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Effective Role of Olive Oil Use on Lipid Profile, Blood Pressure And Blood Glucose in Subjects of Metabolic Syndrome

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Abstract: Study was taken with an objective to investigate the role of oil extracted from olives on lipid profile, blood pressure and glucose level in subjects having metabolic syndrome. A total of 115 male subjects of metabolic syndrome selected on International Diabetes Federation criteria, aged between 20-40 years were included. Blood pressure, fasting glucose levels and lipid profile were performed at base line. Thirty ml of virgin olive oil per day in divided doses 15 ml in the morning and 15 ml in the evening was given to these subjects for six weeks. Then lipid profile, blood pressure and fasting glucose level were performed and compared with base line values. Significant decrease was observed in total cholesterol, triglycerides, low density lipoprotein cholesterol and increase in high density lipoprotein cholesterol, all P values < 0.01. Non-significant low level of fasting blood sugar was observed. Significant decrease in systolic and diastolic blood pressure at P value < 0.01 was observed. It is concluded that use of olive oil caused improvement in lipid profile and blood pressure measurement in metabolic syndrome subjects significantly while non-significant decrease was observed in fasting blood glucose.

Keywords: Olive oil, Lipid profile, Blood pressure, blood glucose, metabolic syndrome.

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Introduction

Metabolic syndrome (MetS) is represented by raised blood pressure, obesity especially central with presence of adipose tissue around abdominal viscera, insulin resistance, lipid derangements and is strongly associated with diabetes and cardiovascular problems [1]. Modern changes in lifestyle like sedentariness with over intake of caloric food saturated with simple sugars leads to metabolic disturbances and age-related disorders [2]. Metabolic disorders, including obesity, diabetes mellitus, and the MetS show impact on public health because of poor prognosis and increased prevalence.

Last two decades have witnessed prominent increase in MetS. As per Statistics provided by 2nd national diabetic survey of Pakistan, the prevalence of diabetes was 26.3% out of this 19.2% were already diabetics and remaining 7.1% as new cases. The urban and rural prevalence was 28.3% and 25.3% respectively [3].

Sufficient evidence is available in support of idea that the monounsaturated fatty acids or MUFA as a nutrient, olive oil as a food component and the Mediterranean diet pattern are related to a reduced risk for obesity, MetS, diabetes mellitus and cardiovascular disease [4]. Olive oil, a main component of Mediterranean diet improves risk factors for cardiovascular disease such as blood pressure, glucose metabolism, lipid and antithrombotic profile [5].

Olive oil is famous for having MUFA in high level and it is good source of polyphenolic compounds, squalene and alpha-tocopherols [6]. These compounds have shown anti-inflammatory, antioxidant and lipid lowering properties [7].
This study was taken to investigate role of olive oil on blood pressure and blood sugar level and lipid profile in subjects with MetS.

Methods:
Comparative study conducted at department of physiology, chandka medical college, Larkana from July to December 2017 with proper ethical rules. Study included 115 male MetS subjects, aged between 20 to 40 years who gave written consent. Anthropometric measurements Lipid profile, blood pressure and fasting sugar levels were performed at base line, taken as pre olive oil use values. Thirty milliliter of virgin olive oil (VOO) per day (15ml in morning 15ml in evening) was given orally to these subjects for six weeks. Then lipid profile, blood pressure and fasting glucose level were performed and compared with base line values.

Inclusion criteria
MetS subjects detected by using International Diabetes Federation criteria expressed as waist circumference (WC) in men ≥90 cm; women≥ 80 cm plus any two of these four (1) triglycerides(TG) > 150 mg /dl. (2) High Density Lipoprotein cholesterol (HDL-C) men <40 mg /dl; women <50 mg /dl. (3) Systolic blood pressure (SBP) ≥130/ Diastolic blood pressure (DBP) ≥85 mmHg. (4) Fasting glucose (FBG)≥100mg/dl.

Exclusion criteria:
Subjects having cardiovascular disease, Diabetes, Chronic inflammatory /infectious diseases, Cancer, Smokers, Alcoholics, any pathology in neck, Subjects taking lipid lowering drugs and steroids.

Measurement of anthropometric parameters and blood pressure:
Weight in kilograms, height in meters, WC in centimeters and Body Mass Index (BMI) were measured with standard methods.
Blood pressure of subjects measured in seated position twice in the right arm second reading taken after rest of 10min by mercury sphygmomanometer and average reading was used for study analysis.

