PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

Pakistan Journal of Nutrition 8 (2): 116-118, 2009
ISSN 1680-5194

Effect of Oilseed Diets on Plasma Lipid Profile in Albino Rats

Ajayi, Olubunmi Bolanle* and Ajayi, David Dais[1]
*Department of Biochemistry, University of Ado-Ekiti, Nigeria
[1]Chemical Pathology Section, Laboratory Department,
State Specialist Hospital, Ado-Ekiti, Nigeria

Abstract: The effect of fermented melon seed oil *(Citrullus lanatus)* (Ogiri) and palm kernel oil on the plasma lipid profile of female albino rats were investigated. Rats were randomly assigned into three groups and fed diet composed with fermented melon seed oil, palm kernel oil and control diet for seven weeks. After the feeding trial, plasma total cholesterol, low density lipoprotein cholesterol were significantly higher ($p<0.05$) than control in palm kernel oil diet while there was no significant difference in high density lipoprotein cholesterol. In contrast, the total cholesterol and high density lipoprotein cholesterol were significantly higher ($p<0.5$) than control while the low density lipoprotein cholesterol was significantly lower ($p<0.05$) in the fermented melon seed oil diet. The Ogiri oil diet had significantly reduced LDL/HDL ratio compared with the control while the palm kernel oil diet had a higher LDL/HDL ratio. The result implies that fermented melon seed oil (Ogiri oil) appears to have hypolipidemic effect while dietary intake of palm kernel oil could pose a risk for coronary artery disease on long term basis.

Key words: Fermented melon seed, palm kernel oil, plasma lipid profile

Introduction

Lipoprotein disorder is among the most common metabolic disease occurring in human. It may lead to Coronary heart disease (CHD) (Sloop, 1999). Excessive levels of blood cholesterol accelerate atherogenesis and lowering high blood cholesterol reduces the incidence of CHD (Grundy, 1986). Knowledge about the levels of cholesterol sub fractions is more meaningful than simple plasma cholesterol level. The higher the level of LDL cholesterol, the greater the risk of atherosclerotic heart disease conversely the higher the level of HDL cholesterol the lower the risk of coronary heart disease (Truswell, 1978).

Different types of dietary lipids have been shown to affect lipid metabolism and serum lipid profile differently. Plasma cholesterol levels are moderately decreased when low cholesterol diets are used (Toth, 2004). It is now generally believed that vegetable oils decrease plasma cholesterol levels although they differ in their cholesterol lowering capacity Furthermore the effect of dietary cholesterol on plasma cholesterol levels way be influenced by the types of fatty acid consumed which may be saturated or unsaturated (Mcpherson and Spiller, 1996)

Extensive studies on experimental animal indicate that the addition of different types of vegetable oils may have different effects on cholesterol metabolism (Smith *et al*., 1993; Stens and Myers, 1975).

Melon seed could be fermented to produce "Ogiri" which is used as a soup condiment and its widely consumed in South West Nigeria (Champe, 1994). The oil extracted from Ogiri after fermentation is often used for medicinal purpose by traditional healers and rarely used for edible purpose, this may be as a result of the rigours involved in the preparation.

Palm kernel oil (PKO) obtained from the kernel of palm fruit is often used for the manufacture of grease, soap and lubricants. However it is largely sold in Nigeria market for edible purpose. It contains 50% oil, which are mostly saturated fatty acids. The high consumption rate of the palm kernel oil and underutilization of the ogiri oil necessitated this study since dietary fats are major causative factors in coronary artery diseases.

The aim of this study therefore is to assess the effect of fermented melon seed *(Citrullus lanatus)* ("Ogiri") oil and palm kernel oil diets on serum lipid profile in albino rats.

Materials and Methods

Palm kernel oil was obtained from the local market in Ado - Ekiti while Ogiri oil was obtained from Ita-Ogbolu. Three weeks old weaning female white albino rats (*Rattus norvegicus)* obtained from the Animal unit of Department of Biochemistry, University of Ilorin, Ilorin, Nigeria, were distributed into three groups and randomly assigned to cages.

Each group was fed one of the three different diets (Table 1). They were given water and diets *ad libitum* and fed for six weeks.

1. Control diet (Group A)
2. Ogiri oil diet (Group B)
3. Palm kernel oil (PKO) diet (Group C)

After an overnight fasting, blood samples were withdrawn from the heart under chloroform anaesthesia.

