Research Article

Effectiveness of Plant-Based Diets in Regression of Coronary Atherosclerosis

Manesha Juriasinghani[1], Monica Punshi[2], Ramsha Tehreem[3], Bakhtawar Kousar[4], Bilal Karim[5], Mahreen Bhatti[6]

[1]Former Lecturer at SZABIST University, Karachi, Pakistan

[2]Consultant Gynaecologist/Obstetrician and Public Health Expert, Dr Ruth KM Pfau Civil Hospital, Karachi, Pakistan

[3]Senior Registrar, Department of Medicine, Sharif Medical City Hospital, Lahore, Pakistan

[4]Mohtarma Benazir Bhutto Shaheed Medical College, Mirpur, AJK

[5]Assistant Professor, Department of Biochemistry, Islamabad Medical and Dental College, Islamabad, Pakistan

[6]Senior Lecturer, Department of Biochemistry, Islamabad Medical and Dental College, Islamabad, Pakistan

Corresponding Author: Bilal Karim,
Assistant Professor, Department of Biochemistry, Islamabad Medical and Dental College, Islamabad, Pakistan, **Email:** bilal111karim@gmail.com

ABSTRACT

Background: In spite of the medical therapy developed, coronary atherosclerosis is still the primary cause of cardiovascular morbidity. Recent data indicate that vegetarian dietary habits can also be used to promote vascular recovery and enhance metabolic risk factors.

Objective: The design of this study was an evaluation of the efficacy of plant-based diet in corroborating the regression of coronary atherosclerosis after one year in adults with a history of coronary artery disease.

Methodology: The study was carried out as a prospective observational study in May 2024 - May 2025 at the Department of Cardiology, SZABIST University Karachi. Assigned by an order of consecutive sampling were seventy-two adults, twenty-six in a group of rice-eaters, and twenty-six in a common diet control group. Baseline and 1 year study involved scoring of coronary artery calcium (cac), plaque volume in CT angiography, lipid profile, glycemic, inflammatory biomarkers, and dietary adherence.

Results: The study participants who were on a plant-based diet experienced significant changes in CAC score (p=0.01), plaque volume (p=0.004), LDL-cholesterol (p<0.001), triglycerides (p=0.003), and hs-CRP (p<0.001). The plant-based group also had advantages over clinical outcomes, such as weight loss, blood pressure, angina severity, and exercise tolerance.

Conclusion: There was a significant regression of coronary atherosclerosis and cardiometabolic improvements with a plant-based dietary pattern-based intervention in 1 year. These results indicate the possibility of using plant-oriented nutrition as an easy-to-use and successful supplement in second-line cardiovascular prevention.

Keywords: Plant based diet, coronary artery calcium, atherosclerosis atrophy, plaque volume, cardiovascular risk, nutrition therapy.

INTRODUCTION

The burden of coronary atherosclerosis remains a serious health issue affecting the world with respect to both mortality and long-term disability despite the current advances in pharmacological and interventional treatment. Although the traditional approach to management focuses on lipid management, blood pressure, and antiplatelet management, more emphasis is currently placed on lifestyle-oriented management methods with a potential change in the pathogenesis of the underlying disease.

Out of them, the dietary habits of plants have become an interesting solution because of its possibility to decrease the level of inflammation, better lipid metabolism, and endothelial performance [1-3].

Atherosclerosis is a dynamic disease that is subject to a variety of metabolic and lifestyle factors. Saturated fat and refined carbohydrates diets are associated with endothelial damage and plaque, and nutrient-dense, plant-based diets have protective factors including fiber, antioxidants, and phytonutrients, which could be helpful in the healing of the vascular system. Past research has shown a change of cardiovascular risks markers with plant-forward dieting yet the present research on its capabilities of causing a quantifiable reversal of the already existing coronary plaque is still inadequately documented [4-6].

