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IS THERE ANY EFFECT OF ALTERATION OF VEGETABLE OIL ON CARDIOVASCULAR PARAMETERS AND LIPID PROFILE ON HEALTHY HUMAN INDIVIDUALS

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ABSTRACT

Olive oil and peanut oil both contain significantly high levels of Mono Unsaturated fatty acids (MUFA) and adequate levels of the essential fatty acids like the n-6 linoleic acid and the n-3 α- linolenic acid. This composition of oils has been reported to be beneficial for overall health, particularly for cardiovascular health by decreasing LDL levels, increasing HDL levels and has also been shown to have anti-inflammatory properties. This study evaluated the effects of olive oil and peanut oil intake on blood lipid levels of healthy normolipidemic subjects (20-50 y/o). Sixty subjects were recruited and were divided into two groups group 1 (30) and group 2 (30). Subjects asked to replace their soybean oil (PUFA rich oil) with olive oil and peanut oil respectively. The levels of total Cholesterol, HDL-Cholesterol (good cholesterol), LDL-Cholesterol and triglyceride were assayed at base line and on three months. Blood pressure and heart rate were also evaluated. The concentration of LDL-Cholesterol and total cholesterol were significantly reduced in both group ($p<0.05$). While systolic and diastolic blood pressures were significantly reduced in group 1 meanwhile, high density lipoproteins (good cholesterol) increased in both groups.

KEYWORDS: Anti-Oxidant enzymes, Peanut oil, Lipid profile, MUFA/ PUFA, Olive oil.

INTRODUCTION

Oil is composed of fatty acids like saturated fatty acids (SFA), monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA) which are chains of hydrogen and carbon attached to a glycerin molecule.[1] In last few years the consumption of olive oil in India has increased. This is largely because of change in eating habits and influence from the Western countries that promote olive oil as healthy oil. Phenolic compounds in olive oil have potentially beneficial biological effects resulting from their antimicrobial, antioxidant and anti-inflammatory activities[2,3]

Groundnut is one of the most important cash crops of our country which is a low priced commodity and a valuable source of all the nutrients.[4] Groundnut oil is also widely used in many parts of India for cooking. According to studies by the American Peanut Council, Peanut/groundnut oil is nutritionally similar to olive oil in the proportions of fatty acids it contains, being high in monounsaturated fatty acids and low in saturated fatty acids and that both oils are beneficial for cardiovascular health.

The climatic conditions in India is most suited for growing groundnuts rather than olives which is largely grown in Mediterranean regions and in higher altitudes[5] Groundnut oil reportedly has greater oxidative stability and higher smoking point as compared to olive oil and has been considered as a premium cooking and frying oil[6] as compared to olive oil. Gomez et. al., 2003 have shown that the phenolic compounds in extra virgin olive oil get damaged very quickly by heat along with a loss of Vitamin E. From the above observations groundnut oil seems to be more appropriate oil for Indian style cooking which involves shallow and deep frying.[7]

Fatty Acid Composition Of Experimental Edible Oils[8]

S. no.	Fats/Oil	Sfa	Mufa	Linoleic Acid (Omega-6 PUFA)	Alpha-Linoleic Acid (Omega-3 PUFA)	n-6:n-3 ratio	Smoke point
1	Olive	13	76	10	<0.5	20:1	220°C
2	Peanut	24	50	25	<0.5	50:1	231°C

MATERIAL AND METHOD

Data collection

A pre/posttest randomized study was designed and utilized to show the impact of peanut oil and olive oil on blood pressure and lipids levels among healthy, normolipidemic, young adults.

Sixty individuals of both sexes of age 20-60 year were recruited for participating in the current study. The study was conducted for 12 weeks. The subjects were told to replace their soybean oil (refined) by Olive oil (refined) and Peanut oil for the next three months in group 1and group 2 respectively. They were to use 20 ml of respective oil per day for three months. We observed cardiovascular parameters (i.e. Systolic and Diastolic blood pressures, pulse rate and lipid profile) on zero day and after three months of using respective oil. This study was conducted in the Department of Physiology, S.P. Medical College, Bikaner (Raj.) with the informed consent of the subjects. The research did not suggest any alterations in other aspects of the subject's medical care, diet, or exercise. Compliance was monitored by contact with the subjects.

