ORIGINAL ARTICLE

CONTENTS

# The potential effects of cinnamon, cumin, and Rosuvastatin on lipid profile among Iraqi patients with dyslipidemia

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## ABSTRACT

**Aim:** To investigate effects of three spices on lipid profile and compare between them in patients with dyslipidaemia.

**Materials and Methods:** This is randomized prospective clinical trials study; it is randomized prospective clinical trials study. Study includes patients that admitted to hospital and diagnosed with dyslipidaemia and have high levels of lipid profile, while patients with normal level of lipid profile and patients who discharged from hospital without complete their tests are excluded. The sample includes 30 patients who admitted to hospital with dyslipidaemia disease.

**Results:** Highest readings are of Rosuvastatin that effected on triglyceride with 53.1, cholesterol with 75.4, high density lipoprotein with 11.8 and low density lipoprotein with 65.5 were noticed, second highest readings are of cumin that effected on triglyceride with 31.6, cholesterol with 47.5, high density lipoprotein with 9.3 and the lowest reading is low density lipoprotein with 32 were noticed, lowest readings are of cinnamon that effected on triglyceride with 25.7, cholesterol with 44.8, high density lipoprotein with 8.4 and the second highest reading is low density lipoprotein with 43.9 were noticed on dyslipidaemia patients living in Al-Najaf City.

**Conclusions:** The study provides evidence that indicates the cumin, cinnamon both have antihyperlipidemic effect but less than Rosuvastatin in dyslipidaemia patients. It can be used as an adjuvant treatment with other drugs to decrease triglyceride, cholesterol, low density lipoprotein and increase high density lipoprotein levels.

**KEY WORDS:** cumin, cinnamon, rosuvastatin, dyslipidaemia, triglyceride

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## ABBREVIATIONS

HDL - High Density Lipoprotein
TG - Triglyceride
LDL - Low Density Lipoprotein
RCTs - Randomized Controlled Trials
SEM - Standard Error Mean
TC - Total Cholesterol
LDL-C - Low Density Lipoprotein Cholesterol
HDL-C - High Density Lipoprotein Cholesterol
CHOL - Cholesterol

## INTRODUCTION

Dyslipidaemia is one of the important of cardiovascular diseases risk factors. It is rising in developed and developing countries [1-3]. Nowadays, many pharmaceutical treatments such as statins are being used to control blood lipids [4]. Consumption of statins results in different complications like digestive problems, flushing, high blood sugar and rhabdomyolysis [5]. Cumin, as one of these medicinal plants, contains more than 100 different chemicals, including essential fatty acids and volatile oils [6-7]. Moreover, some studies have shown that cumin has a decreasing effect on blood lipids and body weight [8]. Furthermore cinnamon with more than 50 different combinations [9] came up as a nutraceutical to improve health such as glycaemic control in humans without documented potential toxic effects and a high therapeutic effect [10-11]. It is found that consumption of 1 to 6 grams cinnamon has a reducing effect on fasting blood glucose, triglycerides and low density lipoprotein cholesterol (LDL-c) [7]. Consumption of 1 gram cinnamon for 3 months has reduced lipid profile in diabetic patients [12]. Data from clinical trial suggests, from a group of comparator statins, Rosuvastatin, give improvement in lipid profiles [13]. *Cuminum Cyminum L.* is an annual plant of the family apiaceae; seeds of cumin contain various phytochemicals which may have carminative, antioxidant and anti-flatulent characteristics. The cumin active principles may enhance the gastro-intestinal tract motility in addition to increase the force of digestion by enhancing secretions gastro-intestinal enzyme. Cumin is considered

an excellent major source of minerals like copper, iron , selenium, potassium, calcium, manganese, magnesium and zinc .The seeds are also represent rich source of numerous flavonoid phenolic anti-oxidants like lutein, carotenes and zeaxanthin [14]. Cinnamon contain many ingredients and most important one is cinnamaldehyde or trans-cinnamaldehyde which present as essential oil, for this reason contributing to the diverse biological activities and fragrance that occur with cinnamon [15]. One of the major constituents of essential oil that obtained from *C. zeylanicum* named (E)-cinnamaldehyde possessing an antityrosinase activity while cinnamaldehyde is the major compound responsible for this activity [16-17]. Cinnamon prevent bleeding because has coagulant property [18]. Cinnamon also enhances the circulation of blood in the uterus and regeneration of advances tissue [19]. This plant plays an important role as a spice, but other constituents and essential oils also have another important activities, including antifungal, antimicrobial, antidiabetic and antioxidant properties. Cinnamon has been used as antiemetic, anti-inflammatory, nematicidal, larvicidal, and antimitotic, mosquito insecticidal, and anticancer agent. Cinnamon has also been classically used as tooth powder for treatment of toothaches, oral microbiota, dental problems, and bad breath (Table 1) [20-21].

**Table 1.** Classification of total LDL, HDL, cholesterol and triglycerides

| **Total Cholesterol** | |
|---|---|
| <200 mg/dL | Desirable |
| 200-239 mg/dL | Borderline high |
| 240 mg/dL | High |
| **LDL Cholesterol** | |
| <100 mg/dL | Optimal |
| 100-129 mg/dL | Near or above optimal |
| 130-159 mg/dL | Borderline high |
| 160-189 mg/dL | High |
| 190 mg/dL | Very High |
| **HDL Cholesterol** | |
| <40 mg/dL | Low |
| 60 mg/dL | High |
| **Triglycerides** | |
| <150 mg/dL | Low |
| 150-199 mg/dL | Borderline high |
| 200-299 mg/dL | High |
| 500 mg/dL | Very high |

## MATERIALS AND METHODS

This is randomized prospective clinical trials study; it was conducted in November-December 2023 in Al-Sader Medical City laboratory and in Al-Hakeem General Hospital Laboratory. Al-Sader Medical City it is one of the biggest medical school in al Najaf in Iraq and Al-Hakeem General Hospital Laboratory.

