

## **ANALYSIS OF CHARACTERISTICS, FREQUENCY OF EATING FRUIT AND VEGETABLES IN DIABETES AND NON DIABETES PATIENT**

*(Analisis Karakteristik dan Frekuensi Konsumsi Buah dan Sayur pada Penderita Diabetes dan Non Diabetes)*

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### **ABSTRACT**

Background: Fruits and vegetables are foods that are recommended for consumption by people to prevent diabetes mellitus because they are low in sugar and have fibre that can bind sugar. The consumption pattern of fruits and vegetables consumed by DM patients and non-DM sufferers is an important thing to know. Objective: to determine the characteristics and frequency of eating fruits and vegetables in diabetics and non-diabetics. Method: The study used a cross-sectional design which was conducted in Belawan I Village, Deli Serdang Regency from August to December 2019. The number of samples in this study was 90 people who were selected by purposive sampling. This research is a research by conducting direct interviews with the community but using the Riskesdas 2018 questionnaire. Result: This study indicates that DM sufferers tend to consume 2-3 servings of vegetables per day, but many DM sufferers still do not consume fruit every day. People who do not have diabetes tend to consume 2-3 servings of vegetables per day and consume 2-3 servings of fruit per day. People who do not eat fruit are at 8,094 times the risk of suffering from diabetes mellitus compared to respondents who eat fruit (2-3 servings/day). Fruit consumption is an important factor in reducing the risk of diabetes mellitus.

Keywords: Fruit, Diabetes Mellitus, Characteristics, Consumption

### **ABSTRAK**

*Latar belakang: Buah dan sayur merupakan makanan yang dianjurkan untuk dikonsumsi oleh masyarakat untuk mencegah penyakit diabetes melitus (DM) karena rendah gula dan dapat mengikat gula. Pola konsumsi buah dan sayur yang dikonsumsi oleh penderita DM maupun non DM merupakan hal yang penting untuk diketahui. Tujuan: Untuk mengetahui karakteristik dan frekuensi makan buah dan sayur pada penderita DM dan non DM. Metode : Penelitian menggunakan desain potong lintang yang dilaksanakan di Desa Belawan I Kabupaten Deli Serdang pada bulan Agustus sampai Desember 2019. Jumlah sampel dalam penelitian ini adalah 90 orang yang dipilih secara purposive sampling. Penelitian ini merupakan penelitian dengan melakukan wawancara langsung dengan masyarakat namun menggunakan kuesioner Riskesdas 2018. Hasil: Penelitian ini menunjukkan bahwa penderita DM cenderung mengkonsumsi sayur-sayuran sebanyak 2-3 porsi per hari, namun masih banyak penderita DM yang tidak mengkonsumsi buah setiap hari. Orang yang tidak mengidap diabetes cenderung mengonsumsi 2-3 porsi sayur per hari dan mengonsumsi 2-3 porsi buah per hari. Orang yang tidak makan buah berisiko 8.094 kali menderita diabetes mellitus dibandingkan dengan responden yang makan buah (2-3 porsi/hari). Konsumsi buah merupakan faktor penting dalam mengurangi risiko diabetes mellitus.*

*Kata Kunci : Buah, Diabetes Mellitus, Karakteristik, Konsumsi*

## INTRODUCTION

The number of people with Diabetes Mellitus (DM) continues to increase, in 2015 there were 415 million people with Diabetes Mellitus (DM), and it is estimated that it will continue to increase until 2040 to 642 million people. DM results in various complications that contribute to an increase in deaths in developing countries compared to developed countries (WHO, 2016). Communities in Southeast Asia and the West Pacific are estimated to account for half the DM cases in the world (WHO, 2018).

Changes in people's lifestyles can cause the increase people with DM in Indonesia, namely lack of exercise and poor consumption patterns, similar to what has happened in several other countries in the world (Sluik D et al, 2014). The third highest mortality rate in Indonesia is caused by DM with complications. Indonesia has experienced an increase in cases of DM from 2007 of 5.7% to 6.9% in 2016. The increase in DM cases continues; in 2013, there were DM cases, namely 1.3% to 1.5% in 2018 DM cases; this increase shows that this disease is increasingly being found in the community (Kementrian Kesehatan RI, 2018).

The 2013 Riskesdas data shows that North Sumatra Province has a prevalence of diabetes mellitus with complications of 1.8% and the proportion of diabetes mellitus sufferers with complications of 2.3%. Furthermore, the prevalence of diabetes mellitus in North Sumatra Province based on interviews with doctors and symptoms was 2.3%, where this number increased compared to the 2007 survey which was 1.21%, while the number of diabetes mellitus sufferers in Medan City diagnosed with doctors and

symptoms was equal to 2.7% (Kementrian Kesehatan RI, 2018).