Table 1: Diet Composition (g kg^{-1})

	A	B	C
Corn Starch	296	296	296
Soya meal	510	510	510
Sucrose	100	100	100
Methionine	4	4	4
Vitamin-mineral mix	40	40	40
Soya bean oil	50	-	-
Ogiri oil	-	50	-
Palm Kernel oil	-	-	50

A - Soya bean oil (control). B - Fermented Melon seed oil (citrullus lanatus) (Ogiri oil). C - Palm kernel oil. Vitamin-Mineral mix, composition, *vitamin A 15,000,000iu, vitamin D_3 4,400, 000 iu, vitamin E 1,350iu, vitamin B_2 4,350mg, vitamin B_6 2,350mg, vitamin B_{12}, 11350mcg, vitamin C 1,000mg, Nicotinic acid 16, 700mg, pantothenic acid 5, 350mg, otassium sulphate 12,000mg, copper sulphate 12, 00mg, Zinc sulphate 12,00mg, manganese sulphate 12,000mg, Lysine 15,000mg, Methionine 10,000mg, Lactose Q.S. 1,000g.

Table 2: Serum Lipid Profile

Group	Total Cholesterol	HDL.C	LDL.C	TG	LDL/HDL
A	1.44±0.50	0.74±0.37	0.51±0.19	0.41±0.14	0.70±0.24
B	2.68±0.45	1.85±0.24	0.55±14	0.61±0.18	0.30±0.11
C	1.71±0.45	0.78±0.32	0.63±0.28	0.67±0.38	0.95±0.26

The blood was then transferred to the labelled centrifuge tube and allowed to clot at room temperature for one hour and then centrifuged for ten minutes at a speed of 3000r. p.m. Serum was separated and used fresh.

Total cholesterol (TC) HDL cholesterol (HDL-C) LDL-cholesterol (LDL-C) Triacylglycerol (TG) were estimated from the serum.

Serum total cholesterol concentration was estimated using Randox laboratory is explained it based on the enzymatic end point method. The serum HDL-cholesterol was determined by the method of Hiller (1987). Serum triacylglycerol levels were determined by the method of Stens and Myers (1975). LDL cholesterol was obtained by subtracting the value of HDL-cholesterol and triacylglycerol from total cholesterol.

Statistical analysis: The results are expressed as Means ± S.E.M. Analysis of variance was used to test for differences in the groups.

Results

Table 2 shows the serum lipid profile of the oilseed diet and the control. The HDL-cholesterol of the Ogiri oil fed rats is significantly higher ($P<0.05$) higher than the control while PKO fed rats had a significant reduction.

The LDL-cholesterol or the Ogiri oil fed diet is not significantly different from the control while the LDL-cholesterol of the PKO fed rats is higher significantly than the control. Of particular interest is the LDL/HDL ratio the LDL/HDL ratio of Ogiri oil fed rats significantly decreased ($P<0.05$), while that of the PKO fed rats is significantly higher than the control.

Discussion

Dietary fats have a major role in the prevention and treatment of atherosclerosis. Both polyunsaturated fatty acids (PUFA) and monounsaturated fatty acids could affect the lipoprotein metabolism with hypo-cholesterolemic effect.

The present study showed a significant increase($P<0.05$) in the concentration of serum HDL-cholesterol of the Ogiri oil fed rats and significant decrease ($P<0.05$) in the palm kernel oil fed rat compared to the control. HDL-cholesterol controls the lipid metabolism by removing free cholesterol from the peripheral tissue cells etherifying it and transporting it in the neutral lipid back to the liver for catabolism. This is important because it indicates a reduced risk for cardiovascular diseases and hypertension (Becque *et al.*, 1988). Previous studies have established an inverse relationship between HDL cholesterol and increase of cardiovascular diseases (Becque *et al.*, 1988 and Kwiterovich, 1997).

The serum LDL-cholesterol and triglyceride concentration is significantly higher in the PKO oil diet compared to the control this could be as a result of the presence of saturated fatty acids in this oil. The principal fatty acid being lauric acid which constitute about 48.3%, such saturated fatty acid have large cholesterol raising effect (Keys, 1992). Moreover, LDL-cholesterol increase rate of triacylglycerol catabolism by mobilizing fats from the liver to adipose tissue. It carries 60% to 70% of total cholesterol in the serum (Beynen and Krichevsky ,1986) hence the higher level of LDL-cholesterol observed in this study implies high circulatory levels of triacylglycerols and cholesterol, this may enhance the possibility of deposition on arterial walls of lipid and hence blood lipid related diseases (McGill *et al.*, 1998). Also the HDL- cholesterol level was significantly reduced in the PKO fed rats compared to the control. Although in the past, an increase in the serum total cholesterol level is associated with increased risk of atherosclerosis, however, recent reports indicated that the LDL/HDL ratio is a stronger index of atherogenicity of the lipoproteins rather than the lipid profile of the individual lipoprotein fraction i.e. the lower the ratio the less atherogenic the lipoprotein profile is thought to be (Wallidus *et al.*, 2001). From Table 2, the LDL/HDL ratio of Ogiri oil fed rats is significantly lower than the control. This may be due to the fact that Ogiri oil (i.e. fermented melon seed oil) is enriched with high percentage of unsaturated fatty acids about 82. 76% of unsaturated fatty acid with linoleic acid constituting about 51%. El-Gengaihi *et al.* (2004) reported that the hypocholesterolemic effect of rocket and borage oil was attributed to the high concentration of unsaturated fatty acids in these oil. Similarly Shad *et al.* (2003) showed that consumption of olive, corn and rapeseed oils is beneficial to health. The LDL/HDL ratio