Inclusion criteria include middle-aged women from 30-59 years that admitted to hospital and diagnosed with dyslipidaemia and have high levels of lipid profile based on the following classification (defined hypercholesterolemia: total cholesterol >250 mg/dl and triglycerides <200 mg/dl , hypertriglyceridemia: total cholesterol <200 mg/dl and triglycerides >200 mg/dl; or mixed hyperlipidemia: total cholesterol >200 mg/dl and triglycerides >200 mg/dl.

Exclusion criteria include patients with normal level of lipid profile and patients who discharged from hospital without complete their tests are excluded. The presence of conditions that may cause secondary dyslipidemia and need medications; previous cardiovascular events or other chronic diseases such as diabetes or chronic obstructive pulmonary disease, cancer, chronic liver or renal failure, alcohol or other substance abusers; patient who were unable to comply with the study procedures or to be subject to loss to follow-up; having allergic reaction to any one of the agents used in the study, pregnant or nursing women; and patients prescribed hypolipidemic drugs during the study.

### SAMPLE SIZE

Sample of study include 30 patients who admitted to hospital with dyslipidaemia disease. Arrangement were done to take approvals from two medical schools in government to seek agreement for data collection. The method of collecting information depends on data from laboratories of these two Hospitals Al-Sader Medical City Hospital and Al-Hakeem General Hospital. The data collection occurs in most days of week.

### STUDY GROUPS

The sample of study include 30 patients divided into three groups each group contain 10 patients:

**Group I:** received Rosuvastatin 20mg tablet once daily for 8 weeks;

**Group II:** received cinnamon 3g/d (6 capsule for 8 weeks);

**Group III:** received cumin 3g/d (6 capsule for 8 weeks).

### PREPARATION OF AGENTS USED IN THE STUDY

Cinnamon and cumin were obtained from local market and verified by a pharmacognosists. Rosuvastatin is obtained

from pharmacy participants were invited to receive advices about the study protocol and were allocated to their groups. Anthropometric measurement, dietary intake and physical activity were assessed. The weights of participants were recorded in light clothing with electronic scales, with accuracy of 0.1 kg (Omron, Japan). Heights were recorded at the first visit with a wall mounted stadiometer with accuracy of 0.5 cm. The waist circumference was measured at the high point of the iliac crest at minimal respiration, using a nonstretched tape meter, without any pressure to body surface to the nearest 0.1 cm. The body mass index (BMI) was calculated as weight in kilograms (kg) divided by height in meters (m) squared. Physical activity was calculated using the formula Metabolic Equivalent of Task – minutes / week. Participants were instructed not to change their usual dietary habits and physical activities for the duration of the study and to take the experimental supplements with meals. To estimate the frequency of supplements consumption, a checklist was used and the consumption of supplements was controlled by telephone at the end of every week. Participants were instructed to return unused capsules and their patient's compliance was measured by counting the remained capsules at the end of the study. In this study, two 24-hour recalls were completed for each participant (before and after the study). The principal researcher, the participants, and laboratory staff were not aware of patients' group assignments. The capsules were produced in laboratory and packed in packages labeled A, B or C by a third person. A code could belong to one of cumin, cinnamon or control groups. This sample size was 30 with power 80%, assuming a two-sided alpha level of 0.05. Supplements were taken three times a day for 8 weeks. Also, the consumption of supplements was controlled by telephone at the end of every week.

## MATERIALS AND METHODS

The patients referred to a laboratory for biochemical assessment. After 12-14 hours of fasting, 5 ml venous blood was taken from all the individuals to measure blood triglycerides, total cholesterol, LDL-C, and HDL-C concentrations. Triglyceride and total cholesterol were measured using commercial assay kits (with sensitivity 3 mg/dl (0.08 mmol/l), with glycerol oxidize and cholesterol oxidize enzymatic methods by the auto-analyzer (Echo plus Company, Italy). HDL cholesterol was measured after the precipitation of beta-lipoproteins by dextran sulfate and chloride magnesium using oxidizes cholesterol method and the auto-analyzer (with sensitivity 1 mg/dl). LDL cholesterol was calculated by Friedewald's formula. Dosage of cumin and cinnamon was selected based on previous studies. Duration of the study was 8 weeks. This period was a bit short but it was enough to show the decrease in lipid profile. We could not extend this period due to possible high attrition rate.

### STATISTICAL ANALYSIS

Statistical analysis were performed using SPSS 16.0. Data of quantitative variables were represented in Mean + SEM. Differences between each pair were compared using paired-sample Student's t-test in addition to use Microsoft Office Excel 2007. In all tests, P-value less than 0.05 was interpreted to be statistically significant.

## RESULTS

### EFFECT OF CUMIN ON SERUM TRIGLYCERIDE LEVELS

There was a significant difference between the mean serum concentration of triglyceride before and after 2 months treatment with cumin among study population as shown in figure 1.

### EFFECT OF CUMIN ON SERUM CHOLESTEROL LEVELS

There was a significant difference between the mean serum concentration of cholesterol before and after 2 months treatment with cumin among study population as shown in figure 2.

### EFFECT OF CUMIN ON SERUM HIGH DENSITY LIPOPROTEIN LEVELS

There was a significant difference between the mean serum concentration of HDL before and after 2 months treatment with cumin among study population as shown in figure 3.

### EFFECT OF CUMIN ON SERUM LOW DENSITY LIPOPROTEIN LEVELS

There was a significant difference between the mean serum concentration of LDL before and after 2 months treatment with cumin among study population as shown in figure 4.

### EFFECT OF CINNAMON ON SERUM TRIGLYCERIDE LEVELS

There was a significant difference between the mean serum concentration of triglyceride before and after 2 months treatment with cinnamon among study population as shown in figure 5.

