Effect of Garlic on Dyslipidemic Patients with Diabetes Mellitus (Type 2)

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Abstract

Back ground: Garlic (Allium sativum) has been used in herbal medicine for treatment of cardiovascular diseases risk factors such as serum lipids , blood pressure and plasma viscosity .

Aim: The aim of present study is to evaluate the effects of garlic on one of the major cardiovascular risk factors which is dyslipidemia in patients with type 2 diabetes mellitus .

Materials and Methods: Type 2 diabetic patients with dyslipidemia were enrolled in this study. It covered 50 patients (35 males and 15 females) whose ages ranged between (40 – 75) years. Twenty clinically healthy individuals were included as a control group at the same above ages. Diabetic patients given garlic for period of 6 weeks and 12 weeks after which their serum lipid profiles where measured after fasting for 12 hours and comparisons was made between the treated and untreated patients .

Results: It was found that the patients had a significant reduction in both total cholesterol (TC) and triglycerides (TG) (the main contributing factors to arteriosclerosis) in comparisons to the control group. The administration of garlic (1000 mg) lowers the levels of low density lipoproteins cholesterol (LDL – C) and raise the concentrations of high density lipoproteins cholesterol (HDL – C) and so for the very low density lipoproteins cholesterol (VLDL–C) if compared with that of the control group .

Conclusion: Garlic may play an important role in the treatment of dyslipidemic patients with type 2 diabetes mellitus.

Keywords: Garlic, Dyslipidemic patients, Type 2 diabetes mellitus, Lipids profile.

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Introduction

The Allium sativum (garlic) is one of the commone herbal remedies today and is also used as a food spice [9]. This plant contains numerous volatile sulfur compounds such as alliin, allicin, dially disulfide, etc. to which its antihypertensive , blood glucose lowering, antitherombotic, antimutagenic and antiplatelet actions may be attributed [1,5,6,7,22,25].

Naturally occurring sulfur containing compounds present in the Allium family may influence plasma cholesterol and atherosclerosis and garlic may play an important role in therapy of hypercholesterolemia, also garlic was known as an effective material in decreasing of blood pressure [20,21].

It is well established that people with diabetes mellitus have a greater risk of cardiovascular morbidity and mortality; than their normal counterparts [2,15,19]. More than 50% of diabetes – related deaths are associated with macrovascular complications especially atherosclerosis[1,22,23]. Multiple risk factors are associated with

atherosclerosis, including hyperglycemia and hyperlipidemia [17,24] . Patients with type 2 diabetes have a two fold to four fold excess risk of coronary artery disease as compared to non – diabetes patients and many of coexisting in this patient population [18]. High blood cholesterol is one of the major modifiable risk factor for coronary heart disease [3,16].

The aim of this study is to evaluate the effects of garlic on dyslipidemic patients with diabetes mellitus type 2 by determination any measurement such as TC (mmol / L), TG (mmol / L), HDL (mmol / L), LDL (mmol / L) and VLDL (mmol / L) .

Material and Methods

Type 2 diabetic patients with dyslipidemia were enrolled in this study which is carried out during the period from February 2013 to May 2013 at the Department of Biochemistry, College of Medicine and in Biochemistry Laboratory, Baquba Teaching Hospital, Diyala, Iraq .

The present study covered 50 diabetic patients (35 males and 15 females) whose ages ranged between (40 – 75) years. Patients with any other diseases were excluded from the experiment, so that it may not interfere with the parameters analyzed in this study. Twenty clinically healthy individuals were included as a control group at the same above ages.

The patients were given two capsules (1000 mg) of garlic powder per day (each capsule contain 500 mg of pure white garlic powder with nothing added, from Shandong Dongbao Foodstuff Co., China) for 12 weeks and they were also prohibited from taking any additional garlic supplements in their diet for the duration of the study. lipid profile was done at day of inclusion i.e. week 0 and repeated at end of week 6 and week 12 .

Serum was separated and total cholesterol, triglycerides , high density lipoproteins cholesterol were measured by enzymatic colorimetric method after 12 hours over night fasting by using analyzer (Selectra – 11, MICRO Germany).

LDL – cholesterol was calculated mathematically from the total cholesterol, triglycerides and HDL – cholesterol concentrations [10]:

$$\text{LDL – cholesterol (mmol / L)} = \text{cholesterol} - \frac{\text{TG}}{2.2} - \text{HDL}$$

Also VLDL – cholesterol was calculated mathematically as following from the triglycerides [8]:

$$\text{VLDL – cholesterol (mmol / L)} = \frac{\text{TG}}{2.2}$$

All data was calculated by fed in SPSS version 10.0 and mean ±SE of each category of lipid profile for each group was calculated .

Results

Table (1) shows the effect of garlic on serum total cholesterol, triglycerides, high density lipoproteins cholesterol, low density lipoproteins cholesterol and very low density lipoproteins cholesterol in diabetes mellitus type 2 patients after 6 and 12 weeks of treatment

with garlic in comparison to that measured before starting of treatment.