of palm kernel oil fed rats is significantly higher than the control. This implies that a more favourable lipoprotein profile was produced with Ogiri oil fed rats. It therefore suggests that long term consumption of palm kernel oil (i.e. its use as edible oil) as the case is presently could pose a risk in the development of cardiovascular diseases.

In conclusion the present study suggest that the consumption of fermented melon seed. (*Citrullus lanatus*) oil "i.e Ogiri oil" could be beneficial to health while long term consumption of palm kernel oil which increased LDL/HDL and lowered serum HDL-cholesterol could be detrimental to health.

Acknowledgement

I wish to acknowledge the contributions of Feyijimi and Ajayi Abimbola to this work. God bless you.

References

Becque, M.D., V.L., Katch, A.P., Rocchini, C.R., Marks and C. Moorehead, 1988. Coronary risk incidence of obese adolescents: Reduction by exercise plus diet intervention, Paediatrics., 81: 605-612.

Beynen, A.C. and D. Krichevsky, 1986. Dietary fats and serum cholesterol In: Nutritional effects on cholesterol metabolism (Beynen A.C.ed) Transmodial Voorthuizen, pp: 1-10.

Champe, P.C ., 1994. Nutrition. In. Lippincott Illustrated. Rev. Biochem. 2nd Edn. Change P.C. Harvey R.A (eds) J.B. Lippincott. Comp., pp: 303- 318.

El - Gengaihi, A.Salem, S.A Bashandi, N.A Iboahim and S.R. Abde l - Hamid, 2004. Hypolipidemic effect of some vegetable oils in rats. J. Fd. Agric. Environ., 2: 88-93.

Grundy, S.M., 1986. Comparison of monounsaturated fatty acid and carbohydrates for lowering plasma cholesterol N. Eng. J. Med., 314: 745-748.

Hiller, A., 1987. National cholesterol education program. Recommendation for HDL - cholesterols measurement. Clin. Chem., 33: 895.

Keys, A., 1992. Serum Cholesterol response to changes in the diet IV, Particular saturated fatty acids in the diet. Metabolism., 14: 776-787.

Kwiterovich, Jr., P.O., 1997. The effect of dietary fat, antioxidants and pro- oxidants on blood lipids, lipoprotein and atherosclesis. J. Am. Diet. Assoc., 95 (Suppl): 531-541.

Mcpherson, R. and G.A. Spiller, 1996. Effect of dietary fatty acids and cholesterol on cardiovascular disease risk factors in man. In: Handbook of lipids in human nutrition. Spiller G.A ed. CRC Press P.41 Sloop, G.D., 1999. A critical analysis of the role of cholesterol in atherogenesis Atherosclerosis., 142: 265-272.

McGill, H.C., S.N. Kole, K. Grupta and T.A.B. Senders, 1998. Unresolved problems in the diet - heart issue. Atherosclerosis., 1: 164-176.

Shad, A.M. Igbal, T. Shah, M.H. Mahmood and M. Tayyah, 2003. Vegetable oils, Dyslipidemia. Pak. J. Med. Sci., 19: 45-51.

Sloop, G.D., 1999. A critical analysis of the role of cholesterol in atherogenesis. Atherosclerosis., 142: 265-272.

Smith, G.D., F. Soup and T.A. Sheldon, 1993. Cholesterol lowering and mortality. Br. Medical J., 301: 1367. Truswell, A.S., 1978. Diet, plasma lipids - a reappraisal. Am. J. Clin. Nutr., 48: 1263-1275.

Stens, A. and G. Myers, 1975. National cholesterol education programme. Recommendation for triglyceride measurement. Clin. Chem., 41: 421-46.

Truswell, A.S., 1978. Diet, plasma lipids - a reappraisal. Am. J. Clin. Nutr., 48: 1263-275.

Toth, P.P., 2004. High Density Lipoprotein, Cardiovascular Risk. Circulation., 109: 1809-1812.

Wallidus, G., I. Jungner, I. Holme, A.H. Aastveit, W. Kolar and E. Sleiner, 2001. High apoliporotein B, low apoliprotein A-I and improvement in the prediction of fatal myocardial infarction (AMORIS study) a prospective study - Lancet, 358: 2026-2033.