An Investigation of the Effect of Vegetarian Diet on Atherosclerosis

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Abstract

Background and Objectives- In recent years, twelve studies have indicated that a vegetarian diet could reduce the progression of atherosclerosis. Because of its applicability in our society, this study was performed to evaluate the effects of a vegetarian diet on atherosclerosis progression during a period of 12 to 31 months (average 17.2 months).

Methods- The case group was a vegetarian one (15 subjects), which was compared with a control group with a normal diet (17 subjects). Coronary angiography was done before and after the study. In each group, lesion number and average maximum stenosis were determined and compared in both coronary angiograms. A statistician analyzed the acquired data with T- test and Chi-square.

Results- In the case (vegetarian) group, there was a 40% progression, a 27% stabilization and a 33% regression, while in the control group, there was a 100% progression of atherosclerosis.

Conclusion- The preventive effects of a vegetarian diet on coronary stenosis lesion progression and the regression of atherosclerotic lesion were observed. Its beneficial clinical effects on reducing angina, total cholesterol, LDL-C, and BMI were established too. **(*Iranian Heart Journal*. 2003; 33-37)**

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Coronary atherosclerosis disease is still one major factor for mortality in most modern countries.[1]

Being a progressive process, atherosclerosis begins from childhood with clinical manifestations in middle ages.

The formation of advanced atherosclerotic lesions depends on three main processes:

1. Proliferation of smooth muscle cells, macrophages, and T - lymphocytes in intima.

2. Proliferation of smooth muscle cells and production of connective tissue matrix such as collagen, elastic, and proteoglycan fibers.

3. Collection of lipids, particularly cholesterol esters and free cholesterol in connective tissue cells.[2]

Epidemiological studies indicate a clear relation between atherosclerosis and some factors. These risk factors of CAD include hypercholesterolemia, smoking, hypertension, diabetes, age, sex (male), and familial history.[3] Other risk factors are immobility, obesity, hypercoagulability, homocysteinemia, alcohol, and psychological factors.[4]

Numerous researches have studied the development of coronary atherosclerotic lesions through various treatments like pharmacologic interaction, (lipid reducing drugs), special regimens, and changes in life-style, etc.[5]

Most of these studies suggest a significant reduction in cardiac events and a significant regression of coronary atherosclerotic lesions.[6]

The relationship between the reduction of cholesterol and LDL in plasma and the development of atherosclerotic lesions has

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been studied in a number of studies such as STAR, FATS, CLAS I, II, NHLB I, etc.[7]

If total plasma cholesterol level can be reduced to below 150 mg/dl, new atherosclerosis plaques cannot be produced. To achieve this level, most adults should adopt vegetarian diets.[8]

In vegetarians, lack of obesity, lower total plasma LDL and cholesterol level, higher plasma polyunsaturated acids, and higher levels of atherosclerotic protective agents such as antioxidants (Vitamin C and E) have been observed.[9]

In the LHT study, a significant reduction in total plasma LDL and cholesterol and the frequency, duration and intensity of the angina, and also a significant regression of coronary atherosclerotic lesions have been reported.[10]

Regarding the high incidence and the prevalence of coronary atherosclerosis in middle- aged men and currently costly and complicated treatments, the society suffers from the aftermath of this disease. Therefore, it would be reasonable to search for simple, feasible, and cost-effective treatments.

Considering the findings of previous studies on the preventive measures and the possibility of the regression of coronary atherosclerotic lesions, particularly through controlling the risk factors; and the promising role of vegetarian diets, and also the fact that there have not been any studies conducted in this regard in Iran, this study was performed to determine the effect of a one -year vegetarian diet on the development of coronary atherosclerosis in patients who had angiography but were not candidates for CABG and PTCA.

Methods and Materials

A vegetarian study group (15 subjects: 11men and 4 women) and a control group with a normal diet (17 subjects: 15 men and 2 women) were randomly selected from a pool of 32 patients who had undergone coronary angiography. The patients were not good candidates for CABC or PTCA; moreover, EF was higher than 25 % and the age range was from 30 to 65.