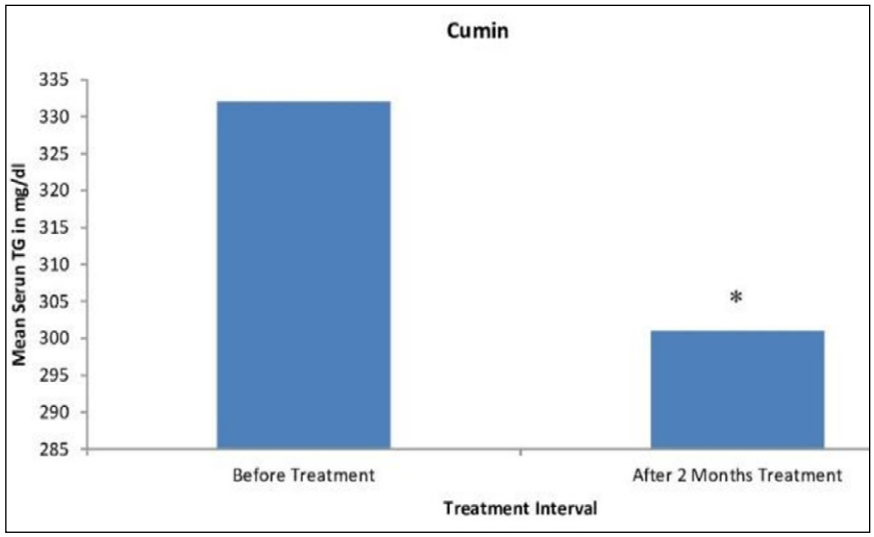


**Fig. 1.** Comparison between the effect of cumin on serum triglyceride before and after 2 month treatment among study population
* Mean statistically significant
*Source: Own materials*

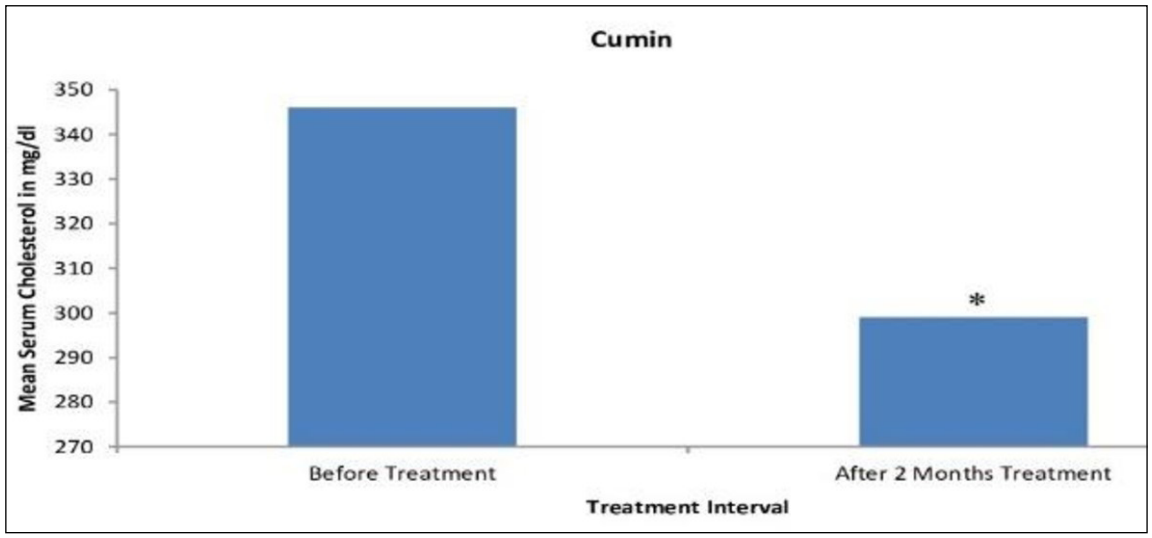


**Fig. 2.** Comparison between the effects of cumin on serum cholesterol before and after 2 month treatment among study population
* Mean statistically significant
*Source: Own materials*

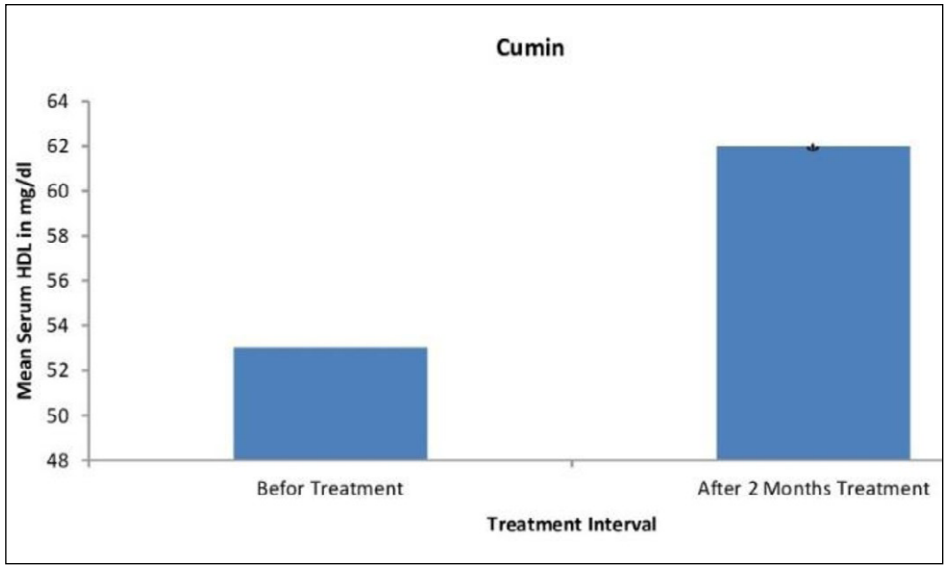


**Fig. 3.** Comparison between the effect of cumin on serum HDL before and after 2 month treatment among study population
* Mean statistically significant
*Source: Own materials*

