Artikel Penelitian

# Implementation of Processed Sago (Kapurung) on Diabetes Mellitus Type 2 Patients

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## Abstrak

**Pendahuluan:** Diabetes Mellitus (DM) merupakan penyakit metabolik kronis yang disebabkan kegagalan pankreas memproduksi insulin yang mencukupi atau tubuh yang tidak dapat menggunakan insulin secara efektif yang telah diproduksi. DM tipe 2 dikaitkan dengan kebiasaan gaya hidup, maka dari itu diperlukan pola hidup sehat seperti mengkonsumsi pangan Indeks Glikemik (IG) rendah. Sagu merupakan salah satu pangan yang memiliki indeks glikemik rendah yang dapat menurunkan respons glukosa darah. Penelitian ini bertujuan untuk mengetahui penerapan pemberian olahan sagu (Kapurung) terhadap penderita diabetes melitus (DM) tipe 2. **Metode:** Desain penelitian menggunakan metode deskriptif, pendekatan studi kasus yang dilakukan pada empat responden dengan kriteria inklusi penderita DM tipe 2, berjenis kelamin perempuan, berusia 21-45 tahun, sebagai sampel penelitian. **Hasil:** Hasil penelitian menunjukkan kadar gula darah puasa pada responden pertama (R1) 187 mg/dL, responden kedua (R2) 116 mg/dL, responden ketiga (R3) 237 mg/dL, responden keempat (R4) dan setelah 2 jam mengkonsumsi olahan sagu kadar gula darah responden pertama (R1) menjadi 198 mg/dL, responden kedua (R2) 96 mg/dL, responden ketiga (R3) 282 mg/dL, responden 4 (R4) 267 mg/dL. **Simpulan:** Penderita diabetes melitus tipe 2 mengalami perubahan kadar gula darah setelah diberikan olahan sagu, 3 responden mengalami peningkatan kadar gula darah dan 1 responden mengalami penurunan kadar gula darah.

**Kata kunci**: Diabetes Melitus, Kadar Gula Darah, Olahan Sagu

## *Abstract*

***Introduction**: Diabetes mellitus (DM) is a chronic metabolic condition characterized by either the pancreas' failure to make enough insulin or the body's inability to adequately use the insulin that is produced. Diabetes type 2 is linked to lifestyle patterns, emphasizing the importance of leading a healthy lifestyle, such as eating meals with a low Glycemic Index. Sago is one of the foods with a low glycemic index that can help lower blood glucose levels. The purpose of this study is to know implementation of processed sago (Kapurung) on diabetes mellitus type 2 patients **Methods**: The research methodology employed a descriptive method, with a case study approach conducted on four respondents who met the inclusion criteria of type 2 diabetes patients, female gender, aged 21-45 years. **Results**: The results showed that the first respondent (R1) had fasting blood sugar levels of 187 mg/dL, the second respondent (R2) had 116 mg/dL, the third respondent (R3) had 237 mg/dL, and the fourth respondent (R4) had 267 mg/dL after two hours of consuming processed sago. **Conclusion**: Patients with type 2 diabetes mellitus experienced changes in blood sugar levels after being administered processed sago; three responders had an increase in blood sugar levels, while one had a decrease.*
***Keywords**: Sago, Kapurung, Diabetes Mellitus, Blood Sugar*

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## INTRODUCTION

Diabetes Mellitus (DM) is a chronic metabolic condition characterized by the pancreas' failure to produce enough insulin or the body's inability to adequately use the insulin that is produced. Uncontrolled diabetes causes high blood sugar, or hyperglycemia, which can cause nerve and blood vessel damage over time (1).

DM is categorized into numerous forms, including diabetes mellitus type 1, which occurs owing to damage to pancreatic beta cells, which can induce extreme insulin insufficiency. The reasons of this beta cell destruction include autoimmune and idiopathic. The next form is diabetes type 2, which is caused by insulin resistance. The source of this insulin resistance is unknown, but several variables contribute, including obesity, a lack of exercise, a low carbohydrate and high fat diet, and inherited factors. Then there is gestational diabetes, which is diabetes that develops during pregnancy, and then there's another type of diabetes with a wide range of causes, including hereditary impacts on beta cell activity, genetic disorders, and others (2).

