Clinical Trial Protocol
Iranian Registry of Clinical Trials

10 Jun 2026

Effect of diet restricted in advanced glycation end products (low-AGEs) on vascular adhesion, inflammatory markers, vascular vasodilation (FMD), energy expenditure and brown adipose tissue activity in patients treated with angioplasty

Protocol summary

Study aim

The aim of this study is to determine the effect of diet restricted in advanced glycation end products (low-AGEs) on vascular adhesion, inflammatory markers, vascular vasodilation (Flow Mediated Dilation), energy expenditure and brown adipose tissue activity in patients treated with angioplasty.

Design

The present study is a parallel randomized clinical trial with a control group.

Settings and conduct

Patients are randomly divided into two groups of 21: intervention and control. Food record questionnaire to measure and control macronutrients and AGEs intake in the diet and physical activity registration to measure energy expenditure and adjustment of physical activity effect on AGEs production in body will be evaluated in beginning and every two weeks during the study. Ten milliliter fasting blood will be taken from all patients at the beginning and end of the intervention.

Participants/Inclusion and exclusion criteria

Patients aged 50 to 70 years whose BMI is between 18.5 to 35 kg/m2 and are required to undergo angioplasty due to obstruction in one or two vessels, will be enrolled. Patients with a history of diabetes, chronic kidney diseases, autoimmune diseases and cancer, consumed multivitamin-mineral supplements over the past 3 months, followed any weight loss or other special diets during last year, or smoke won't be entered in study.

Intervention groups

To the intervention group, the low-AGEs diet, and to the control group, the cardiovascular diet based on general recommendations provided by AHA with focusing on the reduction of saturated fats and salt will be given. Both groups will be required to follow their diet for 12 weeks.

Main outcome variables

The amount of energy expenditure and vascular vasodilatation (FMD) and serum levels of IL-6, TNF-α, VCAM, hs-CRP, MDA, NRG4, FGF21 and carboxy methyl lysine will be measured in both groups before and After the intervention.

General information

Reason for update

Due to the outbreak of COVID-19, the work process of the hospital was disrupted and sampling was stopped for several months, and now that the work process of the hospital has returned to the previous state, the admission rate of patients is much lower than before. On the other hand, a large number of patients are reluctant to participate in the study due to the need to go to the hospital after the intervention and the high risk of developing COVID-19 if they go to the hospital. In general, these problems have disrupted the sampling of the study. At the beginning of the patients' recruitment, during ultrasound examinations, we found out that a large percentage of the patients had non-alcoholic fatty live disease (NAFLD), but were unaware of it. Given that NAFLD is one of the cardiovascular risk factors and increases the risk of atherosclerotic events in these patients, and recent studies have shown the causative role of AGEs in the pathogenesis of NAFLD, thus our intervention (restricting AGEs in the diet) may probably also be effective on reducing hepatic fat accumulation and the risk factors associated with NAFLD. Therefore, a number of extra outcomes related to NAFLD were added to the study, and in patients who also had NAFLD, these outcomes were measured before and after the study.

Acronym

IRCT registration information

IRCT registration number: **IRCT20131125015536N10**
Registration date: **2019-11-24, 1398/09/03**
Registration timing: **registered_while_recruiting**

Last update: **2023-05-13, 1402/02/23**
Update count: **2**

Registration date
2019-11-24, 1398/09/03

Registrant information

Name
Mohammad Javad Hosseinzadeh

Name of organization / entity
School of Nutritional Sciences and Dietetics, TUMS

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Iran (Islamic Republic of)

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Recruitment status
Recruitment complete

Funding source

Expected recruitment start date
2019-11-06, 1398/08/15

Expected recruitment end date
2020-11-05, 1399/08/15

Actual recruitment start date
empty

Actual recruitment end date
empty

Trial completion date
empty

Scientific title
Effect of diet restricted in advanced glycation end products (low-AGEs) on vascular adhesion, inflammatory markers, vascular vasodilation (FMD), energy expenditure and brown adipose tissue activity in patients treated with angioplasty

Public title
Effect of diet restricted in advanced glycation end products (low-AGEs) in patients treated with angioplasty

Purpose
Prevention

Inclusion/Exclusion criteria

Inclusion criteria:
Age of 50 to 70 years BMI of 18.5 to 35 Kg/m2 Diagnosis of need for angioplasty treatment due to obstruction in one or two vessels

Exclusion criteria:
History of diabetes, thyroid disorders, chronic kidney diseases, autoimmune diseases, cancer History of myocardial infarction and stroke in the past 3 months Use of multi-vitamin, mineral, and antioxidant supplements over the past 3 months Follow of any weight loss diet or other special diets over the past year Familial hypercholesterolemia and hypertriglyceridemia History of well-known food allergy History of previous angioplasty Smoking, use of hubble-bubble and other drugs Ladies before menopause

