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Effect of flax seed and barley supplementation on hyperlipidemic patients

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Abstract

The main objective of the present study is on the effect of flax seed and barley seed powders on the mentioned parameters and on reduce the risk of cardiovascular disease on hyperlipidemia patients. Thirty hyperlipidemia patients with range of serum total cholesterol between 175-250 mg/dl, triglycerides between 150 to 250mg/dl and serum LDL cholesterol between 100-150mg/dl of either sex age 50 years were selected the study from – hospital in Guntur, Andhra Pradesh, India. One group received only their anti-hyperlipidemic treatment (control group), second group were given 10g of flax seed powder (Group II) and third group received 10g of barely powder (Group III) per day for a period of 45 days. General characteristics observed that the sedentary life style and family history of CVD could be the main risk factors. The mean weight of the male patients was 66.3kg and female was 62.6 and they were bearing a 12.6kg greater than the standards. Thus, both the male and female subjects were overweight. The results of the present study showed that approximately 10 g of flaxseed and barley seed were significantly reduced serum total cholesterol, serum LDL-cholesterol, and serum HDL-cholesterol and triglyceride level in hyperlipidemia patients. Supplementation of flax seed had shown high significant effect when compared to barely on serum lipid parameters.

Keywords: flax seed, barley, hyperlipidemia, lipid parameters

1. Introduction

High serum lipid levels are major risk factors of coronary heart diseases that are influenced by lifestyle transition and urbanization. In India, there has been an alarming increase in the prevalence of cardio vascular diseases (CVD) over the past two decades so much so that accounts for 24% of all deaths among adults aged 25–69 years [23]. Dyslipidemia has been closely linked to the pathophysiology of CVD and is a key independent modifiable risk factor for cardiovascular disease [6, 7]. Hyperlipidemia, being an important risk factor for cardiovascular disease, is a serious public health problem in the world. Its major role in the pathogenesis of atherosclerosis has been implicated by several clinical and epidemiological studies [10]. Hyperlipidemia also has an indirect role by stimulating the production of oxygen free radicals (OFRs) from polymorpho nuclear leukocytes (PMNLs) and monocytes [21].

Flaxseeds are the best source of lignans, nutrients including protein, soluble and insoluble dietary fiber as well as omega 3 fatty acids. Omega 3 fatty acids play their role in reducing the risk of cardiovascular diseases [9, 16]. Ground flaxseed is high in omega 3 fatty acids which have been shown to reduce hypertension, cholesterol and triglyceride level [17] and improving heart functions due to eicosanoides derived from omega 3 fatty acids [26, 14, 12, 1, 3].

Barley seeds with low glycemic index [19, 4] and high fiber content, water soluble fibers¹³ such as α -glucan and high content of chromium and magnesium⁵ are suitable grains for preventing and treating diabetes and blood fat changes [12, 25, 27]. Studies on healthy humans showed that the use of dietary containing barley seeds as well as consumption of α -glucan supplements produced from barley results in reduction of glucose [20]. Hence, the main purpose of the present study is to investigate the effect of flax seed and barley seed powders on the mentioned parameters and on reduce the risk of cardiovascular disease on hyperlipidemia patients.

2. Materials and methods

Thirty hyper lipidemia patients with range of serum total cholesterol between 175-250 mg/dl, triglycerides between 150 to 250mg/dl and serum LDL cholesterol between 100-150mg/dl of either sex age 50 years were selected the study from Government general hospital in Guntur,

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Andhra Pradesh, India. The subjects with multiple complications such as diabetes, thyroid, chronic cardiovascular diseases, pregnant and lactating women were not included in the study.

Counseling of the patients about the study was done and informed consents were taken from the patients under medical supervision. The fasting blood samples of 5ml were collected to estimate lipid profile. The patients were categorized into three groups. One group received only their anti-hyperlipidemic treatment (control group), second group were given 10g of flax seed powder (Group II) and third group received 10g of barely powder (Group III) per day for a period of 45 days. Keen follow up was done for the entire study period. A detailed pretested questionnaire was developed including questions on anthropometry, dietary consumption pattern and biochemical.