It is to be noted that means of serum total cholesterol were recorded significant difference at level $P < 0.05$ between value of means of after 12 weeks of treatment (6.16 ± 0.03b) to means of before treatment (6.88 ± 0.06a) and means of control (5.63±0.14c) but not recorded any significant differences between after 12 weeks of treatment and after 6 weeks of treatment, that mean serum TC after 12 weeks and after 6 weeks significantly decreased if compared to that before treatment .

When comparing the TG value, theses were recorded significant difference at level $P < 0.05$ between means of after 12 weeks (2.22 ± 0.03b) and means of before treatment (2.60 ± 0.04a) and means of control (1.83 ± 0.09c), but not recorded any significant differences between means of after 12 weeks and means of after 6 weeks of treatment (2.34 ± 0.04b) that mean serum TG was significantly decrease after 12 weeks of treatment in comparison to before treatment .

The HDL – C value, were recorded significant differences at the same level above between means of after 12 weeks (1.06 ± 0.009d) and means of after 6 weeks (0.96± 0.09c) and means of before treatment (0.79 ± 0.03 b) and means of control (1.20 ± 0.01a) that mean serum HDL – C was significantly increased after 6 and 12 weeks of treatment in comparison to that before treatment.

Table (1): Effect of garlic on serum total cholesterol, triglycerides, high density lipoproteins, low density lipoproteins and very low density lipoproteins after 6 and 12 weeks of treatment.

Parameters (lipid profile)	Control	Before treatment	After 6 week of treatment	After12 weeks of treatment
TC(mmoI/L)	5.63 ± 0.14c	6.88 ± 0.06a	6.29 ± 0.04b	6.16 ± 0.03b
TG(mmol/L)	1.83 ± 0.09c	2.60 ± 0.04a	2.34 ± 0.04b	2.22 ± 0.03b
HDL-C(mmol/L)	1.20 ± 0.01a	0.79 ± 0.03b	0.96 ± 0.09c	1.06 ± 0.009d
LDL-C(mmol/L)	3.60 ± 0.14	4.91 ± 0.06	4.27 ± 0.04	4.09 ± 0.03
VLDL(mmol/L)	0.84 ± 0.26	1.18 ± 0.02	1.06 ± 0.02	1.01 ± 0.01

- Data represented by mean ± SE
- Values with non – identical superscript (a, b, c, d) are representing significant difference at level $P < 0.05$.

Discussion

Primary hyperlipidemia due to abnormalities in gene encoding of LDL – C receptors which causes a decrease in the functioning of LDL – C receptors , such result lead to; in turn, to an increase in the LDL - concentration since the major pathway of the removal of LDL – C is via LDL – receptors in the liver cell .Increased production of VLDL , which is the precursor to LDL – C , could result in elevated LDL – C concentration [11] .

Secondary hyperlipidemia occurs as a complication of conditions such as diabetes where poor control of glucose levels could lead to elevated triglyceride levels.

Other medical conditions associated with hyperlipidemia include hypothyroidism, liver disease and Cushing's syndrome [4].

Table (1) shows that total cholesterol, triglycerides, LDL – cholesterol and VLDL – cholesterol were significantly reduced at level ($P < 0.05$) in dyslipidemic patients treated with garlic after 6 and 12 weeks of treatment in comparison to before treatment, these result are in agreement with results of studies conducted by [2] that showed taking 1200 mg garlic powder for 12 weeks reduced total cholesterol (9%), triglycerides (11%) and LDL – cholesterol (15%).

The changes in lipid parameters observed in present study are in accordance with the previous clinical trial [12,14,22].

Garlic principle active agent appears to be allicin, a sulfur – containing compound [13] Allicin is believed to act as nautural form of statin, the class of drugs used to lower cholesterol levels [19]. Statin works by competitively inhibiting HMG – CoA reductase (3 - hydroxyl - 3 - methyl glutaryl coenzyme A reductase, the rate – limiting enzyme for cholesterol synthesis), it is similar molecularly to HMG – CoA reductase , so they are able to situate themselves into the HMG – CoA reductase binding sites and replace the enzyme , this delays the reaction for the formation of cholesterol and thus , less cholesterol is produced [22].

Table 1 showed that HDL – C was significantly increased in hyperglycemic patients,this result was quite similar to that reported by other study [1,2]. It was suggested that a substance found naturally in garlic called allicin is responsible for this effect [2]. As a result , we showed short term benefits of garlic on lipid profile .

Conclusion

Garlic has a siginificant effect on total cholesterol, triglycerides, LDL – Cholesterol, HDL – Cholesterol and VLDL – Cholesterol. Garlic may play an important role in therapy of hypercholesterolemia and hyperlipidemia.

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