

Effects of Ispaghula (Psyllium Husk) on Blood Lipid Parameters in Primary Hyperlipidemic Patients.

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Abstract:

Objective: Objective of study was to examine the effects of psyllium husk on different lipid profile parameters of primary hyperlipidemic patients.

Methods: Protocol of research was single blind placebo-controlled study. Research was conducted in Jinnah Hospital Karachi, Pakistan, from January 2008 to June 2008. Forty hyperlipidemic patients were included in the study. 20 patients were on placebo as control/compare group, and twenty were on psyllium husk, ten gram daily, in divided doses for the period of 12 weeks. Hyperlipidemic patients with other diseases were excluded from the study. Serum cholesterol and triglycerides were estimated by the enzymatic calorimetric method. Serum HDL-Cholesterol was determined by direct method, at day zero and at last day of the treatment. LDL-Cholesterol was calculated by Friedwald formula ($LDL = Tc - (TG/5 + HDL-C)$).

Results: Data were expressed as the mean \pm SD and "t" test was applied to determine statistical significance of results. P value lesser than 0.05 was the limit of significance. Two patients discontinued taking drug given, due to metallic test of psyllium husk. Psyllium decreased serum total cholesterol from 228.27 ± 4.89 mg/dl to 199.22 ± 2.30 mg/dl, triglycerides from 169.27 ± 9.92 mg/dl to 164.5 ± 8.56 mg/dl, LDL-Cholesterol from 159.72 ± 5.70 to 129.55 ± 2.81 mg/dl, and increased serum HDL-Cholesterol from 34.61 ± 1.85 to 36.77 ± 1.96 mg/dl in 90 days of treatment. Results of all parameters were significant when paired 't' test was applied for result analysis.

Conclusion: At end of the research work we concluded that psyllium is very effective agent to maintain lipid profile parameters at normal limits in hyperlipidemic patients.

Keywords: Triglycerides, Primary hyperlipidemia, Heart diseases, Psyllium, Total-Cholesterol, LDL-Cholesterol, HDL-Cholesterol

Introduction:

Hyperlipidemia may be primary or secondary depending on its etiology. Hyperlipidemia is one of the major causes of mortality all over the world due to coronary artery disease. It has been shown that there exists a link between serum cholesterol levels and risk of heart attack. A 1% drop in serum cholesterol reduces the risk of coronary atherosclerosis by 2%.^{1,2} Arteriosclerosis of the coronary and peripheral vasculature is the leading cause of death among men and women in the Europe.³⁻⁵ Hepatic overproduction of VLDL can lead to increases in the serum concentrations of VLDL, remnant lipoprotein, and low density lipoproteins, depending on the ability of the body to metabolize each

of these types of lipoprotein.⁶⁻⁹ The most common and important lipid disorder involving this mechanism is familial combined hyperlipidemia.¹⁰ The modifiable chief risk factors for cardiovascular disease are fatty diet, sedentary life style, alcohol intake, cigarette smoking.^{6,9} When these risk factors occur in combination with hyperlipidemia and low serum HDL concentrations, early cardiovascular disease is likely to occur.^{13,17} Wise expert medical advice to prevention and treatment are the elimination or modification of risk factors, if possible, in conjunction with treatment of the specific lipid disorder.⁹ For treating primary hyperlipidemia, nicotinic acid, statins, bile acid binding resins, psyllium husk and fibrates are main drug groups used.¹⁴ For many years psyllium husk has been used as an agent for gastrointestinal disturbances but it has hypolipidemic effects too.¹⁵

Psyllium husk binds bile acids in the intestine, thereby interrupting the enterohepatic circulation of bile acids and increasing the conversion of cholesterol into bile acids in the liver. Hepatic synthesis of cholesterol is also increased, which in turn increases the secretion of VLDL into the circulation, raises serum triglyceride concentrations, and limits the effect of the drug on LDL cholesterol concentrations.¹⁶ HDL-Cholesterol concentrations increase by about 0.5 mg/dl, when psyllium is added to the treatment regimen of patients who are already receiving a statin.¹⁷

MATERIAL AND METHODS:

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This study was conducted at Basic Medical Sciences Institute, Jinnah Hospital, Karachi, from January 2008 to June 2008. Forty patients with increased serum lipids were registered in this study, selected from ward and OPD of Cardiovascular diseases center, Karachi, Pakistan. Hyperlipidemic male and female patients, age range from 20 to 60 years, were randomly selected. Patients with diabetes mellitus, peptic ulcer, renal disease, hepatic disease, hypothyroidism, and alcoholism were excluded from the study by available laboratory investigations, history and clinical examination. After explaining the limitations, written consent was obtained from all participants. The study period consisted of 90 days with fortnightly follow up visits. The required information such as name, age, sex, occupation, address, previous medication, date of follow up visit and laboratory investigations, etc. of each patient was recorded on a proforma, especially designed for this study. Initially a detailed medical history and physical examination of all patients were carried out. All the base line assessments were taken on the day of inclusion (Day-0) in the study and a similar assessment was taken on day-90 of research design. After fulfilling the inclusion criteria patients were randomly divided into two groups, i.e. Drug-1 (Psyllium husk 10gm/day) and Drug-2 (placebo capsules, containing equal amounts of partly grinded wheat) groups. Patients of drug-1 group were advised to take psyllium husk (ISPAGHULA) 10 gm daily in three divided times after or before each meal. Patients of drug-2 group were provided placebo capsules, i.e. one capsule, thrice daily, after meal for 90 days. Patients were called every 2 weeks for follow up to check blood pressure, weight, pulse rate and general appearance of the individual. Serum total cholesterol and triglycerides were estimated by the enzymatic calorimetric Method.¹⁹

Serum LDL-Cholesterol was calculated by Friedwald formula ($\text{LDL-Cholesterol} = \text{Total Cholesterol} - (\text{Triglycerides}/5 + \text{HDL-Cholesterol})$).¹⁸⁻²⁰ Serum HDL-cholesterol was determined by direct method, at day-0 and day-90.

Data were expressed as the mean \pm SD and "t" test was applied to determine statistical significance as the difference. A probability value of <0.05 was the limit of significance.

Results:

In eighteen patients treated with psyllium husk fibers for three months, mean total serum cholesterol decreased from 228.2 ± 4.8 mg/dl on day-0 to 199.2 ± 2.3 mg/dl on day-90. This reduction in total cholesterol was highly significant ($P < 0.001$) when levels on day-0 and those on day-90 were compared. The average percentage reduction in total cholesterol was -12.7% . The mean serum triglycerides level of 18 patients treated with psyllium husk was 169.2 ± 9.9 mg/dl on day-0 which reduced to 164.5 ± 8.5 mg/dl on day-90. The mean value differences were highly significant ($P < 0.001$) when levels on day-0 and those on day-90 were compared. The percentage change between day-0 to day-90 was -2.81 . In 18 prima-

ry hyperlipidemic patients, when started treatment with psyllium husk, their mean serum LDL-C level at day-0 was 159.7 ± 5.7 mg/dl. This level reduced to 129.5 ± 2.8 mg/dl at day-90. When compared between day-0 to day-90, this change was highly significant (<0.001). The percentage change was -18.88 . In 18 patients treated with psyllium husk, the mean HDL-C at day-0 was 34.6 ± 1.8 mg/dl, which increased to 36.7 ± 1.9 mg/dl on day-90. The result was highly significant ($P < 0.001$) when values were compared at day-0 to day-90. The percentage increase in HDL-C from day-0 to day-90 was $+6.24$. Result of all parameters is shown in table 1, 2 and 3.

TABLE NO: 1

Parameter	At day-0	At day-90	% Change
T-Cholesterol	228.27 ± 4.89	199.22 ± 2.30	-12.72
Triglycerides	169.27 ± 9.92	164.50 ± 8.56	-2.81
LDL-C	159.72 ± 5.70	129.55 ± 2.81	-18.88
HDL-C	34.61 ± 1.85	36.77 ± 1.96	+6.24

Difference in serum lipids by 'psyllium fibers group' of patients (18 patients)

- All observations are measured in mg/dl
- (\pm) indicates standard error of mean
- (-) indicates decrease in percentage
- (+) indicates increase in percentage

TABLE NO: 2

Parameter	At day-0	At day-90	% Change
T-cholesterol	215.95 ± 2.47	208.70 ± 5.38	-3.35
Triglycerides	148.45 ± 4.80	146.20 ± 4.20	-1.51
LDL-C	150.75 ± 2.67	148.80 ± 2.28	-1.29
HDL-C	35.50 ± 1.13	35.75 ± 1.07	+0.70

Difference in serum lipids in patients on placebo group (20 individuals)

- All observations are measured in mg/dl
- (\pm) indicates standard error of mean
- (-) indicates decrease in percentage
- (+) indicates increase in percentage

TABLE NO: 3

Difference of changes in serum lipids between placebo and psyllium fiber group of patients in 12 weeks of treatment.

