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Original Research Article

Effects of the peanut oil on blood lipid and blood pressure of healthy normolipidemic individuals

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Abstract: Peanut oil has been associated with reduced level of plasma cholesterol and triglyceride, possibly due to its high monounsaturated (MUFA) lipid profile. This study evaluated the effects of peanut oil intake on blood lipid levels of healthy normolipidemic young adults (18-50 y/o). Sixty subjects were recruited they were divided into two groups control group (30) and study group (30). Subjects asked to replace their soybean oil with peanut oil except the control group. 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 study group ($p<0.05$). The week and intermediate effect of the peanut oil on cholesterol and blood pressure relative to the soybean oil suggest contribution of its MUFA composition as well as constituent in whole peanuts.
Keywords: Peanut oil, Cholesterol, Soybean oil, Lipoproteins, Blood pressure

INTRODUCTION

Vegetable oils are triglycerides extracted from plants. Such oils have been part of human culture for millennia [1]. The human brain is almost entirely composed of saturated fatty acids (SFA). Fats add taste to meals and give one a feeling of fullness when eaten.

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. Dietary fats are closely related to coronary Artery Disease (CAD). Cholesterol, Saturated and Trans fats are harmful whereas MUFA, PUFA (especially omega-3 PUFA) are beneficial for the heart. A heart healthy oil should be cholesterol and trans fats free, low in saturated fats, high in MUFA and PUFA, should have ideal n-6 to n-3 ratio(<4:1) and high smoking point [2]. Replacing dietary carbohydrate with mono saturated fat raises High Density Lipoprotein (HDL) cholesterol without affecting the LDL fraction. In addition mono saturated fats are resistant to oxidation [3]. The fiber in nuts can add cholesterol excretion and their micro nutrients and phytochemicals can reduce lipid oxidation, relax vascular tone and decrease platelets aggregation among other effects. Beef, dairy products and partially hydrogenated vegetables oils are also significant sources of mono saturated fats in the diet, but their consumption is often associated with intake of saturated and trans fats, which adversely impact lipid profiles [4]. Aside from nuts the major non animal sources of monounsaturated fat (MUFA) include olive and canola oils. Olive oil contains 73% MUFAs. In contrast, safflower oil has high poly unsaturated fat (PUFA) content. Peanut oil is intermediate, with 33% PUFAs and 49% MUFAs. Each of this plant oil has about some quantity of SFA [5].

Although classified with tree nuts, peanuts are legumes and grow underground. They are similar to tree nuts in form and fat content. Approximately 60% of the energy in nuts and peanuts is derived from fat, and greater than 75% of this fat is unsaturated [6]. Much of the health benefit attributed to nuts stems from the lipid-lowering effects [7] of their high unsaturated fatty acid profile as well as actions of other constituents like fiber, vitamin E, and phytochemicals [8].

Replacing dietary carbohydrate monounsaturated fat raises HDL cholesterol without affecting the LDL fraction [9, 10]. In addition, monounsaturated fat is resistant to oxidation. The fiber in nuts can add cholesterol excretion, [6] and their micro nutrients and phytochemicals can reduce lipid oxidation, relax vascular tone, [11] and decrease platelet aggregation [12] among other effects. Beef, dairy products, and partially hydrogenated vegetables oils are also significant sources of monounsaturated fat in the diet, but their consumption is often associated with intake of saturated and trans fats, [13] which adversely impact lipid profiles. Aside from nuts, the major non-animal sources of monounsaturated fat include olive and canola oils and avocados.

Fatty acid composition of experimental edible oils: [14]

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	Soybean	15	27	53	5	10.6:1	241°C
2	Groundnut	24	50	25	<0.5	50:1	231°C

MATERIAL AND METHOD

Data collection

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

Sixty individuals of both sexes (40 males and 20 females) 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 peanut oil (refined) for the next three months in study group. While control group did not change the oil and they used the same soybean oil (refined) for the next three months. 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 days 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 labelled tubes. All biochemical measurements were carried out by using an auto analyser (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

The mean age of participants was 31.16 ± 9.53 years (mean ±standard deviation) in control group and in study group it was 36.66 ± 13.66 years (mean ±standard deviation)(Table-1).

