol/fructose diet. A ≡ Rats fed basal diet (Negative control group), B ≡ Rats fed high cholesterol (2%) diet and high fructose (20%) (Positive control group), C ≡ Rats fed high cholesterol (2%) and fructose (20%) diet and administered with low dose (500 mg/kg Bwt/day) of pomegranate, and D ≡ Rats fed high cholesterol and fructose diet and administered with high dose (1000mg/kg Bwt/day) of pomegranate. The mean ± S.E. is used to express values. Superscript differences between columns indicate a remarkable difference (P ≤ 0.05).

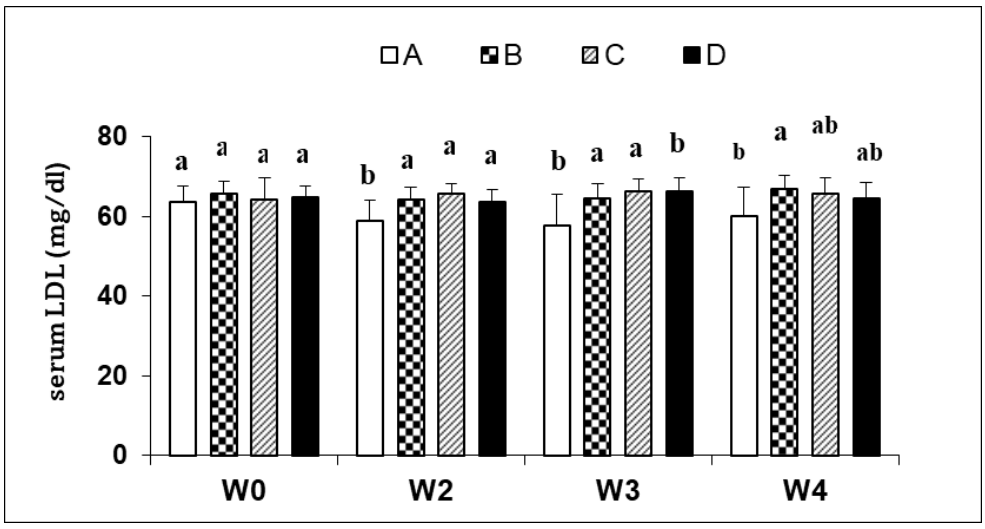

Fig. 3. Effects of Punica granatum seed methanolic extract on serum low-density lipoproteins levels (mg/dl) in Wistar Albino rats fed high cholesterol/fructose diet. A ≡ Rats fed basal diet (Negative control group), B ≡ Rats fed high cholesterol (2%) diet and high fructose (20%) (Positive control group), C ≡ Rats fed high cholesterol (2%) and fructose (20%) diet and administered with low dose (500 mg/kg Bwt/day) of pomegranate, and D ≡ Rats fed high cholesterol and fructose diet and administered with high dose (1000mg/kg Bwt/day) of pomegranate. The mean ± S.E. is used to express values. Superscript differences between columns indicate a remarkable difference (P ≤ 0.05).

