Research Article

Impact of Flax Seed Powder Supplementation on the Anthropometry and Bio-chemical Parameters of Dyslipidemic Patients

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Abstract

Introduction: Dyslipidemia is measured to be one among the 5 top most threatening factors for cardio-vascular diseases, along with hypertension, diabetes mellitus, smoking and obesity. Plant seeds like flax seeds are easy to consume and more effective in dyslipidemic patients. Therefore, this study is intended to conclude whether flax seed powder has any dose response on clinical variables associated with dyslipidemia in dyslipidemic patients.

Aim: To study the impact of supplementation of flax seed powder on the lipid levels as well as on the nutritional status of dyslipidemic patients.

Methodology: A private hospital, Galaxy Specialty Centre, Jaipur was selected to conduct the study. Total 100 dyslipidemic patients of age between 30 and 55 years were selected and 50 patients were given flax seed powder 15 grams per day for three months and 50 patients were kept as control. Anthropometric measurements and biochemical estimations were measured at pre and post intervention.

Results: After three months of supplementation with flax seed powder, there were significant improvements observed in the anthropometric measurements like weight, waist, hip circumference and BMI of the dyslipidemic patients. However, no changes were observed in control group. The lipid levels of the experimental group were found to be reduced significantly. The high density lipoprotein cholesterol was also increased in experimental group whereas in control group it was almost same.

Conclusion: The results indicate that intervention with flax seed powder may be regarded a useful remedial food for the management of dyslipidemia.

Keywords: Dyslipidemia; Total Cholesterol; Low Density Lipoprotein Cholesterol; Triglycerides; High Density Lipoprotein Cholesterol; Flax Seeds; Body Mass Index

Introduction

The prevalence of non-contagious diseases, including obesity, diabetes, cardiovascular disease (CVD), chronic respiratory diseases, hypertension, cancers and mental illness is increasing in epidemic magnitude globally with excessively higher rates in developing countries [1]. CVDs are the main widespread reason of mortality as well as morbidity in both under developed and highly developed countries and India is no exception Gupta., *et al*. [2]. Dyslipidemia is strongly related to the pathophysiology of cariovascular diseases. It is a well-known determinant for CVD [3]. The term dyslipidemia describes the abnormal levels of the lipoproteins such as higher levels of triglycerides (TGs) in serum or LDL-C or low levels of HDL-C. There are some primary causes of dyslipidemia that include the over production and poor clearance of the total choles-

terol, triglycerides and LDL-cholesterol because of the mutations of single or a number of genes. The secondary causes consist of inactive way of life and disproportionate ingestion of trans fats, saturated fat and cholesterol. Some other associated core causes are diabetes mellitus, hypothyroidism, chronic kidney disease, alcohol abuse, liver diseases etc [4].

Prevalence of dyslipidemia
Global

The global occurrence of dyslipidemia differentiates among folks on the basis of their race, genetics, age, income level and other factors. In the developing cities, dyslipidemia prevalence is increasing significantly as the economy is growing [5].

One another study concluded that there was 34% prevalence of dyslipidemia amongst Chinese population. It was found to be elevated in males by 41.9% and in females by 32.5% [6]. Wong., *et al.* [7] also described in their study on Chinese people about the incidences of dyslipidemia and summarized that 56% of the adults were dyslipidemic and many factors were associated with dyslipidemia such as higher age, femininity, urban areas, elevated BMI, high earnings, increased diastolic BP and amount of glucose in blood and smoking. According to a Canadian Health Measures Survey (2007-2009), 45% of Canadians of age group 18-79 had dyslipidemia [8]. One more study suggested that dyslipidemia is certainly linked with age and body mass index. Among 4309 subjects, total cholesterol was found in 43%, low HDL cholesterol was in 41.5%, high LDL cholesterol was in 36.2%, and high triglycerides levels were found in 35.7%. Overall, 78.7% of men and 80.4% of women had at least 1 lipid abnormality [9].