One of the factors that trigger DM is consuming foods high in glucose. Foods that are high in glucose are foods with a high Glycemic Index (GI). Blood sugar levels will rise fast when consuming foods with a high Glycemic Index (GI) while consuming foods with a low Glycemic Index (GI) does not increase blood sugar levels. DM tends to increase the risk if you often consume foods with a high Glycemic Index (GI) (Marine, 2015).

Consumption of foods and drinks that contain high glucose will increase the risk of DM; this is inseparable from an increase in glucose concentrations in the blood (Betteng, 2014). In patients with diabetes mellitus, it is hoped that they can control blood glucose levels by paying attention to the consumption of foods that contain high sugar levels (Soviana, 2020).

DM sufferers are advised to pay attention to their carbohydrates, protein, fat, and fibre intake because they are important in controlling blood glucose levels. However, it turns out that people with diabetes mellitus have implemented a diet program who are still unable to control blood glucose properly so that their daily levels remain high (Hidayati, 2017). The schedule of eating meals becomes an important thing to pay attention to maintain blood glucose.

Fruit extract can reduce blood glucose levels in rats induced by diabetes mellitus. The most significant decrease occurred in the glibenclamide group, followed by ABS 2 and ABS 1 (Afifah, 2015).

The results Wang (2015) study show that consuming less consuming

sugar-sweetened beverages (SSBs) has a 1.3 times lower risk than someone who consumes more SSBs. Murti (2016) research results show that someone who consumes foods with a high glucose content will increase the risk of developing DM by 3.9 times compared to someone who consumes foods with a lower glucose content. Consumption of foods containing fiber in vegetables and fruit will have an impact on blood sugar levels (Fahrian, 2018). The purpose of this study was to see analysis of characteristics, frequency of fruit and vegetables consumption diabetes and non diabetes patient.

## METHOD

This research is quantitative and is an analytical study with a cross-sectional research design, where all the variables studied were collected at the same time. This research was conducted from July to December 2019 in Belawan I Village, Deli Serdang Regency, North Sumatra Province.

This study's population were the people of Belawan I Village, Deli Serdang Regency, North Sumatra Province. The minimum sample is calculated using the hypothesis formula for two sides so that a minimum sample size of 90 people is obtained. using purposive non-random sampling. In this study, the inclusion criteria were willing to be interviewed, domicile in Belawan I Village, Deli Serdang Regency for the last six months, aged more than 17 years old, not senile or still having a good memory willing to be interviewed.

The variables in this study were gender (male and female), aged (41-65 years and 18-40 years), an education level (low if a junior high and primary school, high if high school and

university), employment status (working and not working), fruit consumption (consume 2-3 fruits per day and not consume fruit every day) and vegetable consumption (consume 2-3 servings of vegetables per day and not consume vegetables every day). Primary data collection was carried out by conducting interviews with dietary consumption patterns and vegetable consumption patterns were asked using a questionnaire from Riskesdas in 2018. Data for the incidence of Diabetes Mellitus (DM), questions were asked based on the recognition of respondents who adopted the 2018 Riskesdas questionnaire. Secondary data was carried out by obtaining characteristic data from Belawan I Village, Puskesmas and BPS data. Percut Sei Tuan District. This study's dependent variable was the incidence of Diabetes Mellitus (DM), while the independent variable in this study was eating fruits and vegetables every day.

Data analysis consisted of univariate and bivariate. Univariate analysis was carried out to see an overview of the frequency distribution and proportion of the independent and dependent variables. Bivariate analysis was carried out to determine the relationship between independent and dependent variables by using Fisher's exact test, if  $p < 0.05$ , there was a correlation between fruit and vegetable consumption and the incidence of DM. researchers also conducted a prevalent ratio test (PR) to see the risk factors for DM sufferers and not DM.

## RESULTS AND DISCUSSION

This research was conducted on 90 people in Belawan I Village, Deli Serdang Regency to see the consumption patterns of fruits and vegetables and the incidence of DM in the coastal area of Deli Serdang

Regency. The incidence of DM can be seen from the respondent's recognition when conducting interviews using a questionnaire.

The table above shows that the respondents have 61 female sex (67.8%). Most of them were 41-64 years old as many as 53 people (58.8%). Most education was in the low education level category as many as 48 people (53.3%). Many respondents have a work status of 54 people (60%).