Age
From **50 years** old to **70 years** old

Gender
Both

Phase
N/A

Groups that have been masked
No information

Sample size
Target sample size: **42**

Randomization (investigator's opinion)
Randomized

Randomization description
Since the variable of gender affect the outcomes of the study, and the two groups must be similar in terms of this variable, randomization is done using stratified randomization based on this variable. Therefore, we will have two categories: men and women. Then for each of these categories, random binary blocks are determined using table of random numbers. Eligible individuals entered the study, are placed in their own category according to their gender and based on the randomized sequences defined for that category, are assigned to either of the two groups receiving low-AGEs diet or cardiovascular diet (on basis of AHA recommendations). Given that the intervention of this study is diet and the person who enters the patients in the study and describes the type of diet for each patient, cannot be blind to the type of diet that each patient receives, allocation concealment does not apply in this study.

Blinding (investigator's opinion)
Not blinded

Blinding description

Placebo
Not used

Assignment
Parallel

Other design features

Secondary Ids

empty

Ethics committees

1

Ethics committee

Name of ethics committee
Ethics Committee on Research, Research and Technology department of Tehran University of Medical Sci

Street address
Floor 6, Central Organization of University, corner of Qods St., Keshavarz Blvd.

City
Tehran

Province
Tehran

Postal code
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Approval date
2019-06-23, 1398/04/02

Ethics committee reference number
IR.TUMS.VCR.REC.1398.334

Health conditions studied

1

Description of health condition studied
Atherosclerotic heart disease
ICD-10 code
I25.1
ICD-10 code description
Atherosclerotic heart disease of native coronary artery

2

Description of health condition studied
Non-alcoholic fatty liver disease
ICD-10 code
K76.0
ICD-10 code description
Fatty (change of) liver, not elsewhere classified

Primary outcomes

1

Description
Carboxy methyl lysine
Timepoint
Before and after 12 weeks of intervention
Method of measurement
ELISA method

2

Description
high sensitive C-Reactive Protein (hs-CRP)
Timepoint
Before and after 12 weeks of intervention
Method of measurement
ELISA method

3

Description
Tumor necrosis factor alpha (TNF-α)
Timepoint
Before and after 12 weeks of intervention
Method of measurement
ELISA method

4

Description
Interleukin 6 (IL-6)
Timepoint
Before and after 12 weeks of intervention
Method of measurement
ELISA method

5

Description
Vascular cell adhesion molecule 1 (VCAM-1)
Timepoint
Before and after 12 weeks of intervention
Method of measurement
ELISA method

6

Description
Flow Mediated Dilation (FMD)
Timepoint
Before and after 12 weeks of intervention
Method of measurement
Sonography

7

Description
Basal metabolism rate
Timepoint
Before and after 12 weeks of intervention
Method of measurement
Bioelectrical Impedance Analysis (BIA)

8

Description
Neuregulin 4 (NRG4)
Timepoint
Before and after 12 weeks of intervention
Method of measurement
ELISA method

9

Description
Fibroblast growth factor 21 (FGF-21)
Timepoint
Before and after 12 weeks of intervention
Method of measurement
ELISA method

Secondary outcomes

1

Description
Appetite
Timepoint
Before and after 12 weeks of intervention
Method of measurement
Visual analog scale

2

Description
Nesfatin
Timepoint
Before and after 12 weeks of intervention
Method of measurement
ELSA method

3

Description

Weight

Timepoint

Before and after 12 weeks of intervention

Method of measurement

Weigher

4

Description

Waist circumference

Timepoint

Before and after 12 weeks of intervention

Method of measurement

Meter

5

Description

Body composition

Timepoint

Before and after 12 weeks of intervention

Method of measurement

Bioelectrical Impedance Analysis (BIA)

6

Description

Serum lipid profile (total cholesterol, triglyceride, LDL and HDL)

Timepoint

Before and after 12 weeks of intervention

Method of measurement

Enzymatic method

7

Description

Fasting Blood Sugar

Timepoint

Before and after 12 weeks of intervention

Method of measurement

Enzymatic method

8

Description

Hemoglobin A1C

Timepoint

Before and after 12 weeks of intervention

Method of measurement

Ion exchange chromatography

9

Description

Serum fasting insulin

Timepoint

Before and after 12 weeks of intervention

Method of measurement

ELISA method

10

Description

Omentin

Timepoint

Before and after 12 weeks of intervention

Method of measurement

ELISA method

11

Description

Insulin resistance

Timepoint

Before and after 12 weeks of intervention

Method of measurement

Calculation based on HOMA-IR formula

12

Description

Fatty liver grade

Timepoint

Before and after 12 weeks of intervention

Method of measurement

Sonography

13

Description

Hepatic enzymes (ALT and AST)