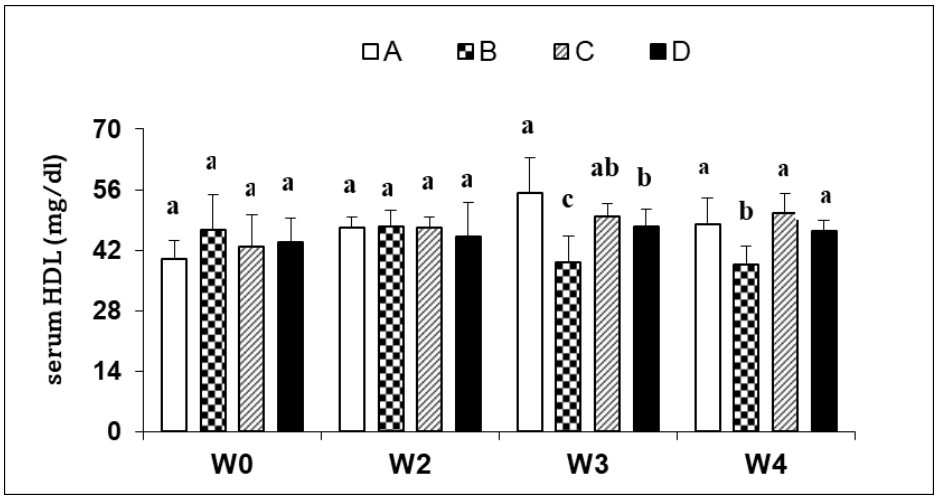

Fig. 4. Effects of Punica granatum seed methanolic extract on serum high-density lipoproteins levels (mg/dl) in Wistar Albino rats fed high cholesterol/fructose diet. A ≡ Rats fed basal diet (Negative control group), B ≡ Rats fed high cholesterol (2%) diet and high fructose (20%) (Positive control group), C ≡ Rats fed high cholesterol (2%) and fructose (20%) diet and administered with low dose (500 mg/kg Bwt/day) of pomegranate, and D ≡ Rats fed high cholesterol and fructose diet and administered with high dose (1000mg/kg Bwt/day) of pomegranate. The mean ± S.E. is used to express values. Superscript differences between columns indicate a remarkable difference (P ≤ 0.05).

TABLE 2. Effects of Punica granatum seed methanolic extract on serum creatinine levels (mg/dl) in Wistar Albino rats fed high cholesterol/fructose diet.

Weeks	Treatments				S.L
	A	B	C	D	
W0	0.77^{a}±0.05	0.78^{a}±0.17	0.68^{a}±0.23	0.7^{a}±0.14	N.S
W2	0.86^{a}±0.26	1.05^{a}±0.16	0.99^{a}±0.2	0.86^{a}±0.22	N.S
W3	0.81^{a}±0.2	1.1^{a}±0.34	0.98^{a}±0.18	1.02^{a}±0.17	N.S
W4	0.94^{a}±0.17	1.01^{a}±0.345	0.69^{b}±0.18	1.01^{a}±0.15	*

The mean ± S.D is used to express values. There is a considerable difference (P ≤ 0.05) between the average of the columns with distinct superscript letters. ***: P ≤ 0.001≡ highly significant, N.S: Not significant. **A** ≡ Rats fed basal diet (Negative control group), **B** ≡ Rats fed high cholesterol (2%) diet and high fructose (20%) (Positive control group), **C** ≡ Rats fed high cholesterol (2%) and fructose (20%) diet and administered with low dose (500 mg/kg Bwt/day) of pomegranate, and **D** ≡ Rats fed high cholesterol and fructose diet and administered with high dose (1000mg/kg Bwt/day) of pomegranate.

TABLE 3. Effects of Punica granatum seed methanolic extract on serum urea levels (mg/dl) in Wistar Albino rats fed high cholesterol/fructose diet.

Weeks	Treatments				S.L
	A	B	C	D	
W0	43.33^{a}±10.46	38.30^{a}±3.91	38.00^{a}±4.71	40.8^{a}±8.05	N.S
W2	38.20^{a}±4.70	35.56^{a}±2.78	38.22^{a}±3.15	38.87^{a}±6.12	N.S
W3	37.20^{b}±4.26	43.50^{a}±6.18	32.22^{b}±3.66	35.17^{b}±6.82	**
W4	33.66^{b}±7.12	39.28^{a}±4.60	31.22^{b}±4.05	31.83^{b}±3.92	*

The mean ± S.D is used to express values. There is a considerable difference (P ≤ 0.05) between the average of the columns with distinct superscript letters. ***: P ≤ 0.001≡ highly significant, N.S: Not significant. **A** ≡ Rats fed basal diet (Negative control group), **B** ≡ Rats fed high cholesterol (2%) diet and high fructose (20%) (Positive control group), **C** ≡ Rats fed high cholesterol (2%) and fructose (20%) diet and administered with low dose (500 mg/kg Bwt/day) of pomegranate, and **D** ≡ Rats fed high cholesterol and fructose diet and administered with high dose (1000mg/kg Bwt/day) of pomegranate.