Based on the table 1, respondents who consume fruit (2-3 servings/day)

are 82%) while respondents who do not consume fruit are 18%. Respondents who consumed vegetables (1-3 servings) were 96%, and respondents who did not consume vegetables were 4%. Based on the table above, it was known that respondents who suffer from DM in coastal communities are as much as 82% and for respondents who stated that they do not suffer from DM as much as 16%.

Table 1. Frequency Distribution of Characteristics and Fruit and Vegetable Consumption Patterns of Coastal Communities.

Variable	f	%
<i>Sex</i>		
Male	29	32,2
Female	61	67,8
<i>Age</i>		
41-65 Years Old	53	58,8
18-40 Years Old	37	41,2
<i>Level Education</i>		
Low	48	53,3
High	42	46,7
<i>Worker</i>		
Work	54	60
Not Work	36	40
<i>Consume Fruit (Servings/Day)</i>		
ConsumeFruit (2-3 servings/day)	74	82
NotConsumeFruit	16	18
<i>Consume Vegetables (Servings/Day)</i>		
Consume Vegetable (2-3 servings/day)	86	96
Not Consume Vegetable	4	4
<i>Diabete Melitus Patient</i>		
Not Diabete Melitus	79	18
Diabete Melitus	11	82
<b>Total</b>	<b>90</b>	<b>100</b>

Based on the table 2, it is known that the respondents who do not work and suffer from DM are two people (5.6%), while those who do not suffer from DM are 34 people (94.4%). Furthermore, respondents who

work and suffer from DM are nine people (16.7%), while those who do not suffer from DM are 45 people (83.3%). The statistical test results showed the PR value = 1.133, which means that respondents who work

have a risk of suffering from DM 1,133 times compared to respondents who do not work.

Based on the table above, it is known that respondents with adult age (18-40 years) who suffer from DM are 0 people (0%), while those who do not suffer from DM are 37 people (100%). Furthermore, 11 respondents with old age (41-65 years) suffering from DM (20. 8%), meanwhile, 42 people (79. 2%) who did not suffer from DM. The statistical test results showed the value of PR = 1. 262, which means that respondents with old age had a greater risk of suffering from DM 1,262 times compared to respondents with adult age.

Based on the table above, it is known that respondents who consumed fruit (2-3 servings/day) and suffered from DM were four people (5. 4%), while those who did not suffer from DM were 19 people (94. 6%). Furthermore, seven respondents (43. 8%) did not eat fruit and suffered from DM , 9 (56. 2%) did not suffer from DM.

The statistical test result of the exact fisher test showed the value of  $p = 0.0001$ , which means that fruit consumption is related to DM. The statistical test results showed the value of PR = 8,094, which means that respondents who do not consume fruit have 18,094 times the risk of suffering from DM compared to respondents who eat fruit (2-3 servings/day).

Based on the table above, it is known that respondents who consume vegetables (1-3 servings/day) and suffer from DM are ten people (11. 6%), while those who do not suffer from DM are 76 people (88. 4%). Furthermore, respondents who do not eat vegetables and suffer from DM are one person (25%), while those who do not suffer from DM are three (75%). The statistical test results of exact fisher test showed  $p\text{-value} = 0.412$ , which means that vegetable consumption is not associated with the incidence of DM.

Table 2. Analysis of the Characteristics and Patterns of Fruit Consumption on the Risk of DM

Variable	Diabetes Melitus Patient				n	p value	PR
	Yes		No				
	n	%	n	%			
<i>Worker</i>							
Work	2	5. 6	34	94. 4	36	0. 189	1. 133
Not Work	9	16. 7	45	83. 3	54		
<i>Age</i>							
41-65 Years Old	0	0	37	100	37	0. 002*	1. 262
18-40 Years Old	11	20. 8	42	79. 2	53		
<i>Consume Fruit (serving/day)</i>							
Consume Fruit (2-3 servings/day)	4	5. 4	70	94. 6	74	0. 0001*	8. 094
Not ConsumeFruit	7	43. 8	9	56. 2	16		
<i>Consume Vegetable (serving/day)</i>							
Consume Vegetable (2-3 servings/day)	10	11. 6	76	88. 4	86		-
Not Consume Vegetable	1	25	3	75	4	0. 412	

\*significant

Consumption of fruits and vegetables is an activity or individual activity to fulfil the need for fruits and vegetables to fulfil nutritional adequacy (Sari, 2018). Many people do not regularly consume fruits and vegetables, especially those with low socio-economic conditions. (Fatimah, 2020). Consumption of vegetables and fruits will play a role in maintaining blood pressure, levels of blood sugar and cholesterol become normal (Kementerian Kesehatan RI, 2017).