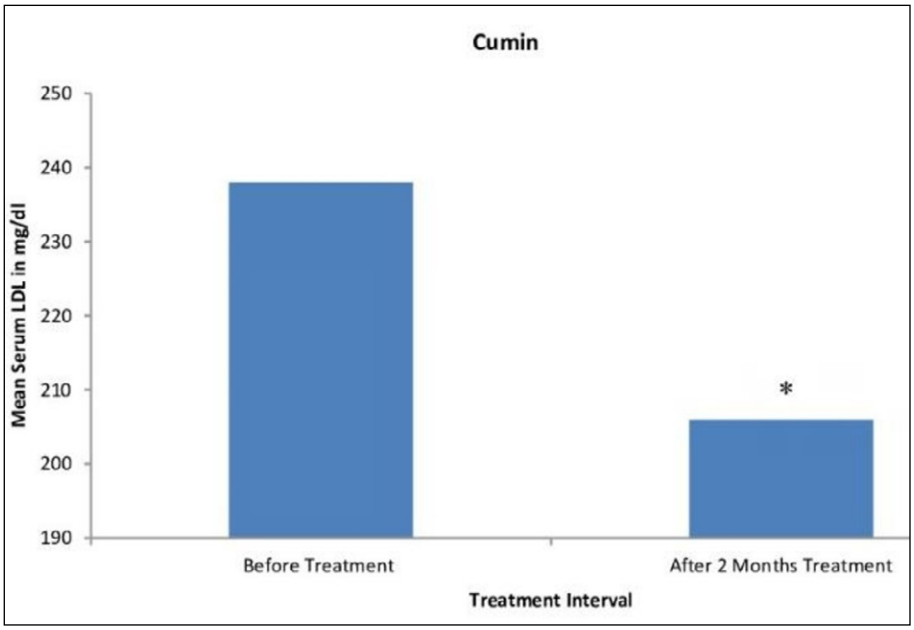


**Fig. 4.** Comparison between the effect of cumin on serum LDL before and after 2 month treatment among study population
* Mean statistically significant
*Source: Own materials*

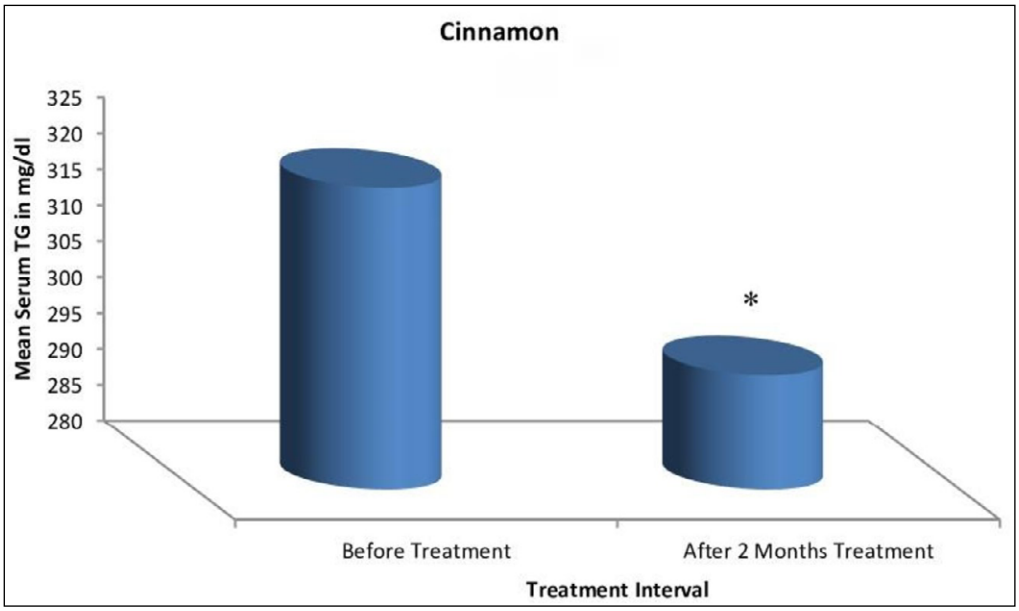


**Fig. 5.** Comparison between the effect of cinnamon on serum triglyceride before and after 2 month treatment among study population
* Mean statistically significant
*Source: Own materials*

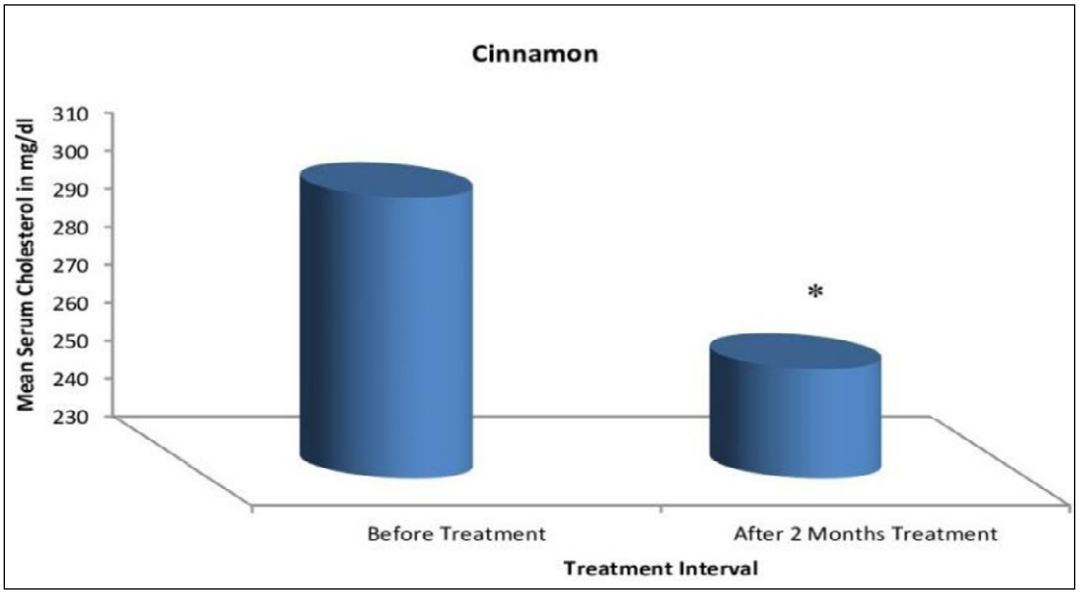


**Fig. 6.** Comparison between the effect of cinnamon on serum cholesterol before and after 2 month treatment among study population
* Mean statistically significant
*Source: Own materials*

