



Effects of Extracted Phenolic Compounds from Grape Seeds on Leptin, Adiponectin and Resistin Levels in Rats Fed with High Fat Foods

Entedhar Rifaat Sarhat¹, Husamuldeen Salim Mohammed Saeed¹, Siham A. Wadi²

¹ Department of Basic Medical Science, Dentistry College, University of Tikrit, Tikrit, Iraq

² Department of Pharmacology, Collage of Veterinary Medicine, University of Tikrit, Tikrit, Iraq

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Corresponding Author:

Name: Siham A. Wadi

E-mail:

Sihamwadee@tu.edu.iq

Tel:

Affiliation:

Abstract

The current study was constructed to evaluate the efficacy of grape seed extracts (GSE) in management of obesity induced by high fat diet (HFD)-induced obesity in rats through assessment of the serum leptin, adiponectin, and resistin. Experimental rats were divided into three groups: G:1 (healthy control), G:2 (obese control), G:3 (received 100 mg/kg of GSE), after 7 weeks, serum leptin, adiponectin, and resistin levels were measured in all groups.

Results in present study showed a significant ($P < 0.01$) increase of serum leptin, and resistin levels in obese rats G2 in comparison to the control healthy rats G1 (39.35 ± 1.07 vs 7.48 ± 0.6), (48.84 ± 3.73 vs 31.43 ± 2.02) respectively. The level of serum leptin, and resistin in obese rats decreased significantly in G3 ($P < 0.01$) when received GSE 100 mg/kg body weight for 7 weeks in regard to G2 (30.46 ± 0.93 vs 39.35 ± 1.07), (42.23 ± 1.21 vs 48.84 ± 3.73), whereas significant decrease in serum adiponectin level in obese rats G2 to G1 (4.8793 ± 0.5040 vs 9.245 ± 0.8794). After treatment with 100 mg/kg GSE, the level of adiponectin decreased in G3 compared with G2 (6.1220 ± 0.6330 vs 4.8793 ± 0.5040).

Conclusions: The results show that, the phenolic extracts of grape seed could reduce serum leptin, and resistin levels and increase adiponectin in HFD induced obesity in rats.

Introduction

Obesity has reached truly epidemic proportions worldwide and has become one of the most prevalent health problems that our world currently faces[1]. Grape seed (*Vitisvinifera* Linn.) is one of the most important bioflavonoid having great therapeutic potential, it is represents a source of various vitamins, minerals, and polyphenols including flavonoids, proanthocyanidins, and procyanidins. GSE exhibits potent intestinal alpha glucosidase and pancreatic α -amylase inhibitors[2,3].

The present study was therefore conducted to determine the effect of GSE the levels of leptin, adiponectin, and resistin in HFD induced obesity in rats.

Materials and Methods

Animals (adult wister albino) rats weighing 120–150g were purchased from the disease-free stock of the animal house of the Faculty of Veterinary Medicine,

University of Tikrit, animals of control group were feed on a HFD and water ad libitum.

The animals were divided into 3 groups each group consists of 10 animals:

G 1: Consists of rats treated with normal diet.

G2: Obese group received HFD for 49 days.

G 3: Obese group received 100 mg/kg of GSE orally three times per week for 7 weeks[4].

High-Fat Diet Formula:

HFD that consists of 58% fat, 25% protein and 17% carbohydrate, lard (13%), cholesterol (1%), vitamin, and minerals (0.6%) as a percentage of total kcal ad libitum, respectively, was administered every[5]. Food intake was calculated every day and bodyweight was measured once in every two days.

Phenolic extraction of grape seeds

(500 g) of the dry powder wall nuts were defatted by washing five times with n-hexane(1L) at (60°C), then it was macerated with (800mL) of acetic acid (2%

v/v), the mixture were placed in conical flask volume (2000mL) and put in water bath (60°C) for 8 hrs, then the extraction process done by reflex condenser. The mixture was heated at 50°C (water bath) for 15 min and left to cool. The suspension was filtered by Buchner funnel by Whatman No.1 filter paper and by the use of vacuum pump. The precipitate was canceled and the filtrate volume was measured. n-propanol was added in to filtrate with the same volume of filtrate. Then (NaCl) was added until to become solution super saturated. Then, it was evaporator by using rotary evaporator until drying[5].

Results

The results of the recent study shown that, there is a significant increase in BMI, leptin and resistin levels (levels decreased in G2 with respect to the G1) (0.341 ± 0.097 vs 0.269 ± 0.097 kg/m²), (39.35 ± 1.07 vs 7.48 ± 0.6 , pg/ml) and (48.84 ± 3.73 vs 31.43 ± 2.02 ng/ml) respectively, whereas decreased adiponectin level in G2 in regard to G1 (4.8793 ± 0.5040 vs 9.245 ± 0.8794 pg/ml). Furthermore, there is a significant decrease in BMI, leptin and resistin levels of G3 versus G2 (0.308 ± 0.097 vs 0.341 ± 0.097 kg/m²), (30.46 ± 0.93 vs 39.35 ± 1.07 pg/ml), and (42.23 ± 1.21 vs 48.84 ± 3.73 ng/ml) respectively, whereas increase adiponectin level in G3 in regard to G2 (6.1220 ± 0.6330 vs 4.8793 ± 0.5040 pg/ml) (Table 1), (Fig.1).

