



Research article

Indigenous herbal product *Nigella sativa* proved effective as an Anti-obesity therapy in metabolic syndrome

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Article information ABSTRACT

Keywords:

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Introduction: The seeds of *Nigella sativa* plant have been used to promote health and fight disease for centuries especially in the Middle East and Southeast Asia. This plant has been a great focus of research. This clinical study was undertaken to know the adjuvant effect of *Nigella sativa* oil on obesity parameters in patients with Metabolic syndrome.

Methodology: This prospective randomized control study was conducted at the tertiary health care centre of north India. After final diagnosis and considering inclusion and exclusion, criteria one hundred and sixty one patients were enrolled in this study. Informed and written consent was taken from all the patients enrolled. Approval from institutional ethical committee was taken. Patients were divided into two groups. In-group I (standard group) patients were advised atorvastatin 10 mg once a day, metformin 500 mg twice a day, atenolol 50 mg once a day, amlodipine 5 mg once a day for a period of six weeks. In-group II (*Nigella sativa*) group, patients were advised the above standard medication plus *Nigella sativa* oil 2.5 twice daily for a period of six weeks. Blood sugar both fasting and postprandial, fasting lipid profile and different parameters of obesity were recorded before therapy and after completion of therapy.

Result: In our study, we had taken five parameters for the measurement of obesity. They were body mass index, waist circumference, hip circumference, and body weight and waist hip ratio. There was improvement in all the five above-mentioned parameters in both groups but the improvement was more in *Nigella sativa* group as compared to standard group.

Conclusion: *Nigella sativa* oil was found to be effective as add-on therapy in patients of insulin resistance syndrome, and proved effective in alleviating the obesity. Further *Nigella sativa* oil has significant favorable effects on hyperglycemia and dyslipidemia.

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1. INTRODUCTION

Obesity is the most commonly encountered disease worldwide. More than half the world's population is considered overweight. Obesity is defined by WHO as a Body Mass Index (BMI) of $>30 \text{ kg/m}^2$, BMI is the gold standard of obesity measurement.^[1] Waist circumference has been recognized as a useful measure of obesity. It is estimated that a waist circumference in men of $>102 \text{ cm}$. and in women of $> 88 \text{ cm}$. carried the same risk of developing cardiovascular risk as a BMI of 30. This is because; waist circumference is a measure of visceral fat-mass, independent of height and muscle mass. The visceral fat, is considered to be the most 'atherogenic, diabetogenic and hypertensiogenic' fat depot of the human

body, associated with the metabolic consequences of obesity.^[2] It is estimated that a waist circumference in men of $>102 \text{ cm}$ and in women of $> 88 \text{ cm}$ carried the same risk of developing cardiovascular risk as a BMI of 30. In most obese patients, obesity is associated with a low-grade inflammation of white adipose tissue (WAT) resulting from chronic activation of the innate immune system and which can subsequently lead to insulin resistance, impaired glucose tolerance and even diabetes.^[3] Alternative medicine has opened new door for the treatment of cardio metabolic disorders, which has attained epidemic proportion throughout the world. *Nigella sativa* seeds have been used for centuries for medicinal and culinary purposes. It is reported to possess a number of metabolic

properties: antioxidant, anti-inflammatory, hypoglycemic, antihypertensive and anti-hyperlipidemic properties.^[4]

The seeds of *Nigella sativa* plant have been used to promote health and fight disease for centuries especially in the Middle East and Southeast Asia. In South Asia, it is called Kalonji, its Arabic name is Habat-ul-Sauda and its English name is Black cumin. The plant is widely grown in different parts of the world and is an annual herb cultivated in India. As an oriental spice, *Nigella sativa* has long been used as a natural remedy for the treatment of many acute as well as chronic diseases.^[5] This plant has been a great focus of research and has several traditional uses and consequently has been extensively studied for its chemical constituents and biological activities.^[6,7]

2. MATERIAL AND METHODS

Adult patients with Metabolic Syndrome, having met 3/5-National Cholesterol Education Programme (NCEP) - Adult Treatment Panel (ATP) III (Asian-modified) criteria^[8]

2.1. Exclusion Criteria

Those having ACE inhibitor or ARB/ any Thiazolidinediones/statins/metformin/steroids in the last 3 months, CHF, Renal failure (S. creatinine > 2.0 mg/dl), Hepatic dysfunction (ALT). Written informed consent was given by all participants. A standard questionnaire was completed in all patients recruited for the study. The study protocol was approved by local ethics committee. The study was conducted in accordance with the declaration of Helsinki. Advices about dietary and lifestyle changes were given to both *Nigella sativa* and standard groups. Dietary advice as recommended by NCEP was given.