India

Numerous studies describe that dyslipidemia incidences in Indians have been rising gradually with the passing of each decade. A study was conducted to estimate the prevalence of dyslipidemia among 200 Delhi residents. The findings of the study suggested that among 200 subjects, the increased total cholesterol levels (≥200 mg%) was in 34%, 38% were having increased low-density lipoprotein levels (≥130 mg%) and 40% of the subjects had elevated triglyceride (≥150 mg %), and LDL cholesterol levels were found in 42% (<40 mg %) [10]. One another study conducted in Punjab indicated that over one fourth (27%) of the subjects have either increased total cholesterol or triglyceride levels. About 9.8% of the subjects were having hypercholesterolemia and 21.6% were diagnosed with hypertriglyceridemia [11]. A recent study by Das and Banik [12] in southern district of Bangladesh suggested that dyslipidemia occurrence was 73% in men while in women it was 71%.

Indian medicinal plants have potent effects in treating diseases such as dyslipidemia. A variety of food sources are currently gaining attention globally for potential health benefits in the treatment of many diseases, such as dyslipidemia and related complications. Flax seed is among one of those conventional health food. Flax seeds had been noticed to possess antioxidant properties which act against many diseases like atherosclerosis, diabetes mellitus, hypertension, chronic inflammation and pre-cancerous stage. Flax is well known as a super food because it has many valuable nutrients such as alpha-linolenic acid, lignin and polysaccharides, all of these have beneficial effects in the prevention of diseases. Whole flax seed contain a total of 28% dietary fibre which consists of 7 to 10% soluble and 11 to 18% insoluble fibre, 40% of fats in which 57% is omega 3 fatty acids and 21% proteins. Changes in life style, weight management, increasing physical activity and healthy nutrition are very important for dyslipidemic patients to maintain their life quality. Although many drugs and intervention are available to manage dyslipidemia, in most instances these are expensive (like statins), for a developing country like India, and have adverse effects also. Botanical products can improve lipid levels and the overall condition of individuals with dyslipidemia. Therefore, the current study is intended to determine whether flax seed powder has any dose response on clinical variables associated with dyslipidemia in dyslipidemic patients.

Objectives of the Study

To assess the impact of administration of flax seed powder on nutritional status of dyslipidemic patients with respect to anthropometry and biochemical profile.

Methodology

A private hospital in Jaipur city was selected for the study. About 100 patients of dyslipidemia in the age group between 30 and 55 years, from the outpatient department of the hospital were selected for the study. Informed consent forms were collected from the patients. The approval from the ethics committee was obtained for carrying out intervention on dyslipidemic patients. Out of 100 patients 50 patients were given flax seed powder 15 grams per day along with diet counselling for three months. And 50 patients were kept as control group and given only diet counselling.

At the baseline, information regarding demographic profile, anthropometry (weight, height, waist and hip circumference) and lipid levels were obtained.

At post intervention data was collected on anthropometric indices such as weight and height, waist and hip circumference and lipid profile.

Criteria for sample selection

Inclusion criteria

- Patients of age group ≥ 30 years to ≤ 55 years.
- Willingness to participate in the study.
- Patients of both the sexes.
- Patients with body mass index ≥ 20 kg/m^2 to ≤ 35 kg/m^2.
- Presence of 2 indicators given below.
- Patients having total cholesterol ≥ 200 mg/dl.
- Patients with low density lipoprotein cholesterol ≥ 130 mg/dl.
- Patients with high density lipoprotein cholesterol < 40 mg/dl.
- Patients with triglyceride levels ≥ 150 mg/dl.

Exclusion criteria

- Patients suffering from severe diabetic complication as retinopathy, nephropathy, neuropathy etc.
- Patients having severe cardiac complications as ischemic heart disease, myocardial infarction, cardiovascular disease.
- Pregnant or lactating women.
- Patients with known hypersensitivity to the supplement.
- Not willing to participate.

Biochemical tests

The blood samples was collected and analysed. Blood serum was used for the analysis of triglycerides, total cholesterol, HDL and LDL cholesterol at baseline (day 0) and after 3 months of supplementation. Blood sample was obtained after 12 hour overnight fasting.

Statistical analysis

Data was tabulated and computed. Mean, median and standard deviation was calculated. Difference in the various parameters of intervention was assessed by using 't' test.