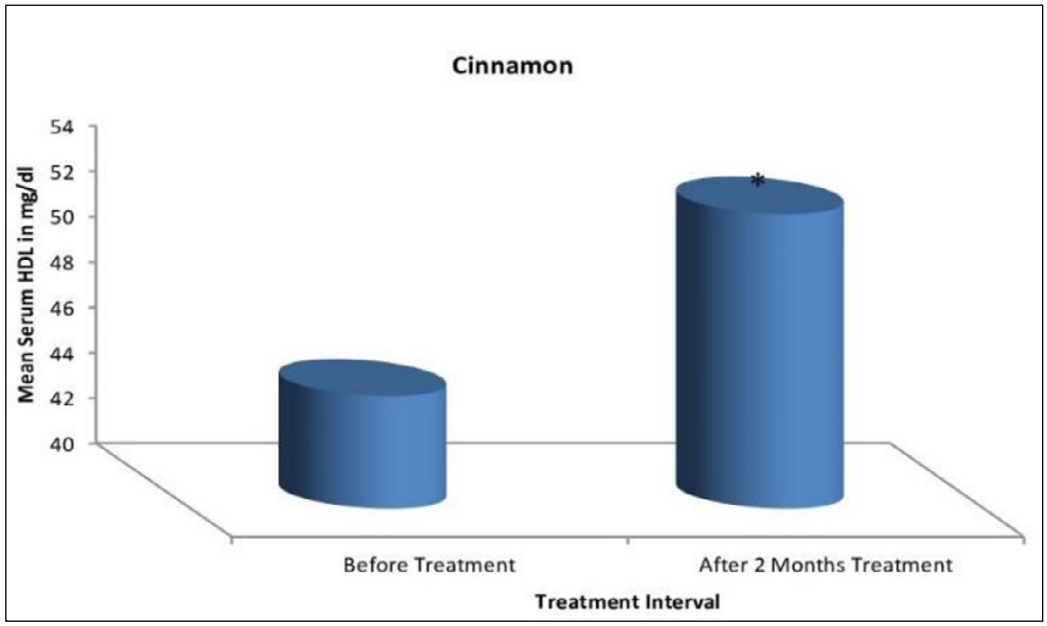


**Fig. 7.** Comparison between the effect of cinnamon on serum HDL before and after 2 month treatment among study population
* Mean statistically significant
*Source: Own materials*

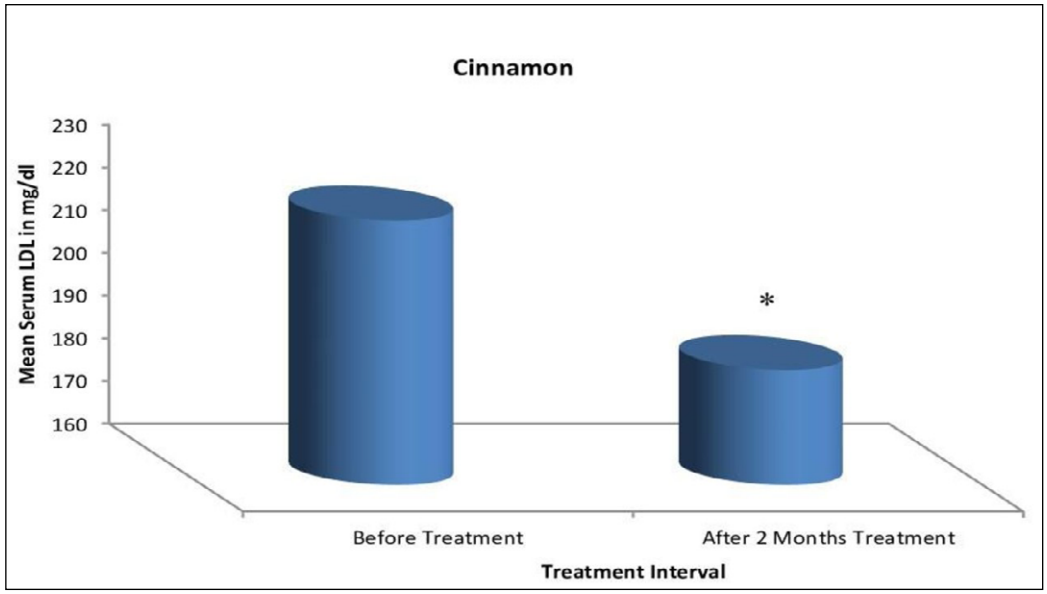


**Fig. 8.** Comparison between the effect of cinnamon on serum LDL before and after 2 month treatment among study population
* Mean statistically significant
*Source: Own materials*

