

# The effect of breakfast fruit meal sequence and physical exercise on glucose level and DPP4 activity among patients with diabetes

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| <b>Submission date</b><br>05/05/2022   | <b>Recruitment status</b><br>No longer recruiting              | <input type="checkbox"/> Prospectively registered    |
| <b>Registration date</b><br>13/05/2022 | <b>Overall study status</b><br>Completed                       | <input type="checkbox"/> Protocol                    |
| <b>Last Edited</b><br>20/12/2022       | <b>Condition category</b><br>Nutritional, Metabolic, Endocrine | <input type="checkbox"/> Statistical analysis plan   |
|  |  | <input checked="" type="checkbox"/> Results          |
|  |  | <input type="checkbox"/> Individual participant data |

## Plain English summary of protocol

### Background and study aims

Type 2 diabetes mellitus (T2DM) remains a major public health concern of which the management includes lifestyle modification and pharmacotherapy. Lifestyle modification can be done by increasing fiber intake from fruits and vegetables and physical exercise. The aim of this study was to compare the short term effects of breakfast fruits meal sequence and postprandial exercise on blood glucose level and DPP4 activity among type 2 diabetes mellitus patients

### Who can participate?

Patients aged 45–65 years old with type 2 diabetes

### What does the study involve?

Participants were randomly allocated to four groups that consumed the breakfast for 7 days. Groups differed on the amount of exercise they were required to do each day after breakfast. To provide an adequate macro and micro-nutrient intake, the daily food composition was based on the Indonesian diabetes diet and contained 55% carbohydrates (mixed brown and white rice), 25% protein and 20% fat from tofu, egg, meat and mixed vegetables.

### What are the possible benefits and risks of participating?

The benefits to participants include:

1. Free blood tests
2. Free whole fruits
3. Knowing their daily energy and nutrition intake
4. Knowing their nutrition status and pancreas function
5. Reduced FBG level
6. Decreased DPP4 activity

The risks include:

1. Mild or moderate pain when giving blood samples
2. Food allergy
3. Discomfort in the stomach

Where is the study run from?

This study was performed at two primary health clinics in Tasikmadu District, Karanganyar Regency and Kartasura District, Sukoharjo Regency, Central Java, Indonesia.

When is the study starting and how long is it expected to run for?

April 2017 to November 2017

Who is funding the study?

Institute of Research and Community Services, Universitas Sebelas Maret, Surakarta (Indonesia)

Who is the main contact?

1. Dono Indarto, dono@staff.uns.ac.id
2. Dwipajati, dwipajati@poltekkes-malang.ac.id

## Contact information

## Additional identifiers

## Study information

### Scientific Title

Acute effects of breakfast fruits meal sequence and postprandial exercise on blood glucose level and DPP4 activity among type 2 diabetes mellitus patients: a pilot study

### Acronym

Nil known

### Study objectives

Different fruit meal sequence with or without combination of postprandial exercise (PE) has different effects on blood glucose levels and DPP4 activity in Indonesian patients with type 2 diabetes.

### Ethics approval required

Old ethics approval format

### Ethics approval(s)

Approved 02/06/2017, Research Ethical Committee, Faculty of Medicine, Universitas Sebelas Maret (Public Hospital Dr. Moewardi, No. 132, Jebres, Surakarta 57126, Indonesia; +62 8121500630; wdatmo@gmail.com), ref: 502/VI/HREC/2017

### Study design

Interventional randomized controlled trial

### Primary study design

Interventional

### Study type(s)

Prevention

### Health condition(s) or problem(s) studied

## Type 2 diabetes mellitus

### Interventions

Initially, we distributed our research plan to all Health Clinics for Management Program of Chronic Diseases in Surakarta and nearby cities. However, only two Health Clinics at Taksikmadu District, Karanganyar Regency and Kartasura District, Sukoharjo Regency respectively participated in this study. To calculate the sample size in this study, we used a numerical analytics formula (Dahlan, 2010) and used the existing study from Trico et al. (2016) which provided the mean differences in blood glucose levels between control and treatment groups.

Patients were randomly divided into four groups using sealed envelopes.