Adequacy of fruit and vegetable consumption is calculated based on the average frequency and portion of fruit and vegetable intake in a day for a week. The portion of fruit consumed by respondents can be said to be not good enough when seen from WHO standards, namely WHO recommends consuming 150 grams of fruit (equivalent to three Ambon bananas, one slice of papaya or three medium-sized oranges). According Huaidong (2017) that consumption of fruits and vegetables should be consumed for people with DM for one week as much as  $\geq$  three days.

This study indicates that respondents who do not eat fruit and suffer from DM are seven people (43.8%) and have 18,094 times the risk of suffering from DM compared to respondents who eat fruit (2-3 servings/day). The statistical test showed the value of PR = 8,094, which means that respondents who do not consume fruit have 18,094 times the risk of suffering from DM than respondents who eat fruit (2-3 servings/day).

Based research Nurohmi (2017) shows that the result that consumption of vegetables and fruit has a relationship to increased blood sugar levels, the value of  $p = 0.037$  is

smaller than 0.05. Bhattacharjee (2015) research shows that respondents who consume fruits and vegetables regularly every day have a 2.91 times lower risk of developing type 2 diabetes than respondents who consume fruits and vegetables irregularly every day

The results of Kistianita (2017) study show that people who consume less fruit tend to have a higher risk of developing DM than respondents who consume enough fruit. Consumption of fruits and vegetables will impact the risk of DM; the fibre content in fruits and vegetables will also reduce DM (Amirudin, 2015).

Liu, et al (2016) research results show that the pectin in oranges can affect fasting blood glucose, reduce insulin resistance, and increase glucose tolerance and liver glycogen levels in mice with DM.

Fruits are a natural source of various natural multivitamins that the body needs. Various fruits contain citric acid, which has a good impact on the body. Citrus fruit is widely consuming after mangoes, tomatoes, and bananas; citrus fruits contain vitamins (including vitamin C/ascorbic acid), minerals, dietary fibre, and pectin. Flavanones in oranges are hesperidin, eriocitrin naringin, The results of research Jayaraman, et al (2018) show that hesperidin can lower blood sugar, and increase plasma insulin and streptozotocin-induced rat glycogen.

Vitamin C is an antioxidant that plays an important role in protecting free radical damage. Vitamin C is structurally similar to glucose and can replace it in many chemical reactions making it effective for preventing non-enzymatic glycosylation in DM patients. As an antioxidant, Vitamin C has a beneficial effect on  $\beta$  cell

function, affecting insulin sensitivity and reducing blood glucose levels by reducing glucose toxicity and preventing a decrease in  $\beta$  cell mass.

The DM prevention program (Diabetes Prevention Pro-gram/DPP) suggests that controlling DM can reduce food and reduce body weight and increase fibre consumption (Wu, 2015). Dietary fibre is known to affect the use of glucose in the body. This dietary fibre intake can be obtained from vegetable products, especially vegetables and fruit (Nurohmi, 2017)

Regular consumption of fruits and vegetables can reduce the risk of developing DM. Vegetables that have high fibre content can reduce insulin resistance in the human body. The fibre in vegetables will also make the stomach full because fibre can reduce hunger and fibre can also slow down glucose uptake in the blood. Consumption of vegetables with high fibre and the low glycemic index will be very effective in lowering blood sugar levels in type 2 DM patients, vegetables such as those found in nuts, grapes, cereals and potatoes.

## CONCLUSION

Diet regulation, especially fibre consumption, will help control blood glucose. People with diabetes are encouraged to consume various foods that contain fibre, which is abundant in fruits and vegetables. Dietary fibre found in fruits and vegetables can absorb water and bind glucose, thereby reducing glucose availability. Consumption of adequate amounts of fibre will provide many benefits for the body; one of the benefits obtained is the metabolic benefits of controlling blood sugar.

DM sufferers tend to consume 2-3 servings of vegetables per day, but many DM sufferers still do not

consume fruit every day. People who do not have diabetes tend to consume 2-3 servings of vegetables per day and consume 2-3 servings of fruit per day. People who do not eat fruit are at 8,094 times the risk of suffering from diabetes mellitus compared to respondents who eat fruit (2-3 servings/day). Fruit consumption is an important factor in reducing the risk of diabetes mellitus.

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