Knowledge on whether or not dietary alteration will have any clinical impact on the structural development of coronary artery disease will have significant clinical importance. In case it works, plant-based diets might be an inexpensive and universal supplement to conventional cardiac care, especially in the resource-constrained localities. In this regard, the objective of the current study was to determine the usefulness of a plant-based diet in terms of its regression of coronary atherosclerosis after one-year follow-up, using imaging, biochemical, and clinical indices to give a complete picture of it.

METHODOLOGY

The proposed study is a prospective observational study and was planned to be carried out in the Department of Cardiology, SZABIST University Karachi during one year (between May 2024 and May 2025). The purpose of the study was to assess the efficacy of a plant-based nutritional pattern in regression of coronary atherosclerosis in people already with coronary artery illness. Recruitment and written informed consent were done beforehand with ethical approval and informed consent.

The number of eligible adults, enrolled in consecutive sampling, was 72. Controlled randomization was carried out by allocating the subjects to the control group (diet) and an intervention group (plant-based diet). The data on the baseline comprised demographic data, cardiovascular risk factors, anthropometric measurements, and medical history. Before the intervention all participants receive coronary artery calcium (CAC) scoring and CT angiography to establish the volume of plaque. The laboratory tests were lipid profile, fasting glucose, and HbA1c and high-sensitivity C-reactive protein(hs-CRP), which gives a complete picture of metabolic and inflammatory condition.

Dietary recalls were used to measure nutritional intake and compliance during the study with validated dietary recalls and periodical counselling. The vegetarian group was provided with systematic education to improve on the intake of whole grains, fruits, vegetables, legumes, and plant proteins and reduce saturated fats and animal products. The controls did not make significant changes in the way they ate. Repeat CAC scoring, plaque volume, and tests such as laboratory tests were conducted at the follow up period of one year.

The data were processed through relevant statistical tools in order to compare the differences between the two groups. The continuous variables were given in the form of mean and standard deviation and the categorical variables were given in the form of frequencies and percentages. Independent t-tests and chi-square were used where necessary and a p-value less than 0.05 was determined to be significant. This systematic method made it possible to have a strong assessment of dietary impact in the development of coronary atherosclerosis.

RESULTS

The demographic characteristics of the two groups did not vary much and there was no considerable difference in terms of their ages, gender distribution, BMI, and

relevant comorbidities. The inherent implication of such a balance is that differences, which will be identified after the intervention, will be more likely to have been due to variation in the diet rather than due to a preexisting risk difference variance. Even lifestyle indicators as far as smoking and physical activity was concerned was evenly allocated which validates the internal validity of the comparison.

Table 1. Baseline Demographic and Clinical Characteristics (n = 72)

Variable	Plant-Based Group (n=36)	Control Group (n=36)	p-value
Age (years), Mean ± SD	52.3 ± 8.4	53.1 ± 9.1	0.68
Gender (Male), n (%)	21 (58.3%)	20 (55.6%)	0.81
BMI (kg/m²)	27.4 ± 3.2	27.9 ± 3.6	0.54
Smoking (Yes)	9 (25%)	11 (30.6%)	0.61
Hypertension, n (%)	18 (50%)	19 (52.8%)	0.82
Diabetes Mellitus, n (%)	11 (30.6%)	10 (27.8%)	0.79
Dyslipidemia, n (%)	20 (55.6%)	22 (61.1%)	0.65
Family History of CAD	14 (38.9%)	15 (41.7%)	0.81
Physical Activity (Moderate/High)	19 (52.8%)	17 (47.2%)	0.64

Plant based group had noticed great improvement particularly in the regression of coronary calcification as well as reduction of volume of plaque. It was observed that the group of intervention was showing a considerable CAC score and plaque burden reduction as compared to the control group that was improving mildly. These trends indicate that in one year, there may be the restorative effect of plant-based dietary trends on the coronary atherosclerosis.