Their body mass index (BMI) ranged from 18 to 25 $kg.m^2$, and body weight was stable (less than 3 kg variation in the prior 6 Months). Exclusionary criteria included regular use of Medication, except oral contraceptive, smoking, vigorous regular exercise, hypertension, blood cholesterol >220 mg/dL, diabetes, glucose intolerance, allergic to any of the vegetable oil and non cooperative subjects.

Biochemical analysis

Biochemical analysis done by collection of blood samples approximately 10ml blood samples were taken before breakfast from the cubital vein directly into lithium heparin vacuum tubes for measurements of triglyceride, total cholesterol, HDL and LDL. The samples were centrifuged within 1hour at 1000xg for 10 min at 4ºC, and the plasma transferred into separate labeled tubes. All biochemical measurements were carried out by using an auto analyzer (Dimension RXL clinical chemistry system, Dade Behring, USA). The samples were taken at the starting day and at end of week 12.

Prior to implementation of the training program, an official permission was obtained from the supervisors of the selected units. This was intended to facilitate data collection and to explain the purpose of the study. At the beginning of the study, participants were invited to participate in the project. The researcher explained the study purpose and procedures for the randomly selected sample. Potential subjects were further informed that the participation was voluntary and that study findings would be presented group wise and no individual would be recognized.

Statistical Analysis

Collected data were tabulated and statistical analyses were done using descriptive statistic, means, and standard deviation (SD) of the means were calculated utilizing the computer data processing (SPSS, version 12). A probability value (*P*) of <0.05 was considered to be statistically significant.

RESULTS

Table 1 Mean age of subjects under study.

	Group 1(Olive oil)	Group 2 (Peanut oil)
Mean	31.83	36.66
SD	11.59	13.66
P Value	0.25	

Table 2: Comparison of Anthropometric and Biochemical parameters in group 1 (olive oil group).

Parameters		Base line		Post intervention		p
		Mean	SD	Mean	SD	
BMI (kg/m^2)		22.96	2.49	23.38	2.43	0.51
Blood Pressure(mmHg)	Systolic	135.06	5.16	129.73	5.88	0.0004*
	Diastolic	83.2	2.32	79.86	2.28	0.0001*
Pulse/ min		75.93	2.76	75.33	2.61	0.39
Lipid profile (mg/dl)	TC	185.66	20.79	173.3	16.66	0.01*
	TG	120.46	6.15	114.8	8.81	0.005*
	HDL	37.53	3.15	42.2	3.75	0.0001*
	LDL	124.04	22.12	107.94	17.76	0.001*
	VLDL	24.09	1.23	22.96	1.76	0.005*

Table 3: Comparison of Anthropometric and Biochemical parameters in study group (peanut oil group).

Parameters		Base line		Post intervention		p
		Mean	SD	Mean	SD	
BMI (kg/m^2)		22.85	3.29	22.89	3.24	0.96
Blood Pressure(mmHg)	Systolic	131.73	5.19	129.33	4.93	0.07
	Diastolic	81.5	3.13	80.93	3.18	0.48
Pulse/ min		74.16	4.03	74.4	3.75	0.81
Lipid profile (mg/dl)	TC	177.1	14.30	167.43	13.42	0.009*
	TG	118.6	14.41	108.8	10.70	0.004*
	HDL	37.1	2.39	40.5	2.20	0.0001*
	LDL	116.28	15.83	105.17	14.03	0.005*
	VLDL	23.72	2.88	21.76	2.14	0.004*

The mean age of participants was 31.83 ± 11.59 years (mean ±standard deviation) in control group and in study group it was 36.66 ± 13.66 years (mean ±standard deviation).

After twelve weeks of consumption of olive oil and peanut oil, the levels of TG, Ch and LDL were significantly reduced in both groups (Table 3 & 4). Meanwhile, significant increases in the levels of HDL were recorded in groups. While systolic and diastolic blood pressures were significantly reduced in group 1 (table 2).