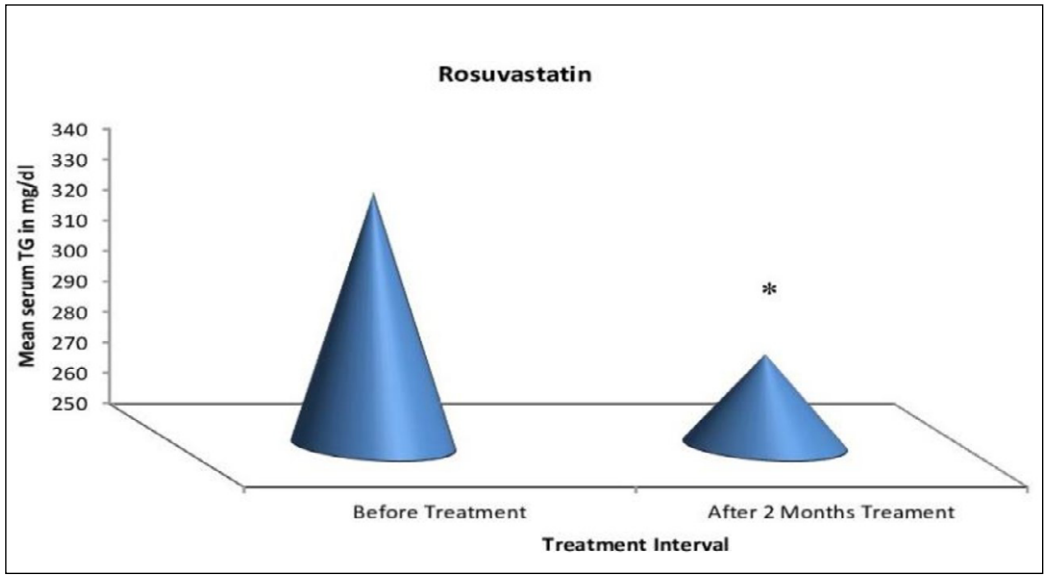


**Fig. 9.** Comparison between the effect of Rosuvastatin on serum triglyceride before and after 2 month treatment among study population
* Mean statistically significant
*Source: Own materials*

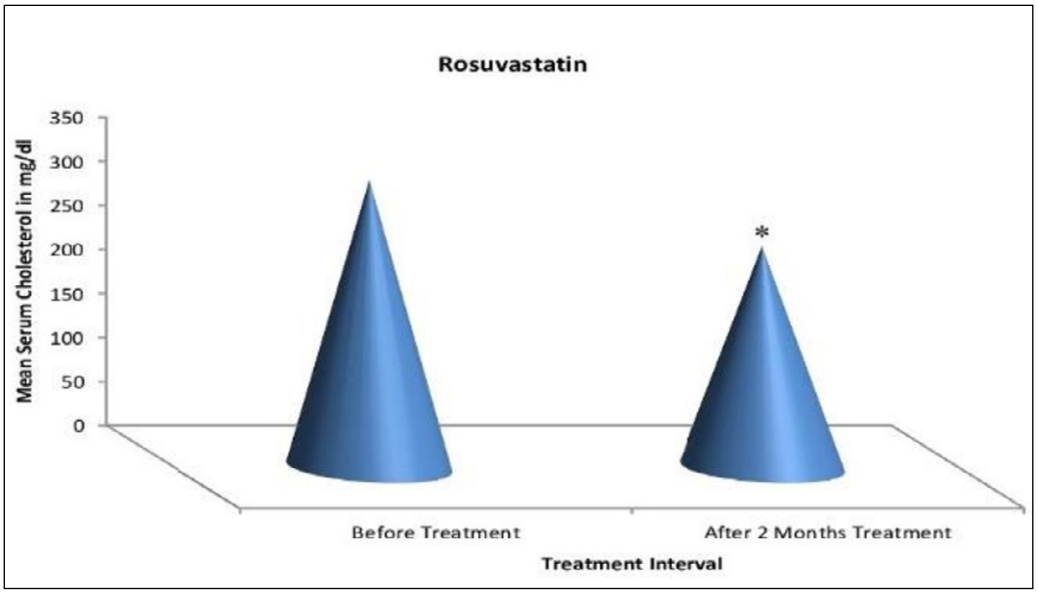


**Fig. 10.** Comparison between the effect of Rosuvastatin on serum cholesterol before and after 2 month treatment among study population
* Mean statistically significant
*Source: Own materials*

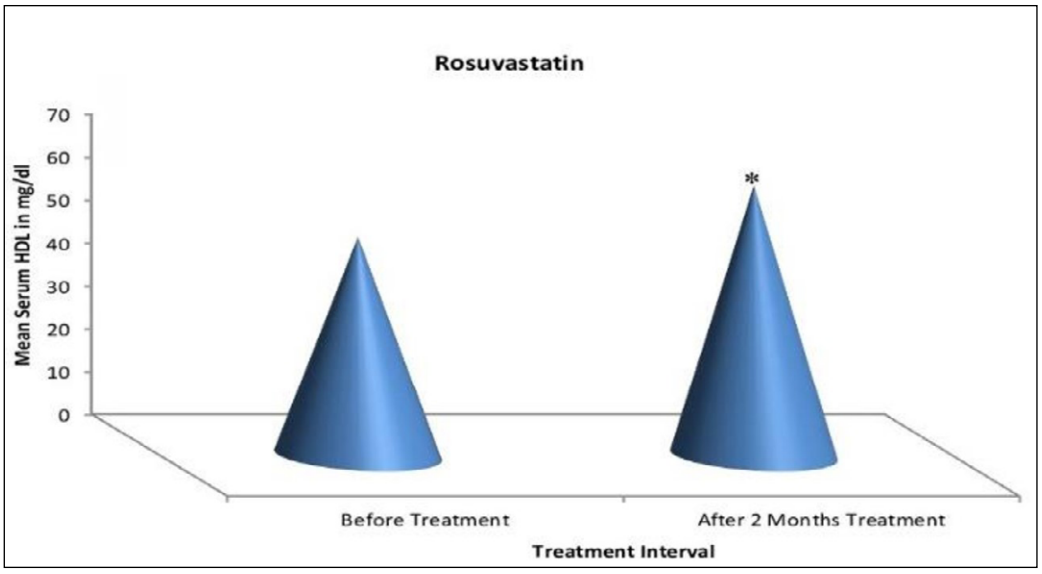


**Fig. 11.** Comparison between the effect of Rosuvastatin on serum HDL before and after 2 month treatment among study population
* Mean statistically significant
*Source: Own materials*