Results and Discussion

After three months of supplementation with flax seed powder, there was significant reduction in weight (t-4.620, p < .000), body mass index (t-4.463, p < .000), waist circumference (t-3.855, p < .000) and hip circumference (t-3.454, p < .001) of the dyslipidemic patients whereas the reduction in control group was not found to be significant.

The reduction in the levels of total cholesterol (t- 6.210, p < .000), triglycerides (t-7.116, p < .000), LDL (4.646, p < .000) and

Variables		Control		Powder	
		Mean	S.D	Mean	S.D
Height (cm)	Baseline	168.9	6.578	167.88	7.592
	Follow-up	168.9	6.578	167.88	7.591
	Paired T test — T value				
	Paired T test — p-value				
Weight (kg)	Baseline	84.4	13.59	81.74	15.518
	Follow-up	84.11	13.443	79.68	15.076
	Paired T test — T value	1.123		4.62	
	Paired T test — p-value	0.267		0	
BMI	Baseline	29.54	4.06	29.03	4.415
	Follow-up	29.5	4.003	28.31	4.272
	Paired T test — T value	0.224		4.463	
	Paired T test — p-value	0.824		0	
HC (cm)	Baseline	108.52	8.375	106.35	11.158
	Follow-up	108.36	8.419	105.27	11.36
	Paired T test — T value	1.168		3.454	
	Paired T test — p-value	0.249		0.001	
WC (cm)	Baseline	113.3	8.326	109.01	11.713
	Follow-up	113.07	8.352	107.45	11.684
	Paired T test — T value	1.784		3.855	
	Paired T test — p-value	0.081		0	
WHR	Baseline	1.04	0.029	1.02	0.048
	Follow-up	1.04	0.028	1.02	0.044
	Paired T test — T value	0.522		1.485	
	Paired T test — p-value	0.604		0.144	

Table 1: Mean anthropometric measurements of dyslipidemic patients from pre to post intervention.

VLDL (t- 7.403, p < .000) was statistically significant in the powder group however, reduction in total cholesterol, triglycerides, LDL levels was also seen in control group but VLDL levels was not found to be reduced in the control group. The mean HDL level was found to be increased in powder group from 41.43 mg/dl to 42.91 mg/dl however, in control group the level of HDL was almost same.

Conclusion

The results of the current trial revealed that after supplementation of flax seeds, there was remarkable reduction in lipid levels and anthropometric indices of dyslipidemic patients. The improvements were seen in weight, BMI, waist and hip circumference of the patients. There was significant improvement observed in the total cholesterol levels, low density lipoprotein cholesterol, triglyc-

Variables		Control Mean	Control S.D	Powder Mean	Powder S.D
Total Cholesterol (mg/dl)	Baseline	259.62	35.085	236.42	44.598
	Follow-up	236.15	45.365	193.89	38.546
	Paired T test — T value	5.69		6.21	
	p-value	0		0	
Triglycerides (mg/dl)	Baseline	267.83	67.543	268.53	88.389
	Follow-up	247.03	61.771	186.3	74.525
	Paired T test — T value	3.029		7.116	
	p-value	0.004		0	
HDL (mg/dl)	Baseline	39.5	6.197	41.43	26.603
	Follow-up	39.97	4.473	42.91	6.843
	Paired T test — T value	-0.716		-0.411	
	p-value	0.477		0.683	
LDL (mg/dl)	Baseline	166.78	31.531	143.95	44.624
	Follow-up	148.74	45.657	114.11	33.86
	Paired T test — T value	4.023		4.646	
	p-value	0		0	
VLDL (mg/dl)	Baseline	53.32	13.582	53.7	17.702
	Follow-up	52.19	21.517	36.98	14.65
	Paired T test — T value	0.365		7.403	
	p-value	0.716		0	

Table 2: Mean biochemical estimations of dyslipidemic patients from pre to post intervention.

erides and very low density lipoprotein cholesterol levels. Hence, the atherogenic indices were also found to be improved. Therefore, the study concluded that three months supplementation of flax seed powder managed the anthropometric indices, lipid profile and overall condition of dyslipidemic patients, thus exhibiting cardio protective effects. Moreover, Flax seeds are good and proposed to be as alternatives to hypolipidemic drugs.

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