The first (control) group consisted of 10 patients who usually ate their meals, based on the Indonesian diabetes diet.

The treatment (T1-3) groups consisted of 9 patients/group who consumed 50g banana before having their breakfast (T1), consumed 50g banana after having their breakfast and followed by performing 2 min jumping jacks (T2) and consumed 50g banana before having their breakfast and followed by performing 2 min jumping jacks (T3) in the day 1 and 7 interventions in front of investigators.

The food composition of each meal during a 7 day-intervention was equally restricted to a specific food composition on day 1 and day 7 interventions of breakfast and closely monitored by the investigators every day. In addition, research participants could consume other fruits with a similar composition to bananas from day 2 to day 6 intervention. The daily food proportion in this study is based on the Indonesian diabetes diet, contained 55% carbohydrates (mixed brown and white rice), 25% protein and 20% fat from tofu, egg, meat and mixed vegetables. The source of fresh fruits (papaya and orange) was based on their availability in the local market and they were consumed with a similar amount to bananas. The amount of vegetable consumption was based on the American Diabetes Recommendation.

### Intervention Type

Behavioural

### Primary outcome(s)

Measured on days 1 and 7:

1. Fasting blood glucose level was measured using the hexokinase method
2. One hour postprandial blood glucose level was measured using the same method
3. Fasting DPP4 activity was determined using a colorimetric assay with a synthetic Gly-Pro-p nitroanilide substrate
4. One hour postprandial DPP4 activity was determined using the same assay with a synthetic Gly-Pro-p nitroanilide substrate

### Key secondary outcome(s)

1. Basic characteristics including age, gender, marital status, education, job, food allergy, duration of type 2 diabetes illness, and type of oral antidiabetic drugs. These data were collected using open questionnaires consisting of short questions and performed one week before the research commenced.
2. Nutritional Intake (macro- and micronutrients) was collected using a 24-hour food recall questionnaire on days 1 and 7 and converted into daily intake values of macro- and micronutrients using the free nutrisurvey software (<https://www.nutrisurvey.de>), which has been translated into the Indonesian language

### Completion date

14/11/2017

## Eligibility

### Key inclusion criteria

1. Diagnosed with T2DM
2. Aged 45–65 years old
3. Able to ingest fresh fruits

### Participant type(s)

Patient

### Healthy volunteers allowed

No

### Age group

Adult

### Sex

All

### Total final enrolment

36

### Key exclusion criteria

1. Taking DPP4 inhibitors (sitagliptin, vildagliptin, and similar drugs)
2. Patients with comorbidities such as heart, renal, and hepatic diseases

### Date of first enrolment

23/07/2017

### Date of final enrolment

01/10/2017

## Locations

### Countries of recruitment

Indonesia

### Study participating centre

**Health Clinics Griya Husada 2**

Suruh Kalong RT 01/RW 07

Pandeyan

Tasikmadu District

Karanganyar Regency

Indonesia

57722

**Study participating centre**  
**Health Clinics Amal Sehat**  
Wirorejan RT 02/RW 07  
Ngadirejo  
Kartasura District  
Sukoharjo Regency  
Indonesia  
57163

## Sponsor information

**Organisation**  
Sebelas Maret University

**ROR**  
<https://ror.org/021hq5q33>

## Funder(s)

**Funder type**  
Government

**Funder Name**  
Ministry of Education, Culture, Research, and Technology (Kementrian Pendidikan, Kebudayaan, Riset dan Teknologi (Kemendikbudristek), Republik Indonesia

## Results and Publications

### Individual participant data (IPD) sharing plan

Patient data are kept confidential. Therefore, data requests need to be sent to Dono Indarto ([dono@staff.uns.ac.id](mailto:dono@staff.uns.ac.id)) and the Research Ethical Committee, Faculty of Medicine, Universitas Sebelas Maret/Public Hospital Dr Moewardi, Surakarta.

### IPD sharing plan summary

Available on request

### Study outputs

| Output type                     | Details | Date created | Date added | Peer reviewed? | Patient-facing? |
|---------------------------------|---------|--------------|------------|----------------|-----------------|
| <a href="#">Results article</a> |         | 27/09/2022   | 20/12/2022 | Yes            | No              |