All the parameters of lipid profile i.e., serum total cholesterol was estimated according to Zlatkis *et al.* (1954) [28], LDL cholesterol, triacylglyceride by Autoenzyme triglyceride kit and HDL- cholesterol by phosphotungstate/ magnesium

method were done at the end of the 30th day. The changes on the lipid levels of each group before and after supplementation were absorbed and statistically analysed using paired T-test. Data was expressed as mean \pm standard deviation. Statistical significance of difference between the base line serum lipid level for control group and experimental group was performed.

3. Results and discussion

This study was an attempt at determining the effects of flax seed and barley powder on lipid profiles in hyperlipidemia patients.

3.1 General characteristics

The general characteristics were obtained from the subjects is shown in Table no: 1. the control group consists of 60% male and 40% females. In group I 80% of the patients was male and 20% female. In group II 30% of the patients were male and 70% female. All the patients belong to the age group 30-40 years. Among the entire patients 73% belong to 30-35 age and the remaining was 35-40 years.

Table 1: General information of the subjects

S. No	Category	Control 10	Group – I 10	Group- II 10
1	Sex			
	Male	6 (60%)	8 (80%)	3 (30%)
	Female	4 (40%)	2 (20%)	7 (70%)
2	Income			
	Low	-	2 (20%)	2 (20%)
	Middle	10 (100%)	6 (60%)	8 (80%)
	High	-	2 (20%)	-
3	Age			
	30-35	4 (40%)	8 (80%)	10 (100%)
	35-40	6 (60%)	2 (20%)	-
4	Family size			
	<4	3 (30%)	2 (20%)	5 (50%)
	=4	2 (20%)	5 (50%)	4 (40%)
	>4	5 (50%)	3 (30%)	1 (10%)
5	Education			
	< Graduate	-	-	2 (20%)
	= Graduate	-	10 (100%)	8 (80%)
	< Graduate	10 (100%)	-	-
6	Activity			
	Sedentary	8 (80%)	10 (100%)	9 (90%)
	Moderate	2 (20%)	-	1 (10%)
	Heavy	-	-	-
7	Family history	4 (40%)	6 (60%)	7 (70%)
8	Type of Diet			
	Veg	8 (80%)	-	-
	Non Veg	2(20%)	10 (100%)	10 (100%)

Among the patients, most of them belong to middle income group. The entire control group belongs to middle class. 20% of group I and II were of low income group. 33.3% of the patients were of family size less than 4 and 36.6% were family size of 4 members. The remaining was of large family. The present study concludes that 69.9% of the patients were of nuclear families. 60% of the patients were graduates and 33.3% were post graduates and 6.7 5 were under graduates. There are no heavy workers among the patients. 10% of the patients are moderate workers and 90% were of sedentary life style. The family history of CVD was observed in all the groups. 40% of the control group shown family history of CVD. In test groups 60-70% of family history of CVD was observed. Vegetarians were few among the patients. 73.3% of the patients were non-vegetarians.

From the general characteristics observed that the sedentary life style and family history of CVD could be the main risk

factors. Bela Shah and Prashant Mathur (2010) [2] stated that ageing of population makes people more vulnerable to chronic diseases.

3.2 Somatic status of the patients

The mean height of the male patients was 162.1 cm and that of females was 160 cm (Table 2). The ICMR standards for male and female were 173.6 and 156 cm. Thus, the present result when compared with reference heights and the males were shorter and females were taller in heights. The mean weight of the male patients was 66.3kg and female was 62.6 kg the reference for male was 60kg but they were 6.3kg more weight and standard for female was 50kg and they were bearing a 12.6kg greater than the standards. Thus, both the male and female subjects were overweight and female are more overweight. Mean BMI values showed the subjects comes under normal. Schuize and Hu (2007) [24] reported that excess

adiposity is the most important risk factor for diabetes and CVD. Population and there is strong evidence to indicate obesity as a risk factor for CVD (Carels *et al.*, 2004)^[5]. The mean waist hip ratio for males was 0.94 and females were 0.92. Reference value of waist hip ratio for males was 1.0 and greater than 1 is obese. Thus, males have normal waist hip ratio. Reference value of females was 0.85 and obtained mean is 0.92. Thus, it is relevant that women were abdominal obese because of their upper body obesity with more than 0.85. The metabolic consequences of abdominal obesity include increased risk of Type 2 diabetes, atherogenic dyslipidemia and hypertension, are all well established risk factors for CHD^[8].