2.2. Study Design

Parallel group, interventional, randomized, open-labeled, active control and comparative study

2.3. Waist circumference measurement technique

Place measuring tape, holding it parallel to floor, around abdomen at the level of the iliac crest. Hold tape snug but do not compress the skin. Measure circumference at the end of normal expiration

2.4. Specific investigations

Blood sugar both fasting and postprandial, Renal function test, Fasting lipid profile, Urine for albumin, Liver function tests, *Nigella sativa* oil 100% (Mohammedia products, Red Hills, Nampally, Hyderabad).

2.5. Study Groups

Group I. (Standard): Patients who were kept on standard regimen: Atorvastatin 10 mg once a day, Metformin 500 mg twice a day, Amlodipine 5 mg once a day, Atenolol 50 mg once a day, Aspirin 150 mg once a day (as and when required).

Group II. (*Nigella sativa*): Patients who were kept on standard regimen plus *Nigella sativa* oil 2.5 ml twice daily per orally for a period of six weeks as an add on therapy.

2.6. Statistical analysis

Pre and post treatment mean \pm standard deviation of each parameter was calculated for both groups. The data were analyzed statistically using unpaired t test between Group I (Standard) and Group II (*Nigella sativa*). The entire statistic was done by using SPSS -13.0.

3. OBSERVATIONS AND RESULTS

The present study was conducted on newly detected patients of metabolic syndrome in a teaching Hospital of North India from October 2005 to March 2007. The study group comprised of 161 patients. There were 115 males and 46 females. The age group of the patients varied from 20 years to 70 years but majority of the patients were in 40-60 years age group. These patients were diagnosed as having metabolic syndrome according to ATP III criteria.

Distribution of patients according to parameters of ATP III definition: Maximum numbers of our patients were suffering from obesity (93.7 %) followed by low serum HDL (87.5 %) followed by raised serum triglyceride (84.3 %) followed by fasting blood glucose >110 mg % (63.7 %) followed by hypertension (62.5 %).

3.1. Different Clinical and Biochemical Parameters

Body mass index (BMI): According to WHO clinical criteria for metabolic syndrome, the cut off point for BMI is > 30 Kg/m². There was improvement in BMI of both the groups. Improvement was more in *Nigella sativa* group as compared to Standard group but the difference in improvement between two groups was not significant. Mean \pm S.D. of pre and post treatment values of BMI are listed in the following table.

Abdominal circumference: According to ATP III, criteria abdominal obesity is calculated by measuring waist circumference. The cut off points for males and females are > 102 cms and > 88 cms respectively. The presence of abdominal obesity is more highly correlated with the metabolic risk factors than is an elevated BMI. Abdominal girth was reduced in both the groups. More reduction was seen in *Nigella sativa* group but the difference between two groups was not significant. Mean \pm S.D. of pre and post treatment values of abdominal circumference are listed in the following table.

Hip circumference: Hip circumference was reduced in both the groups. More reduction was seen in Nigella sativa group but the difference between two groups was not significant. Mean \pm S.D. of pre and post treatment values of hip circumference are listed in the following table.

Body weight: Body weights were reduced in both the groups. The improvement was more in Nigella sativa group but the difference between two groups was not significant. Mean \pm S.D. of pre and post treatment values of body weight are listed in the following table.

Waist hip ratio: According to WHO criteria of metabolic syndrome, the cutoff point of waist hip ratio for males and females are respectively >0.9 and >0.85 respectively. Waist hip ratio was improved in both the groups. Improvement was more in Nigella sativa group but the difference between two groups was not significant. Mean \pm S.D. of pre and post treatment values of waist hip ratio are listed in the following table.

4. DISCUSSION

Central adiposity is a component of the Metabolic Syndrome and one of the key elements in the pathogenesis of Metabolic Syndrome. Increasing obesity is positively correlated with blood pressure, fasting insulin, glucose and triglycerides, and negatively correlated with HDL cholesterol. It therefore seems logical to target weight loss aggressively. The National Institutes of Health guidelines for the treatment of obesity recommend consideration of pharmaceutical therapy for weight loss for individuals with a BMI of at least 30 kg/m^2 or for those with a BMI of at least 27 kg/m^2 and co-morbidities associated with their excess weight.^[9] The primary goal of anti-obesity therapy is to restore the balance between calories intake and expenditure. Currently, sibutramine and orlistat are the only anti-obesity drugs approved, not without adverse effects. (Table. 1.)