Timepoint

Before and after 12 weeks of intervention

Method of measurement

Enzymatic method

14

Description

The amount of visceral adipose tissue in anterior to the aorta, posterior to the aorta and anterior to the liver

Timepoint

Before and after 12 weeks of intervention

Method of measurement

Sonography

15

Description

Carotid intima-media thickness

Timepoint

Before and after 12 weeks of intervention

Method of measurement

Sonography

16

Description

The amount of subcutaneous fat

Timepoint

Before and after 12 weeks of intervention

Method of measurement

Sonography

Intervention groups

1

Description
Intervention group: Individuals in the intervention group will receive isocaloric low AGEs diet (based on dietary recommendations by Uribarrie et al.) for 12 weeks. The general recommendations of American Heart Association for cardiovascular diseases focused on reduction of saturated fats to less than 6 percent of calories, reduction of salt intake to less than 2400 mg per day, and reduction of calorie intake from simple sugars to less than 150 kilocalories per day in men and less than 100 kilocalories per day in women will be considered in the design of this diet, so that the only difference in the diet of the intervention and control group would be the amount of AGEs intake. The list of foods that should be omitted from diet (foods with high amount of AGEs), alternative food sources, the proper type and time of food preparation method in order to reduce the amount of AGEs intake will be explained both verbally and in writing.

Category
Prevention

2

Description
Control group: To the individuals in the control group, isocaloric cardiovascular diet (based on general recommendations by American Heart Association) will be given for 12 weeks. This diet focused on the reduction of saturated fats to less than 6 percent of calories, reduction of salt intake to less than 2400 mg per day, and reduction of calorie intake from simple sugars to less than 150 kilocalories per day in men and less than 100 kilocalories per day in women.

Category
Other

Recruitment centers

1

Recruitment center
Name of recruitment center
Tehran Heart Center
Full name of responsible person
Ali Vasheghani Farahani
Street address
North Kargar Ave.
City
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Province
Tehran
Postal code
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Phone
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+98 21 8802 9731
Email
thc@tums.ac.ir
Web page address
http://thc.tums.ac.ir/en

2

Recruitment center
Name of recruitment center
Shahid Rajaie Cardiovascular, Medical and Research Center
Full name of responsible person
Ata Firouzi
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Phone
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Fax
+98 21 2204 2026
Email
atafirouzi@yahoo.com
Web page address
http://rhc.ac.ir/fa

Sponsors / Funding sources

1

Sponsor
Name of organization / entity
Tehran University of Medical Sciences
Full name of responsible person
Research and Technology Department of University
Street address
Floor 6, Central Organization of University, corner of Qods St., Keshavarz Blvd.
City
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Tehran
Postal code
-
Phone
+98 21 8163 3698
Email
tumspr@tums.ac.ir
Grant name
Grant code / Reference number
Is the source of funding the same sponsor organization/entity?
Yes
Title of funding source
Tehran University of Medical Sciences
Proportion provided by this source
100
Public or private sector

Public

Domestic or foreign origin

Domestic

Category of foreign source of funding

empty

Country of origin

Type of organization providing the funding

Academic

Person responsible for general inquiries

Contact

Name of organization / entity

Tehran University of Medical Sciences

Full name of responsible person

Mohammad Javad Hossein Zadeh

Position

Professor

Latest degree

Ph.D.

Other areas of specialty/work

Nutrition

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School of Nutritional Sciences and Dietetics, No. 44, Hodjat doost Alley, Naderi St., Keshavarz Blvd.

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Person responsible for scientific inquiries

Contact

Name of organization / entity

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Full name of responsible person

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Position

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Latest degree

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Other areas of specialty/work

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Person responsible for updating data

Contact

Name of organization / entity

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Full name of responsible person

Fatemeh Taheri

Position

Ph.D student

Latest degree

Master

Other areas of specialty/work

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00

Email

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Sharing plan

Deidentified Individual Participant Data Set (IPD)

Undecided - It is not yet known if there will be a plan to make this available

Study Protocol

Undecided - It is not yet known if there will be a plan to make this available

Statistical Analysis Plan

Undecided - It is not yet known if there will be a plan to make this available

Informed Consent Form

Undecided - It is not yet known if there will be a plan to make this available

Clinical Study Report

Undecided - It is not yet known if there will be a plan to make this available

Analytic Code

Undecided - It is not yet known if there will be a plan to make this available

Data Dictionary

Undecided - It is not yet known if there will be a plan to make this available