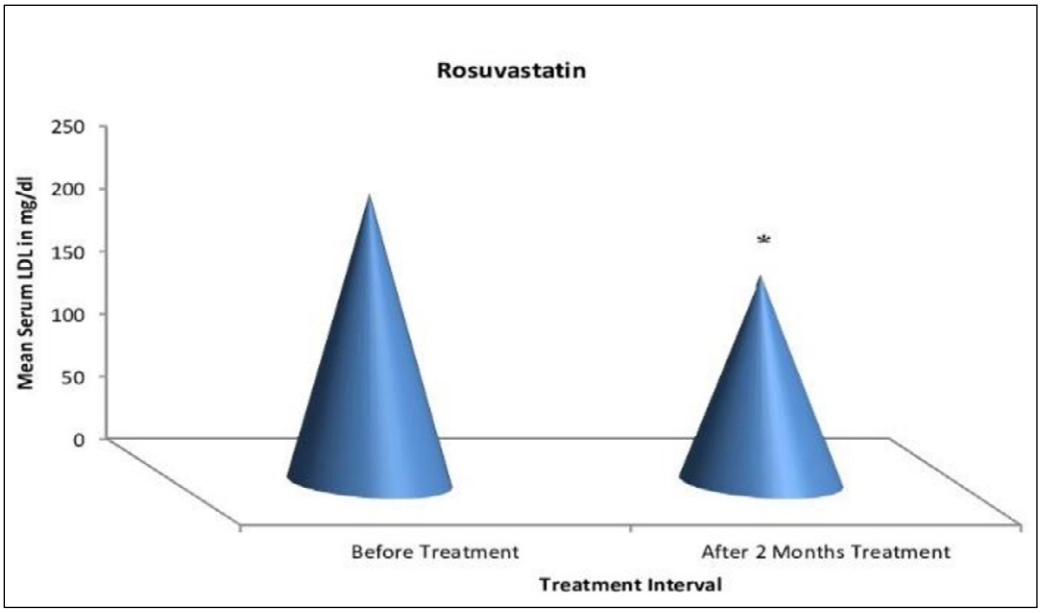


**Fig. 12.** Comparison between the effect of Rosuvastatin on serum LDL before and after 2 month treatment among study population
* Mean statistically significant
*Source: Own materials*

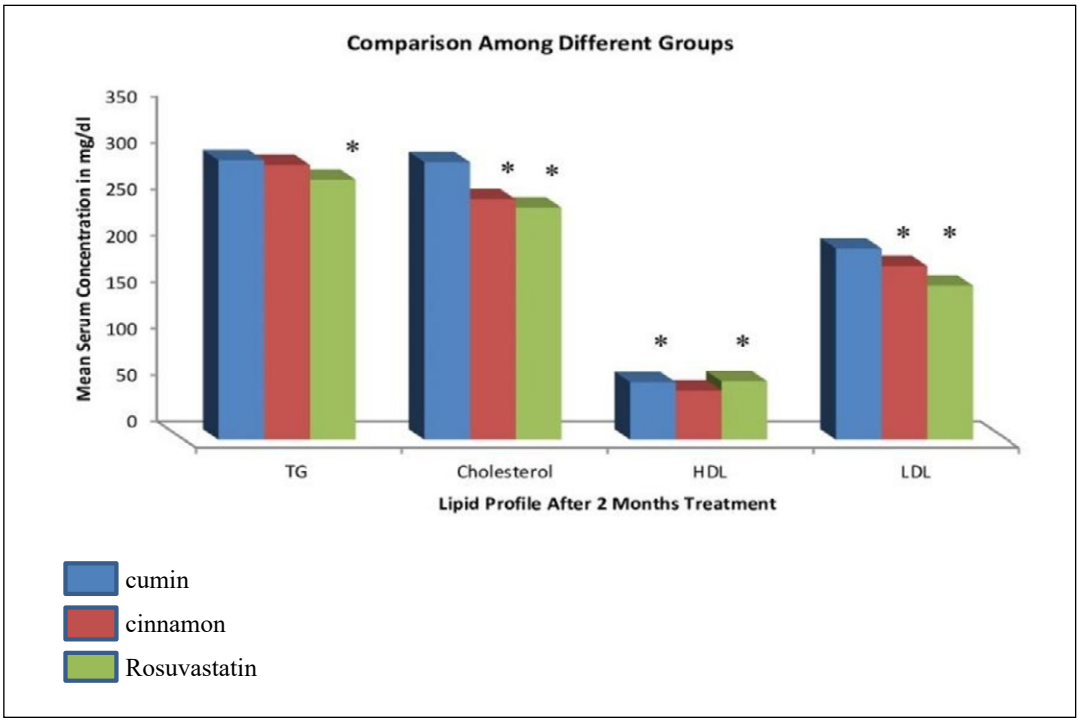


**Fig. 13.** Comparative effects of different treatment on different parameters after 2 months among study population
* Mean statistically significant
*Source: Own materials*

## EFFECT OF CINNAMON ON SERUM CHOLESTEROL LEVELS

There was a significant difference between the mean serum concentration of cholesterol before and after 2 months treatment with cinnamon among study population as shown in figure 6.

## EFFECT OF CINNAMON ON SERUM HIGH DENSITY LIPOPROTEIN LEVELS

There was a significant difference between the mean serum concentration of HDL before and after 2 months treatment with cinnamon among study population as shown in figure 7.

## EFFECT OF CINNAMON ON SERUM LOW DENSITY LIPOPROTEIN LEVELS

There was a significant difference between the mean serum concentration of LDL before and after 2 months treatment with cinnamon among study population as shown in figure 8.

## EFFECT OF ROSUVASTATIN ON SERUM TRIGLYCERIDE LEVELS

There was a significant difference between the mean serum concentration of triglyceride before and after 2 months treatment with Rosuvastatin among study population as shown in figure 9.

## EFFECT OF ROSUVASTATIN ON SERUM CHOLESTEROL LEVELS

There was a significant difference between the mean serum concentration of cholesterol before and after 2 months treatment with Rosuvastatin among study population as shown in figure 10.