Table 2: Somatic measurements of the subjects

Characteristics	Male (Mean ± SD)	Female (Mean ± SD)
Weight (Kg)	66.3 ± 9.43	62.6 ± 6.87433
Height (cms)	162.0 ± 5.18	160.1 ± 5.18
BMI	22.8 ± 2.088	22.8 ± 2.08
Waist Hip Ratio	0.94 ± 0.04	0.92 ± 0.038

3.3 Serum lipid parameters

The lipid parameters are presented in table 3. There was a significant drop in the mean total cholesterol levels (TC) after 45 days consumption of flax seed and the barley seed powder. There was no significant difference among the control group

was observed. The t- value for the Group I TC was 5.79 which indicate a significant effect of flax supplementation. The difference of means among the group II was not much. The t-value of group II was 2.41 and less significant when compared to group I. HDL is the good cholesterol of the body. A decline of HDL levels in both test groups and control were observed. There was a significant difference observed in both test groups. The supplementation did not produce any rise in the HDL levels of the patients. The low HDL of the patients could be due to the sedentary life style which does not have a physical activity. The mean LDL level of group I was reduced from 147.7 to 99.8mg/dl which had a t-value of 5.3 where as a negligible difference was observed in group II with t-value of 0.07. This indicates a significant effect of the flax seed supplementation on the LDL levels. The t-value of group I for VLDL was 4.2 where as for group II was 2.8. The effect was highly significant in case of group I than group II. The triglyceride levels were significantly increased in the control. The difference between the initial and final means of the triglyceride levels of group I was observed. The initial mean and final means were 181.1 and 118.3mg/dl respectively for group I. the t-value was 4.07 which is a highly significant effect on triglyceride levels. The t-value for group II was 2.52; this was less when compared to group I.

Table 3: Effect of supplementation on serum lipid parameters

Lipid parameters (mg/dl)	Control			Group 1			Group 2		
	Initial	Final	't' value	Initial	Final	't' value	Initial	Final	't' value
TC	165.7 ± 32.16	168.8±31.45	0.63NS	226.2 ± 37.8	160.7±28.8	5.79*	180.2 ± 26.9	168.2 ± 31.2	2.41*
HDL	38±4.66369	36.86±4.51	0.23NS	46.9± 6.74	43.1± 2.92	1.66*	44.8± 1.398	42.6± 3.47	2.18*
LDL	92.73±23.278	93.88±23.29	0.82NS	142.7±49.68	99.8±32.59	5.30*	98.5± 34.20	98.2±30.62	0.078NS
VLDL	35.044±18.35	35.79±15.03	0.60NS	35.6±13.63	23.5±8.860	4.28*	34.3±8.31	30.4±11.12	2.83*
TG	176.1±91.2	181.9±91.03	0.007*	181.1±70.4	118.3±44.6	4.08*	170.2±42.84	152±57.60	2.52*

* - Significant at $P < 0.01$ -1% level, NS- Not significant

Saman Khalesi *et al.* (2011)^[22] concluded that 30 days consumption of flaxseed may significantly reduce total cholesterol and increase high density lipoprotein cholesterol in blood. In the present study reduction of cholesterol was observed but increase of HDL was not seen. Administration of roasted flaxseed powder of 15 gm for 4 weeks produces significant ($P < 0.001$) reduction of serum total cholesterol, triglyceride, LDL-cholesterol and increase serum HDL cholesterol in hyperlipidemic group (Parameshwari and Nazni 2012)^[18]. As stated in the present study reduction was seen among serum total cholesterol, triglyceride, LDL cholesterol but no increase was observed in HDL. Lupton *et al.* (1993)^[15] fed supplements of barley bran flour (30 g/day), barley oil (3 g/day), or cellulose (20 g/day) to hypercholesterolemic men and women and the addition of the barley bran flour and barley oil resulted in a significant decrease in total cholesterol.

4. Conclusion

The results of the present study showed that approximately 10 g of flaxseed and barley seed were significantly reduced serum total cholesterol, serum LDL-cholesterol, and serum HDL-cholesterol and triglyceride level in hyperlipidemia patients. Supplementation of flax seed had shown high significant effect when compared to barely on serum lipid parameters. Hence, it can be suggested that roasted flaxseed powder incorporated into the daily diet into dietary changes like laddu, chapattis can be used for lipid lowering purposes.

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