The number of DM patients is increasing year after year, particularly type 2 DM, which is increasingly related with lifestyle choices; thus, additional DM treatment is required. Diabetes treatment can begin with a healthy lifestyle, such as medical nutrition therapy

and physical activity, followed by the administration of antihyperglycemic medications orally or via injection (3).

The most straightforward treatment for DM patients is to change their diet, such as eating foods with a low Glycemic Index (GI). The GI is a meal quality measure that can be seen by increasing a person's blood glucose. Food GI levels are classified into three groups: low (IG < 55), medium (55-70), and high (IG > 70). Rice has a high GI (80), which shows that DM patients are not suggested to consume rice (4).

As a result, other foods are required to substitute rice, such as sago flour, which has a glycemic index of 28, which is considered low because it is less than 55. Apart from that, sago flour is a rather significant source of carbs (84.7 grams), with 14% water content. 3.96-5.96% dietary fiber can help regulate body weight and blood sugar levels (5). The fiber content in the digestive tract can inhibit the pace of food and reduce enzyme activity, resulting in a slower digestive process, particularly the blood glucose response, and slower starch absorption (6). The purpose of the research is to know implementation of processed sago (Kapurung) on patients of diabetes mellitus type 2.

## METHOD

This is descriptive research using a case study approach. A case study is a strategy and approach for evaluating in detail cases that occur from a bound system based on a comprehensive data gathering system (7). The case study approach was used to observe the results obtained by evaluating respondents' fasting blood sugar levels and after 2 hours (*Post Prandial Hyperglycemia*) of consuming processed sago (Kapurung: South Sulawesi dish on a sago basis). Respondents were given 75 grams of processed sago at once.

The respondents in this study were residents of the Pasundan Health Center working area, and four people suffering from type 2 diabetes with the following inclusion criteria: (1) Willing to be a respondent; (2) The patient has type 2 diabetes; (3) Female; (4) Aged 21-45 years; (5) Respondent is a patient at the Pasundan Community Health Center; (6) Cooperative and communicative; and the exclusion criteria: (1) People with type 2 diabetes who also have comorbidities. Ethical Clereance number: No. 161/KEPK/FK/VII/2024

## RESULTS

Respondent characteristics are provided in the following table format:

Table 1. Respondent Characteristics

| | R1 | R2 | R3 | R4 |
|---|---|---|---|---|
| Age | 35 years | 45 years | 45 years | 31 years |
| Job | House Wife | Businessmen | Businessmen | Teacher |
| HoD | 2 years | 1 year | 3 years | 1,6 years |
| BMI | 30,59 | 24,99 | 29,41 | 31,65 |
| BMI Result | Obesity 2 | Ideal | Obesity 1 | Obesity2 |

*Info: R1=Responden 1, R2=Responden 2, R3=Responden 3, R4=Responden 4. HoD: History of Disease. BMI: Body Mass Index

According to the characteristics of the respondents, three out of four have a BMI (Body Mass Index) over normal, meaning they are over 25 and under 45 years old.

Tabel 2. Blood Sugar Levels Before and After Consuming Processed Sago

| | Measurement outcomes | | | |
|---|---|---|---|---|
| | Before | Information | After | Information |
| R1 | 187 mg/dL | High | 198 mg/dL | High |
| R2 | 116 mg/dL | Normal | 96 mg/dL | Normal |
| R3 | 237 mg/dL | High | 282 mg/dL | High |
| R4 | 244 mg/dL | High | 267 mg/dL | High |

Table 2 demonstrates that almost all of the respondents' fasting blood sugar was over normal, meaning greater than 130 mg/dl; only one respondent had normal fasting blood sugar.