Comparison of Anthropometric and Biochemical parameters in control group (Soybean oil group) is given in Table-2.

After twelve weeks of consumption of peanut oil, the levels of TG, Ch and LDL were significantly reduced in study group (Table 3) Reduction of these parameters was more profound in study group than that in control group. Meanwhile, significant increases in the levels of HDL were recorded in both control and study groups but again it is more profound in study group.

Table 1: Mean age of subjects under study

	Control group (soybean oil)	Study group (Peanut oil)
Mean	31.16	36.66
SD	9.53	13.66
P VALUE	0.07	

Table 2: Comparison of Anthropometric and Biochemical parameters in control group (Soybean oil group)

Parameters		Base line		Post intervention		p
		Mean	SD	Mean	SD	
BMI (kg/m^2)		23.55	3.99	23.83	4.05	0.78
Blood Pressure(mmHg)	Systolic	133.53	3.09	132.93	4.97	0.57
	Diastolic	82.06	2.37	81.93	3.54	0.86
Pulse/ min		74.2	2.67	74.06	3.48	0.86
Lipid profile (mg/dl)	TC	180.03	3.48	179.33	9.52	0.91
	TG	118.76	4.99	116	5.55	0.04
	HDL	37.16	2.10	38.7	2.61	0.01
	LDL	119.11	9.92	117.9	9.64	0.63
	VLDL	23.75	0.99	23.2	1.11	0.04

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

DISCUSSION

This study contrasts the effect of peanut oil on plasma triglyceride, total cholesterol, HDL-cholesterol, and LDL-cholesterol. Prior work with whole nuts documented reduction in each of these lipid fractions associated with chronic consumption [7] and it has been assumed to stem from the fat profile. For almonds, it has been demonstrated that the nut and the oil have similar effects on lipid profile and LDL oxidation [15].

In contrast to literature report on the effect on nuts and peanuts [16, 17] 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 ingredients 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. However, the possibility that MUFA may also increase liver cholesterol in humans may need considerations [18].

Miettnen Studied that vegetable oils rich in MUFA such as peanut oil, mustard oil contain different sterols, in particular, camp sterol and sitosterol. These plant sterols in peanut oil may impair cholesterol absorption as suggested by a decrease in serum cholesterol, 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 [19].

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.

Monounsaturated fatty acids (MUFA), n-3 fatty acids from mustard oils affect the composition of lipoprotein subfractions favourably by lowering the triglyceride content, but the interpretation of the composition data is not clear. Reduced triglycerides content might be favourable because triglycerides-poor LDL particle are catabolized faster than TAG-rich particles [20]. However, a reduction of TAG content may also result in a reduction of the size of the particle, which is not considered favourable. This study concluded that peanut oil resulted in a lower number of triglyceride particles in most LDL subfractions compared with soybean oil without affecting the size of lipoproteins.

Grundy reported that plant sterols interfere with intestinal cholesterol absorption and have the ability to lower total and LDL cholesterol [21]. An alternative explanation could be a different impact of the fatty acid components on hepatic lipase activity. Watson *et al.;* concluded that there is an inverse relationship between the concentration and size of large, buoyant LDL particles and hepatic lipase activity [22]. According to Zambon *et al.;* high concentrations of LDL enhance the adhesion of monocytes and platelets to the endothelial wall and cause secretion of chemotactic factors and migration into the intima. Infiltration of macrophages deforms the smooth surface of arteries and progressively thickens the intima and lipid-laden macrophages because foam cell streaks [23].

Fatty acid chain length and degree of saturation may determine the amount of fat absorbed, affecting the extent and duration of lipemia, which may affect hepatic VLDL output indirectly these effects seem to not be mediated via effects on lipoprotein lipase activity [24].

In current study, the volunteers receiving high MUFA oil (peanut oil) experienced a significant change in their level of HDL, LDL and triglyceride. These results are similar to others in the literature [25, 26] where the intake of MUFA or carbohydrate replaced SFA intake.

CONCLUSION

In summary, peanut oil had positive effects on lipid profile and blood pressure in asymptomatic participants.

Further research should include a larger sample size and a long term use.

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