Table 2. Cardiovascular Imaging Outcomes

Variable	Plant-Based Group (n=36)	Control Group (n=36)	p-value
CAC Score Baseline	320 ± 88	315 ± 90	0.82
CAC Score at 1 Year	282 ± 80	338 ± 92	0.01*
% Change in CAC Score	–11.9%	+7.3%	0.001*
Plaque Volume Baseline (mm³)	192 ± 55	189 ± 60	0.78
Plaque Volume at 1 Year (mm³)	158 ± 50	203 ± 63	0.004*
Plaque Regression (Yes)	24 (66.7%)	9 (25%)	0.001*

Plant-based group exhibited a higher metabolic improvement and LDL-C, triglycerides, and hs-CRP and glycemic values had a significant decrease in the plant-based group at one year. All these modifications suggest a reduction in cardiometabolic and inflammatory stress. The Vitamin B12 differences were also not significant and low which indicates that there was no significant deficiency at the period of the study.

Table 3. Laboratory Biomarkers (Year End)

Variable	Plant-Based Group (n=36)	Control Group (n=36)	p-value
LDL-C (mg/dL)	102 ± 28	142 ± 31	<0.001*
HDL-C (mg/dL)	52 ± 10	45 ± 9	0.01*
Triglycerides (mg/dL)	128 ± 40	162 ± 45	0.003*
hs-CRP (mg/L)	2.1 ± 0.8	3.4 ± 1.1	<0.001*
Fasting Glucose (mg/dL)	96 ± 12	104 ± 15	0.01*
HbA1c (%)	5.8 ± 0.6	6.4 ± 0.7	<0.001*
Vitamin B12 (pg/mL)	392 ± 82	418 ± 90	0.18

The trends of dietary adherence and nutrient consumption were strikingly different among the groups and the plant-based one had an extremely higher intake of fiber and intake of plant protein with a lower content of saturated fat. These transformations are the very basic nutritional activities in which the plant based diets can influence the cardiovascular well-being. The elevated percentages of compliance mean the elevated nutritional acknowledgment and the maintenance of these people.

Table 4. Nutritional Intake and Diet Adherence

Variable	Plant-Based Group (n=36)	Control Group (n=36)	p-value
Diet Adherence (High)	28 (77.8%)	12 (33.3%)	<0.001*
Daily Fiber Intake (g/day)	34.5 ± 8.9	18.2 ± 6.1	<0.001*
Saturated Fat Intake (%)	6.2 ± 1.5	12.8 ± 2.4	<0.001*
Calories/day	1750 ± 210	2050 ± 260	<0.001*
Fruit & Vegetable Servings/day	7.1 ± 2.0	3.2 ± 1.4	<0.001*
Plant-Protein Ratio (%)	82 ± 10	41 ± 12	<0.001*

Vegetarian diet was found to be always linked with positive clinical outcome, reduction in weight, and intensity of angina. The exercise tolerance was also more enhanced in the intervention group which is a pointer to functional capacity. Overall, majority of the participants on plant-based diet regression demonstrated a regressed atherosclerosis in a year.