PLACEBO GROUP (20 patients)

PSYLLIUM FIBER GROUP (18 patients)

Parameter	Baseline	Post Treatment	P Value	Baseline	Post Treatment	P Value	% Difference in groups
T-C	215.95 ±2.47	208.70 ±5.38	<0.05	228.27 ±4.89	199.22 ±2.30	<0.001	9.37
TG	148.45 ±4.80	146.20 ±4.20	>0.05	169.27 ±9.92	164.50 ±8.56	<0.001	1.30
LDL-C	150.75 ±2.67	148.80 ±2.28	>0.05	159.72 ±5.70	129.55 ±2.81	<0.001	17.59
HDL-C	35.50 ±1.13	35.75 ±1.07	>0.05	34.61 ±1.85	36.77 ±1.96	<0.001	5.54

- (±) indicates standard error of mean
- T-C stands for Total-Cholesterol
- TG stands for Triglycerides
- LDL-C stands for low-density lipoproteins
- HDL-C stands for high-density lipoproteins
- P Value >0.05 indicates non significant
- P Value <0.001 indicates highly significant

Discussion:

Highly significant changes occurred in serum total cholesterol, triglycerides, LDL-Cholesterol and HDL-Cholesterol when psyllium husk was administered orally in 18 primary hyperlipidemic patients for the period of three months. Psyllium husk decreased serum total cholesterol 12.7 %, triglycerides 2.81%, LDL-C 18.88 % and HDL-C 6.24 %, in 90 days of treatment. Results of all parameters are highly significant (<0.001), bio statistically. These results match with the study of Hokanson JE et al (1999)¹⁵ who observed almost same changes in lipid profile of 26 hyperlipidemic patients, treated with 3.4 gram of psyllium thrice daily for eight weeks. Results also match with the study of Mahley RW et al (1998)¹⁶ in all parameters of lipid profile except change in triglyceride level which was higher than ours. Reason for this difference may be the genetic variation in patients suffering from primary hyperlipidemia. Various types of primary hyperlipidemia could respond in different manners with different drug regimen and duration of the treatment. Results of the study also match with results of placebo-controlled study conducted by Jacobson TA et al (2007) in which 60 primary hyperlipidemic patients were treated by psyllium husk 8 gram daily in divided doses for the period of 4 months. Triglycerides reduction was -2.9%, LDL-C was reduced to -24.1%. They did not calculate HDL-C and total cholesterol. Another study was conducted by Charland SL and Malone DC (2010)¹⁸ on

placebo-based trials, in which 15 male children were treated with 6 gram psyllium husk in divided doses, thrice daily for the period of 8 weeks. Results of the trial almost match with our results. In their results total-cholesterol reduction was 13.1%, triglycerides reduced from 171.12±7.77 mg/dl to 165±2.12 mg/dl (P value <0.001). In percentage it was -3.4%. Observed LDL-C and VLDL-C reduction was -20.01% and -11.11%, respectively. Parameter of VLDL-C was not included in our study and HDL-C was not included in their trial.

Our study is in contrast with the study of Wei ZH et al (2009)¹⁹ who observed less percentile changes in LDL-C, HDL-C, and total cholesterol. Only change in triglycerides match with our study. They even observed 0.3% increase in HDL-C in placebo group but by psyllium treatment, HDL-C was decreased up to 1.2%. They did not mention the mechanisms by which psyllium decreased cholesterol. One of the suggested mechanisms is that psyllium stimulated bile acid synthesis. Psyllium fibers also decrease absorption of lipids from gastrointestinal tract, which is mechanical support system for lowering serum lipids.

Another mechanism is diversion of hepatic cholesterol synthesis to bile acid production, which also exhibit effects of enterohepatic circulation on serum lipid levels.¹⁵ Additional mechanism such as inhibition of hepatic cholesterol synthesis by propionate and secondary effects of slowing glucose absorption may also play a role. Results of our study do not agree with results of placebo-controlled study conducted by Agarwal AR et al (2007)²⁰ who observed much more increase in HDL-Cholesterol and very less decreased levels of plasma total cholesterol, LDL-Cholesterol and triglycerides. They observed 9.12% increase levels of HDL-C. Total cholesterol, LDL-C and triglycerides reduced -21.23%, -36.21%, and -6.81% respectively. This remarkable difference may be

due to large sample size and long period of drug trial in their study. In that study, sample size was 110 male and female primary hyperlipidemic patients who took psyllium husk 6 gram daily, in divided doses, twice daily for the period of 12 months.

Statistical analysis on large sample size, regular follow up, counseling on psyllium husk and so the compliance of the drug to be used may change the results in this type of research.

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