Table (1): Effect of grape seeds extract on leptin, adiponectin and resistin levels in HFD obese rat

Group	BMI (kg/m ²)	Leptin (pg/ml)	Adiponectin (pg/ml)	Resistin (ng/ml)
Lean group	0.269 ± 0.097	7.48 ± 0.6	9.245 ± 0.8794	31.43 ± 2.02
Obese group	0.341 ± 0.097^b	39.35 ± 1.07^a	4.8793 ± 0.5040^a	48.84 ± 3.73^c
Obese+ GSD group	0.308 ± 0.097^a	30.46 ± 0.93^c	6.1220 ± 0.6330^b	42.23 ± 1.21^c

^a $P < 0.01$, ^b $P < 0.01$, ^c $P < 0.0001$

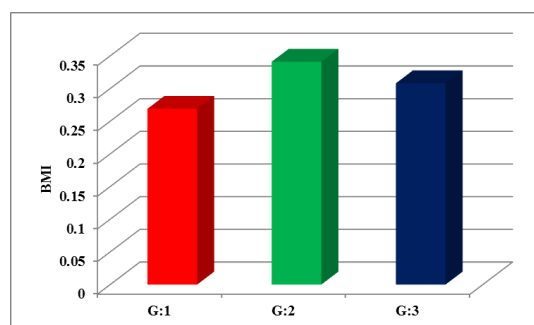


Figure 1: BMI of rats treated with grape seeds extract

Discussion

In the present study, the treatment of G3 with the GSE elicited significant decrease in serum leptin and resistin, whereas increase in adiponectin level.

Adiponectin is an antiatherogenic agent that attenuates cardiovascular risk which may be attributed to its anti-inflammatory properties. It inhibits endothelial adhesion and dysfunction, because it suppresses the expression of "LDL scavenger receptors" on macrophages, thus lowering LDL uptake and plaque formation[6,7]. Contrary to leptin and resistin, adiponectin improves insulin sensitivity, and its concentration in serum is inversely

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proportional to visceral adiposity level. Obese patients with inherited hypo adiponectinemia developed a pattern of leptin resistance followed by insulin resistance, dyslipidemia and cardiovascular disease [8,9].

Resistin is implicated in pathogenesis of insulin resistance by induction of 50 AMP-activated kinase-dependent protein leading to increase of gluconeogenesis through glucose-6-phosphatase, phosphoenolpyruvate carboxykinase, elevation of fatty acid esterification of triglycerides and initiation of fatty acids biosynthesis via acetyl - CoA carboxylase-1 as well. Thus, interestingly GSE treatment decreased glucose-6- phosphatase and phospho enolpyruvate carboxy kinase gene expression in C57BL/6 mice fed high-fat diet, which reduced gluconeogenesis and improved insulin sensitivity, like metformin's mode of action in the treatment of insulin resistance[10,11].

Conclusion

This study showed that GSE can significantly reduce serum leptin, and resistin with an increase in adiponectin level in HFD induced obesity in rats.

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تأثيرات مركبات الفينول المستخلصة من بذور العنب على مستويات الليبتين والاديبونكتين والريزستين في الجرذان التجارب المسممة بغذاء عالي الدهون

انتظار رفعت سرحت¹ ، حسام الدين سالم محمد سعيد¹ ، سهام عجمي وادي²

¹ فرع العلوم الطبية الأساسية ، كلية طب الأسنان ، جامعة تكريت ، تكريت ، العراق

² فرع الأدوية ، كلية الطب البيطري ، جامعة تكريت ، تكريت ، العراق

الملخص

اجريت هذه الدراسة لتقييم فاعلية مستخلص بذور العنب في علاج السمنة المستحدثة في فئران تجارب تعرضوا لغذاء عالي الدهون وذلك من خلال قياس مستويات كل من الليبتين والاديبونكتين والريزستين في مصل الفئران. تم تقسيم حيوانات التجربة الى ثلاث مجاميع : المجموعة الاولى ضمت حيوانات سليمة كعينة ضابطة والمجموعة الثانية ضمت حيوانات مسممة كعينة ضابطة ايضا اما المجموعة الثالثة فقد كانت حيوانات مسممة ايضا وتم اعطاؤها مستخلص بذور العنب. بعد مضي ثلاث اسابيع تم قياس مستويات الليبتين والاديبونكتين والريزستين في مصل الفئران لجميع المجاميع. بينت النتائج ان هناك زيادة ذات مغزى احصائي لمستوى كل من الليبتين والريزستين في الحيوانات المسممة بالمجموعة الثانية قياسا لعينة الحيوانات السليمة في المجموعة الضابطة الاولى. وقد تناقصت مستويات المصل بصورة معنوية لكل من الليبتين والريزستين في الحيوانات المسممة بالمجموعة الثالثة والتي تم اعطاؤها مستخلص بذور العنب مقارنة بالمجموعة الثانية (30.46 ± 0.93 vs 39.35 ± 1.07)، (42.23 ± 1.21 vs 48.84 ± 3.73). كما كان هناك زيادة ذات مغزى احصائي بمستوى الاديبونكتين في هذه المجموعة التي عولجت بمستخلص بذور العنب بالقياس لمستوى الاديبونكتين بالمجموعة الثانية. (6.1220 ± 0.6330 vs 4.8793 ± 0.5040). **الاستنتاج:** المستخلصات الفينولية من بذور العنب كان ذات تأثير في انخفاض مستوى الليبتين والريزستين وزيادة مستوى الاديبونكتين في مصل حيوانات التجربة بعد تسميمها بغذاء عالي الدهون.