DISCUSSION

This study contrasts the effect of peanut oil on plasma triglyceride, total cholesterol, HDL-cholesterol, and LDL-cholesterol.

In contrast to literature report on the effect on nuts and peanuts[9,10] on lipid profile improvement, the current study revealed a significant changes on the triglyceride, total cholesterol and HDL-cholesterol levels after peanut oil intake. Beside its high MUFA content there are several other small ingredient that are responsible for it.

Very recently, MUFA-rich diets were reported to decrease plasma total cholesterol and LDL-C without decreasing HDL-C in humans. In contrast to some recent reports a study indicates that a large amount of dietary MUFA may raise some fractions of plasma lipids in humans.

Miettnen Studied that vegetable oils rich in MUFA such as peanut oil, mustard oil contain different sterols, in particular, campesterol and sitosterol. These plant sterols in peanut oil may impair cholesterol absorption as suggested by a decrease in serum cholestanol, a precursor of cholesterol. This effect may be responsible in part for the significant cholesterol lowering effect of MUFA rich oil shown in the study.[11]

MUFA rich oil such as Peanut oil, Mustard oil and olive oil reduces plasma cholesterol, several hypotheses have been advanced to explain the cholesterol lowering effect, including the stimulation of cholesterol excretion into the intestine and stimulation of oxidation of cholesterol to bile acids. It is possible that cholesterol esters of polyunsaturated fatty acids are more rapidly metabolized by the liver and other tissues, which might enhance their rate of turnover and excretion. There is other evidence that the effect is largely due to a shift in distribution of cholesterol from the plasma into the tissues.

Our findings are consistent to Ferrara et al who showed highly significant improvement in systolic and diastolic blood pressure ($p<0.001$) of mild to moderate hypertensive patients after the consumption of olive oil[12]. Several intervention studies in humans showed that the replacement of SFA by MUFA in the diet lead to a decrease in blood pressure, both in men and women.[13,14] Moreover, an inverse relationship between arterial blood pressure and both the Mediterranean diet and olive oil consumption has been observed in population studies.[15] In hypertensive patients, olive oil was more effective in reducing systolic (SBP) and diastolic blood pressure,[16] and the antihypertensive treatment,[8] than PUFA-rich diets. These authors[17] reported that only the olive oil rich-diet induced a significant reduction of blood pressure, suggesting a role for the minor olive oil components on blood pressure levels. Supporting this hypothesis, Fit´o et al.[18] reported a decrease in the SBP after high-phenolic olive oil consumption, in comparison with low-phenolic olive oil, in hypertensive stable CHD patients. This fact was particularly marked in those who were SBP "140mmHg at the beginning of the study. In Fito's study18a concomitant decrease in circulating oxidized LDL and lipid peroxides was also observed related with the phenolic content of the olive oil. The potential vasodilator activities of olive oil triterpenoids, such as oleanolic acid or erythrodiol, are currently a subject of interest. Although their presence in virgin olive oil is low, they are in high concentrations, up to 120 mg/kg, in pomace olive oil, a mixture of the refined product of the drupe after virgin olive oil extraction and virgin olive oil[19] Thus, the benefits of olive oil and its phenolic compounds on blood pressure could be mediated through their protective effect on the vascular endothelial function.

CONCLUSIONS

The preliminary analysis of the samples collected shows that the biochemical parameters analyzed in the limited

number of samples are comparable for both olive and peanut oil consumers without any significant difference. Since the subjects tested were from a random sample of the general population and not a controlled group it was expected that the data would show a high degree of variability; however all parameters were seen to be with in the normal clinical range. Keeping in mind all the factors (environmental and genetic) that play a role in determining an individual's health status and their relation to the oil they consume, it is obvious that testing of blood samples of a large population is mandatory before it can be conclusively said which oil is better for consumption, both nutritionally, economically and socially from the Indian perspective. However, these preliminary results justifies our contention that peanut oil could be an economically as well as nutritionally a better oil for consumption by an Indian population.

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