Table 5. Clinical Outcomes between groups

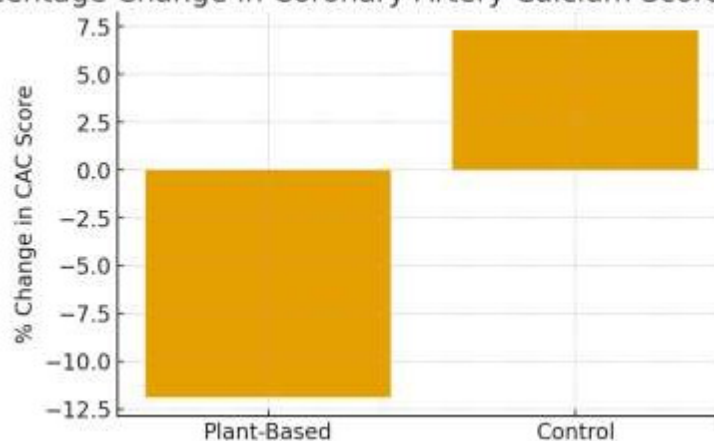| Variable	Plant-Based Group (n=36)	Control Group (n=36)	p-value
Atherosclerosis Regression (%)	26 (72.2%)	10 (27.8%)	<0.001*
Weight Reduction (kg)	5.8 ± 2.9	1.6 ± 1.4	<0.001*
Reduction in Systolic BP (mmHg)	11.5 ± 5.2	3.4 ± 4.1	<0.001*
LDL Reduction ≥30%	22 (61.1%)	8 (22.2%)	0.001*
Angina Class Improvement	18 (50%)	7 (19.4%)	0.005*
Exercise Tolerance (+ minutes)	+6.8 ± 2.3	+2.1 ± 1.9	<0.001*

Figure 1. Percentage Change in Coronary Artery Calcium Score after 1 Year The plant-based diet group reported a mean decrease in CAC score of 11.9 percent in one year compared to a mean reported increase of 7.3 percent in the control group. The following visual difference indicates the different patterns of progression of the coronary atherosclerosis in the two diet groups.

DISCUSSION

The article discussed the impact of a plant-based dietary habit on the progression of coronary atherosclerosis after one year and reported major alteration of imaging, biochemical, and clinical results. The research showed that the score of a coronary artery calcium and plaque burden in the group that was subjected to plant-based diet showed a great regression, and a mild progression in the participants in the control group, which is an indicator of the difference between the metabolic state that the two types of diets were placing on the body. The results are consistent with other studies which have suggested that the nutrients present in high percentage in plants can reduce oxidative stress and improve the endothelial functioning and reduce the process of systemic inflammation resulting in atherosclerotic stabilization and potential reversing [7-9]. The laboratory findings also support this course. The patients in the intervention group had significant decreases in LDL-cholesterol, triglycerides, fasting glucose, and hs-CRP, which are all known to cause cardiovascular risk. The increment of these biomarkers was probably because of the enhanced fiber intake, decreased intake of saturated fats, and the increased

use of plant proteins. The lack of a major decrease in vitamin B12 indicates that short-term changes to plant-based diets are possible with the help of nutritional support, but long-term follow-ups are necessary [10-13].

Also, clinical outcomes served as further evidence of the positive impact of plant-based diets. The study participants stated that exercise tolerance was better, as well as that angina severity improved and weight loss was more impressive than the improvements observed in the control group, which is a collective indicator of the improvement of functional capacity and cardiovascular health. These findings highlight the possibilities of dietary interventions as preventive measures as well as complementary therapeutic methods of secondary cardiovascular care. Though the experiment was not random, the repeatedly positive trend in various areas gives high chances that the identified benefits could be explained by the changes in the diet but not by the differences in the appearance [14-17].

Although these encouraging results have been achieved, there are certain limitations that should be mentioned. Self-reporting was also part of dietary adherence, thereby bringing about recall bias. Despite the sufficient time frame to identify initial alterations of the plaque progression, the study might not be enough to capture the sustainability of the long-term outlook and the possible micronutrient deficiency that might develop over time[18-20]. Randomized designs, extended follow-up, and extending biomarker maps would be a better representation in the future to give us a more clear view about the long-term cardiovascular effects of plant-based diets.

CONCLUSION

Plant-based dietary pattern was structured and correlated with a significant regression of coronary atherosclerosis in one year with correlation to significant improvement of lipid profile, inflammation indicators, blood pressure, and symptoms. In comparison with conventional dietary habits, it was found that the plant-based system has definite benefits in both imaging and metabolic results. These results justify the inclusion of plant-based nutrition in the primary practice of secondary prevention of cardiovascular disease among individuals who already have coronary artery disease.

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