## EFFECT OF ROSUVASTATIN ON SERUM HIGH DENSITY LIPOPROTEIN LEVELS

There was a significant difference between the mean serum concentration of HDL before and after 2 months treatment with Rosuvastatin among study population as shown in figure 11.

## EFFECT OF ROSUVASTATIN ON SERUM LOW DENSITY LIPOPROTEIN LEVELS

There was a significant difference between the mean serum concentration of LDL before and after 2 months treatment with Rosuvastatin among study population as shown in figure 12.

## COMPARATIVE EFFECTS OF CUMIN, CINNAMON AND ROSUVASTATIN ON DIFFERENT PARAMETERS AMONG STUDY POPULATION

There was a significant difference in mean serum concentration of triglyceride regarding to the group treated with Rosuvastatin as compare with groups treated by

**Table 2.** Average reads of Cumin, Cinnamon, and Rosuvastatin on TG, CHOL, HDL and LDL

| | Cumin | | Cinnamon | | Rosuvastatin | |
|---|---|---|---|---|---|---|
| Lab test | Before | After | Before | After | Before | After |
| TG | 332.8 | 301.2 | 322.3 | 296.6 | 333.3 | 280.2 |
| CHOL | 346.7 | 299.2 | 304.2 | 259.4 | 325.5 | 250.1 |
| HDL | 52.9 | 62.2 | 44.9 | 53.3 | 50.9 | 62.7 |
| LDL | 237.9 | 205.9 | 221.5 | 186.6 | 231.2 | 165.7 |

**Table 3.** Difference between before and after reads

| | Cumin | Cinnamon | Rosuvastatin |
|---|---|---|---|
| TG | *31.6 | 25.7 | *53.1 |
| CHOL | *47.5 | 44.8 | *75.4 |
| HDL | *9.3 | 8.4 | *11.8 |
| LDL | 32 | * 34.9 | *65.5 |

cinnamon and cumin but nonsignificant differences in mean serum concentration of triglyceride between cinnamon and cumin treated groups. Also there was a significant difference in mean serum concentration of cholesterol regarding to the groups treated with cinnamon and Rosuvastatin as compare with cumin treated group but nonsignificant differences in mean serum concentration of cholesterol between cinnamon and Rosuvastatin treated groups. There was a significant difference in mean serum concentration of HDL regarding to the groups treated with cumin and Rosuvastatin as compare with cinnamon treated group but nonsignificant differences in mean serum concentration of HDL between cumin and Rosuvastatin treated groups. There was a significant difference in mean serum concentration of LDL regarding to the group treated with Rosuvastatin as compare with groups treated by cinnamon and cumin in addition to significant differences in mean serum concentration of LDL between cinnamon and cumin treated groups (Tables 2-3 and Fig. 3).

## DISCUSSION

According to table 2 show the highest readings are of Rosuvastatin that effected on triglyceride with 53.1, cholesterol with 75.4, high density lipoprotein with 11.8 and low density lipoprotein with 65.5 were noticed on dyslipidaemia patients living in Al-Najaf city. This finding is in agreed with previous study conducted by [22]. Statins are particularly useful in patients with severe forms of hypercholesterolemia. Rosuvastatin when compare with most potent statins is capable of performing the major goals for the treatment of dyslipidemic patients as reduction of LDL cholesterol. In addition to that, Rosuvastatin possess the property of enhancing HDL cholesterol and decreasing small-dense LDL levels [22]. Table 3 shows ssecond highest readings are of cumin that effected on triglyceride with 31.6, cholesterol with 47.5, high density lipoprotein with 9.3 and the lowest reading is low density lipoprotein with 32 were noticed on dyslipidaemia patients living in Al-Najaf city. This finding is in agree with previous study conducted by [23] with the reading of triglyceride and cholesterol and not agree with the reading of high density lipoprotein and low density lipoprotein. Study [23] reported a significant decrease in plasma concentration LDL cholesterol and total cholesterol after taking cumin as compared with control treatment, and HDL cholesterol plasma concentration were found to be enhanced. Despite of finding of present study recorded that supplementation with cumin don't alter the concentration of triglyceride. Table 4 shows lowest readings are of cinnamon that affected on triglyceride with 25.7, cholesterol with 44.8, high density lipoprotein with 8.4 and the second highest reading is low density lipoprotein with 43.9 were noticed on dyslipidaemia patients living in Al-Najaf city. This finding is not agreed with previous study conducted by [24] with the reading of triglyceride and cholesterol and high density lipoprotein but agrees with the reading of low density lipoprotein. Cinnamon reduce total cholesterol (TC), LDL, triglycerides (TG), LDL and increase HDL levels. There is one study suggests that extract from *Cinnamomum aromaticum* in a dose of 120 mg capsule show significant reduction in triglyceride levels after three months of treatment as compared with baseline [24].

## LIMITATIONS

One of the limitations of this study is considering only women with dyslipidemia. The reason is the availability of them. So, the results cannot be generalized to men

or healthy women. Considering the patients of both sexes can help reach better results. Although, physical activity and dietary intake were considered as confounding factors among three groups. The short period of study was another limitation of this study. Further investigations with a longer period are warranted. As far as we know, this is the first study that compared the effect of cumin and cinnamon consumption. The strengths of the present study were the double blind placebo-controlled design and low drop-out. Probably, this study can be effective on treatment of high cholesterol levels. However, due to no significant impact on reducing LDL and TG and no increase of HDL, more research is needed.

## CONCLUSIONS

Overall, this study provides evidence that indicates the cumin, cinnamon has a hypocholesterolemic effect with Rosuvastatin with dyslipidaemia patients. It can be used as an adjuvant treatment with other drugs used to decrease TG, cholesterol, LDL and increase HDL levels.

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**CONFLICT OF INTEREST**

The Author declare no conflict of interest

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