Table 3. Difference in blood sugar of respondents before and after giving processed sago.

| | Measurement outcomes | | Difference | Info |
|---|---|---|---|---|
| | Before | After | | |
| R1 | 187 mg/Dl | 198 mg/dL | 11 mg/dL | Increase |
| R2 | 116 mg/dL | 96 mg/dL | 20 mg/dL | Decrease |
| R3 | 237 mg/dL | 282 mg/dL | 45 mg/dL | Increase |
| R4 | 244 mg/dL | 267 mg/dL | 23 mg/dL | Increase |

Table 3 shows that respondent two (R2) had lower blood sugar levels after consuming processed sago, but respondent one (R1), respondent three (R2), and respondent four (R4) had higher blood sugar levels.

## DISCUSSION

The features of the respondents show that the majority have a BMI (Body Mass Index) that is higher than normal. According to short interviews performed by researchers with respondents, respondents rarely engage in physical activities such as exercise and do not maintain a balanced diet, instead consuming sweet drinks, canned goods, and fast food. This is consistent with the risk factors for DM, which are obesity and lack of physical activity (8).

Obese or overweight people's leptin levels will rise. Leptin is a hormone that is associated with obesity genes. Leptin levels influence body fat levels, the ability to burn fat for energy, and satiety via the peripheral and central neural systems. Leptin suppresses the phosphorylation of insulin receptor substrate-1 (IRS), which limits glucose absorption, causing blood sugar levels to increase (9). Obesity frequently happens when sufferers engage in little physical activity, do not exercise, and do not eat a nutritious diet. Diabetes must be treated immediately; otherwise, it can lead to complications and even death.

The study's findings revealed that almost all of the respondents' fasting blood sugar levels were higher than usual, at more than 130 mg/dl; only one respondent had normal fasting blood sugar. Respondent 2 (R2)'s blood sugar levels decreased after being given processed sago; this could be caused by the content of sago, which has quite high complex carbohydrates, namely 84.70 grams, high dietary fibre of 3.69-5.96%, and the index low glycemic, namely 28, where these ingredients will help control blood sugar in the body and help slow down glucose absorption in the small intestine so that fluctuations in blood sugar levels are relatively small (5). Aside from that, the fibre content in sago can inhibit the rate of food and delay enzyme activity, resulting in a slower digestive process, particularly the blood glucose response, and slower starch absorption (6).

The findings of respondent two (R2) are corroborated by Hariyanto's (2017) research on prediabetic respondents, which discovered that around 65% of respondents reported a decrease in blood sugar levels and approximately 35% experienced an increase in blood sugar levels (4). This is possible due to a variety of processes that reduce blood sugar levels, including absorption barriers, enhanced insulin sensitivity, and higher Glut activity.

Respondents one (R1), three (R3), and four (R4) discovered that the findings of measuring blood sugar levels had improved. This is possible because food intake is not the only element that can affect blood sugar levels in the body; there are several others. Other factors that differ from person to person include family history, BMI, physical activity, and syndromes before and after menopause. (8).

Obesity is a risk factor for diabetes; people who are obese consume an excessive number of calories. Obesity is defined by a higher BMI (Body Mass Index) than usual. The pancreatic gland's beta cells will get tired, rendering them incapable of producing enough insulin to compensate for excessive calorie intake. As a result, blood glucose levels will increase, resulting in diabetes type 2 (10).

Physical activity can help regulate blood sugar levels since it converts glucose into

energy. Physical activity also increases insulin, which lowers blood sugar levels. Food molecules that enter the body are not burned in persons who rarely exercise; instead, they are stored as fat and sugar, which might raise blood sugar levels (11). Limitation of study is participants were only administered processed sago once during the study. We hope for future studies are expected to employ a bigger sample size, treat recurrent patients, and adopt a bivariate study approach.

## CONCLUSION

Diabetes mellitus type 2 patients in the Pasundan health centre working area saw changes in blood sugar levels after being given processed sago; three respondents experienced an increase in blood sugar levels, while one experienced a decrease.

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