They lived in urban or suburban areas of Isfahan. None had diabetes, addiction, an MI history, unstable angina, or other underlying diseases. The following information was collected before the study and at least one year after it:

-Coronary stenosis (through coronary angiography),

-Total cholesterol, LDL, HDL, and triglyceride levels,

-Blood pressure,

-BMI (Body Mass Index),

-And a history of smoking, MI, and the severity of angina (according to NYHA classifications).[11]

Drugs were decided upon by each patient's treating physician according to each patient's clinical needs. Subjects in both groups were advised to stop smoking, get more exercise, lose weight, improve their diets, and avoid stress. Subjects in the study group were trained by a specialist in nutrition in how to eliminate animal foods from their diets and how to adopt a vegetarian diet. The recommended diet met all their daily needs (except Vitamin B 12, which was substituted). All the smokers were advised to quit smoking and the patients with hypertension were asked to avoid stress and get exercise at least for thirty minutes every day .The initial coronary angiography was for clinical and diagnostic considerations and was performed under the supervision of the patients' treating physicians.

For this study, we needed to perform another angiography at least one year after the first one, which was done after the patients and their physician's consent. In each angiography, at least five views were documented; RAO cranial and caudal, LAO cranial and Caudal, and left lateral; other views would be taken if needed.

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We investigated each atherosclerotic lesion. The investigation was done on views that showed the highest and the most obvious stenoses. Both the initial and final angiography films were simultaneously assessed visually by an interventional cardiologist who had no idea about the two groups of the study or the precedence of the films.

Coronary atherosclerotic lesions in angiography were evaluated as maximum cross sectional stenotic area.

In each patient, lesion numbers and average maximum stenoses were determined and compared in both angiograms. The acquired data with T- test and Chi- square were analyzed by the statistician of this research design.

Results

This study was performed on 32 subjects assigned into two groups: a vegetarian group (11 men and 4 women) and a control group (15 men and 2 women). The subjects' ages ranged from 34 -65 with a mean of 51.7 years. No significant difference was observed between the two groups in terms of hypertension, smoking, and MI. BMI for the vegetarian group showed a significant decrease, while for the control group it increased insignificantly (Table I).

Table I. BMI changes in initial and final phases of the study in vegetarian and control groups.

Type of diet	Initial phase (Mean ±SD)	Final phase (Mean ±SD)	Change amount
Vegetarian	27. 7 ± 3.28	26.2 ± 2.24	5.4 %
Control	27.9 ± 1.85	28.1 ± 1.96	0.6 %
P value	0.003	0.083	

Angina variation (classified according to NYHA classification) was not significant in both groups in initial phase, but in the final phase, because of a remarkable reduction of angina in vegetarian group and an increase in the control group, the difference turned out to be significant (Table II).

Table II. a. Angina classification in two phases of the study in vegetarian and control groups

	Angina class in initial phase			Angina class in initial phase		
Type of diet	1	2	3	1	2	3
Vegetarian	%13	%87	-	%66	%33	%7
Control	%18	%82	-	-	%41	%59
p value	0.747			0.0001		

Table II. b. Severity of angina changes in vegetarian and control groups

Type of diet	Decrease	Unchanged	Increase
Vegetarian	%53	%33	%13
Control	-	%24	%76

Total plasma cholesterol level showed a significant decrease of 11% on average in the vegetarian group and 5% on average in the control group (Table III), while LDL decreased by 18% in the vegetarian group and 8% in the control group (Table IV).

Table III. Total cholesterol level in two phases of the study in vegetarian and control group

Type of Diet	Initial Phase (Mean±SD)	Final Phase (Mean±SD)	Change Rate (Mean±SD)	P Value
Vegetarian	222.2 ±25.54	198 ±23.46	%11	0.001
Control	225.1 ±33.92	214.1 ±30.58	%5	0.029

Table IV. LDL levels in initial and final phases of the study in vegetarian and control groups

Type of diet	Initial phase (Mean ± SD)	Final phase (Mean ± SD)	Change rate	P- Value
Vegetarian	136.7 ±24.08	111.8 ±22.21	%18	0.000
Control	139.7 ±36.14	128.8 ±28.26	%8	0.07