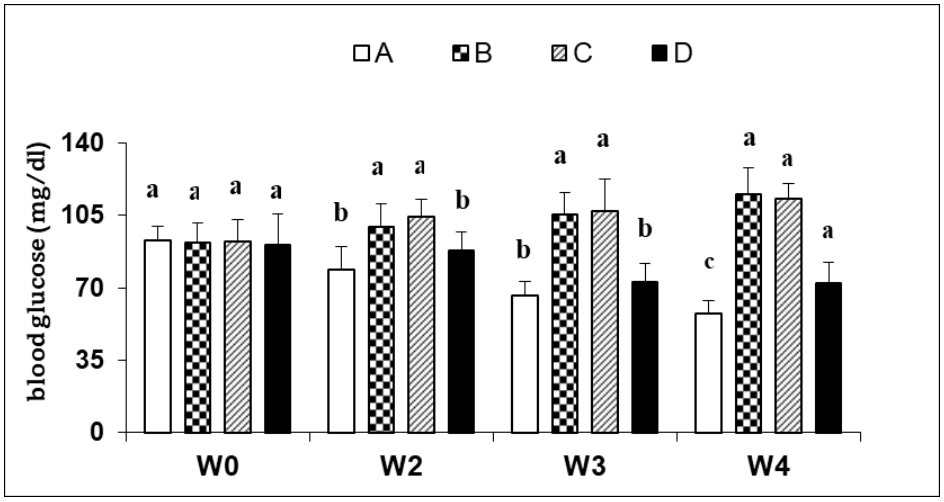

Fig. 5. Effects of Punica granatum seed methanolic extract on blood glucose level (mg/dl) in Wistar Albino rats fed high cholesterol/fructose diet. A ≡ Rats fed basal diet (Negative control group), B ≡ Rats fed high cholesterol (2%) diet and high fructose (20%) (Positive control group), C ≡ Rats fed high cholesterol (2%) and fructose (20%) diet and administered with low dose (500 mg/kg Bwt/day) of pomegranate, and D ≡ Rats fed high cholesterol and fructose diet and administered with high dose (1000mg/kg Bwt/day) of pomegranate. The mean ± S.E. is used to express values. Superscript differences between columns indicate a remarkable difference (P ≤ 0.05).

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تأثير المستخلص الميثانولي لبذور الرمان (*Punica granatum* L.) على نسبة الدهون في الدم ووظيفة الكلى في فئران ويستار التي تغذت على نظام غذائي عالي الكوليسترول والفركتوز

ايات عثمان[1]، احمد عمر الأمين [*1،2]، والي الدين الصادق المقبول[1]، إبراهيم البوخضيم[2]، سمير الحوجلي[2]، سعد شوشا[2،3] وأسامة حسن احمد علي[1]

[1] قسم الفسيولوجيا - كلية الطب البيطري - جامعة الخرطوم – 13314 – شمبات - السودان.

[2] قسم العلوم الطبية الحيوية - كلية الطب البيطري - جامعة الملك فيصل - 31982 الأحساء - المملكة العربية السعودية.

[3] قسم الفسيولوجيا - كلية الطب البيطري - جامعة بنها – بنها – 3736 - مصر.

الخلاصة

الرمان له تأثير قوي كمضاد للأكسدة و له أنشطة مضادة لتصلب الشرايين. كما أن له تأثيرًا وقائيًا على الأعضاء المختلفة مثل الكبد والقلب والعضلات الهيكلية في نماذج الفئران السمينة. تهدف هذه الدراسة إلى معرفة تأثير المستخلص الميثانولي لبذور الرمان على كمية الدهون ووظيفة الكلى وبعض مؤشرات الدم في الجرذان التي تتغذى على نسبة عالية من الكوليسترول/الفركتوز. تم تقسيم أربعين من جرذان ويستار إلى أربع مجموعات، A، B، C، وD، بواقع 10 فئران لكل مجموعة. تم إعطاء المجموعة (أ) نظامًا غذائيًا أساسيًا للفئران لمدة ستة أسابيع وكان بمثابة مجموعة تحكم سلبية، في حين تم تزويد المجموعات (ب) و(ج) و(د) بإضافة 2٪ من الكوليسترول إلى النظام الغذائي للفئران الأساسية و+20٪ فركتوز في مياه الشرب لمدة أربعة أسابيع (كانت المجموعة B بمثابة سيطرة إيجابية). وبعد أسبوعين، تلقت المجموعتان C و D 500 و1000 ملجم من مستخلص ميثانول الرمان/كجم من وزن الجسم/اليوم على التوالي؛ تم جمع عينات الدم في الأسابيع 0 و2 و3 و5. في نهاية التجربة، أظهرت المجموعتان C و D انخفاضًا ملحوظًا في مستويات الكوليسترول الكلي والدهون الثلاثية واليوريا في الدم مقارنة بالمجموعة B. وأظهرت مستويات HDL-C زيادة كبيرة في المجموعتين C و D مقارنة بتلك الموجودة في المجموعة B. انخفضت مستويات الكرياتينين في الدم بشكل ملحوظ في المجموعة C مقارنة بالمجموعات التجريبية الأخرى. انخفضت مستويات الجلوكوز في الدم بشكل ملحوظ في المجموعة D مقارنة بالمجموعة B. أثر مستخلص بذور الرمان بشكل إيجابي على مستوى الدهون في الدم ومستوى الجلوكوز في الدم ومستويات الكرياتينين واليوريا المحمية في فئران ويستار.

الكلمات المفتاحية: فرط كوليسترول الدم، الرمان، الفركتوز، الكلى.