Blood sample collection and analysis:
Six milliliter of blood at fasting was drawn from vein under aseptic conditions in plain test tubes without anticoagulant. The blood was allowed to coagulate. The samples were centrifuged and serum was separated. TC, HDL-C, TG detected by assay kit from human GmbH Germany using Metrolab 1600, SA and FBG by GOD-PAP(Glucose Oxidase-Phenol- Aminophenazone) method. For Low density lipoprotein cholesterol (LDL-C) level Friedewald equation described as LDL-C= Total Cholesterol- (HDL-C+TG/5) was used [8].

Data Analysis
All the collected data were gathered for analysis on SPSS-23. Mean with standard deviation was computed for all quantitative parameters, like BMI, WC, SBP, DBP, FBG, TC, HDL-C, LDL-C and T.G. They were compared by applying independent T-test.

Results: All the subjects were between the ages of 20 to 40 years. Table.1 shows the pre and post study values of BMI, WC, SBP, DBP and FBG. Significant difference was found between values

of before and after taking VOO in values of BMI, WC, SBP, DBP , while non significant decrease in FBG.

Table.1 Pre and post measurement of BMI, WC, SBP, DBP and FBG of study subjects.

Anthropometry, Blood pressure and Blood glucose levels		**Mean**	**Standard Deviation**	**P-value**
BMI (kg/m)	Pre	32.86	3.57	<0.01*
	Post	31.3	3.65	
W.C(cm)	Pre	106.3	12.24	<0.01*
	Post	98.06	13.33	
SBP mmHg	Pre	139.13	10.04	<0.01*
	Post	118.87	5.92	
DBP mmHg	Pre	91	6.66	<0.01*
	Post	78.26	3.56	
FBG (mg/dl)	Pre	108.04	6.91	0.08
	Post	106.53	5.38	
*P<0.05 was considered significant for mean differences				

Table. 2 Shows significant improvement in the lipid parameters values. Significant decrease was found in TC, LDL-C, TG and increase in HDL-C between values of before taking VOO and after taking VOO.

Table. 2 pre and post measurements of TC, HDL-C, LDL-C and TG of study subjects.

Lipid profile		**Mean**	**Standard Deviation**	**P-value**
TC mg/dl	Pre	185.3	22.33	<0.01*
	Post	170.37	18.11	
HDL-C mg/dl	Pre	32.6	4.33	<0.01*
	Post	37.66	2.87	
LDL-C mg/dl	Pre	113.15	20.72	0.01*
	Post	106.86	17.08	
TG mg/dl	Pre	169.27	38.05	<0.01*
	Post	128.06	18.75	

Discussion

Western world has witnessed a rising in number of MetS subjects. Prevention and treatment has become challenge for medical profession. According to an estimation in 2025 about 300 million people worldwide will be diagnosed as diabetics, a disorder related with MetS [9]. Rankwise Pakistan stands 6th with 10 % population of diabetics and with rising trend will become 4th by the year 2030 [10]. Post-prandial abnormal conditions concerned with MetS may be decreased with diets containing MUFA [11].

In this study, 30ml of olive oil with routine diet for six weeks in subjects of metabolic syndrome resulted in significant improvement of, lipid profile, blood pressure and fasting blood glucose.

Significant decrease of BMI after taking VOO is consistent with study which has found low incidence of obesity who consumes olive oil [12]. Significant decrease in WC after consuming VOO is in agreement with study of Romaguera *et al* [13], who observed that diet enriched with olive oil showed reduction in waist circumference. Current study has found decrease in SBP and DBP significantly. This is in accordance with results of other studies [14, 15]. Improved lipid profile showing decrease in TC, LDL- C, TG and rise in HDL-C after taking olive oil are in agreement of other researchers [6, 16]. Our results regarding decrease in LDL-C is not in agreement with study of Jespersen *et al* [17] who have observed raised LDL-C associated with dietary olive oil. Current study has found nonsignificant decrease in level of FBG after taking dietary VOO. This finding is in agreement with number of other studies [16, 18 19].

Conclusion:

Dietary olive oil caused improvement in lipid profile and blood pressure measurement in metabolic syndrome subjects significantly while nonsignificant decrease was observed in fasting blood glucose.

Strengths and limitations of the Study.

Results encourage the use of olive oil as medical dietary therapy in subjects of MetS, while our limitations are small sample size. We also could not get full analysis of locally available VOO.

Future Prospectus

Multifactorial approaches available in genomics, metabolonomics add lipidomics should be utilized to reach reasonable solution for treating metabolic syndrome.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

HUMAN AND ANIMAL RIGHTS

No animals were used in this study. The study on humans was conducted in accordance with the ethical rules of the Helsinki Declaration and Good Clinical Practice.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

None.

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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