HDL level was 46 mg/dl and the average in both groups showed no significant change during the study. Triglyceride level in the vegetarian group increased b y 1.4% on average, while in the control group it showed a significant degrease of 5.3% on average. The intervals between the first and the second angiographies ranged from

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12-31 months (average 17.2 months). In 40% of the cases in the vegetarian group the average maximum stenosis progressed (19.5% on average); in 27% of the cases it remained unchanged; and in 33% of the cases, it regressed (14.4% on average).
In the control group, (100%) progression was observed in all the subjects. In general in the vegetarian group, lesion progression showed a non significant increase of 3%, while in the control group, lesion progression was significant (35%); thus resulting in a significant difference between the average maximum stenosis in the vegetarian and control groups.

Discussion

Generally, the mean maximum cross-sectional stenosis of atherosclerotic lesions increased non significantly by3% (p= 0.54) in the vegetarian group and increased significantly by 35% (p= 0.00) in the control group of the study. It indicates that lesion progression is stopped in the vegetarians, whereas, it continuously progresses in the control group (Table V).

Table V. Maximum average of stenosis for each lesion in primary and secondary angiography of vegetarian and control groups

Type of Diet	1st angiography (Mean ± SD)	2nd angiography (Mean ± SD)	Change rate	P -value
Vegetarian	69.2 ±16.77	72.2 ±14.4	%3	0.549
Control	58.3 ±26.09	83.4 ±12.8	%35	0.000
P Value	0.179	0.026	-	-

In 40% of the vegetarians, lesion progression was about 14%, which in comparison with the control group, it apparently decreased significantly.
The lesions were unchanged in 27% of the vegetarians and 33% of the cases had a considerable regression (on average 14.4% p<0.01), while in the control group 100% of the lesions progressed (Table VI).

Table VI - Atherosclerotic lesion in vegetarian and control groups during study

Type of Diet	Progression	Stabilization	Regression
Vegetarian	%40	%27	%33
Control	%100	-	-

Clinically, the statistical severity of variance of angina was not significant at the beginning of the study, while it became considerably significant at the end.
The reducing effect of a vegetarian diet on angina intensity is initiated at the beginning of the study. An LHT study also shows a remarkable reduction in severity, duration and the number of anginal episodes.
Clinical well-being and return to normal activity of the patients was reported one month after the initiation of a vegetarian diet. It was before the last coronary angiography.
A significant 5% (p = 0.003) reduction is reported on average in the BMI of the vegetarian group, while it is not significant in the control group (table 1). In our study, total cholesterol level 11% (p=0.001) and LDL 18% (p=0.000) are remarkably decreased, while in the control group LDL reduction is not significant and total cholesterol level is significantly less than that in the vegetarian group.
In the main coronary atherosclerosis evaluation studies, total cholesterol reduced to 14 - 34% and LDL reduced to 16 - 46%. This was reported during a 1-year follow- up of the patients.
Our data indicate that the effect of a vegetarian diet on total cholesterol and LDL is as much as lipid reducing drugs.[11]
The effect of a vegetarian regimen on total cholesterol, LDL, progression and regression of coronary lesions of treated patients is illustrated in Table VII.

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Table VII - Change rates of cholesterol, LDL, progression and atherosclerosis regression in interventional study

Study Name	Cholesterol %	LDL %	Progression %	Regression %
Our Study	11	18	40	33
NHLB 1	17	26	32	7
CLAS 1	26	43	39	16
CLAS 2	25	40	48	18
FATS	23	32	25	39
UCSF-SCOR	31	39	20	32
STAR	25	36	12	33
POSCH	28	42	37	13
LHT	24	37	18	82
MARS	32	45	47	23
CCAIT	21	29	33	10
REGRES	20	29	45	17
MASS	22	31	41	33

Conclusion

In this study, the preventive effect of a vegetarian diet on stenotic lesion progression and atherosclerotic lesion regression is demonstrated and its beneficial clinical effects on reducing angina, total cholesterol, LDL and BMI of the patients are established.

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