Table. 1. Body weight reduction in both groups.

Parameters	Group	No. of patients	%age improvement
BMI kg/m^2	A	30	0.019 \pm 1.275
	B	30	0.048 \pm 2.341
W.C cms.	A	30	0.167 \pm 0.641
	B	30	0.523 \pm 0.982
FBS mg/dL	A	30	18.463 \pm 6.772
	B	30	29.239 \pm 6.094
PPG mg/dL	A	30	19.875 \pm 6.216
	B	30	23.388 \pm 8.543
Body weight kg	A	30	0.133 \pm 0.528
	B	30	0.641 \pm 1.151
TC mg/dL	A	30	16.925 \pm 6.252
	B	30	26.871 \pm 6.753
TG mg/dL	A	30	14.183 \pm 0.009
	B	30	12.027 \pm 0.547
LDL mg/dL	A	30	13.968 \pm 3.194
	B	30	15.894 \pm 2.153
HDL mg/dl	A	30	15.947 \pm 5.750
	B	30	23.890 \pm 7.298

In our study, we had taken five parameters for the measurement of obesity. They were body mass index, waist circumference, hip circumference, and body weight and waist hip ratio. Advices about dietary and lifestyle changes as recommended by National Cholesterol Education Programme were given to both Nigella sativa and standard groups.^[10] In addition, Nigella sativa oil 2.5 ml twice daily was added as add on therapy in Nigella sativa group. There was improvement in all the five-above mentioned parameters in both groups but the improvement was more in Nigella sativa group as compared to standard group. Obesity is a major risk factor for type 2 diabetes and cardiovascular disease. It also is an important component of metabolic syndrome, although in a minority of obese persons, insulin resistance does not develop. Insulin resistance may also develop in persons classified as lean by body mass index (BMI) standards, who could thus be considered "metabolically obese". It is thought that visceral, or

central, adiposity is the initial physical event that results in insulin resistance, by an increase in free fatty acid flux in portal and systemic circulations. No such clinical study had been done previously on anti-obesity activity of Nigella sativa. Anti-obesity activity of Nigella sativa is being reported for the first time by us. The exact mechanism regarding anti-obesity action is not known. In an animal study on rats showed that petroleum ether extract of Nigella sativa had slight anorexic effect^[11,12,13]. The various constituents of Nigella sativa seeds for example lipase^[14] may be responsible for its anti-obesity action. It is the android obesity or apple shaped obesity that is associated with metabolic syndrome.^[15,16] The distribution of body fat is more important than the total quantity of fat in predicting the diabetes mellitus and associated macro vascular disease.^[17,18,19] The measurement of central obesity can be done by (1) measuring waist hip ratio, desired ratio, women < 0.8 , men < 0.9 (2) measurement of waist: more than 88 cms in

women and more than 102 cms in men, places them in high risk category for the development of metabolic syndrome. Waist circumference has very crucial role in the detection and diagnosis of metabolic syndrome. Overweight and obesity are associated with insulin resistance and the metabolic syndrome.^[20] However, the presence of abdominal obesity is more highly correlated with the metabolic risk factors than is an elevated BMI.^[21] Therefore, the simple measure of waist circumference is recommended to identify the body weight component of the metabolic syndrome.

5. CONCLUSION

In general, treatment for metabolic syndrome, that targets all or most of the components of metabolic syndrome is currently, non-existent or insufficient. The molecules that have the potential to treat both hemodynamic and biochemical features: blood pressure, dyslipidemia and insulin resistance, increased waist circumference could provide an effective and cost limiting therapeutic strategy for reducing cardio vascular events. Nigella sativa oil, when used as an add on therapy proved effective in reducing weight, HDL-cholesterol and blood glucose levels. However, to the best of our knowledge anti-obesity activity of Nigella sativa oil is being reported for the first time by us. The most important action of Nigella sativa that may be responsible for its beneficial effect in metabolic syndrome is its insulin sensitizing action. The active ingredients of Nigella sativa that may be responsible for its anti-inflammatory effects are thymoquinone, thymol, various unsaturated fatty acids, lipase and tannins.

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